APM Conceptual Design and Cost Estimate Update Deep Geological Repository in Crystalline Rock

NWMO Input to Cost Estimate

APM-REP-00440-0009 October 2011

Nuclear Waste Management Organization

nwmo
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EXECUTIVE SUMMARY

The Nuclear Waste Management Organization (NWMO) is implementing Adaptive Phased Management (APM), Canada's plan for the long-term management of its used nuclear fuel. The APM approach includes centralized containment and isolation of used nuclear fuel in a deep geological repository constructed within a suitable host rock formation such as crystalline rock or sedimentary rock. APM also includes a used fuel transportation system.

From 2009 to 2011, NWMO and SNC-Lavalin updated the previous conceptual design and cost estimate for the APM deep geological repository (DGR) in crystalline rock prepared by CTECH and for the APM used fuel transportation system prepared by Cogema. The cost estimating activities for the APM update were allocated as follows:

1. NWMO was responsible for estimating APM costs for siting, design development, safety assessment, licensing, approvals, program management and related support to APM facility construction, operation decommissioning and closure.

2. SNC-Lavalin was responsible for estimating APM costs for final design, construction, operation, extended monitoring, decommissioning and closure of the APM facility and for the used fuel transportation system.

Two used nuclear fuel inventory scenarios are considered in the APM cost analysis for long-term management. The Base Case assumes 3.6 million used CANDU fuel bundles and the Alternate Case assumes 7.2 million used CANDU fuel bundles.

Methodology

For each case (identified as '560' for the Base Case, and '561' for the Alternate Case), the scope of the APM project was systematically divided into separate areas of effort to create a project Work Breakdown Structure (WBS). Many of these work areas were subsequently broken down into sub-tasks of increasing detail to allow formulation of reasonable cost and schedule estimates.

The Level 2 WBS for NWMO's input to the APM cost estimate is identified as:

- 05 - Building Relationships
- 10 - Adapting to Change
- 15 - Siting
- 20 - Design Development & Safety Case
- 25 - Research & Confidence Building
- 30 - Site Verification & Licence Support
- 90 - Common Services

Each of the evaluated work elements from the WBS was assessed in terms of required internal labour, material and equipment, other and allowances. The WBS components are scheduled in project years. Year 1 is 2010. Estimated costs are stated in constant 2010 Canadian dollars.

Microsoft Excel workbooks were used to collect, consolidate and report the NWMO's portion of the APM cost estimate. Separate workbooks were created for case 560 and 561.

APM Implementation Schedule

For financial planning purposes, the overall schedule for implementing APM is illustrated below for the Base Case used fuel scenario with 3.6 million used fuel bundles:

		Illustrative APM Implementation Schedule	
Calendar Year	**Year**	**Major Activities and Assumptions for Financial Planning & Work Program**	
2007		Government Decision	
2008		**develop Siting Process**	
2009			
2010	Y01	Initial screening of communities Feasibility studies in potential sites Prelim field investigations	Initiate siting process; outreach activities Briefings & resources for communities Third-party reviews
2011	Y02		
2012	Y03		
2013	Y04		
2014	Y05	Surface & subsurface investigations in candidate sites Design & safety assessment work Select preferred site	Engage potentially affected communities Socio-economic impact assessments Detailed site investigations in collaboration with communities; discussion of benefits Negotiate terms & conditions for agreement
2015	Y06		
2016	Y07		
2017	Y08		
2018	Y09		
2019	Y10	Apply for Site Prep & Construction Licence Finalize site-specific design & safety assessment work for EA & licence	NWMO & community ratify formal agreement to host facility Benefits to host community
2020	Y11		
2021	Y12		
2022	Y13	Submit EIS & licensing documents Obtain Site Preparation & Underground Demo Facility Licence	Establish centre of expertise (surface), in partnership with community Participant support to EA process
2023	Y14		
2024	Y15		
2025	Y16	Construct Underground Demo Facility Begin site-specific demonstrations of repository technology Final design & safety assessment Obtain DGR Construction Licence	Establish centre of expertise (underground) Community offsets & benefits Socio-economic impact monitoring
2026	Y17		
2027	Y18		
2028	Y19		
2029	Y20		
2030	Y21	Apply for Operating Licence Construct initial components of DGR Obtain Operating Licence	Centre of expertise (surface / underground) Community offsets & benefits Socio-economic impact monitoring
2031	Y22		
2032	Y23		
2033	Y24		
2034	Y25		
2035	Y26	**begin APM DGR operation**	
…	…	…	…
…	…	…	…
2064	Y55	**end APM DGR operation**	
2065	Y56	**begin Extended Monitoring**	
…	…	…	…
…	…	…	…
2134	Y125	**end Extended Monitoring**	
2135	Y126	**begin Decommissioning & Closure**	
…	…	…	…
…	…	…	…
2159	Y150	**end Decommissioning & Closure**	
2160	Y151	**begin Postclosure Monitoring**	

The Alternate Case extends the end of APM DGR operations to Y85 with all subsequent dates pushed by 30 years into the future.

Estimated APM Costs

Estimates have been prepared for labour, materials and equipment, other costs and contingency.

Subject to the inclusions, exclusions, assumptions and limitations presented in the report, the estimated cost of the NWMO input to the APM cost estimate for a DGR is (in 2010 $):

- Base Case (3.6 million used CANDU fuel bundles): $2.94 billion; and
- Alternate Case (7.2 million used CANDU fuel bundles): $3.68 billion

Costs by APM implementation phase for the Base Case were estimated as follows:

NWMO Input to APM Cost Estimate - Base Case (3.6 million fuel bundles)

APM Implementation Phase	Cost (2010K$)
Siting (Years 1-9)	$766,875
Construction Licence Application (Years 10-15)	$500,721
Construction UDF(Years 16-20)	$274,246
Construction DGR (Years 21-25)	$268,041
DGR Operations (Years 26-55)	$473,524
Extended Monitoring (Years 56-125)	$446,239
Decommissioning (Years 126-150)	$139,072
Postclosure Monitoring (Years 151+)	$67,969
Total Cost	**$2,936,687**

Costs by APM implementation phase for the Alternate Case were estimated as follows:

NWMO Input to APM Cost Estimate - Alternate Case (7.2 million fuel bundles)

APM Implementation Phase	Cost (2010K$)
Siting (Years 1-9)	$956,796
Construction Licence Application (Years 10-15)	$511,041
Construction UDF(Years 16-20)	$279,617
Construction DGR (Years 21-25)	$272,161
DGR Operations (Years 26-85)	$957,503
Extended Monitoring (Years 86-155)	$480,475
Decommissioning (Years 156-180)	$158,532
Postclosure Monitoring (Years 181+)	$67,969
Total Cost	**$3,684,094**

TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY ..... **v**

1. INTRODUCTION **1**

1.1 PURPOSE OF COST ESTIMATE **2**
1.2 COST ESTIMATING ASSUMPTIONS **2**
1.3 LEVEL OF COST ESTIMATION **6**

2. OVERVIEW OF APM WORK PROGRAM **7**

2.1 OVERVIEW **7**
2.2 WORK BREAKDOWN STRUCTURE **7**
2.2.1 560-05, Building Relationships 9
2.2.2 560-10, Adapting to Change 9
2.2.3 560-15, Siting 9
2.2.4 560-20, Design Development & Safety Case 9
2.2.5 560-25, Confidence Building 10
2.2.6 560-30, Site Verification & Licence Support 10
2.2.7 560-40, Facility Design & Construction (SNC-Lavalin) 11
2.2.8 560-45, Facility Operation including Extended Monitoring (SNC-Lavalin) 11
2.2.9 560-55, Environmental Management & Monitoring (SNC-Lavalin) 12
2.2.10 560-60, Facility Decommissioning & Closure (SNC-Lavalin) 12
2.2.11 560-90, Common Services 12

3. OVERVIEW OF APM ACTIVITIES BY PHASE **13**

3.1 SITING PHASE (YEARS 1-9) **13**
3.2 CONSTRUCTION LICENCE APPLICATION (YEARS 10-15) **14**
3.3 CONSTRUCTION UDF PHASE (YEARS 16-20) **14**
3.4 CONSTRUCTION DGR PHASE (YEARS 21-25) **14**
3.5 OPERATION PHASE (YEARS 26-55) **15**
3.6 EXTENDED MONITORING PHASE (YEARS 56-125) **15**
3.7 DECOMMISSIONING PHASE (YEARS 126-150) **15**
3.8 POSTCLOSURE MONITORING (YEARS 151+) **15**

4. COST ESTIMATE **16**

4.1 BASIS OF ESTIMATE **16**
4.2 METHODOLOGY **16**
4.3 COST CATEGORIES **17**
4.3.1 LABOUR COSTS 17
4.3.2 MATERIAL AND EQUIPMENT COSTS 17
4.3.3 OTHER COSTS 18
4.3.4 CONTINGENCY 18
4.4 ASSUMPTIONS **18**
4.5 COST ANALYSIS OF LEVEL TWO WORK ELEMENTS **18**
4.5.1 560-05, Building Relationships 19
4.5.2 560-10, Adapting to Change 21
4.5.3 560-15, Siting 23
4.5.4 560-20, Design Development & Safety Case 25

4.5.5 560-25, Confidence Building 27
4.5.6 560-30, Site Verification & Licence Support 29
4.5.7 560-40, Facility Design & Construction (SNC-Lavalin) 31
4.5.8 560-45, Facility Operation including Extended Monitoring (SNC-Lavalin) 31
4.5.9 560-55, Environmental Management & Monitoring (SNC-Lavalin) 31
4.5.10 560-60, Facility Decommissioning & Closure (SNC-Lavalin) 31
4.5.11 560-90, Common Services 32
4.6 STAFFING 34
4.7 MANAGING COMMUNITY IMPACTS 40
4.8 INSURANCE 40

5. SUMMARY OF COST ESTIMATE 41

REFERENCES 45

APPENDIX A: WORK BREAKDOWN STRUCTURE TO THE LOWEST LEVEL 47

APPENDIX B: WORK ELEMENT DEFINITION SHEETS (WEDS) 55

LIST OF TABLES

Page

Table 2.1: APM WBS to Level 4 – NWMO Input to APM Cost Estimate 8
Table 4.1: Base Case: APM Building Relationships Costs Through Project Phases 19
Table 4.2: Alternate Case: APM Building Relationships Costs Through Project Phases 20
Table 4.3: Base Case: APM Adapting To Change Costs Through Project Phases 21
Table 4.4: Alternate Case: APM Adapting To Change Costs Through Project Phases 22
Table 4.5: Base Case: APM Siting Costs Through Project Phases 23
Table 4.6: Alternate Case: APM Siting Costs Through Project Phases 24
Table 4.7: Base Case: APM Design Development & Safety Case Costs Through Project Phases 25
Table 4.8: Alternate Case: APM Design Development & Safety Case Costs Through Project Phases 26
Table 4.9: Base Case: APM Confidence Building Costs Through Project Phases 27
Table 4.10: Alternate Case: APM Confidence Building Costs Through Project Phases 28
Table 4.11: Base Case: APM Site Verification & Licence Support Costs Through Project Phases 29
Table 4.12: Alternate Case: APM Site Verification & Licence Support Costs Through Project Phases 30
Table 4.13: Base Case: APM Common Services Costs Through Project Phases 32
Table 4.14: Alternate Case: APM Common Services Costs Through Project Phases 33
Table 4.15: Labour Category Definition and Hourly Rates 34
Table 4.16: Summary of NWMO Staffing Levels Years 1 to 25 Base Case 34
Table 4.17: Summary of NWMO Staffing Levels Years 26 to 55 Base Case 35
Table 4.18: Summary of NWMO Staffing Levels Years 56 to 125 Base Case 36
Table 4.19: Summary of NWMO Staffing Levels Years 126 to 150 Base Case 38
Table 4.20: Summary of NWMO Staffing Levels Years 151 to 155 Base Case 38
Table 5.1: NWMO Input to APM Cost Estimate by Level 2 WBS – Base Case 41
Table 5.2: NWMO Input to APM Cost Estimate by Phase - Base Case 41
Table 5.3: NWMO Input to APM Cost Estimate by Level 2 WBS – Alternate Case 42
Table 5.4: NWMO Input to APM Cost Estimate by Phase - Alternate Case 42
Table 5.5: Base Case NWMO APM Project Cash Flow 43
Table 5.6: Alternate Case NWMO APM Project Cash Flow 44

LIST OF FIGURES

Page

Table 2.1: APM WBS to Level 4 – NWMO Input to APM Cost Estimate 8
Table 4.1: Base Case: APM Building Relationships Costs Through Project Phases 19
Table 4.2: Alternate Case: APM Building Relationships Costs Through Project Phases 20
Table 4.3: Base Case: APM Adapting To Change Costs Through Project Phases 21
Table 4.4: Alternate Case: APM Adapting To Change Costs Through Project Phases 22
Table 4.5: Base Case: APM Siting Costs Through Project Phases 23
Table 4.6: Alternate Case: APM Siting Costs Through Project Phases 24
Table 4.7: Base Case: APM Design Development & Safety Case Costs Through Project Phases 25
Table 4.8: Alternate Case: APM Design Development & Safety Case Costs Through Project Phases 26
Table 4.9: Base Case: APM Confidence Building Costs Through Project Phases 27
Table 4.10: Alternate Case: APM Confidence Building Costs Through Project Phases 28
Table 4.11: Base Case: APM Site Verification & Licence Support Costs Through Project Phases 29
Table 4.12: Alternate Case: APM Site Verification & Licence Support Costs Through Project Phases 30
Table 4.13: Base Case: APM Common Services Costs Through Project Phases 32
Table 4.14: Alternate Case: APM Common Services Costs Through Project Phases 33
Table 4.15: Labour Category Definition and Hourly Rates 34
Table 4.16: Summary of NWMO Staffing Levels Years 1 to 25 Base Case 34
Table 4.17: Summary of NWMO Staffing Levels Years 26 to 55 Base Case 35
Table 4.18: Summary of NWMO Staffing Levels Years 56 to 125 Base Case 36
Table 4.19: Summary of NWMO Staffing Levels Years 126 to 150 Base Case 38
Table 4.20: Summary of NWMO Staffing Levels Years 151 to 155 Base Case 38
Table 5.1: NWMO Input to APM Cost Estimate by Level 2 WBS – Base Case 41
Table 5.2: NWMO Input to APM Cost Estimate by Phase - Base Case 41
Table 5.3: NWMO Input to APM Cost Estimate by Level 2 WBS – Alternate Case 42
Table 5.4: NWMO Input to APM Cost Estimate by Phase - Alternate Case 42
Table 5.5: Base Case NWMO APM Project Cash Flow 43
Table 5.6: Alternate Case NWMO APM Project Cash Flow 44

1. INTRODUCTION

The Nuclear Waste Management Organization (NWMO) is implementing Adaptive Phased Management (APM), Canada's plan for the long-term management of its used nuclear fuel. The APM approach includes centralized containment and isolation of used nuclear fuel in a deep geological repository constructed within a suitable host rock formation such as crystalline rock or sedimentary rock. APM also includes a used fuel transportation system.

From 2009 to 2011, NWMO and SNC-Lavalin updated the previous conceptual design and cost estimate for the APM deep geological repository (DGR) prepared by CTECH (2002; 2003) and for the APM used fuel transportation system prepared by Cogema (2003a; 2003b). The cost estimating activities for the APM update were allocated as follows:

1. NWMO was responsible for estimating APM costs for siting, design development, safety assessment, licensing, approvals, program management and related support to APM facility construction, operation decommissioning and closure.

2. SNC-Lavalin was responsible for estimating APM costs for final design, construction, operation, extended monitoring, decommissioning and closure of the APM facility (SNC-Lavalin 2011a; 2011b) and for the used fuel transportation system (SNC-Lavalin 2011c; 2011d).

The Work Breakdown Structure (WBS) defines the APM project work elements for cost estimating purposes and is discussed in further detail in Section 2.2. NWMO's input to the APM cost estimate addresses:

- 05 - Building Relationships
- 10 - Adapting to Change
- 15 - Siting
- 20 - Design Development & Safety Case
- 25 - Research & Confidence Building
- 30 - Site Verification & Licence Support
- 90 - Common Services

SNC-Lavalin's input to the APM cost estimate addresses:

- 40 – Facility Design & Construction
- 45 – Facility Operation
- 55 – Environmental Assessment & Monitoring
- 60 – Decommissioning & Closure

This report presents the NWMO portion of the updated APM cost estimate for a repository constructed in crystalline rock for two possible used nuclear fuel inventory scenarios. The Base Case scenario assumes 3.6 million used CANDU fuel bundles and the Alternate Case scenario assumes 7.2 million used CANDU fuel bundles (SNC-Lavalin 2011a). These used fuel bundles are assumed to be produced at Canadian nuclear facilities owned by Ontario Power Generation Inc. (OPG), New Brunswick Power Nuclear (NBP), Hydro-Québec (HQ) and Atomic Energy of Canada Limited (AECL).

The cost estimate for the NWMO portion of the APM facility was prepared by NWMO subject matter experts based on the WBS listed above, and reviewed and updated the Work Element Definition Sheets (WEDS) previously prepared by OPG and incorporated into the cost estimate prepared by CTECH (2003). The WEDS were subsequently reviewed within NWMO to validate APM content and ensure the estimates were prepared consistent with APM assumptions which are outlined in Section 1.2.

1.1 PURPOSE OF COST ESTIMATE

The purpose of the updated conceptual APM lifecycle cost and schedule estimate for a deep geological repository and associated used fuel transportation system is to allow NWMO to examine the financial implications of managing Canada's used nuclear fuel over the long term.

This report documents the NWMO's portion of the updated cost estimate for an APM deep geological repository. The cost estimate for the balance of the APM deep geological repository can be found in a companion report prepared by SNC-Lavalin (2011b). The cost estimate for the used fuel transportation system can be found in SNC-Lavalin (2011d).

1.2 COST ESTIMATING ASSUMPTIONS

The APM cost estimate has been based on a number of high-level assumptions. Many of these assumptions are for financial planning purposes. Actual implementation of APM may differ substantially. These assumptions can affect the scope of work and the timing of the activities. The major APM cost estimating assumptions are outlined below:

Cost Estimating Assumptions:

Siting Phase

1. All APM technical development work will be completed by the time of construction of the APM deep geological repository. Demonstration of repository technology may occur in the Underground Demonstration Facility (UDF).
2. APM technical work program activities will proceed in parallel with the schedule for APM siting to support advancement of the siting process, design development and the safety case for a used fuel deep geological repository.
3. The cost estimate assumes the APM program will be continuous with no hold points or abnormal periods of inactivity whilst awaiting funding approvals, management reviews or licensing decisions. However, the cost estimate has assumed reasonable time periods for the completion of siting tasks.
4. The design of the APM facility will accept and accommodate the total Canadian used nuclear fuel inventory of 3.6 million used CANDU bundles (Base Case) and 7.2 million used CANDU bundles (Alternate Case).
5. The used fuel container (UFC) design will be optimised and a prototype container built prior to submission of the Canadian Nuclear Safety Commission (CNSC) licence and federal environmental assessment (EA) hearing for a preferred site.
6. It is assumed that up to two candidate sites would be subject to detailed site characterisation and evaluation and as a result, two sites would be purchased or have options to purchase.

Construction Phase

7. Detailed engineering design and Engineer, Procure and Construction (EPC) costs have been prepared by SNC-Lavalin (2011b).
8. Detailed final engineering design and the preparation of working drawings for the facility will commence immediately following award of a site preparation and construction licence by the CNSC.
9. The APM facility includes construction of a campsite. Any improvement or expansion of town site services or infrastructure is a contingent item subject to discussions between the NWMO and the community.
10. The underground portion of the APM facility is assumed to be a network of horizontal tunnels and placement rooms for the UFCs excavated at a depth of 500 m in plutonic rock, with vertical shafts extending to surface. During construction of the underground facilities, unsuitable rock conditions are assumed for 10% of the in-floor borehole excavations in the placement rooms.
11. The APM facility is designed to accommodate underground characterisation, technology demonstration and monitoring tests during operations and a period of extended monitoring until the site is ready for decommissioning.
12. NWMO staff increases during construction are required for owner's acceptance of drawings, engineering packages, and general constructor oversight.

Operations Phase

13. The APM facility operations will commence following the construction of the surface facilities, shafts, underground infrastructure and initial placement room panels and with the successful submission of the Final Safety Report and award of an Operating Licence by the CNSC.
14. The design throughput of the APM facility will be 120,000 used fuel bundles per year resulting in 333 UFCs/year.
15. All used fuel assumed to be transported to the APM facility via road. (Other modes of transport, such as mostly rail and mostly water, are possible).
16. The APM facility will have all necessary staff and equipment to unload a transportation cask from the transport vehicle, conduct radiological surveys, unload used nuclear fuel from the cask and to prepare the empty cask for the return journey.
17. The Used Fuel Packaging Plant (UFPP) is located at the APM facility site.
18. All used fuel delivered to the APM facility will be received at the packaging plant in transportation casks and then packaged for placement underground.
19. The UFC copper container and inner vessel will be fabricated at an unspecified off-site location(s) and then shipped 1,000 km to the APM facility. The cost of the copper container and inner vessel will include the cost of transportation to the site.
20. NWMO's input to the cost estimate includes support required for licence renewals, monitoring, geoscience and social support during operations and long-term monitoring.

Extended Monitoring Phase

21. The APM site infrastructure, surface buildings and underground works will be held in a care and maintenance regime for an extended period of monitoring following the completion of UFC placement operations. After this time the site infrastructure and surface buildings will be made good for use during the decommissioning of the overall facility. By adopting this philosophy, all facilities will also be available for use should monitoring of the DGR identify the need to retrieve placed UFCs at any time during extended monitoring.
22. During this preclosure period the placement rooms will be sealed but the tunnels and shafts will remain open so that monitoring and access to the placement rooms is maintained.

Decommissioning and Closure Phase

23. Decommissioning work is conducted by others.
24. NWMO's staff support includes work required for licence renewals, monitoring, geoscience and social support.
25. All major surface facilities are decontaminated, dismantled and removed. All underground tunnels, shafts and exploratory boreholes are backfilled and sealed.
26. After major decommissioning activities are complete, institutional control, site security and monitoring of remaining infrastructure are maintained until a Site Abandonment licence has been obtained from CNSC.

Postclosure Monitoring

27. The specific requirements and activities associated with closure of the APM facility such as the nature and duration of postclosure monitoring are not known and will be decided in collaboration with a future society.

General

28. All labour, equipment and material costs are inclusive of any profit.
29. The estimate is based on an APM facility design that receives CANDU used fuel bundles from the Canadian nuclear fuel waste owners (i.e., OPG, NBP, HQ and AECL).
30. The scope of this estimate excludes consideration of non-standard nuclear fuels.
31. All costs reflect the cost of local labour and materials.
32. The cost estimate is prepared and budgeted in January 2010 current dollars and will be scheduled in elapsed time.

More detailed estimating assumptions associated with lower levels of the APM project work breakdown structure (WBS) are included on work element definition sheets (WEDS) for each individual work element (see Appendices A and B).

For financial planning purposes, Figure 1.1 illustrates the assumed sequence of APM activities and their durations through the phases of siting, design, construction, operation, decommissioning and closure.

		Illustrative APM Implementation Schedule	
Calendar Year	**Year**	**Major Activities and Assumptions for Financial Planning & Work Program**	
2007		Government Decision	
2008		**develop Siting Process**	
2009			
2010	Y01	Initial screening of communities Feasibility studies in potential sites Prelim field investigations	Initiate siting process; outreach activities Briefings & resources for communities Third-party reviews
2011	Y02		
2012	Y03		
2013	Y04		
2014	Y05	Surface & subsurface investigations in candidate sites Design & safety assessment work Select preferred site	Engage potentially affected communities Socio-economic impact assessments Detailed site investigations in collaboration with communities; discussion of benefits Negotiate terms & conditions for agreement
2015	Y06		
2016	Y07		
2017	Y08		
2018	Y09		
2019	Y10	Apply for Site Prep & Construction Licence Finalize site-specific design & safety assessment work for EA & licence	NWMO & community ratify formal agreement to host facility Benefits to host community
2020	Y11		
2021	Y12		
2022	Y13	Submit EIS & licensing documents Obtain Site Preparation & Underground Demo Facility Licence	Establish centre of expertise (surface), in partnership with community Participant support to EA process
2023	Y14		
2024	Y15		
2025	Y16	Construct Underground Demo Facility Begin site-specific demonstrations of repository technology Final design & safety assessment Obtain DGR Construction Licence	Establish centre of expertise (underground) Community offsets & benefits Socio-economic impact monitoring
2026	Y17		
2027	Y18		
2028	Y19		
2029	Y20		
2030	Y21	Apply for Operating Licence Construct initial components of DGR Obtain Operating Licence	Centre of expertise (surface / underground) Community offsets & benefits Socio-economic impact monitoring
2031	Y22		
2032	Y23		
2033	Y24		
2034	Y25		
2035	Y26	**begin APM DGR operation**	
…	…	…	…
…	…	…	…
2064	Y55	**end APM DGR operation**	
2065	Y56	**begin Extended Monitoring**	
…	…	…	…
…	…	…	…
2134	Y125	**end Extended Monitoring**	
2135	Y126	**begin Decommissioning & Closure**	
…	…	…	…
…	…	…	…
2159	Y150	**end Decommissioning & Closure**	
2160	Y151	**begin Postclosure Monitoring**	

Figure 1.1: Illustrative APM Implementation Schedule for 3.6 Million Bundle Scenario

1.3 LEVEL OF COST ESTIMATION

The APM design and cost estimate for a deep geological repository is currently at a concept level of development and has been prepared for financial planning purposes as part of the NWMO funding formula and is not a project control estimate.

No site has been identified for the APM facility. It is assumed that initial screening will be performed for interested communities, followed by desktop feasibility studies, preliminary field investigations, detailed site characterization and planned selection of a preferred site by 2018.

Engineering design for the APM facility is at the conceptual level. NWMO's effort through siting and into construction licence submission is focused on advancement of unique APM technology and site characterization activities. Therefore, NWMO engineering design development cost estimates are based on concept advancement, development of prototypes and pre-production demonstration of repository technology. For example, CANDU fuel transfer operations in a Used Fuel Packaging Plant (UFPP) have not been defined at a detailed level. Specialised technology for implementation will need to be developed and will require proof of principle to manage technology risk followed by prototype development.

The safety case for a deep geological repository will require refinements in safety assessment tools and methods, supporting science and preparation of a preliminary safety case as well as a final safety case prior to obtaining an Operating Licence.

Regulatory affairs effort and expenses are based on facilitating pre-project and other submissions to the CNSC as well as cost recovery expenses from the CNSC.

Geoscience activities are in support of the siting process through screening and evaluation of site characteristics to ensure site suitability for its intended purpose.

The APM cost estimate has been developed using 2010 dollars. Unless otherwise stated, all cost estimates in this report are in 2010 dollars.

Year 01 costs are defined as APM costs incurred in 2010.

2. OVERVIEW OF APM WORK PROGRAM

2.1 OVERVIEW

The APM design process that has led to the facility description provided in this report and described in detail by SNC-Lavalin (2011a) has involved the application of design parameters and specifications set by previous development work (CTECH 2002). Using these parameters and specifications together with information from existing repository design experience drawn from other national radioactive waste management organizations with repository development programs, a conceptual APM facility incorporating the placement of used fuel containers (UFCs) at a depth of 500 m beneath ground level was produced and analysed.

The work program for the APM design presented covers all aspects in the implementation of the project, from initial siting studies through to the closure of the site, after which there will be no institutional controls in place. Operational activities begin at the receipt of used fuel consignments at the APM facility, and therefore the cost of handling and transporting used fuel prior to its receipt at the APM facility are addressed elsewhere in the program.

2.2 WORK BREAKDOWN STRUCTURE

Figure 2.1 shows the APM facility WBS work elements at Level 2 of the program. The WBS incorporates eleven Level 2 work elements that cover all the aspects of a program to site, design, develop, construct, operate, monitor, decommission and close an APM facility for long-term management of Canada's used nuclear fuel.

The WBS also indicates the work element identifiers and the organisations (e.g., NWMO and SNC-Lavalin) that prepared the cost estimate for the various areas of the project, on which the total APM cost estimate has been based.

Table 2.1 shows the general structure of the WBS to Level 4 of the NWMO input to the APM cost estimate:

- Level 1: Project
- Level 2: Objective
- Level 3: Functional Area
- Level 4: Project Stage

The WBS to the lowest level of the NWMO input to the APM cost estimate is Appendix A.

The WBS example in Table 2.1 has been developed for an APM facility with 3.6 million used CANDU fuel bundles in crystalline rock.

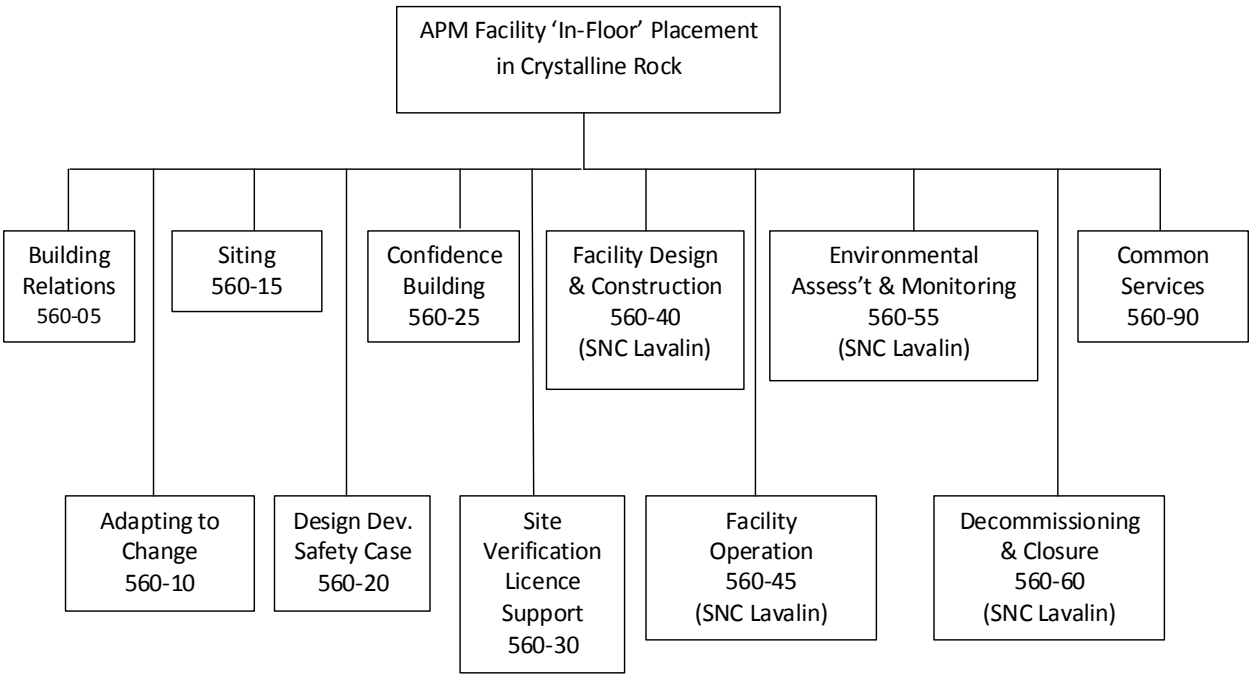

Figure 2.1: APM Work Breakdown Structure (WBS)

Table 2.1: APM WBS to Level 4 – NWMO Input to APM Cost Estimate

L1: Project	L2: Objective	L3: Functional Area	L4: Project Stage
560 – 3.6 million used fuel bundles in crystalline rock	05 – Building Relationships	10 – Social	10 – Siting (Y1 – Y9)
	10 – Adapting to Change	20 – Geoscience	20 – Construction Licence Application (Y10 – Y15)
	15 – Siting	30 – Repository Safety	30 – Construction (Y16 – Y25)
	20 – Design Development & Safety Case	40 – Regulatory Affairs	40 – Operation (Y26 – Y55)
	25 – Research & Confidence Building	50 – Repository Engineering	50 – Extended Monitoring (Y56 – Y125)
	30 – Site Verification & Licence Support	60 – Finance	60 – Decommissioning (Y126 – Y150)
	90 – Common Services	70 – Quality Assurance	70 – Closure (Y151)
		80 – Office of the President & Head Office	

The following subsections describe the activities associated with the Level 2 work elements indicated in the WBS.

2.2.1 560-05, Building Relationships

Critical to the success of Adaptive Phased Management (APM) is the involvement of the Canadian public, including Aboriginal people, at all stages of implementation and in key decisions through open, transparent and inclusive engagement processes. In building relationships, the NWMO will seek and be responsive to a diversity of views and perspectives. NWMO will communicate and consult actively, promoting thoughtful reflection and facilitating a constructive dialogue in different aspects of APM implementation.

A continuum of briefings, collaborative projects and partnerships will be advanced to support the further development and maintenance of relationships with municipal, Aboriginal and federal and provincial governments.

2.2.2 560-10, Adapting to Change

A fundamental tenet of APM is the ongoing incorporation of new learning and knowledge to guide decision making. NWMO has established a process for ongoing monitoring, review and reporting in areas of technological developments and societal views and expectations relating to APM implementation. NWMO reports regularly on its progress in implementing APM, especially in response to the advice of Canadians and the changing external environment.

2.2.3 560-15, Siting

The process to select an APM site in an informed and willing host community was initiated in May 2010. The siting process begins with a period of learning and capacity building for communities. The APM program assumes communities elect to progress through subsequent steps of screening, feasibility study and field investigations. The assumptions for this cost estimate are:

- Up to 2 sites enter detailed characterization and evaluation
- 1 preferred site selected

The end of the process is achieved with selection of one preferred site selected which is assumed to be completed in Year 09 or 2018.

Although the activities related to siting are completed upon successful site selection, some financial obligations continue beyond Year 09. These include infrastructure commitments to the successful community and modeled commitments for a centre of excellence.

2.2.4 560-20, Design Development & Safety Case

Design Development and Safety Case includes all activities related to the development of conceptual, feasibility and preliminary designs for the APM facility. The work activities include advancement of generic design concepts in support of site selection, site specific design

advancement, unique technology advancement, generic and site specific safety cases. Specific activities focus on:

- Container development, demonstration and fabrication
- Site dependent repository designs
- Used fuel packaging plant conceptual design and demonstration
- Placement and retrieval systems
- Sealing materials
- Management support

Areas where technology requires additional development for deployment in the APM program are generally focused around the used fuel processes. Although a copper container has been produced by other national waste management organizations such as SKB (Sweden) and Posiva (Finland), their container dimensions are different from NWMO's current reference design for cost estimating. Application engineering would be required to customize the demonstrated products for NWMO's specific container type and size. While the UFPP can reference a significant portion of established technology from SKB's more mature and demonstrated technologies with respect to container sealing, inspection and deployment underground, the Canadian CANDU fuel transfer operations for the UFPP require advancement of concepts in preparation of prototype units for technology demonstration.

Canada has demonstrated leadership in CANDU fuel transfer operations and this domestic expertise will be investigated for fuel transfer operations. Similar advancement programs are required for monitoring, container placement and retrieval, and sealing system demonstration.

2.2.5 560-25, Confidence Building

A number of technical and scientific activities are being conducted to further increase confidence in the safety case for the APM facility and to improve NWMO's understanding of key scientific processes that may influence repository safety.

These confidence building and process understanding activities include models of the engineered barrier system, groundwater flow system evolution, integrated safety assessment models and full-scale demonstration of repository technology both in Canada and with international partners in joint research facilities.

2.2.6 560-30, Site Verification & Licence Support

NWMO site verification and licensing support activities ultimately lead/support confirmation of site characteristics in support of licensing and environmental assessments. Also, site verification and licensing support provide ongoing technical support required to obtain and maintain the various licences through construction, operation, long-term monitoring, decommissioning and site closure of the APM facility. The functional areas contributing most significantly to site verification and licence support include repository safety, geoscience and regulatory affairs. Repository engineering also has some involvement in support of the licensing processes and monitoring technologies. Specific areas of work scope include:

- Establishing a geoscience information management system
- Geoscience activities to support:

    - Supporting the regulatory process by addressing regulatory questions
    - Monitoring at the preferred site
    - Numerical analysis during construction
    - DGR operation, extended monitoring, decommissioning and closure
- Repository Safety activities to support:
    - Update of safety case data sets
    - Preclosure and postclosure safety cases
    - ALARA, conventional, and radiological safety assessments
    - Natural analogues
    - Biosphere characterization and monitoring
    - Preparation of PSR and FSAR safety case reports
    - Human health monitoring included during extended monitoring
    - Operations, monitoring, decommissioning and closure safety assessments
    - Support the regulatory review
- Regulatory Affairs activities to support:
    - Preparation for EA, EA submission and public hearings
    - Government approvals at the federal, provincial and municipal level
    - Licence applications and hearings
    - Licence maintenance through all phases of the APM lifecycle
- Repository Engineering activities are in support of:
    - Ongoing monitoring activities
    - Safeguards

2.2.7 560-40, Facility Design & Construction (SNC-Lavalin)

The APM DGR Facility Design & Construction has been outlined in detail by SNC-Lavalin (2011b). The scope includes:

- Preferred Site Confirmation (excludes NWMO's scope of work)
- Site Improvements
- Construction Phase Indirects
- Surface Process Facilities
- Surface Auxiliary Facilities
- Underground Facilities
- Common Services (infrastructure structure for electrical distribution, communication, water system, sewerage, etc.)

2.2.8 560-45, Facility Operation including Extended Monitoring (SNC-Lavalin)

The APM DGR Facility Operation has been outlined in detail by SNC-Lavalin (2011b). The scope includes operation and management functions for surface and underground facilities for the receipt of used fuel transported from the interim storage facilities to the UFPP at the APM facility, re-packaging the used fuel into long-lived UFCs and placement of the UFCs in the deep geological repository from Year 26 to Year 55 (Base Case).

APM facility operation and the UFPP have been designed to receive 120,000 used fuel bundles per year with an annual throughput of about 333 UFCs per year for placement in the repository. The Sealing Materials Compaction Plant will prepare the clay-based bentonite buffer rings and disks, backfill blocks and gap fill material for the underground placement rooms.

Following placement of the final UFC, operation of the APM facility will continue with a period of extended monitoring for up to 70 years from Year 56 to Year 125 (Base Case). The duration of extended monitoring will be decided in collaboration with a future society.

2.2.9 560-55, Environmental Management & Monitoring (SNC-Lavalin)

The APM DGR Environmental Management and Monitoring has been outlined in detail by SNC-Lavalin (2011b). The scope includes operation and management of the APM facility during extended monitoring following the final UFC placement underground.

2.2.10 560-60, Facility Decommissioning & Closure (SNC-Lavalin)

The APM DGR Facility Decommissioning and Closure has been outlined in detail by SNC-Lavalin (2011b). The scope includes decommissioning management, construction and operation of related facilities and decommissioning and closure of the surface and underground. The nature and duration of postclosure monitoring will be decided in collaboration with a future society.

2.2.11 560-90, Common Services

Common Services for the NWMO portion of the APM cost estimate describes the pre-operational program management costs from Year 1 to Year 25 and includes senior-level APM staff direction to the program, as well as project management and financial and business support for the program up to the point where operations commence.

Corporate quality assurance (QA) staffing for NWMO have been costed separately from Common Services and are carried in the NWMO estimate through Year 01 to the end of the project at Year 151 for the base case and Year 181 for the alternate case.

As a point of clarification, the SNC-Lavalin report (SNC-Lavalin 2011b) identifies this same function as Operations Program Management.

3. OVERVIEW OF APM ACTIVITIES BY PHASE

Generally, the majority of NWMO's project activities forming the basis of the cost estimate are pre-operational APM activities incurred in the initial twenty-five years of the project. During this period, the NWMO will be performing activities necessary to:

- Obtain a site preparation and construction site
- Communicate and consult facilitating constructive dialogue in different aspects of APM implementation
- Advance unique technologies currently not in a production ready state
- Reduce technology and licensing risks
- Mature the overall design in preparation for an EPC contract
- Maintain and build an organization capable of performing the EPC Management

Following the start of APM DGR operation in Year 26, the NWMO cost estimate identifies those unique costs not included in the SNC-Lavalin cost estimate (SNC-Lavalin 2011b) for activities beyond Year 25 such as:

- Site licence maintenance through all project phases.
- Performance monitoring of the APM facility.
- Ongoing community consultation and communication.
- Support operations, long-term monitoring, decommissioning and closure.

3.1 SITING PHASE (YEARS 1-9)

The siting phase covers the time period in which a suitable location for the APM facility is being sought. It begins after a formal decision is made to start the process of finding a suitable site and ends once the preferred site is selected.

The siting phase involves developing a siting process and site screening criteria, site screening and site evaluations.

Site characterisation activities during the Siting Phase would involve an iterative process of investigation. Initially, a preliminary screening exercise would be performed on up to fifteen sites followed by non-invasive surface-based feasibility studies on up to eight candidate areas. These studies would then be followed by preliminary field studies on up to four sites followed by invasive surface-based studies at up to two candidate sites to arrive at the final preferred site. These activities would provide an understanding of site specific geosphere and biosphere conditions necessary to assess and communicate possible site suitability to host an APM facility. These site characterisation activities would be coupled with stakeholder consultation to gain consensus and to select a preferred APM site.

During the siting phase, preliminary conceptual APM designs would be prepared for each site being evaluated. Design work would be completed for the surface and underground facilities primarily to establish the access, utility and infrastructure requirements. These requirements would be assessed during site screening to ensure that they could be met at potentially suitable site locations in the areas selected for detailed evaluation. Details of the environmental and APM monitoring program would also be developed, and the plan to incorporate this program

into subsequent site evaluation activities would be prepared during site screening. The end point of the siting phase is selection of a preferred site.

3.2 CONSTRUCTION LICENCE APPLICATION (YEARS 10-15)

Upon successful selection of a preferred site, the APM program will move into preparation of safety assessment and environmental impact documents, participation in public consultations and hearings, and the preparation of licence applications.

The implementing agency would be required to demonstrate, during the Environmental Assessment process, that there would be no adverse impact on the environment resulting from the construction, operation, decommissioning and closure of the APM facility, and during the post-closure period. Whilst there would inevitably be much focus on the radiological component on the environment, the more conventional environmental concerns would also be addressed. A comprehensive environmental survey to measure and record the current background conditions at the proposed site would be conducted.

A preliminary APM facility design specific for the site would be completed prior to entering into the Environmental Assessment process.

3.3 CONSTRUCTION UDF PHASE (YEARS 16-20)

The Construction UDF Phase in the life cycle of the APM facility is the period when the Underground Demonstration Facility (UDF) and some functional surface and underground facilities and infrastructure are constructed. The phase begins with the receipt of regulatory approval to begin construction at the site and ends when the inactive commissioning of some facilities are completed for the UDF and related facilities.

The construction phase, by others, would involve constructing the infrastructure and surface facilities needed for the UDF and the underground access ways and service areas. The UDF would be the first area to be developed underground and the UDF may be used to test and confirm the configuration, equipment, and methodologies used to develop and operate the underground portion of the APM facility. The other main objective of the UDF would be to assess the characteristics of the geosphere within which the UFC repository will be developed and identify any major geologic features which could affect repository layout and construction. The UDF may operate for several years prior to the commencement of used fuel disposition and could have a continuing role over the life of the underground repository.

3.4 CONSTRUCTION DGR PHASE (YEARS 21-25)

The construction of the DGR will be conducted by contractors. The NWMO will have project oversight and all licensing, social and regulatory scope related to the project as well as performing the unique geoscience characterization work required to ensure the APM project proceeds as expected.

After the underground evaluation studies have been carried out during the UDF construction phase and the final designs completed, the construction of the full-scale APM facility can begin. The purpose of the construction is to build all the facilities necessary for the operation of the APM facility and its components. Provision is made in the design for concurrent excavation during the operations phase to provide further placement rooms at the required time.

NWMO activities include site characterization, UDF experimentation, social activities required to maintain social licence, preparation of the required safety cases, securing all required licences, advancement/demonstration of unique technologies and maintenance of an organization to execute the project. The phase begins with the receipt of regulatory approval to begin construction of the used fuel repository and ends when the inactive and active commissioning of the facilities are completed prior to receiving the first formal shipment of used fuel for placement

3.5 OPERATION PHASE (YEARS 26-55)

The Operation Phase is based on a 30 year period from Year 26 to 55, during which used fuel is packaged into UFCs and transferred underground and placed in the repository placement room.

The operation phase involves receiving used fuel transported to the APM facility, sealing it in corrosion resistant UFCs, placing and sealing the UFCs in placement room, and constructing and preparing additional placement rooms. The operation phase ends upon the start of extended monitoring.

3.6 EXTENDED MONITORING PHASE (YEARS 56-125)

For cost estimating purposes, 70 years of extended monitoring of the repository has been assumed from Year 56 to 125, during which the evolution of the APM facility is monitored to ensure performance evolves as expected. The precise duration of extended monitoring will be a decision taken by a future generation, the host community and the NWMO.

Extended monitoring (Years 56 – 125) would involve monitoring and assessing the conditions in the vicinity of the APM facility prior to its decommissioning and closure. The extended monitoring program would make use of the shafts and underground access tunnels while still available, prior to APM facility sealing during the decommissioning phase. Extended monitoring activities would include environmental monitoring, monitoring UFC performance and monitoring rock mass behaviour. The monitoring data would be used to confirm and improve the long-term safety assessment of the sealed APM facility. The extended monitoring phase ends when approval is given to start decommissioning the APM facility.

3.7 DECOMMISSIONING PHASE (YEARS 126-150)

Following the period of extended monitoring, the Decommissioning Phase is the 10 year period (Years 126 – 135) in the life cycle of the APM facility during which the major surface facilities are decontaminated, dismantled and removed. As well, the underground facilities are decontaminated (if necessary) and dismantled, and the access tunnels and shafts are backfilled and sealed.

Following these major decommissioning activities, the APM facility would enter into a 15 year closure period (Years 136 – 150) with continued institutional control, site security and monitoring of the remaining infrastructure and facility until a licence to abandon the site is obtained.

3.8 POSTCLOSURE MONITORING (YEARS 151+)

The specific requirements and activities associated with the closure of the APM facility such as the nature and duration of any postclosure monitoring are not known and will be decided in collaboration with a future society. The objective is to return the site to a state such that safety would not depend on institutional controls.

4. COST ESTIMATE

4.1 BASIS OF ESTIMATE

A cost estimate has been developed for NWMO's scope of activities for the siting, design, construction, operation, preclosure monitoring, decommissioning and closure of an APM facility. The estimate is based on a conceptual design that includes the receipt of used fuel bundles, their packaging in UFCs and their subsequent placement in the underground excavations. The estimate also includes extended monitoring of the APM facility following placement of the used fuel prior to decommissioning and closure of the facility. The complete APM estimate is comprised of two independent estimates as documented by SNC-Lavalin (2011b) and this report.

The complete APM lifecycle cost estimate is the sum of the cost estimates in these reports.

The estimate documented in this report was developed through a bottom-up estimate of the conceptual and demonstration work by NWMO. A series of internal reviews confirmed assumptions and clarified scope. The authors of the estimates defined the content of their estimate in Work Element Definition sheets (WEDs) and the WEDs provide qualitative and quantitative scope descriptions. Detail of the work scope and content beyond this report can be obtained through review of the individual work elements used to generate the cost estimate.

4.2 METHODOLOGY

This section describes the methodology by which costs for the various work elements of the project were established.

The WBS was re-organized to permit financial data definition by timeline and to be consistent with business planning processes as defined in Section 2.2.

The original 2003 CTECH work element sheets (essentially unique word documents containing task descriptions to the lowest meaningful level) for the deep geological repository concept were circulated to the NWMO content experts for review and update reflective of the 2010 state of knowledge. A basis of estimate document was generated to go along with the content update. A new WEDs structure was created and an excel workbook was used to capture content and present the numerical results in a tabular form. The WEDs workbook became the live financial model to generate the cost estimate on which this report is based.

Upon completion of the Excel WED workbook (financial model), a series of reviews were performed among authors, mid level management and senior level management. The reviews were completed to challenge the estimates and the underlying assumptions, validate consistency of approach and ensure organizational alignment of the WEDs content.

In addition to the high level assumptions, further assumptions were made to allow lower level work elements to be estimated. The importance of these lower level assumptions and their effect on the final estimated cost was documented during their formulation.

The financial model is the detailed back-up supporting the numbers generated in this report.

Costs included in the estimate presented have been established using various estimating methods, with the particular method used dependent upon the work element under consideration. Typical estimating techniques adopted and sources of information include:

- Previous experience, i.e., to estimate Licensing and Approval costs, nuclear facilities construction and decommissioning, mining facilities construction
- Comparison with similar facilities
- Research i.e. UFC procurement costs
- Construction from base levels i.e. identification of individual process activities to establish resource levels.

The overall management structure and staffing levels were determined and cross-checked with comparable facilities where possible.

4.3 COST CATEGORIES

This section describes the four major cost categories that have been used in the cost estimate for each work element i.e. labour, materials and equipment, other and allowance.

4.3.1 LABOUR COSTS

All labour costs are fully burdened costs, whether the labour costs are internal or external purchased services labour costs.

The labour resources together with the basis for the calculated rates are given in Section 4.6. To reduce the number of different labour resources applied to the project, a selection of composite labour resources have been identified for each of the organisations involved in the implementation of the project. These organisational categories can be summarised as:

- Nuclear Waste Management Organization (NWMO)
- Purchased Services

A composite labour resource was taken as the average of a group of grades that would make up a typical team representing that resource. This range of grades, or job descriptions, would reflect the hierarchy within the group under consideration. For example a composite administration resource may account for example; 1 administration manager, 10 senior clerical and 10 junior clerical grades. In this case, the composite labour resource gross hourly rate would be the total of each grades rate per hour divided by 21.

The manning levels for each activity were estimated using differing methods depending on the activities being considered, details of these are given on the WEDS for each lower level activity.

4.3.2 MATERIAL AND EQUIPMENT COSTS

Where sufficient definition in the work scope permitted identification of materials and equipment costs, those costs were described in the work element description and financial summary. Typically for NWMO, material and equipment would be experimental equipment or prototyping equipment required to demonstrate technology or processes.

4.3.3 OTHER COSTS

In most cases it was not possible to define the blend of unique material and equipment costs. In those instances, reliance on the technical subject matter experts and external references and benchmarks (e.g., SKB, Sweden) were used to generate estimates for contract costs expected to develop technology. The costs defined were identified as “other” since these costs will be a blend of labour, equipment and materials but the distributions within these categories is not known with certainty. The consolidated estimate update has been cross referenced against the previous CTECH cost estimate and other external benchmarks to validate the estimate generated.

4.3.4 CONTINGENCY

A contingency of 25% has been allocated to the “Allowance Field” in the WEDS prepared by NWMO.

4.4 ASSUMPTIONS

The major APM cost estimating assumptions are listed in Section 1.2. More detailed assumptions are compiled in the WEDS found in Appendix B.

4.5 COST ANALYSIS OF LEVEL TWO WORK ELEMENTS

A summary of all costs can be found in the WEDS listing which can be found in Appendix B.

4.5.1 560-05, Building Relationships

Base Case: 560. 3.6 M Bundles

The NWMO must communicate and consult actively to facilitate dialogue throughout the implementation of the APM program. A continuum of briefings, collaborative projects and partnerships will be advanced to support the further development and maintenance of relationships with municipal, Aboriginal and federal and provincial governments.

The total cost for the 3.6 million fuel bundle case is $533.3 M for the duration of the project for Building Relationships.

Table 4.1: Base Case: APM Building Relationships Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$77,036,367
Construction Licence Application (Years 10-15)	$60,452,565
Construction UDF (Years 16-20)	$42,553,633
Construction DGR (Years 21-25)	$42,478,633
DGR Operation (Years 26-55)	$140,616,982
Extended Monitoring (Years 56-125)	$135,702,760
Decommissioning (Years 126-150)	$34,260,570
Postclosure Monitoring (Years 151+)	$156,250
Total	**$533,257,760**

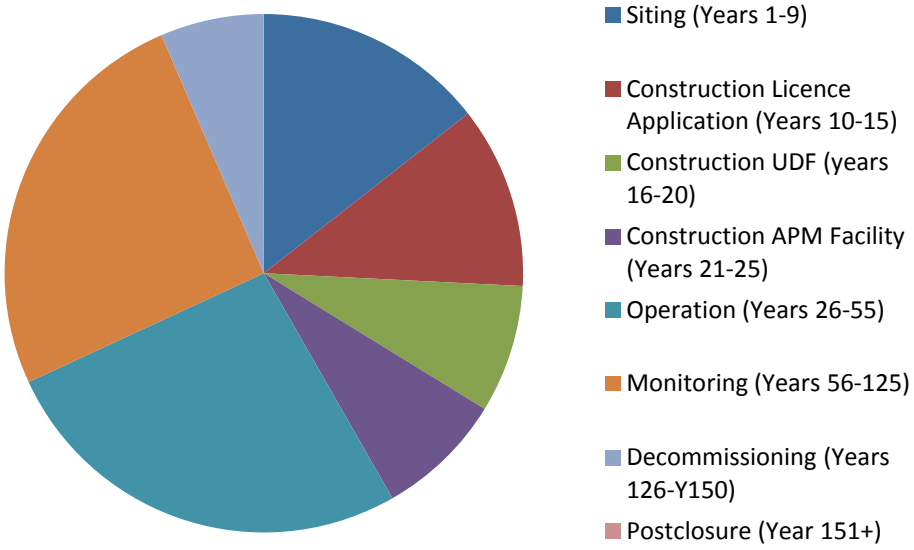

Figure 4.1: Base Case: APM Building Relationships Costs Through Project Phases

Alternate Case: 561, 7.2 M Bundles

Table 4.2: Alternate Case: APM Building Relationships Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$77,598,867
Construction Licence Application (Years 10-15)	$61,390,065
Construction UDF (Years 16-20)	$43,178,633
Construction DGR (Years 21-25)	$43,103,633
DGR Operation (Years 26-85)	$250,681,558
Extended Monitoring (Years 86-155)	$135,702,760
Decommissioning (Years 156-180)	$34,260,570
Postclosure Monitoring (Years 181+)	$156,250
Total	**$646,072,336**

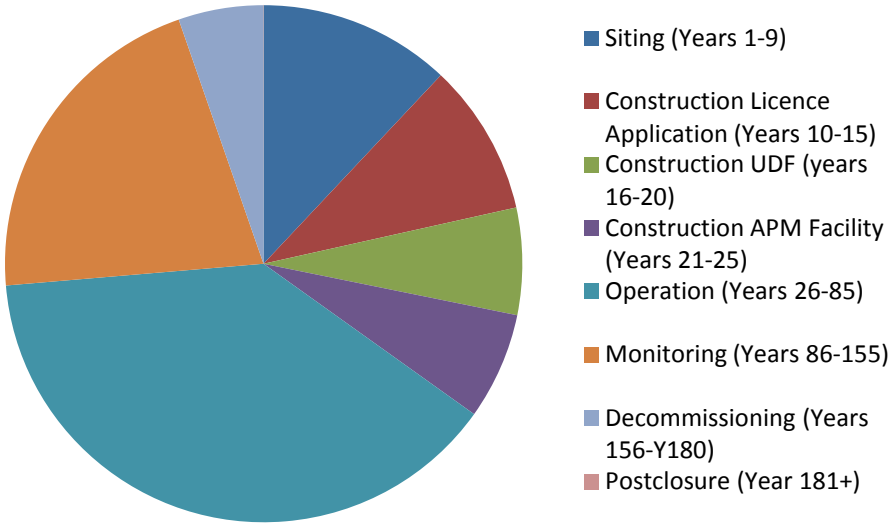

Figure 4.2: Alternate Case: APM Building Relationships Costs Through Project Phases

4.5.2 560-10, Adapting to Change

Base Case: 560, 3.6 M Bundles

The NWMO has established a process for ongoing monitoring, review and reporting in areas of technological developments and societal views and expectations relating to APM implementation. NWMO reports regularly on its progress in implementing APM, especially in response to the advice of Canadians and the changing external environment. The total cost for the 3.6 million fuel bundle case is $28.5 M for the duration of the project for Adapting to Change.

Table 4.3: Base Case: APM Adapting To Change Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$9,765,312
Construction Licence Application (Years 10-15)	$4,864,283
Construction UDF (Years 16-20)	$1,020,954
Construction DGR (Years 21-25)	$590,505
DGR Operation (Years 26-55)	$2,952,275
Extended Monitoring (Years 56-125)	$6,888,641
Decommissioning (Years 126-150)	$2,460,229
Postclosure Monitoring (Years 151+)	$0
Total	**$28,542,199**

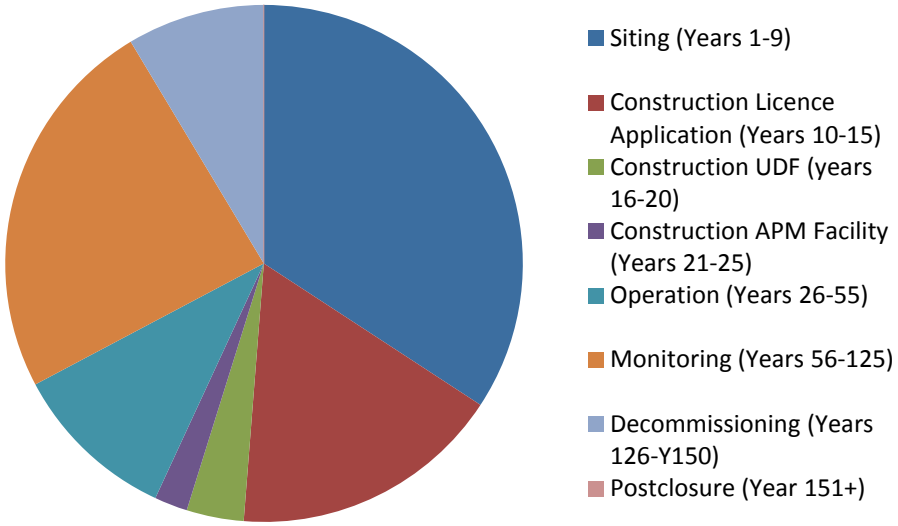

Figure 4.3: Base Case: APM Adapting To Change Costs Through Project Phases

Alternate Case: 561, 7.2 M Bundles

Table 4.4: Alternate Case: APM Adapting To Change Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$9,765,312
Construction Licence Application (Years 10-15)	$4,864,283
Construction UDF (Years 16-20)	$1,020,954
Construction DGR (Years 21-25)	$590,505
DGR Operation (Years 26-85)	$5,904,549
Extended Monitoring (Years 86-155)	$6,888,641
Decommissioning (Years 156-180)	$2,460,229
Postclosure Monitoring (Years 181+)	$0
Total	**$31,494,473**

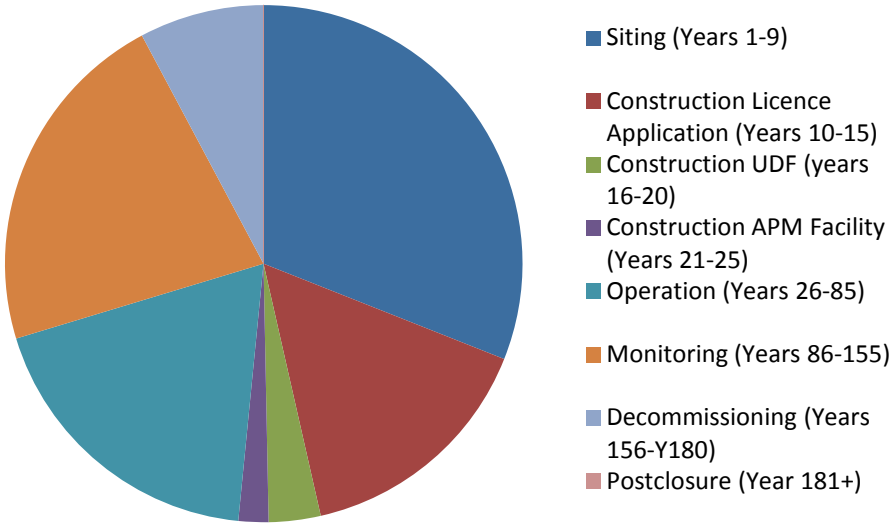

Figure 4.4: Alternate Case: APM Adapting To Change Costs Through Project Phases

4.5.3 560-15, Siting

Base Case: 560, 3.6 M Bundles

Siting costs for the full duration of the project are $568 M for the base of case of 3.6 million CANDU fuel bundles. Infrastructure costs for siting continue for 15 years after site selection.

Table 4.5: Base Case: APM Siting Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$457,496,780
Construction Licence Application (Years 10-15)	$59,427,443
Construction UDF (Years 16-20)	$11,468,750
Construction DGR (Years 21-25)	$8,368,750
DGR Operation (Years 26-55)	$22,500,000
Extended Monitoring (Years 56-125)	$8,750,000
Decommissioning (Years 126-150)	$0
Postclosure Monitoring (Years 151+)	$0
Total	**$568,011,723**

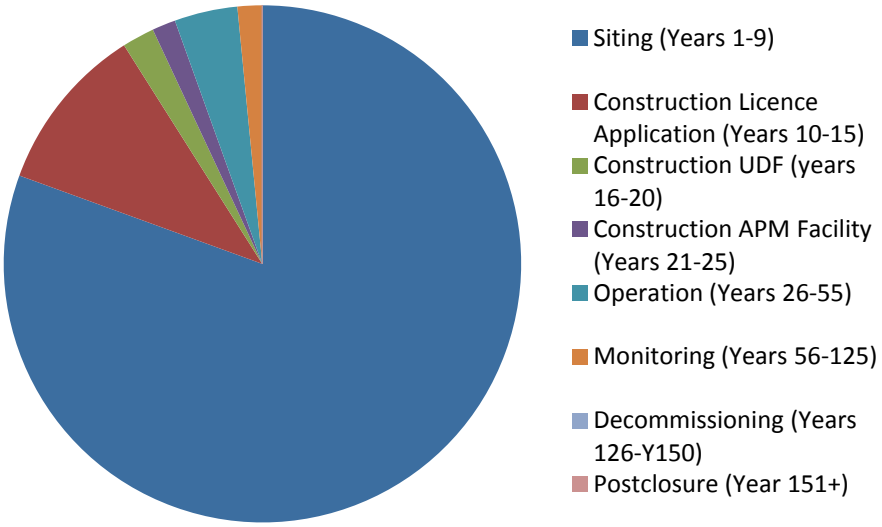

Figure 4.5: Base Case: APM Siting Costs Through Project Phases

Alternate Case: 561, 7.2 M Bundles

Table 4.6: Alternate Case: APM Siting Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$646,855,255
Construction Licence Application (Years 10-15)	$59,427,443
Construction UDF (Years 16-20)	$11,468,750
Construction DGR (Years 21-25)	$8,368,750
DGR Operation (Years 26-85)	$45,000,000
Extended Monitoring (Years 86-155)	$8,750,000
Decommissioning (Years 156-180)	$0
Postclosure Monitoring (Years 181+)	$0
Total	**$779,870,198**

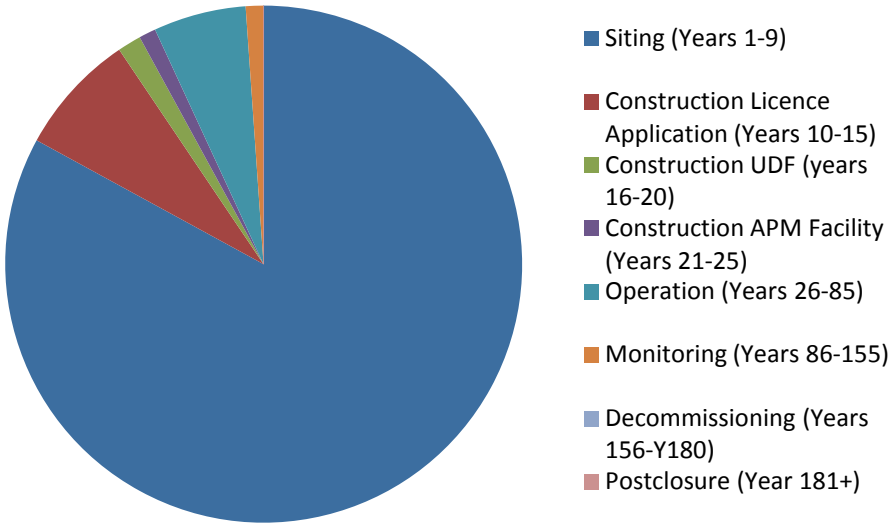

Figure 4.6: Alternate Case: APM Siting Costs Through Project Phases

4.5.4 560-20, Design Development & Safety Case

Base Case: 560, 3.6 M Bundles

Design Development & Safety Case includes all activities related to the development of conceptual, feasibility and preliminary designs for the DGR. The work activities include advancement of generic design concepts in advance of site selection, site specific design advancement, unique technology advancement, generic safety cases and site specific safety cases.

Total Design Development & Safety Case costs for the full duration of the project are $425.5 M for the base of case of 3.6 million CANDU fuel bundles.

Table 4.7: Base Case: APM Design Development & Safety Case Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$90,121,558
Construction Licence Application (Years 10-15)	$186,367,888
Construction UDF (Years 16-20)	$84,457,192
Construction DGR (Years 21-25)	$42,563,509
DGR Operation (Years 26-55)	$10,577,385
Extended Monitoring (Years 56-125)	$11,391,030
Decommissioning (Years 126-150)	$0
Postclosure Monitoring (Years 151+)	$0
Total	**$425,478,562**

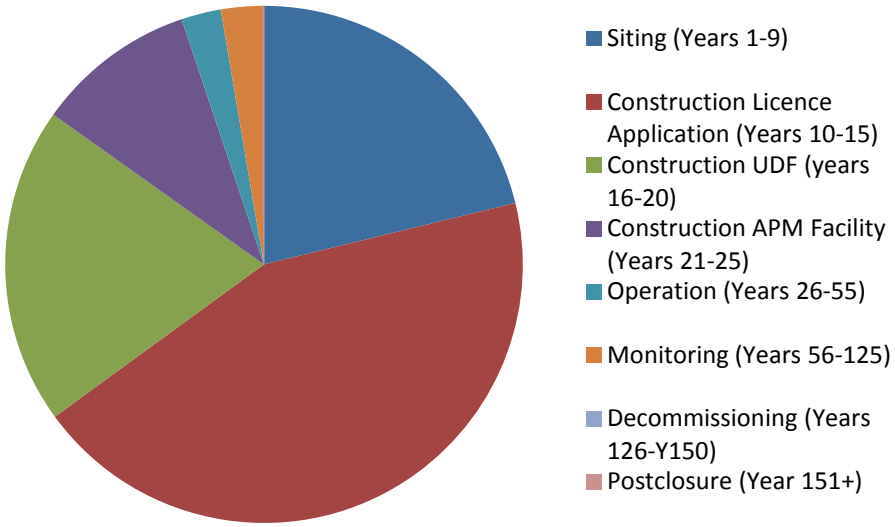

Figure 4.7: Base Case: APM Design Development & Safety Case Costs Through Project Phases

Alternate Case: 561, 7.2 M Bundles

Table 4.8: Alternate Case: APM Design Development & Safety Case Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$90,121,558
Construction Licence Application (Years 10-15)	$186,367,888
Construction UDF (Years 16-20)	$84,457,192
Construction DGR (Years 21-25)	$42,563,509
DGR Operation (Years 26-85)	$20,341,125
Extended Monitoring (Years 86-155)	$11,391,030
Decommissioning (Years 156-180)	$0
Postclosure Monitoring (Years 181+)	$0
Total	**$435,242,302**

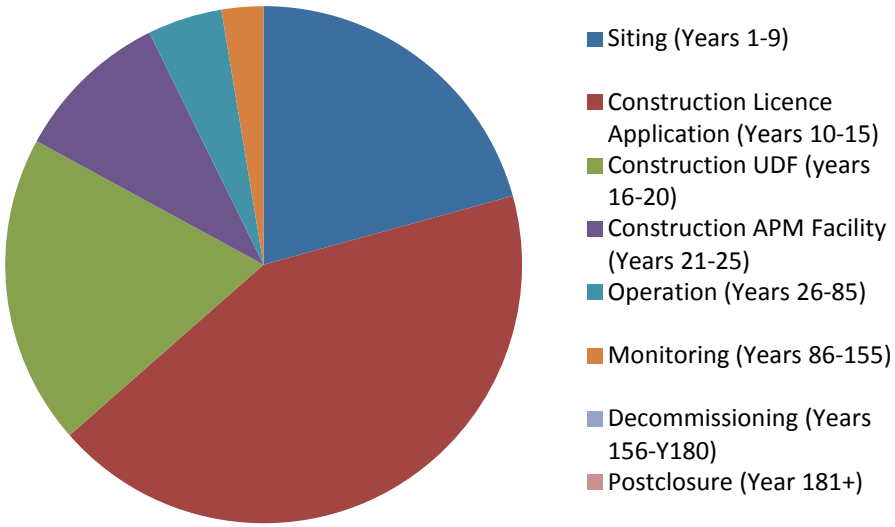

Figure 4.8: Alternate Case: APM Design Development & Safety Case Costs Through Project Phases

4.5.5 560-25, Confidence Building

Base Case: 560, 3.6 M Bundles

Confidence building are those family of activities required to enhance the scientific understanding required to successfully implement the APM technology. These activities are designed to increase the understanding of the underlying assumptions key to the safety case.

Total Confidence Building costs for the full duration of the project are $183.9 M for the base of case of 3.6 million CANDU fuel bundles.

Table 4.9: Base Case: APM Confidence Building Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$45,180,277
Construction Licence Application (Years 10-15)	$27,250,000
Construction UDF (Years 16-20)	$23,625,000
Construction DGR (Years 21-25)	$59,750,000
DGR Operation (Years 26-55)	$28,125,000
Extended Monitoring (Years 56-125)	$0
Decommissioning (Years 126-150)	$0
Postclosure Monitoring (Years 151+)	$0
Total	**$183,930,277**

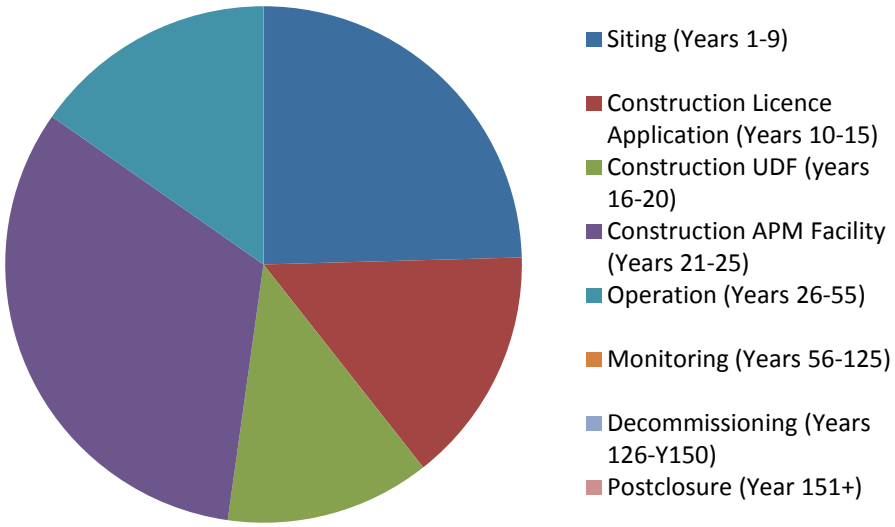

Figure 4.9: Base Case: APM Confidence Building Costs Through Project Phases

Alternate Case: 561, 7.2 M Bundles

Table 4.10: Alternate Case: APM Confidence Building Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$45,180,277
Construction Licence Application (Years 10-15)	$27,250,000
Construction UDF (Years 16-20)	$23,625,000
Construction DGR (Years 21-25)	$59,750,000
DGR Operation (Years 26-85)	$46,875,000
Extended Monitoring (Years 86-155)	$0
Decommissioning (Years 156-180)	$0
Postclosure Monitoring (Years 181+)	$0
Total	**$202,680,277**

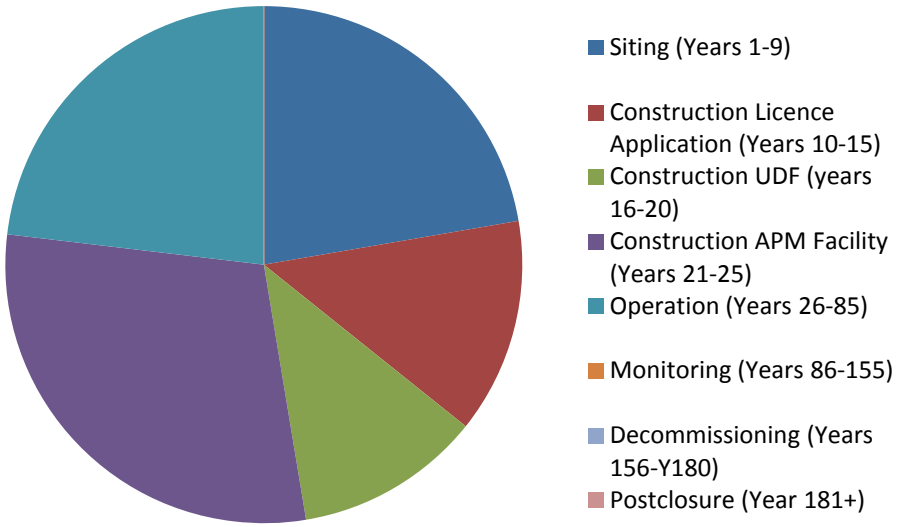

Figure 4.10: Alternate Case: APM Confidence Building Costs Through Project Phases

4.5.6 560-30, Site Verification & Licence Support

Base Case: 560, 3.6 M Bundles

NWMO site verification and licensing support activities ultimately lead/support confirmation of site characteristics in support of licensing and environmental assessments. Also, site verification and licensing support provide ongoing technical support required to and maintain the various licences through construction, operation, long term monitoring decommissioning and site closure of the APM facility.

Total Site Verification & Licence Support costs for the full duration of the project are $877.9 M for the base of case of 3.6 million CANDU fuel bundles.

Table 4.11: Base Case: APM Site Verification & Licence Support Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$2,185,380
Construction Licence Application (Years 10-15)	$87,668,389
Construction UDF (Years 16-20)	$62,117,352
Construction DGR (Years 21-25)	$65,706,004
DGR Operation (Years 26-55)	$241,836,811
Extended Monitoring (Years 56-125)	$269,615,232
Decommissioning (Years 126-150)	$80,959,973
Postclosure Monitoring (Years 151+)	$67,812,786
Total	**$877,901,927**

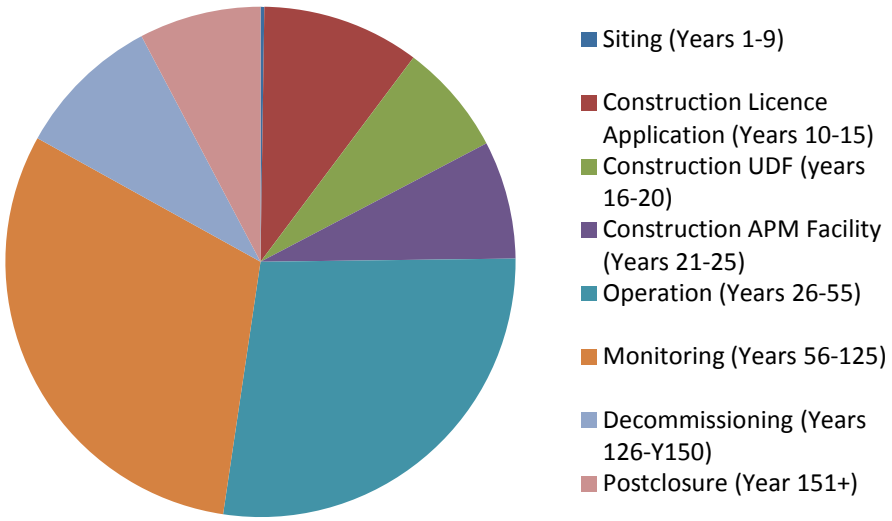

Figure 4.11: Base Case: APM Site Verification & Licence Support Costs Through Project Phases

Alternate Case: 561, 7.2 M Bundles

Table 4.12: Alternate Case: APM Site Verification & Licence Support Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$2,185,380
Construction Licence Application (Years 10-15)	$97,051,137
Construction UDF (Years 16-20)	$66,863,392
Construction DGR (Years 21-25)	$69,202,044
DGR Operation (Years 26-85)	$522,069,572
Extended Monitoring (Years 86-155)	$295,968,762
Decommissioning (Years 156-180)	$96,351,717
Postclosure Monitoring (Years 181+)	$67,812,786
Total	**$1,217,504,790**

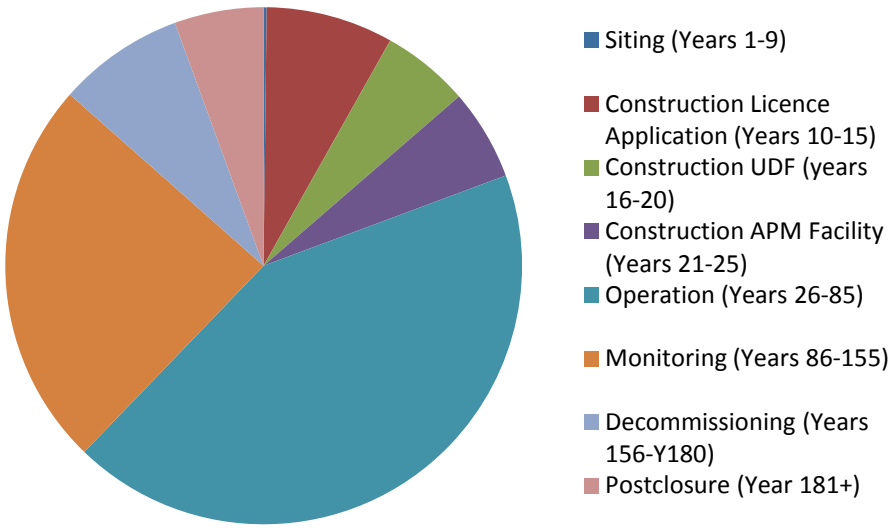

Figure 4.12: Alternate Case: APM Site Verification & Licence Support Costs Through Project Phases

4.5.7 560-40, Facility Design & Construction (SNC-Lavalin)

The Facility Design & Construction estimate is as defined in the “Deep Geological Repository Lifecycle Cost and Schedule Report” authored by SNC-Lavalin for the Base and Alternate case.

4.5.8 560-45, Facility Operation including Extended Monitoring (SNC-Lavalin)

The facility operation and extended monitoring costs are to be found in the “Deep Geological Repository Lifecycle Cost and Schedule Report” authored by SNC-Lavalin for the Base and Alternate case.

4.5.9 560-55, Environmental Management & Monitoring (SNC-Lavalin)

The environmental management system costs are to be found in “Deep Geological Repository Lifecycle Cost and Schedule Report” authored by SNC-Lavalin for the Base and Alternate Case.

4.5.10 560-60, Facility Decommissioning & Closure (SNC-Lavalin)

The facility decommissioning and closure estimate is as defined in the “Deep Geological Repository Lifecycle Cost and Schedule Report” authored by SNC-Lavalin for the Base and Alternate Case.

4.5.11 560-90, Common Services

Base Case: 560, 3.6 M Bundles
Common Services include senior-level staff direction to the program, as well as, project management and financial and business support for the program up to the point where operations commence.

Corporate QA staffing for NWMO were estimated separately from Common Services but are included in the NWMO Common Services estimate.

Table 4.13: Base Case: APM Common Services Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$85,089,516
Construction Licence Application (Years 10-15)	$74,690,152
Construction UDF (Years 16-20)	$49,002,926
Construction DGR (Years 21-25)	$48,583,254
DGR Operation (Years 26-55)	$26,915,837
Extended Monitoring (Years 56-125)	$13,891,030
Decommissioning (Years 126-150)	$21,390,990
Postclosure Monitoring (Years 151+)	$0
Total	**$319,563,705**

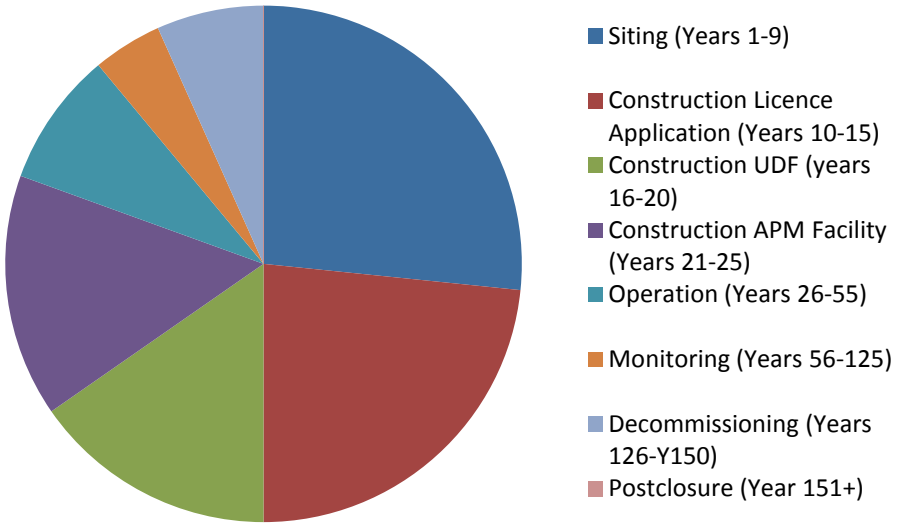

Figure 4.13: Base Case: APM Common Services Costs Through Project Phases

Alternate Case: 561, 7.2 M Bundles

Table 4.14: Alternate Case: APM Common Services Costs Through Project Phases

APM Project Phase	Estimate (2010 $)
Siting (Years 1-9)	$85,089,516
Construction Licence Application (Years 10-15)	$74,690,152
Construction UDF (Years 16-20)	$49,002,926
Construction DGR (Years 21-25)	$48,583,254
DGR Operation (Years 26-85)	$66,631,997
Extended Monitoring (Years 86-155)	$21,774,045
Decommissioning (Years 156-180)	$25,459,215
Postclosure Monitoring (Years 181+)	$0
Total	**$371,231,105**

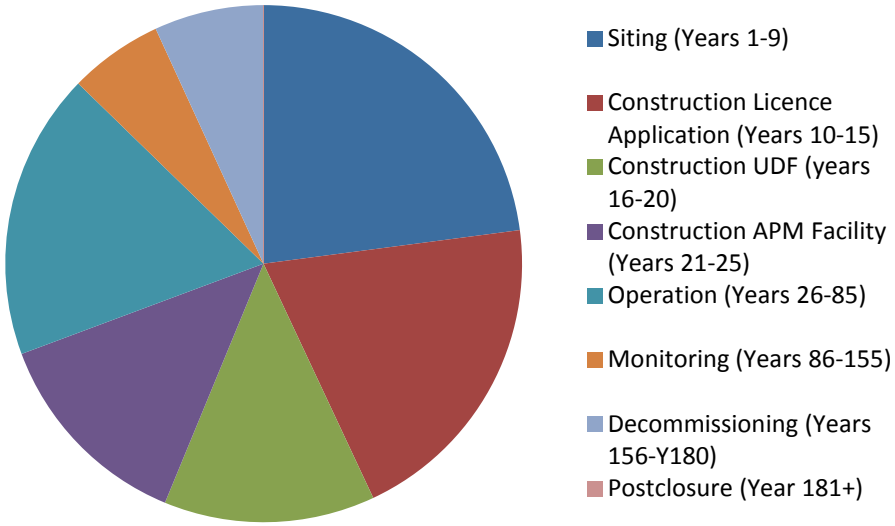

Figure 4.14: Alternate Case: APM Common Services Costs Through Project Phases

4.6 STAFFING

The staffing levels required by NWMO were estimated at the program activity level for the duration of the APM project. The details of NWMO staffing and hourly rates are found in Tables 4.15, 4.16, 4.17, 4.18, 4.19, and 4.20. These tables document the NWMO labour requirements through each of the APM project phases. NWMO's staffing profile pertaining to this estimate is found in Figure 4.15 (base case) and 4.16 (alternate case).

NWMO's portion of the APM cost estimate for staff loading is front end loaded, meaning that NWMO's most significant effort is in securing a site and obtaining a construction licence by Year 15. Although the SNC-Lavalin cost report estimates most costs, some scope is included in this estimate to account for scope not integrated into the SNC-Lavalin cost report. These staff will be supporting ongoing submissions to the regulator and verifying repository system performance.

Table 4.15: Labour Category Definition and Hourly Rates

Job Category	Description	Hourly Rate ($/h)
NWMO1	President, Vice President, Department Manager, Director	$150.58
NWMO2	Administration	$57.01
NWMO3	Section Manager, Engineer, Advisor, Technical Specialist	$88.56

Table 4.16: Summary of NWMO Staffing Levels Years 1 to 25 Base Case

By Year		NWMO1	NWMO2	NWMO3	Total
Year 1	2010	13.0	1.5	31.6	46.1
Year 2	2011	25.1	8.4	56.3	89.8
Year 3	2012	28.3	8.5	70.9	107.7
Year 4	2013	29.6	8.5	84.5	122.6
Year 5	2014	31.1	9.5	84.8	125.4
Year 6	2015	31.1	9.5	84.6	125.1
Year 7	2016	33.2	9.9	87.6	130.7
Year 8	2017	33.2	9.9	87.9	131.0
Year 9	2018	34.5	10.1	91.4	136.0
Year 10	2019	35.5	11.2	101.5	148.2
Year 11	2020	35.5	11.2	101.5	148.2
Year 12	2021	35.3	11.2	99.3	145.7
Year 13	2022	34.3	10.2	96.8	141.2
Year 14	2023	32.4	9.2	94.1	135.7
Year 15	2024	32.4	9.2	93.1	134.7
Year 16	2025	22.4	7.8	75.9	106.1
Year 17	2026	22.4	8.0	74.7	105.0
Year 18	2027	22.4	8.0	76.7	107.1
Year 19	2028	22.6	8.0	76.6	107.2

By Year		NWMO1	NWMO2	NWMO3	Total
Year 20	2029	22.6	8.0	77.2	107.8
Year 21	2030	23.1	8.0	73.0	104.1
Year 22	2031	22.2	7.9	69.3	99.5
Year 23	2032	22.2	7.9	69.3	99.4
Year 24	2033	22.6	7.9	69.3	99.8
Year 25	2034	22.6	7.9	69.3	99.8

Table 4.17: Summary of NWMO Staffing Levels Years 26 to 55 Base Case

By Year		NWMO1	NWMO2	NWMO3	Total
Year 26	2035	12.5	3.0	34.1	49.5
Year 27	2036	12.3	3.0	33.1	48.3
Year 28	2037	12.3	3.0	33.1	48.3
Year 29	2038	12.5	3.0	34.1	49.5
Year 30	2039	12.5	3.0	34.1	49.5
Year 31	2040	12.5	3.0	33.1	48.5
Year 32	2041	12.3	3.0	31.1	46.3
Year 33	2042	12.3	3.0	31.1	46.3
Year 34	2043	12.5	3.0	32.1	47.5
Year 35	2044	12.5	3.0	32.1	47.5
Year 36	2045	5.5	1.0	26.5	33.0
Year 37	2046	5.3	1.0	25.5	31.8
Year 38	2047	5.3	1.0	25.5	31.8
Year 39	2048	5.5	1.0	26.5	33.0
Year 40	2049	5.5	1.0	26.5	33.0
Year 41	2050	5.5	1.0	26.5	33.0
Year 42	2051	5.3	1.0	25.5	31.8
Year 43	2052	5.3	1.0	25.5	31.8
Year 44	2053	5.5	1.0	26.5	33.0
Year 45	2054	5.5	1.0	26.5	33.0
Year 46	2055	5.5	1.0	26.5	33.0
Year 47	2056	5.3	1.0	25.5	31.8
Year 48	2057	5.3	1.0	25.5	31.8
Year 49	2058	5.5	1.0	26.5	33.0
Year 50	2059	5.5	1.0	26.5	33.0
Year 51	2060	5.5	1.0	26.5	33.0
Year 52	2061	5.3	1.0	25.5	31.8
Year 53	2062	5.3	1.0	25.5	31.8
Year 54	2063	5.5	1.0	26.5	33.0
Year 55	2064	5.5	1.0	26.5	33.0

Table 4.18: Summary of NWMO Staffing Levels Years 56 to 125 Base Case

By Year		NWMO1	NWMO2	NWMO3	Total
Year 56	2065	2.5	1.0	16.0	19.5
Year 57	2066	2.5	1.0	16.0	19.5
Year 58	2067	2.5	1.0	16.0	19.5
Year 59	2068	2.5	1.0	16.0	19.5
Year 60	2069	2.5	1.0	16.0	19.5
Year 61	2070	2.5	1.0	16.0	19.5
Year 62	2071	2.5	1.0	16.0	19.5
Year 63	2072	2.5	1.0	16.0	19.5
Year 64	2073	2.5	1.0	16.0	19.5
Year 65	2074	2.5	1.0	16.0	19.5
Year 66	2075	2.5	1.0	16.0	19.5
Year 67	2076	2.5	1.0	16.0	19.5
Year 68	2077	2.5	1.0	16.0	19.5
Year 69	2078	2.5	1.0	16.0	19.5
Year 70	2079	2.5	1.0	16.0	19.5
Year 71	2080	2.5	1.0	16.0	19.5
Year 72	2081	2.5	1.0	16.0	19.5
Year 73	2082	2.5	1.0	16.0	19.5
Year 74	2083	2.5	1.0	16.0	19.5
Year 75	2084	2.5	1.0	16.0	19.5
Year 76	2085	2.5	1.0	16.0	19.5
Year 77	2086	2.5	1.0	16.0	19.5
Year 78	2087	2.5	1.0	16.0	19.5
Year 79	2088	2.5	1.0	16.0	19.5
Year 80	2089	2.5	1.0	16.0	19.5
Year 81	2090	2.5	1.0	16.0	19.5
Year 82	2091	2.5	1.0	16.0	19.5
Year 83	2092	2.5	1.0	16.0	19.5
Year 84	2093	2.5	1.0	16.0	19.5
Year 85	2094	2.5	1.0	16.0	19.5
Year 86	2095	2.5	1.0	16.0	19.5
Year 87	2096	2.5	1.0	16.0	19.5
Year 88	2097	2.5	1.0	16.0	19.5
Year 89	2098	2.5	1.0	16.0	19.5
Year 90	2099	2.5	1.0	16.0	19.5
Year 91	2100	2.5	1.0	16.0	19.5
Year 92	2101	2.5	1.0	16.0	19.5

By Year		NWMO1	NWMO2	NWMO3	Total
Year 93	2102	2.5	1.0	16.0	19.5
Year 94	2103	2.5	1.0	16.0	19.5
Year 95	2104	2.5	1.0	16.0	19.5
Year 96	2105	2.5	1.0	16.0	19.5
Year 97	2106	2.5	1.0	16.0	19.5
Year 98	2107	2.5	1.0	16.0	19.5
Year 99	2108	2.5	1.0	16.0	19.5
Year 100	2109	2.5	1.0	16.0	19.5
Year 101	2110	2.5	1.0	16.0	19.5
Year 102	2111	2.5	1.0	16.0	19.5
Year 103	2112	2.5	1.0	16.0	19.5
Year 104	2113	2.5	1.0	16.0	19.5
Year 105	2114	2.5	1.0	16.0	19.5
Year 106	2115	2.5	1.0	16.0	19.5
Year 107	2116	2.5	1.0	16.0	19.5
Year 108	2117	2.5	1.0	16.0	19.5
Year 109	2118	2.5	1.0	16.0	19.5
Year 110	2119	2.5	1.0	16.0	19.5
Year 111	2120	2.5	1.0	16.0	19.5
Year 112	2121	2.5	1.0	16.0	19.5
Year 113	2122	2.5	1.0	16.0	19.5
Year 114	2123	2.5	1.0	16.0	19.5
Year 115	2124	2.5	1.0	16.0	19.5
Year 116	2125	2.5	1.0	16.0	19.5
Year 117	2126	2.5	1.0	16.0	19.5
Year 118	2127	2.5	1.0	16.0	19.5
Year 119	2128	2.5	1.0	16.0	19.5
Year 120	2129	2.5	1.0	16.0	19.5
Year 121	2130	3.0	1.0	17.0	21.0
Year 122	2131	3.5	1.0	18.0	22.5
Year 123	2132	3.5	1.0	18.0	22.5
Year 124	2133	3.5	1.0	18.0	22.5
Year 125	2134	3.5	1.0	18.0	22.5

Table 4.19: Summary of NWMO Staffing Levels Years 126 to 150 Base Case

By Year		NWMO1	NWMO2	NWMO3	Total
Year 126	2135	4.0	0.5	14.5	19.0
Year 127	2136	4.0	0.5	14.5	19.0
Year 128	2137	4.0	0.5	14.5	19.0
Year 129	2138	4.0	0.5	14.5	19.0
Year 130	2139	4.0	0.5	14.5	19.0
Year 131	2140	4.0	0.5	13.5	18.0
Year 132	2141	4.0	0.5	13.5	18.0
Year 133	2142	4.0	0.5	13.5	18.0
Year 134	2143	4.0	0.5	13.5	18.0
Year 135	2144	4.0	0.5	13.5	18.0
Year 136	2145	4.0	0.5	13.5	18.0
Year 137	2146	4.0	0.5	13.5	18.0
Year 138	2147	4.0	0.5	11.5	16.0
Year 139	2148	4.0	0.5	11.5	16.0
Year 140	2149	4.0	0.5	11.5	16.0
Year 141	2150	4.0	0.5	11.5	16.0
Year 142	2151	4.0	0.5	11.5	16.0
Year 143	2152	4.0	0.5	11.5	16.0
Year 144	2153	4.0	0.5	11.5	16.0
Year 145	2154	4.0	0.5	11.5	16.0
Year 146	2155	4.0	0.5	11.5	16.0
Year 147	2156	4.0	0.5	11.5	16.0
Year 148	2157	5.0	0.5	12.5	18.0
Year 149	2158	5.0	0.5	12.5	18.0
Year 150	2159	5.0	0.5	12.5	18.0

Table 4.20: Summary of NWMO Staffing Levels Years 151 to 155 Base Case

By Year		NWMO1	NWMO2	NWMO3	Total
Year 151	2160	1.0	0.0	2.0	3.0
Year 152	2161	1.0	0.0	2.0	3.0
Year 153	2162	1.0	0.0	2.0	3.0
Year 154	2163	1.0	0.0	2.0	3.0
Year 155	2164	1.0	0.0	0.0	1.0

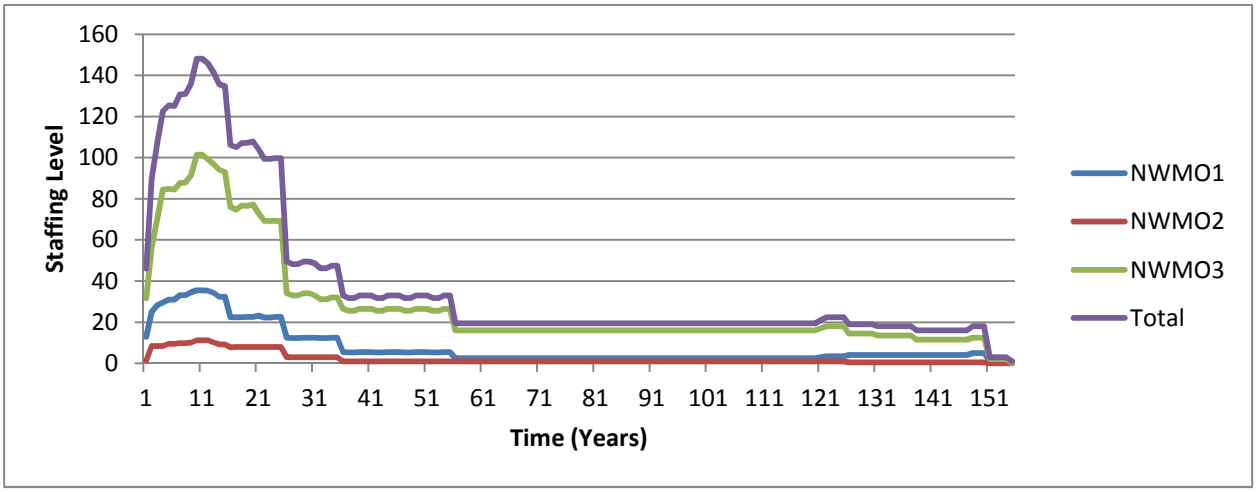

Figure 4.15: NWMO Labour Profile Base Case

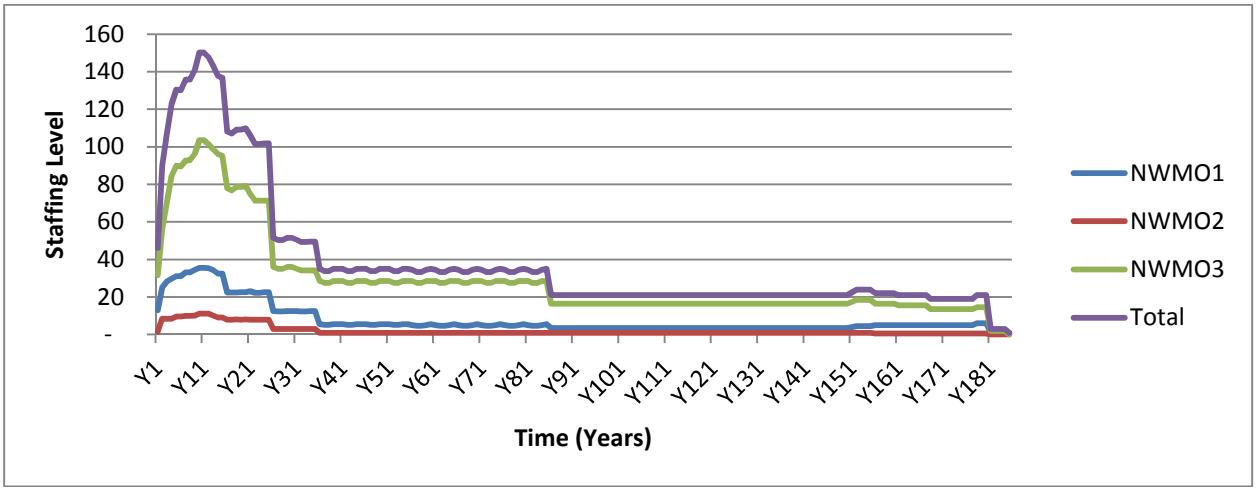

Figure 4.16: NWMO Labour Profile Alternate Case

4.7 MANAGING COMMUNITY IMPACTS

Managing Community Impacts includes community infrastructure programs and community offsets and benefits in conjunction with the APM project. Any improvement or expansion of town site services or infrastructure is a contingent item subject to discussions between the NWMO and the community.

The potential cost of Goods and Services Tax (GST) has not been included in the cost estimate. Land purchase and land transfer tax are included in the site acquisition costs.

Property Tax is carried in the SNC-Lavalin (2011b) input to the APM cost estimate as the timing of purchase site of coincides with start of construction.

4.8 INSURANCE

Allowances for insurances are included in the Common Services work elements of the estimate.

Commercial general liability	$65,000/annum
Director's & officer's liability	$70,000/annum
All risk property insurance	$40,000/annum

These rates are only applicable for Year 1-25 after which the SNC-Lavalin (2011b) input to the APM cost estimate captures insurance costs.

5. SUMMARY OF COST ESTIMATE

The detailed cost estimates for the siting, development, construction, operation, decommissioning and closure of an APM facility are presented in the consolidated WEDs listings (see Appendix B).

The NWMO's total life cycle cost for a DGR that can accept 3.6 million used fuel bundles over 30 years is approximately $2.94 billion (2010 constant dollars). Tables 5.1 and 5.2 present the cost estimate for an APM facility by Level 2 work element and development phase, respectively. Costs by project phase and Level 2 work breakdown structure for the Base Case can be found in Table 5.5 with an annual cash flow plotted in Figure 5.1.

Table 5.1: NWMO Input to APM Cost Estimate by Level 2 WBS – Base Case

WBS	NWMO Scope Description	Cost (2010k$)
560.05	Building Relationships	$533,258
560.10	Adapting To Change	$28,542
552.15	Siting	$568,012
552.20	Design Development & Safety Case	$425,479
552.25	Research & Confidence Building	$183,930
552.30	Site Verification & Licence Support	$877,902
552.90	Common Services (Years 1>>25)	$319,564
Total Cost		**$2,936,687**

Table 5.2: NWMO Input to APM Cost Estimate by Phase - Base Case

APM Implementation Phase	Cost (2010K$)
Siting (Years 1-9)	$766,875
Construction Licence Application (Years 10-15)	$500,721
Construction UDF(Years 16-20)	$274,246
Construction DGR (Years 21-25)	$268,041
DGR Operations (Years 26-55)	$473,524
Extended Monitoring (Years 56-125)	$446,239
Decommissioning (Years 126-150)	$139,072
Postclosure Monitoring (Years 151+)	$67,969
Total Cost	**$2,936,687**

The NWMO's total life cycle cost for a DGR that can accept 7.2 million fuel bundles over 60 years is approximately $3.68 billion (2010 constant dollars). Tables 5.3 and 5.4 present the cost estimate for a DGR facility by level two work element and development phase, respectively. Costs by project phase and Level 2 work breakdown structure for the Alternate Case can be found in Table 5.6 with an annual cash flow plotted in Figure 5.2.

Table 5.3: NWMO Input to APM Cost Estimate by Level 2 WBS – Alternate Case

WBS	NWMO Scope Description	Cost (2010k$)
560.05	Building Relationships	$646,072
560.10	Adapting To Change	$31,494
552.15	Siting	$779,870
552.20	Design Development & Safety Case	$435,242
552.25	Research & Confidence Building	$202,680
552.30	Site Verification & Licence Support	$1,217,505
552.90	Common Services (Years 1>>25)	$371,231
Total Cost		**$3,684,094**

Table 5.4: NWMO Input to APM Cost Estimate by Phase - Alternate Case

APM Implementation Phase	Cost (2010K$)
Siting (Years 1-9)	$956,796
Construction Licence Application (Years 10-15)	$511,041
Construction UDF(Years 16-20)	$279,617
Construction DGR (Years 21-25)	$272,161
DGR Operations (Years 26-85)	$957,503
Extended Monitoring (Years 86-155)	$480,475
Decommissioning (Years 156-180)	$158,532
Postclosure Monitoring (Years 181+)	$67,969
Total Cost	**$3,684,094**

Table 5.5: Base Case NWMO APM Project Cash Flow

Development Phase	TOTAL	05 Building Relationships	10 Adapting To Change	15 Siting	20 Design Development & Safety Case	25 Confidence Building &Process Understanding	30 Site Verification & Licensing Support	90 Common Services
Siting (Y1-9)	**$766,875,190**	$77,036,367	$9,765,312	$457,496,780	$90,121,558	$45,180,277	$2,185,380	$85,089,516
Construction Licence Application (Y10-Y15)	**$500,720,720**	$60,452,565	$4,864,283	$59,427,443	$186,367,888	$27,250,000	$87,668,389	$74,690,152
Construction UDF (Y16-Y20)	**$274,245,807**	$42,553,633	$1,020,954	$11,468,750	$84,457,192	$23,625,000	$62,117,352	$49,002,926
Construction DGR (Y21-Y25)	**$268,040,655**	$42,478,633	$590,505	$8,368,750	$42,563,509	$59,750,000	$65,706,004	$48,583,254
Operation (Y26-Y55)	**$473,524,290**	$140,616,982	$2,952,275	$22,500,000	$10,577,385	$28,125,000	$241,836,811	$26,915,837
Extended Monitoring Y56-Y125)	**$446,238,693**	$135,702,760	$6,888,641	$8,750,000	$11,391,030	$0	$269,615,232	$13,891,030
Decommissioning & Closure (Y126-Y150)	**$139,071,762**	$34,260,570	$2,460,229	$0	$0	$0	$80,959,973	$21,390,990
Postclosure Monitoring (Y151)	**$67,969,036**	$156,250	$0	$0	$0	$0	$67,812,786	$0
TOTAL	**$2,936,686,153**	**$533,257,760**	**$28,542,199**	**$568,011,723**	**$425,478,562**	**$183,930,277**	**$877,901,927**	**$319,563,705**

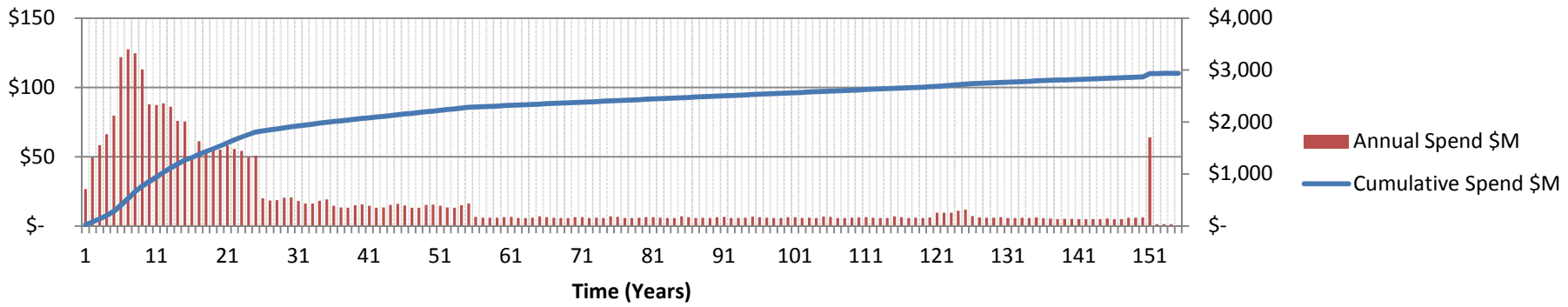

Figure 5.1: Base Case NWMO APM Project Annual Cash Flow and Cumulative Costs

Table 5.6: Alternate Case NWMO APM Project Cash Flow

Development Phase	TOTAL	05 Building Relationships	10 Adapting To Change	15 Siting	20 Design Development & Safety Case	25 Confidence Building &Process Understanding	30 Site Verification & Licensing Support	90 Common Services
Siting (Y1-9)	**$956,796,165**	$77,598,867	$9,765,312	$646,855,255	$90,121,558	$45,180,277	$2,185,380	$85,089,516
Construction Licence Application (Y10-Y15)	**$511,040,968**	$61,390,065	$4,864,283	$59,427,443	$186,367,888	$27,250,000	$97,051,137	$74,690,152
Construction UDF (Y16-Y20)	**$279,616,847**	$43,178,633	$1,020,954	$11,468,750	$84,457,192	$23,625,000	$66,863,392	$49,002,926
Construction DGR (Y21-Y25)	**$272,161,695**	$43,103,633	$590,505	$8,368,750	$42,563,509	$59,750,000	$69,202,044	$48,583,254
Operation (Y26-Y55)	**$957,503,801**	$250,681,558	$5,904,549	$45,000,000	$20,341,125	$46,875,000	$522,069,572	$66,631,997
Extended Monitoring Y56-Y125)	**$480,475,238**	$135,702,760	$6,888,641	$8,750,000	$11,391,030	$0	$295,968,762	$21,774,045
Decommissioning & Closure (Y126-Y150)	**$158,531,731**	$34,260,570	$2,460,229	$0	$0	$0	$96,351,717	$25,459,215
Postclosure Monitoring (Y151)	**$67,969,036**	$156,250	$0	$0	$0	$0	$67,812,786	$0
TOTAL	**$3,684,095,481**	**$646,072,336**	**$31,494,473**	**$779,870,198**	**$435,242,302**	**$202,680,277**	**$1,217,504,790**	**$371,231,105**

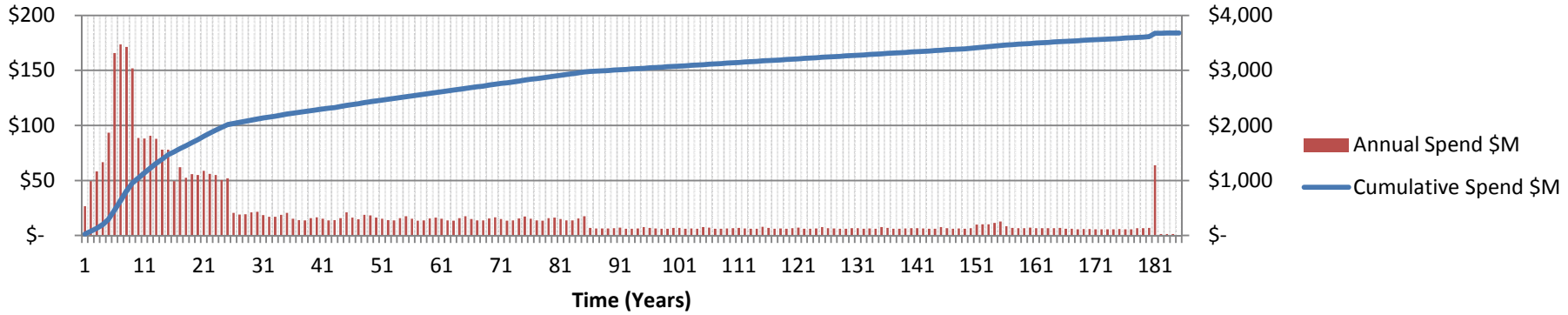

Figure 5.2: Alternate Case NWMO APM Project Annual Cash Flow and Cumulative Costs

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APPENDIX A: WORK BREAKDOWN STRUCTURE TO THE LOWEST LEVEL

WBS Number					WBS Title
560	**05**				**BUILDING RELATIONSHIPS**
560	05	10	10	10	TITLE: APM Social – Staffing – Building Relationships
560	05	10	10	20	EXHIBITS AND EDUCATION TOOLS
560	05	10	10	30	ABORIGINAL ENGAGEMENT – ELDERS FORUM, NIIGANI
560	05	10	10	40	NATIONAL ABORIGINAL ORGANIZATIONS
560	05	10	10	50	ABORIGINAL PROVINICAL ORGANIZATIONS
560	05	10	10	60	ABORIGINAL YOUTH INITIATIVES
560	05	10	10	70	ABORIGINAL AWARENESS BUILDING
560	05	10	10	80	STAFF TRAVEL COSTS – ABORIGINAL
560	05	10	10	90	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION
560	05	10	10	100	PROVINCIAL STAKEHOLDER ENGAGEMENT
560	05	10	10	110	COMMUNITY, SERVICE and ADVOCACY BRIEFINGS
560	05	10	10	120	MUNICIPAL FORUM MEETINGS
560	05	10	10	130	MUNICIPAL ASSOCIATIONS
560	05	10	10	140	GOVERNMENT RELATIONS MEETINGS
560	05	10	10	150	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS
560	05	10	10	160	CONTRACTED WRITING
560	05	10	10	170	MEDIA MONITORING
560	05	10	10	180	WEBSITE MAINTENANCE
560	05	10	10	190	DIRECTED COMMUNICATIONS
560	05	10	10	200	TRANSLATION
560	05	10	10	210	MEDIA RELATIONS
560	05	10	10	220	CORPORATE CITIZENSHIP
560	05	10	10	230	MAILING
560	05	10	10	240	PREMIUM PROGRAM
560	05	10	10	250	YOUTH COMMUNICATIONS
560	05	10	10	260	TRIENNIAL REPORT
560	05	10	10	270	TRACKING PUBLIC OPINION
560	05	10	20	10	TITLE: APM Social – Staffing – Building Relationships
560	05	10	20	30	ABORIGINAL ENGAGEMENT – ELDERS FORUM, NIIGANI
560	05	10	20	40	NATIONAL ABORIGINAL ORGANIZATIONS
560	05	10	20	50	ABORIGINAL PROVINICAL ORGANIZATIONS
560	05	10	20	60	ABORIGINAL YOUTH INITIATIVES
560	05	10	20	70	ABORIGINAL AWARENESS BUILDING
560	05	10	20	80	STAFF TRAVEL COSTS – ABORIGINAL
560	05	10	20	90	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION

WBS Number					WBS Title
560	05	10	20	100	COMMUNITY, SERVICE and ADVOCACY BRIEFINGS
560	05	10	20	110	MUNICIPAL FORUM MEETINGS
560	05	10	20	120	MUNICIPAL ASSOCIATIONS
560	05	10	20	130	GOVERNMENT RELATIONS MEETINGS
560	05	10	20	140	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS
560	05	10	20	150	CONTRACTED WRITING
560	05	10	20	160	MEDIA MONITORING
560	05	10	20	170	WEBSITE MAINTENANCE
560	05	10	20	180	DIRECTED COMMUNICATIONS
560	05	10	20	190	TRANSLATION
560	05	10	20	200	MEDIA RELATIONS
560	05	10	20	210	CORPORATE CITIZENSHIP
560	05	10	20	220	MAILING
560	05	10	20	230	PREMIUM PROGRAM
560	05	10	20	250	TRIENNIAL REPORT
560	05	10	20	260	TRACKING PUBLIC OPINION
560	05	10	30	10	TITLE: APM Social – Staffing – Building Relationships
560	05	10	30	20	NATIONAL ABORIGINAL ORGANIZATIONS
560	05	10	30	30	ABORIGINAL PROVINICAL ORGANIZATIONS
560	05	10	30	40	ABORIGINAL YOUTH INITIATIVES
560	05	10	30	50	ABORIGINAL AWARENESS BUILDING
560	05	10	30	60	STAFF TRAVEL COSTS – ABORIGINAL
560	05	10	30	70	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION
560	05	10	30	80	COMMUNITY, SERVICE and ADVOCACY BRIEFINGS
560	05	10	30	90	MUNICIPAL FORUM MEETINGS
560	05	10	30	100	MUNICIPAL ASSOCIATIONS
560	05	10	30	110	GOVERNMENT RELATIONS MEETINGS
560	05	10	30	120	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS
560	05	10	30	130	CONTRACTED WRITING
560	05	10	30	140	MEDIA MONITORING
560	05	10	30	150	WEBSITE MAINTENANCE
560	05	10	30	160	DIRECTED COMMUNICATIONS
560	05	10	30	170	TRANSLATION
560	05	10	30	180	MEDIA RELATIONS
560	05	10	30	190	CORPORATE CITIZENSHIP
560	05	10	30	200	MAILING
560	05	10	30	210	PREMIUM PROGRAM
560	05	10	30	230	TRIENNIAL REPORT
560	05	10	40	10	TITLE: APM Social – Staffing – Building Relationships

WBS Number					WBS Title
560	05	10	40	20	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION
560	05	10	40	60	GOVERNMENT RELATIONS MEETINGS
560	05	10	40	70	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS
560	05	10	40	80	CONTRACTED WRITING
560	05	10	40	90	MEDIA MONITORING
560	05	10	40	100	WEBSITE MAINTENANCE
560	05	10	40	110	DIRECTED COMMUNICATIONS
560	05	10	40	120	TRANSLATION
560	05	10	40	130	MEDIA RELATIONS
560	05	10	40	140	CORPORATE CITIZENSHIP
560	05	10	40	150	MAILING
560	05	10	40	160	PREMIUM PROGRAM
560	05	10	40	180	TRIENNIAL REPORT
560	05	10	50	10	TITLE: APM Social – Staffing – Building Relationships
560	05	10	50	20	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION
560	05	10	50	30	GOVERNMENT RELATIONS MEETINGS
560	05	10	50	40	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS
560	05	10	50	70	WEBSITE MAINTENANCE NIU
560	05	10	50	80	DIRECTED COMMUNICATIONS
560	05	10	50	90	TRANSLATION
560	05	10	50	120	MAILING
560	05	10	50	150	TRIENNIAL REPORT
560	05	10	60	10	TITLE: APM Social – Staffing – Building Relationships
560	05	10	60	20	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION
560	05	10	60	30	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS
560	05	10	60	40	DIRECTED COMMUNICATIONS
560	05	10	60	50	TRANSLATION
560	05	10	60	60	MAILING
560	05	10	60	70	TRIENNIAL REPORT
560	05	10	70	10	TRIENNIAL REPORT
560	**10**				**ADAPTING TO CHANGE**
560	10	10	10	10	ABORIGINAL TRADITIONAL KNOWLEDGE
560	10	10	10	20	ETHICAL FRAMEWORK FOR APM IMPLEMENTATION
560	10	10	10	30	TRACKING BEST PRACTICES AND EXTERNAL ADVICE
560	10	10	10	40	TITLE: APM Social – Staffing – Adapting to Change
560	10	10	20	10	ETHICAL FRAMEWORK FOR APM IMPLEMENTATION
560	10	10	20	20	TRACKING BEST PRACTICES AND EXTERNAL ADVICE
560	10	10	20	30	TITLE: APM Social – Staffing – Adapting to Change
560	10	10	20	40	ABORIGINAL TRADITIONAL KNOWLEDGE

WBS Number					WBS Title
560	10	10	30	10	TITLE: APM Social – Staffing – Adapting to Change
560	10	10	40	10	TITLE: APM Social – Staffing – Adapting to Change
560	10	10	50	10	TITLE: APM Social – Staffing – Adapting to Change
560	10	10	60	10	TITLE: APM Social – Staffing – Adapting to Change
560	10	50	10	10	REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, APM SITING PHASE TECHNOLOGY WATCH
560	**15**				**SITING**
560	15	10	10	10	SITE ACQUISITION AND IMPROVEMENTS
560	15	10	10	20	TITLE: APM Social – Staffing – Siting Process
560	15	10	10	30	COMMUNITY CAPACITY BUILDING – Community support for participation in Step 1 and Step 2 of the Siting process (information and initial screening)
560	15	10	10	40	MUNICIPAL FORUM AND TOOL DEVELOPMENT
560	15	10	10	50	CAPACITY BUILDING OF OTHERS – Non profit organizations/ academics
560	15	10	10	60	COMMUNITY CAPACITY BUILDING – Community support for participation in Step 3 of the Siting process (feasibility study)
560	15	10	10	70	THIRD PARTY REVIEWS
560	15	10	10	80	STAKEHOLDER MAPPING FOR SITING REGIONS
560	15	10	10	90	NATIONAL WORKSHOPS ON SOCIAL CONSIDERATIONS OF SITING
560	15	10	10	100	STAFF TRAVEL COSTS – NON ABORIGINAL
560	15	10	10	110	STORE FRONT NWMO OFFICES
560	15	10	10	120	ASSESSMENTS OF SITE SUITABILITY (SOCIAL ASPECTS)
560	15	10	10	130	MANAGING COMMUNITY IMPACTS (Community Benefits)
560	15	10	10	140	DVDs FOR SITING
560	15	10	10	150	COMMUNITY CAPACITY BUILDING – Community support for participation in Step 4/5/6 of the Siting process (detailed site characterization)
560	15	10	10	160	CENTRE OF EXPERTISE (NEW)
560	15	10	10	170	PRODUCTION, TRANSLATION OF SITING PROCESS DOC
560	15	10	10	180	EXPERT ADVICE, WORKSHOPS
560	15	60	40	10	SUSTAINING RELATIONSHIPS/ COLLABORATION DURING OPERATIONS
560	15	10	20	10	SITE ACQUISITION AND IMPROVEMENTS
560	15	10	20	20	TITLE: APM Social – Staffing – Siting Process
560	15	10	20	30	STAFF TRAVEL COSTS – NON ABORIGINAL
560	15	10	20	40	STORE FRONT NWMO OFFICES
560	15	10	20	50	MANAGING COMMUNITY IMPACTS (Community Benefits)
560	15	10	20	60	CENTRE OF EXPERTISE (NEW)
560	15	10	20	70	STAKEHOLDER MAPPING FOR SITING REGIONS
560	15	10	30	10	STAFF TRAVEL COSTS – NON ABORIGINAL
560	15	10	30	20	STORE FRONT NWMO OFFICES
560	15	10	30	30	MANAGING COMMUNITY IMPACTS (Community Benefits)

WBS Number					WBS Title
560	15	10	30	40	CENTRE OF EXPERTISE (NEW)
560	15	10	40	30	MANAGING COMMUNITY IMPACTS (Community Benefits)
560	15	10	40	40	CENTRE OF EXPERTISE (NEW)
560	15	10	50	10	CENTRE OF EXPERTISE (NEW)
560	15	20	10	10	DATABASE AND INFORMATION SYSTEMS
560	15	20	10	20	GEOSCIENCE TECHNICAL SITING MANAGEMENT AND SUPPORT TO ENGAGEMENT
560	15	20	10	30	INITIAL SCREENING
560	15	20	10	40	DESKTOP FEASIBILITY STUDIES
560	15	20	10	50	PRELIMINARY FIELD STUDIES IN SUPPORT OF FEASIBILITY ASSESSMENTS
560	15	20	10	60	CHARACTERISATION AND MONITORING PLANS FOR 2 SITES
560	15	20	10	70	DETAILED SITE CHARACTERISATION (CRYSTALLINE SITE)
560	15	20	10	80	GEOSPHERE MONITORING DURING DETAILED SITE CHARACTERIZATION AT 2 SITES
560	15	30	10	10	SAFETY ASSESSMENT FOR SCREENING
560	15	30	10	20	BIOSPHERE CHARACTERIZATION FOR SCREENING
560	15	30	10	30	SAFETY ASSESSMENT FOR CANDIDATE SITES
560	15	30	10	40	BIOSPHERE CHARACTERIZATION FOR CANDIDATE SITES
560	**20**				**DESIGN DEVELOPMENT & SAFETY CASE**
560	20	20	10	10	TECHNICAL SUPPORT FOR SITING AND ILLUSTRATIVE SAFETY ASSESSMENT STUDIES
560	20	30	10	10	ILLUSTRATIVE SAFETY ASSESSMENT STUDIES FOR HYPOTHETICAL SITES
560	20	40	10	10	LIAISON WITH CNSC
560	20	40	10	20	CNSC Pre-licensing Review
560	20	40	10	30	SECURITY AND SAFEGUARDS INPUT TO DESIGN
560	20	50	10	10	REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, APM SITING PHASE DESIGN & COST UPDATE
560	20	50	10	20	PREL CONTAINER DESIGN ENGINEERING
560	20	50	10	30	CONTAINER FABRICATION, INSPECTION & SEALING TECH DEV
560	20	50	10	50	SITE DEPENDENT REPOSITORY DESIGNS
560	20	50	10	60	UFPP CONCEPTUAL DESIGN, SITING
560	20	50	10	70	PLACEMENT SYSTEMS ENGINEERING, SPECS & PSAR INPUT
560	20	50	10	80	RETRIEVAL SYSTEMS ENGINEERING, SPECS & PSAR INPUT
560	20	50	20	10	REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, CONSTRUCTION LICENSE PHASE
560	20	50	20	20	FABRICATION, INSPECTION & SEALING DEMONSTRATIONS
560	20	50	20	30	REFERENCE CONTAINER DESIGN & ENGINEERING
560	20	50	20	40	CONDUCT REPOSITORY DEVELOPMENT STUDIES
560	20	50	20	50	UFPP PRELIMINARY DESIGN FOR PSAR, EA AND CONSTRUCTION

WBS Number					WBS Title
					LICENSE APPLICATION
560	20	50	20	60	SEALING MATERIALS ENGINEERING – FINALIZE SITE SPECIFIC DEVELOPMENT
560	20	50	20	70	SEALING MATERIALS ENGINEERING PROTOTYPE AQUISITION
560	20	50	20	80	PLACEMENT SYSTEMS ENGINEERING, SPECS & PSAR INPUT
560	20	50	20	90	RETRIEVAL SYSTEMS ENGINEERING, SPECS & PSAR INPUT
560	20	50	30	10	REPOSITORY CONSTRUCTION MANAGEMENT, CONSTRUCTION UDF & OBTAIN FSR
560	20	50	30	20	DEVELOPMENT AND DEMONSTRATION OF SERIAL PRODUCTION OF UFC COMPONENTS AND UFCS
560	20	50	30	30	REFERENCE CONTAINER DESIGN & ENGINEERING
560	20	50	30	40	TECH SPECS FOR REPOSITORY & UFPP
560	20	50	30	50	UFPP Construction/Technology Demonstration
560	20	50	30	60	SEALING MATERIALS ENGINEERING
560	20	50	30	70	PLACEMENT SYSTEMS ENGINEERING, SPECS & FSAR INPUT
560	20	50	30	80	RETRIEVAL SYSTEMS ENGINEERING, SPECS & FSAR INPUT
560	20	50	40	10	Repository Engineering Program & Project Costs - Operation
560	20	50	50	10	Repository Engineering Program & Project Costs - Extended Operation/Monitoring
560	**25**				**RESEARCH AND CONFIDENCE BUILDING**
560	25	20	10	10	TECHNICAL SUPPORT DURING CANDIDATE SITE PHASE
560	25	20	20	10	TECHNICAL SUPPORT DURING EA AND PSR PHASE
560	25	30	10	10	TECHNICAL SUPPORT FOR APM TECHNICAL PROGRAM OBJECTIVE #3 DURING SCREENING PHASE
560	25	30	10	40	TECHNICAL SUPPORT FOR APM TECHNICAL PROGRAM OBJECTIVE #3 DURING CANDIDATE SITE PHASE
560	25	30	20	10	TECHNICAL SUPPORT DURING EA AND PSR PHASE
560	25	30	30	10	TECHNICAL SUPPORT FOR OPERATING LICENCE APPLICATION
560	25	50	10	10	GENERIC REPOSITORY SEALING SYSTEMS
560	25	50	10	20	CANDIDATE SITES REPOSITORY SEALING SYSTEMS, SITING
560	25	50	10	30	DEVELOPMENT OF REPOSITORY MONITORING STRATEGIES AND TECHNOLOGIES
560	25	50	20	10	PREFERRED SITE REPOSITORY SEALING SYSTEMS, LICENSE PHASE
560	25	50	20	20	REPOSITORY MONITORING AND TECHNOLOGY DEVELOPMENT
560	25	50	30	40	PLAN UDF DEMONSTRATIONS and UDF SPECIFICATIONS
560	25	50	30	50	CONDUCT UDF DEMONSTRATIONS - INITIATE
560	25	50	30	60	MONITORING SYSTEMS DEVELOPMENT AND DEMONSTRATION
560	25	50	30	70	MONITORING SYSTEMS AND PROGRAM – DGR CONSTRUCTION PHASE
560	25	50	40	10	CONTINUING UDF DEMONSTRATIONS - OPERATIONS
560	**30**				**SITE VERIFICATION & LICENCE SUPPORT**

WBS Number					WBS Title
560	30	20	20	10	DATABASE AND INFORMATION SYSTEMS
560	30	20	20	20	GEOSPHERE SUPPORT AND MONITORING AT PREFERRED SITE DURING REGULATORY PROCESS
560	30	20	30	10	DATABASE AND INFORMATION SYSTEMS
560	30	20	30	20	GEOSCIENCE SUPPORT AND MONITORING DURING UDF CONSTRUCTION
560	30	20	30	30	GEOSCIENCE SUPPORT AND MONITORING DURING UDF OPERATION
560	30	20	40	10	GEOSCIENCE SUPPORT AND MONITORING DURING DGR OPERATION
560	30	20	50	10	GEOSCIENCE SUPPORT DURING EXTENDED MONITORING
560	30	20	60	10	GEOSCIENCE SUPPORT AND MONITORING DURING DGR DECOMMISSIONING
560	30	20	70	10	GEOSCIENCE SUPPORT AND MONITORING DURING DGR ABANDONMENT
560	30	30	20	10	SAFETY ASSESSMENT FOR EA AND PSR
560	30	30	20	20	SUPPORT FOR REVIEW AND HEARINGS FOR CONSTRUCTION LICENCE
560	30	30	20	30	BIOSPHERE CHARACTERIZATION FOR EA AND PSR
560	30	30	30	10	SAFETY ASSESSMENT FOR FSR
560	30	30	30	20	BIOSPHERE MONITORING
560	30	30	30	30	HUMAN HEALTH MONITORING
560	30	30	30	90	SUPPORT FOR REVIEW AND HEARINGS FOR OPERATING LICENCE
560	30	30	40	10	OPERATIONS SAFETY ASSESSMENT
560	30	30	40	20	BIOSPHERE MONITORING
560	30	30	40	30	HUMAN HEALTH MONITORING
560	30	30	50	10	EXTENDED MONITORING
560	30	30	50	20	BIOSPHERE MONITORING
560	30	30	50	40	HUMAN HEALTH MONITORING
560	30	30	60	10	BIOSPHERE MONITORING
560	30	30	60	20	DECOMMISSIONING
560	30	30	70	10	ABANDONMENT
560	30	40	10	10	OTHER GOVERNMENT APPROVALS – REQUIREMENTS
560	30	40	10	20	PREPARATION FOR ENVIRONMENTAL ASSESSMENT
560	30	40	20	10	SITE PREP. AND CONSTR. LICENCE (CNSC) APPLICATION
560	30	40	20	20	LICENSING REVIEW INCLUDING PUBLIC HEARING
560	30	40	20	30	ENVIRONMENTAL ASSESSMENT
560	30	40	20	40	OTHER GOVERMENT APPROVALS – FEDERAL
560	30	40	20	50	OTHER GOVERNMENT APPROVALS – PROVINCIAL
560	30	40	20	60	OTHER GOVERNMENT APPROVALS – MUNICIPAL/REGIONAL
560	30	40	30	10	OTHER GOVERMENT APPROVALS – FEDERAL
560	30	40	30	20	OTHER GOVERNMENT APPROVALS – PROVINCIAL

WBS Number					WBS Title
560	30	40	30	30	OTHER GOVERNMENT APPROVALS – MUNICIPAL/REGIONAL
560	30	40	30	40	MAINTAIN CONSTRUCTION LICENCE DURING THE SITE PREPARATION AND CONSTRUCTION OF THE UNDERGROUND DEMONSTRATION FACILITY (UDF)
560	30	40	30	50	MAINTAIN THE CONSTRUCTION LICENCE DURING THE CONSTRUCTION OF THE DEEP GEOLOGICAL REPOSITORY (DGR) COMPONENTS
560	30	40	30	60	OPERATING LICENCE (CNSC) APPLICATION
560	30	40	30	70	LICENSING REVIEW INCLUDING PUBLIC HEARING
560	30	40	40	10	MAINTAIN OPS LICENCE DURING OPERATIONS/APPLY TO RENEW LICENCE
560	30	40	40	20	LICENSING REVIEW INCLUDING PUBLIC HEARING
560	30	40	50	10	MAINTAIN/RENEW OPS LICENCE DURING EXTENDED MONITORING
560	30	40	50	20	DECOMMISSIONING LICENCE (CNSC) APPLICATION
560	30	40	50	30	LICENSING REVIEW INCLUDING PUBLIC HEARING
560	30	40	50	40	EA FOR CNSC DECOMMISSIONING LICENCE
560	30	40	60	10	LICENCE TO ABANDON (CNSC) APPLICATION
560	30	40	60	20	LICENSING REVIEW INCLUDING PUBLIC HEARING
560	30	40	60	30	MAINTAIN DECOMMISSIONING LICENCE (CNSC)
560	30	40	70	30	LICENCE TO ABANDON (CNSC)
560	30	50	20	10	PROVIDE ENGINEERING INPUT TO PSAR
560	30	50	20	20	ENGINEERING SUPPORT DURING LICENSING REVIEW AND EA HEARINGS
560	30	50	30	10	PROVIDE ENGINEERING INPUT TO FSAR
560	30	50	30	20	SAFEGUARDS INTERFACE IMPLEMENTATION
560	30	50	30	30	PRODUCE SPECS AND INPUT TO FSAR (FINAL SAFETY ASSESSMENT REPORT)
560	30	50	40	10	MONITORING SYSTEMS AND PROGRAM – DGR OPERATION PHASE
560	30	50	50	10	EXTENDED MONITORING PERIOD
560	30	50	60	10	DECOMMISSIONING PERIOD
560	**90**				**COMMON SERVICES**
560	90	50	10	10	Common Services (Y01-Y09), Siting Phase
560	90	50	20	10	Common Services (Y10-Y15), Construction License Phase
560	90	50	30	10	Common Services Y16-Y25, Construction Phase
560	90	70	10	10	QUALITY ASSURANCE PROGRAM SITING
560	90	70	20	10	QUALITY ASSURANCE PROGRAM LICENCE APPLICATION
560	90	70	30	10	QUALITY ASSURANCE PROGRAM UDF and DGR CONSTRUCTION
560	90	70	40	10	QUALITY ASSURANCE PROGRAM, DGR OPERATIONS
560	90	70	50	10	QUALITY ASSURANCE PROGRAM, EXTENDED OPERATIONS
560	90	70	60	10	QUALITY ASSURANCE PROGRAM, DECOMMISSIONING & CLOSURE

APPENDIX B: WORK ELEMENT DEFINITION SHEETS (WEDS)

B.1 Base Case 3.6 Million Bundle Work Element Definition Sheets

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	50	10	10			**Prepared By:**	A. Murchison
WBS (Old)	552	20	2						
WBS Title	REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, APM SITING PHASE TECHNOLOGY WATCH								
Description	Provide overall management of the repository system development during repository siting. Tasks include: - Technology watch on alternative used fuel management approaches. - Identify and provide technical risk management recommendations to the executive								
Deliverable	- Management of: - Technology watch through external contractors on such topics as Re-processing & transmutation, very deep borehole disposal, alternative fuel management approaches, etc.,								
Assumptions	Duration of work: Y01 to Y09. Staff requirements found in REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, APM SITING PHASE DESIGN & COST UPDATE Description Y01 Y02 Y03 Y04 Y05 Y06 Y07 Y08 Y09 Year 2010 2011 2012 2013 2014 2015 2016 2017 2018 Watching Brief $52k $75k $75k $75k $75k $75k $75k $75k $75k Budget based on historical costs to place technology watch contracts.								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 652,000	$ 652,000	$ 163,000	$ 815,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	20	10	10			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	20	40					
WBS Title	DATABASE AND INFORMATION SYSTEMS								
Description	Develop the infrastructure for an integrated electronic geographic and geologic database and information management system. System design intended for spatial and temporal analysis, interpretation, integration and communication of site specific characterisation and monitoring data. Information System would be applied and, as required, up-graded throughout the repository siting process. It would further serve to archive site specific geosphere/biosphere data and create traceable data sets that would evolve as siting proceeded toward confirmation of the preferred site and UCF construction/operation. Databases would be accessible by a suite of analyses and visualization applications (GIS, Gocad, ...), which would likely evolve over the timeframe of the project. Interoperability is essential. Databases would be structured to include data information on transportation, natural environment, remote imaging, airborne geophysics, seismicity, geology, borehole data, municipal/ regional boundaries, aboriginal lands, surface hydrology, topography and groundwater resources. Results of geosphere model development and associated numerical simulations will also be archived in a suitable database. Database would facilitate internet access by project team members and other stakeholders, if appropriate.								
Deliverable	Integrated Electronic Information system and infrastructure to apply in support of repository siting, Environmental Assessment, conceptual geosphere model development, Performance and Safety Assessment.								
Assumptions	**Cost (Y01-Y09)**: - DBS Equipment start-up costs (software, server): $100k for Y02; - Annual Licensing fees and upgrades: $100k/a for Y03-Y09; Database/Information management system maintained through Geoscience and monitoring support beyond Y25.								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 800,000	$ -	$ 800,000	$ 200,000	$ 1,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	20	10	20			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	10						
WBS Title	GEOSCIENCE TECHNICAL SITING MANAGEMENT AND SUPPORT TO ENGAGEMENT								
Description	Provide technical siting management for geosphere characterisation activities related to the siting process for a Deep Geologic Repository. Requires the planning and co-ordination of field, laboratory and modelling studies, as well as, electronic information systems to support repository engineering, Safety Assessment and Environmental Assessment functions. Tasks include: - Management of Technical Siting activities (Initial Screening, Feasibility Studies, Detailed Characterization) - Providing support for community engagement activities. - Technical support for repository design/engineering, repository safety and environmental assessment. - The administration and formation of technical advisory and peer review panels. - Liaison with international geosphere radioactive waste management programs on issues related to collaborative RD&D activities and siting program status.								
Deliverable	- Site Characterisation and Monitoring plans throughout the siting process. - Technical Advisory/Expert panel reports.								
Assumptions	NWMO Staffing: Y01: 1 x NWMO-1 and 4.6 x NWMO-3: Travel of $15k Y02: 1 x NWMO-1 and 10.8 x NWMO-3; Travel of $30k Y03: 1 x NWMO-1 and 12.5 x NWMO-3; Travel of $35k Y04: 1 x NWMO-1 and 20.7 x NWMO-3; Travel of $55k Y05 to Y09: 1 x NWMO-1 and 20.2 x NWMO-3 Travel of $50k/a								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	Staffing scenario 2 assumed. Travel is assuming one trip per year per staff.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 21,467,580	$ -	$ 385,000	$ 21,852,580	$ 5,463,145	$ 27,315,725

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	20	10	30			**Prepared By:**	B. Belfadhel
WBS (Old)									
WBS Title	INITIAL SCREENING								
Description	An initial screening study will be undertaken when a community expresses interest in entering the site evaluation process. The initial screening is a desktop study based on readily available information. The five Initial Screening Criteria relate to a site having sufficient space, an absence of significant natural environment and heritage features, minimal possibility of future disruption due to human intrusion, and avoiding known geoscientific conditions that would compromise repository safety. The overall objective of initial screening is to allow sites or areas that clearly have the potential to host a used nuclear fuel repository to be moved forward in the process, while eliminating those sites or areas that are clearly unsuitable. The level of detail at which these various aspects will be assessed will depend on the amount of site information that will be available. A more detailed assessment will be conducted at the feasibility stage provided the community meets all the initial screening criteria and the community remains interested in participating in the site selection process.								
Deliverable	- Geoscientific screening assessment reports for each community to identify suitability for desktop Feasibility Study. - All data sets used in the screening assessment will be stored in the NWMO data management system accompanied with necessary metadata for future reference and traceability. - Technical communication/presentation of screening study findings to community representatives.								
Assumptions	- 15 communities have expressed interest in entering voluntary siting process. - Information Management System infrastructure is operational. - Screening assessment methodology is in place, one or more external service providers are familiar with the NWMO approach to screening and relevant geoscientific data are available. - Staffing included in WED 560.15.20.10.20 entitled "Geoscience Technical Siting Management and Support to Engagement". **Cost:** - Purchased Services: Geoscience consultants to complete screening assessments and reporting at 14 communities (2010-2011): - Initial screening costs average $50k/ community. - Y1: $317k (4 communities) - Y2: $500k (10 communities) Year 1 includes $67k of the detailed plan for initial screening and geotechnical feasibility studies.								
Schedule	Start Year		1 2010			Finish Year	2 2011		
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 817,000	$ 817,000	$ 204,250	$ 1,021,250

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	20	10	40			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	50	20					

WBS Title DESKTOP FEASIBILITY STUDIES

Description

A feasibility study is initially conducted in the form of thorough desktop study to assess whether a proposed site has the potential to meet the detailed safety-related criteria based on geoscientific factors identified in NWMO site selection process. The study will be conducted using published available information. Some interested communities are expected to propose larger areas for consideration without having selected a specific site. In such cases, the feasibility study will initially examine these larger areas and identify a specific site or multiple sites from within that area that have the potential to meet the detailed safety-related criteria.

Depending on the desktop study findings, the feasibility studies may potentially include preliminary field investigations, as described below. If field investigations are deemed not necessary, the site is moved forward for further consideration and compared with other sites to assess whether it is advanced to the detailed site characterization stage.

Deliverable

- Desktop Site-specific Feasibility Study reports for 8 sites in 2011-2012
- All data sets used in the feasibility studies will be stored in the NWMO data management system accompanied with necessary metadata for future reference and traceability.
- Technical communication/presentation of feasibility study findings to community representatives.

Assumptions

- Procedure for completion of Desktop Feasibility Studies is available and external consultants are prepared to develop site-specific plans and undertake the studies in an efficient manner.
- Desktop Feasibility Studies would be conducted at 8 Candidate sites.
- Information Management System infrastructure is operational.
- Work is done by external contractors. NWMO Staffing is included in WED 560.15.20.10.20 entitled "GEOSCIENCE TECHNICAL SITING MANAGEMENT AND SUPPORT TO ENGAGEMENT".

Cost:

- Y2: Complete desktop feasibility studies for four sites ($500K per site): $2,000K
- Y3: Complete desktop feasibility studies for four additional sites ($500K per site): $2,000K

Schedule	Start Year	2 2011	Finish Year	3 2012	

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 4,000,000	$ 4,000,000	$ 1,000,000	$ 5,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	20	10	50			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	50	30					

WBS Title	PRELIMINARY FIELD STUDIES IN SUPPORT OF FEASIBILITY ASSESSMENTS
Description	The objective of conducting preliminary field investigations is to increase confidence in the suitability of a particular site. Where required, this is an important final data gathering step, before the decision is made to proceed to detailed characterization at one or more sites. The first step in the decision making process is to assess the extent, nature and cost of the preliminary field studies that would be required to increase confidence in the suitability of the site. A preliminary field study plan would be prepared outlining the requirements and necessary approach. These field studies would be designed to focus on addressing site-specific safety-related criteria by investigating key features, in order to assess particular conditions. Preliminary field studies may include: i) airborne geophysical; ii) aerial photography; iii) reconnaissance level geologic/structural mapping; vi) surface based geophysical surveys; v) topographic surveys; vi) structural lineament analysis; vii) Landsat/Radarsat data analysis; viii) surface hydrology surveys, ix) groundwater resource/quality assessments and x) limited borehole drilling and surveys if justified.
Deliverables	- Site-specific Preliminary Field Study plans - Preliminary Field Investigation Report and updated Feasibility study report - All data sets developed during field studies will be stored in the NWMO data management system accompanied with necessary metadata for future reference and traceability. - Technical communication/presentation of preliminary field study findings to community representatives.
Assumptions	- Desktop Feasibility Study identifies knowledge gaps and summarizes the benefits of undertaking preliminary field studies. - Information Management System infrastructure is operational. - Up to 4 preliminary field studies are completed between 2011 to 2013. - Work is done by external contractors. NWMO Staffing is included in WED 560.15.20.10.20 - Community and Offsets & Benefits assumed to provide compensation to communities to permit early borehole activity. Field studies per site will include: Site field study plan ($150K); Remote Imaging/Landsat/Radarsat ($50k); DEM/Lidar ($50k); Airborne Geophysics(500k); field geology and lineament mapping ($100K); 3 percussion boreholes including analysis ($1,500); Transportation/Access/Field Expenses/equipment: $500k; project coordination and data synthesis and update of feasibility study report ($500K); external advice and review ($150K). $ 3, 500K per site **Cost:** - Y02: Begin preliminary field investigations at one site: $400k - Y03: Complete preliminary field investigations at one site and begin investigations at 2 additional sites: $5,725k - Y04: Complete preliminary field investigations at three sites: $7,875k

Schedule	Start Year		2	2011		Finish Year		4	2013	
Type	Fixed									
Calculations and Notes:										

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 14,000,000	$ 14,000,000	$ 3,500,000	$ 17,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	20	10	60			**Prepared By:**	B. Belfadhel
WBS (Old)									

WBS Title	CHARACTERISATION AND MONITORING PLANS FOR 2 SITES
Description	Develop site-specific characterisation plans for up to 2 separate crystalline sites (10-20 km2). The plans will focus on the co-ordination of surface based and borehole geosphere characterization activities to confirm site suitability and provide input to the development of a Geoscientific Site Model. The plan would be designed to support Safety Assessment activities and Underground Characterisation Facility (UCF) engineering functions, through supporting geoscience numerical modelling tasks. As part of the plan geologic, geomechanical, hydrogeochemical, hydrogeologic and associated numerical modelling activities to confirm or revise the basis for the geoscientific models at the preferred sites, would be co-ordinated. Site characterisation activities would be designed to establish site specific baseline monitoring programs. The site characterisation plans would be reviewed and revised during the 5-year period to account for acquired knowledge and remaining needs. Development of the plan and its subsequent review would include stakeholdering with the potential host communities, government agencies and regulatory bodies.
Deliverable	- Phase I Detailed Site Characterisation and Monitoring Plans for two sites. - Phase II Detailed Site Characterisation and Monitoring Plans for two sites. - Phase III Detailed Site Characterisation and Monitoring Plans for two sites.
Assumptions	- Two sites both in crystalline rock (10 to 20 km2). - Work is done by external contractors. NWMO Staffing is included in 560.15.20.10.20 - Site Characterisation activities proceed according to three phases. - Cost includes peer-review of the plans. **Cost:** - Y04: Develop detailed site characterization and monitoring plans for first site: $600K - Y05: Develop detailed site characterization and monitoring plans for second site: $600K - Y06: Revise detailed site characterization and monitoring plans for both sites : $650K - Y08: Revise detailed site characterization and monitoring plans for both sites : $650K

Schedule	Start Year	4	2013	Finish Year	8	2017
Type	Fixed					
Calculations and Notes:						

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,500,000	$ 2,500,000	$ 625,000	$ 3,125,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	20	10	70			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	70	30					

WBS Title DETAILED SITE CHARACTERISATION (CRYSTALLINE SITE)

Description

Complete surface based geologic and geotechnical characterisation of a crystalline rock site approximately 10 to 20 km2 in area. Site characterisation activities would involve laboratory and field investigations to support Geoscience, Safety Assessment and Repository Engineering functions including the design of an Underground Characterisation Facility (UCF). Site specific monitoring programs designed to establish baseline conditions will be established and managed under WBS 560 15 40 40 and WBS 560 15 40 50. This monitoring information would serve to define impacts resulting from on-going site characterization activities and eventual development of an Underground Characterization Facility, if approved. The monitoring information will also support the Environmental Assessment process and licensing.

Characterisation activities would include detailed geologic mapping with a focus on nature and distribution of bedrock lithology and in particular the acquisition of fracture network statistics A network of borehole seismographs would be established to monitor micro-seismicity in the region around the sites. Field and laboratory activities would be described in a series of supporting reports for the purpose of creating a 3-dimensional Descriptive Site Geosphere Model DGSM. Database support activities would include application of GIS and Virtual Reality Technologies for integration and interpretation of multi-disciplinary data sets. Three-dimensional numerical analyses of the Site groundwater flow system would be conducted and documented. The simulations would explore flow system uncertainty based on field observation and boundary conditions at time scales relevant to repository construction and long-term safety. Model results would serve as basis for preliminary impact modelling and confirmation of potentially suitable repository scale preferred siting locations.

Airborne surveys (such as aerial photography, Lidar, EM) will be undertaken if required based on the extent of available information from the Feasibility Studies. Surface based investigations will include a coordinated campaign of geophysical surveys (such as 2D seismic, EM, Resistivity) and deep and shallow boreholes.

The drilling and analysis of boreholes is the most expensive component during detailed site characterization. The number of boreholes that will be required is site specific. However, based on the Swedish experience and the OPG-DGR project, it would be reasonable to assume that a full detailed site characterization would cost $100M per site. Site characterization activities at each site would likely involve: Geophysics 2D and Field geological mapping; drilling, testing and analysis of 20 cored boreholes; the drilling and testing of 20 percussion boreholes; external independent advice and review; and development and regular update of site descriptive model.

Activities and costs to undertake detailed characterization at a sit with an average degree of complexity include:

Geophysics = $5.5M; 20 cored BH x $3.0M=$60M; 20 percussion BH x $1.0M = $20M; geosynthesis, Descriptive site model = $13.0M; and peer reviews = $1.5M.

These activities and costs are consistent with the Swedish experience where 2 crystalline sites have been investigated in detail. They are also consistent with recent OPG DGR experience.

Deliverable

- Descriptive Geosphere Site Model, including groundwater flow system modelling.
- Supporting geosphere characterisation documentation.
- Updated Site Database and VR simulations.

Assumptions

- Two crystalline sites are available for detailed investigation.
- Sites are investigated in parallel.
- Characterization activities are conducted by external contractors. NWMO Staffing is included in 560.15.20.10.20.
- Electronic database and Information systems are operational.
- Assumed total cost is $100M per site spread over 5 years based on Swedish experience.

Cost flow:

- Y05: $14M ($7M per site)
- Y06: $46M ($23M persite)
- Y07 to Y08 : $50M per year ($25M per site) and Y09: $40M ($20M per site)

Schedule	Start Year	5	2014	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 200,000,000	$ 200,000,000	$ 50,000,000	$ 250,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	20	10	80			**Prepared By:**	B. Belfadhel
WBS (Old)									

WBS Title GEOSPHERE MONITORING DURING DETAILED SITE CHARACTERIZATION AT 2 SITES

Description

Detailed geoscientific site characterization activities will be undertaken at up to 2 sites over several years (Y04-Y09). These activities are directed in part to obtain primary data on the geologic, hydrogeologic, hydrogeochemical and geomechanical characteristics of the sites for the purpose of further addressing their suitability and to support the development of the Descriptive Geoscientific Site Model (DGSM). The detailed site characterization plan also requires establishing permanent installations for the purpose of developing the baseline, or undisturbed conditions of the site and for monitoring the natural time-varying trends in specific geosphere properties and responses as well as potential changes associated with continued borehole characterization activities. Monitoring installations may be established in a step-wise fashion throughout the detailed site characterization program and will require an increasing level of geoscience support to acquire, evaluate, store and report the new data sets.

During the detailed site characterization phase, geosphere monitoring installations will consist primarily of shallow groundwater monitoring wells (~ 100 m), multiple-level groundwater monitoring systems in deep boreholes (~ 1000 m), borehole seismographs and GPS stations. Groundwater monitoring will consist of periodic (ex: quarterly) measurements of hydraulic pressures and periodic collection of groundwater samples for hydrogeochemical analyses. Only routine maintenance of the monitoring well network and equipment is anticipated during this phase. Seismograph and GPS stations will include automatic data acquisition systems accessed remotely, but will require routine maintenance.

Deliverable

- Annual reports on baseline monitoring conditions, and evaluation of trends.
- Provision of QA'd monitoring data to the electronic Information management system

Assumptions

- Two sites are undergoing detailed site characterization.
- All monitoring installations are made operational as part of detailed characterization activities.
- Groundwater pressure monitoring will take place quarterly and sampling will take place semi-annually
- An electronic information management system is operational.
- Local climate monitoring, such as rainfall and snow accumulation, as well as surface water monitoring is assumed to be undertaken under Biosphere Characterization for candidate sites.
- Formal monitoring program begins in the year following the start of detailed site characterization.

Purchase Services:

Y06-Y09:

- Hydraulic pressure measurement, groundwater sample collection and reporting: Y06 $42k ($21k/site); Y07 $180k ($90k per site); Y08 $330k ($165k per site); Y09 $480k ($240k per site)[1].
- Monitor and maintain seismograph and GPS stations: $200k/a ($100k/a/site).
- Analytical costs for both sites: Y06 $8k; Y07 $36k; Y08 $66k and Y09 $96k.

Schedule	Start Year	6	2015	Finish Year	9	2018

Type Fixed

Calculations and Notes:

[1] Groundwater sampling and analyses will escalate throughout the period. By the end of the period, 20 multi-level wells will be available for hydraulic pressure profiling and groundwater sample collection where permeability conditions permit. Far-field monitoring activities on the entire installed network will only commence in the first year of the licensing phase (Y10) in WED 560.15.20.10.70. Monitoring during the characterization stage will gradually escalate throughout the period as more boreholes are drilled and instrumented as per the budget allocations in WED 560.15.20.10.70. The monitoring costs as a percentage of per site, full cost reflected in WED 560.30.20.20.20 escalate over the 4 year period from: as 7%, 30%, 55%, 80%.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,038,000	$ 2,038,000	$ 509,500	$ 2,547,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	30	10	10			**Prepared**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title SAFETY ASSESSMENT FOR SCREENING

Description

This task is to provide safety assessment support for the initial screening and feasibility assessments for prospective sites.

The overall approach is to apply information learned from the generic safety assessments for hypothetical sites to the potential sites.

The assessment will focus on identifying any key aspects of the site that would be of potential benefit or concern with respect to construction, transportation, operation or postclosure safety. These would follow the points noted in the NWMO siting guidelines.

Deliverable

- Screening and Feasibility Assessments for the prospective sites as required.
- Participation in information and engagement activities as required.

Assumptions

- The screening and feasibility assessments will be based primarily on information generated in WBS 560.20.30.10.10 (Illustrative Safety Assessment Studies for Hypothetical Sites) and on information generated in WBS 560.25.30.10.10 (Technical Support for APM Technical Program Objective #3 During Screening Phase).
- Initial screening is for 15 communities and feasibility assessments are for 8 communities.
- Preliminary field investigations are for 4 sites.
- The staffing model is consistent with the current status quo (i.e., more buy than make oriented).

The total NWMO Safety Assessment staff requirements are 0 FTE for Y1, 1.9 FTE for Y2 and 2.9 FTE for Y3 (see the Calculation Section below for more information and job categorization).

Funding for contractor support is $50K for Y2. Allowance is for analysis or data collection as needed to evaluate any site-specific issues identified during screening phase.

Overhead allowances (Other) are $0K for Y1, $50K for Y2 and $30K for Y3 (4 person-trips x 10 sites x 2k$/trip). This will cover travel and special presentation material.

Schedule	Start Year	2	2011	Finish Year	3	2012

Type Fixed

Calculations and Notes:

Biosphere and transportation Safety Assessment staffing requirements are not included here.

	Y1	Y2	Y3
Dir, NWMO-01	0.25	0.50	0.50
Mgr UF SA, NWMO-01	1.00	1.00	1.00
Sr Scientist, NWMO-03	0.75	0.75	0.75
Sci/Eng, NWMO-03	3.00	4.00	5.00
Total FTE	5.00	6.25	7.25
Utilization Factor	0.00	0.30	0.40
FTE for this WEDS	**0.00**	**1.88**	**2.90**

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 717,353	$ -	$ 130,000	$ 847,353	$ 211,838	$ 1,059,191

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	30	10	20			**Prepared**	N. Hunt, P. Gierszewski.
WBS (Old)									
WBS Title	BIOSPHERE CHARACTERIZATION FOR SCREENING								
Description	This task is to provide high level biosphere characterization data in support of the initial screening and feasibility assessments. The focus will be on determining whether there are Valued Ecosystem Components whose distribution / rarity might be such as to preclude acceptance of the Environmental Assessment for construction and operation of a repository at the prospective site. Valued Ecosystem Components (VECs) are features of the environment selected to be a focus of the Environmental Assessment study because of their ecological, social, cultural and economic value, and their potential vulnerability to the effects of a project. VECs are usually individual species or represent important groups of species within food webs. It is important that selected VECs represent meaningful measures of the environmental changes and effects that may be caused by the Project. Readily available biosphere data will be collected with respect to: · meterology · surface hydrology · land use · flora/fauna · environmental stresses · Aboriginal Traditional Knowledge (ATK)								
Deliverable	- Contribution to the screening and feasibility assessments as required								
Assumptions	- Initial screening is for 15 communities and feasibility assessments are for 8 communities. - Preliminary field investigations are for 4 sites. - Work would be primarily via desktop review, consultation with provincial or regional authorities (e.g. Conservation councils, Ministry of Natural Resources) and limited local field work. Local field work likely limited to verifying key features rather than surveys. - Initial contacts would be made with First Nations in the area. Intent would be to learn about environmental or spiritual features of the region. However it is recognized that sharing of traditional knowledge would likely require time to establish relationships, and that during this period the work would be primarily to initiate this task and gather any readily available information. NWMO Safety Assessment staffing for biosphere characterization and related activities is 0.25 NWMO-03 FTE for Y1, 1 NWMO-03 FTE for Y2 and 1 NWMO-03 FTE for Y3. Funding for contractor support is $0 for Y1, $160K for Y2 and $240K for Y3. Assumes approx. $300k for site biosphere data collection, and up to $100k for initial ATK discussions with local First Nations communities.								
Schedule	Start Year	1 2010			Finish Year	3 2012			
Type	Fixed								
Calculations and Notes:	Cost based on assuming a blanket contract with a contractor to provide support and summary of available information at all sites.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 292,912	$ -	$ 400,000	$ 692,912	$ 173,228	$ 866,140

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	30	10	30			**Prepared By:**	N. Hunt, P. Gierszewski.
WBS (Old)									

WBS Title SAFETY ASSESSMENT FOR CANDIDATE SITES

Description

This task is to provide preclosure and postclosure safety assessments in support of candidate sites.

The approach will be to use the generic safety assessments for hypothetical sites from WBS 560.20.30.10.10 (Illustrative Safety Assessment Studies for Hypothetical Sites) as the basis for assessing and documenting the safety aspects of the candidate sites.

The preclosure assessments will address conventional and radiological safety for normal, upset and accident conditions. Anticipated effects on the natural environment during site construction and operation will also be considered.

The postclosure assessment will address the anticipated effects on human and non-human biota following decommissioning and abandonment. Both radiological and non-radiological contaminants will be considered.

Deliverable

Safety Assessment for Candidate Site A
Safety Assessment for Candidate Site B

Assumptions

- Two candidate sites in crystalline rock.
- Detailed geoscience information for the two sites is not available initially, but results from at least one deep borehole would be provided by Y5.
- The generic safety assessment deliverables produced as part of WBS 560.20.30.10.10 (Illustrative Safety Assessment Studies for Hypothetical Sites) provide a basis for producing safety assessments for the two candidate sites.
- The safety assessment staffing model is consistent with the current status quo (i.e., more buy than make oriented).

NWMO Safety Assessment staff requirements are 7.75 in Y4, 7.5 in each of Y5 and Y6, 6.75 in Y7, 7.0 in Y8 and 7.75 in Y9.

This includes the effort for management of contracts that support this activity in WBS 560.25.30.10.40 (Technical Support for APM Technical Program Objective #3 During Candidate Site Phase). See the Calculation Section below for more information and job categorization.

Funding for contractor support is $0.8M for Y4, $1.5M for Y5, $2.1M for Y6, $2.85M for Y7, $2.7M for Y8 and $2.7M for Y9. These are based on experience with APM Case Studies and experience with OPG's DGR analysis.

Costs for transportation safety assessments are in WBS 660.20.30.10.10 (Transportation Safety Assessment).

Overhead allowances (Other) have been estimated at $60k/a. This will cover travel (technical meetings, CNSC), software licences, graphics, and miscellaneous expenses.

Schedule	Start Year	4	2013	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Biosphere and transportation staffing requirements are not included here.

	Y4	Y5	Y6	Y7	Y8	Y9
Safety Assessment						
Dir	0.75	0.75	0.75	0.50	0.50	0.75
Mgr UF	1.00	1.00	1.00	1.00	1.00	1.00
Sr Scientist , NWMO-03	1.00	1.00	1.00	0.75	0.75	1.00
Sci/Eng, NWMO-03	5.00	4.75	4.75	4.50	4.75	5.00
Safety Assessment FTE	**7.75**	**7.50**	**7.50**	**6.75**	**7.00**	**7.75**

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 6,672,301	$ -	$ 13,010,000	$ 19,682,301	$ 4,920,575	$ 24,602,876

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	30	10	40			**Prepared**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title BIOSPHERE CHARACTERIZATION FOR CANDIDATE SITES

Description

This task is to develop a biosphere database for each Candidate Site, approximately 300 to 1000 km2 in area, principally with public domain information, to aid characterisation of terrestrial conditions and identify potential receptors/impacts resulting from a DGR construction/operation. The information so collected will be included in the Environmental Assessment performed as part of the Construction Licence process.

Reconnaissance level field activities would provide the basis for classification of land use; forest, wildlife and fishery resources; meteorological data; flora and fauna; soils; surface hydrology; and surface/sub-surface hydrologic interfaces. Areas of natural and/or environmental significance would be defined based on public domain and field data, as well as by consultation with potential host community. Information gathered would be entered into a biosphere GIS base information system for analysis, interpretation and communication. A conceptual Biosphere model would be developed that would serve as a basis for preliminary impact assessments. Biosphere field data would be compiled within an integrated report and visual materials prepared to allow stakeholder communication.

The task also includes identification/inclusion of Aboriginal Tribal Knowledge.

This is intended to provide a significant amount of site biosphere characterization to support the site selection. Further work at the selected preferred site would extend the dataset, but would not require this level of field effort.

Deliverable

- Biosphere Characterisation reports, including a conceptual Biosphere model, for two Candidate Sites.
- Biosphere Electronic (GIS) databases for two Candidate Sites.
- Supporting reports documenting reconnaissance field investigation and identification of natural/environmental areas of significance.
- Survey of Aboriginal Tribal Knowledge (english and local First Nations language versions).
- Participation in meetings and other communications related to biosphere characterization and preliminary impact analyses.

Assumptions

- 2 separate Candidate Sites (300-1000 km2).
- Sites are "green-field" (i.e., no significant existing site characterization available).
- Field work undertaken over 3 years/2 field seasons.
- Most meteorological information can be compiled from local stations.
- Electronic Information databases are operational.
- Protocals can be prepared to allow sharing of Aboriginal Tribal Knowledge.

Projected Costs are:

- NWMO Safety Assessment staff requirement is 1 NWMO-03 FTE/a
- Contractors to undertake Biosphere Characterisation Studies, preparation of reports and biosphere databases:
  - Project manager plus 4 FTE/a for 3 years per candidate site.
  - Sample analyses: $75k/a for 3 years per candidate site.
  - Equipment: $200k per candidate site.
  - Transportation/Access/Expenses: $330k per candidate site. This includes modest allowance for air transportation for animal population surveys.
  - The resulting expenses are approximately $6M total per site, or about $2M/a for 3 years per site.
- Note: the above assumes it takes 3 years to compile the data, covering two field seasons. This can be scheduled at any time once the Candidate Sites are selected given that the requirement is to have the information is available for use in the EA activities. It is assumed for scheduling purposes that the effort occurs at the first site from Y5 to Y7, and the second site from Y6 to Y8. This leaves Y4 for planning and Y9 for the final preferred site selection.
- Other costs will include:
  - $100k in Y4 for planning and literature review.
  - $200k in Y9 for assessment and summary reports.
  - $50k/a Y4 to Y9 for Aboriginal Tribal Knowledge discussions/surveys/translations.

Schedule	Start Year	4	2013	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 781,099	$ -	$ 12,600,000	$ 13,381,099	$ 3,345,275	$ 16,726,374

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	20	10	10		**Prepared By:**	A. Vorauer
WBS (Old)								

WBS Title	TECHNICAL SUPPORT FOR SITING AND ILLUSTRATIVE SAFETY ASSESSMENT STUDIES
Description	This element addresses technical activities from Y1-Y3 aimed at enhancing scientific understanding of geologic processes that may influence repository safety (APM Technical Program Objective 5). Knowledge gained will be applied in subsequent tasks pertaining to the selection of candidate sites, analysis support for the Environmental Assessment, creation of the Preliminary Safety Report, and creation of the Final Safety Report. This also includes participation in various international groups and collaborations with international organizations interested in similar topics.
Deliverable	Deliverables are specific to individual sub-objectives defined in APM Technical Program Objective 5 and will consist of reports and technical memoranda. These sub-objectives include: - 5a: Advance the understanding of factors affecting geosphere stability and its long-term stability for both crystalline and sedimentary settings. - 5b: Advance the understanding of the evolution of groundwater flow and the impact of glaciation on a deep geological repository. - 5c: Develop methods for conducting detailed geoscientific site investigations and evaluations at candidate sites in both crystalline and sedimentary settings.
Assumptions	NWMO staffing requirements for managing activities in support of APM Technical Program objectives are included in others WEDs ("Geoscience Technical Siting Management and Support to Engagement" and "Illustrative Safety Assessment Studies for Hypothetical Sites"). Funding for contractor support for Objective 5 is $1.732M for Y1, $2.235M for Y2, and $2.195M for Y3(1).

Schedule	Start Year	1	2010			Finish Year	3	2012
Type	Fixed							
Calculations and Notes:	1 Contractor funding costs extracted from "Technical RD Program 2011 - 2015_R4a"							

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,162,000	$ 6,162,000	$ 1,540,500	$ 7,702,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	30	10	10			**Prepared By:**	N. Hunt
WBS (Old)									

WBS Title ILLUSTRATIVE SAFETY ASSESSMENT STUDIES FOR HYPOTHETICAL SITES

Description

This captures all activities under Objective #1 in the Jan 2011 (Revision 4) version of the APM Technical Program with the exception of Design related items (i.e., 1a and 1g). The captured tasks support a CNSC pre-licensing review of the methodology, acquisition and testing of new computer codes, improvements to existing codes and improvements to the long-term safety case through container corrosion and geosphere glaciation studies. The information produced will assist in feasibility assessments for prospective sites. The results also provide a template for Safety Assessment reports to support site selection.

Deliverable

Deliverables are specific to individual sub-objectives and will consist of reports and technical memoranda. The principal sub-objectives are:

Objective #1: Prepare updated generic reference designs, cost estimates and safety cases for a deep geological repository in crystalline rock and in sedimentary rock.

1b) Complete an illustrative postclosure safety assessment for a deep geological repository in crystalline rock
1c) Initiate illustrative preclosure safety analyses and transportation risk assessment.
1d) Maintain and improve the system level safety assessment software
1e) Acquire and test thermal-hydraulic-mechanical modelling tools to evaluate and assess groundwater flow and geomechanical properties.

1f) Improve the long-term safety case for a deep geological repository for key components of the engineered barrier and the natural barrier systems.

Assumptions

- Engineering will provide reference used fuel containers and repository designs.
- Geoscience will provide the reference geosphere characteristics.
- The staffing model is consistent with the current status quo (i.e., more buy than make oriented).

The NWMO Geoscience staff requirements are 6.4 FTE for Y1 and 5.0 for Y2 to Y3.
The NWMO Safety Assessment staff requirements are 5.0 FTE for Y1, 4.4 FTE for Y2 and 4.4 FTE for Y3.
The NWMO Repository Engineering staff requirement is 1.75 FTE for each of Y1 to Y3.

These safety assessment staff estimates include the effort for management of technical support contracts in WBS 560 25 30 10 10 (Technical Support for APM Technical Program Objective #3 During Screening Phase). Note that the reason the staff estimates are for Y1 to Y3 while the contractor funding estimates are for Y1 to Y6 is due to changes to this WEDS implemented to match the Jan 2011 (Rev 4) version of the APM Technical Program document. These changes extended the funding into Y4 to Y6. Since the staff needed for Y4 to Y6 are accounted for in other WEDS it was decided not to update the staffing changes to minimize the cascading effect. The total staffing count remains unchanged.

Contractor costs are $2.017M for Y1, $2.489M for Y2, $2.550M for Y3, $1.750M for Y4, $0.75M for Y5 and $0.65M for Y6.

Overhead allowances (Other) have been estimated at $60k/a. This will cover travel (technical meetings, CNSC), software licences, graphics, and miscellaneous expenses.

Schedule	Start Year	1	2010	Finish Year	6	2015

Type Fixed

Calculations and Notes:

Biosphere and transportation staffing requirements are not included here.

	Y1	Y2	Y3
Geoscience			
Sci/Eng, NWMO-3	6.40	5.00	5.00
Geoscience FTE	**6.40**	**5.00**	**5.00**
Safety Assessment			
Dir, NWMO-01	0.25	0.50	0.50
Mgr UF SA, NWMO-01	1.00	1.00	1.00
Sr Scientist, NWMO-3	0.75	0.75	0.75
Sci/Eng, NWMO-3	3.00	4.00	5.00
FTE	5.00	6.25	7.25
Utilization Factor	1.00	0.70	0.60
Safety Assessment FTE	**5.00**	**4.38**	**4.35**
Repository Engineering			
Sci/Eng, NWMO-3	1.75	1.75	1.75
Repository Engineering FTE	**1.75**	**1.75**	**1.75**

	Y1	Y2	Y3	Y4	Y5	Y6
1b	$777	$1,140	$1,100	$700	$0	$0
1c	$82	$110	$100	$0	$0	$0
1d	$196	$89	$200	$200	$300	$300
1e	$91	$150	$150	$150	$0	$0
1f	$871	$1,000	$1,000	$700	$450	$350
total	$2,017	$2,489	$2,550	$1,750	$750	$650

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 4,896,973	$ -	$ 10,326,000	$ 15,222,973	$ 3,805,743	$ 19,028,716

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	40	10	10				**Prepared By:**	A. Khan
WBS (Old)	552	30	30							

WBS Title LIAISON WITH CNSC

Description Liaise with CNSC and other regulatory agencies prior to filing the Notice of Intent to apply for a Site Preparation/Construction License (Y01 - Y09)

Deliverable To maintain good relations with the regulator and to interface with the regulator to confirm the understanding of requirements to be used as inputs to design. This translates into a deliverable that includes identifying applicable regulatory documents, regulatory requirements and criteria, and the development of safety criteria. The deliverable also includes agreed processes, consultation with CNSC staff on feasibility study plans, consultation with CNSC staff on candidate site investigations, consultation with CNSC staff on process for choice of preferred site. A licensing plan will be prepared in Y09 and will incorporate the relevant information from interactions with the CNSC.

Assumptions It is assumed that:

1. NWMO Regulatory Affairs will lead regulatory interface activities to confirm the regulatory requirements to be used as inputs to design and safety assessments for such things as:
   - Security and safeguards (see WBS 560.20.40.10.30);
   - Geoscientific site characterization plans;
   - Human factors;
   - Emergency management;
   - Fire protection;
   - Mining; and
   - Other government requirements such as Transport Canada (see WBS 560.30.40.10.10).
2. NWMO Regulatory Affairs will arrange the Annual Technical Program Updates to be provided to the CNSC.
3. NWMO Regulatory Affairs will coordinate feedback to the CNSC on the development of regulatory documents.
4. NWMO Regulatory Affairs will support the Safety Assessment group in developing acceptable safety criteria.
5. NWMO Regulatory Affairs will support the Geoscience group in presenting the site characterization plans to CNSC staff. This is expected to occur around the Y04 time frame. Yearly updates on the plans are expected in Y05/Y06.
6. NWMO Regulatory Affairs will communicate NWMO requests to the CNSC in support of APM engagement activities with the general public and aboriginal communities as identified in the Service Arrangement between CNSC and NWMO, effective April 1, 2008 and in effect until March 31, 2014. During this time, interested communities may also request visits to the CNSC office (up to 10 visits per year).
7. NWMO Regulatory Affairs will prepare a Licensing Plan in Y08/Y09 time frame (as required by the licensing procedure, NWMO-PROC-RG-02) that documents the licensing prerequisites, the scope of the licensing tasks, a licensing schedule, a tabulation of resource requirements from other NWMO groups and contractors, and licensing risks.
8. The costs associated with and the resources needed to support the CNSC liaison varies across Y01 to Y09 since the major activities during this time will change and are captured in three separate WEDS; CNSC liaison (this WEDS), CNSC pre-licensing review (WBS 560.20.40.10.20) and preparation for the Environmental Assessment (WBS 560.30.40.10.20). The activities are expected to occur in the following time frames:
   - Y01 is considered the year that leads up to the CNSC pre-licensing review (see WBS 560.20.40.10.20) and includes the launch of the siting process part way into the year;
   - Y02-Y04 is the time associated with the CNSC pre-licensing review (see WBS 560.20.40.10.20) and the Service Arrangement noted above that includes CNSC arrangements for public engagement activities, including community visits to the CNSC offices;
   - Y05-Y06 is the time that follows the CNSC's review of the conceptual design(s) where a further understanding of design inputs, to meet regulatory requirements and to be used in the preliminary design, is expected. Also, the NWMO anticipates presenting site characterization plans and activities with CNSC staff; and
   - The years of Y07-Y09 are assumed to be focused on sharing, with the CNSC, preliminary site characterization results from site investigations in support of preparing for the Environmental Assessment (see WBS 560.30.40.10.20).
9. The costs associated with and the resources needed to support the CNSC liaison from years Y01 to Y09 are:

	Y01	Y02	Y03	Y04	Y05	Y06	Y07	Y08	Y09
CNSC Licensing Fees ($k)	125	450	450	495	480	480	340	340	340
NWMO-1 (FTE)	0.12	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.95
NWMO-3 (FTE)	0.25	0.25	1.2	1.2	2	2.25	1.75	1.75	2.95
Travel ($k)	8	8	8	8	8	8	8	8	8

Schedule Start Year 1 2010 Finish Year 9 2018

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;
NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

- **For information purposes only**, the total CNSC licensing fees for the three separate activities (this WEDs, WBS 560.20.40.10.20, and WBS 560.30.40.10.20) are as follows:

	Y01	Y02	Y03	Y04	Y05	Y06	Y07	Y08	Y09
CNSC Licensing Fees ($k)	370	1050	1050	755	480	480	745	745	745

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,649,261	$ -	$ 3,572,000	$ 6,221,261	$ 1,555,315	$ 7,776,577

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	40	10	20			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title: CNSC Pre-licensing Review

Description: Conduct a CNSC pre-licensing review as agreed to by the NWMO and the CNSC (Y01 – Y05)

Deliverable: Obtain CNSC review results from their review of NWMO design concepts for the APM to identify any regulatory concerns with the concepts meeting regulatory requirements (as described in the Service Arrangement between CNSC and NWMO, effective April 1, 2008).

Assumptions: It is assumed that:

1. NWMO Regulatory Affairs will compile the submissions that will be made to the CNSC in April 2011 and in April 2013 for their review (Report Title – CNSC Pre-licensing Review of Used Fuel Repository Conceptual Design and Postclosure Safety).
2. The April 2011 submission will be for Crystalline Rock and the April 2013 submission will be for Sedimentary Rock.
3. Input for these submissions will be obtained from:
   - Engineering Division;
   - Geosciences Division; and
   - Safety Assessment Division.
4. NWMO Regulatory Affairs will support the CNSC review as outlined in the APM Design Review Process documented in correspondence to the CNSC (APM-CORR-00531-0018).
5. The costs associated with and the resources needed to compile the submissions (not including time required by engineering/technical staff for their input into the submissions) and to support CNSC reviews are as follows:

	Y01	Y02	Y03	Y04	Y05
CNSC Licensing Fees ($k)	260	500	200	760	
NWMO-1 (FTE)	0.13	0.2	0.2	0.2	
NWMO-3 (FTE)	0.5	0.5	1.3	1.3	0.5
Travel ($k)	5	5	5	5	

Schedule: Start Year 1 2010 Finish Year 5 2014

Type: Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 695,339	$ -	$ 1,740,000	$ 2,435,339	$ 608,835	$ 3,044,173

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	40	10	30			**Prepared By:**	A. Khan
WBS (Old)									
WBS Title	SECURITY AND SAFEGUARDS INPUT TO DESIGN								
Description	Liaise with CNSC specialists focused in the area of Security and Safeguards to ensure that regulatory requirements are well understood and appropriately used as inputs to facility design (Y01 – Y09)								
Deliverable	Security and Safeguards Design Inputs								
Assumptions	It is assumed that: 1. NWMO Regulatory Affairs will support activities to confirm that CNSC expectations in the area of Security and Safeguards will be met. This will be achieved by confirming that the facility will meet the Security Regulations as well as international agreements such as facilitating the IAEA's additional protocol. 2. The costs associated with and the resources needed to prepare the design inputs and interface with CNSC security and safeguards staff (not including time required by engineering/technical staff for their input) have been captured in the efforts assigned to liaison with the CNSC (see WBS 560.20.40.10.10).								
Schedule	Start Year	1	2010				Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars; NWMO-1 values represent the FTE effort required by NWMO management; NWMO-3 values represent the FTE effort required by NWMO technical staff; and Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	10	10			**Prepared By:**	A. Murchison
WBS (Old)	552	20	2						

WBS Title REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, APM SITING PHASE DESIGN & COST UPDATE

Description

Provide overall management of the repository system development during repository siting. Tasks include:

- Assemble and maintain management team responsible for container and repository system optimization;
- Develop/approve conceptual & preliminary design requirements for container and repository systems;
- Conduct integrated transportation, packaging plant and repository facility studies
- Oversight of demonstration of fabricability of key DGR components
- Preparation of APM reference design updates and cost update as required for funding
- Identify and provide technical risk management recommendations to the executive

Deliverable

- Management of:
  - o Updates of the repository system development plans.
  - o Status reports on the repository system development.
  - o Conceptual & Preliminary container designs.
  - o Fabricated full size UFC container.
  - o Demonstrated container fabrication and inspection specifications and procedures.
  - o Surveillance of demonstrated container placement methods and retrieval methods, equipment and procedures (generic URL).
  - o Optimised used fuel container and used-fuel packaging plant and repository facility designs and specifications.
  - o Surface based and underground characterisation requirements/information for engineering gathered and defined.
  - o Identification of technical risks that could impact licensing, schedule or costs as they may arise and provide recommendations to the executive of options available.
  - o Updated APM design & cost estimate in 2010/2011 and next updated APM design & cost estimate in 2014/2015.
  - o 2+ year activity once contract let (RFP preparation, tendering, contract assignment assignment starting 2014).
  - o Integrated repository conceptual design as required for construction license submission.

Assumptions

Duration of work: Y01 to Y09.

(work continues under REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, LICENSING PSAR, EA & CONSTRUCTION LICENSE)

Staff requirements are 2.25 fte NWMO-01 (Y01), 3.25 fte NWMO-01 (Y02-Y04) and 4 fte NWMO-01 (Y05-Y09)
UFC /UFPP design development (surface)
Underground repository design layout (mine)

Description	Y01	Y02	Y03	Y04	Y05	Y06	Y07	Y08	Y09
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
APM Cost Update	$2,250k	$600k	$400k	$400k	$2,000k	$4,000k	$600k	$0k	$0k

NWMO03 FTE Y01 3, Y02 5, Y03 to Y09 6

Contract costs based on recent experience for technology advancement contracts.

Schedule	Start Year		1	2010		Finish Year		9	2018

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 13,556,674	$ -	$ 10,250,000	$ 23,806,674	$ 5,951,668	$ 29,758,342

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	10	20			**Prepared By:**	G. Kwong
WBS (Old)	552	20	10	10					
WBS Title	PREL CONTAINER DESIGN ENGINEERING								
Description	Tasks include: 1. Conduct an optimization study to assess a portfolio of UFC geometries in relation to the DGR size, UFPP throughputs, deposition constraints, thermal effects, sealing material requirements and industrial capabilities / practices for manufacturing the copper and steel UFCs. 2. Prepare conceptual level technical specifications and design drawings for fabrication demonstrations of both the Cu and steel UFC components. (UFC components include (i) the copper tube and lid; steel tube and lid; and steel basket(s).) Actual demonstration of component fabricability and material availability will be carried out under a separate work task. 3. If required, validate design basis through limited fabrication trials (fabrication effort per fabrication technology demonstration work element). 4. Conduct a study to evaluate the creep behaviour of the copper vessel (study includes creep modelling and physical test). 5. Carry out structural analyses of the conceptual steel UFC design. 6. Prepare preliminary specifications for steel vessel casting trials (steel casting to be retained as a fabrication alternative). Revise preliminary designs for both copper and steel UFCs incorporating all obtained results. 7. Support manufacturing trials as required to ensure fabricability with respect to specifications. 8. Provide independent review and advice on repository designs and development ideas.								
Deliverable	- Technical memoranda or technical reports for tasks # 1, 3, 4, 5, 6, and 7. - Preliminary engineering design package include conceptual level technical specifications and engineering drawings. - Final optimized design of a UFC by 2018 (Y09).								
Assumptions	Duration of work: Y01 to Y09. Note: Labour included in Repository Engineering Management: 0.5 NWMO-03 fte Y01 and 1.5 fte for Y02 to Y09 Purchased Services Cashflow: Y01-$0.259M Y02- Y04 $0.35M Y05-Y09-$0.2M								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 2,139,000	$ 2,139,000	$	534,750	$ 2,673,750

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	10	30			**Prepared By:**	P. Maak
WBS (Old)	552	20	10	20					
WBS Title	CONTAINER FABRICATION, INSPECTION & SEALING TECH DEV								
Description	Develop and demonstrate methods for fabricating, sealing and inspecting the copper and steel used-fuel container (UFC) conceptual designs as defined in WBS 560.20.50.10.20, Preliminary Container Design Engineering. Tasks include: - Identify qualified supply base - Perform engineering assessment and test trials for evaluation technologies for fabricating, inspecting and sealing the copper and steel UFC designs. - Identify preferred copper and steel UFC designs based on manufacturability and inspectability of the container components and the assembled UFC.								
Deliverable	- Reports on development and demonstration of fabricating, inspecting and sealing the copper and steel UFC conceptual designs. - Preliminary technical specifications for the fabrication, inspection and sealing methods. - A preliminary list of potential suppliers for copper and steel UFCs from the raw materials to assembled UFCs. - Input to WBS 560.20.50.10.20 for the development of the UFC conceptual designs. - Demonstration of UFC fabrication, sealing and inspection by 2018 (Y09). - Input to WBS 560.20.50.10.60 for the development UFPP conceptual designs.								
Assumptions	Duration of work: Y01 to Y09 Contractor/consultants to develop technologies and prepare preliminary technical specifications for fabrication, inspection and sealing of the copper and steel UFCs: $2,000k for 5a (Y05 to Y09). Assumes the availability of resources and equipment that can be adapted for fabricating, sealing and inspecting copper vessels.								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 10,000,000	$ 10,000,000	$ 2,500,000	$ 12,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	10	50				**Prepared By:**	K. Birch
WBS (Old)	552	20	15	20						

WBS Title SITE DEPENDENT REPOSITORY DESIGNS

Description

Y1 - Y3:

The objective of the Site Dependent Repository Designs work program is to; (i) conduct sensitivity analyses on the 2010 APM design and cost updates, in order to reflect the variable conditions that may be expected at the potential candidate sites. These variables may include; rock strength, in-situ stresses, stratigraphy, area restrictions at surfaces, used fuel container design, etc. This sensitivity analysis would be conducted in support of selecting up to 2 candidate sites in 2013 for further assessment, and in support of a pre-licensing review of the reference designs. The effect of varying features such as depth, rock strength/type, UFC design on the overall cost of the project would be assessed ;

Review and assess whether alternative approaches (such as horizontal borehole, drill and blast methods for hard sedimentary rock, supercontainer with heavy ground support) provide an economic, technical or safety improvement over the current two reference conceptual concepts: the In-Floor Borehole (IFB) method for crystalline rock, and the Horizontal Tunnel Placement (HTP) method for sedimentary rock. This component of the assessment would be carried out a part of the sensitivity study.

Post Y4 - Y9:

From Years 4 to 9, the objective of this work package is to; (i) cunduct supplemantal conceptual designs for the two candidate sites selected for detailed site characterization; (ii) Acquire/modify/recommend specialized equipment for the conceptual underground design of the APM DGR in support of constructing and testing prototype equipment for further assessment in conducting the repository development studies (WBS 560.20.50.20.40); and (iii) Review alternative methodologies in optioneering studies for the DGR with respect to site specific conditions, such as stratigraphy, at the two candidate sites. These methods could include; (iii) Review alternative methodologies in optioneering studies for the DGR with respect to site specific conditions, such as stratigraphy, at the two candidate sites. These alternative methods could include:

- i.e. shaft vs. ramp multi-level repository; and
- placement methods (horizontal vs. vertical) excavation methods (drill and blast vs. mechanical) and related issues (i.e. resulting size openings).

Deliverable

- Optioneering reports on alternative methods to preferred methods identified in 2010 APM Conceptual Design Cost Updates.
- Sensitivity studies carried out on the variables which would be reflective of the potential sites.
- Reports describing the conceptual design alternatives (Horizontal borehole - supercontainer concept; drill and blast methods for hard sedimentary rock; etc.); advantages and disadvantages; and associated costs, and provide recommendations for further evaluation or termination of review, and to address, if necessary, identified gaps in technology.
- Recommendations for equipment development or equipment acquisition.
- Recommendations on timing of procurement activities required to meet in service dates.

Assumptions

The work that will be carried out under this WBS will be on conceptual designs for the 2 candidate sites based on the feasibility studies of the 10 potential sites in Y01 to Y03.

All Labour found in the Repository Engineering WEDs:

Year	Staff (fte)	cnslt ($M)
1	0.5	NWMO-03
2	0.5	NWMO-03
3	0.5	NWMO-03

Year	Staff (fte)	cnslt ($M)
4	0.50	$ 0.35
5	0.50	$ 0.35
6	0.50	$ 0.35
7	0.50	$ 0.25
8	0.50	$ 0.25
9	0.50	$ 0.25

Assumed travel related costs less than 10k per year (2 trips per year) - in general some potential minor equipment purchases for laboratory studies.

Schedule Start Year 1 2010 Finish Year 9 2018

Type Fixed

Calculations and Notes:

- Note: Design/cost update to take place 2014/2015 and costs for site specific conceptual design are embedded in Repository Engineering System Development.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,360,000	$ 2,360,000	$ 590,000	$ 2,950,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	10	60			**Prepared By:**	P. Maak
WBS (Old)	552	20	20	10					

WBS Title UFPP CONCEPTUAL DESIGN, SITING

Description

Provide updated UFPP conceptual designs for selected UFC. Specific tasks include:

- Addressing all issues identified by SKB International through the 2009/2010 technology review, ie., exploring elimination of wet bay storage with dry storage to avoid re-wetting fuel as an example: if analysis indicates it's advantagous.
- Continue enhancing the relationship with SKB International to enhance technology transfer.
- Identify opportunities to simplify the plant design.
- Desktop studies/analysis related to plant design, optimization, logistics screening.
- Fuel bundle module to basket technology development.
- Review / analysis of critical process steps and develop technology risk mitigation strategies.
- Support the Safety Case.
- Perform engineering assessment and preliminary design studies to assess and update the generic UFPP design concepts for copper and steel UFC designs concepts as described in WBS 560.20.50.10.20.
- Develop & maintain preliminary technical specifications for UFPP equipments and processes.
- Update plant drawings as design evolves

Deliverable

- Preliminary optimized UFPP conceptual design by 2013 (Y04).
- Preliminary technical specifications for the UFPP components for the various UFPP design concepts.
- Final optimized UFPP conceptual design by 2018 (Y09).

Assumptions

Duration of work: Y01 to Y09.

Staff requirement accounting for Repository Engineering Management: 0.25 NWMO-03 fte for Y01, 1.0 NWMO-3 fte for Y02, 2.0 NWMO-03 fte for Y03 to Y09.

Contractor/consultants, see below:

Year	cnslt ($M)
1	$ -
2	$ 0.20
3	$ 0.40
4	$ 0.40
5 TO 6	$ 0.25
7 TO 9	$ 0.75

Schedule	Start Year	1	2010	Finish Year	9	2018

Type Fixed

Calculations and Notes:

New staff to augment the current team (mechanical engineer with automation / fabrication experience in high volume manufacturing for bundle transfer technology development

Technology for the fuel transfer operations will be bounded by the fuel module, fuel transfer station and the receiving basket (core competency to be developed in Canada)

Y2 - Wet Bay Study
Y3 - Fuel Transfer Technology Conceptual Advancement
Y4 - UFPP Optimization Study
Y5 - Fuel Handling Cell Review (Simplification)
Y6 - Plant Layout Review & Prototype Bundle Transfer Equipment
Y7 - Y9 - Fuel Bundle Transfer Prototype Module to Basket

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,750,000	$ 3,750,000	$ 937,500	$ 4,687,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	10	70			**Prepared By:**	G. Kwong
WBS (Old)	552	20	30						
WBS Title	PLACEMENT SYSTEMS ENGINEERING, SPECS & PSAR INPUT								
Description	Tasks include: 1. Stay abreast with potential UFC placement methods / technologies and the latest sealing system design details in both crystalline and sedimentary DGR scenarios.								
Deliverable	TM to identify the recommended placement method based on technology watch results.								
Assumptions	Duration of work: Y01 toY18. Note: Labour included in Repository Engineering Management Task # 1: Y01-Y09, 0.1 fte/a, NWMO-3 to stay abreast with potential placement methods.								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	10	80			**Prepared By:**	G. Kwong
WBS (Old)	552	20	35						
WBS Title	RETRIEVAL SYSTEMS ENGINEERING, SPECS & PSAR INPUT								
Description	Tasks include: 1. Stay abreast with feasible retrieval methods / technologies being considered in other national nuclear waste management programs. (i) Y01: NWMO-3 to participate in nuclear waste management R&R working group meetings and stay abreast with the latest retrieval technologies and strategies being considered in other national nuclear waste management programs. Issue a NWMO backgrounder on retrievability by Q4, Y01. (ii) Y02: issue a summary report on the processes and step associated with retrieving UFC from a DGR in Q1, Y02. Issue 2 technical reports on the technical details of retrieving UFC for reference repository designs in crystalline rock and in sedimentary rock; and develop a DVD to graphically illustrate the retrieval of UFC from a DGR by Q4, Y02. (iii) Y03: review retrievability options and revise the summary report by incorporating monitoring requirements to support retrieval of UFC from the repository. (iv) Y04: complete preliminary repository design optimization studies and update the summary report by incorporating retrieval methods of used fuel.								
Deliverable	TM to summarize the various viable retrieval processes and document research results. Summary report on the retrieval processes of UFC from a reference DGR.								
Assumptions	Duration of work: Y01 toY19. Note: Labour included in Repository Engineering Management. Task # 1: Y01-Y09, 0.2 fte/a, 9 years. NWMO-3 to participate in nuclear waste management R&R working group meetings and stay abreast with the latest retrieval technologies and strategies being considered in other national nuclear waste management programs.								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	20	10			**Prepared By:**	A. Murchison
WBS (Old)	552	20	2						
WBS Title	REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, CONSTRUCTION LICENSE PHASE								
Description	Provide overall management of the repository system development during repository construction license application. Tasks include: - Maintain management team responsible for container and repository system optimization and licensing submission - Develop/approve preliminary and final design requirements for container and repository systems; - Conduct integrated transportation, packaging plant and repository facility studies; and - Plan and manage characterization development and demonstration activities - Support licensing and environmental assessment processes as required								
Deliverable	- Management of: o Design updates of the repository system development plans reflective of CNSC comments. o Status reports on the repository system development. o Detailed container design (site specific) o Demonstrated full size container fabrication and inspection specifications and procedures. (site specific) o Demonstrated container emplacement methods and retrieval methods, equipment and procedures (site specific). o Demonstrated sealing materials fabrication (ie., pucks, rings, blocks, pedestal as required) o Optimised used-fuel packaging plant and repository facility designs and specifications. o Identification of technical risks that could impact licensing, schedule or costs as they may arise and provide recommendations to the executive of options available o Long-term demonstration and monitoring tests: plans in progress. o Surface based and underground characterisation requirements/information for engineering defined and gathered								
Assumptions	Duration of work: Y10 to Y15. - Staff requirements are 4 fte/a for 5a based on: - Director APM Technical(Y10-Y15) 1 fte - Used Fuel Container Development Manager, NWMO-01 1 fte - Used Fuel Packaging Plant Manager, NWMO-01 1 fte. - Conventional Systems & Mining Engineer 1fte - Travel and expenses are $50k/a - Engineering contracts to advance engineering design to preliminary engineering stage. 3 year duration performed post CNSC construction license submission. (Y10-Y12) $4M per annum (Costs based on recent experience with the DGR project preliminary engineering contracts). - Preliminary engineering costs carried in the capital cost portion of the estimate (Prepared by SNC) . - NWMO-03 for preparation for construction contracts to provide owners oversight, review detailed design packages, etc. - NWMO-03 Y10 to Y12 16 FT, Y13 to Y14 19 FTE, Y15 21 FTE.								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 28,654,310	$ -	$ 12,300,000	$ 40,954,310	$ 10,238,578	$ 51,192,888

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	20	20			**Prepared By:**	P. Maak
WBS (Old)	552	20	10	30					

WBS Title FABRICATION, INSPECTION & SEALING DEMONSTRATIONS

Description

Engineering assessment and test trails would be carried out to develop and demonstrate suitable methods for fabricating, sealing and inspecting the reference used-fuel container (UFC) design, which has been selected for the preparation of PSAR, EA and construction license application of the deep geologic repository design for the preferred site. Trials are required to mitigate technology and licensing risk.

Tasks include:

- develop and demonstrate suitable methods for fabricating , sealing, inspecting and testing prototype UFCs based on the reference UFC design.
- Complete the technical specifications for materials, equipments and procedures for fabricating, sealing and inspecting the UFC components and UFCs.

Deliverable

- Reports describing the engineering assessment and demonstration trials on fabrication of UFC components. Reports describing the assembly, seal welding and inspection of prototype UFCs.
- Technical specifications for the materials, equipment and procedures for fabricating, sealing and inspecting the reference UFC design (required for the preparation of the PSAR, EA and construction license application, input to WBS 560.20.50.20.30 and input to WBS 560.20.50.20.50).
- Prototype UFCs for demonstration purposes.
- A list of potential suppliers of the reference UFC from raw material to an assembled UFC.

Assumptions

Duration of work: Y10 to Y15.

Contractor/consultants to a) develop and demonstrate methods for fabricating, sealing and inspecting prototype UFCs, and b) prepare technical specifications for these methods: $5,000k/a for 6 a (Y10 to Y15).

Assumes the availability of resources and equipment that can be adapted for fabrication, sealing and inspection of copper vessels. (i.e., if copper UFC design is selected as the reference UFC design for the PSAR, EA and license application).

Assumes the development of fabrication and inspection technologies for inner load-bearing components of UFCs in North America.

Staff requirement accounting for Repository Engineering Management: 3 fte/a, NWMO-3, 6 yeas (Y010 to Y15) to manage various projects in the manufacture, seal welding and inspection of UFC components and assembled prototype UFCs.

Travel: 30k/a.

Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes: The cost calculations are conservatively assumed to be based on the assumption that the copper UFC is to be selected as the reference estimated costs for the copper UFC design.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 30,180,000	$ 30,180,000	$ 7,545,000	$ 37,725,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	20	30			**Prepared By:**	G. Kwong
WBS (Old)	552	20	10	40					
WBS Title	REFERENCE CONTAINER DESIGN & ENGINEERING								
Description	Tasks include: 1. Perform detailed engineering analyses as required to support PSAR, EA and licensing of the selected site. 2. Develop a reference UFC design by incorporating specific information of the selected site and the latest fabrication, inspection and sealing developments into the preliminary UFC design. Carry out structural analyses to confirm the structural integrity of the reference UFC. 3. Prepare detailed design documentation including construction drawings, detailed technical and welding specifications, fabrication, handling, and transport procedures, and inspection test plans for the reference UFC and its components. 4. Perform engineering analyses as required to support FSAR based on specific site information obtained from UCF and UFC placement demonstration. 5. Refine detailed design documents, engineering drawings, technical specifications, fabrication and inspection procedures for all UFC components.								
Deliverable	TM or TR to support FSAR. Revise detailed design documentations for all components of the reference UFC design.								
Assumptions	Duration of work: Y10 toY15. Note: Labour included in Repository Engineering Management: Task # 1: Y10 – Y12. 0.5 fte/a NWMO-3 to design engineering analyses required and to manage contracts. Contractor/consultants to conduct analyses to support PSAR, EA and licensing of the selected site: $ 1,000k/a for 3 a. Task # 2: Y10 - Y13. 0.7 fte/a NWMO-3 to develop reference UFC design manage contract. Consultant to perform task: $ 100K/a, 4 a. Task # 3: Y14 – Y15. 0.5 fte/a NWMO-3 to manage contract(s). Contractor/consultants to develop detailed design documents; fabrication and inspection plans and procedures: $ 500K/a for 2 a. Travel allowance: Y10 – Y15, $ 10K/a.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 4,460,000	$ 4,460,000	$ 1,115,000	$ 5,575,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	20	40			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	60	20				

WBS Title CONDUCT REPOSITORY DEVELOPMENT STUDIES

Description

The objective of the Conduct Repository Development studies work program is to;

- Plan and carry out tests and full-scale demonstrations at surface based laboratories to resolve technology gaps, constructability issues and design analysis issues related to site specific repository design (WBS 560.20.50.10.10) and (WBS 560.20.50.20.10); and, based upon the development of plans and technical specifications in year 12 of this WBS.

- Modify existing equipment, including IFB drilling equipment and UFC placement systems, as needed and based on the full-scale surface demonstration program.

Deliverable

- Reports describing the implementation, results and interpretations of the individual test and demonstrations.
- Reports addressing the satisfactory resolution of technology gaps, constructability issues and design analysis issues identified in the preliminary design (WBS 560.20.50.10.10).

- Reports recommending changes to the preferred-site preliminary design for the repository facility, with emphasis on the placement room, container placement and sealing systems.

Assumptions

Duration of work: Y12 to Y15.
Note: Labour (1.0 FTE Y12 and 5.0 FTEs for each of years 13 to 15) are located in Repository Management Engineering WEDs (560.20.50.20.10):

Year	Staff (fte)	cnslt ($M)	Equip ($M)	Other (M)
12	1.0			
13	5.0	$ 1.0	$ 4.0	$ -
14	5.0	$ 1.0	$ 4.0	$ -
15	5.0	$ 1.0	$ 4.0	$ -

Schedule	Start Year	12	2021	Finish Year	15	2024

Type Fixed

Calculations and Notes:

- Buffer, backfill, UFC, placement, and demonstration of equipment including placement, radiation shielding, etc., under simulated DGR conditions.
- Instrumentation and analysis of data through numerical modelling with QA/QC on code

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 12,000,000	$ 3,000,000	$ 15,000,000	$ 3,750,000	$ 18,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	20	50			**Prepared By:**	P. Maak
WBS (Old)	552	20	20	20					

WBS Title UFPP PRELIMINARY DESIGN FOR PSAR, EA AND CONSTRUCTION LICENSE APPLICATION

Description

Following selection of a preferred repository site, a reference used-fuel container design will be selected that is suitable for the DGR design at this preferred repository site(input from WBS 560.20.50.20.30). In this WBS, a preliminary UFPP design will be developed based on this reference UFC design. The preliminary UFPP design documents, technical specifications and construction drawings of the UFPP components of this preliminary UFPP design will be developed to the details that are necessary for the preparation of the PSAR, EA and construction license application of the DGR and UFPP. The key components of a preliminary UFPP would include:

- Equipment for the removing the modules from the transportation cask.
- Equipment for handling modules in the module handling cell.
- Equipment for removing bundles from the modules and placing bundles into the used-fuel baskets in the fuel handling cell.

- Equipment for drying the inside of UFCs.
- Equipment for replacing air with inert gas inside the UFCs.
- Equipment for sealing and inspection of UFC seal weld (input from WBS 560.20.50.20.20 and WBS 560.20.50.20.30).
- Equipment for machining the weld surface and cutting off the defective copper-vessel lids.
- Equipment for loading, handling and transfer of UFCs in the UFPP.
- Storage pool for modules;
- Storage facility for empty UFC components and filled UFCs.
- Electrical and ventilation facility.

Deliverable

- Preliminary UFPP design documents and preliminary technical specifications of the UFPP components for the preparation of the PSAR, EA and construction license application.

Assumptions

Duration of work: Y10 to Y15.
Contractor/consultants to prepare preliminary design, documents and specifications for used-fuel packaging plant: $1,000k/a for 6 a (Y10 to Y15).

Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes:

Staff requirement accounting for Repository Engineering Management: Staff requirement: 2 fte/a, NMWO-3, 6 years for managing projects related to the design of the UFPP.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,000,000	$ 6,000,000	$ 1,500,000	$ 7,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	20	60			**Prepared By:**	K. Birch
WBS (Old)	552	20	25						
WBS Title	SEALING MATERIALS ENGINEERING – FINALIZE SITE SPECIFIC DEVELOPMENT								
Description	The objective of this Sealing Materials Engineering work program is to; - finalize the design of the buffer disk, buffer ring and backfill block for the selected site, - develop performance requirements for the manufacturing equipment, and - develop performance requirements for the plant for the production of rings, disks, buffer block and pellets.								
Deliverable	- Specifications for the bentonite products and manufacturing equipment, - Demonstration of: (i) quality of supply of bentonite in North America due to potential variability in properties (i.e. montmorillonite content) which have an effect on hydraulic conductivity and swelling pressure; and (ii) quantity of bentonite, as well as aggregate, sand and clay from local sources.								
Assumptions	Year / Staff (FTE) / Sealing Materials Demonstration (Backfill) / Sealing Materials Demonstration (Blocks,rings) Note: FTEs (1.0 for Y10 to Y12) are included in Management Repository (WBS 560.20.50.20.10). 10 – $0.5k – $2.0k 11 – $0.5k – $2.0k 12 – $0.5k – $2.0k								
Schedule	Start Year		10	2019		Finish Year	12	2021	
Type	Fixed								
Calculations	Note: Staff costed in Repository System Development Management Construction License Phase (WBS 560.20.50.20.10).								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 7,500,000	$ 7,500,000	$ 1,875,000	$ 9,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	20	70			**Prepared By:**	K. Birch
WBS (Old)	552	20	25						
WBS Title	SEALING MATERIALS ENGINEERING PROTOTYPE AQUISITION								
Description	The objective of this aspect of the Sealing Materials Engineering work program is to; - Aquire the prototype compaction equipment for the pedestals in collaboration with international partners, and - Produce trial batches of the bentonite based products.								
Deliverable	- Acquire and / or construct compaction equipment prototypes in collaboration with international partners based on geometry of blocks, disks, rings as defined in the (i) preliminary design (WBS 560.20.50.10.10) and the (ii) site specific development of the repository sealing systems work program (WBS 560.20.50.20.60). - Manufacture and test prototype disks, rings and blocks produced. - Modify prototype system to accommodate deficiencies identified. - Research and development program to establish optimum processes to manufacture bentonite buffer, dense backfill blocks, and gap fill and light backfill pellets. - Preparation of conceptual designs for manufacturing systems for the production of bentonite buffer, dense backfill blocks, and gap fill and light backfill pellets. - Optimisation exercise to determine the most suitable rings, disks and blocks manufacturing system. - Preparation of revised specifications for sealing materials compaction equipment and compaction plant.								
Assumptions	Year Staff (FTE) Consultants Equipment Note: FTEs (1.0 FTEs for Y13 to Y15) are included in Repository System Development Management Construction License Phase (WBS 560.20.50.20.10). 13 $1.5M $7.5M 14 $1.5M $1.5M 15 $1.5M $1.5M								
Schedule	Start Year	13	2022			Finish Year	15	2024	
Type	Fixed								
Calculations									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 10,500,000	$ 4,500,000	$ 15,000,000	$ 3,750,000	$ 18,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	20	80			**Prepared By:**	G. Kwong
WBS (Old)	552	20	30						
WBS Title	PLACEMENT SYSTEMS ENGINEERING, SPECS & PSAR INPUT								
Description	Tasks include: 2. Conduct research and development, as required, to identify an optimal method for emplacing UFCs in the selected site. 3. Develop preliminary design documents including engineering drawings, technical specifications of the placement system and its components. 4. Perform engineering analyses as required to support PSAR, EA and licensing requirements of the placement system. 5. Construct a prototype system for the evaluation and demonstration of the preliminary UFC placement system.								
Deliverable	Preliminary design documents including preliminary design requirements and engineering drawings. TM to summarize analysis results to support PSAR, EA and licensing requirements. A prototype placement system. Detailed design documents including design requirements and description, engineering drawings, technical specifications; system commissioning / operating / maintenance procedures of the UFC placement system.								
Assumptions	Duration of work: Y10 toY15. Note: Labour included in Repository Engineering Management Tasks #2 – 4: Y10 – Y13, 0.4 fte/a, NWMO-3 to manage project, Contractor / consultant to design and carry out application engineering activities to evaluate various potential placement methods as described: $1.25M/a, Y10 to Y13. Estimated costs include costs associated with the use of laboratory or workshop facilities for testing the placement system. Task #5: Y14-Y15, 0.7 fte/a, NWMO-3 to coordinate the construction of a prototype placement system with a qualified contractor. Contractor to demonstrate the constructability and capability of the UFC placement system. $3.25M/a, 2 years. Estimated cost includes capital costs for the construction of equipment and/or facility required for testing and commissioning of the UFC placement system. Placement/Development contracts: $500k/a								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 14,500,000	$ 14,500,000	$ 3,625,000	$ 18,125,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	20	90			**Prepared By:**	G. Kwong
WBS (Old)	552	20	35						
WBS Title	RETRIEVAL SYSTEMS ENGINEERING, SPECS & PSAR INPUT								
Description	Tasks include: 2. Conduct research and development to develop a viable retrieval process for the retrieval of emplaced UFC (including the removal of both saturated and unsaturated bentonite around the emplaced UFC). 3. Develop preliminary design documents including engineering drawings, technical specifications of the retrieval system and its components. 4. Perform engineering analyses as required to support PSAR, EA and licensing requirements of the retrieval system. 5. Construct a prototype system for the evaluation and demonstration of the preliminary retrieval system.								
Deliverable	2 TRs including the technical details of the retrieval processes from a reference DGR design (both crystalline and sedimentary scenarios) DVD to graphically illustrate the retrieval of UFCs from a DGR. Preliminary design documents including design requirements and engineering drawings TM to summarize engineering analysis results to support PSAR, EA and licensing process.								
Assumptions	Duration of work: Y10 to Y13. Note: Labour included in Repository Engineering Management Tasks #2 – 4: Y10 – Y13, 0.5 fte/a, NWMO-3 to manage project, Contractor / consultant to carry out tasks as described: $2.25M/a, 4 years. Estimated costs include costs associated with the use of laboratory or workshop facilities for testing the retrieval system. Task #5: Y14-Y15, 0.5 fte/a, NWMO-3 to coordinate the construction of a prototype retrieval system with a qualified contractor. Contractor to demonstrate the constructability and capability of the retrieval system. $3.25M/a, 2 years. Estimated cost includes capital costs for the construction of equipment and/or facility required for testing the retrieval system.								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 15,500,000	$ 15,500,000	$ 3,875,000	$ 19,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	30	10			**Prepared By:**	A. Murchison
WBS (Old)	552	20	2						
WBS Title	REPOSITORY CONSTRUCTION MANAGEMENT, CONSTRUCTION UDF & OBTAIN FSR								
Description	Implementation of EPCM management of the repository system during construction. Tasks include: - Assemble and maintain an implementation team to oversee engineering EPC tendering and the implementation process. - Maintain management team responsible for container and repository system implementation; - Develop/approve final design requirements for container and repository systems; - Continue site baseline monitoring as required - Support Final Safety Report as required. - Support construction as required								
Deliverable	- Updates/finalization of the repository system plans. - Status reports on the repository system. - Site specific final container design. - Final container fabrication and inspection specifications and procedures. - Final container emplacement methods and retrieval methods, equipment and procedures (Site specific). - Final site specific DGR design, UFPP and related DGR systems. - Oversight of detailed engineering technical package. - Implementation contract for design, procurement, construct and commission contract. - Identification of technical risks that could impact licensing, schedule or costs as they may arise and provide recommendations to the executive of options available - Long-term demonstration and monitoring tests in progress.								
Assumptions	Duration of work: Y16 to Y25. - Staff requirements are 4 fte/a NWMO-01 for 10a based on: - Director APM Technical(Y16-Y25) 1 fte - Repository System Development Manager, Surface Systems (Y16-Y25) 1 fte - Repository System Development Manager, Sub-Surface Systems (Y16-Y25) 1 fte. - Conventional Systems & Mining Engineer 1fte - Assume EPC contract model - Detailed engineering of underground development, conventional mining structures, surface facilities, - NWMO-03 for construction contracts oversight, review of field changes and incorporation of any required changes to the design. - NWMO-03: Y16 15 fte, Y17 to Y18 16 fte, Y19 to Y20 14 fte, Y21 10 fte, Y22 to Y25 7fte. - EPC implementation contract model, preliminary & detailed engineering costs captured by SNC's capital estimate. - It is assumed that construction/licensing support will be required and $2M per year has been budgetted for external support contracts.								
	-Program Management Year 15 to Year 25 includes the augmented staff require for EPCM contract oversight.								
Schedule	Start Year	16	2025			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	- A $250k yearly engineering fee has been included for Y16-Y25 to resolve engineering discoveries that will arise through implementation.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 39,316,561	$ 10,000,000	$ 2,500,000	$ 51,816,561	$ 12,954,140	$ 64,770,702

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	30	20			**Prepared By:**	P. Maak
WBS (Old)									
WBS Title	DEVELOPMENT AND DEMONSTRATION OF SERIAL PRODUCTION OF UFC COMPONENTS AND UFCS								
Description	Development and demonstration of serial production of UFC components and assembled UFCs of the reference UFC design are to be carried out in Canada or North America. The findings would be applied for establishment of the final UFC design for the preparation of the FSAR, EA and operating license application. Tasks include: - Develop and demonstrate serial production of UFC components. - Develop and demonstrate assembling of UFCs from the UFC components. - Complete the quality control plan and technical specifications (i.e., materials, equipments and procedures) for manufacturing and inspecting the UFC components and assembled UFCs. - Establish production capabilities, including qualification of the process equipment, procedures and technical personnel for serial production of the UFC components and assembled UFCs.								
Deliverable	- Reports on demonstration trails for serial production of UFC components and assembled UFCs. - Final technical specifications (material and equipment) and qualified procedures for serial production of UFC components and assembled UFCs. - List of selected suppliers for UFC components and assembled UFCs and a final supply model. - Completely assembled and finished UFCs for demonstration purposes. - Input to support the final design of the reference UFC design in WBS 560.20.50.30.20 for the preparation of the FSAR, EA and operating licence application								
Assumptions	Contractor/consultants to develop and demonstrate methods for manufacturing, sealing and inspecting prototype UFCs. Prepare quality control documents and technical specifications for these methods: $2,000k/a for 10a (Y16 to Y25). A baseline level of repeat container fabrication to maintain knowledge and capability has been budgeted.								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	Staff requirement accounting for Repository Engineering Management: Staff requirement: 2 fte/a, NWMO-3, 10 years ((Y16 to Y25)								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 20,000,000	$ 20,000,000	$ 5,000,000	$ 25,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	30	30			**Prepared By:**	G. Kwong
WBS (Old)	552	20	10	40					
WBS Title	REFERENCE CONTAINER DESIGN & ENGINEERING								
Description	Tasks include: 1. Validation of container design in underground facility. 2. Refine detailed design documents, engineering drawings, technical specifications, fabrication and inspection procedures for all UFC components.								
Deliverable	TM or TR to support FSAR. Revise detailed design documentations for all components of the reference UFC design.								
Assumptions	Duration of work: Y22 toY23. Note: Labour included in Repository Engineering Management: Task # 1: Y22-Y23. 0.5 fte /a NWMO-3 Validation of container design in underground facility. Contractor to conduct analyses: $ 700k/a for 2 a. Task # 2: Y23. Consultants to revise detailed design documents, engineering drawings, fabrication, inspection, test plans and procedures: $ 500k/a for 1 a.								
Schedule	Start Year		22	2031		Finish Year	23	2032	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,900,000	$ 1,900,000	$ 475,000	$ 2,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	30	40			**Prepared By:**	J. Villagran
WBS (Old)	552	20	15	60	70				
WBS Title	TECH SPECS FOR REPOSITORY & UFPP								
Description	Tasks include: - Prepare the revised technical specifications for the final design of the used-fuel packaging plant (UFPP) and the repository facility based on feedback from the environmental assessment (EA) review process and additional underground characterisation data at the preferred site. - Prepare updated designs for the used-fuel packaging plant and the repository facility at the preferred site that address all of the significant issues raised during the EA and CNSC licensing processes. - Prepare technical input to the architect/engineer (AE) for the design/build procurement package.								
Deliverables	- Technical specifications for the repository facility and used fuel packaging plant final design. - Revised preliminary design for the used-fuel packaging plant and the repository facility that satisfy the technical specifications. - Technical inputs, including technical specifications and preliminary designs, to the procurement package for the design/build contractor.								
Assumptions	Duration of the work: Y16 to Y20. NWMO staff requirements to manage the specified tasks are 1 fte/a for 5a (Senior Technical Specialist) plus the following: - Specialist Consultant to provide technical inputs to the technical specifications and preliminary Engineering design for the UFPP: Purchased Services $200k/a for 2a, (Y16 to Y17). - Contractor/consultants to prepare revised preliminary Engineering designs and inputs to the repository facility design-build contract: Purchased Services, $500k/a for 3a (Y18 to Y20).								
Schedule	Start Year		16	2025		Finish Year	20	2029	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,900,000	$ 1,900,000	$ 475,000	$ 2,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	30	50			**Prepared By:**	P. Maak
WBS (Old)	552	20	20	30					
WBS Title	UFPP Construction/Technology Demonstration								
Description	After obtaining the construction license for the DGR and UFPP, prototype UFPP process equipment will be designed, procured,constructed and tested. The findings will be applied to develop and qualify the final production process equipment and procedures for the UFPP. The production equipment will be installed, tested and commissioned in the UFPP under WBSs 560 40 40 10 20 (receipt and transfer), . 560 40 40 10 30 (Package), and 560 40 40 10 40 (dispatch). The work activities described in this WBS can be performed in a Container Laboratory or at vendor locations. The key process equipment in the UFPP includes: - Equipment for the removing the modules from the transportation cask. - Equipment for handling modules in the module handling cell. - Equipment for removing bundles from the modules and placing bundles into the used-fuel baskets in the fuel handling cell (New equipment not commercially available). - Equipment for drying the inside of UFCs. - Equipment for replacing air with inert gas inside the UFCs. - Equipment for sealing and inspection of UFCs (input from WBS 560.20.50.20.20 and WBS 560.20.50.20.30). - Equipment for machining the weld surface and cutting off the defective copper-vessel lids. - Equipment for loading, handling and transfer of UFCs in the UFPP. - Inspection equipment - Storage pool for modules (if required); - Storage and monitoring facility for empty UFC components and filled UFCs. - UFC dispatch area. - Electrical and ventilation facility.								
Deliverable	- Final technical specifications and design documents ready for procurement and construction of the production process equipment in a used-fuel packaging plant. - Qualified process procedures for operation in a used-fuel packaging plant.								
Assumptions	Duration of work: Y16 to Y25. Contractor/consultants to i) prepare final design, documents and specifications for construction/procurement of the container-related process equipment for the used-fuel packaging plant: $3,000k/a for 5 a (Y17 to Y21). Production equipment for manufacturing and inspection of copper vessels are available and are adapted to the used-fuel packaging plant. Some of the testing of equipment necessary for copper container sealing and inspection may be available at laboratories such as the SKB canister laboratory in Sweden.								
Schedule	Start Year	16	2025			Finish Year	21	2030	
Type	Fixed								
Calculations and Notes:	Staff requirement accounting for Repository Engineering Management: Staff requirements are 3 fte/a, NMWO-3, 6 years.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 15,000,000	$ 15,000,000	$ 3,750,000	$ 18,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	30	60			**Prepared By:**	K. Birch
WBS (Old)	552	20	25						
WBS Title	SEALING MATERIALS ENGINEERING								
Description	The objective of the Sealing Materials Engineering work program is to; - further develop the design of the buffer disk, buffer ring and backfill block, - develop specifications for the manufacturing equipment, the procedures, and - develop the plant for the production of rings, disks, buffer block and pellets.								
Deliverable	- Conduct optimization studies on equipment and processes, and refine as required prior to production process at operation implementation.								
Assumptions	Year Staff (fte) 16 2.0 17 2.0 18 2.0 19 1.0 20 1.0 All costs associated with this WBS are covered under Repository Construction Management, Construction UDF & Obtain FSR (WBS 560.20.50.30.10).								
Schedule	Start Year		16 2025				Finish Year	20 2029	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	30	70			**Prepared By:**	G. Kwong
WBS (Old)	552	20	30						
WBS Title	PLACEMENT SYSTEMS ENGINEERING, SPECS & FSAR INPUT								
Description	Tasks include: 6. Perform engineering analyses as required to support FSAR. 7. Develop detailed design documents, engineering drawings, technical specifications, system commissioning /operating / maintenance procedures of the UFC placement system.								
Deliverable	A prototype placement system. TM to conclude the capability of the placement system based on system evaluation results. TM to summarize design analysis results to support FSAR.								
Assumptions	Duration of work: Y14 toY18. Tasks #6 - 7: Y16-Y18, 0.3 fte/a, NWMO-3 to manage contract, consultant to carry out tasks as described: $1M/a, 3 years. Note: Labour included in Repository Engineering Management								
Schedule	Start Year		16	2025			Finish Year	18	2027
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,000,000	$ 3,000,000	$ 750,000	$ 3,750,000

APM Cost Estimate

Work Element Definition Sheet

Construction

WBS (New)	560	20	50	30	80			**Prepared By:**	G. Kwong
WBS (Old)	552	20	35						
WBS Title	RETRIEVAL SYSTEMS ENGINEERING, SPECS & FSAR INPUT								
Description	Tasks include: 6. Perform engineering analyses as required to support FSAR 7. Develop detailed design documents, engineering drawings, technical specifications, and retrieval procedures of the UFC retrieval system. 8. Carry out on site testing of the prototype system at the Underground Demonstration Facility and revise design documents as necessary to reflect testing outcomes.								
Deliverable	Construct a prototype retrieval system TM to summarize engineering analysis results to support FSAR. Detailed design documents including design requirements and descriptions, engineering drawings for construction, technical specifications; and retrieval procedures of the UFC retrieval system.								
Assumptions	Duration of work: Y14 toY19. Note: Labour included in Repository Engineering Management Tasks #6 - 8: Y16-Y19, 0.4 fte/a, NWMO-3 to manage contract, consultant to carry out tasks as described: $2M/a, 4 years.								
Schedule	Start Year		16	2025			Finish Year	19	2028
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 8,000,000	$ 8,000,000	$ 2,000,000	$ 10,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	40	10			**Prepared**	A. Murchison
WBS (Old)									
WBS Title	Repository Engineering Program & Project Costs - Operation								
Description	NWMO staff costs not covered under operations. Staff costs for : - Continuing UDF Demonstrations - Operations - Monitoring Systems & Program - DGR Operation Phase Work scope includes ongoing long term demonstration tests at the UDF and ongoing data collection of DGR performance monitoring activities to ensure DGR evolution is as predicted.								
Deliverable	Reports and summaries of system performance.								
Assumptions	Continuing UDF Demonstrations: 2 FTE/a NWMO-03 Y26 - Y30 & 1 FTE/a NWMO-03 Y31 - Y55. Monitoring Systems & Programs: 1 FTE/a NWMO-03 Y26 - Y55.								
Schedule	Start Year		26	2035			Finish Year	85	2094
Type	Step-Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 8,461,908	$ -	$ -	$ 8,461,908	$ 2,115,477	$ 10,577,385

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	20	50	50	10			**Prepared**	A. Murchison
WBS (Old)									
WBS Title	Repository Engineering Program & Project Costs - Extended Operation/Monitoring								
Description	NWMO staff costs not covered under operations. Staff costs for: - Continued operations & maintenance of repository monitoring system and monitoring system data collection to ensure DGR evolution is as predicted.								
Deliverable	Reports summerizing the results of ongoing monitoring.								
Assumptions	1 NWMO-03 FTE/a from Y56 - Y125								
Schedule	Start Year		56	2065			Finish Year	125	2134
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 9,112,824	$ -	$ -	$ 9,112,824	$ 2,278,206	$ 11,391,030

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	20	10	10			**Prepared By:**	A. Vorauer
WBS (Old)									

WBS Title	TECHNICAL SUPPORT DURING CANDIDATE SITE PHASE
Description	This element addresses largely a continuation of technical program activities from Y4-Y9 aimed at enhancing scientific understanding of geologic processes that may influence repository safety (APM Technical Program Objective 5). A specific focus is placed on supporting the selection of candidate sites. Much of the knowledge gained will also pertain to analysis support for the Environmental Assessment, the Preliminary Safety Report, and the Final Safety Report for the preferred site. This also includes membership in various international groups and collaborations with international organizations interested in similar topics.
Deliverable	Deliverables are specific to individual sub-objectives defined in APM Technical Program Objective 5 and will consist of reports and technical memoranda. These sub-objectives include: - 5a: Advance the understanding of factors affecting geosphere stability and its long-term stability for both crystalline and sedimentary settings. - 5b: Advance the understanding of the evolution of groundwater flow and the impact of glaciation on a deep geological repository. - 5c: Develop methods for conducting detailed geoscientific site investigations and evaluations at candidate sites in both crystalline and sedimentary settings.
Assumptions	NWMO Geoscience staffing requirements for managing activities in this WEDS are 3 FTE in each of Y4 to Y9. Funding for contractor support for Objective 5 is $2.095M for Y4, $1.275M for Y5 and $.7M for Y6 to Y9(1)

Schedule	Start Year	4	2013	Finish Year	9	2018	
Type	Fixed						
Calculations and Notes:	1 Contractor funding costs extracted from "Technical RD Program 2011-2015_R4a". Y6 funding extrapolated to Y9.						

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,343,298	$ -	$ 6,170,000	$ 8,513,298	$ 2,128,324	$ 10,641,622

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	20	20	10			**Prepared By:**	A. Vorauer
WBS (Old)									
WBS Title	TECHNICAL SUPPORT DURING EA AND PSR PHASE								
Description	This element addresses largely a continuation of technical program activities during Y10 to Y15 aimed at enhancing scientific understanding of geologic processes that may influence repository safety (APM Technical Program Objective 5). A specific focus is placed on the preferred site and knowledge required to support development of the Environmental Assessment, the Preliminary Safety Report, and the Final Safety Report in the long-term. This also includes membership in various international groups and collaborations with international organizations interested in similar topics.								
Deliverable	Deliverables are specific to individual sub-objectives defined in APM Technical Program Objective 5 and will consist of reports and technical memoranda. These sub-objectives include: - 5a: Advance the understanding of factors affecting geosphere stability and its long-term stability for both crystalline and sedimentary settings. - 5b: Advance the understanding of the evolution of groundwater flow and the impact of glaciation on a deep geological repository. Within the sub-objectives above, the specific items addressed in this work element include:								
Assumptions	NWMO Geoscience staff required to manage the activities under this WED are accounted for in another WED (Geosphere Support and Monitoring at Preferred Site during Regulatory Process). Funding for contractor support for Objective 5: $500k/a(1).								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	(1) Funding estimate based in 2015 cost for Objective 5a and 5b and therefore assumes continuing support for participation in international underground laboratories (pre-UCF) and on-going improvements to geosphere-related modelling methodologies and tools.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,000,000	$ 3,000,000	$ 750,000	$ 3,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	30	10	10			Prepared By:	N. Hunt
WBS (Old)									

WBS Title TECHNICAL SUPPORT FOR APM TECHNICAL PROGRAM OBJECTIVE #3 DURING SCREENING PHASE

Description

This task captures all activities under Objective 3 of the Jan 2011 revision (Version 4) of the APM Technical Program. Objective 3 is part of the Confidence Building and Process Understanding section. Much of the knowledge gained here will also be applied in subsequent tasks pertaining to the selection of candidate sites, analysis support for the environmental assessment, creation of the Preliminary Safety Report and creation of the Final Safety Report.

APM Technical Program Objective #3 is:

- Further increase confidence in the deep geological repository safety case

Deliverable

Deliverables are specific to individual sub-objectives and will consist of reports and technical memoranda. The principal sub-objectives are:

Objective #3: Further increase confidence in the deep geological repository safety case:

3a) Maintain and improve process understanding.
3b) Support system model validation through integrated tests and international joint projects.
3c) Improve lifetime predictions and modelling of copper and steel used fuel containers in a deep geological repository.
3d) Provide technical support and modelling expertise to Canadian participation in international joint repository technology
3e) Demonstrate components of full-scale shaft seal and monitoring instrumentation by 2011 and support international

Assumptions

NWMO staffing requirements for managing activities in this WEDS are included in WBS 560 20 30 10 10 (Illustrative Safety Assessment Studies for Hypothetical Sites).

Funding for contractor support for Objective 3 is $1,9152M for Y1, $2.099M for Y2 and $2.350M for Y3.

See the calculation section below for a more detailed breakdown.

Schedule	Start Year	1	2010		Finish Year	3	2012

Type Fixed

Calculations and Notes:

(k$)

	Y01	Y02	Y03
(a)	$ 629	$ 778	$ 900
(b)	$ 21	$ 21	$ 150
(c)	$ 115	$ 100	$ 100
(d)	$ 1,100	$ 1,000	$ 1,000
(e)	$ 50	$ 200	$ 200
Sub Total	**$ 1,915**	**$ 2,099**	**$ 2,350**

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,364,000	$ 6,364,000	$ 1,591,000	$ 7,955,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	30	10	40			**Prepared By:**	N. Hunt, P. Gierszewski, B. Belfadhel, G.
WBS (Old)									

WBS Title TECHNICAL SUPPORT FOR APM TECHNICAL PROGRAM OBJECTIVE #3 DURING CANDIDATE SITE PHASE

Description

This task captures all activities under Objective 3 of the Jan 2011 revision (Version 4) of the APM Technical Program and is a continuation of efforts outlined in WBS 560 15 30 10 10 (Technical Support for APM Technical Program Objective #3 During Screening Phase). Much of the knowledge gained here will also be applied in subsequent tasks pertaining to analysis support for the Environmental Assessment, creation of the Preliminary Safety Report, and creation of the Final Safety Report.

APM Technical Program Objective #3 is:

- Further increase confidence in the deep geological repository safety case

Deliverable

Deliverables are specific to individual sub-objectives and will consist of reports and technical memoranda. The principal sub-objectives are:

Objective #3: Further increase confidence in the deep geological repository safety case:

3a) Maintain and improve process understanding.
3b) Support system model validation through integrated tests and international joint projects.
3c) Improve lifetime predictions and modelling of copper and steel used fuel containers in a deep geological repository.
3d) Provide technical support and modelling expertise to Canadian participation in international joint repository technology
3e) Demonstrate components of full-scale shaft seal and monitoring instrumentation by 2011 and support international

Assumptions

NWMO Repository Engineering staff requirement is 1.75 FTE in each of Y4 to Y9.
NWMO Safety Assessment staff requirement is included in 560 15 30 10 30 (Safety Assessment for Candidate Sites).

Funding for contractor support for is $2.850M for Y4, $3.300M for Y5, $3.300M for Y6, $3.700M for Y7, $3.400M for Y8 and $3.35M for Y9.

See the calculation section below for a more detailed breakdown.

Schedule	Start Year	4	2013	Finish Year	9	2018

Type Fixed

Calculations and Notes:

	Y04	Y05	Y06	Y07	Y08	Y09
Repository Engineering						
Sci/Eng, NWMO-03	1.75	1.75	1.75	1.75	1.75	1.75
Repository Engineering FTE	**1.75**	**1.75**	**1.75**	**1.75**	**1.75**	**1.75**

($k)

	Y04	Y05	Y06	Y07	Y08	Y09
(a)	$ 900	$ 900	$ 900	$ 1,150	$ 1,150	$1,100
(b)	$ 300	$ 500	$ 500	$ 350	$ 350	$ 350
(c)	$ 250	$ 500	$ 500	$ 500	$ 200	$ 200
(d)	$ 1,200	$ 1,200	$ 1,200	$ 500	$ 500	$ 500
(e)	$ 200	$ 200	$ 200	$ 1,200	$ 1,200	$1,200
Sub Total	$ 2,850	$ 3,300	$ 3,300	$ 3,700	$ 3,400	$3,350

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,366,924	$ -	$ 19,900,000	$ 21,266,924	$ 5,316,731	$ 26,583,655

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	30	20	10			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	TECHNICAL SUPPORT DURING EA AND PSR PHASE								
Description	This task continues the research and development work started in WBS 560.25.30.10.40 (Technical Support for APM Technical Program Objective #3 During Candidate Site Phase), with specific focus on the selected site and the information needed to support production of the Environmental Assessment and Preliminary Safety Report. The work may also be longer-term to support the Final Safety Report. This also includes membership in various international groups and collaborations with international organizations interested in similar topics.								
Deliverable	Deliverables are specific to individual items defined in the work program and will consist of reports and technical memoranda. Given that the final site is selected at this point, the experimental program will focus on measurement of key assessment parameters using site specific materials and conditions to the extent practicable. Participation in integrated experiments that could be used to further support / calibrate computer models is also contemplated.								
Assumptions	- Data on characteristics and performance of waste forms other than CANDU bundles is provided by the organization that created the waste; - Biosphere information is provided in WBS 560.30.30.20.30 (Biosphere Characterization for EA and PSR). NWMO staff for managing Safety Assessment activities are included in WBS 560.30.30.20.10 (Safety Assessment for EA and PSR). Funding for contractor support: Safety Assessment: $1.65M in Y10, $1.4M in Y11, $1.3M in Y12, $1.0M in Y13-Y15. Engineering: $1.0M/a								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 13,350,000	$ 13,350,000	$ 3,337,500	$ 16,687,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	30	30	10			**Prepared By:**	N. Hunt, P.
WBS (Old)									Gierszewski

WBS Title TECHNICAL SUPPORT FOR OPERATING LICENCE APPLICATION

Description

This task is to confirm the behaviour of key processes for predicting the behaviour of a deep geologic repository at the specific conditions of the selected site. This work will extend the studies in WBS 560.25.30.20.10 (Technical Support During EA and PSR Phase).

Tests will be carried out at the selected site either underground in the UDF or aboveground in the biosphere at this site. The work will focus on:

- Measurement of relevant parameters using site-specific materials and conditions.
- In-situ integrated experiments that can be used to validate or calibrate computer models.

Most work will be carried to conclusion during the construction period to support the Operating Licence application; however, some experiments will involve the installation of test coupons or assemblies for long-term exposure tests (e.g. up to 100 years). Even though 100 years is still short relative to the repository design life, it is anticipated that these test results will:

- Help build confidence with the local community (over multiple generations).
- Check for any problems during the initial transient period with the hottest temperatures, driest materials, and most oxygen.
- Ensure that there is competent technical staff on-hand to deal with topical questions that may arise or, if necessary, retrieval.

Deliverable Experimental result reports, including analysis and recommendations for models and for model parameters.

Assumptions

- Engineering demonstration projects are not included.
- Costs for constructing the UDF, including excavating the experimental rooms are not included.
- Costs for general operation support of the UDF (e.g. utilities, monitoring, ventilation, supplies) are included in UDF Operation and located in Repository Engineering.
- Costs associated with technical staff dedicated to support projects in the UDF are included, as are installation and instrumentation costs specific to a given experiment.

Costs are estimated as $3 M/a for 10 years (Y16 to Y25).

These costs are judged appropriate because, while the generic issues should be addressed by this point, this period is when the most detailed site-specific measurements are made. Also, the Construction Licence may have identified issues that must be resolved before an Operating Licence could be issued.

Although a specific support program at the UDF is not defined here, this rate of expenditure would be consistent with tests and experiments such as:

- Construction of specialised test facilities within the UDF, such as a radioactive materials (tracer) laboratory (instrumentation, glove box and ventilation), and acquisition of specialised instruments ($1M).
- Projects aimed at improving understanding of site-specific processes or topical issues (5 x $0.2M).
- 1 major in-situ test of the scale of the Buffer Container Experiment ($5 - $10M).
- Evaluation of material properties or behaviour under site-specific conditions, especially near-field transport parameters (e.g. CHEMLAB-type tests, SKB TR-01-10, Äspö Annual Report 2000, p.67) ($10M for 5 in-situ tests);
- Initiation of long-term material or container-type tests that will be left in place for time scales of 20-120 years to provide data on the behaviour of the materials on the longest possible time frame in support of future decisions regarding the repository closure ($3M).
- Geoscience tracer experiments, such as similar to the Moderately Fractured Rock Experiment, including some with radioactive tracers ($5M).

NWMO staff requirements for incorporation of test results into the safety assessment models are included WBS 560.30.30.30.10 (Safety Assessment for FSR).

Schedule	Start Year	16	2025	Finish Year	25	2034

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 30,000,000	$ 30,000,000	$ 7,500,000	$ 37,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	50	10	10			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	30					

WBS Title GENERIC REPOSITORY SEALING SYSTEMS

Description

The objectives of this work program is to develop repository-sealing systems for generic repository sealing system development as follows:

- Development of suite of material properties for both saturated and unsaturated conditions. These properties are required in support of; the modelling of the potential sites, and of the detailed modelling of the conceptual design of the two candidate sites (starting in 2013). The suite of material properties have been developed from standard geotechnical laboratory methods such as consolidation and triaxial testing, and from additional test methods such as the 2-component tests, and thermal conductivity assessments
- The reference buffer and backfill materials will be analyzed along with potential new bentonite/sand mixtures such as the reference shaft seal material, (the in-situ compacted 70 / 30 bentonite/ sand mix). The sealing systems include clay-based and cement-based sealing systems (e.g., buffer, backfills, grouts for bulkheads, boreholes, access cross-cuts and shafts).
- Support on “International Obligations” such as the SKB ASPO HRL & Mont Terri for collective “demonstration” technology.
- Development of numerical modelling codes and procedures, including validation and verification. The modelling would use the material properties determined for both saturated and unsaturated conditions. Examples of on-going NWMO sponsored modelling development include; the joint development of CODE_BRIGHT, and the task force on engineered barrier systems (EBS-TF).
- Assessment of the constructability of Conceptual Designs - Continued assessment of developed conceptual design related to sealing systems (placement of pellets adjacent to UFC, and in-situ compaction of shaft seal materials.
- Identification of technology development & demonstration (i.e. asphalt shaft seals) for Canadian concepts.

Deliverable

Generic Repository Sealing System Development

- Material property databases for variable site conditions
- Assessment of constructability of various concepts
- Validated numerical codes for use in preliminary conceptual design (WBS 560.20.50.10.10)

Assumptions

Duration of work: Y01 to Y03.

Note: Labour is located in Repository Management Engineering WEDs:

Year	Staff (NWMO-3) (fte)	cnslt ($M)
1	1.0	$ 0.8
2	1.0	$ 0.8
3	1.0	$ 0.8

Costs captured in 560.25.30.10.10.

Assumed travel related costs less than 10k per year. (2 trips per year) – in general some potential minor equipment purchases for laboratory studies.

Schedule	Start Year	1 2010	Finish Year	3 2012	

Type Fixed

Calculations

- Linked to repository design WBS 560.20.50.10.10
- Links to instrumentation and monitoring
- Note: Costs included in "Technical Support for Siting & Illustrative Safety Assessment Studies".

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	50	10	20			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	30					

WBS Title CANDIDATE SITES REPOSITORY SEALING SYSTEMS, SITING

Description

The objectives of this work program is to develop repository-sealing systems for the candidate sites as follows:

- The work program would provide input into the selection of the preferred site from the 2 candidate sites, with the focus on site specific materials testing for compatibility of sealing materials with rock and ground water from two sites.
- Assess design improvements from years 1 to 3 (WED 560.25.50.10.10), including statistical variability of test results on bentonite.
- Identify sealing technology refinement opportunities specific to candidate sites.
- Commence long term testing programs on the two sites (buffer, backfill and concrete).
- Preliminary design requirements and specifications
- Reflect on International compliance proficiencies such as the SKB ASPO HRL & Mont Terri for collective “demonstration” technology.
- Continue with aspects of WBS 560.25.50.10.10, (i) long term testing programs on buffer and backfill, (ii) reflection on International compliance proficiencies such as the SKB ASPO HRL & Mont Terri for collective “demonstration” technology, and (iii) identification of sealing technology refinement opportunities specific to the preferred site.

Deliverable

Candidate Site-specific Repository Sealing System Development (years 4 to 9)

- Site specific reports on anticipated EBS performance for two candidate sites with recommendations.

Assumptions

Duration of work: Y04 to Y09.

Note: Labour is located in Repository Management Engineering WEDs:

Year	(NWMO-3) (fte)	cnslt ($M)
4	1.0	$ 1.0
5	1.0	$ 1.0
6	1.0	$ 1.0
7	1.0	$ 1.0
8	1.0	$ 1.0
9	1.0	$ 1.0

Costs captured in 560.25.30.10.40.

Assumed travel related costs less than 10k per year. (2 trips per year) – in general some potential minor equipment purchases for laboratory studies.

Schedule	Start Year	4	2013	Finish Year	9	2018	

Type Fixed

Calculations

- Linked to repository design WBS 560.20.50.10.10.
- Links to instrumentation and monitoring.
- Note: Costs included in "Technical Support for Siting & Illustrative Safety Assessment Studies".

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	50	10	30			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	DEVELOPMENT OF REPOSITORY MONITORING STRATEGIES AND TECHNOLOGIES								
Description	The overarching task consists of monitoring a set of parameters suitable for assessing repository performance and ensuring that there are no significant effects on public safety or the environment. It includes the development of a strategy to monitor a set of selected parameters that characterize repository performance and can be used to assess the impact of a DGR facility on the hydrogeology, geochemistry and biological systems at the repository site. Specific objectives under this scope are: - Development of an overall monitoring strategy and identification of an approach suitable to meet APM strategic objectives. - Participating in collective international initiatives and projects for development of repository monitoring methods and technologies. - Review of available methods and technologies suitable for meeting the required monitoring functions. - Conducting work as required on dvelopment and demonstration of technologies identified as suitable to monitor the evolution and safety of an APM repository.								
Deliverables	- APM Monitoring Strategy document. - Partnership in an advanced international Monitoring project. - Monitoring Requirements document. - Assessment of available technologies. - Preliminary monitoring system designs. - Technical specifications for the procurement of demonstration monitoring systems.								
Assumptions	Duration of work: Y01 to Y09. Costs captured in 560.25.30.10.10 and 560.25.30.10.40. NWMO staff requirements to manage/execute the above tasks are 0.5 fte for 9a (Senior Technical Specialist) plus the following: - Specialist Consultant to conduct work in specific monitoring technologies, plus support to international monitoring programs: Purchased Services $200 k/a for 4a (Y02 to Y05). - Contractor/consultants to prepare Technical Specifications and preliminary Engineering designs for specific monitoring systems: Purchased Services $200k/a for 4a (Y06 to Y09).								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	50	20	10			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	30					

WBS Title PREFERRED SITE REPOSITORY SEALING SYSTEMS, LICENSE PHASE

Description

The objective of the preferred Site Repository Sealing Systems work program is to;

- Demonstrate feasibility of concept in support of EA submission (year 12) – including long term demonstrations (consolidation, swelling pressure)
- Final design requirements and specifications for the application of sealing materials at the repository level, and within the shafts.

Deliverable

Preferred Site-specific Repository Sealing System Development (Years 10 to 12) for inclusion into final design specifications (WBS 560.20.50.20.10).

Assumptions

Note: Labour is located in Repository Management Engineering WEDs:

Year	Staff (NWMO-3) (fte)	cnslt ($M)
10	1.0	$ 0.75
11	1.0	$ 0.50
12	1.0	$ -

Schedule	Start Year	10	2019	Finish Year	12	2021

Type Fixed

Calculations

- Linked to repository design WBS 560.20.50.20.10
- Links to instrumentation and monitoring

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,250,000	$ 1,250,000	$ 312,500	$ 1,562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	50	20	20			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	REPOSITORY MONITORING AND TECHNOLOGY DEVELOPMENT								
Description	Tasks include: - Update and expand as required the borehole network established for site characterization in order to monitor the long-term evolution of the site groundwater hydraulic network (e.g. groundwater pressure, temperature and chemistry). Implement a monitoring system suitable to assess the repository long term performance. - Monitoring a set of parameters selected as indicators of repository safety in order to establish a baseline. - Establish a database that will include Environmental parameters.								
Deliverables	- Technical specifications and optimized designs for monitoring systems. - Updated monitoring systems for groundwater flow and geosphere evolution, Environmental parameters, and repository safety and performance related parameters. - Procurement, installation and commissioning of Environmental monitoring systems. - Established baseline for surface, subsurface and environmental parameters at the selected repository site.								
Assumptions	Duration of work: Y10 to Y15. NWMO staff requirements to manage/execute the above tasks are 0.5 fte for 6a (Senior Technical Specialist) and 1 fte for 6a (Technical staff) to operate systems and conduct data acquisition for use by NWMO scientists (Y10 to Y15); plus the following: - Specialist Consultant to conduct work in specific monitoring technologies: Purchased services $200k/a for 6a (Y10 to Y15). - Contractor/consultant to prepare technical specifications and provide input to the procurement process for Environmental Monitoring systems and to assist with system installation and commissioning at the repository site: Purchased services $300k/a for 3 a (Y10 to Y12). - Purchase, installation and commissioning of Environmental Monitoring systems in the repository site and surrounding area, with an estimated total value of $3,000k ($1,000k/a Y10 to Y12).								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Step-Fixed								
Calculations and Notes:	The equipment costs do not include the purchase of a computer for the central database, which is included in the geosciences WEDS.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 3,000,000	$ 1,200,000	$ 4,200,000	$ 1,050,000	$ 5,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	50	30	40			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	60	30				

WBS Title PLAN UDF DEMONSTRATIONS and UDF SPECIFICATIONS

Description

The objective of the "Plan Underground Demonstration Facility (UDF) AND UDF Technical specifications" work program is to; finalize plans and prepare technical specifications for:

- short-term underground characterisation, design confirmation and commissioning tests for the repository facility systems for implementation in the UDF (links to WBS 560.20.50.20.40).
- long-term demonstration and monitoring tests to be located in the UDF and other parts of the repository
- The short-term confirmation studies include: container placement; container retrieval; borehole sealing; placement room sealing; access drift sealing; and shaft sealing.
- The long-term demonstration studies are focused on monitoring the performance of the engineered barrier system and near-field evolution of the repository environment over time.
- The long term studies will be conducted on full-scale container placement studies which would include the use of heated containers, and used-fuel containers containing used fuel bundles (The installation of these live UFCs would occur in Year 26 once the operating license is granted).

Deliverable

Technical specifications for:

- short-term underground characterisation, design confirmation and commissioning tests for the repository facility systems for implementation in the UDF.
- long-term demonstration and monitoring tests to be located in the UDF and other parts of the repository.
- Issue drawings and technical specifications for construction of the UDF.

Assumptions

Duration of work: Y18 to Y20.

Note: Labour is located in Repository Management Engineering WEDs:

Year	Staff (fte)	cnslt ($M)	Equip ($M)	Other (M)
18	2.0	$ 0.5	$ -	$ -
19	2.0	$ 1.0	$ -	$ -
20	2.0	$ 1.0	$ -	$ -

Schedule	Start Year	18	2027	Finish Year	20	2029

Type Fixed

Calculations and Notes:

- Refinement to equipment / design based on results of surface study program Repository development studies (WBS 560.20.50.20.40).

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,500,000	$ 2,500,000	$ 625,000	$ 3,125,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	50	30	50			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	60	40				

WBS Title CONDUCT UDF DEMONSTRATIONS - INITIATE

Description

The objective of the "Conduct Underground Demonstration Facility (UDF)" work program is to;
Initiate, conduct, analyse and report on the full-scale, underground repository technology demonstrations, including; placement and retrieval of containers, container sealing through the placement of disks, rings and gap fill pellets, placement room sealing through the installation of dense backfill blocks, light backfill pellets and concrete bulkheads; borehole sealing and shaft sealing. These demonstrations would confirm the performance of the materials during the installation processes.

- Initiate, conduct, analyse and report on commissioning tests conducted in the UDF for the specially developed equipment for placement and retrieval (WBS 560.20.50.20.80 and WBS 560.20.50.20.90).
- Initiate, monitor and periodically report on long-term demonstrations and monitoring tests in the UDF (Note: additional tests may be initiated at other locations in the repository). Monitoring tests include performance of the engineered barrier system and near-field evolution of the repository environment over time using simulated heated containers.

Deliverable

- Commissioned underground equipment, methods and procedures for excavation, drilling, repository construction and repository sealing systems installation.
- Confirmed repository design for the preferred site.
- Short-term underground characterisation data and analyses as input to Geoscience support (WBS 560.30.20.30.30) and final safety assessment report (WBS 560.20.50.30.10).

Assumptions

Duration of work: Y16 to Y20..
Note: Labour (2.0 FTEs for each of years 21 to 25) is located in Repository Management Engineering WEDs:

Year	Staff (fte)	cnslt ($M)	Equip ($M)
21		$ 2.0	$ -
22		$ 2.0	$ 5.0
23		$ 2.0	$ 5.0
24		$ 2.0	$ 5.0
25		$ 2.0	$ 5.0

It should be noted that costs related to the drifts, excavation of the shafts, perimeter access routes, and the excavation of the rooms within the UDF are covered under operations.

Contractors/consultants to procure equipment, install, conduct analyses and report on design confirmation and repository equipment commissioning tests and the resolution of any issues identified.

Schedule	Start Year	21	2030	Finish Year	25	2034

Type Fixed

Calculations and Notes:

Note: Equipment is assumed to be outside the scope of SNC's capital estimate. Equipment would be technology demonstration specific.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 20,000,000	$ 10,000,000	$ 30,000,000	$ 7,500,000	$ 37,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	50	30	60			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	MONITORING SYSTEMS DEVELOPMENT AND DEMONSTRATION								
Description	Tasks include: - Maintain/upgrade monitoring system as required. - Continue the monitoring of site baseline environmental parameters. - Update technical specifications and optimize design for UDF monitoring systems based on feedback from the licensing and EA review process. - Maintain and update repository performance database.								
Deliverables	- Upgraded systems and continued operation of Environmental Monitoring systems within the repository site and the surrounding area. - Updated database of relevant environmental and repository parameters.								
Assumptions	Duration of work: Y16 to Y20. NWMO staff requirements to manage/execute the above tasks are 0.5 fte for 5a (Senior Technical Specialist) and 1 fte for 5a (Technical staff) to operate monitoring systems, conduct data acquisition and manage the database for use by NWMO scientists; plus the following: - Specialist Consultant to conduct work in specific monitoring technologies and support to international monitoring programs: Purchased services $200k/a for 5a (Y16 to Y20). - Contractor/consultants to prepare technical specifications and provide input to system procurement of UDF monitoring systems: Purchased Services $400k/a for 1a (Y20).								
Schedule	Start Year		16	2025			Finish Year	20	2029
Type	Fixed								
Calculations and Notes:	Construction of the UDF will take place over this five-year period, with the UDF test rooms becoming available in Y21. Therefore, the initiation of experiments and system demonstrations will not start before Y21. The Monitoring tasks during this period will be limited to operation of the Environmental Monitoring system (on- and off-site) and to the updating of system designs for procurement, installation and commissioning in the period Y21 to Y25.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,400,000	$ 1,400,000	$ 350,000	$ 1,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	50	30	70			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	MONITORING SYSTEMS AND PROGRAM – DGR CONSTRUCTION PHASE								
Description	Tasks include: - Purchase, install and commission UDF Monitoring systems with an estimated total value of $1,000k. - Demonstrate function of monitoring system in the UDF. - Update designs for repository monitoring systems as required, based on experience from UDF operation and up to date technologies. - Procure and commission monitoring systems for the DGR. - Continue the monitoring of site parameters. - Update repository monitoring database.								
Deliverables	- Technical specifications, final designs and procurement packages for DGR monitoring systems. - Installed and commissioned monitoring systems in the UDF. - Demonstration of monitoring systems operation in the UDF. - Continued operation of repository monitoring systems. - Updated database of repository performance parameters.								
Assumptions	Duration of work: Y21 to Y25. NWMO staff requirements to manage/execute the above tasks are 1 fte for 5a (Senior Technical Specialist) and 1 fte for 5a (Technical staff) to operate systems, conduct data acquisition and manage the database for use by NWMO scientists; plus the following: - Specialist Consultant to conduct work in specific monitoring technologies 1 fte for 5a: Purchased services, $200k/a for 5a (Y21 to Y25). - Contractor/consultants to prepare system technical specifications, provide input to system procurement packages and assist with commission of repository monitoring systems: Purchased services $400k/a for 2a (Y21 to Y22) - Purchase/update of monitoring equipment for installation and commissioning in the UDF with an estimated total value of $1,000k. This equipment is for demonstration at the UDF of system components for the monitoring of RLTP and include detectors and sensors for measuring: - displacement, stress, - acoustic emission, - seismic motion, - water flow and water pressure, - temperature, and for the detection of tracers.								
Schedule	Start Year		21	2030		Finish Year		25	2034
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ 1,000,000	$ 1,800,000	$ 2,800,000	$	700,000	$ 3,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	25	50	40	10			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	60	40				
WBS Title	CONTINUING UDF DEMONSTRATIONS - OPERATIONS								
Description	The objective of the "Conduct Underground Demonstration Facility (UDF)" work program is to; - Initiate, conduct, analyse and periodically report on long term underground demonstration tests using the initial used fuel containers produced from the used fuel packaging plant placed in an repository setting, for long term monitoring of the performance of the bentonite based sealing materials. Other aspects of long term performance monitoring covered under other WEDS.								
Deliverable	- Complete demonstrations to either confirm final designs or revise design during operations of the DGR								
Assumptions	Duration of work: Y26 to Y30, with continuation to year 55. Note: Labour (2.0 FTEs Y26 to Y30 & 1.0 FTEs Y31 to Y55) is located in Repository Management Engineering WEDs:								

Year	Staff (fte)	cnslt ($M)	Equip ($M)
26		$ 1.0	$ 1.0
27		$ 1.0	$ 1.0
28		$ 1.0	$ 1.0
29		$ 1.0	$ 1.0
30		$ 1.0	$ 1.0
Years 31		$ 0.5	$ -

Contractors/consultants to procure equipment, install, conduct analyses and report on design confirmation and repository equipment commissioning tests and the resolution of any issues identified.

Schedule	Start Year	26	2035	Finish Year	55	2064
Type	Fixed					
Calculations and Notes:	Note: Container emplacement/retrieval UDF trials are accounted for in Repository Engineering Management & Emplacement/Retrieval WEDs.					

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 5,000,000	$ 17,500,000	$ 22,500,000	$ 5,625,000	$ 28,125,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	20	20	10			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	20	40					
WBS Title	DATABASE AND INFORMATION SYSTEMS								
Description	Develop the infrastructure for an integrated electronic geographic and geologic database and information management system. System design intended for spatial and temporal analysis, interpretation, integration and communication of site specific characterisation and monitoring data. Information System would be applied and, as required, up-graded throughout the repository siting process. It would further serve to archive site specific geosphere/biosphere data and create traceable data sets that would evolve as siting proceeded toward confirmation of the preferred site and UCF construction/operation. Databases would be accessible by a suite of analyses and visualization applications (GIS, Gocad, ...), which would likely evolve over the timeframe of the project. Interoperability is essential. Databases would be structured to include data information on transportation, natural environment, remote imaging, airborne geophysics, seismicity, geology, borehole data, municipal/ regional boundaries, aboriginal lands, surface hydrology, topography and groundwater resources. Results of geosphere model development and associated numerical simulations will also be archived in a suitable database. Database would facilitate internet access by project team members and other stakeholders, if appropriate.								
Deliverable	Integrated Electronic Information system and infrastructure to apply in support of repository siting, Environmental Assessment, conceptual geosphere model development, Performance and Safety Assessment.								
Assumptions	**Cost**: - Annual Licensing fees and upgrades: $100k/a for Y10-Y15; Database/Information management system maintained through Geoscience and monitoring support beyond Y25.								
Schedule	Start Year	10	2019				Finish Year	15	2024
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 600,000	$ -	$ 600,000	$ 150,000	$ 750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	20	20	20			**Prepared By:**	B. Belfadhel
WBS (Old)									

WBS Title GEOSPHERE SUPPORT AND MONITORING AT PREFERRED SITE DURING REGULATORY PROCESS

Description

During this period, geoscience staff will provide support to the regulatory process by addressing regulatory comments, preparation of licensing documentation and participating in other licensing activities.

Geosphere monitoring will continue at the preferred site during the regulatory process and prior to UDF construction. The objective of the continued monitoring is similar to that in WBS 560 15 40 40: continue monitoring the baseline or undisturbed conditions of the site to support performance assessment, engineering design and licensing. During this period it is assumed that no additional monitoring installations will be added, although some routine maintenance may be required. Certain monitoring installations may need to be completely refurbished or replaced during this pre-construction period to ensure on-going integrity of the monitoring program.

Maintenance of the Descriptive Geoscientific Site Model (DGSM) and associated flow system model will be supported throughout the regulatory process time period.

During this phase, geosphere monitoring installations will consist primarily of shallow groundwater monitoring wells (~ 100 m), multiple-level groundwater monitoring systems in deep boreholes (~ 1000 m), borehole seismographs and GPS stations. Groundwater monitoring will consist of periodic (ex: quarterly) measurements of hydraulic pressures and periodic (semi-annual) collection of groundwater samples for hydrogeochemical analyses for the purpose of establishing background conditions and variability. Seismograph and GPS stations will include automatic data acquisition systems accessed remotely.

Deliverable

- Annual reports on baseline monitoring conditions, and evaluation of trends.
- Provision of QA'd monitoring data to the electronic information management system
- Maintenance and updating of DGSM and associated numerical geosphere models.
- Supporting licensing activities, address regulatory comments, licensing documentation
- Support planning for UDF and DGR construction.

Assumptions

- One preferred site enters the regulatory process and licensing
- All monitoring installations are operational as part of detailed characterization activities.
- No new field or laboratory activities during the licensing phase.
- Monitoring installations (wells and seismographs) at the second site not selected will be gradually decommissioned during this period.

- An electronic information management system is operational.
- Local climate monitoring, such rainfall and snow accumulation, as well as surface water monitoring is assumed to be undertaken under biosphere monitoring.
- Formal monitoring program begins in the year following the end of detailed site characterization.

Information collected by the groundwater monitoring system would include, though not be limited to:

Major ions, trace elements, tritium and gross beta radiation, drilling water tracers within groundwater samples.

- Selected isotopes, known to be potential contaminants associated with the repository
- Suite of metals
- Basic organic analysis

Hydraulic pressure measurements in the multi-level wells will be collected quarterly if possible and may be extended to semi-annually later in the period. Water samples will be collected from specific intervals in the mulit-level wells on a semi-annual basis. The information collected will be added to the baseline data collected during the Siting Phase to assess any long-term trends or changes in background conditions.

- The surface-based groundwater monitoring system would be maintained and refurbished as required as it will be needed throughout the construction and operation phases of the DGR.

NWMO Staff:

Senior management at 1 NWMO-1/a (Y10-Y15)

NWMO Specialists: 11 NWMO-3/a (Y10-Y15) required in geosynthesis (1), hard rock or sedimentary rock geology (2), hydrogeology (1) geosphere modelling(2), hydrogeochemistry(2), rock mechanics (1), geophysics (1) and data management (1).

Travel/Expenses: $22k/a (Y10 to 15), assuming one trip per staff per year.

Purchased Services:

- Hydraulic pressure profiling: 20 multi-level wells [1xPS-4 at 400 hrs per quarter], travel, accomodation and reporting [PS-3 at 16 hrs per quarter] = $200k/a. Groundwater sample collection: 10 multi-level wells [1xPS-4 at 350 hrs semi-annual], travel, accomodation and reporting (PS-3 at 16 hrs semi-annual) = $100k/a.
- Analytical costs: $60k/a from Y10 to Y15; assuming 120 samples at $500/sample
- Monitor and maintain seismograph and GPS stations: $100k/a from Y10 toY15.
- Abandoning/grouting instrumented boreholes including development of decommissioning plan for second site (assuming 20 instrumented boreholes at $200k per borehole = $4M). For planning purposes assume abandonment of 5 boreholes per year in the last 4 years of the period (Y12 to Y15) at $1M/a.
- Address regulatory comments and update hydrogeological model at two intervals during the period accounting for monitoring results: $300k in Y12 and $300k in Y14 for a total effort of $600k
- Address regulatory comments and update Geomechanical models to support design (one time): $250k in Y14
- Address regulatory comments and maintain and update DGSM during period: $500k averaged over Y11 to Y15.

Equipment Replacement Provision:

One seismograph replacement during period: $150k (assume Y12)

One Westbay system replacement in a deep borehole, including removal and installation : $500k (assume Y15)

Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes:

Based on the DGR experience, for deep boreholes instrumented with a Westbay system it may take on average 20 hours per borehole to complete hydraulic pressure profiling measurements. It should be noted that the DGR-series boreholes include betrween 20 and 40 monitoring intervals each. This may be required in a sedimentary rock setting. By comparison, the groundwater monitoring wells at Forsmark, Sweden are instrumented with a maximum of 8 intervals that tend to target higher conductivity, fractured horizons, similar to the URL network in Pinawa. Based on the DGR experience, it may atke on average 35 hours per borehole to purge and collected groundwater samples, primarily from the shallower, US-series Westbay systems. The recent DGR experience has formed the basis for this cost estimate, including the seismic monitoring activity.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 9,920,207	$ 650,000	$ 8,242,000	$ 18,812,207	$ 4,703,052	$ 23,515,259

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	20	30	10			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	20	40					
WBS Title	DATABASE AND INFORMATION SYSTEMS								
Description	Develop the infrastructure for an integrated electronic geographic and geologic database and information management system. System design intended for spatial and temporal analysis, interpretation, integration and communication of site specific characterisation and monitoring data. Information System would be applied and, as required, up-graded throughout the repository siting process. It would further serve to archive site specific geosphere/biosphere data and create traceable data sets that would evolve as siting proceeded toward confirmation of the preferred site and UCF construction/operation. Databases would be accessible by a suite of analyses and visualization applications (GIS, Gocad, ...), which would likely evolve over the timeframe of the project. Interoperability is essential. Databases would be structured to include data information on transportation, natural environment, remote imaging, airborne geophysics, seismicity, geology, borehole data, municipal/ regional boundaries, aboriginal lands, surface hydrology, topography and groundwater resources. Results of geosphere model development and associated numerical simulations will also be archived in a suitable database. Database would facilitate internet access by project team members and other stakeholders, if appropriate.								
Deliverable	Integrated Electronic Information system and infrastructure to apply in support of repository siting, Environmental Assessment, conceptual geosphere model development, Performance and Safety Assessment.								
Assumptions	**Cost**: - Annual Licensing fees and upgrades: $100k/a for Y16-Y25; Database/Information management system maintained through Geoscience and monitoring support beyond Y25.								
Schedule	Start Year		16	2025		Finish Year		25	2034
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 1,000,000	$ -	$ 1,000,000	$ 250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	20	30	20			**Prepared By:**	B. Belfadhel
WBS (Old)	552	25	80						

WBS Title GEOSCIENCE SUPPORT AND MONITORING DURING UDF CONSTRUCTION

Description

Provide capability for geoscience characterisation and numerical analysis during the UDF construction period (Y16-Y20). During this period, the DGR's main shaft, service shaft and exhaust ventilation shaft, associated stations and services will be constructed including the access drifts and testing rooms of the Underground Demonstration Facility (UDF). Testing rooms will become available for trials following this period.

Work activities support DGSM refinement and confirmation, Repository Engineering and Safety Assessment functions. The main tasks are:

- Far-field hydrogeological and seismic monitoring and maintenance of the associated existing monitoring network;
- geologic mapping, hydrogeological, geochemical and geomechanical characterization activities during construction of shafts, access drifts (1&2) and UDF drifts and testing rooms;
- reporting and interpretation of hydrogeological/geologic site characterization and monitoring data gathered during UDF construction;
- maintenance and updating of the DGSM and associated hydrogeologic and geomechanical numerical models;
- planning, management and reporting of studies for the characterization of the shafts, access drifts and testing rooms EDZs; seepage monitoring; installation and monitoring of underground seismograph and microseismic network; excavation deformation monitoring; in-situ stress measurement.

Deliverable

- Geoscientific characterization and monitoring plans to support multi-year UDF and DGR construction activities.
- Annual monitoring reports on far-field and near-field conditions, including evaluation of trends.
- Provision of QA'd monitoring data to the electronic information management system.
- Update DGSM and reference hydrogeological and geomechanical numerical models.
- Geoscience reports describing updated geologic/hydrogeologic descriptive and numerical models in support of Repository Engineering and Safety Assessment.

Assumptions

- DGR design includes main shaft, service shaft and vent. All three will be excavated simultaneously.
- Shafts/vent sinking and station construction completed between Y16 and Y18; UDF and DGR access drifts completed by Y20.
- UDF and access drifts will be excavated at multiple faces concurrently.

NWMO Staff Requirements:
NWMO Staff:

- Senior management at 1 NWMO-1/a for 5 years (Y16-Y20)
- NWMO Specialists: 11 NWMO-3/a for 5 years (Y16-Y20) required in geosynthesis (1) hard rock or sedimentary rock geology (2), hydrogeology (1), geosphere modelling (2), hydrogeochemistry (2), rock mechanics (1), geophysics/seismicity (1), and data management (1).
- Travel/Expenses: $22k/a for 5 years (Y16 to Y20).

Purchased Services:

- Far field Monitoring:
  - o Quarterly hydraulic pressure profiling and semi-annual groundwater sample collection where possible and reporting over 5 years(as per WED 560.30.20.20.20): $360k/a from Y16 to Y20: Pressure profiling @ $200k/a, Groundwater sampling @ $100k/a and Analytical cost @ $60k/a.
  - o Monitor and maintain existing seismograph and GPS stations: $100k/a from Y16 to Y20.
- Geoscience characterization during shafts/vent construction[1], to include mapping/imaging activities 24/7 during sinking of three shafts concurrently: $10M (Y17)
- Geoscience characterization during shaft station, access drifts 1 or 2, and UDF gallery excavations[2]: $2M (averaged over Y18 to Y20)
- Install one aboveground and one underground seismograph to support attenuation studies : $300k (Y19)
- Update hydrogeological model during the period accounting for monitoring: $300k in Y18.
- Update Geomechanical models to support design (one time): $250k in Y19.
- Maintain and update DGSM during period: $400k over the period ($80k/a from Y16 to Y20).

Equipment Replacement provision: One replacement seismograph during period: $150k (assume Y18).
One Westbay system replacement in a deep borehole, including removal and installation if needed: $500k (assume Y20).

Schedule	Start Year	16	2025	Finish Year	20	2029

Type Fixed

Calculations and Notes:

[1] Similar to the OPG DGR plan, shaft/vent characterization activities include: wall imaging and mapping, EDZ mapping and geophysics, EDZ permeability testing, lateral coring and logging at selected locations, seepage collection, in-situ stress measurement, deformation monitoring, geochemical testing.

[2] Similar to the OPG DGR plan, access drift and UDF characterization activities include: Wall imaging and mapping, EDZ and rock mass geophysical surveys, rock core and block sampling, seepage water monitoring, borehole hydraulic conductivity testing and instrumentation, micro seismic network installation, in-situ stress measurements, geomechanics testing and deformation monitoring system installation.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 8,266,839	$ 650,000	$ 19,660,000	$ 28,576,839	$ 7,144,210	$ 35,721,049

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	20	30	30			**Prepared By:**	B. Belfadhel
WBS (Old)	552	25	80						

WBS Title GEOSCIENCE SUPPORT AND MONITORING DURING UDF OPERATION

Description

The Underground Demonstration Facility (UDF) will be operational during the concurrent phase of DGR construction.

Provide capability for geoscience far-field and near-field monitoring, numerical analysis and geoscience-based confirmation tests during UDF operation (Y21-Y25). Work activities support Geoscience Repository Engineering and Safety Assessment functions. The main tasks are:

- Maintenance of the site hydrogeological and seismic monitoring networks;
- Geoscience verification activities and reporting during construction of DGR perimeter drifts and cross-cuts;
- Planning, execution and analyses of geoscience-based confirmation tests in the UDF and selected locations within the DGR access ways.
- Maintenance and updating of the DGSM and associated hydrogeologic and geomechanical numerical models during the period;

Deliverable

- Geoscientific verification and monitoring plan to support multi-year DGR construction activities.
- Plans, status and final analysis reports of geoscience-based confirmation tests.
- Annual monitoring reports on far-field and near-field conditions, including evaluation of trends.
- Provision of QA'd monitoring data to the electronic information management system.
- Update DGSM and reference hydrogeological and geomechanical numerical models.
- Geoscience reports updating geologic/hydrogeologic descriptive and numerical models in support of Repository Engineering and Safety Assessment.

Assumptions

- DGR excavations will include perimeter drifts 1 & 2 and perimeter cross-cuts A & B (7 km).

NWMO Staff:

- Senior management at 1 NWMO-1/a for 5 years (Y21-Y25).
- NWMO Specialists: 8 NWMO-3/a for 5 years (Y21-Y25) required in hard rock or sedimentary rock geology (2), hydrogeology (1), geosphere modelling(1), hydrogeochemistry (1), rock mechanics (1), geophysics/seismicity (1) and data management (1).
- Travel/Expenses: $16k/a for Y21 to Y25.

Purchase Services:

- Far field[1] hydraulic pressure measurements and groundwater sample collection where possible and reporting: $150k/a for Y21 to Y25.
- Analytical costs: $30k/a for Y21 to Y25.
- Monitor and maintain far field seismograph and GPS stations: $100k/a for Y21 to Y25.
- Geoscience verification activities[2] during DGR perimeter drift and cross-cut excavations (assume scaled, by excavation length, level of effort as per previous WED 560.30.20.30.20 on access drifts, UDF galleries and shaft stations excavations): $4M in Y21 and $2M in Y22.
- Geoscience-based confirmation tests[3]: $1M/a over the entire 5-year period to confirm parameters.
- Update hydrogeological model during the period accounting for monitoring results: $300k in Y23.
- Update Geomechanical models to support on-going construction: $250k in Y24.
- Maintain and update DGSM during period: $100k/a for Y21 to Y25.

Equipment: One replacement seismograph during period: $150k (assume Y23)
One Westbay system replacement in a deep borehole, including removal and installation if needed: $500k (assume Y25)

Schedule	Start Year	21	2030	Finish Year	25	2034

Type Fixed

Calculations and Notes:

[1] Level of effort in far field hydraulic pressure monitoring and sampling is assumed to be reduced by half during UDF/DGR operations as near field measurements from sub-surface collared wells are assumed acquired under the overall DGR monitoring activity.

[2] Wall imaging and mapping, EDZ and rock mass geophysical surveys, rock core and block sampling, seepage water monitoring, fracture infilling mineralogy, borehole groundwater water sampling, hydraulic conductivity testing and instrumentation at selected locations along the perimeter access ways (away from emplacement rooms), in-situ stress measurements, geomechanics .

[3] Geoscience-based confirmation tests may include one or more of the following during the period: In-situ stress evolution during excavation to support geomechanical modelling, large scale stability test, rock mass creep, EDZ evolution and testing, field scale thermal properties, tracer transport parameter measurements in proximal fractures, microbial sampling in controlled environment, borehole-based long term diffusion and sorption experiments to support parameter upscaling.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 6,314,091	$ 650,000	$ 13,530,000	$ 20,494,091	$ 5,123,523	$ 25,617,614

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	20	40	10			**Prepared By:**	B. Belfadhel
WBS (Old)	552	25	80						

WBS Title GEOSCIENCE SUPPORT AND MONITORING DURING DGR OPERATION

Description

- The operational period for the DGR occurs between Y26-Y55. During this period, emplacement rooms will be built successively in panels. Placement of containers and sealing of emplacement rooms will be ongoing in one panel as another is being excavated. Geoscience verification studies will be completed to supplement the descriptive geoscientific model throughout the operations period. Geoscience-based monitoring activities will take place throughout the period as well.

Deliverable

- Geoscientific verification plan to support multi-year DGR construction activities.
- Annual reports on far-field monitoring conditions, and evaluation of trends.
- Provision of QA'd monitoring data to the electronic information management system.
- Review and update DGSM and reference hydrogeological and geomechanical numerical models in support of Repository Engineering and Safety Assessment.

Assumptions

- DGR excavations will consist of emplacement rooms excavated in panels. Each panel will be excavated during approximately a 24/7 period by two separate mining crews. Each panel will require approximately 1900 m/a of excavation and will take about 4 years to complete.
- Near field monitoring activities are included in a separate WED.
- All long-term geoscience-based confirmation tests have been completed prior to the operational phase of the DGR.

NWMO Staff:

· Senior management at 1 NWMO-1/a (Y26-Y55).

· NWMO Specialists: 7 NWMO-3/a (Y26-Y55) required in hard rock geology (1), hydrogeology (1), geosphere modelling(1), hydrogeochemistry (1), rock mechanics (1), geophysics/seismicity (1) and data management (1).

· Travel/Expenses: $14k/a for Y26 to Y55.

Purchase Services:

- Far field hydraulic pressure measurements and groundwater sample collection where possible and reporting: $150k/a for Y26 to Y55.
- Analytical costs: $30k/a for Y26 to Y55.
- Monitor and maintain seismograph and GPS stations: $100k/a for Y26 to Y55.
- Geoscience verification activities[1] during DGR emplacement room excavation: $470k/a
- Update hydrogeological model every 5 years during the period accounting for monitoring results: $300k in Y30, Y35, Y40, Y45, Y50 and Y55.
- Update Geomechanical models to support on-going construction: $250k in Y30, Y35, Y40, Y45, Y50 and Y55.
- Review and update DGSM during period based on emplacement room verification activities: $50k/a.
- Equipment Replacement provision: One replacement seismograph every 5 years during period: $150k in Y30, Y35, Y40, Y45, Y50 and Y55.
- One Westbay system replacement in a deep borehole, including removal and installation if needed: $500k every 10 years starting in Y35. This assumes that some broken or malfunctioning systems will not be replaced during the period and that some attrition will be allowed.

Schedule	Start Year	26	2035	Finish Year	55	2064

Type Step-Fixed

Calculations and Notes:

[1] Wall imaging and mapping (1 mapping geologist, 8 hrs-day for 4 years), EDZ and rock mass geophysical surveys, rock core and block sampling, seepage water monitoring, mineralogical analyses, laboratory geomechanics testing (760k per panel over 4 years).

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 33,979,050	$ 2,400,000	$ 27,720,000	$ 64,099,050	$ 16,024,763	$ 80,123,813

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	20	50	10			**Prepared By:**	B. Belfadhel
WBS (Old)	552	25	80						
WBS Title	GEOSCIENCE SUPPORT DURING EXTENDED MONITORING								
Description	- This period of extended monitoring occurs from Y56 to Y125. During this period of extended monitoring, the facility will remain open and accessible.								
Deliverable	- Annual reports on far-field monitoring conditions, and evaluation of trends.								
Assumptions	Near-field monitoring activities are captured by another WED (ex: micro-seismic, deformation of access and perimeter tunnels, thermal, groundwater pressure measurement and sampling). NWMO Staff: requirements are 3 NWMO-3/a for 70 years based on: - Geoscience management (1 fte) - Geoscience specialist (1 fte) - Geoscience technologist (1 fte). - Travel: $6k/a throughout the period. Purchase Services: - Far field (surface-collared multi-level wells) hydraulic pressure measurements and groundwater sample collection where possible and reporting: $150k/a. - Analytical costs: $30k/a for the period. - Monitor and maintain seismograph and GPS stations: $100k/a for period. - Far-field monitoring equipment Replacement provision: One replacement seismograph: $150k every 5 years. - One Westbay system replacement in a deep borehole, including removal and installation if needed: $500k every 10 years - Not all instruments will be able to be replaced or repaired and thus some attrition is to be expected. Future improvements in monitoring technologies and approaches will be evaluated and applied to the DGR as appropriate.								
Schedule	Start Year		56	2065		Finish Year	125	2134	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 27,338,472	$ 5,600,000	$ 20,020,000	$ 52,958,472	$ 13,239,618	$ 66,198,090

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	20	60	10			**Prepared By:**	B. Belfadhel
WBS (Old)	552	25	80						
WBS Title	GEOSCIENCE SUPPORT AND MONITORING DURING DGR DECOMMISSIONING								
Description	Provide capability for geoscience monitoring and numerical analysis during the facility decommissioning period (Y126-Y150). During this period, main access ways and shafts will progressively be backfilled and surface facilities removed. Work activities support geoscience Performance Assessment and post-closure Safety Assessment functions. The main tasks are: - Management and evaluation of the long-term monitoring system program. - Far-field monitoring of geoscience instrumentation (ex: groundwater monitoring wells, seismographs) to establish impacts of various decommissioning stages on geosphere responses and to acquire post-operational baseline conditions prior to abandonment. - Review and update of the Descriptive Geosphere Site Model and associated hydrogeologic and geomechanical models to support decommissioning license; - Planning and management of studies for the improvement and validation of the site numerical hydrogeologic and geomechanical models based on post-operational responses; - Assessment of topical issues as may be required; - Address regulatory comments;								
Deliverable	- Decommissioning plan for far-field monitoring network. - Annual monitoring reports on post-operational geosphere conditions, and evaluation of trends. - Review and update DGSM and reference hydrogeological and geomechanical numerical models in support of decommissioning license. - Update long-term monitoring data in the electronic information management system								
Assumptions	- Facility will remain open (shafts and main access tunnels) throughout the early stages of decommissioning period (first 5 years to obtain license), but will be systematically closed during most of the period. - Electronic information management system is operational. NWMO Staff: requirements are 5 NWMO-3/a for 25 years based on: - Geoscience management (1 fte) - Geoscience specialists (2 fte) - Geoscience technologists (2 fte). - Travel: $10k/a Purchased Services: - Far field (surface-collared multi-level wells) hydraulic pressure measurements and groundwater sample collection where possible and reporting: $130k/a. - Analytical costs: $30k/a for the period. - Monitor and maintain seismograph and GPS stations: $100k/a for period. - Update hydrogeological model during first year decommissioning period: $300k in Y126. - Update Geomechanical model during first year decommissioning period: $250k in Y126. - Review and update DGSM during first year decommissioning period: $300k. Equipment Replacement Provision: It is anticipated that many monitoring instruments will not survive throughout the period. It is assumed that mal-functioning monitoring instruments will not be replaced during the decommissioning phase.								
Schedule	Start Year		126	2135		Finish Year	150	2159	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 16,272,900	$ -	$ 7,600,000	$ 23,872,900	$ 5,968,225	$ 29,841,125

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	20	70	10			**Prepared By:**	A. Vorauer
WBS (Old)									
WBS Title	GEOSCIENCE SUPPORT AND MONITORING DURING DGR ABANDONMENT								
Description	Specific requirements and duration of an abandonment phase following completion of decommissioning activities are not well defined. However, a lump sum cost is associated with this WED to accommodate all potential abandonment activities of a technical nature including post-closure monitoring.								
Deliverable									
Assumptions	- Abandonment activity costs estimated at $50M.								
Schedule	Start Year			151	2160		Finish Year	151	2160
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 50,000,000	$ 50,000,000	$ 12,500,000	$ 62,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	20	10		**Prepared By:**	N. Hunt, P. Gierszewski	
WBS (Old)									

WBS Title: SAFETY ASSESSMENT FOR EA AND PSR

Description

This task is to provide preclosure and postclosure safety assessment contributions to both the Environmental Assessment (EA) and the Preliminary Safety Report (PSR). The EA and PSR documents will be submitted in support of the applications for a Licence to Prepare Site and for a Licence to Construct.

The preclosure assessment will address conventional and radiological safety for normal, upset and accident conditions associated with the operating and monitoring phases.

The postclosure assessment will address the anticipated effects on human and non-human biota following decommissioning and abandonment. Both radiological and non-radiological contaminants will be considered.

Deliverable

- Preclosure Safety Assessment report.
- Postclosure Safety Assessment report.
- Preliminary ALARA Assessment.
- Conventional Safety Assessment.
- Radiological Safety Assessment.
- Preclosure and postclosure contributions to the EA and the PSR.
- Updated computer codes and support documents.
- Updated datasets.
- Key supporting reports, for example: Reference Data; Features, Events and Processes; Normal Evolution scenario; Disruptive Scenario.

Assumptions

- Assessment builds on report(s) produced at end of Y9 for the selected preferred site.
- Work is carried out iteratively, with interim version released in mid-Y11.
- Preliminary design fixed and available one year ahead of when final safety assessment reports are due. That is, by end Y11 if reports are to be completed by end Y12.
- Geosynthesis and Descriptive Geosphere Site Model reports available one year ahead of when final safety assessment reports are due.
- Preliminary ALARA assessment is primarily initial estimate of doses, and does not provide significant ALARA optimization. This will be addressed in Operating Licence stage.
- Conventional Safety Assessment detail is more consistent with dry storage facility Conventional Safety Assessment rather than a uranium mine.
- The staffing model is consistent with the current status quo (i.e., more buy than make oriented).
- Transportation safety assessment is covered under WBS 660.20.30.20.10 (Transportation Safety Assessment).

NWMO Safety Assessment staff requirements are 2 NWMO-01 FTE and 6.0 NWMO-03 FTE in each of Y10, Y11, and Y12 (see the Calculation Section below for more information and staff categorization). This includes the effort for management of contracts that support this activity in WBS 560.25.30.20.10 (Technical Support During EA and PSR Phase).

Funding for contractor support with preclosure and postclosure assessments (including review and comment) is $2.8M for Y10, $2.8M for Y11, $3.5M for Y12.

NWMO expenses are $40 K/a (~5 K$/a/FTE). This will cover software licences, travel (sites, conferences) and other costs (e.g. high speed computing).

Schedule	Start Year	10	2019	Finish Year	12	2021

Type: Fixed

Calculations

Biosphere and transportation staffing requirements are not included here.

	Y10	Y11	Y12
Dir (NWMO-01)	1	1	1
Mgr UF NWM (NWMO-01)	1	1	1
Sr Scientist (NWMO-03)	1	1	1
Sci/Eng (NWMO-03)	5	5	5
Total FTE	**8**	**8**	**8**

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 3,671,413	$ -	$ 9,220,000	$ 12,891,413	$ 3,222,853	$ 16,114,267

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	20	20			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	SUPPORT FOR REVIEW AND HEARINGS FOR CONSTRUCTION LICENCE								
Description	This task is to support the public hearings and respond to review panel and regulatory questions on the Environmental Assessment (EA) and Preliminary Safety Report (PSR) submission. It is also anticipated that Safety Assessment staff will attend a variety of sessions with the public, elected representatives and aboriginal groups to provide information on the technical aspects of the project.								
Deliverable	Prepare responses to review questions. Presentation material for public and regulatory review. Participation in public review of EA and PSR materials.								
Assumptions	NWMO staffing requirements are 2 NWMO-01 FTE/a and 6 NWMO-03 FTE/a. This includes the effort for management of contracts that support this activity in WBS 560.25.30.20.10 (Technical Support During EA and PSR Phase). Funding for contractor support during the EA hearing is estimated at $400 K/a for 3 years.								
Schedule	Start Year	13	2022			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	OPG L&ILW DGR project estimate (2010) for Preclosure and Postclosure safety assessment contractor support during hearings is $360 K/a for two years. A similar value is assumed for APM, although more work will likely be carried out by NWMO staff than was case with DGR where most work was by contractors. Based on Darlington New Build EA Panel experience that there will be a significant number of questions raised during public review, and staff will be involved in preparing responses.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 3,671,413	$ -	$ 1,200,000	$ 4,871,413	$ 1,217,853	$ 6,089,267

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	20	30			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	BIOSPHERE CHARACTERIZATION FOR EA AND PSR								
Description	This task is for maintenance of the detailed biosphere characterization information created in WBS 560.15.30.10.40 (Biosphere Characterization for Candidate Sites) with specific focus on the selected site.								
Deliverable	Maintenance and update of Biosphere Characterization report. Maintenance and update of biosphere database. Participation in meetings and other communications related to biosphere characterization and impact analysis.								
Assumptions	- Biosphere characterization performed in WBS 560.15.30.10.40 (Biosphere Characterization for Candidate Sites) provides most of the information necessary to define the biosphere. However, it is anticipated that there will be some additional Environmental Assessment (EA) or Preliminary Safety Report (PSR) specific fieldwork identified as these documents are prepared, which is covered here. NWMO staff requirement is 1 NWMO-03 FTE/a for each of Y10 to Y12. Funding for contractor support is $200 K in each of Y10 to Y12.								
Schedule	Start Year		10	2019		Finish Year	12	2021	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 390,550	$ -	$ 600,000	$ 990,550	$ 247,637	$ 1,238,187

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	30	10			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title	SAFETY ASSESSMENT FOR FSR
Description	This task is to provide the preclosure and postclosure safety assessment contributions to the Final Safety Report (FSR). The FSR document will be submitted in support of the applications for a Licence to Operate. The preclosure assessment will address conventional and radiological safety for normal, upset and accident conditions associated with the operating and monitoring phases. It will include a preliminary ALARA assessment, a Conventional Safety Assessment, and a Radon Assessment. The postclosure assessment will address the anticipated effects on human and non-human biota following decommissioning and abandonment. Both radiological and non-radiological contaminants will be considered.
Deliverable	Contributions to the FSR include: - Preclosure Safety Assessment report. - Postclosure Safety Assessment report. - ALARA Assessment. - Conventional Safety Assessment. - Radiological Safety Assessment. - Natural Analogues. - Updated computer codes and support documents. - Updated datasets. - Updated Features, Events and Processes document.
Assumptions	- The assessment will build on work performed for the Environmental Assessment (EA) and Preliminary Safety Report (PSR) in WBS 560.30.30.20.10 (Safety Assessment for EA and PSR); however, in this case additional information from the Underground Demonstration Facility (UDF) and the final decision will be used. - Site specific information from UDF testing is available as required from WBS 560.25.30.30.10 (Technical Support for Operating License Application). - Final design is fixed and available 2 years ahead of when the FSR is due. - The regulatory review and approval period takes 2 years which implies the final version is to be completed by end Y23. - The FSR take 3 years to complete for the interim version, with a further 2 years required for review and revision to produce the final version. This means the FSR work must start no later than Y19. - The staffing model is consistent with the current status quo (i.e., more buy than make oriented). NWMO Safety Assessment staff requirements are 8 FTE/a (2 NWMO-01 and 6 NWMO-03). This includes the management of contracts that support this activity in WBS 560.25.30.30.10 (Technical Support for Operating Licence Application). Contractor support with preclosure and postclosure assessments (including review and comment) is $3 M/a for Y19 to Y23 (similar to the PSR stage). NWMO expenses are $40 K/a (~$5 K/a/FTE). This will cover software licences, travel (sites, conferences) and other costs (e.g. high speed computing).

Schedule	Start Year	16	2025	Finish Year	23	2032
Type	Fixed					
Calculations and Notes:						

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 9,790,435	$ -	$ 15,320,000	$ 25,110,435	$ 6,277,609	$ 31,388,044

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	30	20			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title BIOSPHERE MONITORING

Description

This task is for the development and operation of a biosphere monitoring program.

Environmental Effects Monitoring is a process which will establish the baseline conditions of the biosphere and then monitor for changes to the baseline from the activities occurring at the facility site, whether this is construction, normal operations, emergency procedures or decommissioning. Any changes to the baseline will be investigated to determine the cause.

The monitoring program includes:

- Demonstration of compliance with targets set within the Environmental Management System Plan.
- Evaluation of any releases into the environment including assessment of the likely cause and determining mitigation / actions.
- Compliance Monitoring will be conducted to ensure that all Provincial regulatory requirements are met for effluent discharges, and on- and off-site air action levels are met.

A variety of measurements from off-site locations will also be collected on a regular basis for use with public health and monitoring assessments, including:

- Air – continual radioactivity monitoring at 10 locations with sampling each quarter
- Water – rain, drinking water, lakes, streams, rivers – 10 samples per event
- Soil – 20 soil samples per quarter
- Wildlife and Plants – 10 flora and fauna samples from various locations each quarter
- Produce (e.g.; milk) – 5 samples from various local produce per quarter (on rotation)

Deliverable

The main deliverables are:

- Reporting of baseline condition changes and assessments of the likely reasons for the changes.
- Periodic reports on compliance with targets set out in the Environmental Management System Plan.
- Provision of environmental data and analysis for public information.
- Demonstration of compliance with legislation and regulations and provision of reports to the Ministry of the Environment as required.

Assumptions

- Baseline biosphere data are available from WBS 560.30.30.20.30 (Biosphere Characterization for EA and PSR).
- Excludes groundwater monitoring wells.

NWMO staff requirement is 1 NWMO-03 FTE/a as long as the program is running.

Contractor costs for data collection and sampling is $200 K/a as long as the program is running. This includes contractor staff costs, costs to install and maintain equipment, sample analysis costs, and report preparation.

Schedule	Start Year	16	2025	Finish Year	25	2034

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,301,832	$ -	$ 2,000,000	$ 3,301,832	$ 825,458	$ 4,127,290

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	30	30			**Prepared By:**	N. Hunt, P.
WBS (Old)									Gierszewski
WBS Title	HUMAN HEALTH MONITORING								
Description	A regular assessment of public health will be conducted and may involve the following activities: - Identification of community health concerns - Public health implications - Site specific health outcomes The focus is on assessing the potential impacts of facility operations on the health of the people living in the area of the facility.								
Deliverable	The main deliverables for the Human Health monitoring are: - Evaluation of public health through analysis of collated data including generation of public health assessment reports. - Reports to regulators and any other interested parties								
Assumptions	- Monitoring of worker health is not included. - Public health evaluation is reviewed on an ongoing basis. A study is conducted every 5 years at a cost of $500 K/study.								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,000,000	$ 1,000,000	$ 250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	30	90			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	SUPPORT FOR REVIEW AND HEARINGS FOR OPERATING LICENCE								
Description	This task is to support the public hearings and respond to review panel and regulatory questions on the Final Safety Report (FSR) submission. It is also anticipated that Safety Assessment staff will attend a variety of sessions with the public, elected representatives and aboriginal groups to provide information on the technical aspects of the project.								
Deliverable	Prepare responses to review questions. Presentation material for public and regulatory review. Participation in public review of FSR materials.								
Assumptions	NWMO staffing requirements are 2 NWMO-01 and 6 NWMO-03 FTE/a. This includes the management of contracts that support this activity in WBS 560.25.30.30.10 (Technical Support for Operating Licence Application). Funding for contractor support during the Operating Licence review process is estimated at $400 K/a for 2 years.								
Schedule	Start Year	24	2033			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	Assumed similar level of effort as in supporting the Construction Licence application.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,447,609	$ -	$ 800,000	$ 3,247,609	$ 811,902	$ 4,059,511

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	40	10			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	OPERATIONS SAFETY ASSESSMENT								
Description	This task is to provide safety assessment support during the facility operating period. Specific items include: - Preparation of periodic safety assessment reports to support continuation of the site Operating Licence. - Assessment of topical issues as may be required, including any follow-up issues from Operating Licence approval. - Maintenance and improvement of the safety and performance assessment computer codes, including reference databases and tools, under a suitable QA system. - Maintenance of the reference site numerical model developed in WBS 560.30.30.30.10 (Safety Assessment for FSR). - Planning and management of technical support related to the development and validation of safety and performance assessment models and codes, and associated databases. - Training of qualified staff to ensure continued capability to support the monitoring and eventual closure of the facility. - Interpretation and application of experiments conducted in the Underground Demonstration Facility (UDF).								
Deliverable	- Up-to-date reference repository safety assessment model. - Periodic updates to the Final Safety Report (FSR) as required for supporting renewal of the site Operating Licence. - Annual report describing ongoing results to further validate or improve the reference safety assessment model.								
Assumptions	- The monitoring of geologic conditions around the site, and maintenance of the site hydrogeological reference numerical model is not addressed here. - Costs do not include biosphere monitoring. - Costs do not include monitoring of repository as needed to support operations. - Costs do not include responsibility for conventional Health, Safety & Environmental program in support of operations. - The cost for technical support work in the UDF and elsewhere (i.e., universities, international collaboration) is described in WBS 560.25.50.40.10 (Conduct UDF Demonstrations – Operations). NWMO staff requirements are 5 FTE/a based on: - safety assessment manager (1 NWMO-01) - technical specialists in safety assessment (2 NWMO-03) - analyst/engineers (2 NWMO-03) Expenses are estimated as $400 K/a to provide consultant support (software support, technical analysis and peer review), and costs for travel to attend public meetings and to participate in international conferences and workshops.								
Schedule	Start Year		26	2035		Finish Year		55	2064
Type	Step-Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 22,262,562	$ -	$ 12,000,000	$ 34,262,562	$ 8,565,641	$ 42,828,203

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	40	20			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title BIOSPHERE MONITORING

Description

This task is for the development and operation of a biosphere monitoring program.

Environmental Effects Monitoring is a process which will establish the baseline conditions of the biosphere and then monitor for changes to the baseline from the activities occurring at the facility site, whether this is construction, normal operations, emergency procedures or decommissioning. Any changes to the baseline will be investigated to determine the cause.

The monitoring program includes:

- Demonstration of compliance with targets set within the Environmental Management System Plan.
- Evaluation of any releases into the environment including assessment of the likely cause and determining mitigation / actions.

- Compliance Monitoring will be conducted to ensure that all Provincial regulatory requirements are met for effluent discharges, and on- and off-site air action levels are met.

A variety of measurements from off-site locations will also be collected on a regular basis for use with public health and monitoring assessments, including:

- Air – continual radioactivity monitoring at 10 locations with sampling each quarter
- Water – rain, drinking water, lakes, streams, rivers – 10 samples per event
- Soil – 20 soil samples per quarter
- Wildlife and Plants – 10 flora and fauna samples from various locations each quarter
- Produce (e.g.; milk) – 5 samples from various local produce per quarter (on rotation)

Deliverable

The main deliverables are:

- Reporting of baseline condition changes and assessments of the likely reasons for the changes.
- Periodic reports on compliance with targets set out in the Environmental Management System Plan.
- Provision of environmental data and analysis for public information.
- Demonstration of compliance with legislation and regulations and provision of reports to the Ministry of the Environment as required.

Assumptions

- Biosphere data are available from WBS 560.30.30.30.20 (Biosphere Monitoring).
- Excludes groundwater monitoring wells.

NWMO staff requirement is 1 NWMO-03 FTE/a as long as the program is running.

Contractor costs for data collection and sampling are $200 K/a as long as the program is running. This includes contractor staff costs, costs to install and maintain equipment, sample analysis costs, and report preparation.

Schedule	Start Year	26	2035	Finish Year	55	2064

Type Step-Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 3,905,496	$ -	$ 6,000,000	$ 9,905,496	$ 2,476,374	$ 12,381,870

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	40	30			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	HUMAN HEALTH MONITORING								
Description	A regular assessment of public health will be conducted and may involve the following activities: - Identification of community health concerns - Public health implications - Site specific health outcomes The focus is on assessing the potential impacts of facility operations on the health of the people living in the area of the facility.								
Deliverable	The main deliverables for the Human Health monitoring are: - Evaluation of public health through analysis of collated data including generation of public health assessment reports. - Reports to regulators and any other interested parties								
Assumptions	- Monitoring of worker health is not included. - Public health evaluation is reviewed on an ongoing basis. A study is conducted every 5 years at a cost of $500 K/study.								
Schedule	Start Year		26	2035			Finish Year	55	2064
Type	Fixed								
Calculations									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,000,000	$ 3,000,000	$ 750,000	$ 3,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	50	10			**Prepared By:**	N. Hunt, P.
WBS (Old)									Gierszewski

WBS Title EXTENDED MONITORING

Description

This task is to provide safety assessment activities during the Extended Monitoring period (Y56-Y125). Specific items include:

- Preparation of periodic safety assessment reports to support continuation of the site Operating Licence.
- Assessment of the repository performance against model predictions, and continual improvement in the reference repository safety assessment models.
- Maintenance of safety and performance assessment computer codes, including reference databases and tools, under a suitable QA system.
- Maintenance of the reference site numerical model developed in WBS 560.30.30.40.10 (Operations Safety Assessment).
- Planning and management of technical support related to the continuous validation of safety and performance assessment models and codes, and in particular on the implications of continued monitoring on the long-term safety.
- Training of qualified staff to ensure continued capability to support the monitoring and eventual closure of the facility.

Deliverable

- Up-to-date reference repository safety assessment model.
- Periodic updates to the FSR as required for supporting renewal of the site Operating Licence.
- Annual report describing ongoing work to further validate or improve the reference safety assessment model, and specifically its conclusions with respect to the implications for continued monitoring and for repository closure.

Assumptions

The following is not included here:

- General operating costs of the Underground Demonstration Facility (UDF).
- Groundwater monitoring.
- Biosphere monitoring (compliance with environmental targets).

NWMO staff requirements are 2 FTE/a based on:

- technical specialist in safety assessment (1 NWMO-03)
- analyst/software specialist (1 NWMO-03)

Costs for consultants for software support, technical analysis support, ongoing peer review and for travel to public meetings and international conferences and workshops is estimated at $M 0.2/a.

Cost for analysis of the long-term experiments is estimated at $M 0.2/a. It is assumed that no major new experiments are undertaken, but that that previously installed long-term experiments are continuously monitored and, per their experimental plan, eventually recovered for detailed analysis. Thus the costs are likely to be modest, with periodic spikes for the duration of a recovery and analysis campaign.

In particular, it is expected that at least one long-term container test will have been emplaced and instrumented earlier, and will be recovered during this period. In addition, smaller experiments will focus on analysis of long-term exposed coupons or test assemblies to confirm model predictions on decade time-scales, and provide as much confidence as is possible for making a decision with respect to continued monitoring or closure. Thirdly, the experiments may increasingly focus on the influence of the extended monitoring itself on the repository (e.g. resaturation) and/or on concepts for remote monitoring of a closed and sealed repository.

Schedule	Start Year	56	2065	Finish Year	125	2134

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 18,225,648	$ -	$ 28,000,000	$ 46,225,648	$ 11,556,412	$ 57,782,060

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	50	20			**Prepared By:**	N. Hunt, P.
WBS (Old)									Gierszewski

WBS Title BIOSPHERE MONITORING

Description

This task is for the development and operation of a biosphere monitoring program.

Environmental Effects Monitoring is a process which will establish the baseline conditions of the biosphere and then monitor for changes to the baseline from the activities occurring at the facility site, whether this is construction, normal operations, emergency procedures or decommissioning. Any changes to the baseline will be investigated to determine the cause.

The monitoring program includes:

- Demonstration of compliance with targets set within the Environmental Management System Plan.
- Evaluation of any releases into the environment including assessment of the likely cause and determining mitigation / actions.
- Compliance Monitoring will be conducted to ensure that all Provincial regulatory requirements are met for effluent discharges, and on- and off-site air action levels are met.

A variety of measurements from off-site locations will also be collected on a regular basis for use with public health and monitoring assessments, including:

- Air – continual radioactivity monitoring at 10 locations with sampling each quarter
- Water – rain, drinking water, lakes, streams, rivers – 10 samples per event
- Soil – 20 soil samples per quarter
- Wildlife and Plants – 10 flora and fauna samples from various locations each quarter
- Produce (e.g.; milk) – 5 samples from various local produce per quarter (on rotation)

Deliverable

The main deliverables are:

- Reporting of baseline condition changes and assessments of the likely reasons for the changes.
- Periodic reports on compliance with targets set out in the Environmental Management System Plan.
- Provision of environmental data and analysis for public information.
- Demonstration of compliance with legislation and regulations and provision of reports to the Ministry of the Environment as required.

Assumptions

- Biosphere data are available from WBS 560.30.30.40.20 (Biosphere Monitoring).
- Excludes groundwater monitoring wells.

NWMO staff requirement is 1 NWMO-03 FTE/a as long as the program is running.

Contractor costs for data collection and sampling is $200 K/a as long as the program is running. This includes contractor staff costs, costs to install and maintain equipment, sample analysis costs, and report preparation.

Schedule	Start Year		56	2065			Finish Year		125	2134	

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 9,112,824	$ -	$ 14,000,000	$ 23,112,824	$ 5,778,206	$ 28,891,030

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	50	40			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	HUMAN HEALTH MONITORING								
Description	A regular assessment of public health will be conducted and may involve the following activities: - Identification of community health concerns - Public health implications - Site specific health outcomes The focus is on assessing the potential impacts of facility operations on the health of the people living in the area of the facility.								
Deliverable	The main deliverables for the Human Health monitoring are: - Evaluation of public health through analysis of collated data including generation of public health assessment reports. - Reports to regulators and any other interested parties								
Assumptions	- Monitoring of worker health is not included. - Public health is reviewed on an ongoing basis. A study is conducted every 5 years at a cost of $500 K/study.								
Schedule	Start Year			86	2095		Finish Year	155	2164
Type	Fixed								
Calculations									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 7,000,000	$ 7,000,000	$ 1,750,000	$ 8,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	60	10			**Prepared By:**	N. Hunt, P.
WBS (Old)									Gierszewski

WBS Title BIOSPHERE MONITORING

Description

This task is for the development and operation of a biosphere monitoring program.

Environmental Effects Monitoring is a process which will establish the baseline conditions of the biosphere and then monitor for changes to the baseline from the activities occurring at the facility site, whether this is construction, normal operations, emergency procedures or decommissioning. Any changes to the baseline will be investigated to determine the cause.

The monitoring program includes:

- Demonstration of compliance with targets set within the Environmental Management System Plan.
- Evaluation of any releases into the environment including assessment of the likely cause and determining mitigation / actions.

- Compliance Monitoring will be conducted to ensure that all Provincial regulatory requirements are met for effluent discharges, and on- and off-site air action levels are met.

A variety of measurements from off-site locations will also be collected on a regular basis for use with public health and monitoring assessments, including:

- Air – continual radioactivity monitoring at 10 locations with sampling each quarter
- Water – rain, drinking water, lakes, streams, rivers – 10 samples per event
- Soil – 20 soil samples per quarter
- Wildlife and Plants – 10 flora and fauna samples from various locations each quarter
- Produce (e.g.; milk) – 5 samples from various local produce per quarter (on rotation)

Deliverable

The main deliverables are:

- Reporting of baseline condition changes and assessments of the likely reasons for the changes.
- Periodic reports on compliance with targets set out in the Environmental Management System Plan.
- Provision of environmental data and analysis for public information.
- Demonstration of compliance with legislation and regulations and provision of reports to the Ministry of the Environment as required.

Assumptions

- Biosphere data are available from WBS 560.30.30.50.20 (Biosphere Monitoring).
- Excludes groundwater monitoring wells.

NWMO staff requirement is 1 NWMO-03 FTE/a as long as the program is running.

Contractor costs for data collection and sampling is $200 K/a as long as the program is running. This includes contractor staff costs, costs to install and maintain equipment, sample analysis costs, and report preparation.

Schedule	Start Year	126	2135	Finish Year	150	2159

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 3,254,580	$ -	$ 5,000,000	$ 8,254,580	$ 2,063,645	$ 10,318,225

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	60	20			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	DECOMMISSIONING								
Description	This task is for Safety Assessment support for the application for Decommissioning Licence and possible associated Environmental Assessment.								
Deliverable	Support to the Environmental Assessment (EA) as required. Preparation of updated safety assessment Final Safety Report (FSR).								
Assumptions	- The existing FSR will be updated with current data, but is otherwise sufficient to support the decommissioning EA/licence application. - Preparation for the EA/Licence application begins at the start of the Decommissioning and Closure stage. - The EA/Licence application takes 3 years to prepare and thereafter the hearing process takes 2 year to complete. - The EA addresses all issues related to obtaining the Decommissioning Licence and the Licence to Abandon. - Technical support activities are largely over (i.e., it is assumed that all issues have been sufficiently addressed in the >100 years of research that have taken place prior to the decision to close and abandon the facility). However $200 K/a funding is maintained with universities or contractors or international collaboration in order to address issues that may arise during the 25-year Decommissioning period. NWMO safety assessment staff requirements for the final wrap up of safety assessment activities and Decommissioning Licence application are 2 NWMO-03 FTE/a for 5 years, Y126 to Y130. Subsequently the effort is 1 NWMO-03 FTE/a to maintain the facility licence during the Decommissioning phase, and to ensure that the FSR remains consistent with the as-decommissioned facility. WEDS 560.30.40.50.40 (EA for CNSC Decommissioning Licence) states that the EA will require a support Manager and full time Technical Specialist, together with support from consultants and contractors engaged to perform technical studies and data analysis. These costs are included in that item and no additional safety assessment staff are required.								
Schedule	Start Year		126	2135		Finish Year	150	2159	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 3,905,496	$ -	$ -	$ 3,905,496	$ 976,374	$ 4,881,870

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	30	70	10			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	ABANDONMENT								
Description	This task is for Safety Assessment support for an application for abandonment of the facility.								
Deliverable	Preparation of updated safety assessment Final Safety Report (FSR)								
Assumptions	- The Environmental Assessment (EA) created in WEDS 560.30.40.50.40 (EA for CNSC Decommissioning Licence) addresses all EA issues related to obtaining the Decommissioning Licence and the Licence to Abandon. - The existing FSR will be updated with current data, but is otherwise sufficient to support the abandonment licence application. - The Updated FSR will include information obtained during the Decommissioning phase, including if necessary information on the actual seal installation characteristics, and the actual as-decommissioned facility. - Preparation for the Licence application begins 5 years prior to the end of the Decommissioning phase. - The application takes 3 years to complete and thereafter the hearing process takes 1 year to complete. NWMO staff requirements are 2 NWMO-03 FTE/a for 4 years. Contractor support costs are $400 K/a for 4 years.								
Schedule	Start Year		151	2160		Finish Year	154	2163	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,041,466	$ -	$ 1,600,000	$ 2,641,466	$ 660,366	$ 3,301,832

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	10	10			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	10					
WBS Title	OTHER GOVERNMENT APPROVALS - REQUIREMENTS								
Description	Identify those licenses, permits, approvals, and plans that will be required from federal, provincial and municipal agencies (other than the Canadian Nuclear Safety Commission and approval under CEAA) in order to site, construct or operate the facility. Determine the actions that will be necessary to obtain those licenses, permits and approvals. (Y01 – Y09)								
Deliverable	Listing of the necessary licenses, permits approvals, and plans needed as well as the actions required to obtain them.								
Assumptions	It is assumed that: 1. This will include at a minimum regulatory reviews from such agencies as Transport Canada, Natural Resources Canada, Fisheries and Oceans Canada, and the Canadian Transport Agency; and 2. The costs associated with and the resources needed to manage the liaison with the applicable federal, provincial and municipal agencies have been captured in the efforts assigned to liaison with the CNSC (see WBS 560.20.40.10.10).								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	10	20			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title PREPARATION FOR ENVIRONMENTAL ASSESSMENT

Description Prepare for the Environmental Assessment process by informally sharing the results of the site characterization activities with the CNSC (Y07 – Y09). Site characterization will be carried out as part of the Siting Process. The EA process can be initiated as soon as a site is selected.

Deliverable Informally submit the results of the site characterization activities to the CNSC

Assumptions It is assumed that:

1. As part of the siting process, surface/subsurface investigations will be conducted.
2. The work associated with the investigations is captured as part of the siting process (WBS 560.15.20.10.70, 560.15.20.10.80). The site characterization studies will cover such things as meteorology, flora, fauna, hydrology, geology, hydrogeology, etc.
3. The results will be documented in technical reports that will be shared with the CNSC.
4. This work will support the interactions with the CNSC as technical reports are submitted and reviewed by CNSC staff.
5. The studies are expected to start about 5 years (Y07) prior to the submission of the Environmental Impact Statement. The review of the site information is expected to occur over 3 years but is dependent on the number of candidate sites.
6. The early site characterization activities are expected to expedite the EA process.
7. The costs associated with and the resources needed to support the early environmental assessment interactions with the CNSC on the site characterization activities are as follows:

	Y07	Y08	Y09
CNSC Licensing Fees ($k)	405	405	405
NWMO-1	0.5	0.5	0.5
NWMO-3	0.5	0.5	0.5
Travel ($k)	2	2	2

Schedule Start Year 7 2016 Finish Year 9 2018

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 527,304	$ -	$ 1,221,000	$ 1,748,304	$ 437,076	$ 2,185,380

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	20	10			**Prepared By:**	A. Khan
WBS (Old)	552	30	50						

WBS Title SITE PREP. AND CONSTR. LICENCE (CNSC) APPLICATION

Description

Apply for a Site Preparation & Construction Licence from the Canadian Nuclear Safety Commission (Y10 –Y12) by implementing the licensing plan (see WBS 560.20.40.10.10). This includes:

1. Preparing and submitting a licence application and supporting documents that include all of the information required under Nuclear Safety Control Act and its associated regulations; and
2. Confirming that safety criteria used in design and safety assessments have been met.

Deliverable Class I Nuclear Facility Site Preparation & Construction Licence Application and Supporting Documents

Assumptions

It is assumed that:

1. A Letter of Intent will be submitted as soon as the site is selected. The project description will also be submitted.
2. A separate licence to prepare the site will not be required.
3. The Commission will issue a licence which will require CNSC approvals at identified stages of work.
4. The licence will be valid for the entire construction period; licence renewals will not be required.
5. An Environmental Assessment will be required before the CNSC can issue any licence (see WBS 560.30.40.20.30).
6. A licence application package will contain at a minimum the listing presented in the licensing procedure, NWMO-PROC-RG-0002 which includes such items as:

- A Preliminary Safety Report (PSR) that includes preliminary safety assessments (see WBS 560.30.30.20.10) and relevant preliminary design details (see WBS 560.20.50.20.10);
- Considerations for Radiation Protection and ALARA;
- Considerations for Human Factors;
- Considerations for Fire Protection;
- Considerations for Security and Robustness;
- Considerations for Safeguards;
- Considerations to Operate and Maintain the Facility;
- Description of the Organizational Management Structure;
- Description of the Conventional Safety Program;
- A Compliance Matrix;
- A Quality Assurance Program (see WBS 560.90.70.20.10);
- A Construction Program; and
- A Preliminary Decommissioning Plan and Decommissioning Cost Estimate plan for Financial Guarantee.

7. The licensing process (from filling the project description and notice of intent through to issue of licence) is expected to require 5 years;
8. A Hearing plan will be produced to support the licencing review and Hearing activities (WBS 560.30.40.20.20);
9. The costs associated with and the resources needed to oversee the licensing process and to prepare the application and supporting documents (not including time required by engineering/technical staff for their input into the submissions) are as follows:

	Y10	Y11	Y12
CNSC Licensing Fees ($k)	$ 900	$ 900	$ 900
NWMO-1 (FTE)	0.95	0.95	0.75
NWMO-3 (FTE)	2.95	2.95	2.25
Travel ($k)	$ 10	$ 10	$ 10

Schedule	Start Year	10	2019	Finish Year	12	2021

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;

NWMO-3 values represent the FTE effort required by NWMO technical staff; and

Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,647,577	$ -	$ 2,730,000	$ 4,377,577	$ 1,094,394	$ 5,471,972

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	20	20			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title LICENSING REVIEW INCLUDING PUBLIC HEARING

Description Provide required support during the application review process and attend the Public Hearing that will be held in support of obtaining the licence (Y13 – Y15). This will include:

1. Answering CNSC staff questions (as required);
2. Providing supplementary information as per a schedule and/or as required;
3. Preparing information needed for the Public Hearing; and
4. Attending and participating in the hearing prior to initial licence and possibly prior to any licence modifications or stages identified by the CNSC (e.g.: beginning of commissioning).

Deliverable Class I Nuclear Facility Site Preparation & Construction Licence issued by the CNSC

Assumptions It is assumed that:

1. A separate licence to prepare the site will not be required.
2. The Commission will issue a licence which will require CNSC approvals before identified stages of work.
3. The licence will be valid for the entire construction period; licence renewals will not be required.
4. Environmental Assessment submissions have been made (see WBS 560.30.40.20.30).
5. Submissions in support of the licence application have been made (see WBS 560.30.40.20.10).
6. The consultants used to support the Environmental Assessment will be available to answer CNSC staff questions and to attend the Public Hearing.
7. The costs associated with and the resources needed to support CNSC staff's review of the application (not including time required by engineering/technical staff) as well as to prepare for and attend the Public Hearing are as follows:

	Y13	Y14	Y15
CNSC Licensing Fees ($k)	2025	1980	1980
NWMO-1 (FTE)	0.75	0.85	0.85
NWMO-3 (FTE)	2.25	2.75	2.75
Travel ($k)	5	5	5
Purchased Services ($k)	854	854	854

Schedule Start Year 13 2022 Finish Year 15 2024

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff;
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars; and

Purchased services for the environmental assessment are calculated assuming that 1 FTE equals 1856 hours.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,551,234	$ -	$ 8,562,000	$ 10,113,234	$ 2,528,308	$ 12,641,542

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	20	30			**Prepared By:**	A. Khan
WBS (Old)	552	55	20						

WBS Title ENVIRONMENTAL ASSESSMENT

Description

Prepare and submit the Environmental Impact Statement and Technical Support Documents required to support the Environmental Assessment that will be prepared by the Responsible Authority (Y10 – Y12). This includes:

- Liaising with the Responsible Authorities;
- Conducting a public involvement process;
- Performing any field work that might be required;
- Collecting and analysing the data; and
- Preparing the Environmental Impact Statement and the Technical Support Documents.

Deliverable

Environmental Impact Statement and Technical Support Documents for the Environmental Assessment (the Environmental Assessment itself will be prepared by the Responsible Authority or the Review Panel).

Assumptions

It is assumed that:

1. The Letter of Intent will be submitted as soon as the site is selected. The project description will also be submitted.
2. Provincial authorities will not conduct a separate Environmental & Socio-economic Impact Assessment.
3. The Responsible Authority will likely recommend that the Minister of the Environment refer the Environmental Assessment to a Joint Review Panel early in the EA Process.
4. The Review Panel will conduct the Public Hearing (see WBS 560.30.40.20.20).
5. The Review Panel will likely delegate the responsibility for data collection, field studies and the preparation of the Environmental Impact Statement and the Technical Support Documents to the proponent.
6. Documents will be submitted by Proponent.
7. Other information needed for the environmental assessment will be available, such as:

- The site characterization studies (meteorology, flora, fauna, hydrology, geology, hydrogeology, etc.) performed to evaluate the suitability of the site, all costs associated with performing these studies have been included under Geoscience (WBS 560.15.20.10.70, 560.15.20.10.80);
- The biosphere characterization studies performed to evaluate the suitability of the site, all costs associated with performing these studies have been included under Safety Assessment (WBS 560.30.30.20.30);
- The dose assessments for workers, members of the public and non-human biota prepared for the Preliminary Safety Assessment Report (WBS 560.30.30.20.10); and
- Conceptual design for the facility prepared under Repository System Development (WBS 560.20.50.20.10).

8. Intervener funding will be provided by CEAA from the funds available to that organization (i.e.: there will be no additional intervener funding provided by the Proponent).
9. All costs associated with the public involvement process are included under Public Affairs – Public Review and EA Approval (WBS XXX XX XX).
10. No revision of the Environmental Assessment will be required after completion of the work in the underground characterization facility. However there will be updated reports to the EA which provides new information about site conditions as observed in the UCF.
11. Preparation of technical documents and the Environmental Impact Statement (EIS) will start 2 years prior to the submission of the EIS and will use the relevant information gathered in the EA preparation phase (see WBS 560.30.40.10.20). The review of the EIS and the Public Hearing is expected to take 3 years to complete. The Hearing Plan will start 3 years prior to start of construction (see WBS 560.30.40.20.10). The EA process will include the following:

- Preparation of an EA Scoping Document (EA Guidelines);
- Hearing to make decisions related to the EA Guidelines;
- Preparation of Environmental Impact Statement Guidelines;
- Preparation of the Environmental Impact Statement;
- Submission of Environmental Impact Statement; and
- Review of Environmental Impact Statement which includes public engagement.

12. It is assumed that the EIS and other supporting documents as well as the Panel Public Hearing will likely cover the EA process and the CNSC licensing process (covered by WBS 560.30.40.20.20).
13. The costs associated with and the resources needed to support the environmental assessment are as follows:

	Y10	Y11	Y12
CNSC Licensing Fees ($k)	$ 99	$ 99	$ 99
NWMO-1 (FTE)	1	1	1
NWMO-3 (FTE)	1.5	1.5	1
Travel ($k)	2	2	2
Purchased Services ($k)	$ 4,454	$ 4,454	$ 4,454

Schedule Start Year 10 2019 Finish Year 12 2021

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;
NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff;
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars; and
Purchased services for the environmental assessment are calculated assuming that 1 FTE equals 1856 hours.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,184,791	$ -	$ 13,665,000	$ 14,849,791	$ 3,712,448	$ 18,562,238

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	20	40			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	30					

WBS Title OTHER GOVERMENT APPROVALS - FEDERAL

Description

Obtain the federal permits, certificates or approvals (from agencies other than the Canadian Nuclear Safety Commission and approval under CEAA) that are required in order to construct or operate the facility (Y14 – Y25). Depending on the site selected for the facility, these may include:

1. Permits from Fisheries & Oceans Canada to allow:
   - the discharge of substances deleterious to fish,
   - the removal of fish habitat, or
   - the construction of roadways near water bodies.
2. License from Natural Resources Canada to Store Explosives (during construction); along with any other permits and approvals required for a given site.
3. Approval from Transport Canada following an assessment of impact on navigation, emergency response, etc.
4. Authorization from Canadian Transport Agency.

Deliverable

Permits, Certificates and Approvals required from federal regulatory agencies other than the Canadian Nuclear Safety Commission

Assumptions

The number and nature of the permits that may be required may depend on the location selected.

It is assumed that:

1. Most of the technical information that will be required to obtain federal permits, certificates or approvals (from agencies other than the Canadian Nuclear Safety Commission) will be available from either the environmental assessment or CNSC license applications. It is also assumed that this information will be available around the same time as the application for the Site Preparation and Construction Licence.
2. The environmental assessment must be completed before any federal permits, certificates or approvals can be issued.
3. Any required federal permits, certificates or approvals will be obtained as needed during construction or prior to the beginning of operations.
4. Some permits, certificates or approvals may need to be renewed on a yearly basis.
5. The effort required will be limited to that required to prepare and submit applications and liaise with regulatory agencies.
6. It is expected that other regulatory reviews from other government agencies will be conducted during the last two years in which the EA and licence application's supporting documents are being reviewed (Y14&Y15) (WBS 560.30.40.20.20). It is also expected a larger effort will be needed during the first year of construction licence (Y16). The effort needed in the subsequent years is captured as part of maintaining the Site Preparation and Construction Licence during construction (see WBS 560.30.40.30.10).
7. The costs associated with and the resources needed to manage the liaison with the applicable federal agencies are as follows (note that CNSC staff will also interface with Transport Canada):

	Y14	Y15	Y16
Licensing Fees ($k)	45	45	45
NWMO-1 (FTE)	0.1	0.1	0.1
NWMO-3 (FTE)	0.7	0.7	0.7
Travel ($k)	1	1	1

Schedule	Start Year	14	2023	Finish Year	15	2024

Type Fixed

Calculations and Notes:

Licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 226,527	$ -	$ 92,000	$ 318,527	$ 79,632	$ 398,159

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	20	50			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	40					
WBS Title	OTHER GOVERNMENT APPROVALS - PROVINCIAL								
Description	Obtain the provincial permits, certificates or approvals that are required in order to construct or operate the facility (Y14 – Y25). These is likely to include: 1. Registering the construction project with the Ministry of Labour; 2. Obtaining Certificates of Approval for atmospheric emissions (operational & construction), liquid effluents (sewage, waste water), water works (domestic water, fire water) and waste disposal (domestic waste, construction waste & soil) from the Ministry of the Environment; 3. Complying with the MISA Regulations for liquid wastes; and 4. Registering as a Hazardous Waste Generator with the Ministry of the Environment. Other permits (e.g.: permit to cut timber on crown land, patent for water lots, permission to dump fill within a conservation area, permit to excavate or alter an archaeological or historic site, etc.) may be required on a site specific basis.								
Deliverable	Permits, Certificates and Approvals required from provincial regulatory agencies.								
Assumptions	The number and nature of the permits that may be required may depend on the location selected. It is assumed that there will be no need to conduct a separate environmental assessment under the Environmental Assessment Act (Ontario). Provincial authorities generally accept that nuclear facilities fall under the jurisdiction of the federal process. It is assumed that: 1. Permits, certificates or approvals will be required from provincial agencies for both the construction and operation of the facility; 2. The Technical Support Document for the Environmental Assessment will provide all of the required information on gaseous & liquid effluents and wastes, no additional data collection or modelling will be necessary; 3. The environmental assessment must be completed before provincial regulatory agencies will issue any permits, certificates or approvals for the construction/operation of the facility. 4. The costs associated with and the resources needed to manage the liaison with the applicable provincial agencies have already been captured in the estimates for liaison with the federal agencies (WBS 560.30.40.20.40).								
Schedule	Start Year	14	2023		Finish Year	15	2024		
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	20	60			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	50					
WBS Title	OTHER GOVERNMENT APPROVALS – MUNICIPAL/REGIONAL								
Description	Obtain the municipal permits or approvals required to construct or operate the facility (Y14 – Y25). The permits or approvals that will be required will depend on the location selected but are likely to include: 1. Official Plan/Zoning Variance; 2. Building Permit; along with any other municipal permits, approvals or inspections related to highways, roads, sidewalks, sewers, potable water, electricity, fire safety, fences, waste disposal, public health (e.g.: cafeterias), etc.								
Deliverable	Obtain the permits and approvals required from municipal authorities								
Assumptions	The number and nature of the permits that may be required will vary depending on the municipality in which the facility will be located. It is assumed that: 1. Permits, certificates or approvals will be required from municipality for both the construction and operation of the facility. 2. The Technical Support Document for the Environmental Assessment, the PSAR and the facility design documents will provide all of the information required to support applications for permits from the municipality. 3. The environmental assessment must be completed before provincial regulatory agencies will issue any permits, certificates or approvals for the construction/operation of the facility. 4. Municipal actions will not be challenged before a provincial oversight body (e.g.: the Ontario Municipal Board). 5. The costs associated with and the resources needed to manage the liaison with the applicable provincial agencies have already been captured in the estimates for liaison with the federal agencies (WBS 560.30.40.20.40).								
Schedule	Start Year		14	2023			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	30	10			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	30					

WBS Title OTHER GOVERMENT APPROVALS - FEDERAL

Description

Obtain the federal permits, certificates or approvals (from agencies other than the Canadian Nuclear Safety Commission and approval under CEAA) that are required in order to construct or operate the facility (Y14 – Y25). Depending on the site selected for the facility, these may include:

1. Permits from Fisheries & Oceans Canada to allow:
   - the discharge of substances deleterious to fish,
   - the removal of fish habitat, or
   - the construction of roadways near water bodies.
2. License from Natural Resources Canada to Store Explosives (during construction); along with any other permits and approvals required for a given site.
3. Approval from Transport Canada following an assessment of impact on navigation, emergency response, etc.
4. Authorization from Canadian Transport Agency.

Deliverable

Permits, Certificates and Approvals required from federal regulatory agencies other than the Canadian Nuclear Safety Commission

Assumptions

The number and nature of the permits that may be required may depend on the location selected.

It is assumed that:

1. Most of the technical information that will be required to obtain federal permits, certificates or approvals (from agencies other than the Canadian Nuclear Safety Commission) will be available from either the environmental assessment or CNSC license applications. It is also assumed that this information will be available around the same time as the application for the Site Preparation and Construction Licence.
2. The environmental assessment must be completed before any federal permits, certificates or approvals can be issued.
3. Any required federal permits, certificates or approvals will be obtained as needed during construction or prior to the beginning of operations.
4. Some permits, certificates or approvals may need to be renewed on a yearly basis.
5. The effort required will be limited to that required to prepare and submit applications and liaise with regulatory agencies.
6. It is expected that other regulatory reviews from other government agencies will be conducted during the last two years in which the EA and licence application's supporting documents are being reviewed (Y14&Y15) (WBS 560.30.40.20.40). It is also expected a larger effort will be needed during the first year of construction licence (Y16). The effort needed in the subsequent years is captured as part of maintaining the Site Preparation and Construction Licence during construction (WBS 560.30.40.30.40 and 560.30.40.30.50).
7. The costs associated with and the resources needed to manage the liaison with the applicable federal agencies are as follows (note that CNSC staff will also interface with Transport Canada):

	Y14	Y15	Y16
Licensing Fees ($k)	45	45	45
NWMO-1 (FTE)	0.1	0.1	0.1
NWMO-3 (FTE)	0.7	0.7	0.7
Travel ($k)	1	1	1

Schedule	Start Year	16	2025	Finish Year	25	2034

Type Fixed

Calculations and Notes:

Licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ 113,264	$ -	$ 46,000	$ 159,264	$	39,816	$ 199,079

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	30	20			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	40					
WBS Title	OTHER GOVERNMENT APPROVALS - PROVINCIAL								
Description	Obtain the provincial permits, certificates or approvals that are required in order to construct or operate the facility (Y14 – Y25). These is likely to include: 1. Registering the construction project with the Ministry of Labour; 2. Obtaining Certificates of Approval for atmospheric emissions (operational & construction), liquid effluents (sewage, waste water), water works (domestic water, fire water) and waste disposal (domestic waste, construction waste & soil) from the Ministry of the Environment; 3. Complying with the MISA Regulations for liquid wastes; and 4. Registering as a Hazardous Waste Generator with the Ministry of the Environment. Other permits (e.g.: permit to cut timber on crown land, patent for water lots, permission to dump fill within a conservation area, permit to excavate or alter an archaeological or historic site, etc.) may be required on a site specific basis.								
Deliverable	Permits, Certificates and Approvals required from provincial regulatory agencies.								
Assumptions	The number and nature of the permits that may be required may depend on the location selected. It is assumed that there will be no need to conduct a separate environmental assessment under the Environmental Assessment Act (Ontario). Provincial authorities generally accept that nuclear facilities fall under the jurisdiction of the federal process. It is assumed that: 1. Permits, certificates or approvals will be required from provincial agencies for both the construction and operation of the facility; 2. The Technical Support Document for the Environmental Assessment will provide all of the required information on gaseous & liquid effluents and wastes, no additional data collection or modelling will be necessary; 3. The environmental assessment must be completed before provincial regulatory agencies will issue any permits, certificates or approvals for the construction/operation of the facility. 4. The costs associated with and the resources needed to manage the liaison with the applicable provincial agencies have already been captured in the estimates for liaison with the federal agencies (WBS 560.30.40.30.10).								
Schedule	Start Year	16	2025		Finish Year	25	2034		
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	30	30			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	50					
WBS Title	OTHER GOVERNMENT APPROVALS – MUNICIPAL/REGIONAL								
Description	Obtain the municipal permits or approvals required to construct or operate the facility (Y14 – Y25). The permits or approvals that will be required will depend on the location selected but are likely to include: 1. Official Plan/Zoning Variance; 2. Building Permit; along with any other municipal permits, approvals or inspections related to highways, roads, sidewalks, sewers, potable water, electricity, fire safety, fences, waste disposal, public health (e.g.: cafeterias), etc.								
Deliverable	Obtain the permits and approvals required from municipal authorities								
Assumptions	The number and nature of the permits that may be required will vary depending on the municipality in which the facility will be located. It is assumed that: 1. Permits, certificates or approvals will be required from municipality for both the construction and operation of the facility. 2. The Technical Support Document for the Environmental Assessment, the PSAR and the facility design documents will provide all of the information required to support applications for permits from the municipality. 3. The environmental assessment must be completed before provincial regulatory agencies will issue any permits, certificates or approvals for the construction/operation of the facility. 4. Municipal actions will not be challenged before a provincial oversight body (e.g.: the Ontario Municipal Board). 5. The costs associated with and the resources needed to manage the liaison with the applicable provincial agencies have already been captured in the estimates for liaison with the federal agencies (WBS 560.30.40.30.10).								
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	30	40			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title

MAINTAIN CONSTRUCTION LICENCE DURING THE SITE PREPARATION AND CONSTRUCTION OF THE UNDERGROUND DEMONSTRATION FACILITY (UDF)

Description

Maintain the Site Preparation & Construction Licence from the Canadian Nuclear Safety Commission (Y16 – Y20) during the construction of the Underground Demonstration Facility (UDF). This includes:

1. Preparing and submitting reports to the CNSC according to the schedule specified in the licence;
2. Preparing and submitting unscheduled reports, if required, in accordance with the licence;
3. Seeking approvals as required by the Licence; and
4. Supporting CNSC staff activities during the course of the licence (also includes supporting CNSC compliance inspections).

Deliverable

Maintain the Class I Nuclear Facility Site Preparation & Construction Licence issued by the CNSC by submitting reports and seeking approvals as required. Also, prepare the licensing plan (for the operating licence) during this stage of the project.

Assumptions

It is assumed that:

1. The Commission will issue licence which will require CNSC approvals before identified stages of work (such as hold points identified in the licence).
2. The licence will be valid for the entire construction period; licence renewals will not be required.
3. Finalizing the site specific design and construction (i.e., the work performed under the licence) of the UDF will require 5 years.
4. Seeking CNSC approval to construct the initial components of the DGR will likely be required.
5. The licensing plan that will be executed for the operating licence application will be also prepared during this time.
6. The costs associated with and the resources needed to support compliance with the licence (not including technical support to address issues related to designs, plans and procedures), seeking CNSC approvals, and preparing the operating licensing plan are as follows:

	Y16	Y17	Y18	Y19	Y20
CNSC Licensing Fees ($k)	990	405	405	405	990
NWMO-1 (FTE)	0.85	0.75	0.75	0.95	0.95
NWMO-3 (FTE)	2.75	2.25	2.25	3.45	3.45
Travel ($k)	2	2	2	2	2

Schedule	Start Year	16	2025	Finish Year	20 2029

Type

Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,782,841	$ -	$ 3,205,000	$ 5,987,841	$ 1,496,960	$ 7,484,801

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	30	50			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title MAINTAIN THE CONSTRUCTION LICENCE DURING THE CONSTRUCTION OF THE DEEP GEOLOGICAL REPOSITORY (DGR) COMPONENTS

Description

Maintain the Site Preparation & Construction Licence from the Canadian Nuclear Safety Commission (Y21 – Y25) during the construction of the Deep Geological Repository (DGR) components. This includes:

1. Preparing and submitting reports to the CNSC according to the schedule specified in the licence;
2. Preparing and submitting unscheduled reports, if required, in accordance with the licence;
3. Seeking approvals as required by the licence; and
4. Supporting CNSC staff activities during the course of the licence (also includes supporting CNSC compliance inspections).

Deliverable

Maintain the Class I Nuclear Facility Site Preparation & Construction Licence issued by the CNSC by submitting reports and seeking approvals as required. Preparation of the Final Safety Analysis Report will also occur during this stage.

Assumptions

It is assumed that:

1. The Commission will issue licence which will require CNSC approvals before identified stages of work (such as hold points identified in the licence).
2. The licence will be valid for the entire construction period; licence renewals will not be required.
3. CNSC approvals, if required, will have been sought but some effort is expected during Y21 to ensure that all the required information has been provided to the CNSC. It is also likely that a round of CNSC comments will have to be addressed related to the results obtained from the UDF activities.
4. The assessments needed for the FSAR and to support the operating licence application will also be completed during this time (see WBS 560.30.30.30.10).
5. The costs associated with and the resources needed to support compliance with the licence (not including technical support to address issues related to designs, plans and procedures), seeking CNSC approvals, responding to comments, and obtaining assessments for the FSAR are as follows:

	Y21	Y22	Y23	Y24	Y25
CNSC Licensing Fees ($k)	990	405	405	405	990
NWMO-1 (FTE)	0.85	0.75	0.75	0.95	0.95
NWMO-3 (FTE)	2.75	2.25	2.25	3.45	3.45
Travel ($k)	2	2	2	2	2

Schedule	Start Year	21	2030	Finish Year	25	2034

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;
NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,782,841	$ -	$ 3,205,000	$ 5,987,841	$ 1,496,960	$ 7,484,801

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	30	60			**Prepared By:**	A. Khan
WBS (Old)	552	30	65						

WBS Title OPERATING LICENCE (CNSC) APPLICATION

Description

Apply for an Operating Licence from the Canadian Nuclear Safety Commission (Y21 – Y23) by implementing the licensing plan (see WBS 560.30.40.30.40). This includes:

1. Preparing and submitting a licence application that includes all of the information required under the Nuclear Safety and Control Act and its associated regulations; and
2. Confirming that safety criteria used in the design and safety assessments have been met.

Deliverable Class I Nuclear Facility Operating Licence Application Package and Supporting Documents

Assumptions

It is assumed that:

1. No amendments or additions to the Environmental Assessment submitted in conjunction with the application for a Site Preparation/Construction Licence will be required.
2. The Commission will issue a licence which will require CNSC approvals before identified stages of work.
3. A licence application package will contain at a minimum the listing presented in the licensing procedure, NWMO-PROC-RG-0002 which includes such items as follows:
   - A Final Safety Analysis Report (FSAR) that includes final safety assessments (see WBS 560.30.30.30.10) and represents the detailed design (see WBS 560.20.50.30.10);
   - Operating Policies and Principles;
   - Considerations for Radiation Protection and ALARA;
   - Considerations for Human Factors;
   - Third Party Review of Fire Protection Design and Installation;
   - Considerations for Security and Robustness;
   - Considerations for Safeguards;
   - Considerations to Operate and Maintain the Facility;
   - Description of the Organizational Management Structure;
   - Description of the Conventional Safety Program;
   - Compliance Matrix, confirming completion of all pre-requisites;
   - A Quality Assurance Program (see WBS 560.90.70.30.10);
   - A Commissioning Program; and
   - An Updated Decommissioning Plan and Decommissioning Cost Estimate plan for Financial Guarantee.
4. The costs associated with and the resources needed to oversee the licensing process and to prepare the application and supporting documents (not including time required by engineering/technical staff for their input into the submissions) are as follows:

	Y21	Y22	Y23
CNSC Licensing Fees ($k)	405	405	405
NWMO-1 (FTE)	0.7	0.5	0.5
NWMO-3 (FTE)	2	1.75	1.75
Travel ($k)	5	5	5

Schedule	Start Year	21 2030	Finish Year	23 2032	

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;

NWMO-3 values represent the FTE effort required by NWMO technical staff; and

Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,092,307	$ -	$ 1,230,000	$ 2,322,307	$ 580,577	$ 2,902,884

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	30	70			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title LICENSING REVIEW INCLUDING PUBLIC HEARING

Description Provide required support during the application review process and attend Hearings needed to obtain the licence (Y24 – Y25). This includes:

1. Answering CNSC questions (as required);
2. Providing supplementary information as per a schedule and/or as required;
3. Preparing information needed for the Public Hearing; and
4. Attending and participating in Public Hearings before the CNSC prior to initial licence and possibly prior to any licence modifications or stages identified by the CNSC (e.g.: beginning of active commissioning).

Deliverable Class I Nuclear Facility Operating Licence issued by the CNSC

Assumptions It is assumed that:

1. The Commission will issue a licence which may require CNSC approvals before identified stages of work (e.g., active commissioning).
2. Submissions in support of the licence application have been made (see WBS 560.30.40.30.60).
3. The Environmental Assessment completed for the Site Preparation and Construction Licence also covers the operation of the facility.
4. The costs associated with and the resources needed to support CNSC staff's review of the application (not including time required by engineering/technical staff) as well as to prepare for and attend the Public Hearing are as follows:

	Y24	Y25
CNSC	990	990
NWMO-1	0.7	0.7
NWMO-3	2	2
Travel	5	5

Schedule	Start Year	24	2033	Finish Year	25	2034

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 830,626	$ -	$ 1,990,000	$ 2,820,626	$ 705,157	$ 3,525,783

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	40	10			**Prepared By:**	A. Khan
WBS (Old)	552	30	70	10					

WBS Title MAINTAIN OPS LICENCE DURING OPERATIONS/APPLY TO RENEW LICENCE

Description Renew and maintain the Class I Facility Operating License issued by the Canadian Nuclear Safety Commission (Y26 – Y55). This includes:

1. Preparing and submitting reports according to the schedule prescribed by the Operating Licence;
2. Preparing and submitting unscheduled reports, if required, in accordance with the licence;
3. Preparing and submitting an application for renewal of the Operating Licence that includes all of the information required under the Nuclear Safety and Control Act and its associated regulations; and
4. Supporting CNCS staff compliance activities as well as IAEA inspections during the course of the licence.

Deliverable Maintain Class I Facility Operating Licence issued by the CNSC during operation and submit licence renewal applications

Assumptions It is assumed that:

1. The Operating Licence will be issued for 5-year terms continuing until the end of the Operations phase (30 years of operation beginning in year 26 (Y26 – Y55)).
2. The first year of the operating stage (Y26) will require additional resources and effort to complete active commissioning of the facility.
3. The terms of the licence are expected to require the submission of Reports to the CNSC.
4. No amendments or additions to the Environmental Assessment submitted in conjunction with the initial application for the Operating Licence will be required to support the application for renewal of the Operating Licence.
5. No significant amendments or additions to the FSAR submitted in conjunction with the initial application for the Operating License will be required to support the application for renewal of the Operating Licence, although periodic updates (prepared under WBS 560.30.30.40.10) in support of the renewal application will be submitted to the CNSC.
6. A midterm report will be made to the Commission at about the mid-point to every licence term starting with Y28 and then Y33, Y38, Y43, Y48, and Y53.
7. A licence renewal application will be compiled at 5-year intervals starting with Y29 and then Y34, Y39, Y44, and Y49. The application that will be compiled in Y54 is to support the application for an operating licence for the extended monitoring stage.
8. Licence renewal applications will contain at a minimum the information identified in the NWMO licensing procedure, NWMO-PROC-RG-0002. The main substance of which includes:

- Updated project requirements;
- Final Safety Report; and
- Operating Policies and Principles.

9. Regulatory Affairs will support the Transportation Group in interfacing with the CNSC for package and user certificate renewals as well as security requirements for transportation purposes. The effort and resources needed to prepare for renewals are captured in the transportation costs (see WBS 660.20.50.40.10).
10. The costs associated with and the resources needed to manage the licensing and to prepare applications for licence renewals with supporting documents (not including time required by engineering/technical staff for their input into the submissions and/or for resolving any issues that may arise during operations) are as follows for Y26 to Y51:

	Y26		Repeat every 5 years starting with Y27 and ending with Y51				
CNSC Licensing Fees ($k)	900		450	450	900	450	450
NWMO-1 (FTE)	0.95		0.75	0.75	0.75	0.25	0.75
NWMO-3 (FTE)	3.5		2.5	2.5	2.5	2.5	2.5
Travel ($k)	2		2	2	2	2	2

11. The costs associated with and the resources needed to manage the licensing and to prepare applications for licence renewals with supporting documents (not including time required by engineering/technical staff for their input into the submissions and/or for resolving any issues that may arise during operations) are as follows for Y52 to Y55:

	Y52	Y53	Y54	Y55
CNSC Licensing Fees ($k)	450	450	900	450
NWMO-1 (FTE)	0.75	0.75	0.75	0.25
NWMO-3 (FTE)	2.5	2.5	2.5	2.5
Travel ($k)	2	2	2	2

Schedule	Start Year	26	2035	Finish Year	55	2064

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 14,254,569	$ -	$ 16,710,000	$ 30,964,569	$ 7,741,142	$ 38,705,712

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	40	20			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title LICENSING REVIEW INCLUDING PUBLIC HEARING

Description Provide required support during the application review process and attend Hearings needed to obtain the licence (Y30 – Y55). This includes:

1. Answering CNSC questions (as required);
2. Providing supplementary information as per a schedule and/or as required;
3. Preparing information needed for Public Hearing; and
4. Attending and participating in Public Hearings before the CNSC prior to initial licence and possibly prior to any licence modifications or stages identified by the CNSC (e.g.: beginning of commissioning).

Deliverable Class I Nuclear Facility Operating Licence issued by the CNSC.

Assumptions It is assumed that:

1. The licence term will be 5 years and that the licence will need to be renewed in 5-year intervals, beginning on Y30 and then Y35, Y40, Y45, and Y50. The licence renewal in Y55 is expected to be in support of the licence application for the extended monitoring stage.
2. Submissions in support of the licence applications will have been made (see WBS 560.30.40.40.10).
3. All activities will be identified and executed as described in a supporting hearing plan that is prepared by the Regulatory Affairs group.
4. The costs associated with and the resources needed to support CNSC staff's review of the application (not including time required by engineering/technical staff) as well as to prepare for and attend the Public Hearing will occur over three years on a five-year cycle as follows:

	Y29 Y34 Y39 Y44 Y49 Y54	**Y30 Y35 Y40 Y45 Y50 Y55**	**Y31 Y36 Y41 Y46 Y51**
CNSC Licensing Fees ($k)	900	900	450
NWMO-1 (FTE)	0.2	0.7	0.2
NWMO-3 (FTE)	1	1	1
Travel ($k)	4	4	2

Schedule	Start Year	29	2038	Finish Year	55	2064

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	**Material Costs**	**Other Costs**	**Subtotal**	**Allowance 25%**	**Total Cost**
$ 3,629,771	$ -	$ 13,108,000	$ 16,737,771	$ 4,184,443	$ 20,922,214

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	50	10			**Prepared By:**	A. Khan
WBS (Old)	552	30	70	20					

WBS Title MAINTAIN/RENEW OPS LICENCE DURING EXTENDED MONITORING

Description Renew and maintain the Class I Facility Operating License issued by the Canadian Nuclear Safety Commission (Y56 – Y125). This includes:

1. Preparing and submitting reports according to the schedule prescribed by the Operating Licence;
2. Preparing and submitting unscheduled reports, if required, in accordance with the licence;
3. Preparing and submitting an application for renewal of the Operating Licence that includes all of the information required under the Nuclear Safety and Control Act and its associated regulations; and
4. Supporting CNSC staff compliance activities (as well as IAEA inspections) during the course of the licence.

Deliverable Maintain Class I Facility Operating Licence issued by the CNSC during extended monitoring and submit licence renewal applications

Assumptions It is assumed that:

1. During the extended monitoring phase (70 years of monitoring beginning in year 56 (Y56 – Y125), renewals may be required or an extended licence may be issued. Regulatory Affairs activities are assumed to be similar in either case since documents that form the licensing basis will have to be kept up-to-date and submitted to the CNSC for either situation.
2. The application for the first licence renewal to operate during the extended monitoring stage is expected to be submitted around the Y54 timeframe (see WBS 560.30.40.40.10).
3. It is assumed that appearances before the Commission will be required at five-year intervals, either to report to the Commission or to renew the licence. The first appearance to support the extended monitoring phase is expected to be in Y55 (see WBS 560.30.40.40.20).
4. The terms of the licence are expected to require the submission of routine Reports, as required by the CNSC.
5. No amendments or additions to the Environmental Assessment submitted in conjunction with the initial application for the Operating Licence will be required.
6. No amendments or additions to the FSAR submitted in conjunction with the initial application for the Operating Licence will be required, although periodic updates (covered under WBS 560.30.50.50.10) will be submitted to the CNSC.
7. The licence application will contain, at a minimum, the information identified in the NWMO licensing procedure, NWMO-PROC-RG-0002. Regular updates to these documents are expected to be submitted to the CNSC even if the licence does not need to be renewed. The main substance of which includes:
   - Updated project requirements;
   - Final Safety Report; and
   - Operating Policies and Principles.
8. The costs associated with and the resources needed to manage the licensing and to prepare supporting documents throughout the course of the monitoring phase (not including time required by engineering/technical staff for their input into the submissions and/or for resolving any issues that may arise during the monitoring phase) are expected to be covered by a staffing plan of:

	Repeat every 5 years starting with Y56 and ending with Y124				
CNSC Licensing Fees ($k)	250	250	250	250	450
NWMO-1 (FTE)	1	1	1	1	1
NWMO-3 (FTE)	1	1	1	1	1
Travel ($k)					2

Schedule Start Year 56 2065 Finish Year 125 2134

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	**Material Costs**	**Other Costs**	**Subtotal**	**Allowance 25%**	**Total Cost**
$ 24,607,506	$ -	$ 20,328,000	$ 44,935,506	$ 11,233,877	$ 56,169,383

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	50	20			**Prepared By:**	A. Khan
WBS (Old)	552	30	75						

WBS Title DECOMMISSIONING LICENCE (CNSC) APPLICATION

Description Apply for a Decommissioning Licence from the Canadian Nuclear Safety Commission (Y122 –Y123) by preparing and implementing the licensing plan. This includes preparing and submitting a licence application and supporting documents that include all of the information required under Nuclear Safety Control Act and its associated regulations.

Deliverable Class I Nuclear Facility Decommissioning Licence Application and Supporting Documents

Assumptions It is assumed that:

1. The Commission will issue a licence which will be valid for 5 years.
1. An Environmental Assessment will be required before the CNSC can issue any licence (see WBS 560.30.40.50.40). It is expected that this process, from notice of intent to issue of licence, will require 5 years and the work will begin 5 years prior to the end of the Extended Monitoring period. It is also expected that the bulk of the licence application activities will occur during the years of Y122-Y123 followed by the licensing review and the hearing in Y124-Y125 (see WBS 560.30.40.50.30).
2. A licence plan will be prepared to capture the intent of the licensing procedure, NWMO-PROC-RG-0002 as it applies to decommissioning.
3. The topics expected to be covered as part of the licence application, many of which will be captured in detailed decommissioning planning, will include such items as:

- Considerations for Radiation Protection and ALARA;
- Considerations for Human Factors;
- Considerations for Fire Protection;
- Considerations for Security and Safeguards;
- Description of the Organizational Management Structure;
- Description of the Conventional Safety Program;
- A Compliance Matrix; and
- A Quality Assurance Program (see WBS 560.90.70.50.10).

4. The licensing process (from filling the project description and notice of intent through to issue of licence) is expected to require 5 years;
5. The costs associated with and the resources needed to oversee the licensing process and to prepare the application and supporting documents (not including time required by engineering/technical staff for their input into the submissions) are as follows:

	122	123
CNSC Licensing Fees ($k)	450	450
NWMO-1 (FTE)	0.5	0.5
NWMO-3 (FTE)	1	1
Travel ($k)	5	5

Schedule Start Year 122 2131 Finish Year 123 2132

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 481,719	$ -	$ 910,000	$ 1,391,719	$ 347,930	$ 1,739,649

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	50	30			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title LICENSING REVIEW INCLUDING PUBLIC HEARING

Description Provide required support during the application review process and attend Hearings needed to obtain the licence (Y124 – Y125). This includes:

1. Answering CNSC questions (as required);
2. Providing supplementary information as per a schedule and/or as required;
3. Preparing information needed for the Public Hearing; and
4. Attending and participating in Public Hearings before the CNSC prior to initial licence.

Deliverable Class I Nuclear Facility Decommissioning Licence issued by the CNSC

Assumptions It is assumed that:

1. Submissions in support of the licence application have been made (see WBS 560.30.40.50.20).
2. The Environmental Assessment for the Decommissioning of the facility has been completed (see WBS 560.30.40.50.40).
3. All activities will be identified and executed as described in a supporting hearing plan that is prepared by the Regulatory Affairs group.
4. The costs associated with and the resources needed to support CNSC staff's review of the application (not including time required by engineering/technical staff) as well as to prepare for and attend the Public Hearing are as follows:

	Y124	Y125
CNSC Licensing Fees ($k)	900	900
NWMO-1 (FTE)	0.5	0.5
NWMO-3 (FTE)	1	1
Travel ($k)	10	2

Schedule	Start Year	124 2133	Finish Year	125 2134	

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 481,719	$ -	$ 1,812,000	$ 2,293,719	$ 573,430	$ 2,867,149

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	50	40			**Prepared By:**	A. Khan
WBS (Old)	552	55	30						

WBS Title EA FOR CNSC DECOMMISSIONING LICENCE

Description

Prepare and submit the Environmental Impact Statement and Technical Support Documents required to support the Environmental Assessment prepared by the Responsible Authority. This includes:

- Liaising with the Responsible Authorities;
- Conducting a public involvement process;
- Performing any field work that might be required;
- Collecting and analyzing the data; and
- Preparing the Environmental Impact Statement and the Technical Support Documents.

Deliverable

Environmental Impact Statement and the Technical Support Documents for the Environmental Assessment (the Environmental Assessment itself will be prepared by the Responsible Authority).

Assumptions

It is assumed that:

1. Provincial authorities will not conduct a separate Environmental & Socio-economic Impact Assessment.
2. The Responsible Authority will not recommend that Minister of the Environment refer the Environmental Assessment to a Review Panel.
3. The scope of the EA will include an evaluation of different decommissioning technologies.
4. The Regulatory Authority will likely delegate the responsibility for data collection, field studies and the preparation of the Technical Support Documents to the proponent.
5. Preparations will begin 5 years prior to the end of operations-extended monitoring and the environmental assessment hearing process will require 2 years to complete with the hearing starting 1 year prior to start of decommissioning (see WBS 561.30.40.50.30).
6. The site characterization data (meteorology, flora, fauna, hydrology, geology, hydrogeology, etc.) and technical data collected over the lifetime of the project will be available, suitable and sufficient for the Environmental Assessment; all costs associated with collecting this data have been included under other work elements (WBS 560.30.20 series of WEDs).
7. The dose assessments for workers, members of the public and non-human biota prepared for the Final Safety Assessment Report will be available for inclusion in the Environmental Assessment.
8. The Environmental Assessment will address all issues related to the eventual 'abandonment' of the site and no revision of the Environmental Assessment will be required to support an Application for a Licence to Abandon. However there would be updated reports to EA that would provide new information on site conditions as observed throughout decommissioning and closure activities.
9. The EA process will include the following:
   - Preparation of an EA Scoping Document (EA Guidelines);
   - Hearing to make decisions related to the EA Guidelines;
   - Preparation of Environmental Impact Statement Guidelines;
   - Preparation of the Environmental Impact Statement;
   - Submission of Environmental Impact Statement; and
   - Review of Environmental Impact Statement which includes public engagement.
10. The Environmental Assessment process will require a support Manager and full-time Technical Specialist.
11. The Proponent will contract consultants to perform the technical studies and prepare the Technical Support Documents.
12. Collecting & analyzing the data, and preparing the Technical Support Documents will be contracted out and will be performed by a team of a Project Manager & 4 Senior Consultants with administrative support.

1. The review of the EIS and other supporting documents as well as the Panel Public Hearing will likely cover the EA process and the CNSC licensing process (covered by WBS 560.30.40.50.30).
2. The costs associated with and the resources needed to support the environmental assessment are as follows:

	Y121	Y122	Y123	Y124	Y125
CNSC Licensing Fees ($k)	450	450	450	900	900
NWMO-1 (FTE)	0.5	0.5	0.5	0.5	0.5
NWMO-3 (FTE)	1	1	1	1	1
Travel ($k)	2	2	2	2	2
Purchased Services ($k)	1782	1782	1782	1782	1782

Schedule Start Year 121 2130 Finish Year 125 2134

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,204,298	$ -	$ 12,070,000	$ 13,274,298	$ 3,318,574	$ 16,592,872

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	60	10			**Prepared By:**	A. Khan
WBS (Old)	552	30	80						

WBS Title LICENCE TO ABANDON (CNSC) APPLICATION

Description Apply for a Decommissioning Licence from the Canadian Nuclear Safety Commission (Y148 –Y149) by preparing and implementing the licensing plan. This includes preparing and submitting a licence application and supporting documents that include all of the information required under Nuclear Safety Control Act and its associated regulations.

Deliverable Class I Facility Licence to Abandon Application and Supporting Documents

Assumptions 'Abandonment' refers to the cessation of all licensed activities on the site rather than the termination of ownership or control of the site.

It is assumed that:

1. The Environmental Assessment prepared prior to decommissioning will satisfactorily address all issues related to abandonment.

2. The Regulatory Affairs group will prepare a licensing plan that covers the topics that need to be addressed in the licence application, many of which will be captured in a final decommissioning report, such as:

- The results of the decommissioning; and
- The results of the environmental monitoring programs.

3. Preparation of the licence application will be completed by the Regulatory Affairs group as outlined in the licensing plan during Y149.

4. The licensee (or its successors) will continue to own/control the site following abandonment.

5. The Licence to Abandon may impose ongoing requirements on the licensee (likely related to control, safeguards, and transfer of information/records) but it will not involve active regulatory oversight or continuing liaison with regulators.

1. The costs associated with and the resources needed to oversee the licensing process and to prepare the application and supporting documents (not including time required by engineering/technical staff for their input into the submissions) are as follows:

	Y148	Y149
CNSC Licensing Fees ($k)	450	450
NWMO-1 (FTE)	1	1
NWMO-3 (FTE)	1	1
Travel ($k)	4	4

Schedule	Start Year	148	2157	Finish Year	149	2158	

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 703,072	$ -	$ 908,000	$ 1,611,072	$ 402,768	$ 2,013,840

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	60	20			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title LICENSING REVIEW INCLUDING PUBLIC HEARING

Description Provide required support during the application review process and attend Hearings needed to obtain the licence (Y180). This includes:

1. Answering CNSC questions (as required);
2. Providing supplementary information as per a schedule and/or as required;
3. Preparing information needed for the Public Hearing; and
4. Attending and participating in Public Hearings before the CNSC prior to initial licence.

Deliverable Class I Nuclear Facility Licence to Abandon issued by the CNSC

Assumptions It is assumed that:

1. Submissions in support of the licence application have been made (see WBS 560.30.40.60.10).
2. The Environmental Assessment for the Decommissioning of the facility has been completed (see WBS 560.30.40.50.50).
3. All activities will be identified and executed as described in a supporting hearing plan that is prepared by the Regulatory Affairs group.
4. The costs associated with and the resources needed to support CNSC staff's review of the application (not including time required by engineering/technical staff) as well as to prepare for and attend the Public Hearing are as follows:

	150
CNSC Licensing Fees ($k)	450
NWMO-1 (FTE)	1
NWMO-3 (FTE)	1
Travel ($k)	4

Schedule	Start Year	150	2159	Finish Year	150	2159

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 351,536	$ -	$ 454,000	$ 805,536	$ 201,384	$ 1,006,920

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	60	30			**Prepared By:**	A. Khan
WBS (Old)	552	30	75						

WBS Title MAINTAIN DECOMMISSIONING LICENCE (CNSC)

Description Maintain a Class I Facility Decommissioning Licence from the Canadian Nuclear Safety Commission (Y126 - Y150). This includes:

1. Preparing and submitting reports according to the schedule prescribed by the Decommissioning Licence;
2. Preparing and submitting unscheduled reports, if required, in accordance with the licence;
3. Preparing and submitting an application for renewal of the Decommissioning Licence that includes all of the information required under the Nuclear Safety and Control Act and its associated regulations; and
4. Supporting CNSC staff compliance activities (as well as IAEA inspections) during the course of the licence.

Deliverable Class I Facility Decommissioning Licence issued by CNSC

Assumptions It is assumed that:

1. During the decommissioning phase (Y126 – Y150), renewals will be required at 5-year intervals. It is also expected that mid-term reports will be presented to the Commission. Therefore, the effort required to maintain the decommissioning licence is expected to cycle on 5-year intervals.
2. The application for the first licence renewal during this stage is expected to be submitted around the Y134 timeframe followed by Y144.
3. It is assumed that appearances before the Commission will be required at five-year intervals, either to report to the Commission or to renew the licence. The first appearance to support the extended decommissioning phase is expected to be in Y130.
4. A Detailed Decommissioning Plan, together with all of the necessary supporting plans and procedures, will continue to be available to support the licence application. All other information as specified in the licensing plan will also be available to continue to support the licence.
5. The terms of the licence are expected to require the submission of scheduled reports to the CNSC.
6. No amendments or additions to the Environmental Assessment submitted in conjunction with the initial application for the Decommissioning License will be required.
7. The costs associated with and the resources needed to oversee the licensing process and to prepare the application and supporting documents (not including time required by engineering/technical staff for their input into the submissions) are as follows:

	Repeat every 5 years starting with Y126 and ending with Y150				
CNSC Licensing Fees ($k)	250	250	250	250	450
NWMO-1 (FTE)	1	1	1	1	1
NWMO-3 (FTE)	1	1	1	1	1
Travel ($k)	1	1	1	1	2

Schedule	Start Year	126	2135	Finish Year	150	2159

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	**Material Costs**	**Other Costs**	**Subtotal**	**Allowance 25%**	**Total Cost**
$ 8,788,395	$ -	$ 7,280,000	$ 16,068,395	$ 4,017,099	$ 20,085,494

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	40	70	30			**Prepared By:**	A. Khan
WBS (Old)	552	30	75						

WBS Title LICENCE TO ABANDON (CNSC)

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Description

Maintain a Class I Facility Decommissioning Licence from the Canadian Nuclear Safety Commission (Y151 - Y155). This includes:

1. Preparing and submitting reports according to the schedule prescribed by the Licence to Abandon;
2. Maintaining records during the term of the licence;
3. Preparing to transfer records to national archives at the end of the licence term; and
4. Supporting CNSC staff activities (as well as IAEA inspections) during the course of the licence.

Deliverable Class I Facility Licence to Abandon issued by CNSC

Assumptions

It is assumed that:

1. A licence to abandon will be issued with a licence term of 5 years.
2. During the course of the licence term, the licensee will submit scheduled reports to the CNSC.
3. Records needed to meet Canadian regulations and/or agreements will be maintained.
4. Plans to transfer these records to the appropriate Canadian authority will be made.
5. No amendments or additions to the Environmental Assessment submitted in conjunction with the initial application for the Decommissioning License will be required.
6. The costs associated with and the resources needed to support the licence are as follows:

	Y151	Y152	Y153	Y154	Y155
CNSC Licensing Fees ($k)	100	100	100	100	100
NWMO-1 (FTE)	1	1	1	1	1
Travel ($k)					2

Schedule	Start Year	151	2160	Finish Year	155 2164

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;
NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,106,763	$ -	$ 502,000	$ 1,608,763	$ 402,191	$ 2,010,954

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	50	20	10			**Prepared By:**	J. Villagran
WBS (Old)	552	20	15	60	50				
WBS Title	PROVIDE ENGINEERING INPUT TO **P**SAR								
Description	Tasks include: Prepare system descriptions and specifications to support the PSAR and the Environmental Assessment report for the repository facility construction licence application.								
Deliverable	Site-specific system design descriptions and system specifications Documentation of prototype tests and results where applicable.								
Assumptions	Duration of work three years: Y10 to Y12 NWMO staff requirements are 1fte/a for 3a (Senior Technical Specialist) to manage/direct the tasks specified below plus consultant services as described below: 4fte/a for 3a of specialist consultant to prepare site-specific preliminary designs, conduct the required data analysis and prepare technical documents in support of the PSAR and EA report. These preliminary design documents, system technical specifications and prototype test results will be inputs to the PSAR and EA reports. Purchased services: 500k$/a for 3a.								
Schedule	Start Year		10	2019		Finish Year	12	2021	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,500,000	$ 1,500,000	$ 375,000	$ 1,875,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	50	20	20			**Prepared By:**	J. Villagran
WBS (Old)	552	20	15	60	60				
WBS Title	ENGINEERING SUPPORT DURING LICENSING REVIEW AND EA HEARINGS								
Description	Tasks include: - Prepare technical documents and descriptive material on repository technology and the preferred site-specific repository design for the EA process and the CNSC licensing process. - Prepare "less technical" documents on repository technology and the preferred site-specific repository design for the EA process and the CNSC licensing process. - Deliver presentations and respond to review questions on repository technology and the preferred site-specific repository design for the EA process and the CNSC licensing process.								
Deliverables	- Technical documents describing the repository technology and the preferred site-specific repository design. - Less-technical documents describing the repository technology and the preferred site-specific repository design.								
Assumptions	Duration of work: Y13 to Y15. NWMO staff requirements are 1 fte/a for 3a (Manager/Senior Technical Specialist) plus the following: - Senior Consultant writing, staff training: Purchased services: $200k/a for 3a(Y13 to Y15), - travel & expenses of $70k/a for 3a (Y13 to Y15), and - document production & distribution $100k/a for 3a (Y13 to Y15).								
Schedule	Start Year		13	2022		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	Making presentations and defending the DGR system design and safety in front of regulatory bodies will remain the role of senior NWMO staff. Consultants or external staff will be required to prepare supporting technical documents.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 810,000	$ 810,000	$ 202,500	$ 1,012,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	50	30	10			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	PROVIDE ENGINEERING INPUT TO FSAR								
Description	Tasks include: Prepare updated system descriptions and specifications to support the FSAR and the Environmental Assessment report for the repository facility operating licence application.								
Deliverables	Site-specific system final design descriptions and system specifications Documentation of prototype tests and results where applicable.								
Assumptions	Duration of work: Y21 to Y23. NWMO staff requirements are 1fte/a for 3a (Senior Technical Specialist) to manage/direct both the tasks specified above and the Consultants. Specialist consultants to prepare site-specific preliminary designs, conduct the required data analysis and prepare technical documents in support of the PSAR and EA report. These preliminary design documents, system technical specifications and prototype test results will be inputs to the PSAR and EA reports. Purchased services: 250k$/a for 3a.								
Schedule	Start Year		21	2030			Finish Year	23	2032
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$ 187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	50	30	20			**Prepared By:**	J. Villagran
WBS (Old)	552	20	40	20					
WBS Title	SAFEGUARDS INTERFACE IMPLEMENTATION								
Description	Tasks include: - Prepare designs for system interfaces with nuclear materials safeguard measures for packaging plant and repository to satisfy the specifications completed under WBS 550 20 40 10 (precursor). - Construct and field test prototypes of all non-standard interface systems and equipment. - Resolve any deficiencies in the performance and robustness of the systems and equipment. - Prepare final technical specifications and final designs.								
Deliverable	- Demonstrated function of the safeguards interface systems for nuclear materials safeguards measures and equipment. - Final technical specifications and designs for the safeguards interface systems.								
Assumptions	Duration of work: Y23 to Y25. NWMO staff requirements are 0 fte/a based on management and supervision being provided under WBS 560.20.50.30.10, except as noted. Consultant/contractor services to complete prototype design, to acquire prototype equipment, to conduct demonstration tests of nuclear safeguards interfaces, to resolve deficiencies and to document the final methods, designs and technical specifications: Purchased Services $500k/a for 3 a. Subsequent installation of safeguard equipment interfaces at the DGR facility will be executed in coordination the IAEA.								
Schedule	Start Year		23	2032		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	System design and procurement can be completed in two years and system demonstration can be conducted in the last year of the period.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,500,000	$ 1,500,000	$ 375,000	$ 1,875,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	50	30	30			**Prepared By:**	A. Murchison
WBS (Old)									
WBS Title	PRODUCE SPECS AND INPUT TO FSAR (FINAL SAFETY ASSESSMENT REPORT)								
Description	Prepare the descriptions, specifications and demonstration test results to support the final safety assessment report (FSAR) for repository facility construction.								
Deliverable	Descriptions, specifications and demonstration results to support to FSAR and the EA report for construction approval.								
Assumptions	Duration of work: Y16 to Y20. 2 NWMO-03 fte/a for Y16-Y20 Specialist consultant to prepare the input to the FSAR and EA on the repository facility and used-fuel packaging plant: 2 fte/a for 5 a. Staff are accounted for in WBS 560.20.50.30.10.								
Schedule	Start Year		16	2025			Finish Year	20	2029
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	50	40	10		**Prepared By:**	J. Villagran
WBS (Old)								
WBS Title	MONITORING SYSTEMS AND PROGRAM – DGR OPERATION PHASE							
Description	Tasks include: - Continued operation and maintenance of monitoring system. - Data collection and database management.							
Deliverables	- Updated repository monitoring system. - Updated database for repository monitoring parameters.							
Assumptions	Duration of work: Y26 to Y55. NWMO staff requirements to manage/execute the above tasks are 1 fte for 30a (Technical staff) to operate systems and manage data acquisition and the monitoring database; plus the following: - Contractor/consultants to prepare technical specifications and provide input to equipment procurement process and to assist with the maintenance and expansion of repository monitoring systems: Purchased Services $150k/a for 30a (Y26 to Y55). - Purchase and commissioning of monitoring equipment as required for maintenance and upgrading of both the DGR and repository monitoring systems with an estimated average value of $1,000k/a							
Schedule	Start Year	26	2035			Finish Year	55	2064
Type	Step-Fixed							
Calculations and Notes:								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 30,000,000	$ 4,500,000	$ 34,500,000	$ 8,625,000	$ 43,125,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	50	50	10			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	EXTENDED MONITORING PERIOD								
Description	Tasks include: - Continued operation and maintenance of repository monitoring systems, as required following the 30-year DGR operating period. - Data collection and database management.								
Deliverables	- Operation and maintenance of repository monitoring systems at the repository site and surrounding area. - Accessible and continuously updated database.								
Assumptions	Duration of work: Y56 to Y125. NWMO staff requirements to manage/execute the above tasks are 1 fte for 100a (Technical Specialist) to operate systems and manage data acquisition and the monitoring database, plus the following: - Contractor/consultant to provide input to equipment procurement process and assist with the maintenance and upgrading of repository monitoring systems. Purchased services: $100k/a for 100a (Y56 to Y155). - Purchase and commissioning of monitoring equipment as required for maintenance and updating of the repository monitoring system with an estimated average value of $250k/a for 100 a.								
Schedule	Start Year		56	2065			Finish Year	125	2134
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 17,500,000	$ 7,000,000	$ 24,500,000	$ 6,125,000	$ 30,625,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	30	50	60	10			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	DECOMMISSIONING PERIOD								
Description	Tasks include: - Continued operation and maintenance of repository monitoring systems. - Progressive decommissioning and removal of systems as required, following the 100-year period of pre-closure monitoring. - Continued data collection and database management.								
Deliverables	- Operation and maintenance of repository monitoring systems at the repository site and surrounding area. - Management of decommissioning operations - Accessible and continuously updated database. - Monitoring systems removed from the repository.								
Assumptions	Duration of work: Y156 to Y180. NWMO staff requirements to manage/execute the above tasks are 1 fte for 10 a (Senior Engineer) to manage the decommissioning of repository monitoring systems and 1 fte for 25 a (Technical Specialist) to manage data acquisition as well as the database for the Environmental Monitoring system; plus the following: - Contractor/consultant to assist with equipment maintenance for the Environmental Monitoring systems. Purchased services: $100k/a for 25 a (Y126 to Y150). - Contractor/consultant to implement the process of decommissioning the repository monitoring systems. Purchased services: $400k/a for 10 a (Y126 to Y135). - Maintenance and updating of equipment as required for maintenance of the repository monitoring system and database, with an estimated average value of $150k/a for 25 a.								
Schedule	Start Year		126	2135		Finish Year	150	2159	
Type	Fixed								
Calculations and Notes:	The listed assumptions include the continuation of the environmental monitoring (EM) program in areas surrounding the repository and a period of five years for decommissioning and removal of repository monitoring systems in advance of backfilling and sealing of repository tunnels and shafts.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 3,750,000	$ 6,500,000	$ 10,250,000	$ 2,562,500	$ 12,812,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	90	50	10	10					**Prepared By:**	C. Vardy
WBS (Old)	552	90									
WBS Title	Common Services (Y01-Y09), Siting Phase										
Description	· The program management and administration of the DGR facility during Siting (Y01-Y09). This work will be undertaken by NWMO staff. Management functions covered and their scope include: · President's Office: Project implementation management, siting and public affairs. · Quality Program Mgmt will be covered under a unique set of work element definition sheets. · Safety Program Management: Management of health and safety programs · Finance and Business Services: Account management, reporting, invoicing, contract payments, staff payments, buyer and IT support. · Human Resources: Recruitment, staff management, purchase of payroll services, general support. · Overheads miscellaneous expenses, IT costs, training, holidays, pension contributions, office accommodation and staff expenses. · Legal and Insurance – Internal and external legal counsel as well as conventional insurance coverage for work during the pre-operations phase.										
Deliverable	· An overall business, administrative and management function that will deliver the following: - President's Office: Program estimates, schedules, resource plans and management reports. - Finance and Business Services: Program finance, business planning/budgeting, systems development and maintenance, documentation, filing, work processing and strategic planning - Human Resources: Personnel services to all areas of the program - Insurance – Insurance against conventional risks										
Assumptions	· The program management and administration of the DGR beyond the duration of this activity are costed elsewhere for the Operations Phase (Y30-Y59), etc., · Broadly, overall staffing levels are assumed to be for 35 NWMO-01 and 5 NWMO-03 (admin staff) for Y01-Y09. · These numbers do not include NWMO staff listed under Siting, Repository System Development, Safety Assessment, QA, Licensing & Approvals and Public Affairs. This work element includes a cost allowance for the overhead associated with these staff. Insurance premiums as per CTECK estimate for Y01-Y09 see below- right:										
Schedule	Start Year		1	2010			Finish Year		9	2018	
Type	Fixed										
Calculations and Notes:	· Detailed bottom up budgets were developed for the years 2010 - 2015 by function. These were extended through Y09 based on an anaysis of HC and changes in activities in the organization · Basis of cost estimate was NWMO Business Plan common services. · NWMO staff numbers range from 24 to 33 based on the existing common services compliment and projected growth of NWMO.										

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 32,031,947	$ -	$ 32,374,851	$ 64,406,798	$ 16,101,700	$ 80,508,498

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	90	50	20	10			**Prepared By:**	C. Vardy
WBS (Old)	552	90							
WBS Title	Common Services (Y10-Y15), Construction License Phase								

Description

· The program management and administration of the DGR facility during Siting (Y10-Y15). This work will be undertaken by NWMO staff supplemented by Architect Engineering personnel. Management functions covered and their scope include:

· President's Office: Project implementation management, siting and public affairs.

· Technical Development Program Mgmt. – Engineering office, integration of siting, development and design, Directs Geoscience, Repository System Development & Safety Assessment Mgrs will be covered under a unique set of work element definition sheets.

· Quality Program Mgmt will be covered under a unique set of work element definition sheets.

· Safety Program Management: Management of health and safety programs will be covered under a unique set of work element definition sheets

· Finance and Business Services: Account management, reporting, invoicing, contract payments, staff payments, buyer and IT support.

· Human Resources: Recruitment, staff management, purchase of payroll services, general support.

· Architect Engineer: Purchased services engineers responsible for development of outline design, preparation of specifications and management of design and build contractors. Provides procurement and project management services to the NWMO including schedule and cost control will be covered under a unique set of work element definition sheets.

· Legal and Insurance – Internal and external legal counsel as well as conventional insurance coverage for work during the pre-operations phase.

Deliverable

· An overall business, administrative and management function that will deliver the following:

- President's Office: Program estimates, schedules, resource plans and management reports.
- Finance and Business Services: Program finance, business planning/budgeting, systems development and maintenance,documentation, filing, work processing and strategic planning
- Human Resources: Personnel services to all areas of the program
- Offsite overheads applicable to NWMO staff
- Insurance – Insurance against conventional risks

Assumptions

· The program management and administration of the DGR are costed elsewhere for the Operations Phase (Y30-Y59), etc.,

· Broadly, overall staffing levels are assumed range from 27 to 33 for Y10 -Y15 as outlined to the right (approx 9 NWMO1, 6 NWMO2 and 15 NWMO3)

· These numbers do not include NWMO staff listed under Siting, Repository System Development, Safety Assessment, Licensing & Approvals and Public Affairs. This work element includes a cost allowance for the overhead associated with these staff.

· Insurance premiums as per CTECK estimate over years 10-15 - see below-right

Schedule	Start Year	10	2019	Finish Year	15	2024	
Type	Fixed						

Calculations and Notes:

· Detailed bottom up budgets were developed for the years 2010 - 2015 by function. These were extended through Y09 based on an anaysis of HC and changes in activities in the organization

· NWMO staff numbers range from 27 to 33 based on current common services HC and projected through Y15 based on project growth.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 27,437,036	$ -	$ 28,595,504	$ 56,032,540	$ 14,008,135	$ 70,040,675

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	90	50	30	10			**Prepared By:**	C. Vardy
WBS (Old)	552	90							

WBS Title Common Services Y16-Y25, Construction Phase

Description

· The program management and administration of the DGR facility during Siting (Y10-Y15). This work will be undertaken by NWMO staff supplemented by Architect Engineering personnel. Management functions covered and their scope include:

· President's Office: Project implementation management, siting and public affairs.

· Technical Development Program Mgmt. – Engineering office, integration of siting, development and design, Directs Geoscience, Repository System Development & Safety Assessment Mgrs will be covered under a unique set of work element definition sheets.

· Quality Program Mgmt will be covered under a unique set of work element definition sheets.

· Safety Program Management: Management of health and safety programs will be covered under a unique set of work element definition sheets

· Finance and Business Services: Account management, reporting, invoicing, contract payments, staff payments, buyer and IT support.

· Human Resources: Recruitment, staff management, purchase of payroll services, general support.

· Architect Engineer: Purchased services engineers responsible for development of outline design, preparation of specifications and management of design and build contractors. Provides procurement and project management services to the NWMO including schedule and cost control will be covered under a unique set of work element definition sheets.

· Legal and Insurance – Internal and external legal counsel as well as conventional insurance coverage for work during the pre-operations phase.

Deliverable

· An overall business, administrative and management function that will deliver the following:

- President's Office: Program estimates, schedules, resource plans and management reports.
- Finance and Business Services: Program finance, business planning/budgeting, systems development and maintenance,documentation, filing, work processing and strategic planning
- Human Resources: Personnel services to all areas of the program
- Offsite overheads applicable to NWMO staff
- Insurance – Insurance against conventional risks

Assumptions

· The program management and administration of the DGR are costed elsewhere for the Operations Phase (Y30-Y59), etc.,

· Broadly, overall staffing levels are assumed range from 27 to 33 for Y10 -Y15 as outlined to the right (approx 9 NWMO1, 6 NWMO2 and 15 NWMO3)

· These numbers do not include NWMO staff listed under Siting, Repository System Development, Safety Assessment, Licensing & Approvals and Public Affairs. This work element includes a cost allowance for the overhead associated with these staff.

· Insurance premiums as per CTECK estimate over years 10-15 - see below-right

Schedule	Start Year	16	2025	Finish Year	25	2034

Type Fixed

Calculations and Notes:

· Detailed bottom up budgets were developed for the years 2010 - 2015 by function. These were extended through Y09 based on an anaysis of HC and changes in activities in the organization

· NWMO staff numbers range from 27 to 33 based on current common services HC and projected through Y15 based on project growth.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 32,812,159	$ -	$ 37,158,496	$ 69,970,655	$ 17,492,664	$ 87,463,318

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	90	70	10	10			**Prepared By:**	P. Hader
WBS (Old)	552	15	20	50					

WBS Title QUALITY ASSURANCE PROGRAM SITING

Description

Establish a Quality Assurance (QA) program consistent with ISO 9001 and 14001 requirements. Work Program would include:

- Development and maintenance of QA training and guidance documents.
- Conduct QA audits to verify implementation of QA program with project staff/contractors.
- Conduct periodic reviews and revision of QA documents specific to site characterisation work program activities.
- Conduct technical audits to verify and maintain Quality Control on site characterisation data/interpretation.
- Maintain/implement/audit software QA program.
- Conduct QA training for project staff and contractors.
- Prepare annual QA program status reports.
- QA Management System Audits (annual) and Management Review
- Establishing QA guidelines early in the siting program will be important to ensure that work program expectations are conveyed to staff and external contractors. This is necessary to avoid program delays in re-qualifying data and/or analyses not satisfying QA requirements/expectations.

Deliverable

- Maintenance of an ISO 9001/14001 based QA program.
- Audit reports on implementation of QA program.
- Annual QA program status reports.
- Quality Assurance training programs and manuals.
- Technical audits on site characterisation data/interpretation
- QA of Route Options Studies and Route/Mode Selection Studies/Evaluations
- QA of Conveyance Design – Concept
- QA of Package Design - Preliminary

Assumptions

- Purchase Information Technology Management System for use by QA program ($75 K, Y2).
- ISO 9001/14001 accreditation is program standard.
- QA program will be subsumed by Licence and PSAR activities in year 10.
- QA Management Support @ 0.25 NWMO-01 fte/a for 2 years (Y1-2).
- QA Management Support @ 0.33 NWMO-01 fte/a for 2 years (Y3-4) and 1 NWMO-01 fte/a for 5 years (Y5 to 9)
- QA Specialist @ 0.5 NWMO-03 fte/a for 2 years (Y2-3) (Feasibility Studies in potential sites).
- QA Specialists @ 1 NWMO-03 fte/a for 6 years (Y4 to 9).
- Contracts: $15k (Y1), $50k/a for 2 years (Y2 to 3); $100k/a for 2 yrs (Y4-5)
- Contracts: $250k/a for 4 years (Y6 to 9)

Schedule	Start Year	1	2010	Finish Year	9 2018

Type Fixed

Calculations and Notes:

Assuming purchase of NWMO I.T. Management System for QA @ $75K (1/2 of $150K), shared between L&ILW DGR and APM DGR.

Assuming site characterization of up to two sites between 2013 and 2018.

Contracts are for program audits, assessments and evaluations which escalate in number from one in year one to twenty a year starting in year six.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,274,814	$ 75,000	$ 1,315,000	$ 3,664,814	$ 916,204	$ 4,581,018

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	90	70	20	10			**Prepared By:**	P. Hader
WBS (Old)	552	15	20	50					
WBS Title	QUALITY ASSURANCE PROGRAM LICENCE APPLICATION								
Description	Maintain a Quality Assurance (QA) program consistent with ISO 9001 and 14001 requirements. Work Program would include: - Maintenance of QA training and guidance documents. - Conduct QA audits to verify implementation of QA program with project staff/contractors. - Conduct periodic reviews and revision of QA documents specific to licensing PSAR, EA & construction license stage. - Conduct technical audits to verify and maintain Quality Control. - Maintain/implement/audit software QA program. - Conduct QA training for project staff and contractors. - Prepare annual QA program status reports. - QA Management System Audits (annual) and Management Review Note: Establishing QA guidelines early in the siting program will be important to ensure that work program expectations are conveyed to staff and external contractors. This is necessary to avoid program delays in re-qualifying data and/or analyses not satisfying QA requirements/expectations.								
Deliverable	- Maintenance of an ISO 9001/14001 based QA program. - Audit reports on implementation of QA program. - Annual QA program status reports. - Quality Assurance training programs and manuals. - Technical audits on site characterisation data/interpretation - QA of Conveyance Design – Preliminary QA of Package Design – Detail including Analytic Analysis and Evaluation - QA of Package Prototype – Manufacture, Testing and Evaluation.								
Assumptions	- Information Management System exists for use by QA program. - ISO 9001/14001 accreditation is program standard. - QA program will be subsumed by Construction UDF (we've been re-aligning the acronym to UDF for underground demonstration facility) & Obtain Construction License starting in year 15. - QA Management Support @ 1 fte/a for 6 years (Y10 to 15). - QA Specialist @ 1 fte/a for 6 years (Y10 to 15) (Licensing & PSAR Studies Support). - QA Specialist @ 1 fte/a for 2 years (Y14 to Y15) - Contracts: $150k/a for 1 years (Y10); $ 200k/a for 1 yrs (Y11) $250k/a for 4 yrs (Y12-15).								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	Contracts are for program audits, assessments and evaluations which escalate in number from twelve in year one to twenty a year starting in year two. Assume subsurface investigations are completed in year nine and quality assurance activities are somewhat decreased but rampup again for the environmental assessment.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,369,581	$ -	$ 1,350,000	$ 3,719,581	$ 929,895	$ 4,649,477

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	90	70	30	10			**Prepared By:**	P. Hader
WBS (Old)	552	15	20	50					
WBS Title	QUALITY ASSURANCE PROGRAM UDF and DGR CONSTRUCTION								
Description	Maintain a Quality Assurance (QA) program consistent with ISO 9001 and 14001 requirements. Work Program would include: - Maintenance of QA training and guidance documents. - Conduct QA audits to verify implementation of QA program with project staff/contractors. - Conduct periodic reviews and revision of QA documents specific to construction of UDF & SFAR stage - Maintain/implement/audit software QA program. - Conduct QA training for project staff and contractors. - Prepare annual QA program status reports. - QA Management System Audits (annual) and Management Review								
Deliverable	- Maintenance of an ISO 9001/14001 based QA program. - Audit reports on implementation of QA program. - Quarterly and Annual QA program status reports. - Quality Assurance training programs and manuals. - Technical audits on site characterisation data/interpretation - QA Package Prototype Manufacture, Testing and Evaluation.								
Assumptions	- Information Management System exists for use by QA program. - ISO 9001/14001 accreditation is program standard. - QA program will be subsumed by Construct DGR, Commissioning and Licensing in year 25. - QA Management Support NWMO-01 @ 1 fte/a for 10 years (Y16 to 25). - QA Specialists NWMO-03 @ 2 fte/a for 4 years (Y16 to 19); 3 fte/a for 6 years (Y20 to Y25). - Contracts: $250k/a for 10 years (Y16 to 25).								
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	Contracts will be for quality inspections, testing, equipment calibration, oversight monitoring and audits. Quality Assurance FTE is increased in year 20 to support construction verification activities.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 5,598,289	$ -	$ 2,500,000	$ 8,098,289	$ 2,024,572	$ 10,122,862

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	90	70	40	10			**Prepared By:**	P. Hader
WBS (Old)	552	15	20	50					
WBS Title	QUALITY ASSURANCE PROGRAM, DGR OPERATIONS								
Description	Maintain a Quality Assurance (QA) program consistent with ISO 9001 and 14001 requirements. Work Program would include: - Maintenance of QA training and guidance documents. - Conduct QA audits to verify implementation of QA program with operations staff/contractors. - Conduct periodic reviews and revision of QA documents specific to operations - Maintain/implement/audit and action tracking software QA program. - Conduct QA training for operations staff and contractors. - Prepare monthly, quarterly and annual QA program status reports. - Maintain corrective action tracking system - QA Management System Audits (annual) and Management Review.								
Deliverable	- Maintenance of an ISO 9001/14001 based QA program. - Audit reports on implementation of QA program. - Quarterly and Annual QA program status reports. - Quality Assurance training programs and manuals. - Technical audits on operations monitoring data/ interpretation. - QA Package Manufacture. - QA Transportation Services.								
Assumptions	- Information Management System implementation for use by QA program. - ISO 9001/14001 accreditation is program standard. - QA program will be subsumed by UF DGR Operations in year 26. - QA Management Support @ 1 NWMO-01 fte/a for 30 years (Y26 to 55). - QA Specialists @ 3 NWMO-03 fte/a for 6 years (Y26 to 31); 2 fte/a for 24 years (Y32 to Y55). - Contracts: $250k/a for 6 years (Y26 to 31), $200k/a for 24 years (Y32 to Y55).								
Schedule	Start Year		26	2035		Finish Year	55	2064	
Type	Fixed								
Calculations and Notes:	Assume a new Information Management System is installed during commissioning. Assume additional contracted assistance in first years of operation (assume some extended commissioning activities). Contracts will be for quality inspections, testing, equipment calibration, oversight monitoring and audits for package manufacturing, contracted services and transportation services.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 15,232,669	$ -	$ 6,300,000	$ 21,532,669	$ 5,383,167	$ 26,915,837

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	90	70	50	10			**Prepared By:**	P. Hader
WBS (Old)	552	15	20	50					
WBS Title	QUALITY ASSURANCE PROGRAM, EXTENDED OPERATIONS								
Description	Maintain a Quality Assurance (QA) program consistent with ISO 9001 and 14001 requirements. Work Program would include: - Maintenance of QA training and guidance documents. - Conduct QA audits to verify implementation of QA program with monitoring staff. - Conduct periodic reviews and revision of QA documents specific to extended operations. - Conduct QA training for extended operations staff. - Prepare annual QA program status report. - Maintain corrective action tracking system. - QA Management System Audits (annual) and Management Review.								
Deliverable	- Maintenance of an ISO 9001/14001 based QA program. - Audit reports on implementation of QA program. - Annual QA program status reports. - Quality Assurance training programs and manuals for extended operations. - Technical audits on extended operations monitoring data/ interpretation.								
Assumptions	- Information Management System implementation for use by QA program. - ISO 9001/14001 accreditation is program standard. - Reduced QA program will be subsumed by UF DGR Extended Operations in year 56. - QA Specialists @ 1 NWMO-03 fte/a for 70 years (Y56 to 125). - Contracts: $75k/a for 5 years (Y56 to 60), $25k/a for 65 years (Y61 to Y125).								
Schedule	Start Year		56	2065			Finish Year	125	2134
Type	Fixed								
Calculations and Notes:	Assume reduced staff levels and reduced training and oversight. Technical audits on a reduced frequency (one/18 -24 months) after first five years. Contracts will be for quality inspections, testing, equipment calibration, oversight monitoring and audits.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 9,112,824	$ -	$ 2,000,000	$ 11,112,824	$ 2,778,206	$ 13,891,030

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	90	70	60	10			**Prepared By:**	P. Hader
WBS (Old)	552	15	20	50					
WBS Title	QUALITY ASSURANCE PROGRAM, DECOMMISSIONING & CLOSURE								
Description	Maintain a Quality Assurance (QA) program consistent with ISO 9001 and 14001 requirements. Work Program would include: - Preparation of detailed QA plan for decommissioning activities (Phase 1). - Maintenance of QA training and guidance documents. - Conduct QA audits to verify implementation of QA program with decommissioning staff and contractors. - Conduct periodic reviews and revision of QA documents specific to decommissioning stage. - Implement and maintain audit and action tracking software QA program. - Conduct QA training for decommissioning staff and contractors. - Prepare monthly, quarterly and annual QA program status reports. - QA Management System Audits (annual) and Management Review								
Deliverable	- Maintenance of an ISO 9001/14001 based QA program. - Audit reports on implementation of QA program. - Quarterly and annual QA program status reports. - Quality Assurance training programs and manuals for decommissioning activities. - Technical audits on shaft sealing testing/ data/ interpretation. - QA shaft sealing materials acceptance, installation, and verification testing. - QA of instrumentation acceptance, installation and verification testing.								
Assumptions	- Information Management System for decommissioning work installed for use by QA program. - ISO 9001/14001 accreditation is program standard. - QA program will be created by Decommissioning and Closure Staff in year 126. - QA Management Support @ 1 NWMO-01 fte/a for 25 years (Y126 to 150). - QA Specialists @ 3 NWMO-03 fte/a for 12 years (Y126 to 137); 1 NWMO-03 fte/a for 13 years (Y138 to Y150). - Contracts: $250k/a for 12 years (Y126 to 137), $200K/a for 3 yrs (Y138-140), $150K/a for 10 years (Y141-Y150). - New QA System $100k/a for 1 year (Y126).								
Schedule	Start Year		126	2135			Finish Year	150	2159
Type	Fixed								
Calculations and Notes:	Contracts will be for quality inspections, testing, oversight monitoring, audits, and supplier audits. Expect decreased activity after the underground facility is closed.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 11,912,792	$ 100,000	$ 5,100,000	$ 17,112,792	$ 4,278,198	$ 21,390,990

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Building Relationships								
Description	Tasks include: General Tasks: - Critical to the success of Adaptive Phased Management (APM) is the involvement of the - Canadian public, including Aboriginal people, at all stages of implementation and in key - decisions through open, transparent and inclusive engagement processes - Through communications and earned media, build awareness among the Canadian public, including Aboriginal people about the NWMO, the management of used nuclear fuel and APM - Develop and maintain relationships with the federal government and with provincial and local governments in nuclear provinces to support their involvement in the implementation of APM and support for NWMO as implementer. - Develop and maintain relationships with national, provincial and regional Aboriginal governments in nuclear provinces to support their involvement in the implementation of APM. Continue to work on projects with Elders on Niigani (NWMO Aboriginal working group) and NWMO Elders Forum. Seek advice of Elders on interweaving of Aboriginal Traditional Knowledge and western science and respectful engagement of Aboriginal peoples. - Continue to work with Natural Resources Canada to implement a process to meet the NWMO's statutory obligations with respect to the Crown's duty to consult. - Implement communications and learning opportunities to inform young people of NWMO's work. - Regularly assess the effectiveness of website, engagement and communication vehicles to identify opportunities for improvement in future initiatives. Tasks Specific to Siting & Design Phase: - Develop relations and collaboration with municipal associations to advance understanding of local perspectives and to involve the municipal level in the design and implementation of APM. - Cultivate and maintain new relationships on a regional level as communities begin to engage in siting process and develop understanding of local and regional priorities								
Deliverables									
Assumptions									
Schedule	Start Year	1	2010		Finish Year	9	2018		
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 19,709,348	$ -	$ -	$ 19,709,348	$ 4,927,337	$ 24,636,686

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Building Relationships								
Description	Tasks include: General Tasks: - Critical to the success of Adaptive Phased Management (APM) is the involvement of the - Canadian public, including Aboriginal people, at all stages of implementation and in key - decisions through open, transparent and inclusive engagement processes - Through communications and earned media, build awareness among the Canadian public, including Aboriginal people about the NWMO, the management of used nuclear fuel and APM - Develop and maintain relationships with the federal government and with provincial and local governments in nuclear provinces to support their involvement in the implementation of APM and support for NWMO as implementer. - Develop and maintain relationships with national, provincial and regional Aboriginal governments in nuclear provinces to support their involvement in the implementation of APM. - Continue to work with Natural Resources Canada to implement a process to meet the NWMO's statutory obligations with respect to the Crown's duty to consult. - Implement communications and learning opportunities to inform young people of NWMO's work. - Regularly assess the effectiveness of website, engagement and communication vehicles to identify opportunities for improvement in future initiatives.								
Deliverables									
Assumptions									
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 23,978,052	$ -	$ -	$ 23,978,052	$ 5,994,513	$ 29,972,565

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Building Relationships								
Description	Tasks include: General Tasks: - Critical to the success of Adaptive Phased Management (APM) is the involvement of those who are potentially affected, including those along the transportation route, in the implementation and in key decisions through open, transparent and inclusive engagement processes. - Through communications and earned media, build awareness among the potentially affected Canadian public, including Aboriginal people about the NWMO, the management of used nuclear fuel and APM. - Develop and maintain relationships with the federal government and with potentially affected provincial and local governments to support their involvement in the implementation of APM and support for NWMO as implementer. - Develop and maintain relationships with,potentially affected provincial and regional Aboriginal governments to support their involvement in the implementation of APM. Seek advice of Elders on interweaving of Aboriginal Traditional Knowledge and western science and respectful engagement of Aboriginal peoples. - Continue to work with Natural Resources Canada to implement a process to meet the NWMO's statutory obligations with respect to the Crown's duty to consult. - Implement communications and learning opportunities to inform young people of NWMO's work. - Regularly assess the effectiveness of website, engagement and communication vehicles to identify opportunities for improvement in future initiatives.								
Deliverables									
Assumptions									
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 36,925,812	$ -	$ -	$ 36,925,812	$ 9,231,453	$ 46,157,265

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Building Relationships								
Description	Tasks include: General Tasks: - Critical to the success of Adaptive Phased Management (APM) is the involvement of those who are potentially affected, including those along the transportation route, at all stages of the implementation and in key decisions through open, transparent and inclusive engagement processes. - Through communications and earned media, build awareness among the potentially affected Canadian public, including Aboriginal people about the NWMO, the management of used nuclear fuel and APM. - Develop and maintain relationships with the federal government and with potentially affected provincial and local governments to support their involvement in the implementation of APM and support for NWMO as implementer. - Develop and maintain relationships with,potentially affected provincial and regional Aboriginal governments to support their involvement in the implementation of APM. Seek advice of Elders on interweaving of Aboriginal Traditional Knowledge and western - Continue to work with Natural Resources Canada to implement a process to meet the NWMO's statutory obligations with respect to the Crown's duty to consult. - Implement communications and learning opportunities to inform young people of NWMO's work. - Regularly assess the effectiveness of website, engagement and communication vehicles to identify opportunities for improvement in future initiatives.								
Deliverables									
Assumptions									
Schedule	Start Year		26	2035		Finish Year	55	2064	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 61,893,586	$ -	$ -	$ 61,893,586	$ 15,473,396	$ 77,366,982

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	50	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Building Relationships								
Description	Tasks include: General Tasks: - Critical to the success of Adaptive Phased Management (APM) is the involvement of those who are potentially affected, including those along the transportation route, at all stages of the implementation and in key decisions through open, transparent and inclusive engagement processes. - Through communications and earned media, build awareness among the potentially affected Canadian public, including Aboriginal people about the NWMO, the management of used nuclear fuel and APM. - Develop and maintain relationships with the federal government and with potentially affected provincial and local governments to support their involvement in the implementation of APM and support for NWMO as implementer. - Develop and maintain relationships with,potentially affected provincial and regional Aboriginal governments to support their involvement in the implementation of APM. Seek advice of Elders on interweaving of Aboriginal Traditional Knowledge and western science and respectful engagement of Aboriginal peoples. - Continue to work with Natural Resources Canada to implement a process to meet the NWMO's statutory obligations with respect to the Crown's duty to consult. - Implement communications and learning opportunities to inform young people of NWMO's work. - Regularly assess the effectiveness of website, engagement and communication vehicles to identify opportunities for improvement in future initiatives.								
Deliverables									
Assumptions									
Schedule	Start Year		56	2065		Finish Year	125	2134	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 87,387,208	$ -	$ -	$ 87,387,208	$ 21,846,802	$ 109,234,010

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	60	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Building Relationships								
Description	Tasks include: General Tasks: - Critical to the success of Adaptive Phased Management (APM) is the involvement of those who are potentially affected, including those along the transportation route, at all stages of the implementation and in key decisions through open, transparent and inclusive engagement processes. - Through communications and earned media, build awareness among the potentially affected Canadian public, including Aboriginal people about the NWMO, the management of used nuclear fuel and APM. - Develop and maintain relationships with the federal government and with potentially affected provincial and local governments to support their involvement in the implementation of APM and support for NWMO as implementer. - Develop and maintain relationships with,potentially affected provincial and regional Aboriginal governments to support their involvement in the implementation of APM. Seek advice of Elders on interweaving of Aboriginal Traditional Knowledge and western science and respectful engagement of Aboriginal peoples. - Continue to work with Natural Resources Canada to implement a process to meet the NWMO's statutory obligations with respect to the Crown's duty to consult. - Implement communications and learning opportunities to inform young people of NWMO's work. - Regularly assess the effectiveness of website, engagement and communication vehicles to identify opportunities for improvement in future initiatives.								
Deliverables									
Assumptions									
Schedule	Start Year		126	2135		Finish Year	150	2159	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 18,283,456	$ -	$ -	$ 18,283,456	$ 4,570,864	$ 22,854,320

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	10	10	40			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Adapting to Change								
Description	Tasks include: - Complete and publish reviews of used fuel reprocessing and alternative waste management technologies. - Annually update and publish used fuel inventories and projections. - Continue to research citizen priorities and concerns relating to APM implementation. - Continue to assess developments in environmental and energy policies and the impact of new build nuclear reactors on APM in terms of volume and potential characteristics of different used fuel types to be managed. - Advance NWMO's understanding of insight from Aboriginal Traditional Knowledge that may guide implementation of APM. - Collaborate with interested academics in Canada and internationally to access the best knowledge and practices in social and community-based processes. - Participate in international projects and collaboration for sharing information and best practices.								
Deliverables									
Assumptions									
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 3,440,250	$ -	$ -	$ 3,440,250	$ 860,062	$ 4,300,312

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	10	20	30			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Adapting to Change								
Description	Tasks include: - Complete and publish reviews of used fuel reprocessing and alternative waste management technologies. - Annually update and publish used fuel inventories and projections. - Continue to research citizen priorities and concerns relating to APM implementation. - Continue to assess developments in environmental and energy policies and the impact of new build nuclear reactors on APM in terms of volume and potential characteristics of different used fuel types to be managed. - Advance NWMO's understanding of insight from Aboriginal Traditional Knowledge that may guide implementation of APM. - Collaborate with interested academics in Canada and internationally to access the best knowledge and practices in social and community-based processes. - Participate in international projects and collaboration for sharing information and best practices.								
Deliverables									
Assumptions									
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,241,427	$ -	$ -	$ 2,241,427	$ 560,357	$ 2,801,783

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	10	30	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Adapting to Change								
Description	Tasks include: - Complete and publish reviews of used fuel reprocessing and alternative waste management technologies. - Annually update and publish used fuel inventories and projections. - Continue to research citizen priorities and concerns relating to APM implementation. - Continue to assess developments in environmental and energy policies and the impact of new build nuclear reactors on APM in terms of volume and potential characteristics of different used fuel types to be managed. - Advance NWMO's understanding of insight from Aboriginal Traditional Knowledge that may guide implementation of APM. - Collaborate with interested academics in Canada and internationally to access the best knowledge and practices in social and community-based processes. - Participate in international projects and collaboration for sharing information and best practices.								
Deliverables									
Assumptions									
Schedule	Start Year	16	2025			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,289,166	$ -	$ -	$ 1,289,166	$ 322,292	$ 1,611,458

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	10	40	10			**Prepared**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Adapting to Change								
Description	Tasks include: - Complete and publish reviews of used fuel reprocessing and alternative waste management technologies. - Annually update and publish used fuel inventories and projections. - Continue to research citizen priorities and concerns relating to APM implementation. - Continue to assess developments in environmental and energy policies and the impact of new build nuclear reactors on APM in terms of volume and potential characteristics of different used fuel types to be managed. - Advance NWMO's understanding of insight from Aboriginal Traditional Knowledge that may guide implementation of APM. - Collaborate with interested academics in Canada and internationally to access the best knowledge and practices in social and community-based processes. - Participate in international projects and collaboration for sharing information and best practices.								
Deliverables	-								
Assumptions									
Schedule	Start Year		26	2035		Finish Year	55	2064	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,361,820	$ -	$ -	$ 2,361,820	$ 590,455	$ 2,952,275

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	10	50	10			**Prepared**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Adapting to Change								
Description	Tasks include: - Complete and publish reviews of used fuel reprocessing and alternative waste management technologies. - Annually update and publish used fuel inventories and projections. - Continue to research citizen priorities and concerns relating to APM implementation. - Continue to assess developments in environmental and energy policies and the impact of new build nuclear reactors on APM in terms of volume and potential characteristics of different used fuel types to be managed. - Advance NWMO's understanding of insight from Aboriginal Traditional Knowledge that may guide implementation of APM. - Collaborate with interested academics in Canada and internationally to access the best knowledge and practices in social and community-based processes. - Participate in international projects and collaboration for sharing information and best practices.								
Deliverables									
Assumptions									
Schedule	Start Year		56	2065		Finish Year	125	2134	
Type	Fixed								
Calculations									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 5,510,912	$ -	$ -	$ 5,510,912	$ 1,377,728	$ 6,888,641

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	10	60	10			**Prepared**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Adapting to Change								
Description	Tasks include: - Complete and publish reviews of used fuel reprocessing and alternative waste management technologies. - Annually update and publish used fuel inventories and projections. - Continue to research citizen priorities and concerns relating to APM implementation. - Continue to assess developments in environmental and energy policies and the impact of new build nuclear reactors on APM in terms of volume and potential characteristics of different used fuel types to be managed. - Advance NWMO's understanding of insight from Aboriginal Traditional Knowledge that may guide implementation of APM. - Collaborate with interested academics in Canada and internationally to access the best knowledge and practices in social and community-based processes. - Participate in international projects and collaboration for sharing information and best practices.								
Deliverables									
Assumptions									
Schedule	Start Year	126	2135			Finish Year	150	2159	
Type	Fixed								
Calculations									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,968,183	$ -	$ -	$ 1,968,183	$ 492,046	$ 2,460,229

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	20			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Siting Process								
Description	Tasks include: General: - NWMO will work to ensure that siting is inclusive, fair and transparent. The execution of the site selection process must meet the expectations of Canadians and address their key issues, such as the protection of humans and the environment, fairness and transportation considerations, and continue to build trust and confidence in the NWMO and its operations. Tasks Specific to Siting Process Phase: - Respond to community requests for capacity-building by administering "Learn More" program and delivering briefings on request. - Conduct screenings and initiate feasibility studies and field upon request of communities. - Select the 1-2 willing communities to move forward to detailed site characterization. - Initiate Regional Studies with one or more communities interested in moving to detailed site evaluations. - As required, provide dedicated regional NWMO staff/support in communities progressing through siting process. - Administer community benefits for communities in advanced stages of siting process consistent with Board-approved principles and frameworks - For the communities selected for detailed site characterization, initiate the establishment of centres of expertise as hubs of technical and social support for the multi-year testing and assessment of the site and discussion of community well-being. - Continue activities to build awareness of the APM siting process. Develop mobile exhibits and tools that are responsive to local needs to support community-based discussions of APM project and siting. Seek advice of municipal associations and Aboriginal organizations on design of information and tool kits to support community-driven siting process. - Develop tools and methods for conducting detailed geoscientific site investigations and evaluations at candidate sites in both crystalline and sedimentary settings by 2012. - Provide engineering design and preliminary safety assessments to support evaluation of candidate sites.								
Deliverables	- Selection of preferred site. NWMO and community enter into formal hosting agreement - Continued support to host community throughout EA & licensing process								
Assumptions									
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 37,668,572	$ -	$ -	$ 37,668,572	$ 9,417,143	$ 47,085,715

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	20	20			**Prepared**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Siting Process								
Description	Tasks include: General: - NWMO will work to ensure that siting is inclusive, fair and transparent. The execution of the site selection process must meet the expectations of Canadians and address their key issues, such as the protection of humans and the environment, fairness and transportation considerations, and continue to build trust and confidence in the NWMO and its operations. Tasks Specific to Siting Process Phase: - Respond to community requests for capacity-building by administering "Learn More" program and delivering briefings on request. - Conduct screenings and initiate feasibility studies and field upon request of communities. - Select the 1-2 willing communities to move forward to detailed site characterization. - Initiate Regional Studies with one or more communities interested in moving to detailed site evaluations. - As required, provide dedicated regional NWMO staff/support in communities progressing through siting process. - Administer community benefits for communities in advanced stages of siting process consistent with Board-approved principles and frameworks. - For the communities selected for detailed site characterization, initiate the establishment of centres of expertise as hubs of technical and social support for the multi-year testing and assessment of the site and discussion of community well-being. - Continue activities to build awareness of the APM siting process. Develop mobile exhibits and tools that are responsive to local needs to support community-based discussions of APM project and siting. Seek advice of municipal associations and Aboriginal organizations on design of information and tool kits to support community-driven siting process. - Develop tools and methods for conducting detailed geoscientific site investigations and evaluations at candidate sites in both crystalline and sedimentary settings by 2012. - Provide engineering design and preliminary safety assessments to support evaluation of candidate sites.								
Deliverables	- Selection of preferred site. NWMO and community enter into formal hosting agreement - Continued support to host community throughout EA & licensing process								
Assumptions									
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 18,625,811	$ -	$ -	$ 18,625,811	$ 4,656,453	$ 23,282,264

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	100			**Prepared**	J. Facella
WBS (Old)									
WBS Title	PROVINCIAL STAKEHOLDER ENGAGEMENT								
Description	Ongoing involvement of provincial opinion leaders through briefings and periodic dialogue sessions focused on the implementation plan.								
Deliverable	Ensure understanding of project activities and forum for identification of issues that need to be addressed that may effect licensing.								
Assumptions									
Schedule	Start Year	2	2011			Finish Year	6	2015	
Type	Fixed								
Calculations and Notes:									

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**19**

WBS (New)	560	05	10	10	110			**Prepared By:**	P. Simmons
WBS (Old)									

BUILDING RELATIONS – Regional Engagement - Community Engagement (50k)

WBS Title **COMMUNITY, SERVICE and ADVOCACY BRIEFINGS**

Description

Category currently includes speaking engagements and briefings on request to community groups and their committees in the 4 nuclear-cycle provinces and includes local, regional, and provincial organizations. Community groups include the Canadian Association of Nuclear Host Communities (CANHC), Durham Nuclear Health Committee (DNHC), Pickering Community Advisory Committee (PCAC), Point Lepreau Community Liaison Committee (PLCLC), Community Consultation Advisory Group (CCAG – Bruce County); provincial groups include Chambers of Commerce; and regional groups include service clubs, smaller chambers of commerce and boards of trade, educational institutions among others. Costs include travel-related expenses for staff participating in speaking engagements/briefings, special events and award ceremonies (tickets and registration fees), on or off-site meetings/briefing related costs (catering, meeting room, A/V), sponsorships, and membership fees.

Deliverable

This category's primary deliverable is fostering and building relationships with community leaders and members, and increasing awareness of the NWMO and APM. The secondary deliverable is maintaining the brand, and relationships with groups already aware of the NWMO and providing updates and progress reports to those bodies. These costs and activities, as outlined, assist in the distribution of information, support brand recognition, and provide networking opportunities.

Assumptions

Currently the NWMO participates, on average, in 12 community organization meetings/briefings per year. As the siting process progresses and specific communities express interest in the project, it is expected that requests for briefings from community organizations will increase significantly in the potentially interested host communities and surrounding regions, and among communities along potential, or assumed, transportation routes, and in existing nuclear host communities and their respective regions.

Beyond the potentially interested host communities, it is reasonable to expect interest may also be expressed after the site selection process is initiated from transportation communities, first responder/emergency services groups, planning advisory groups and boards, and newly formed community groups responding to opportunity and local interest. In some cases these will be affiliated with the municipality expressing interest, in others it may be adjacent communities, or larger regional areas.

Membership in national, provincial, and local chambers of commerce (potentially several) is also assumed as being prudent and reasonable as are public-policy events, and related AGM's and special events. This requirement is expected to reduce by 50% once a site is selected.

Despite potentially being at Step 5 of the site selection process by 2018, the involvement and interaction with community groups large and small is not expected to diminish, in fact the opposite is more likely, and will continue through to the construction commencement of the APM DGR in 2035.

Schedule	Start Year	1	2010	Finish Year	9	2018

Type Fixed

Calculations and Notes:

- Estimated minimum 12 meetings per year in Ontario assumes: CANHC (2 – 1 in Ottawa, 1 in GTA), DNHC (4), PCAC (1), CCAG (2), Provincial Chamber of Commerce briefing (1), and 2 potential community organization briefings (e.g. educational institutions, planning boards).

- Comparable groups in other nuclear provinces, but at 50% = 6 meetings (fewer orgs.)
- Memberships with Chambers of commerce – National, provincial and select local.
- Cost per meeting: varies depending on location and duration. An estimated $2500 per meeting is reasonable for this purpose (each meeting requires 3 NWMO staff).

- In the assumptions the increase/frequency of meetings is expected to increase around 2018, and will continue to 2024 and reduce by 50% to 2035.

- With unknown changes to meeting frequency, as well as locations, or other resource requirements the annual estimates should reflect an a modest increase versus decrease until 2035.

Approved Y01 (2010) budget $50,000

Preliminary Estimates
- Y02 – Y09 (2011 – 2018) - 8 x $200,000 = $ 1,600,000
- Y10 - Y15 (2019 – 2024) - 6 x $200,000 = $1,200,000
- Y16 - Y25 (2025 – 2034) - 10 x $200,000 = $2,000,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,650,000	$ 1,650,000	$ 412,500	$ 2,062,500

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**19**

WBS (New)	560	05	10	20	100			**Prepared By:**	P. Simmons
WBS (Old)									
	BUILDING RELATIONS – Regional Engagement - Community Engagement (50k)								
WBS Title	**COMMUNITY, SERVICE and ADVOCACY BRIEFINGS**								

Description

Category currently includes speaking engagements and briefings on request to community groups and their committees in the 4 nuclear-cycle provinces and includes local, regional, and provincial organizations. Community groups include the Canadian Association of Nuclear Host Communities (CANHC), Durham Nuclear Health Committee (DNHC), Pickering Community Advisory Committee (PCAC), Point Lepreau Community Liaison Committee (PLCLC), Community Consultation Advisory Group (CCAG – Bruce County); provincial groups include Chambers of Commerce; and regional groups include service clubs, smaller chambers of commerce and boards of trade, educational institutions among others. Costs include travel-related expenses for staff participating in speaking engagements/briefings, special events and award ceremonies (tickets and registration fees), on or off-site meetings/briefing related costs (catering, meeting room, A/V), sponsorships, and membership fees.

Deliverable

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Assumptions

Currently the NWMO participates, on average, in 12 community organization meetings/briefings per year. As the siting process progresses and specific communities express interest in the project, it is expected that requests for briefings from community organizations will increase significantly in the potentially interested host communities and surrounding regions, and among communities along potential, or assumed, transportation routes, and in existing nuclear host communities and their respective regions.

Beyond the potentially interested host communities, it is reasonable to expect interest may also be expressed after the site selection process is initiated from transportation communities, first responder/emergency services groups, planning advisory groups and boards, and newly formed community groups responding to opportunity and local interest. In some cases these will be affiliated with the municipality expressing interest, in others it may be adjacent communities, or larger regional areas.

Membership in national, provincial, and local chambers of commerce (potentially several) is also assumed as being prudent and reasonable as are public-policy events, and related AGM's and special events. This requirement is expected to reduce by 50% once a site is selected.

Despite potentially being at Step 5 of the site selection process by 2018, the involvement and interaction with community groups large and small is not expected to diminish, in fact the opposite is more likely, and will continue through to the construction commencement of the APM DGR in 2035.

Schedule	Start Year	10	2019	Finish Year	15	2024
Type	Fixed					

Calculations and Notes:

- Estimated minimum 12 meetings per year in Ontario assumes: CANHC (2 – 1 in Ottawa, 1 in GTA), DNHC (4), PCAC (1), CCAG (2), Provincial Chamber of Commerce briefing (1), and 2 potential community organization briefings (e.g. educational institutions, planning boards).
- Comparable groups in other nuclear provinces, but at 50% = 6 meetings (fewer orgs.)
- Memberships with Chambers of commerce – National, provincial and select local.
- Cost per meeting: varies depending on location and duration. An estimated $2500 per meeting is reasonable for this purpose (each meeting requires 3 NWMO staff).
- In the assumptions the increase/frequency of meetings is expected to increase around 2018, and will continue to 2024 and reduce by 50% to 2035.
- With unknown changes to meeting frequency, as well as locations, or other resource requirements the annual estimates should reflect an a modest increase versus decrease until 2035.

Approved Y01 (2010) budget $50,000

Preliminary Estimates
- Y02 – Y09 (2011 – 2018) - 8 x $200,000 = $ 1,600,000
- Y10 - Y15 (2019 – 2024) - 6 x $200,000 = $1,200,000
- Y16 - Y25 (2025 – 2034) - 10 x $200,000 = $2,000,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,200,000	$ 1,200,000	$ 300,000	$ 1,500,000

APM Cost Estimate

Work Element Definition Sheet

								NWMO Cost Code: 0170020-**19**	
WBS (New)	560	05	10	30	80			**Prepared By:**	P. Simmons
WBS (Old)									
	BUILDING RELATIONS – Regional Engagement - Community Engagement (50k)								
WBS Title	**COMMUNITY, SERVICE and ADVOCACY BRIEFINGS**								

Description

Category currently includes speaking engagements and briefings on request to community groups and their committees in the 4 nuclear-cycle provinces and includes local, regional, and provincial organizations. Community groups include the Canadian Association of Nuclear Host Communities (CANHC), Durham Nuclear Health Committee (DNHC), Pickering Community Advisory Committee (PCAC), Point Lepreau Community Liaison Committee (PLCLC), Community Consultation Advisory Group (CCAG – Bruce County); provincial groups include Chambers of Commerce; and regional groups include service clubs, smaller chambers of commerce and boards of trade, educational institutions among others. Costs include travel-related expenses for staff participating in speaking engagements/briefings, special events and award ceremonies (tickets and registration fees), on or off-site meetings/briefing related costs (catering, meeting room, A/V), sponsorships, and membership fees.

Deliverable

This category's primary deliverable is fostering and building relationships with community leaders and members, and increasing awareness of the NWMO and APM. The secondary deliverable is maintaining the brand, and relationships with groups already aware of the NWMO and providing updates and progress reports to those bodies. These costs and activities, as outlined, assist in the distribution of information, support brand recognition, and provide networking opportunities.

Assumptions

Currently the NWMO participates, on average, in 12 community organization meetings/briefings per year. As the siting process progresses and specific communities express interest in the project, it is expected that requests for briefings from community organizations will increase significantly in the potentially interested host communities and surrounding regions, and among communities along potential, or assumed, transportation routes, and in existing nuclear host communities and their respective regions.

Beyond the potentially interested host communities, it is reasonable to expect interest may also be expressed after the site selection process is initiated from transportation communities, first responder/emergency services groups, planning advisory groups and boards, and newly formed community groups responding to opportunity and local interest. In some cases these will be affiliated with the municipality expressing interest, in others it may be adjacent communities, or larger regional areas.

Membership in national, provincial, and local chambers of commerce (potentially several) is also assumed as being prudent and reasonable as are public-policy events, and related AGM's and special events. This requirement is expected to reduce by 50% once a site is selected.

Despite potentially being at Step 5 of the site selection process by 2018, the involvement and interaction with community groups large and small is not expected to diminish, in fact the opposite is more likely, and will continue through to the construction commencement of the APM DGR in 2035.

Schedule	Start Year	16	2025	Finish Year	25	2034

Type

Fixed

Calculations and Notes:

- Estimated minimum 12 meetings per year in Ontario assumes: CANHC (2 – 1 in Ottawa, 1 in GTA), DNHC (4), PCAC (1), CCAG (2), Provincial Chamber of Commerce briefing (1), and 2 potential community organization briefings (e.g. educational institutions, planning boards).
- Comparable groups in other nuclear provinces, but at 50% = 6 meetings (fewer orgs.)
- Memberships with Chambers of commerce – National, provincial and select local.
- Cost per meeting: varies depending on location and duration. An estimated $2500 per meeting is reasonable for this purpose (each meeting requires 3 NWMO staff).
- In the assumptions the increase/frequency of meetings is expected to increase around 2018, and will continue to 2024 and reduce by 50% to 2035.
- With unknown changes to meeting frequency, as well as locations, or other resource requirements the annual estimates should reflect an a modest increase versus decrease until 2035.

Approved Y01 (2010) budget $50,000

Preliminary Estimates
- Y02 – Y09 (2011 – 2018) - 8 x $200,000 = $ 1,600,000
- Y10 - Y15 (2019 – 2024) - 6 x $200,000 = $1,200,000
- Y16 - Y25 (2025 – 2034) - 10 x $200,000 = $2,000,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,000,000	$ 2,000,000	$ 500,000	$ 2,500,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**21**

WBS (New)	560	05	10	10	120			**Prepared By:**	P. Simmons
WBS (Old)									

BUILDING RELATIONS – Regional Engagement – MUNCIPAL FORUM MEETINGS (150)

WBS Title **MUNICIPAL FORUM MEETINGS**

Description

Municipal Forum category includes those costs associated with the meetings and assemblies of the Municipal Forum, a group formed in late 2008 comprised of senior level municipal experts from the four nuclear-cycle provinces primarily drawn from the municipal associations, and who inform a research agenda for a large national infrastructure project, and who also provide advice and comment to related municipal-specific issues, and effectively communicating with the local level of government.

The Forum consists of 15 individual organizations whom are invited to participate at the meetings typically held up to 4 times per year.

The Municipal Forum convenes up to four times per year (avg. 3). To date the meetings have been held in Toronto (at the NWMO offices), and at a meeting facility in downtown Ottawa.

Deliverable

The category's primary deliverable is the provision of guidance to a research agenda as it relates to municipally related areas of interest, with a secondary deliverable of providing insight, comment and advice on existing and emerging local government policy areas potentially affecting the siting process including those policies emerging at a provincial government level.

The costs and activities, as outlined, assist in strengthening existing relationships with Municipal Forum members, facilitate effective NWMO liaison with municipal associations, and provide guidance on research aimed at yielding tools to assist municipalities in considering large economic development projects, such as APM.

A complementary deliverable to the inputs received from the Forum members on the siting process, is insight on effective communication techniques and best practices, and the reciprocal educating of the Forum members on APM and the NWMO including coordinated tours of the dry storage facilities. As primary contacts for members in their host provinces, first-hand experience is well-received and assists in awareness building.

Assumptions

Current commitment from the Forum members has been articulated and communicated through to the end of 2010 with tacit commitment beyond, e.g. into 2011. Election cycles can potentially affect membership on the Forum (e.g. failure to be re-elected in a municipal election, decision not to seek re-election), and the municipal election cycles are different in each province. This has an effect on the historical knowledge of the core Forum membership were membership to change.

As the siting process progresses, it is expected that the Forum membership and advisory direction will change and adapt to reflect the trends and patterns emerging both as a result of the siting process, but also as a result of local government relations, municipal-provincial relations and the effect and progress of the research directed by the Forum. For example, the methods of communicating to municipalities whom have expressed interest will evolve once the siting process has been officially been launched. Similarly, priority issues will emerge for local government in areas within their sphere of influence and jurisdiction such as emergency response, local transportation, and taxation. Regardless of the change the value of maintaining a relationship with municipal experts and especially those connected to municipal associations in a collective setting is clear.

Costs included in this category are primarily travel-related expenses for all Forum members and necessary and participating NWMO staff, as well as related expenses for off-site educational excursions for Forum Members (e.g. tour of Darlington Dry Storage Facility). Costs can also include the necessary on and off-site meeting expenses (catering, meeting room, A/V), and it is contemplated that one or more educational excursions is expected to be held per year. Finally, and depending on the issues being discussed and raised by Forum members additional expertise in the form of guest speakers at Forum meetings may be required/requested and the estimates include for that possibility in the form of per diems and travel and accommodation.

As the process gets closer to the time when 1 or more potential host communities are preparing to negotiate with the NWMO to be a potential host (Step 5), the Forum will likely be disbanded or significantly changed in scope to reflect, a. being at Step 5, and/or b. a new set of issues that prompt municipalities to turn to their Associations for guidance/interaction with the NWMO such as those affecting the potential transportation communities. Future meetings of Forum and their scope are not known and may include an evolved Forum dealing with newer and emerging municipal issues concerning communities on the transportation routes.

Schedule	Start Year	1	2010	Finish Year	9	2018

Type Fixed

Calculations and Notes:

- 4 meetings per year @ $20k per meeting = $80k for total meeting costs.
- 1-2 educational excursions = $3k (includes lengthened/extended accommodations, meals, group (bus) transportation, and catering costs).
- Potential travel to other provinces for meetings (e.g. SK, NB)
- Potential expenses/per diems for guest speakers
- Potential expenses for Forum Members to attend future, and other NWMO events such as an international Frum/expo in 2011.
- Current commitment for Forum is to end of 2010
- Tacit commitment for Forum to 2011

Current budget Y01 (2010) budget - $150,000

Y02 (2011) – Y04 (2013) 3 x $150,000 = $ 450,000
Y05 (2014) – Y09 (2018) 5 x $100,000 = $ 500,000
Y10 (2019) - Y25 (2034) 16 x $100,000 = $1,600,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,100,000	$ 1,100,000	$ 275,000	$ 1,375,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**21**

WBS (New)	560	05	10	20	110			**Prepared By:**	P. Simmons
WBS (Old)									

BUILDING RELATIONS – Regional Engagement – MUNCIPAL FORUM MEETINGS (150)

WBS Title **MUNICIPAL FORUM MEETINGS**

Description

Municipal Forum category includes those costs associated with the meetings and assemblies of the Municipal Forum, a group formed in late 2008 comprised of senior level municipal experts from the four nuclear-cycle provinces primarily drawn from the municipal associations, and who inform a research agenda for a large national infrastructure project, and who also provide advice and comment to related municipal-specific issues, and effectively communicating with the local level of government.

The Forum consists of 15 individual organizations whom are invited to participate at the meetings typically held up to 4 times per year.

The Municipal Forum convenes up to four times per year (avg. 3). To date the meetings have been held in Toronto (at the NWMO offices), and at a meeting facility in downtown Ottawa.

Deliverable

The category's primary deliverable is the provision of guidance to a research agenda as it relates to municipally related areas of interest, with a secondary deliverable of providing insight, comment and advice on existing and emerging local government policy areas potentially affecting the siting process including those policies emerging at a provincial government level.

The costs and activities, as outlined, assist in strengthening existing relationships with Municipal Forum members, facilitate effective NWMO liaison with municipal associations, and provide guidance on research aimed at yielding tools to assist municipalities in considering large economic development projects, such as APM.

A complementary deliverable to the inputs received from the Forum members on the siting process, is insight on effective communication techniques and best practices, and the reciprocal educating of the Forum members on APM and the NWMO including coordinated tours of the dry storage facilities. As primary contacts for members in their host provinces, first-hand experience is well-received and assists in awareness building.

Assumptions

Current commitment from the Forum members has been articulated and communicated through to the end of 2010 with tacit commitment beyond, e.g. into 2011. Election cycles can potentially affect membership on the Forum (e.g. failure to be re-elected in a municipal election, decision not to seek re-election), and the municipal election cycles are different in each province. This has an effect on the historical knowledge of the core Forum membership were membership to change.

As the siting process progresses, it is expected that the Forum membership and advisory direction will change and adapt to reflect the trends and patterns emerging both as a result of the siting process, but also as a result of local government relations, municipal-provincial relations and the effect and progress of the research directed by the Forum. For example, the methods of communicating to municipalities whom have expressed interest will evolve once the siting process has been officially been launched. Similarly, priority issues will emerge for local government in areas within their sphere of influence and jurisdiction such as emergency response, local transportation, and taxation. Regardless of the change the value of maintaining a relationship with municipal experts and especially those connected to municipal associations in a collective setting is clear.

Costs included in this category are primarily travel-related expenses for all Forum members and necessary and participating NWMO staff, as well as related expenses for off-site educational excursions for Forum Members (e.g. tour of Darlington Dry Storage Facility). Costs can also include the necessary on and off-site meeting expenses (catering, meeting room, A/V), and it is contemplated that one or more educational excursions is expected to be held per year. Finally, and depending on the issues being discussed and raised by Forum members additional expertise in the form of guest speakers at Forum meetings may be required/requested and the estimates include for that possibility in the form of per diems and travel and accommodation.

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Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes:

- 4 meetings per year @ $20k per meeting = $80k for total meeting costs.
- 1-2 educational excursions = $3k (includes lengthened/extended accommodations, meals, group (bus) transportation, and catering costs).
- Potential travel to other provinces for meetings (e.g. SK, NB)
- Potential expenses/per diems for guest speakers
- Potential expenses for Forum Members to attend future, and other NWMO events such as an international Frum/expo in 2011.
- Current commitment for Forum is to end of 2010
- Tacit commitment for Forum to 2011

Current budget Y01 (2010) budget - $150,000

Y02 (2011) – Y04 (2013) 3 x $150,000 = $ 450,000
Y05 (2014) – Y09 (2018) 5 x $100,000 = $ 500,000
Y10 (2019) - Y25 (2034) 16 x $100,000 = $1,600,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 600,000	$ 600,000	$ 150,000	$ 750,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**21**

WBS (New)	560	05	10	30	90			**Prepared By:**	P. Simmons
WBS (Old)									

BUILDING RELATIONS – Regional Engagement – MUNCIPAL FORUM MEETINGS (150)

WBS Title **MUNICIPAL FORUM MEETINGS**

Description

Municipal Forum category includes those costs associated with the meetings and assemblies of the Municipal Forum, a group formed in late 2008 comprised of senior level municipal experts from the four nuclear-cycle provinces primarily drawn from the municipal associations, and who inform a research agenda for a large national infrastructure project, and who also provide advice and comment to related municipal-specific issues, and effectively communicating with the local level of government.

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Deliverable

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Assumptions

Current commitment from the Forum members has been articulated and communicated through to the end of 2010 with tacit commitment beyond, e.g. into 2011. Election cycles can potentially affect membership on the Forum (e.g. failure to be re-elected in a municipal election, decision not to seek re-election), and the municipal election cycles are different in each province. This has an effect on the historical knowledge of the core Forum membership were membership to change.

As the siting process progresses, it is expected that the Forum membership and advisory direction will change and adapt to reflect the trends and patterns emerging both as a result of the siting process, but also as a result of local government relations, municipal-provincial relations and the effect and progress of the research directed by the Forum. For example, the methods of communicating to municipalities whom have expressed interest will evolve once the siting process has been officially been launched. Similarly, priority issues will emerge for local government in areas within their sphere of influence and jurisdiction such as emergency response, local transportation, and taxation. Regardless of the change the value of maintaining a relationship with municipal experts and especially those connected to municipal associations in a collective setting is clear.

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Schedule	Start Year	16	2025	Finish Year	25	2034

Type Fixed

Calculations and Notes:

- 4 meetings per year @ $20k per meeting = $80k for total meeting costs.
- 1-2 educational excursions = $3k (includes lengthened/extended accommodations, meals, group (bus) transportation, and catering costs).
- Potential travel to other provinces for meetings (e.g. SK, NB)
- Potential expenses/per diems for guest speakers
- Potential expenses for Forum Members to attend future, and other NWMO events such as an international Frum/expo in 2011.
- Current commitment for Forum is to end of 2010
- Tacit commitment for Forum to 2011

Current budget Y01 (2010) budget - $150,000

Y02 (2011) – Y04 (2013) 3 x $150,000 = $ 450,000
Y05 (2014) – Y09 (2018) 5 x $100,000 = $ 500,000
Y10 (2019) - Y25 (2034) 16 x $100,000 = $1,600,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,000,000	$ 1,000,000	$ 250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	140			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	GOVERNMENT RELATIONS MEETINGS								
Description	· Brief government officials and elected representatives from the nuclear provinces and federal government o Quarterly in-person briefings with Natural Resources Canada, every year o Annual in-person briefing with the Minister of Natural Resources Canada, or as required o Minimum of one annual in-person briefing with representatives from the lead provincial department/ministry for the NWMO file o Minimum of one annual cross-departmental briefing in each province and at the federal level o One-on-one briefings as required with Ministers of relevant portfolios at federal and provincial levels o One-on-one briefings as required with individual MPs, MPPs, MLAs, MNAs, if there is community interest within their riding o Contribute to Government of Canada delegations at the OECD Nuclear Energy Agency								
Deliverable	· Build relationships. · Build understanding of and support for the project and process. · Facilitate decision-making where required.								
Assumptions	· Costs involve travel, accommodation, meals and registration.								
Schedule	Start Year		6 2015			Finish Year	9 2018		
Type	Fixed								
Calculations and Notes:	· 2011 – 2015, $150k/year. · 2016 – 2064, same level of spending, $200K/year then $100k/year 2065 - 2100.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,350,000	$ 1,350,000	$ 337,500	$ 1,687,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	130			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	GOVERNMENT RELATIONS MEETINGS								
Description	· Brief government officials and elected representatives from the nuclear provinces and federal government o Quarterly in-person briefings with Natural Resources Canada, every year o Annual in-person briefing with the Minister of Natural Resources Canada, or as required o Minimum of one annual in-person briefing with representatives from the lead provincial department/ministry for the NWMO file o Minimum of one annual cross-departmental briefing in each province and at the federal level o One-on-one briefings as required with Ministers of relevant portfolios at federal and provincial levels o One-on-one briefings as required with individual MPs, MPPs, MLAs, MNAs, if there is community interest within their riding o Contribute to Government of Canada delegations at the OECD Nuclear Energy Agency								
Deliverable	· Build relationships. · Build understanding of and support for the project and process. · Facilitate decision-making where required.								
Assumptions	· Costs involve travel, accommodation, meals and registration.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	· 2016 – 2064, same level of spending, $200K/year then $100k/year 2065 - 2100.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,200,000	$ 1,200,000	$ 300,000	$ 1,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	110			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	GOVERNMENT RELATIONS MEETINGS								
Description	· Brief government officials and elected representatives from the nuclear provinces and federal government o Quarterly in-person briefings with Natural Resources Canada, every year o Annual in-person briefing with the Minister of Natural Resources Canada, or as required o Minimum of one annual in-person briefing with representatives from the lead provincial department/ministry for the o Minimum of one annual cross-departmental briefing in each province and at the federal level o One-on-one briefings as required with Ministers of relevant portfolios at federal and provincial levels o One-on-one briefings as required with individual MPs, MPPs, MLAs, MNAs, if there is community interest within their o Contribute to Government of Canada delegations at the OECD Nuclear Energy Agency								
Deliverable	· Build relationships. · Build understanding of and support for the project and process. · Facilitate decision-making where required.								
Assumptions	· Costs involve travel, accommodation, meals and registration.								
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	· 2016 – 2064, same level of spending, $200K/year then $100k/year 2065 - 2100.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,000,000	$ 2,000,000	$ 500,000	$ 2,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	60			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	GOVERNMENT RELATIONS MEETINGS								
Description	· Brief government officials and elected representatives from the nuclear provinces and federal government o Quarterly in-person briefings with Natural Resources Canada, every year o Annual in-person briefing with the Minister of Natural Resources Canada, or as required o Minimum of one annual in-person briefing with representatives from the lead provincial department/ministry for the NWMO file o Minimum of one annual cross-departmental briefing in each province and at the federal level o One-on-one briefings as required with Ministers of relevant portfolios at federal and provincial levels o One-on-one briefings as required with individual MPs, MPPs, MLAs, MNAs, if there is community interest within their riding o Contribute to Government of Canada delegations at the OECD Nuclear Energy Agency								
Deliverable	· Build relationships. · Build understanding of and support for the project and process. · Facilitate decision-making where required.								
Assumptions	· Costs involve travel, accommodation, meals and registration.								
Schedule	Start Year		26	2035		Finish Year	55	2064	
Type	Fixed								
Calculations and Notes:	· 2016 – 2064, same level of spending, $200K/year then $100k/year 2065 - 2100.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,000,000	$ 6,000,000	$ 1,500,000	$ 7,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	50	30			**Prepared By:**	J. Robinson	
WBS (Old)										
WBS Title	GOVERNMENT RELATIONS MEETINGS									
Description	· Brief government officials and elected representatives from the nuclear provinces and federal government o Quarterly in-person briefings with Natural Resources Canada, every year o Annual in-person briefing with the Minister of Natural Resources Canada, or as required o Minimum of one annual in-person briefing with representatives from the lead provincial department/ministry for the NWMO file o Minimum of one annual cross-departmental briefing in each province and at the federal level o One-on-one briefings as required with Ministers of relevant portfolios at federal and provincial levels o One-on-one briefings as required with individual MPs, MPPs, MLAs, MNAs, if there is community interest within their riding o Contribute to Government of Canada delegations at the OECD Nuclear Energy Agency									
Deliverable	· Build relationships. · Build understanding of and support for the project and process. · Facilitate decision-making where required.									
Assumptions	· Costs involve travel, accommodation, meals and registration.									
Schedule	Start Year		56	2065			Finish Year	125	2134	
Type	Fixed									
Calculations and Notes:	· 2016 – 2064, same level of spending, $200K/year then $100k/year 2065 - 2100.									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,600,000	$ 3,600,000	$ 900,000	$ 4,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	150			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS								
Description	In alignment with the recommendations from the NWMO Youth Roundtable and the NWMO Implementation Plan in response to the Youth Roundtable, develop an NWMO education, outreach and capacity building strategy for young Canadians that incorporates both technical and social disciplines. This would include consideration of Youth Roundtable recommendations in such areas as: · Targeted outreach to relevant university clubs to provide information sessions; · Targeted outreach to key professors to explore opportunities to integrate the initiative in classroom dialogues/student projects; · Establishment of scholarships and grants across relevant disciplines; · Opportunities to sponsor youth participation at relevant national and international conferences; · Promotion of science learning through investment in science fairs, camps, clubs.								
Deliverable									
Assumptions									
Schedule	Start Year		2	2011		Finish Year	9	2018	
Type	Fixed								
Calculations	· Y2 – Y55, $200K/year · Y56 - Y150 $50K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,600,000	$ 1,600,000	$ 400,000	$ 2,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	140			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS								
Description	In alignment with the recommendations from the NWMO Youth Roundtable and the NWMO Implementation Plan in response to the Youth Roundtable, develop an NWMO education, outreach and capacity building strategy for young Canadians that incorporates both technical and social disciplines. This would include consideration of Youth Roundtable recommendations in such areas as: · Targeted outreach to relevant university clubs to provide information sessions; · Targeted outreach to key professors to explore opportunities to integrate the initiative in classroom dialogues/student projects; · Establishment of scholarships and grants across relevant disciplines; · Opportunities to sponsor youth participation at relevant national and international conferences; · Promotion of science learning through investment in science fairs, camps, clubs.								
Deliverable									
Assumptions									
Schedule	Start Year		10	2019		Finish Year		15	2024
Type	Fixed								
Calculations	· Y2 – Y55, $200K/year · Y56 - Y150 $50K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,200,000	$ 1,200,000	$ 300,000	$ 1,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	120			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS								
Description	In alignment with the recommendations from the NWMO Youth Roundtable and the NWMO Implementation Plan in response to the Youth Roundtable, develop an NWMO education, outreach and capacity building strategy for young Canadians that incorporates both technical and social disciplines. This would include consideration of Youth Roundtable recommendations in such areas as: · Targeted outreach to relevant university clubs to provide information sessions; · Targeted outreach to key professors to explore opportunities to integrate the initiative in classroom dialogues/student projects; · Establishment of scholarships and grants across relevant disciplines; · Opportunities to sponsor youth participation at relevant national and international conferences; · Promotion of science learning through investment in science fairs, camps, clubs.								
Deliverable									
Assumptions									
Schedule	Start Year		16	2025		Finish Year		25	2034
Type	Fixed								
Calculations	· Y2 – Y55, $200K/year · Y56 - Y150 $50K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,000,000	$ 2,000,000	$ 500,000	$ 2,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	70			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS								
Description	In alignment with the recommendations from the NWMO Youth Roundtable and the NWMO Implementation Plan in response to the Youth Roundtable, develop an NWMO education, outreach and capacity building strategy for young Canadians that incorporates both technical and social disciplines. This would include consideration of Youth Roundtable recommendations in such areas as: · Targeted outreach to relevant university clubs to provide information sessions; · Targeted outreach to key professors to explore opportunities to integrate the initiative in classroom dialogues/student projects; · Establishment of scholarships and grants across relevant disciplines; · Opportunities to sponsor youth participation at relevant national and international conferences; · Promotion of science learning through investment in science fairs, camps, clubs.								
Deliverable									
Assumptions									
Schedule	Start Year		26	2035			Finish Year	55	2064
Type	Fixed								
Calculations	· Y2 – Y55, $200K/year · Y56 - Y150 $50K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,000,000	$ 6,000,000	$ 1,500,000	$ 7,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	50	40			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS								
Description	In alignment with the recommendations from the NWMO Youth Roundtable and the NWMO Implementation Plan in response to the Youth Roundtable, develop an NWMO education, outreach and capacity building strategy for young Canadians that incorporates both technical and social disciplines. This would include consideration of Youth Roundtable recommendations in such areas as: · Targeted outreach to relevant university clubs to provide information sessions; · Targeted outreach to key professors to explore opportunities to integrate the initiative in classroom dialogues/student projects; · Establishment of scholarships and grants across relevant disciplines; · Opportunities to sponsor youth participation at relevant national and international conferences; · Promotion of science learning through investment in science fairs, camps, clubs.								
Deliverable									
Assumptions									
Schedule	Start Year		56	2065		Finish Year	125	2134	
Type	Fixed								
Calculations	· Y2 – Y55, $200K/year · Y56 - Y150 $50K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,500,000	$ 3,500,000	$ 875,000	$ 4,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	60	30			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS								
Description	In alignment with the recommendations from the NWMO Youth Roundtable and the NWMO Implementation Plan in response to the Youth Roundtable, develop an NWMO education, outreach and capacity building strategy for young Canadians that incorporates both technical and social disciplines. This would include consideration of Youth Roundtable recommendations in such areas as: · Targeted outreach to relevant university clubs to provide information sessions; · Targeted outreach to key professors to explore opportunities to integrate the initiative in classroom dialogues/student projects; · Establishment of scholarships and grants across relevant disciplines; · Opportunities to sponsor youth participation at relevant national and international conferences; · Promotion of science learning through investment in science fairs, camps, clubs.								
Deliverable									
Assumptions									
Schedule	Start Year		126	2135		Finish Year	150	2159	
Type	Fixed								
Calculations	· Y2 – Y55, $200K/year · Y56 - Y150 $50K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,250,000	$ 1,250,000	$ 312,500	$ 1,562,500

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**20**

WBS (New)	560	05	10	10	130			**Prepared By:**	P. Simmons
WBS (Old)									

BUILDING RELATIONS – Regional Engagement - MUNICIPAL ASSOCIATIONS (50)

WBS Title **MUNICIPAL ASSOCIATIONS**

Description

Category is specific to local (municipal) government relationships and their Associations only and includes for all activities related to relationship building and maintenance with municipal and municipally-related associations and organizations in the 4 nuclear-cycle provinces and includes both national-municipal and provincial-municipal organizations and their affiliates.

Activities associated with this category may include, but are not limited to, staff travel, accommodation, presentations, booth/exhibit transport, and related expenses including materials and related logistical costs required for the following:

Briefings provided on request to municipal associations, their affiliates, or municipally-related organizations and groups (e.g. Executive or specific committees, Boards of Directors),

Costs and related fees to participate, and/or attend annual/semi-annual association conferences and/or trade shows in all nuclear provinces. Conference costs include staff registration fees as delegates or participants, exhibitor participation in trade shows (including booth logistics costs), exhibitor booth space at trade shows, approved sponsorships,

Attendance and participation at special events (e.g. municipal associations, municipal-professional and quasi-professional) such as sector specific meetings (e.g. AMCTO) upon invitation and request to attend only

Deliverable

The primary deliverable associated with the activities, as outlined above, assists in maintaining and strengthening existing, and building new, relationships with the municipal associations and their affiliated organizations, and the municipally-related professional organizations and their leadership, executive and membership body.

The secondary, but no less important, deliverable, is the opportunity to increase awareness including the distribution of information, gathering intelligence about communities and regions, and their relationships, providing support to NWMO brand recognition, and growing and cultivating networking opportunities.

Assumptions

It is estimated and assumed that the NWMO will attend 20 - 25 conferences/briefings per year on average until 2018 after which a temporary 10% decline in conferences can be expected. Maintaining relations with interested organizations interested is recommended and prudent; the various associations tend to provide support to one another. The decline is the result of being at the negotiation Step 5 with one or more communities, and who may not be members of all affiliated associations. Presence at association conferences or trade shows once 2 candidate sites are selected would need to be examined until re-entry/continued membership is deemed appropriate.

Based on a current inventory of known associations presently in contact with the NWMO it is reasonable to assume a marginal expansion into the professional associations and their municipal affiliates in the years to come.

Currently relationships exist with the following municipal associations (although not all have requested/invited NWMO presence at conferences in 2009/10)

SASKATCHEWAN – 5 (SUMA, SARM, SEDA, RMAA, UMAAS)
ONTARIO – 9 (AMO, NOMA & NWORC, FONOM, ROMA, OSUM, EDCO, OMAA, AMCTO)
QUEBEC – 4 (FMQ, UMQ, ADMQ, APDEQ)
NEW BRUNSWICK - 4 (UMNB, CNBA, AFMNB, AMANB)
CANADA/NATIONAL – 3 (FCM, CAMA, EDAC)
OTHER – MEA, PEO, MFOA.

Conference and trade show locations change annually, and will affect the total cost of participation (e.g. 2009 OSUM in Cornwall = train, 2010 OSUM in Stratford = car; 2009 FCM in BC vs. 2010 FCM in Ontario).

Conference fees and registration also change from 1 year to the next with increases known only the year of the event. Increases can vary from 10% to 25%. Consequently, no average conference fee/cost is applicable for these estimates. Cost of entry one year does not necessarily commute into the next year as booth logistics will vary (new larger exhibit, modules, and transport), sponsorship may be lower/higher and the number of staff attending the booth will be higher than in past years due potentially to the to the larger exhibit at certain conferences.

An average of 25 conferences per year is expected to 2018 after which they may become more discretionary (e.g. municipal administrators associations may not be necessary in provinces that do not include a community in Step 5). Nonetheless it is expected that relationships with all municipal associations up to 2018 with potential for minor expansion of professional associations (e.g. transportation, planners, etc.) after 2018 will occur resulting in potentially a net zero change (adding/dropping).

Assumed that 80% of conferences will require a display booth, 3-4 NWMO staff, accommodation, travel, expenses, auto rental, mid-range sponsorship, and associated costs for occasional additional registration of NWMO staff.

Schedule	Start Year	1	2010	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Conferences and Trades shows

Approved Y01 (2010) Budget $50,000

Sponsorship, staff attendance, and participation year-over-year supports an increase in annual estimated expenditures and includes the transport of the new exhibit and display in various configurations. Similar to other budget areas, an increase in requests to participate may be realized after 2018 to accommodate specialized associations conferences.

Y02 (2011) – Y05 (2014) 4 x $100,000 = $ 400,000
Y06 (2015) - Y9 (2018) 4 x $125,000 = $ 500,000
Y10 (2019) – Y36 (2034) 16 x $125,000 = $ 2,000,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 950,000	$ 950,000	$ 237,500	$ 1,187,500

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**20**

WBS (New)	560	05	10	20	120			**Prepared By:**	P. Simmons
WBS (Old)									

BUILDING RELATIONS – Regional Engagement - MUNICIPAL ASSOCIATIONS (50)

WBS Title **MUNICIPAL ASSOCIATIONS**

Description

Category is specific to local (municipal) government relationships and their Associations only and includes for all activities related to relationship building and maintenance with municipal and municipally-related associations and organizations in the 4 nuclear-cycle provinces and includes both national-municipal and provincial-municipal organizations and their affiliates.

Activities associated with this category may include, but are not limited to, staff travel, accommodation, presentations, booth/exhibit transport, and related expenses including materials and related logistical costs required for the following:

Briefings provided on request to municipal associations, their affiliates, or municipally-related organizations and groups (e.g. Executive or specific committees, Boards of Directors),

Costs and related fees to participate, and/or attend annual/semi-annual association conferences and/or trade shows in all nuclear provinces. Conference costs include staff registration fees as delegates or participants, exhibitor participation in trade shows (including booth logistics costs), exhibitor booth space at trade shows, approved sponsorships,

Attendance and participation at special events (e.g. municipal associations, municipal-professional and quasi-professional) such as sector specific meetings (e.g. AMCTO) upon invitation and request to attend only

Deliverable

The primary deliverable associated with the activities, as outlined above, assists in maintaining and strengthening existing, and building new, relationships with the municipal associations and their affiliated organizations, and the municipally-related professional organizations and their leadership, executive and membership body.

The secondary, but no less important, deliverable, is the opportunity to increase awareness including the distribution of information, gathering intelligence about communities and regions, and their relationships, providing support to NWMO brand recognition, and growing and cultivating networking opportunities.

Assumptions

It is estimated and assumed that the NWMO will attend 20 - 25 conferences/briefings per year on average until 2018 after which a temporary 10% decline in conferences can be expected. Maintaining relations with interested organizations interested is recommended and prudent; the various associations tend to provide support to one another. The decline is the result of being at the negotiation Step 5 with one or more communities, and who may not be members of all affiliated associations. Presence at association conferences or trade shows once 2 candidate sites are selected would need to be examined until re-entry/continued membership is deemed appropriate.

Based on a current inventory of known associations presently in contact with the NWMO it is reasonable to assume a marginal expansion into the professional associations and their municipal affiliates in the years to come.

Currently relationships exist with the following municipal associations (although not all have requested/invited NWMO presence at conferences in 2009/10)

SASKATCHEWAN – 5 (SUMA, SARM, SEDA, RMAA, UMAAS)
ONTARIO – 9 (AMO, NOMA & NWORC, FONOM, ROMA, OSUM, EDCO, OMAA, AMCTO)
QUEBEC – 4 (FMQ, UMQ, ADMQ, APDEQ)
NEW BRUNSWICK - 4 (UMNB, CNBA, AFMNB, AMANB)
CANADA/NATIONAL – 3 (FCM, CAMA, EDAC)
OTHER – MEA, PEO, MFOA.

Conference and trade show locations change annually, and will affect the total cost of participation (e.g. 2009 OSUM in Cornwall = train, 2010 OSUM in Stratford = car; 2009 FCM in BC vs. 2010 FCM in Ontario).

Conference fees and registration also change from 1 year to the next with increases known only the year of the event. Increases can vary from 10% to 25%. Consequently, no average conference fee/cost is applicable for these estimates. Cost of entry one year does not necessarily commute into the next year as booth logistics will vary (new larger exhibit, modules, and transport), sponsorship may be lower/higher and the number of staff attending the booth will be higher than in past years due potentially to the to the larger exhibit at certain conferences.

An average of 25 conferences per year is expected to 2018 after which they may become more discretionary (e.g. municipal administrators associations may not be necessary in provinces that do not include a community in Step 5). Nonetheless it is expected that relationships with all municipal associations up to 2018 with potential for minor expansion of professional associations (e.g. transportation, planners, etc.) after 2018 will occur resulting in potentially a net zero change (adding/dropping).

Assumed that 80% of conferences will require a display booth, 3-4 NWMO staff, accommodation, travel, expenses, auto rental, mid-range sponsorship, and associated costs for occasional additional registration of NWMO staff.

Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes:

Conferences and Trades shows

Approved Y01 (2010) Budget $50,000

Sponsorship, staff attendance, and participation year-over-year supports an increase in annual estimated expenditures and includes the transport of the new exhibit and display in various configurations. Similar to other budget areas, an increase in requests to participate may be realized after 2018 to accommodate specialized associations conferences.

Y02 (2011) – Y05 (2014) 4 x $100,000 = $ 400,000
Y06 (2015) - Y9 (2018) 4 x $125,000 = $ 500,000
Y10 (2019) – Y36 (2034) 16 x $125,000 = $ 2,000,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$ 187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**20**

WBS (New)	560	05	10	30	100			**Prepared By:**	P. Simmons
WBS (Old)									

BUILDING RELATIONS – Regional Engagement - MUNICIPAL ASSOCIATIONS (50)

WBS Title **MUNICIPAL ASSOCIATIONS**

Description

Category is specific to local (municipal) government relationships and their Associations only and includes for all activities related to relationship building and maintenance with municipal and municipally-related associations and organizations in the 4 nuclear-cycle provinces and includes both national-municipal and provincial-municipal organizations and their affiliates.

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Attendance and participation at special events (e.g. municipal associations, municipal-professional and quasi-professional) such as sector specific meetings (e.g. AMCTO) upon invitation and request to attend only

Deliverable

The primary deliverable associated with the activities, as outlined above, assists in maintaining and strengthening existing, and building new, relationships with the municipal associations and their affiliated organizations, and the municipally-related professional organizations and their leadership, executive and membership body.

The secondary, but no less important, deliverable, is the opportunity to increase awareness including the distribution of information, gathering intelligence about communities and regions, and their relationships, providing support to NWMO brand recognition, and growing and cultivating networking opportunities.

Assumptions

It is estimated and assumed that the NWMO will attend 20 - 25 conferences/briefings per year on average until 2018 after which a temporary 10% decline in conferences can be expected. Maintaining relations with interested organizations interested is recommended and prudent; the various associations tend to provide support to one another. The decline is the result of being at the negotiation Step 5 with one or more communities, and who may not be members of all affiliated associations. Presence at association conferences or trade shows once 2 candidate sites are selected would need to be examined until re-entry/continued membership is deemed appropriate.

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QUEBEC – 4 (FMQ, UMQ, ADMQ, APDEQ)
NEW BRUNSWICK - 4 (UMNB, CNBA, AFMNB, AMANB)
CANADA/NATIONAL – 3 (FCM, CAMA, EDAC)
OTHER – MEA, PEO, MFOA.

Conference and trade show locations change annually, and will affect the total cost of participation (e.g. 2009 OSUM in Cornwall = train, 2010 OSUM in Stratford = car; 2009 FCM in BC vs. 2010 FCM in Ontario).

Conference fees and registration also change from 1 year to the next with increases known only the year of the event. Increases can vary from 10% to 25%. Consequently, no average conference fee/cost is applicable for these estimates. Cost of entry one year does not necessarily commute into the next year as booth logistics will vary (new larger exhibit, modules, and transport), sponsorship may be lower/higher and the number of staff attending the booth will be higher than in past years due potentially to the to the larger exhibit at certain conferences.

An average of 25 conferences per year is expected to 2018 after which they may become more discretionary (e.g. municipal administrators associations may not be necessary in provinces that do not include a community in Step 5). Nonetheless it is expected that relationships with all municipal associations up to 2018 with potential for minor expansion of professional associations (e.g. transportation, planners, etc.) after 2018 will occur resulting in potentially a net zero change (adding/dropping).

Assumed that 80% of conferences will require a display booth, 3-4 NWMO staff, accommodation, travel, expenses, auto rental, mid-range sponsorship, and associated costs for occasional additional registration of NWMO staff.

Schedule	Start Year	16	2025	Finish Year	25	2034

Type Fixed

Calculations and Notes:

Conferences and Trades shows

Approved Y01 (2010) Budget $50,000

Sponsorship, staff attendance, and participation year-over-year supports an increase in annual estimated expenditures and includes the transport of the new exhibit and display in various configurations. Similar to other budget areas, an increase in requests to participate may be realized after 2018 to accommodate specialized associations conferences.

Y02 (2011) – Y05 (2014) 4 x $100,000 = $ 400,000
Y06 (2015) - Y9 (2018) 4 x $125,000 = $ 500,000
Y10 (2019) – Y36 (2034) 16 x $125,000 = $ 2,000,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,250,000	$ 1,250,000	$ 312,500	$ 1,562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	260			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRIENNIAL REPORT								
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.								
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely								
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.								
Schedule	Start Year	4	2013			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 225,000	$ 225,000	$ 56,250		$ 281,250

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	250			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRIENNIAL REPORT								
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.								
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely								
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.								
Schedule	Start Year	10	2019		Finish Year	15	2024		
Type	Fixed								
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 250,000	$ 250,000	$	62,500	$ 312,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	230			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title	TRIENNIAL REPORT
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.

Schedule	Start Year	16	2025	Finish Year	25	2034	
Type	Fixed						
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.						

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 500,000	$ 500,000	$ 125,000	$ 625,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	180			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title	TRIENNIAL REPORT
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.

Schedule	Start Year	26	2035	Finish Year	55	2064	
Type	Fixed						
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.						

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,250,000	$ 1,250,000	$ 312,500	$ 1,562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	50	150			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRIENNIAL REPORT								
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.								
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely								
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.								
Schedule	Start Year	56	2065			Finish Year	125	2134	
Type	Fixed								
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,875,000	$ 2,875,000	$ 718,750	$ 3,593,750

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	60	70			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRIENNIAL REPORT								
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.								
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely								
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.								
Schedule	Start Year	126	2135			Finish Year	150	2159	
Type	Fixed								
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,000,000	$ 1,000,000	$ 250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	70	10			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRIENNIAL REPORT								
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.								
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely								
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.								
Schedule	Start Year	151	2160			Finish Year	151	2160	
Type	Fixed								
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 125,000	$ 125,000	$	31,250	$ 156,250

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	20			**Prepared By:**	J. Robinson
WBS (Old)									

WBS Title	EXHIBITS AND EDUCATION TOOLS
Description	Develop mobile exhibits and tools to facilitate community understanding of Adaptive Phased Management and the repository project. Exhibits will support engagement and capacity building initiatives in interested potential host communities. Replicate existing modules to allow concurrent use in up to two communities/events. Develop new modules to address issues such as transportation, community well-being, regulatory processes, Aboriginal Traditional Knowledge. Regular review and update of existing modules as repository designs evolve. Update virtual DGR. Maintenance of modules, e.g., repairs, upgrades, replace interactive components, etc. Develop two community-specific fixed modules for use in communities to support feasibility studies. Design and develop fixed exhibit in interested potential host community as part of Centre of Expertise. Develop training module, education materials to support staff in the use of the exhibits. Develop education kit to support visitor experience to the exhibit.
Deliverable	Y02 (2011) Replicate mobile exhibit for use for use at conferences and in communities potentially interested in hosting the project and neighbouring regions/communities. Y02 (2011) develop two new modules (Transportation, to be determined). Y04 to Y12 Two fixed exhibits in operation in two potential host communities that have sites undergoing detailed site investigations and socio-economic impact assessments. Y04 Develop community-specific modules. Y04 Education kit for visitors to the exhibit. Y13 Museum-style exhibit in operation in Centre of Expertise. Y13 Education kit for visitors to the museum-style exhibit.
Assumptions	Y01 to Y03: 2 mobile exhibits to support initial screening of 15 communities and feasibility studies in 10 potential sites Y02, develop two new modules, $100K Y03 to Y09 surface/subsurface investigations in two candidate sites, 2 fixed exhibits in community storefront office, with one module containing community-specific information. Design work for fixed exhibits begins in 2011 (Y02). Y13 (2022) Exhibit in place in Centre of expertise. Modules in mobile exhibits test concepts to be developed for museum-style exhibits. Design work for museum-style exhibit begins in Y10. Each new module (transportation, community specific information, etc.) costs approximately $42 to 47K based on Welcome Tower configuration and including content development, design, fabrication, computer interactive software and hardware, crating and initial installation in Toronto. Changes to video components of virtual DGR are as follows: · Add new chapter to video $10 to 12K ($ 4 to 6K programming plus content development) · Add new video or illustration to system, programming cost $1 to 2K · Revise DGR illustration/representation $ 1 to 5K programming cost Cost for each new set of 7 mobile exhibit modules: $115-140K Additional elements to create a more immersive environment for the virtual DGR display, $30K. Cost of fixed exhibit in community, $200K each.
Schedule	Start Year 1 2010 — Finish Year 9 2018
Type	Fixed
Calculations and Notes:	2011 (Y02) Replicate exhibit, update existing exhibit elements and develop supporting education materials $180K 2011 (Y02) Develop two new modules $100K 2011(Y02) Begin design and development of fixed exhibit for two communities, $400K 2011 (Y02) Total $680K 2012 (Y03) Fixed Exhibit development completed $80K 2013 (Y04) Exhibit maintenance and update, $75K 2014 (Y05) Exhibit maintenance and update, $50K 2015 (Y06) Exhibit maintenance and update, $50K

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 917,745	$ 917,745	$ 229,436	$ 1,147,181

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	160			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CONTRACTED WRITING								
Description	Support the NWMO's communication and engagement activities that seek to: – To raise the profile and enhance the image and reputation of the Nuclear Waste Management Organization (NWMO) among interested parties. – To build awareness and understanding for the important work that is being undertaken by the NWMO, in particular the siting process. – To build confidence and trust in the NWMO and its activities.								
Deliverable	Professional Writing/Copy-Editing, as required								
Assumptions	Work involves contracting external consultants to provide writing/copy-editing service to the NWMO: · Support required is consistent year to year (i.e. copy editing of Annual Report/Implementation Plan etc.)								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $165K; 2011 $125k; 2012 - 2014 $165/a. · 2015-2064, same level of spending, 165k/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,445,000	$ 1,445,000	$ 361,250	$ 1,806,250

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	150			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CONTRACTED WRITING								
Description	Support the NWMO's communication and engagement activities that seek to: – To raise the profile and enhance the image and reputation of the Nuclear Waste Management Organization (NWMO) among interested parties. – To build awareness and understanding for the important work that is being undertaken by the NWMO, in particular the siting process. – To build confidence and trust in the NWMO and its activities.								
Deliverable	Professional Writing/Copy-Editing, as required								
Assumptions	Work involves contracting external consultants to provide writing/copy-editing service to the NWMO: · Support required is consistent year to year (i.e. copy editing of Annual Report/Implementation Plan etc.)								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $165K; 2011 $125k; 2012 - 2014 $165/a. · 2015-2064, same level of spending, 165k/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 990,000	$ 990,000	$ 247,500	$ 1,237,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	130			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CONTRACTED WRITING								
Description	Support the NWMO's communication and engagement activities that seek to: – To raise the profile and enhance the image and reputation of the Nuclear Waste Management Organization (NWMO) among interested parties. – To build awareness and understanding for the important work that is being undertaken by the NWMO, in particular the siting process. – To build confidence and trust in the NWMO and its activities.								
Deliverable	Professional Writing/Copy-Editing, as required								
Assumptions	Work involves contracting external consultants to provide writing/copy-editing service to the NWMO: · Support required is consistent year to year (i.e. copy editing of Annual Report/Implementation Plan etc.)								
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $165K; 2011 $125k; 2012 - 2014 $165/a. · 2015-2064, same level of spending, 165k/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,650,000	$ 1,650,000	$ 412,500	$ 2,062,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	80			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CONTRACTED WRITING								
Description	Support the NWMO's communication and engagement activities that seek to: – To raise the profile and enhance the image and reputation of the Nuclear Waste Management Organization (NWMO) among interested parties. – To build awareness and understanding for the important work that is being undertaken by the NWMO, in particular the siting process. – To build confidence and trust in the NWMO and its activities.								
Deliverable	Professional Writing/Copy-Editing, as required								
Assumptions	Work involves contracting external consultants to provide writing/copy-editing service to the NWMO: · Support required is consistent year to year (i.e. copy editing of Annual Report/Implementation Plan etc.)								
Schedule	Start Year		26	2035			Finish Year	55	2064
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $165K; 2011 $125k; 2012 - 2014 $165/a. · 2015-2064, same level of spending, 165k/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 4,950,000	$ 4,950,000	$ 1,237,500	$ 6,187,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	170			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA MONITORING								
Description	Support the NWMO's communication and engagement by tracking media on a consistent and on-going basis.								
Deliverable	Engage media monitoring services to provide copies of media references of the NWMO in print or electronic formats.								
Assumptions	Media monitoring activities will increase as the NWMO generates more media attention on a local level through the implementation of the siting process.								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $65K/year; 2011 $50k/year; 2012 & 2014 $65k/year · 2015-2064, same level of spending, 65K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 570,000	$ 570,000	$ 142,500	$ 712,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	160			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA MONITORING								
Description	Support the NWMO's communication and engagement by tracking media on a consistent and on-going basis.								
Deliverable	Engage media monitoring services to provide copies of media references of the NWMO in print or electronic formats.								
Assumptions	Media monitoring activities will increase as the NWMO generates more media attention on a local level through the implementation of the siting process.								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $65K/year; 2011 $50k/year; 2012 & 2014 $65k/year · 2015-2064, same level of spending, 65K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 390,000	$ 390,000	$	97,500	$ 487,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	140			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA MONITORING								
Description	Support the NWMO's communication and engagement by tracking media on a consistent and on-going basis.								
Deliverable	Engage media monitoring services to provide copies of media references of the NWMO in print or electronic formats.								
Assumptions	Media monitoring activities will increase as the NWMO generates more media attention on a local level through the implementation of the siting process.								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $65K/year; 2011 $50k/year; 2012 & 2014 $65k/year · 2015-2064, same level of spending, 65K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 650,000	$ 650,000	$ 162,500	$ 812,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	90			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA MONITORING								
Description	Support the NWMO's communication and engagement by tracking media on a consistent and on-going basis.								
Deliverable	Engage media monitoring services to provide copies of media references of the NWMO in print or electronic formats.								
Assumptions	Media monitoring activities will increase as the NWMO generates more media attention on a local level through the implementation of the siting process.								
Schedule	Start Year			26	2035		Finish Year	55	2064
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $65K/year; 2011 $50k/year; 2012 & 2014 $65k/year · 2015-2064, same level of spending, 65K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,950,000	$ 1,950,000	$ 487,500	$ 2,437,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	180			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	WEBSITE MAINTENANCE								
Description	Maintenance, hosting and refinements to nwmo.ca on an on-going basis.								
Deliverable	Hosting agreement established and maintained with a web-hosting company on an annual basis. Review and update the website as necessary.								
Assumptions	Annual hosting agreement with web-hosting company. Every 3 years, the NWMO will also contract with a web development company to conduct a complete overhaul of nwmo.ca to ensure that the site incorporates latest technology and continues to be interesting and impactful.								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $25K · Board approved budget 2011 $25K · Board approved budget 2012-2014 $40K/year · 2015-2064, same level of spending, $40K/year and 100K every third year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 390,000	$ 390,000	$ 97,500	$ 487,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	170			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	WEBSITE MAINTENANCE								
Description	Maintenance, hosting and refinements to nwmo.ca on an on-going basis.								
Deliverable	Hosting agreement established and maintained with a web-hosting company on an annual basis. Review and update the website as necessary.								
Assumptions	Annual hosting agreement with web-hosting company. Every 3 years, the NWMO will also contract with a web development company to conduct a complete overhaul of nwmo.ca to ensure that the site incorporates latest technology and continues to be interesting and impactful.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $25K · Board approved budget 2011 $25K · Board approved budget 2012-2014 $40K/year · 2015-2064, same level of spending, $40K/year and 100K every third year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 360,000	$ 360,000	$ 90,000	$ 450,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	150			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	WEBSITE MAINTENANCE								
Description	Maintenance, hosting and refinements to nwmo.ca on an on-going basis.								
Deliverable	Hosting agreement established and maintained with a web-hosting company on an annual basis. Review and update the website as necessary.								
Assumptions	Annual hosting agreement with web-hosting company. Every 3 years, the NWMO will also contract with a web development company to conduct a complete overhaul of nwmo.ca to ensure that the site incorporates latest technology and continues to be interesting and impactful.								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $25K · Board approved budget 2011 $25K · Board approved budget 2012-2014 $40K/year · 2015-2064, same level of spending, $40K/year and 100K every third year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 580,000	$ 580,000	$ 145,000	$ 725,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	100			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	WEBSITE MAINTENANCE								
Description	Maintenance, hosting and refinements to nwmo.ca on an on-going basis.								
Deliverable	Hosting agreement established and maintained with a web-hosting company on an annual basis. Review and update the website as necessary.								
Assumptions	Annual hosting agreement with web-hosting company. Every 3 years, the NWMO will also contract with a web development company to conduct a complete overhaul of nwmo.ca to ensure that the site incorporates latest technology and continues to be interesting and impactful.								
Schedule	Start Year		26	2035			Finish Year	55	2064
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $25K · Board approved budget 2011 $25K · Board approved budget 2012-2014 $40K/year · 2015-2064, same level of spending, $40K/year and 100K every third year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 1,800,000	$ 1,800,000	$	450,000	$ 2,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	190			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	DIRECTED COMMUNICATIONS								
Description	Support the NWMO's communication and engagement activities through the development of various corporate communication collateral including: · Backgrounders · Fact Sheets · Trade Show Booths · Newsletters · Etc.								
Deliverable	The communication collateral will bridge print, web development, graphic design, video and social media to provide written, digital and multimedia communications solutions that are aligned with and contribute to the overall NWMO communications strategy.								
Assumptions	The NWMO will continue to develop corporate communication material at the same level as it has. More and different types of information will need to be made available as the NWMO begins to work with communities on a local basis as part of the siting process.								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations	· 2010 560K · 2011 360K · 2012 360K · 2013 360K · 2014 360K · 2015-2064, same level of spending, 360K/year · 2065-2134 - Y155 $100K/yr · 2135-2159 $200K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,430,000	$ 3,430,000	$ 857,500	$ 4,287,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	180			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	DIRECTED COMMUNICATIONS								
Description	Support the NWMO's communication and engagement activities through the development of various corporate communication collateral including: · Backgrounders · Fact Sheets · Trade Show Booths · Newsletters · Etc.								
Deliverable	The communication collateral will bridge print, web development, graphic design, video and social media to provide written, digital and multimedia communications solutions that are aligned with and contribute to the overall NWMO communications strategy.								
Assumptions	The NWMO will continue to develop corporate communication material at the same level as it has. More and different types of information will need to be made available as the NWMO begins to work with communities on a local basis as part of the siting process.								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations	· 2010 560K · 2011 360K · 2012 360K · 2013 360K · 2014 360K · 2015-2064, same level of spending, 360K/year · 2065-2134 - Y155 $100K/yr · 2135-2159 $200K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,160,000	$ 2,160,000	$ 540,000	$ 2,700,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	160			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	DIRECTED COMMUNICATIONS								
Description	Support the NWMO's communication and engagement activities through the development of various corporate communication collateral including: · Backgrounders · Fact Sheets · Trade Show Booths · Newsletters · Etc.								
Deliverable	The communication collateral will bridge print, web development, graphic design, video and social media to provide written, digital and multimedia communications solutions that are aligned with and contribute to the overall NWMO communications strategy.								
Assumptions	The NWMO will continue to develop corporate communication material at the same level as it has. More and different types of information will need to be made available as the NWMO begins to work with communities on a local basis as part of the siting process.								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations	· 2010 560K · 2011 360K · 2012 360K · 2013 360K · 2014 360K · 2015-2064, same level of spending, 360K/year · 2065-2134 - Y155 $100K/yr · 2135-2159 $200K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,600,000	$ 3,600,000	$ 900,000	$ 4,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	110			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	DIRECTED COMMUNICATIONS								
Description	Support the NWMO's communication and engagement activities through the development of various corporate communication collateral including: · Backgrounders · Fact Sheets · Trade Show Booths · Newsletters · Etc.								
Deliverable	The communication collateral will bridge print, web development, graphic design, video and social media to provide written, digital and multimedia communications solutions that are aligned with and contribute to the overall NWMO communications strategy.								
Assumptions	The NWMO will continue to develop corporate communication material at the same level as it has. More and different types of information will need to be made available as the NWMO begins to work with communities on a local basis as part of the siting process.								
Schedule	Start Year		26	2035			Finish Year	55	2064
Type	Fixed								
Calculations	· 2010 560K · 2011 360K · 2012 360K · 2013 360K · 2014 360K · 2015-2064, same level of spending, 360K/year · 2065-2134 - Y155 $100K/yr · 2135-2159 $200K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 10,800,000	$ 10,800,000	$ 2,700,000	$ 13,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	50	80			**Prepared By:**	J. Robinson
WBS (Old)									

WBS Title	DIRECTED COMMUNICATIONS
Description	Support the NWMO's communication and engagement activities through the development of various corporate communication collateral including: · Backgrounders · Fact Sheets · Trade Show Booths · Newsletters · Etc.
Deliverable	The communication collateral will bridge print, web development, graphic design, video and social media to provide written, digital and multimedia communications solutions that are aligned with and contribute to the overall NWMO communications strategy.
Assumptions	The NWMO will continue to develop corporate communication material at the same level as it has. More and different types of information will need to be made available as the NWMO begins to work with communities on a local basis as part of the siting process.

Schedule	Start Year	56	2065	Finish Year	125	2134
Type	Fixed					

Calculations

- 2010 560K
- 2011 360K
- 2012 360K
- 2013 360K
- 2014 360K
- 2015-2064, same level of spending, 360K/year
- 2065-2134 - Y155 $100K/yr
- 2135-2159 $200K/yr

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 7,000,000	$ 7,000,000	$ 1,750,000	$ 8,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	60	40			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	DIRECTED COMMUNICATIONS								
Description	Support the NWMO's communication and engagement activities through the development of various corporate communication collateral including: · Backgrounders · Fact Sheets · Trade Show Booths · Newsletters · Etc.								
Deliverable	The communication collateral will bridge print, web development, graphic design, video and social media to provide written, digital and multimedia communications solutions that are aligned with and contribute to the overall NWMO communications strategy.								
Assumptions	The NWMO will continue to develop corporate communication material at the same level as it has. More and different types of information will need to be made available as the NWMO begins to work with communities on a local basis as part of the siting process.								
Schedule	Start Year		126	2135			Finish Year	150	2159
Type	Fixed								
Calculations	· 2010 560K · 2011 360K · 2012 360K · 2013 360K · 2014 360K · 2015-2064, same level of spending, 360K/year · 2065-2134 - Y155 $100K/yr · 2135-2159 $200K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 5,000,000	$ 5,000,000	$ 1,250,000	$ 6,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	200			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	TRANSLATION								
Description	Translation of all NWMO communication material.								
Deliverable	Translate all NWMO communication material into French. (i.e. print/audio/visual/website) into French.								
Assumptions	Assumes that the level of translation remains the same on an annual basis. The company should consider whether hiring a translator on full-time is more cost-efficient. Depending on the communities that the NWMO works with on a local basis, translation into other languages may be required. Does not assume aboriginal translation.								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations	· 2010, 220K · 2011, $50k; 2012-2064, 120K/year · 2065 - 2159 $40K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,110,000	$ 1,110,000	$ 277,500	$ 1,387,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	190			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	TRANSLATION								
Description	Translation of all NWMO communication material.								
Deliverable	Translate all NWMO communication material into French. (i.e. print/audio/visual/website) into French.								
Assumptions	Assumes that the level of translation remains the same on an annual basis. The company should consider whether hiring a translator on full-time is more cost-efficient. Depending on the communities that the NWMO works with on a local basis, translation into other languages may be required. Does not assume aboriginal translation.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations	· 2010, 220K · 2011, $50k; 2012-2064, 120K/year · 2065 - 2159 $40K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 720,000	$ 720,000	$ 180,000	$ 900,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	170			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	TRANSLATION								
Description	Translation of all NWMO communication material.								
Deliverable	Translate all NWMO communication material into French. (i.e. print/audio/visual/website) into French.								
Assumptions	Assumes that the level of translation remains the same on an annual basis. The company should consider whether hiring a translator on full-time is more cost-efficient. Depending on the communities that the NWMO works with on a local basis, translation into other languages may be required. Does not assume aboriginal translation.								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations	· 2010, 220K · 2011, $50k; 2012-2064, 120K/year · 2065 - 2159 $40K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,200,000	$ 1,200,000	$ 300,000	$ 1,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	120			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	TRANSLATION								
Description	Translation of all NWMO communication material.								
Deliverable	Translate all NWMO communication material into French. (i.e. print/audio/visual/website) into French.								
Assumptions	Assumes that the level of translation remains the same on an annual basis. The company should consider whether hiring a translator on full-time is more cost-efficient. Depending on the communities that the NWMO works with on a local basis, translation into other languages may be required. Does not assume aboriginal translation.								
Schedule	Start Year		26	2035			Finish Year	55	2064
Type	Fixed								
Calculations	· 2010, 220K · 2011, $50k; 2012-2064, 120K/year · 2065 - 2159 $40K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,600,000	$ 3,600,000	$ 900,000	$ 4,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	50	90			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	TRANSLATION								
Description	Translation of all NWMO communication material.								
Deliverable	Translate all NWMO communication material into French. (i.e. print/audio/visual/website) into French.								
Assumptions	Assumes that the level of translation remains the same on an annual basis. The company should consider whether hiring a translator on full-time is more cost-efficient. Depending on the communities that the NWMO works with on a local basis, translation into other languages may be required. Does not assume aboriginal translation.								
Schedule	Start Year		56	2065			Finish Year	125	2134
Type	Fixed								
Calculations	· 2010, 220K · 2011, $50k; 2012-2064, 120K/year · 2065 - 2159 $40K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,800,000	$ 2,800,000	$ 700,000	$ 3,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	60	50			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	TRANSLATION								
Description	Translation of all NWMO communication material.								
Deliverable	Translate all NWMO communication material into French. (i.e. print/audio/visual/website) into French.								
Assumptions	Assumes that the level of translation remains the same on an annual basis. The company should consider whether hiring a translator on full-time is more cost-efficient. Depending on the communities that the NWMO works with on a local basis, translation into other languages may be required. Does not assume aboriginal translation.								
Schedule	Start Year			126	2135		Finish Year	150	2159
Type	Fixed								
Calculations	· 2010, 220K · 2011, $50k; 2012-2064, 120K/year · 2065 - 2159 $40K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,000,000	$ 1,000,000	$ 250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	210			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA RELATIONS								
Description	Media relations activities to support the NWMO's communication and engagement activities.								
Deliverable	Development and execution of media relations activities on a corporate and local basis.								
Assumptions	Assumes that as the NWMO works more closely with communities and regions, more detailed media relations plans will be developed and executed.								
Schedule	Start Year		1	2010			Finish Year	9 2018	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $50K; 2011 $126K; 2012 - 2014 $50K. · 2015-2064, same level of spending, 50K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 426,000	$ 426,000	$ 106,500	$ 532,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	200			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA RELATIONS								
Description	Media relations activities to support the NWMO's communication and engagement activities.								
Deliverable	Development and execution of media relations activities on a corporate and local basis.								
Assumptions	Assumes that as the NWMO works more closely with communities and regions, more detailed media relations plans will be developed and executed.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $50K; 2011 $126K; 2012 - 2014 $50K. · 2015-2064, same level of spending, 50K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 300,000	$ 300,000	$ 75,000		$ 375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	180			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA RELATIONS								
Description	Media relations activities to support the NWMO's communication and engagement activities.								
Deliverable	Development and execution of media relations activities on a corporate and local basis.								
Assumptions	Assumes that as the NWMO works more closely with communities and regions, more detailed media relations plans will be developed and executed.								
Schedule	Start Year	16	2025			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $50K; 2011 $126K; 2012 - 2014 $50K. · 2015-2064, same level of spending, 50K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 500,000	$ 500,000	$ 125,000	$ 625,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	130			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA RELATIONS								
Description	Media relations activities to support the NWMO's communication and engagement activities.								
Deliverable	Development and execution of media relations activities on a corporate and local basis.								
Assumptions	Assumes that as the NWMO works more closely with communities and regions, more detailed media relations plans will be developed and executed.								
Schedule	Start Year	26	2035				Finish Year	55	2064
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $50K; 2011 $126K; 2012 - 2014 $50K. · 2015-2064, same level of spending, 50K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,500,000	$ 1,500,000	$ 375,000	$ 1,875,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	220			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CORPORATE CITIZENSHIP								
Description	The Nuclear Waste Management Organization (NWMO) has developed and implemented a Corporate Citizenship Program to enhance the organization's brand and image.								
Deliverable	Develop the focus for the Corporate Citizenship Program on an annual basis including themes for support.								
Assumptions	The NWMO's organizational mandate straddles both national and local parameters · The APM project is framed as a national infrastructure project but its impact is felt at the local level The scope for NWMO's corporate citizenship investments are anchored around identifying initiatives that build our brand nationally, and earn our reputation locally through a series of investments · 2008-2010: focused on 4 provinces; going forward, recognition that the scope of geographical focus may shift · Fluid framework to allow for regional expansion where we are active								
Schedule	Start Year		1	2010			Finish Year	9 2018	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010-2014 200K/year · 2015-2064, same level of spending, 200K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,800,000	$ 1,800,000	$ 450,000	$ 2,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	210			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CORPORATE CITIZENSHIP								
Description	The Nuclear Waste Management Organization (NWMO) has developed and implemented a Corporate Citizenship Program to enhance the organization's brand and image.								
Deliverable	Develop the focus for the Corporate Citizenship Program on an annual basis including themes for support.								
Assumptions	The NWMO's organizational mandate straddles both national and local parameters · The APM project is framed as a national infrastructure project but its impact is felt at the local level The scope for NWMO's corporate citizenship investments are anchored around identifying initiatives that build our brand nationally, and earn our reputation locally through a series of investments · 2008-2010: focused on 4 provinces; going forward, recognition that the scope of geographical focus may shift · Fluid framework to allow for regional expansion where we are active								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010-2014 200K/year · 2015-2064, same level of spending, 200K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,200,000	$ 1,200,000	$ 300,000	$ 1,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	190			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CORPORATE CITIZENSHIP								
Description	The Nuclear Waste Management Organization (NWMO) has developed and implemented a Corporate Citizenship Program to enhance the organization's brand and image.								
Deliverable	Develop the focus for the Corporate Citizenship Program on an annual basis including themes for support.								
Assumptions	The NWMO's organizational mandate straddles both national and local parameters · The APM project is framed as a national infrastructure project but its impact is felt at the local level The scope for NWMO's corporate citizenship investments are anchored around identifying initiatives that build our brand nationally, and earn our reputation locally through a series of investments · 2008-2010: focused on 4 provinces; going forward, recognition that the scope of geographical focus may shift · Fluid framework to allow for regional expansion where we are active								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010-2014 200K/year · 2015-2064, same level of spending, 200K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,000,000	$ 2,000,000	$ 500,000	$ 2,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	140			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CORPORATE CITIZENSHIP								
Description	The Nuclear Waste Management Organization (NWMO) has developed and implemented a Corporate Citizenship Program to enhance the organization's brand and image.								
Deliverable	Develop the focus for the Corporate Citizenship Program on an annual basis including themes for support.								
Assumptions	The NWMO's organizational mandate straddles both national and local parameters · The APM project is framed as a national infrastructure project but its impact is felt at the local level The scope for NWMO's corporate citizenship investments are anchored around identifying initiatives that build our brand nationally, and earn our reputation locally through a series of investments · 2008-2010: focused on 4 provinces; going forward, recognition that the scope of geographical focus may shift · Fluid framework to allow for regional expansion where we are active								
Schedule	Start Year		26	2035			Finish Year	55	2064
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010-2014 200K/year · 2015-2064, same level of spending, 200K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,000,000	$ 6,000,000	$ 1,500,000	$ 7,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	230			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MAILING								
Description	Cost of postage for NWMO mailings.								
Deliverable	The NWMO has a suite of corporate communication material that is mailed to those individuals on the NWMO mailing list.								
Assumptions	Assumes mailing of Annual Report, 4 newsletters, Implementation Plan (2) etc. Costs are expected to rise with the cost of postage rising as well as the number of people on the NWMO mailing list.								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations	· 2010 $50K; 2011 $40K; 2012 - 2014 $50K/year · 2015-2064, same level of spending, 50K/year · Y56 - Y150 $10K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 440,000	$ 440,000	$ 110,000	$ 550,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	220			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MAILING								
Description	Cost of postage for NWMO mailings.								
Deliverable	The NWMO has a suite of corporate communication material that is mailed to those individuals on the NWMO mailing list.								
Assumptions	Assumes mailing of Annual Report, 4 newsletters, Implementation Plan (2) etc. Costs are expected to rise with the cost of postage rising as well as the number of people on the NWMO mailing list.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations	· 2010 $50K; 2011 $40K; 2012 - 2014 $50K/year · 2015-2064, same level of spending, 50K/year · Y56 - Y150 $10K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 300,000	$ 300,000	$ 75,000	$ 375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	200			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MAILING								
Description	Cost of postage for NWMO mailings.								
Deliverable	The NWMO has a suite of corporate communication material that is mailed to those individuals on the NWMO mailing list.								
Assumptions	Assumes mailing of Annual Report, 4 newsletters, Implementation Plan (2) etc. Costs are expected to rise with the cost of postage rising as well as the number of people on the NWMO mailing list.								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations	· 2010 $50K; 2011 $40K; 2012 - 2014 $50K/year · 2015-2064, same level of spending, 50K/year · Y56 - Y150 $10K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 500,000	$ 500,000	$ 125,000	$ 625,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	150			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MAILING								
Description	Cost of postage for NWMO mailings.								
Deliverable	The NWMO has a suite of corporate communication material that is mailed to those individuals on the NWMO mailing list.								
Assumptions	Assumes mailing of Annual Report, 4 newsletters, Implementation Plan (2) etc. Costs are expected to rise with the cost of postage rising as well as the number of people on the NWMO mailing list.								
Schedule	Start Year			26	2035		Finish Year	55	2064
Type	Fixed								
Calculations	· 2010 $50K; 2011 $40K; 2012 - 2014 $50K/year · 2015-2064, same level of spending, 50K/year · Y56 - Y150 $10K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,500,000	$ 1,500,000	$ 375,000	$ 1,875,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	50	120			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MAILING								
Description	Cost of postage for NWMO mailings.								
Deliverable	The NWMO has a suite of corporate communication material that is mailed to those individuals on the NWMO mailing list.								
Assumptions	Assumes mailing of Annual Report, 4 newsletters, Implementation Plan (2) etc. Costs are expected to rise with the cost of postage rising as well as the number of people on the NWMO mailing list.								
Schedule	Start Year			56	2065		Finish Year	125	2134
Type	Fixed								
Calculations	· 2010 $50K; 2011 $40K; 2012 - 2014 $50K/year · 2015-2064, same level of spending, 50K/year · Y56 - Y150 $10K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 700,000	$ 700,000	$ 175,000	$ 875,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	60	60			**Prepared By:**	J. Robinson	
WBS (Old)										
WBS Title	MAILING									
Description	Cost of postage for NWMO mailings.									
Deliverable	The NWMO has a suite of corporate communication material that is mailed to those individuals on the NWMO mailing list.									
Assumptions	Assumes mailing of Annual Report, 4 newsletters, Implementation Plan (2) etc. Costs are expected to rise with the cost of postage rising as well as the number of people on the NWMO mailing list.									
Schedule	Start Year			126	2135			Finish Year	150	2159
Type	Fixed									
Calculations	· 2010 $50K; 2011 $40K; 2012 - 2014 $50K/year · 2015-2064, same level of spending, 50K/year · Y56 - Y150 $10K/yr									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 250,000	$ 250,000	$ 62,500	$ 312,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	240			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	PREMIUM PROGRAM								
Description	NWMO program of small gifts, giveaways promotional products at conferences, trade shows etc. Intended to support the organization's communications and engagement activities.								
Deliverable	Develop a comprehensive premium program with a suite of giveaways (pens, clothing etc.)								
Assumptions	Assumes that the premium program will be constant but that more products may be required due to increased level of activities at the local community level as part of siting.								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $75K; 2011 $50K; 2012 - 2014 $75K/year · 2015-2064, same level of spending, 75K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 650,000	$ 650,000	$ 162,500	$ 812,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	230			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	PREMIUM PROGRAM								
Description	NWMO program of small gifts, giveaways promotional products at conferences, trade shows etc. Intended to support the organization's communications and engagement activities.								
Deliverable	Develop a comprehensive premium program with a suite of giveaways (pens, clothing etc.)								
Assumptions	Assumes that the premium program will be constant but that more products may be required due to increased level of activities at the local community level as part of siting.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $75K; 2011 $50K; 2012 - 2014 $75K/year · 2015-2064, same level of spending, 75K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 450,000	$ 450,000	$	112,500	$ 562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	210			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	PREMIUM PROGRAM								
Description	NWMO program of small gifts, giveaways promotional products at conferences, trade shows etc. Intended to support the organization's communications and engagement activities.								
Deliverable	Develop a comprehensive premium program with a suite of giveaways (pens, clothing etc.)								
Assumptions	Assumes that the premium program will be constant but that more products may be required due to increased level of activities at the local community level as part of siting.								
Schedule	Start Year	16	2025			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $75K; 2011 $50K; 2012 - 2014 $75K/year · 2015-2064, same level of spending, 75K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$ 187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	160			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	PREMIUM PROGRAM								
Description	NWMO program of small gifts, giveaways promotional products at conferences, trade shows etc. Intended to support the organization's communications and engagement activities.								
Deliverable	Develop a comprehensive premium program with a suite of giveaways (pens, clothing etc.)								
Assumptions	Assumes that the premium program will be constant but that more products may be required due to increased level of activities at the local community level as part of siting.								
Schedule	Start Year		26	2035			Finish Year	55	2064
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $75K; 2011 $50K; 2012 - 2014 $75K/year · 2015-2064, same level of spending, 75K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,250,000	$ 2,250,000	$ 562,500	$ 2,812,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	250			**Prepared By:**	J Robinson
WBS (Old)									
WBS Title	YOUTH COMMUNICATIONS								
Description	The NWMO has established a program to engage youth on the work of the NWMO and the long-term management of used nuclear fuel due to the multi-generational nature of the long term management of used nuclear fuel.								
Deliverable	Annual Youth Engagement Program								
Assumptions	Assumes that as the NWMO works more closely with communities and regions, a more detailed local youth engagement program will be developed and executed.								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	2010, 160K 2011-2015 100K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 660,000	$ 660,000	$ 165,000	$ 825,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	90			**Prepared By:**	J. Robinson, P. Patton
WBS (Old)									
WBS Title	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION								
Description	Develop culturally-appropriate communication material that will be used to assist Aboriginal peoples in communities affected through the site selection process in understanding the NWMO, the long-term management of used nuclear fuel, to ensure that affected Aboriginal peoples are involved and able to make informed decisions.								
Deliverable	- Individual communication products for general use that explain the various components of the NWMO's work – DVD, brochures. - Translation of appropriate materials into Aboriginal languages common to the potential host community region - Y2-3: Engage with Aboriginal peoples in the areas of potential host communities involved in Feasibility Study to ensure that communication material is culturally appropriate; development of materials - Y4 onwards: communication materials development specific to Aboriginal communities in areas undergoing Detailed Analysis - Translators travelling with NWMO when engaging community members								
Assumptions	- Consultant/contractors with expertise to assisting in designing culturally appropriate material - Translators in appropriate languages - Development, printing and production of written, visual, web-based and interactive communication products - Independent contractors to Aboriginal communities to assist communities in reviewing and developing appropriate material - Translation services will continue in construction and operation to assist NWMO in communicating with local communities								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations	Y1-Y15: $125,000 per year Y16-Y55: $100,000 Y56 - Y125 $10K/yr Y126 - Y150 $25K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 1,125,000	$ 1,125,000	$ 281,250		$ 1,406,250

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	90			**Prepared By:**	J. Robinson, P.
WBS (Old)									
WBS Title	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION								
Description	Develop culturally-appropriate communication material that will be used to assist Aboriginal peoples in communities affected through the site selection process in understanding the NWMO, the long-term management of used nuclear fuel, to ensure that affected Aboriginal peoples are involved and able to make informed decisions.								
Deliverable	- Individual communication products for general use that explain the various components of the NWMO's work – DVD, brochures. - Translation of appropriate materials into Aboriginal languages common to the potential host community region - Y2-3: Engage with Aboriginal peoples in the areas of potential host communities involved in Feasibility Study to ensure that communication material is culturally appropriate; development of materials - Y4 onwards: communication materials development specific to Aboriginal communities in areas undergoing Detailed Analysis - Translators travelling with NWMO when engaging community members								
Assumptions	- Consultant/contractors with expertise to assisting in designing culturally appropriate material - Translators in appropriate languages - Development, printing and production of written, visual, web-based and interactive communication products - Independent contractors to Aboriginal communities to assist communities in reviewing and developing appropriate material - Translation services will continue in construction and operation to assist NWMO in communicating with local communities								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	Y1-Y15: $125,000 per year Y16-Y55: $100,000 Y56 - Y125 $10K/yr Y126 - Y150 $25K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$ 187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	70			**Prepared By:**	J. Robinson, P.
WBS (Old)									
WBS Title	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION								
Description	Develop culturally-appropriate communication material that will be used to assist Aboriginal peoples in communities affected through the site selection process in understanding the NWMO, the long-term management of used nuclear fuel, to ensure that affected Aboriginal peoples are involved and able to make informed decisions.								
Deliverable	- Individual communication products for general use that explain the various components of the NWMO's work – DVD, brochures. - Translation of appropriate materials into Aboriginal languages common to the potential host community region - Y2-3: Engage with Aboriginal peoples in the areas of potential host communities involved in Feasibility Study to ensure that communication material is culturally appropriate; development of materials - Y4 onwards: communication materials development specific to Aboriginal communities in areas undergoing Detailed Analysis - Translators travelling with NWMO when engaging community members								
Assumptions	- Consultant/contractors with expertise to assisting in designing culturally appropriate material - Translators in appropriate languages - Development, printing and production of written, visual, web-based and interactive communication products - Independent contractors to Aboriginal communities to assist communities in reviewing and developing appropriate material - Translation services will continue in construction and operation to assist NWMO in communicating with local communities								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	Y1-Y15: $125,000 per year Y16-Y55: $100,000 Y56 - Y125 $10K/yr Y126 - Y150 $25K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,000,000	$ 1,000,000	$ 250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	40	20			**Prepared By:**	J. Robinson, P.
WBS (Old)									
WBS Title	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION								
Description	Develop culturally-appropriate communication material that will be used to assist Aboriginal peoples in communities affected through the site selection process in understanding the NWMO, the long-term management of used nuclear fuel, to ensure that affected Aboriginal peoples are involved and able to make informed decisions.								
Deliverable	- Individual communication products for general use that explain the various components of the NWMO's work – DVD, brochures. - Translation of appropriate materials into Aboriginal languages common to the potential host community region - Y2-3: Engage with Aboriginal peoples in the areas of potential host communities involved in Feasibility Study to ensure that communication material is culturally appropriate; development of materials - Y4 onwards: communication materials development specific to Aboriginal communities in areas undergoing Detailed Analysis - Translators travelling with NWMO when engaging community members								
Assumptions	- Consultant/contractors with expertise to assisting in designing culturally appropriate material - Translators in appropriate languages - Development, printing and production of written, visual, web-based and interactive communication products - Independent contractors to Aboriginal communities to assist communities in reviewing and developing appropriate material - Translation services will continue in construction and operation to assist NWMO in communicating with local communities								
Schedule	Start Year		26	2035			Finish Year	55	2064
Type	Fixed								
Calculations and Notes:	Y1-Y15: $125,000 per year Y16-Y55: $100,000 Y56 - Y125 $10K/yr Y126 - Y150 $25K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,000,000	$ 3,000,000	$ 750,000	$ 3,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	50	20			**Prepared By:**	J. Robinson, P.
WBS (Old)									
WBS Title	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION								
Description	Develop culturally-appropriate communication material that will be used to assist Aboriginal peoples in communities affected through the site selection process in understanding the NWMO, the long-term management of used nuclear fuel, to ensure that affected Aboriginal peoples are involved and able to make informed decisions.								
Deliverable	- Individual communication products for general use that explain the various components of the NWMO's work – DVD, brochures. - Translation of appropriate materials into Aboriginal languages common to the potential host community region - Y2-3: Engage with Aboriginal peoples in the areas of potential host communities involved in Feasibility Study to ensure that communication material is culturally appropriate; development of materials - Y4 onwards: communication materials development specific to Aboriginal communities in areas undergoing Detailed Analysis - Translators travelling with NWMO when engaging community members								
Assumptions	- Consultant/contractors with expertise to assisting in designing culturally appropriate material - Translators in appropriate languages - Development, printing and production of written, visual, web-based and interactive communication products - Independent contractors to Aboriginal communities to assist communities in reviewing and developing appropriate material - Translation services will continue in construction and operation to assist NWMO in communicating with local communities								
Schedule	Start Year		56	2065			Finish Year	125	2134
Type	Fixed								
Calculations and Notes:	Y1-Y15: $125,000 per year Y16-Y55: $100,000 Y56 - Y125 $10K/yr Y126 - Y150 $25K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 700,000	$ 700,000	$ 175,000	$ 875,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	60	20			**Prepared By:**	J. Robinson, P.
WBS (Old)									

WBS Title	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION
Description	Develop culturally-appropriate communication material that will be used to assist Aboriginal peoples in communities affected through the site selection process in understanding the NWMO, the long-term management of used nuclear fuel, to ensure that affected Aboriginal peoples are involved and able to make informed decisions.
Deliverable	- Individual communication products for general use that explain the various components of the NWMO's work – DVD, brochures. - Translation of appropriate materials into Aboriginal languages common to the potential host community region - Y2-3: Engage with Aboriginal peoples in the areas of potential host communities involved in Feasibility Study to ensure that communication material is culturally appropriate; development of materials - Y4 onwards: communication materials development specific to Aboriginal communities in areas undergoing Detailed Analysis - Translators travelling with NWMO when engaging community members
Assumptions	- Consultant/contractors with expertise to assisting in designing culturally appropriate material - Translators in appropriate languages - Development, printing and production of written, visual, web-based and interactive communication products - Independent contractors to Aboriginal communities to assist communities in reviewing and developing appropriate material - Translation services will continue in construction and operation to assist NWMO in communicating with local communities

Schedule	Start Year	126	2135	Finish Year	150	2159
Type	Fixed					
Calculations and Notes:	Y1-Y15: $125,000 per year Y16-Y55: $100,000 Y56 - Y125 $10K/yr Y126 - Y150 $25K/yr					

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 625,000	$ 625,000	$ 156,250	$ 781,250

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	40			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	NATIONAL ABORIGINAL ORGANIZATIONS								
Description	Maintain relationships with National Aboriginal Organizations to ensure internal capacity to understand the NWMO's work, to engage with the NWMO on an ongoing basis to provide insight on all phases of the project and to support their member organizations in being involved with the NWMO. National Aboriginal organizations will want to ensure that the NWMO and Crown fulfill the duty to consult and accommodate in an appropriate and respectful manner and that Aboriginal and treaty rights are protected. Support to national Aboriginal organizations will require consistent contact/liaison with the NWMO and internal capacity regarding the long-term management of used nuclear fuel.								
Deliverable	- Annual briefings and training of national Aboriginal organization core staff. - Consistent liaison mechanism with organizations - Organization input to NWMO documents and projects as requested over time								
Assumptions	- National Aboriginal organizations have limited capacity to sustain involvement on this subject over the very long term - NWMO will need to make considerable effort to ensure consistent liaison - Funds will be required to ensure that national Aboriginal organizations are able to devote the effort needed to maintain a consistent liaison with the NWMO; this will normally be interpreted as the need for partial funding of a liaison person and associated administrative expenses. - National organizations will request funds to conduct independent research and/or observation to ensure fulfillment of duty to consult and accommodate - Funds will be required through at least the beginning of the project Y1-6 and may be required over an extended period at least to completion of the Environmental Assessment and license (Y25-2034)								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	Individual organization funding for part of on FTE along with travel, overhead expenses, research/independent observation, training sessions with NWMO: Y1-Y2 (2010-2011): $520K – Years of capacity building, support and monitoring NWMO commitments & action Y3-5 (2012-2014): $460K - Years of capacity building, support and monitoring NWMO commitments & action Y 6-Y9 (2015-2018): $530K per year – Negotiation of agreements and EA process will be scrutinized closely Y10-Y15 (2019-2024): $340K per year - Negotiation of agreements and EA process will be scrutinized closely Y16-Y25 (2025-2034): $225K per year – Monitoring and observation								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 4,540,000	$ 4,540,000	$ 1,135,000	$ 5,675,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	40			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	NATIONAL ABORIGINAL ORGANIZATIONS								
Description	Maintain relationships with National Aboriginal Organizations to ensure internal capacity to understand the NWMO's work, to engage with the NWMO on an ongoing basis to provide insight on all phases of the project and to support their member organizations in being involved with the NWMO. National Aboriginal organizations will want to ensure that the NWMO and Crown fulfill the duty to consult and accommodate in an appropriate and respectful manner and that Aboriginal and treaty rights are protected. Support to national Aboriginal organizations will require consistent contact/liaison with the NWMO and internal capacity regarding the long-term management of used nuclear fuel.								
Deliverable	- Annual briefings and training of national Aboriginal organization core staff. - Consistent liaison mechanism with organizations - Organization input to NWMO documents and projects as requested over time								
Assumptions	- National Aboriginal organizations have limited capacity to sustain involvement on this subject over the very long term - NWMO will need to make considerable effort to ensure consistent liaison - Funds will be required to ensure that national Aboriginal organizations are able to devote the effort needed to maintain a consistent liaison with the NWMO; this will normally be interpreted as the need for partial funding of a liaison person and associated administrative expenses. - National organizations will request funds to conduct independent research and/or observation to ensure fulfillment of duty to consult and accommodate - Funds will be required through at least the beginning of the project Y1-6 and may be required over an extended period at least to completion of the Environmental Assessment and license (Y25-2034)								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	Individual organization funding for part of on FTE along with travel, overhead expenses, research/independent observation, training sessions with NWMO: Y1-Y2 (2010-2011): $520K – Years of capacity building, support and monitoring NWMO commitments & action Y3-5 (2012-2014): $460K - Years of capacity building, support and monitoring NWMO commitments & action Y 6-Y9 (2015-2018): $530K per year – Negotiation of agreements and EA process will be scrutinized closely Y10-Y15 (2019-2024): $340K per year - Negotiation of agreements and EA process will be scrutinized closely Y16-Y25 (2025-2034): $225K per year – Monitoring and observation								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 2,040,000	$ 2,040,000	$ 510,000		$ 2,550,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	20			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	NATIONAL ABORIGINAL ORGANIZATIONS								
Description	Maintain relationships with National Aboriginal Organizations to ensure internal capacity to understand the NWMO's work, to engage with the NWMO on an ongoing basis to provide insight on all phases of the project and to support their member organizations in being involved with the NWMO. National Aboriginal organizations will want to ensure that the NWMO and Crown fulfill the duty to consult and accommodate in an appropriate and respectful manner and that Aboriginal and treaty rights are protected. Support to national Aboriginal organizations will require consistent contact/liaison with the NWMO and internal capacity regarding the long-term management of used nuclear fuel.								
Deliverable	- Annual briefings and training of national Aboriginal organization core staff. - Consistent liaison mechanism with organizations - Organization input to NWMO documents and projects as requested over time								
Assumptions	- National Aboriginal organizations have limited capacity to sustain involvement on this subject over the very long term - NWMO will need to make considerable effort to ensure consistent liaison - Funds will be required to ensure that national Aboriginal organizations are able to devote the effort needed to maintain a consistent liaison with the NWMO; this will normally be interpreted as the need for partial funding of a liaison person and associated administrative expenses. - National organizations will request funds to conduct independent research and/or observation to ensure fulfillment of duty to consult and accommodate - Funds will be required through at least the beginning of the project Y1-6 and may be required over an extended period at least to completion of the Environmental Assessment and license (Y25-2034)								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	Individual organization funding for part of on FTE along with travel, overhead expenses, research/independent observation, training sessions with NWMO: Y1-Y2 (2010-2011): $520K – Years of capacity building, support and monitoring NWMO commitments & action Y3-5 (2012-2014): $460K - Years of capacity building, support and monitoring NWMO commitments & action Y 6-Y9 (2015-2018): $530K per year – Negotiation of agreements and EA process will be scrutinized closely Y10-Y15 (2019-2024): $340K per year - Negotiation of agreements and EA process will be scrutinized closely Y16-Y25 (2025-2034): $225K per year – Monitoring and observation								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,250,000	$ 2,250,000	$ 562,500	$ 2,812,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	50			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL PROVINICAL ORGANIZATIONS								
Description	Maintain relationships with provincial Aboriginal Organizations to ensure internal capacity to understand the NWMO's work, to engage with the NWMO on an ongoing basis to provide insight on all phases of the project and to support their member organizations in being involved with the NWMO. Provincial Aboriginal organizations will want to ensure that the NWMO and Crown fulfill the duty to consult and accommodate in an appropriate and respectful manner and that Aboriginal and treaty rights are protected. Support to provincial Aboriginal organizations will require consistent contact/liaison with the NWMO and internal capacity regarding the long-term management of used nuclear fuel.								
Deliverable	- Annual briefings and training of provincial Aboriginal organization core staff. - Input to NWMO documents and projects as requested over time - Annual update of provincial membership to apprise of NWMO work								
Assumptions	- Provincial Aboriginal organizations have limited capacity to sustain involvement on this subject over the very long term - NWMO will need to make considerable effort to ensure consistent liaison - Funds will be required to ensure that provincial Aboriginal organizations are able to devote the effort needed to maintain a consistent liaison with the NWMO; this will normally be interpreted as the partial funding of a liaison person and associated administrative expenses. - Funds will be required through at least the beginning of the project and may be required over an extended period at least to completion of the Environmental Assessment and license (Y34) - Provincial/regional organizations will request funds to conduct independent research and/or observation to ensure fulfillment of duty to consult and accommodate - Initially funds will be needed in all four provinces Y1-Y4; in Y4 funds will be needed for the provinces in which the potential site communities are located and at a minimum the 3 nuclear energy production provinces for the purposes of the transportation network; assume minimum 3 provinces Note: This has not provided for substantive involvement beyond the four nuclear provinces								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	Individual organization funding for part of on FTE along with travel, overhead expenses, research/independent observation, training sessions with NWMO: Y1 (2010) $590K; Y2 (2011) $882K; Years of capacity building, support and monitoring NWMO commitments & action Y3-9 (2012-2018): $652K per year; Years of capacity building, support and monitoring NWMO commitments & action; Negotiation of agreements and EA process will be scrutinized closely Y10-Y15 (2019- 2024): $492K per year; Negotiation of agreements and EA process will be scrutinized closely Y16-25 (2025-2034): $417K per year; Monitoring and observation								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,036,000	$ 6,036,000	$ 1,509,000	$ 7,545,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	50			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL PROVINICAL ORGANIZATIONS								
Description	Maintain relationships with provincial Aboriginal Organizations to ensure internal capacity to understand the NWMO's work, to engage with the NWMO on an ongoing basis to provide insight on all phases of the project and to support their member organizations in being involved with the NWMO. Provincial Aboriginal organizations will want to ensure that the NWMO and Crown fulfill the duty to consult and accommodate in an appropriate and respectful manner and that Aboriginal and treaty rights are protected. Support to provincial Aboriginal organizations will require consistent contact/liaison with the NWMO and internal capacity regarding the long-term management of used nuclear fuel.								
Deliverable	- Annual briefings and training of provincial Aboriginal organization core staff. - Input to NWMO documents and projects as requested over time - Annual update of provincial membership to apprise of NWMO work								
Assumptions	- Provincial Aboriginal organizations have limited capacity to sustain involvement on this subject over the very long term - NWMO will need to make considerable effort to ensure consistent liaison - Funds will be required to ensure that provincial Aboriginal organizations are able to devote the effort needed to maintain a consistent liaison with the NWMO; this will normally be interpreted as the partial funding of a liaison person and associated administrative expenses. - Funds will be required through at least the beginning of the project and may be required over an extended period at least to completion of the Environmental Assessment and license (Y34) - Provincial/regional organizations will request funds to conduct independent research and/or observation to ensure fulfillment of duty to consult and accommodate - Initially funds will be needed in all four provinces Y1-Y4; in Y4 funds will be needed for the provinces in which the potential site communities are located and at a minimum the 3 nuclear energy production provinces for the purposes of the transportation network; assume minimum 3 provinces Note: This has not provided for substantive involvement beyond the four nuclear provinces								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	Individual organization funding for part of on FTE along with travel, overhead expenses, research/independent observation, training sessions with NWMO: Y1 (2010) $590K; Y2 (2011) $882K; Years of capacity building, support and monitoring NWMO commitments & action Y3-9 (2012-2018): $652K per year; Years of capacity building, support and monitoring NWMO commitments & action; Negotiation of agreements and EA process will be scrutinized closely Y10-Y15 (2019- 2024): $492K per year; Negotiation of agreements and EA process will be scrutinized closely Y16-25 (2025-2034): $417K per year; Monitoring and observation								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,952,000	$ 2,952,000	$ 738,000	$ 3,690,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	30			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL PROVINICAL ORGANIZATIONS								
Description	Maintain relationships with provincial Aboriginal Organizations to ensure internal capacity to understand the NWMO's work, to engage with the NWMO on an ongoing basis to provide insight on all phases of the project and to support their member organizations in being involved with the NWMO. Provincial Aboriginal organizations will want to ensure that the NWMO and Crown fulfill the duty to consult and accommodate in an appropriate and respectful manner and that Aboriginal and treaty rights are protected. Support to provincial Aboriginal organizations will require consistent contact/liaison with the NWMO and internal capacity regarding the long-term management of used nuclear fuel.								
Deliverable	- Annual briefings and training of provincial Aboriginal organization core staff. - Input to NWMO documents and projects as requested over time - Annual update of provincial membership to apprise of NWMO work								
Assumptions	- Provincial Aboriginal organizations have limited capacity to sustain involvement on this subject over the very long term - NWMO will need to make considerable effort to ensure consistent liaison - Funds will be required to ensure that provincial Aboriginal organizations are able to devote the effort needed to maintain a consistent liaison with the NWMO; this will normally be interpreted as the partial funding of a liaison person and associated administrative expenses. - Funds will be required through at least the beginning of the project and may be required over an extended period at least to completion of the Environmental Assessment and license (Y34) - Provincial/regional organizations will request funds to conduct independent research and/or observation to ensure fulfillment of duty to consult and accommodate - Initially funds will be needed in all four provinces Y1-Y4; in Y4 funds will be needed for the provinces in which the potential site communities are located and at a minimum the 3 nuclear energy production provinces for the purposes of the transportation network; assume minimum 3 provinces Note: This has not provided for substantive involvement beyond the four nuclear provinces								
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	Individual organization funding for part of on FTE along with travel, overhead expenses, research/independent observation, training sessions with NWMO: Y1 (2010) $590K; Y2 (2011) $882K; Years of capacity building, support and monitoring NWMO commitments & action Y3-9 (2012-2018): $652K per year; Years of capacity building, support and monitoring NWMO commitments & action; Negotiation of agreements and EA process will be scrutinized closely Y10-Y15 (2019- 2024): $492K per year; Negotiation of agreements and EA process will be scrutinized closely Y16-25 (2025-2034): $417K per year; Monitoring and observation								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 4,170,000	$ 4,170,000	$ 1,042,500	$ 5,212,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	60			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL YOUTH INITIATIVES								
Description	Aboriginal youth will be involved in a gradual progression of learning and understanding used fuel management beginning with a learning program conducted with the youth of the Elders Forum. As the NWMO works closely with potential host communities and the surrounding Aboriginal communities, the Aboriginal youth in these communities will become involved through the Elders Forum youth and will learn from their experience, gradually taking a leadership role in their own communities through involvement with the Elders Forum. A program of involvement of Aboriginal youth in vicinity of communities in site selection will be important for the long term sustainability of intergenerational transfer of knowledge. Over time the program will involve capacity building projects and summer employment projects to help youth in potentially affected Aboriginal communities understand used fuel management and the APM project. Community Elders will be involved in the guidance and involvement of youth. An annual Aboriginal youth scholarship program to be included in the program development.								
Deliverable	- Initial learning sessions for youth of the NWMO Elders Forum - As the Elders Forum transitions to be representative of the Aboriginal communities in the vicinity of potential host communities, information sessions for community youth - Annual scholarship program								
Assumptions	- The Elders Forum will wish to continue with a program of development of the youth members to provide for a transition to the youth of the affected Aboriginal communities - Youth involvement should continue through EA licensing								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	Y1 (2010): $125K; Y2 (2011): $61K; Projects will be conducted through initiatives of youth of Elders Forum Y3-5: (2012-2014): $175K per year: : Summer Program with youth of Elders Forum assisting youth in affected areas Y 6-25 (2015-2034): $175K per year; Youth liaison program/group with affected Aboriginal communities including involvement of Elders with youth								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,411,000	$ 1,411,000	$ 352,750	$ 1,763,750

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	60			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL YOUTH INITIATIVES								
Description	Aboriginal youth will be involved in a gradual progression of learning and understanding used fuel management beginning with a learning program conducted with the youth of the Elders Forum. As the NWMO works closely with potential host communities and the surrounding Aboriginal communities, the Aboriginal youth in these communities will become involved through the Elders Forum youth and will learn from their experience, gradually taking a leadership role in their own communities through involvement with the Elders Forum. A program of involvement of Aboriginal youth in vicinity of communities in site selection will be important for the long term sustainability of intergenerational transfer of knowledge. Over time the program will involve capacity building projects and summer employment projects to help youth in potentially affected Aboriginal communities understand used fuel management and the APM project. Community Elders will be involved in the guidance and involvement of youth. An annual Aboriginal youth scholarship program to be included in the program development.								
Deliverable	- Initial learning sessions for youth of the NWMO Elders Forum - As the Elders Forum transitions to be representative of the Aboriginal communities in the vicinity of potential host communities, information sessions for community youth - Annual scholarship program								
Assumptions	- The Elders Forum will wish to continue with a program of development of the youth members to provide for a transition to the youth of the affected Aboriginal communities - Youth involvement should continue through EA licensing								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	Y1 (2010): $125K; Y2 (2011): $61K; Projects will be conducted through initiatives of youth of Elders Forum Y3-5: (2012-2014): $175K per year: : Summer Program with youth of Elders Forum assisting youth in affected areas Y 6-25 (2015-2034): $175K per year; Youth liaison program/group with affected Aboriginal communities including involvement of Elders with youth								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,050,000	$ 1,050,000	$ 262,500	$ 1,312,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	40			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL YOUTH INITIATIVES								
Description	Aboriginal youth will be involved in a gradual progression of learning and understanding used fuel management beginning with a learning program conducted with the youth of the Elders Forum. As the NWMO works closely with potential host communities and the surrounding Aboriginal communities, the Aboriginal youth in these communities will become involved through the Elders Forum youth and will learn from their experience, gradually taking a leadership role in their own communities through involvement with the Elders Forum. A program of involvement of Aboriginal youth in vicinity of communities in site selection will be important for the long term sustainability of intergenerational transfer of knowledge. Over time the program will involve capacity building projects and summer employment projects to help youth in potentially affected Aboriginal communities understand used fuel management and the APM project. Community Elders will be involved in the guidance and involvement of youth. An annual Aboriginal youth scholarship program to be included in the program development.								
Deliverable	- Initial learning sessions for youth of the NWMO Elders Forum - As the Elders Forum transitions to be representative of the Aboriginal communities in the vicinity of potential host communities, information sessions for community youth - Annual scholarship program								
Assumptions	- The Elders Forum will wish to continue with a program of development of the youth members to provide for a transition to the youth of the affected Aboriginal communities - Youth involvement should continue through EA licensing								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	Y1 (2010): $125K; Y2 (2011): $61K; Projects will be conducted through initiatives of youth of Elders Forum Y3-5: (2012-2014): $175K per year: : Summer Program with youth of Elders Forum assisting youth in affected areas Y 6-25 (2015-2034): $175K per year; Youth liaison program/group with affected Aboriginal communities including involvement of Elders with youth								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,750,000	$ 1,750,000	$ 437,500	$ 2,187,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	70			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL AWARENESS BUILDING								
Description	The APM project will require providing ongoing information briefings and general information/awareness programs among Aboriginal people in the provinces where site selection takes place and in general through national Aboriginal organizations. Opportunities to conduct awareness building activities will generally be sought through annual assemblies of national, provincial and regional organizations. Speaking engagements and briefings on request will also be conducted.								
Deliverable	- Tradeshow attendance at annual assembly of provincial and national Aboriginal organizations in affected provinces - Tradeshow attendance on request at regional assemblies								
Assumptions	- National and provincial organizations will request attendance of NWMO at annual assembly to keep members informed on APM - Requests will increase once communities enter Feasibility Study step in siting - Attendance at tradeshows will generate interest in regional areas for NWMO attendance at tradeshows								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	$50K per year 4 national organizations 10 provincial organizations 10 additional requests per year Tradeshow registration fees and staff travel expenses								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 450,000	$ 450,000	$ 112,500	$ 562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	70			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL AWARENESS BUILDING								
Description	The APM project will require providing ongoing information briefings and general information/awareness programs among Aboriginal people in the provinces where site selection takes place and in general through national Aboriginal organizations. Opportunities to conduct awareness building activities will generally be sought through annual assemblies of national, provincial and regional organizations. Speaking engagements and briefings on request will also be conducted.								
Deliverable	- Tradeshow attendance at annual assembly of provincial and national Aboriginal organizations in affected provinces - Tradeshow attendance on request at regional assemblies								
Assumptions	- National and provincial organizations will request attendance of NWMO at annual assembly to keep members informed on APM - Requests will increase once communities enter Feasibility Study step in siting - Attendance at tradeshows will generate interest in regional areas for NWMO attendance at tradeshows								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	$50K per year 4 national organizations 10 provincial organizations 10 additional requests per year Tradeshow registration fees and staff travel expenses								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 300,000	$ 300,000	$ 75,000	$ 375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	50			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL AWARENESS BUILDING								
Description	The APM project will require providing ongoing information briefings and general information/awareness programs among Aboriginal people in the provinces where site selection takes place and in general through national Aboriginal organizations. Opportunities to conduct awareness building activities will generally be sought through annual assemblies of national, provincial and regional organizations. Speaking engagements and briefings on request will also be conducted.								
Deliverable	- Tradeshow attendance at annual assembly of provincial and national Aboriginal organizations in affected provinces - Tradeshow attendance on request at regional assemblies								
Assumptions	- National and provincial organizations will request attendance of NWMO at annual assembly to keep members informed on APM - Requests will increase once communities enter Feasibility Study step in siting - Attendance at tradeshows will generate interest in regional areas for NWMO attendance at tradeshows								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	$50K per year 4 national organizations 10 provincial organizations 10 additional requests per year Tradeshow registration fees and staff travel expenses								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 500,000	$ 500,000	$ 125,000	$ 625,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	30			**Prepared By:**	P. Patton
WBS (Old)									

WBS Title ABORIGINAL ENGAGEMENT – ELDERS FORUM, NIIGANI

Description

Elders Forum

The NWMO Elders Forum provides advice to the NWMO in its relationships with Aboriginal peoples and in understanding Aboriginal culture, protocols, practices and Traditional Knowledge. The members of the Elders Forum represent a broad range of interests including, but not limited to, Aboriginal Traditional Knowledge, political affairs, community development, health and welfare, Aboriginal communications, cultural life of community and relationships, community protocols, treaty and historical relationships and youth interests.

· Members of the Elders Forum are residents of each of the four nuclear provinces Saskatchewan, Ontario, Quebec and New Brunswick. The NWMO may also choose, from time-to-time, to accept recommendations of a member from one of Canada's other provinces or territories and the NWMO may, at its discretion, appoint additional members to the Elders Forum.

· Each Elder is invited to ask a young person to accompany him/her to Forum meetings to provide support and, in keeping with Aboriginal cultural teachings, attend Forum meetings to learn from Elders.

· Members are invited to participate in the Elders Forum to bring an Aboriginal perspective to the work of the NWMO.

Niigani

· Niigani membership is composed of 5 Elders and 5 youth, a Chairperson and a Secretary/Facilitator and is chosen by the Elders Forum members from among the Forum membership.

· The NWMO may, from time-to-time at its discretion, appoint additional members to Niigani from among the members of the Elders Forum.

The NWMO recognizes the importance of the continuity of the membership of the Elders Forum while acknowledging that as the APM Site Selection process evolves the membership of the Elders Forum will gradually change to reflect the Aboriginal groups in the vicinity of a potential willing host community, estimated to take place in 2011-2012. In the Feasibility Study step of site selection, the Elders Forum will transition to include Elders representative of the siting communities and in the Detailed Analysis step the Elders Forum will again transition to be representative of the communities in this step. Throughout these transitions the Elders Forum will maintain a select number of representatives that bring a perspective of national and provincial Aboriginal issues.

Once a site has been selected, the negotiation with local Aboriginal communities will determine the nature of an Elders advisory group to the project.

- In first two years of siting (2010-2011), Niigani members will initially provide assistance to NWMO in introductions to Aboriginal peoples in areas of potential host communities.

- During Feasibility Study and Detailed Study years of siting (2012-2024), Niigani members will include Elders from communities involved in these steps who will assist NWMO in understanding the Traditional Knowledge and culture/protocols/practices of their communities and will assist in building relationships with their communities.

Deliverable

- Annual meeting of the Elders Forum: Y1-15
- 3-5 Niigani meetings annually: Y1-15
- Niigani members will assist NWMO in establishing meetings with local, provincial, regional groups and will attend events, tradeshows, meetings along with NWMO

Assumptions

- Elders Forum and Niigani members will assist in program for Aboriginal youth involvement and Traditional Knowledge projects
- Elders Forum will meet a minimum of 1X per year with the possibility of meeting 2X meetings per year if necessary
- Niigani will meet 3-5X per year including an annual meeting with the NWMO Board and Advisory Council
- Niigani members will receive an honorarium for meetings attended along with coverage of travel expenses
- Expense will continue at least to completion of Environmental Assessment and License (Y15)

Schedule	Start Year	1	2010	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Y1 (2010): $705K
Y2 (2011): $627K; Y3-Y5 (2012 - 2014): $604K/year;
Y 6-Y15 (2015-2024): $632K per year

Description:
Elders Forum:
Y1 (2010):$170K;
Y2-Y9 (2011-2018): $180K;
Y10-15 (2019-2024): $200K per year (assumes need for community Elders to be involved and provide insight on project to interested Aboriginal people)

Niigani meeting & assistance:
Y 1: $495K per year (Includes: Niigani Community Involvement Project);
Y2 (2011):$460K (Includes: Niigani Community Involvement Project):
Y3-15 (2012-2024): $382 K per year

Staff travel: Y1: $40K; Y2-5: $42K; Y6-15: $50k

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 5,616,000	$ 5,616,000	$ 1,404,000	$ 7,020,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	30			**Prepared By:**	P. Patton
WBS (Old)									

WBS Title ABORIGINAL ENGAGEMENT – ELDERS FORUM, NIIGANI

Description

Elders Forum

The NWMO Elders Forum provides advice to the NWMO in its relationships with Aboriginal peoples and in understanding Aboriginal culture, protocols, practices and Traditional Knowledge. The members of the Elders Forum represent a broad range of interests including, but not limited to, Aboriginal Traditional Knowledge, political affairs, community development, health and welfare, Aboriginal communications, cultural life of community and relationships, community protocols, treaty and historical relationships and youth interests.

· Members of the Elders Forum are residents of each of the four nuclear provinces Saskatchewan, Ontario, Quebec and New Brunswick. The NWMO may also choose, from time-to-time, to accept recommendations of a member from one of Canada's other provinces or territories and the NWMO may, at its discretion, appoint additional members to the Elders Forum.

· Each Elder is invited to ask a young person to accompany him/her to Forum meetings to provide support and, in keeping with Aboriginal cultural teachings, attend Forum meetings to learn from Elders.

· Members are invited to participate in the Elders Forum to bring an Aboriginal perspective to the work of the NWMO.

Niigani

· Niigani membership is composed of 5 Elders and 5 youth, a Chairperson and a Secretary/Facilitator and is chosen by the Elders Forum members from among the Forum membership.

· The NWMO may, from time-to-time at its discretion, appoint additional members to Niigani from among the members of the Elders Forum.

The NWMO recognizes the importance of the continuity of the membership of the Elders Forum while acknowledging that as the APM Site Selection process evolves the membership of the Elders Forum will gradually change to reflect the Aboriginal groups in the vicinity of a potential willing host community, estimated to take place in 2011-2012. In the Feasibility Study step of site selection, the Elders Forum will transition to include Elders representative of the siting communities and in the Detailed Analysis step the Elders Forum will again transition to be representative of the communities in this step. Throughout these transitions the Elders Forum will maintain a select number of representatives that bring a perspective of national and provincial Aboriginal issues.

Once a site has been selected, the negotiation with local Aboriginal communities will determine the nature of an Elders advisory group to the project.

- In first two years of siting (2010-2011), Niigani members will initially provide assistance to NWMO in introductions to Aboriginal peoples in areas of potential host communities.
- During Feasibility Study and Detailed Study years of siting (2012-2024), Niigani members will include Elders from communities involved in these steps who will assist NWMO in understanding the Traditional Knowledge and culture/protocols/practices of their communities and will assist in building relationships with their communities.

Deliverable

- Annual meeting of the Elders Forum: Y1-15
- 3-5 Niigani meetings annually: Y1-15
- Niigani members will assist NWMO in establishing meetings with local, provincial, regional groups and will attend events, tradeshows, meetings along with NWMO

Assumptions

- Elders Forum and Niigani members will assist in program for Aboriginal youth involvement and Traditional Knowledge projects
- Elders Forum will meet a minimum of 1X per year with the possibility of meeting 2X meetings per year if necessary
- Niigani will meet 3-5X per year including an annual meeting with the NWMO Board and Advisory Council
- Niigani members will receive an honorarium for meetings attended along with coverage of travel expenses
- Expense will continue at least to completion of Environmental Assessment and License (Y15)

Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes:

Y1 (2010): $705K
Y2 (2011): $627K; Y3-Y5 (2012 - 2014): $604K/year;
Y 6-Y15 (2015-2024): $632K per year

Description:
Elders Forum:
Y1 (2010):$170K;
Y2-Y9 (2011-2018): $180K;
Y10-15 (2019-2024): $200K per year (assumes need for community Elders to be involved and provide insight on project to interested Aboriginal people)

Niigani meeting & assistance:
Y 1: $495K per year (Includes: Niigani Community Involvement Project);
Y2 (2011):$460K (Includes: Niigani Community Involvement Project):
Y3-15 (2012-2024): $382 K per year

Staff travel: Y1: $40K; Y2-5: $42K; Y6-15: $50k

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,672,000	$ 3,672,000	$ 918,000	$ 4,590,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	80			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	STAFF TRAVEL COSTS – ABORIGINAL								
Description	Staff travel will be necessary for the purposes of meeting with Aboriginal communities through the site selection process to build confidence in APM, to involve national, provincial, regional and local Aboriginal groups to build awareness and confidence in the NWMO and APM on an ongoing basis. Travel will also include meetings with Aboriginal groups, organizations and individuals and speaking engagements on request. Costs include travel-related expenses for staff participating in speaking engagements/briefings, off-site meetings, and related costs (catering, meeting room, A/V, travel for delegates and accommodations if needed.)								
Deliverable	- Provision of information on APM and site selection process in response to requests for this information - Support to NWMO brand in building confidence in APM - Maintenance and building of relationships between Aboriginal organizations, potential host communities and surrounding Aboriginal communities for long-term sustainability of site selection process and confidence in NWMO								
Assumptions	- Regular meetings/briefings with Aboriginal organizations, groups, communities and individuals will build confidence in NWMO and APM								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	National organizations meetings/briefings Provincial organizations meetings/briefings Regional organizations meetings/briefings Travel to local communities Meetings/briefings on request Y1 (2010): 200K Y2 (2011): 187K; Y3 (2012): $191K Y4-25 (2013-2034): 125K per year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,328,000	$ 1,328,000	$ 332,000	$ 1,660,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	80			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	STAFF TRAVEL COSTS – ABORIGINAL								
Description	Staff travel will be necessary for the purposes of meeting with Aboriginal communities through the site selection process to build confidence in APM, to involve national, provincial, regional and local Aboriginal groups to build awareness and confidence in the NWMO and APM on an ongoing basis. Travel will also include meetings with Aboriginal groups, organizations and individuals and speaking engagements on request. Costs include travel-related expenses for staff participating in speaking engagements/briefings, off-site meetings, and related costs (catering, meeting room, A/V, travel for delegates and accommodations if needed.)								
Deliverable	- Provision of information on APM and site selection process in response to requests for this information - Support to NWMO brand in building confidence in APM - Maintenance and building of relationships between Aboriginal organizations, potential host communities and surrounding Aboriginal communities for long-term sustainability of site selection process and confidence in NWMO								
Assumptions	- Regular meetings/briefings with Aboriginal organizations, groups, communities and individuals will build confidence in NWMO and APM								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	National organizations meetings/briefings Provincial organizations meetings/briefings Regional organizations meetings/briefings Travel to local communities Meetings/briefings on request Y1 (2010): 200K Y2 (2011): 187K; Y3 (2012): $191K Y4-25 (2013-2034): 125K per year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$ 187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	30	60			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	STAFF TRAVEL COSTS – ABORIGINAL								
Description	Staff travel will be necessary for the purposes of meeting with Aboriginal communities through the site selection process to build confidence in APM, to involve national, provincial, regional and local Aboriginal groups to build awareness and confidence in the NWMO and APM on an ongoing basis. Travel will also include meetings with Aboriginal groups, organizations and individuals and speaking engagements on request. Costs include travel-related expenses for staff participating in speaking engagements/briefings, off-site meetings, and related costs (catering, meeting room, A/V, travel for delegates and accommodations if needed.)								
Deliverable	- Provision of information on APM and site selection process in response to requests for this information - Support to NWMO brand in building confidence in APM - Maintenance and building of relationships between Aboriginal organizations, potential host communities and surrounding Aboriginal communities for long-term sustainability of site selection process and confidence in NWMO								
Assumptions	- Regular meetings/briefings with Aboriginal organizations, groups, communities and individuals will build confidence in NWMO and APM								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	National organizations meetings/briefings Provincial organizations meetings/briefings Regional organizations meetings/briefings Travel to local communities Meetings/briefings on request Y1 (2010): 200K Y2 (2011): 187K; Y3 (2012): $191K Y4-25 (2013-2034): 125K per year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,250,000	$ 1,250,000	$ 312,500	$ 1,562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	10	270			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title TRACKING PUBLIC OPINION

Description

This work program is designed to assist NWMO to:

- identify changes in citizen values and concerns which may affect support (passive or active) for NWMO's policies, plans or activities in a timely way
- identify opportunities to re-align policies, plans and activities to better reflect the evolving values, preferences and concerns of Canadians
- identify opportunities to refine NWMO brand
- Identify emerging issues/challenges
- Demonstrate ongoing support of Canadians for NWMO policies and plans to Federal and Provincial government policy makers
- Benchmark NWMO progress in building acceptability among communities and opinion leaders in Canada with that experienced by waste organizations in other countries and be similar projects within Canada.

On a yearly basis, this work may involve: nationally representative telephone survey; conduct of focus groups on targeted issues; purchase of and/or participation in syndicated studies; use of existing online or mail panel; tracking of relevant publicly available research conducted within Canada or by waste organizations in other countries.

The program anticipates expenditure of $200,000 each year until Environmental Assessment successfully completed.

Deliverable

1) Yearly survey of the attitudes of Canadians on key topics of importance to sustaining and building acceptance for NWMO activities

2) Yearly summary report of findings from the broad range of inputs outlined above timed to support internal NWMO business planning

3) Communication testing

Assumptions It is assumed that there will be sufficient activity over the course of the year, either with respect to the NWMO siting process or in the general policy environment in which NWMO operates, to warrant a yearly survey. If activity is less intense than anticipated, the survey might be conducted every 18 months rather than every 12 months and in its stead qualitative research would be conducted..

Schedule	Start Year	1	2010	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Notes

Consider the following addition to the program:

- Bi-Annual workshop of a cross section of citizens to input to NWMO policies and plans
- Bi-Annual workshop of provincial opinion leaders to input to NWMO policies and plans
- Note that additional funding would be required to support these activities

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 1,800,000	$ 1,800,000	$ 450,000		$ 2,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	05	10	20	260			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRACKING PUBLIC OPINION								
Description	This work program is designed to assist NWMO to: · identify changes in citizen values and concerns which may affect support (passive or active) for NWMO's policies, plans or activities in a timely way · identify opportunities to re-align policies, plans and activities to better reflect the evolving values, preferences and concerns of Canadians · identify opportunities to refine NWMO brand · Identify emerging issues/challenges · Demonstrate ongoing support of Canadians for NWMO policies and plans to Federal and Provincial government policy makers · Benchmark NWMO progress in building acceptability among communities and opinion leaders in Canada with that experienced by waste organizations in other countries and be similar projects within Canada. On a yearly basis, this work may involve: nationally representative telephone survey; conduct of focus groups on targeted issues; purchase of and/or participation in syndicated studies; use of existing online or mail panel; tracking of relevant publicly available research conducted within Canada or by waste organizations in other countries. The program anticipates expenditure of $200,000 each year until Environmental Assessment successfully completed.								
Deliverable	1) Yearly survey of the attitudes of Canadians on key topics of importance to sustaining and building acceptance for NWMO activities 2) Yearly summary report of findings from the broad range of inputs outlined above timed to support internal NWMO business planning 3) Communication testing								
Assumptions	It is assumed that there will be sufficient activity over the course of the year, either with respect to the NWMO siting process or in the general policy environment in which NWMO operates, to warrant a yearly survey. If activity is less intense than anticipated, the survey might be conducted every 18 months rather than every 12 months and in its stead qualitative research would be conducted..								
Schedule	Start Year	10	2019			Finish Year	13	2022	
Type	Fixed								
Calculations and Notes:	Notes Consider the following addition to the program: - Bi-Annual workshop of a cross section of citizens to input to NWMO policies and plans - Bi-Annual workshop of provincial opinion leaders to input to NWMO policies and plans - Note that additional funding would be required to support these activities								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 800,000	$ 800,000	$ 200,000		$ 1,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	10	10	30			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRACKING BEST PRACTICES AND EXTERNAL ADVICE								
Description	This work program is designed to assist the NWMO: - keep track of best practices and evolving experience in a number of key success areas: o Approaches to community engagement and dialogue and best practice design o Awareness building, design of information materials and communication planning o Approaches to development of tools and design and implementation of sustainability pans which capture the long-term vision a community has for itself o Approaches to assessment of environmental, social, economic and cultural effects o Approaches to and issues associated with ethics and their application to NWMO work o Approaches to various siting related issues such as hosting agreements, community engagement, communications, and o Approaches to engaging Aboriginal peoples and application of Aboriginal Traditional Knowledge - participate in international information and experience sharing, and development of international best practice, as part of the Nuclear Energy Agency's Forum on Stakeholder Confidence. (Estimated at $10,000 per year) Includes review of materials published by the Forum. - Facilitate limited participation in initiatives which explore these issues and discuss experience and best practices such as C2D2 and International Institute for Public Participation - At any given point in time be up to date with respect to evolving societal expectation in this area in order to: o inform the design of NWMO activities and plans; o support accountable authorities in potentially interested communities in the engagement of their own citizens to explore interest and ultimately to assess and demonstrate willingness o Inform the design of NWMO sponsored community and region based research designed to support the social, economic and cultural impact (community well-being) assessment and analysis o Assist in capacity building of NWMO relationship managers, and other NWMO staff, to engage with and support communities in this area. The program anticipates expenditure of: · $200,000 in 2011 · $200,000 in 2012 · $150,000 in 2013 · $150,000 in 2014 · $125,000 in 2015								
Deliverable	- Consulting advice - Yearly summary report of findings from the broad range of inputs outlined above, timed to support internal NWMO business planning and engagement plan design (internal) - Preparation of case studies of projects of particular interest with a focus on the engagement approaches used (internal) - Development of information sheets and tools to support communities in engaging their residents for publishing on the NWMO website (internal, in collaboration with Communications staff) - Yearly workshop of practitioners to review and explore best practice and input to NWMO's plans going forward (Estimated at $100,000 per year) - Ad hoc expert advice including commissioning of papers designed to explore key topics of interest (Estimated at $60,000) - Sponsorship of a conference such as C2D2 or other, or a discussion session at a conference (Estimated at $30,000 per year)								
Assumptions	- Using appropriate processes, and encouraging communities to use appropriate processes will help build and sustain public acceptance of NWMO's policies, plans and activities - It will be important to the documentation required to support the EA and licencing process to be able to demonstrate that appropriate processes were used in these areas and that these processes meaningfully influenced proposals and decisions made.								
Schedule	Start Year		1	2010		Finish Year		9	2018
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,200,000	$ 1,200,000	$ 300,000	$ 1,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	10	20	20		**Prepared By:**	J. Facella	
WBS (Old)									
WBS Title	TRACKING BEST PRACTICES AND EXTERNAL ADVICE								
Description	This work program is designed to assist the NWMO: - keep track of best practices and evolving experience in a number of key success areas: o Approaches to community engagement and dialogue and best practice design o Awareness building, design of information materials and communication planning o Approaches to development of tools and design and implementation of sustainability pans which capture the long-term vision a community has for itself o Approaches to assessment of environmental, social, economic and cultural effects o Approaches to and issues associated with ethics and their application to NWMO work o Approaches to various siting related issues such as hosting agreements, community engagement, communications, and o Approaches to engaging Aboriginal peoples and application of Aboriginal Traditional Knowledge - participate in international information and experience sharing, and development of international best practice, as part of the Nuclear Energy Agency's Forum on Stakeholder Confidence. (Estimated at $10,000 per year) Includes review of materials published by the Forum. - Facilitate limited participation in initiatives which explore these issues and discuss experience and best practices such as C2D2 and International Institute for Public Participation - At any given point in time be up to date with respect to evolving societal expectation in this area in order to: o inform the design of NWMO activities and plans; o support accountable authorities in potentially interested communities in the engagement of their own citizens to explore interest and ultimately to assess and demonstrate willingness o Inform the design of NWMO sponsored community and region based research designed to support the social, economic and cultural impact (community well-being) assessment and analysis o Assist in capacity building of NWMO relationship managers, and other NWMO staff, to engage with and support communities in this area. The program anticipates expenditure of: · $200,000 in 2011 · $200,000 in 2012 · $150,000 in 2013 · $150,000 in 2014 · $125,000 in 2015								
Deliverable	- Consulting advice - Yearly summary report of findings from the broad range of inputs outlined above, timed to support internal NWMO business planning and engagement plan design (internal) - Preparation of case studies of projects of particular interest with a focus on the engagement approaches used (internal) - Development of information sheets and tools to support communities in engaging their residents for publishing on the NWMO website (internal, in collaboration with Communications staff) - Yearly workshop of practitioners to review and explore best practice and input to NWMO's plans going forward (Estimated at $100,000 per year) - Ad hoc expert advice including commissioning of papers designed to explore key topics of interest (Estimated at $60,000) - Sponsorship of a conference such as C2D2 or other, or a discussion session at a conference (Estimated at $30,000 per year)								
Assumptions	- Using appropriate processes, and encouraging communities to use appropriate processes will help build and sustain public acceptance of NWMO's policies, plans and activities - It will be important to the documentation required to support the EA and licencing process to be able to demonstrate that appropriate processes were used in these areas and that these processes meaningfully influenced proposals and decisions made.								
Schedule	Start Year		10	2019			Finish Year	11	2020
Type	Fixed								
Calculations and Notes:									

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	10	10	20			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	ETHICAL FRAMEWORK FOR APM IMPLEMENTATION								
Description	This work program is designed to: - Demonstrate the importance of ethical considerations in NWMO's decision making through a yearly reflection of past performance in this area included as standard in the Annual Report. - Demonstrate NWMO's commitment to general societal capacity building in this area through continued partnership in the Canadian Business Ethics Research Network (CBERN) (Estimated at $25,000 per year) and through participation in Annual General meeting ($5,000) and general project support for the period 2010 to 2020. - Track practices used by other waste organizations to use as a benchmark through desktop research (internal) - Ad hoc expert advice (Estimated at $40,000 per year beginning in 2010 through to the end of the successful completion of Environmental Assessment The program anticipates expenditure of $70,000 per year for the duration of the program.								
Deliverable	- Participation in and support for Canadian Business Ethics Research Network - Internal yearly reflection on ethical performance and assessment of need to evolve ethical framework as work proceeds and new issues arise - Third party input and review to help guide NWMO policies, plans and activities.								
Assumptions	- Using processes which encourage explicit consideration of ethical considerations throughout NWMO's work, and against which NWMO can publicly report, will help build and sustain public and government acceptance of NWMO's policies, plans and activities - It will be important to the documentation required to support the EA and licencing process to be able to demonstrate that ethical considerations were appropriately addressed in decision making throughout the siting process. - Early third party guidance, which can begin to be documented publically, will help build and sustain public and government acceptance of NWMO's policies, plans and activities and provide NWMO forewarning of issues and maximum flexibility to address them in the early stages.								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	CBERN - $25,000 per year sponsorship. CBERN - $5,000 per year participation in annual general meeting. Other - $40,000 expert advice. Expenditure per year through to end of Environmental Assessment process.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 630,000	$ 630,000	$ 157,500	$ 787,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	10	20	10			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title ETHICAL FRAMEWORK FOR APM IMPLEMENTATION

Description

This work program is designed to:

- Demonstrate the importance of ethical considerations in NWMO's decision making through a yearly reflection of past performance in this area included as standard in the Annual Report.
- Demonstrate NWMO's commitment to general societal capacity building in this area through continued partnership in the Canadian Business Ethics Research Network (CBERN) (Estimated at $25,000 per year) and through participation in Annual General meeting ($5,000) and general project support for the period 2010 to 2020.
- Track practices used by other waste organizations to use as a benchmark through desktop research (internal)
- Ad hoc expert advice (Estimated at $40,000 per year beginning in 2010 through to the end of the successful completion of Environmental Assessment

The program anticipates expenditure of $70,000 per year for the duration of the program.

Deliverable

- Participation in and support for Canadian Business Ethics Research Network
- Internal yearly reflection on ethical performance and assessment of need to evolve ethical framework as work proceeds and new issues arise
- Third party input and review to help guide NWMO policies, plans and activities.

Assumptions

- Using processes which encourage explicit consideration of ethical considerations throughout NWMO's work, and against which NWMO can publicly report, will help build and sustain public and government acceptance of NWMO's policies, plans and activities
- It will be important to the documentation required to support the EA and licencing process to be able to demonstrate that ethical considerations were appropriately addressed in decision making throughout the siting process.
- Early third party guidance, which can begin to be documented publically, will help build and sustain public and government acceptance of NWMO's policies, plans and activities and provide NWMO forewarning of issues and maximum flexibility to address them in the early stages.

Schedule	Start Year	10	2019	Finish Year	11	2020

Type Fixed

Calculations and Notes:

CBERN - $25,000 per year sponsorship.
CBERN - $5,000 per year participation in annual general meeting.
Other - $40,000 expert advice.
Expenditure per year through to end of Environmental Assessment process.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 140,000	$ 140,000	$ 35,000	$ 175,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	10	10	10			**Prepared By:**	P. Patton
WBS (Old)									

WBS Title ABORIGINAL TRADITIONAL KNOWLEDGE

Description

Aboriginal Traditional Knowledge includes important knowledge about the land and ecology stemming from long contact with the land. It also includes knowledge about developing and maintaining effective and meaningful relationships between generations and within and between communities.

Traditional Knowledge provides rules for protecting the land while using it; clarifying and enhancing relationships amongst users; assisting in the development of technologies to meet the subsistence, health, trade and ritual needs of local people; and helping to create a world view that incorporates and makes sense of all of these in the context of a long-term, holistic perspective in decision-making.

Appropriate consideration and respect must be given to factors such as:

- spiritual and physical aspects of the land, people, wildlife and their habitat;
- the relationships between various aspects of the environment, including humans;
- the aboriginal sense of responsibility and stewardship;
- the health, trade and spiritual needs of people;
- aspects of traditional community life such as cultural oriented activities, the wide range of volunteer activities, recreational activities, housework and subsistence activities; and the impact of our actions seven generations or more in the future.

This work program is to support NWMO in ongoing understanding and interweaving of Traditional Knowledge through a workshop, desktop research and related preparatory work. This work program is designed to engage those involved as holders of Traditional Knowledge or experts in this field to assist in the inclusion of Traditional Knowledge in assessment of potential host sites for social, economic and cultural impact (community well-being related) assessment. Activities conducted through this work program include:

a. Desktop research on traditional uses of land in territories of siting communities in order to identify important fishing, hunting, ceremonial and burial sites

b. Track evolving practices used by other organizations, as appropriate, to use as a benchmark through desktop research, including preparation of case studies concerning national resource management initiatives of interest

c. Monitor impact benefit agreements within Canada and in North America

d. Convene a workshop of practitioners to provide advice and counsel to NWMO with respect to its future activities – meeting to be conducted in 2012, 2013, 2016, 2018

- Assist in capacity building of NWMO relationship managers, and other NWMO staff, to engage with and support communities in this area.
- Cultural sensitivity training of NWMO staff to understand traditional practices, protocols and cultures of Aboriginal peoples in siting areas.

Estimate of expenditures begins in 2010 and concludes at end of detailed site characterization (2018)

Deliverable

- Desktop research on traditional uses of land
- Project with Niigani Elders 2011 (Workshop)
- Workshop of practitioners to provide advice and counsel to NWMO with respect to its future activities –2012, 2013, 2016, 2018
- Program to develop appropriate cultural training of NWMO staff and project teams associated with APM to understand cultura protocols, practices, governance and traditional laws of Aboriginal peoples in siting areas

Assumptions

- Information is publicly available for the purposes of desktop research or can be gathered with involvement of local Aboriginal people.
- Traditional peoples in siting areas will provide insight to their local Traditional Knowledge and land use.
- Work on a detailed Traditional Land Use Study will be conducted separately as part of the siting steps and will take place in the Feasibility Study and Detailed Analysis steps with Aboriginal communities and through the EA.

Schedule	Start Year	1	2010	Finish Year	9 2018

Type Fixed

Calculations and Notes:

Y1 – Y2(2010-2011): $210
$125K (project with Niigani)
$45K Staff training
$10K Cultural training NWMO staff
$30 Staff travel

Y3- Y15 (2012-2024): $210
$125K per year (Workshop, Research projects)
$45K Staff training
$10K Cultural sensitivity training NWMO staff
$30 Staff travel

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,890,000	$ 1,890,000	$ 472,500	$ 2,362,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	10	10	20	40			**Prepared By:**	P. Patton
WBS (Old)									

WBS Title ABORIGINAL TRADITIONAL KNOWLEDGE

Description

Aboriginal Traditional Knowledge includes important knowledge about the land and ecology stemming from long contact with the land. It also includes knowledge about developing and maintaining effective and meaningful relationships between generations and within and between communities.

Traditional Knowledge provides rules for protecting the land while using it; clarifying and enhancing relationships amongst users; assisting in the development of technologies to meet the subsistence, health, trade and ritual needs of local people; and helping to create a world view that incorporates and makes sense of all of these in the context of a long-term, holistic perspective in decision-making.

Appropriate consideration and respect must be given to factors such as:

- spiritual and physical aspects of the land, people, wildlife and their habitat;
- the relationships between various aspects of the environment, including humans;
- the aboriginal sense of responsibility and stewardship;
- the health, trade and spiritual needs of people;
- aspects of traditional community life such as cultural oriented activities, the wide range of volunteer activities, recreational activities, housework and subsistence activities; and the impact of our actions seven generations or more in the future.

This work program is to support NWMO in ongoing understanding and interweaving of Traditional Knowledge through a workshop, desktop research and related preparatory work. This work program is designed to engage those involved as holders of Traditional Knowledge or experts in this field to assist in the inclusion of Traditional Knowledge in assessment of potential host sites for social, economic and cultural impact (community well-being related) assessment. Activities conducted through this work program include:

a. Desktop research on traditional uses of land in territories of siting communities in order to identify important fishing, hunting, ceremonial and burial sites

b. Track evolving practices used by other organizations, as appropriate, to use as a benchmark through desktop research, including preparation of case studies concerning national resource management initiatives of interest

c. Monitor impact benefit agreements within Canada and in North America

d. Convene a workshop of practitioners to provide advice and counsel to NWMO with respect to its future activities – meeting to be conducted in 2012, 2013, 2016, 2018

- Assist in capacity building of NWMO relationship managers, and other NWMO staff, to engage with and support communities in this area.
- Cultural sensitivity training of NWMO staff to understand traditional practices, protocols and cultures of Aboriginal peoples in siting areas.

Estimate of expenditures begins in 2010 and concludes at end of detailed site characterization (2018)

Deliverable

- Desktop research on traditional uses of land
- Project with Niigani Elders 2011 (Workshop)
- Workshop of practitioners to provide advice and counsel to NWMO with respect to its future activities –2012, 2013, 2016, 2018
- Program to develop appropriate cultural training of NWMO staff and project teams associated with APM to understand cultural protocols, practices, governance and traditional laws of Aboriginal peoples in siting areas

Assumptions

- Information is publicly available for the purposes of desktop research or can be gathered with involvement of local Aboriginal people.
- Traditional peoples in siting areas will provide insight to their local Traditional Knowledge and land use.
- Work on a detailed Traditional Land Use Study will be conducted separately as part of the siting steps and will take place in the Feasibility Study and Detailed Analysis steps with Aboriginal communities and through the EA.

Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes:

Y1 – Y2(2010-2011): $210
$125K (project with Niigani)
$45K Staff training
$10K Cultural training NWMO staff
$30 Staff travel

Y3- Y15 (2012-2024): $210
$125K per year (Workshop, Research projects)
$45K Staff training
$10K Cultural sensitivity training NWMO staff
$30 Staff travel

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,260,000	$ 1,260,000	$ 315,000	$ 1,575,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**21**

WBS (New)	560	15	10	10	110			**Prepared By:**	P. Simmons
WBS (Old)									
	SITE SELECTION PROCESS								
WBS Title	**STORE FRONT NWMO OFFICES**								

Description

Category includes all those expenses (non-staffing related) associated with the operation of 'store front' offices and regional office in communities involved in the site selection process from Step 3 through to selection of host community, and operation of the DGR.

Store front operation is both 'in community' and 'regional' and is a liaison office for the NWMO to provide information, displays, and other related public relations activities including municipal/local government relations.

Deliverable

This category's primary deliverable is the provision of a store front operation/liaison in communities.

A complementary deliverable is the ongoing relationship building/maintenance, NWMO brand support, and community presence.

Assumptions

The Feasibility stage (Step 3 a. or b.) triggers a store front operation. Only those communities moving from Step 2 into Step 3 will be candidates for a store front/community liaison office.

2010 – screenings begin (no storefronts).

2011 – screenings continue.
Store fronts are only initiated at feasibility stage.
The screenings initiated in late 2010, and 2011, are assumed to lead to 4 feasibility studies (stages a or b) in 2011. Other screened communities should they enter during this period are assumed to begin opting out, or be screened out. It is also assumed that the timing of the feasibility studies will be 50% early in the year, 50% latter part of year. Each of the feasibility communities (4) will receive a store front operation in 2011.

2012 – Assumed that more communities may enter screening stage, and 4 more feasibility studies may be initiated. Assumed that 4 more store fronts will be required in 2012 in addition to the 4 initiated in 2011. Dissimilar to 2011, however, is that the all store fronts in 2012 will be required at the beginning of the year for the duration of the year (total store fronts required in 2012 = 8).

All feasibility stage store fronts are assumed to remain in operation during 2012 – early closure of a store front may come from self-elimination by the community or clear revelation of suboptimal conditions.

In 2013, 2 candidate sites are assumed to emerge from all completed feasibility studies. Any remaining feasibility communities (lower ranked) will see the removal/closure of store front operations.

Store fronts in 2013 = 2 per candidate site = 4.

The candidate sites selected from the feasibility studies will host 2 store front operations – 1 in the host community, the other in the 'region.' The 'region' is the proposed site location in each candidate community, and also the proposed location of the Centre of Expertise (C of E) assumed to commence operation in 2014.

It is assumed that each of the 2 candidate sites will require 2 store fronts (total of 4) between 2013- 2018. Once the preferred site is selected, 2 of the 4 store fronts will close. The remaining 2 will continue through to construction of the full Centre of Expertise c/w underground Lab. The local store front (in community) will remain in operation until 2035. The Centre of Expertise/lab morphs into the 2nd store front/information centre - n**o Centre of Expertise** costs are included in these estimates.

Store front(s) will be staffed (staffing FTE's budgeted elsewhere), and resourced with supplies, material, and displays. Storefront assumed to be min. 1500 ft2. Leased, utilities, taxes, overhead, travel - $ 60,000 per store front (staff not included). Assumed that marginally frequent travel of staff between NWMO office (Toronto) and candidate site communities will be required.

Schedule	Start Year	1	2010	Finish Year	9	2018

Type

Fixed

Calculations and Notes:

Current approved budget Y02 (2010) = $0

Y02 (2011)	2 x $60,000 for full year ($120,000)	$120,000
Y03 (2012)	4 x $60,000 for full year = $ 240,000 4 x $60,000 (full year from 2011) = $240,000	$ 480,000
Y04 (2013)	2 x $60,000 x in ea. candidate site (2)) (C of E initiated in each community)	$ 240,000
Y05 (2014)	1 x $60,000 x ea. candidate (2) C of E under development	$ 240,000
Y06 (2015)	1 x $60,000 x ea. candidate site (2), C of E morphs into '2nd store front'	$ 120,000
Y07 (2016)	« «	$ 120,000
Y08 (2017)	« «	$ 120,000
Y09 (2018)	« «	$ 120,000

Y10 (2019) to Y15 (2024) Preferred site selected = 1 local storefront, 1 at Centre of Expertise
1 x $60,000 = $ 60,000 x 6 years = $360,000

Y16 (2025) – Y21 (2030) Preferred site – 1 local store front, 1 at Centre of Expertise/UG lab.
1 x $ 60,000 x 6yrs = $ 360,000

Y22 (2031) – Y26 (2034) 1 local store front, Centre of expertise/UG lab remains until operations begin in 2035 (5 years).
1 x $60,000 x 4yrs = $ 240,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,560,000	$ 1,560,000	$ 390,000	$ 1,950,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**21**

WBS (New)	560	15	10	20	40			**Prepared By:**	P. Simmons
WBS (Old)									
	SITE SELECTION PROCESS								
WBS Title	**STORE FRONT NWMO OFFICES**								

Description

Category includes all those expenses (non-staffing related) associated with the operation of 'store front' offices and regional office in communities involved in the site selection process from Step 3 through to selection of host community, and operation of the DGR.

Store front operation is both 'in community' and 'regional' and is a liaison office for the NWMO to provide information, displays, and other related public relations activities including municipal/local government relations.

Deliverable

This category's primary deliverable is the provision of a store front operation/liaison in communities.

A complementary deliverable is the ongoing relationship building/maintenance, NWMO brand support, and community presence.

Assumptions

The Feasibility stage (Step 3 a. or b.) triggers a store front operation. Only those communities moving from Step 2 into Step 3 will be candidates for a store front/community liaison office.

2010 – screenings begin (no storefronts).

2011 – screenings continue.
Store fronts are only initiated at feasibility stage.
The screenings initiated in late 2010, and 2011, are assumed to lead to 4 feasibility studies (stages a or b) in 2011. Other screened communities should they enter during this period are assumed to begin opting out, or be screened out. It is also assumed that the timing of the feasibility studies will be 50% early in the year, 50% latter part of year. Each of the feasibility communities (4) will receive a store front operation in 2011.

2012 – Assumed that more communities may enter screening stage, and 4 more feasibility studies may be initiated. Assumed that 4 more store fronts will be required in 2012 in addition to the 4 initiated in 2011. Dissimilar to 2011, however, is that the all store fronts in 2012 will be required at the beginning of the year for the duration of the year (total store fronts required in 2012 = 8).

All feasibility stage store fronts are assumed to remain in operation during 2012 – early closure of a store front may come from self-elimination by the community or clear revelation of suboptimal conditions.

In 2013, 2 candidate sites are assumed to emerge from all completed feasibility studies. Any remaining feasibility communities (lower ranked) will see the removal/closure of store front operations.

Store fronts in 2013 = 2 per candidate site = 4.

The candidate sites selected from the feasibility studies will host 2 store front operations – 1 in the host community, the other in the 'region.' The 'region' is the proposed site location in each candidate community, and also the proposed location of the Centre of Expertise (C of E) assumed to commence operation in 2014.

It is assumed that each of the 2 candidate sites will require 2 store fronts (total of 4) between 2013- 2018. Once the preferred site is selected, 2 of the 4 store fronts will close. The remaining 2 will continue through to construction of the full Centre of Expertise c/w underground Lab. The local store front (in community) will remain in operation until 2035. The Centre of Expertise/lab morphs into the 2nd store front/information centre - n**o Centre of Expertise** costs are included in these estimates.

Store front(s) will be staffed (staffing FTE's budgeted elsewhere), and resourced with supplies, material, and displays. Storefront assumed to be min. 1500 ft2. Leased, utilities, taxes, overhead, travel - $ 60,000 per store front (staff not included). Assumed that marginally frequent travel of staff between NWMO office (Toronto) and candidate site communities will be required.

Schedule	Start Year	10	2019	Finish Year	15	2024
Type	Fixed					

Calculations and Notes:

Current approved budget Y02 (2010) = $0

Y02 (2011)	2 x $60,000 for full year ($120,000)	$120,000
Y03 (2012)	4 x $60,000 for full year = $ 240,000 4 x $60,000 (full year from 2011) = $240,000	$ 480,000
Y04 (2013)	2 x $60,000 x in ea. candidate site (2)) (C of E initiated in each community)	$ 240,000
Y05 (2014)	1 x $60,000 x ea. candidate (2) C of E under development	$ 240,000
Y06 (2015)	1 x $60,000 x ea. candidate site (2), C of E morphs into '2nd store front'	$ 120,000
Y07 (2016)	« «	$ 120,000
Y08 (2017)	« «	$ 120,000
Y09 (2018)	« «	$ 120,000

Y10 (2019) to Y15 (2024) Preferred site selected = 1 local storefront, 1 at Centre of Expertise
1 x $60,000 = $ 60,000 x 6 years = $360,000

Y16 (2025) – Y21 (2030) Preferred site – 1 local store front, 1 at Centre of Expertise/UG lab.
1 x $ 60,000 x 6yrs = $ 360,000

Y22 (2031) – Y26 (2034) 1 local store front, Centre of expertise/UG lab remains until operations begin in 2035 (5 years).
1 x $60,000 x 4yrs = $ 240,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,160,000	$ 2,160,000	$ 540,000	$ 2,700,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**21**

WBS (New)	560	15	10	30	20			**Prepared By:**	P. Simmons
WBS (Old)									
	SITE SELECTION PROCESS								
WBS Title	**STORE FRONT NWMO OFFICES**								

Description

Category includes all those expenses (non-staffing related) associated with the operation of 'store front' offices and regional office in communities involved in the site selection process from Step 3 through to selection of host community, and operation of the DGR.

Store front operation is both 'in community' and 'regional' and is a liaison office for the NWMO to provide information, displays, and other related public relations activities including municipal/local government relations.

Deliverable

This category's primary deliverable is the provision of a store front operation/liaison in communities.

A complementary deliverable is the ongoing relationship building/maintenance, NWMO brand support, and community presence.

Assumptions

The Feasibility stage (Step 3 a. or b.) triggers a store front operation. Only those communities moving from Step 2 into Step 3 will be candidates for a store front/community liaison office.

2010 – screenings begin (no storefronts).

2011 – screenings continue.
Store fronts are only initiated at feasibility stage.
The screenings initiated in late 2010, and 2011, are assumed to lead to 4 feasibility studies (stages a or b) in 2011. Other screened communities should they enter during this period are assumed to begin opting out, or be screened out. It is also assumed that the timing of the feasibility studies will be 50% early in the year, 50% latter part of year. Each of the feasibility communities (4) will receive a store front operation in 2011.

2012 – Assumed that more communities may enter screening stage, and 4 more feasibility studies may be initiated. Assumed that 4 more store fronts will be required in 2012 in addition to the 4 initiated in 2011. Dissimilar to 2011, however, is that the all store fronts in 2012 will be required at the beginning of the year for the duration of the year (total store fronts required in 2012 = 8).

All feasibility stage store fronts are assumed to remain in operation during 2012 – early closure of a store front may come from self-elimination by the community or clear revelation of suboptimal conditions.

In 2013, 2 candidate sites are assumed to emerge from all completed feasibility studies. Any remaining feasibility communities (lower ranked) will see the removal/closure of store front operations.
Store fronts in 2013 = 2 per candidate site = 4.

The candidate sites selected from the feasibility studies will host 2 store front operations – 1 in the host community, the other in the 'region.' The 'region' is the proposed site location in each candidate community, and also the proposed location of the Centre of Expertise (C of E) assumed to commence operation in 2014.

It is assumed that each of the 2 candidate sites will require 2 store fronts (total of 4) between 2013- 2018. Once the preferred site is selected, 2 of the 4 store fronts will close. The remaining 2 will continue through to construction of the full Centre of Expertise c/w underground Lab. The local store front (in community) will remain in operation until 2035. The Centre of Expertise/lab morphs into the 2nd store front/information centre - n**o Centre of Expertise** costs are included in these estimates.

Store front(s) will be staffed (staffing FTE's budgeted elsewhere), and resourced with supplies, material, and displays. Storefront assumed to be min. 1500 ft2. Leased, utilities, taxes, overhead, travel - $ 60,000 per store front (staff not included). Assumed that marginally frequent travel of staff between NWMO office (Toronto) and candidate site communities will be required.

Schedule	Start Year	16	2025	Finish Year	25	2034	
Type	Fixed						

Calculations and Notes:

Current approved budget Y02 (2010) = $0

Y02 (2011)	2 x $60,000 for full year ($120,000)	$120,000
Y03 (2012)	4 x $60,000 for full year = $ 240,000	
	4 x $60,000 (full year from 2011) = $240,000	$ 480,000
Y04 (2013)	2 x $60,000 x in ea. candidate site (2)) (C of E initiated in each community)	$ 240,000
Y05 (2014)	1 x $60,000 x ea. candidate (2) C of E under development	$ 240,000
Y06 (2015)	1 x $60,000 x ea. candidate site (2), C of E morphs into '2nd store front'	$ 120,000
Y07 (2016)	« «	$ 120,000
Y08 (2017)	« «	$ 120,000
Y09 (2018)	« «	$ 120,000

Y10 (2019) to Y15 (2024) Preferred site selected = 1 local storefront, 1 at Centre of Expertise
1 x $60,000 = $ 60,000 x 6 years = $360,000

Y16 (2025) – Y21 (2030) Preferred site – 1 local store front, 1 at Centre of Expertise/UG lab.
1 x $ 60,000 x 6yrs = $ 360,000

Y22 (2031) – Y26 (2034) 1 local store front, Centre of expertise/UG lab remains until operations begin in 2035 (5 years).
1 x $60,000 x 4yrs = $ 240,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,120,000	$ 3,120,000	$ 780,000	$ 3,900,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	10		**Prepared By:**	K. Shaver,A. Murchison
WBS (Old)	552	40	10					
WBS Title	SITE ACQUISITION AND IMPROVEMENTS							
Description	Option to purchase sites and eventual purchase of land to house the DGR.							
Deliverable	Layout of the facilities and services on the selected site. Purchase land and mineral rights for the site, access route and township. Preparation of the site, including clearing and rough grading. Preparation of the site access route. Provision of initial site security facilities. Site improvements including landscaping and final grading/drainage. Provision of on-site road and rail transportation routes and parking.							
Assumptions	Land requirements will be 3150 hectares, 3 km x 2km for DGR footprint, 25 km x 20 m access route and 5 km x 5 km for the township Land cost $5000 per hectare, including mineral rights costs. (NOTE: Per Ian P. recent experience for crown land purchase was $1,000 per hectare) Land registration and legal fees, 50% of land cost. Site is a flat green area situated in the Canadian Shield, within 25 km of an existing highway. Access road will be 10 m wide and 25 km in length Rail access to the site is not required. Surface preparation is calculated for surface facilities footprint only @ 6 km2							
Schedule	Start Year		1 2010			Finish Year	9 2018	
Type	Step-Fixed							
Calculations and Notes:								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,054,607	$ -	$ 15,075,000	$ 16,129,607	$ 4,032,402	$ 20,162,009

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	20	10			**Prepared By:**	A. Murchison
WBS (Old)	552	40	10						
WBS Title	SITE ACQUISITION AND IMPROVEMENTS								
Description	Option to purchase sites and eventual purchase of land to house the DGR.								
Deliverable	Layout of the facilities and services on the selected site. Purchase land and mineral rights for the site, access route and township. Preparation of the site, including clearing and rough grading. Preparation of the site access route. Provision of initial site security facilities. Site improvements including landscaping and final grading/drainage. Provision of on-site road and rail transportation routes and parking.								
Assumptions	Land requirements will be 3150 hectares, 3 km x 2km for DGR footprint, 25 km x 20 m access route and 5 km x 5 km for the township. Land cost $5000 per hectare, including mineral rights costs. (NOTE: Per Ian P. recent experience for crown land purchase was $1,000 per hectare) Land registration and legal fees, 50% of land cost. Site is a flat green area situated in the Canadian Shield, within 25 km of an existing highway. Access road will be 10 m wide and 25 km in length Rail access to the site is not required. Surface preparation is calculated for surface facilities footprint only @ 6 km2								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Step-Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,406,143	$ -	$ 18,000,000	$ 19,406,143	$ 4,851,536	$ 24,257,679

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	170			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	PRODUCTION, TRANSLATION OF SITING PROCESS DOC								
Description	Siting Document								
Deliverable	Design, production and translation of the Siting Document								
Assumptions	50 pages in length, design completed internally, production (printing) and translation done externally								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	2010 100K (will be less because design is being done internally)								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 100,000	$ 100,000	$ 25,000	$ 125,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	140			**Prepared By:**	K. Shaver
WBS (Old)									
WBS Title	DVDs FOR SITING								
Description	NWMO Core Video								
Deliverable	Update the NWMO core video to reflect initiation of the site selection process.								
Assumptions	The core video needs to be updated. Not an entire re-write.								
Schedule	Start Year		1	2010			Finish Year	4	2013
Type	Fixed								
Calculations and Notes:	2010 - 2015: $40K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 240,000	$ 240,000	$ 60,000	$ 300,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	70			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	THIRD PARTY REVIEWS								
Description	Expenses associated with conduct of a review of NWMO's site assessment work by a Third Party Review group of experts, as documented in the site selection process document.								
Deliverable									
Assumptions									
Schedule	Start Year		2	2011		Finish Year	13	2022	
Type	Fixed								
Calculations and Notes:	Reviews will be triggered by communities as they reach key steps in the site selection process. The pace and manner of moving through these steps will be determined by the community. Trigger points in the process are: completion of initial screening in Step 2 (Third Party Review is optional), completion of preliminary assessment (feasibility study) in Step 3, and completion of detailed site characterization in step 4. All work will be completed prior to initiation of Environmental Assessment process.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 650,000	$ 650,000	$ 162,500	$ 812,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	30			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title

COMMUNITY CAPACITY BUILDING – Community support for participation in Step 1 and Step 2 of the Siting process (information and initial screening)

Description

The work package is designed to capture funding which will need to be provided to communities (regions, band councils etc. as outlined in siting document) to support their participation in the early steps of the siting process (Step 1 and Step 2)

1. Communities
   a. Travel costs associated for a small group of community representatives to travel to an NWMO briefing in a nearby regional hub or NWMO offices: Estimate $10,000 per community

   b. Proposals to hire a third party expert to review material published to date, in order to answer questions the community representatives may have about the safety of the project and the basis for confidence at this early stage: Estimate $15,000 per community

   c. Travel expenses associated with trip to visit an interim waste storage site by a small representative delegation: Estimate maximum $20,000 per community

   d. Hire a third party expert to review NWMO's evaluation of the suitability of the community based on readily available information and a short list of initial screening criteria (Step 2): Estimate $15,000 per community

   e. Should initial screening suggest community has potential to be suitable for the project the community, as represented by accountable authorities, may request and receive resources (funding and information, if desired) to develop and/or augment an existing sustainability plan which captures the long-term vision the community has for itself: Estimate $40,000 per community

   f. Should initial screening suggest community has potential to be suitable for the project, the community as represented by accountable authorities, may request and receive resources (funding and information, if desired) to engage citizens and begin to explore interest in hosting the project: Estimate $20,000 per community

Total of above per community: Potentially $120,000.

Note, uncertainties include: number of activities a community will choose to participate in; length of time a community will wish to take to complete all the tasks; number of communities who will enter the process and request funding and drop out before initial screening. Assumption for cost estimating purposes is that all tasks are completed in the calendar year noted.

NOT INCLUDED IN COST ESTIMATE: Other support which communities may request:

   g. Funding to support a community based advisory or liaison group to work with NWMO to conduct the initial screening: Estimate $25,000 for each community

   h. Funding to support an FTE or partial FTE municipal staff: Estimate $40,000 - $80,000 per community
   i. Honorarium/reimbursement for attending meetings for public and elected politicians and out of pocket expenses

2. COVERED IN A SEPARATE WED: Funding national and provincial Aboriginal organizations:
   j. National organizations: Activities similar to a-h although completed at a non-site specific level and also develop information and communication material about the project to inform Aboriginal peoples.

   k. Provincial organizations: Activities similar to a-h although completed at a non-site specific level.

3. Funding regional level:
   l. No Funding planned at the regional level at this point in the process

4. Non-profit organizations and academics: See separate WED sheet

5. NWMO staff travel costs associated with trips to community in order to plan for, deliver and support (participate) community in capacity building activity and other relationship building. Note that each trip may involve a stay of one week or more:

   a. Estimate $5,000 associated with each community
   b. Estimate $5,000 associated with each community
   c. Estimate $5,000 associated with each community
   d. Estimate $5,000 associated with each community
   e. Estimate $10,000 (2 or 3 trips) associated with each community
   f. Estimate $10,000 (2 or 3 trips) associated with each community
   g. Estimate $10,000 (2 or 3 trips) associated with each community
   h. Estimate $40,000 associated with each community
   i.
   j. Estimate $18,000 (6 trips) associated with each of 5 national organizations
   k. Estimate $18,000 (6 trips) associated with each of 7 provincial organizations in 2010
   l. $0

Total of above per community: Potentially $255,000.

Deliverable

Support to communities to engage in various activities associated with Step 1 and Step 2 in the siting process

Assumptions

Assumes a 50% take-up rate on published capacity building program; assumes interested communities complete Steps 1 and 2 by end of 2011.

Schedule	Start Year	1	2010	Finish Year	3	2012

Type

Fixed

Calculations and Notes:

Costs reflect commitments made in Learn More Program - Early Steps published on the website.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 867,000	$ 867,000	$ 216,750	$ 1,083,750

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	60			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title COMMUNITY CAPACITY BUILDING – Community support for participation in Step 3 of the Siting process (feasibility study)

Description

The work package is designed to capture funding which will need to be provided to communities to support their participation in Step 3 of the siting process. The nature of funding provided to be outlined in a memorandum of understanding between the community(ies) involved at this stage and the NWMO. Use of funds is subject to third party audit.

1. Communities
   a. Travel expenses associated with trip to Sweden (or Carlsbad) to visit research facilities and to meet with community leaders involving a small representative delegation from the community: Estimate maximum $40,000 per community

   b. Hire a third party expert or establish a peer review group to support community's participation in feasibility study (Step 3), community based advisory group and part or full FTE to work with NWMO to conduct the feasibility study, develop information and communication material about the project to inform citizens and foster dialogue, conduct activities to inform residents and assess interest in surrounding areas, including First Nations, Métis and Inuit as appropriate: Estimate $150,000 per year

   c. Establish a community office for the project: See budget for store front offices described elsewhere

Total of above per community:
2011: $200,000
2012: $624,000
Note, assumptions and uncertainties include: Only 4 of 8 communities which begin this step will remain through to the end of the step, meaning that more resources will be devoted to these communities during this step than to the communities which drop out

2. Funding available to accountable authorities in potentially affected surrounding areas, including First Nations, Métis and Inuit, as appropriate, to support their participation.

   d. Travel costs associated for a small group of community representatives to travel to an NWMO briefing in a nearby regional hub or NWMO offices: Estimate $10,000 per community

   e. Proposals to hire a third party expert to review material published to date, in order to answer questions the community representatives may have about the safety of the project and the basis for confidence at this early stage: Estimate $15,000 per community

   f. Travel expenses associated with trip to visit an interim waste storage site by a small representative delegation: Estimate maximum $20,000 per community

   g. Hire a third party expert

   h. Develop information and communication material about the project to inform Aboriginal peoples and support their exploration of interest in hosting the project

   i. Funding to support a partial FTE municipal staff and honorarium/reimbursement for attending meetings for public and elected politicians.

2011: $204,000
2012: $624,000

3. Funding to region
   j. Included in above.

4. COSTS FOR THIS ITEM OUTLINED IN A SEPARATE WED. Funding national and provincial Aboriginal organizations:
   k. National organizations: Activities similar to a-b although completed at a non-site specific level.
   l. Provincial organizations: Activities similar to a-b although completed at a non-site specific level.

5. NWMO travel costs associated with trips to community in order to plan for, deliver and support (participate) community in capacity building activity and other relationship building:

- Communities: Assume 6 trips to each at $7,000 each.
- Surrounding communities: Assume 4 trips to each
- INCLUDED IN OTHER WED: Estimate $18,000 (6 trips) associated with each of: 5 national organizations in 2012 ($90,000)
- INCLUDED IN OTHER WED: Estimate $18,000 (6 trips) associated with each of: 6 provincial organizations in 2012 ($108,000)

Total of above:
2011: $100,000
2012: $100,000

Deliverable Support to communities to engage in various activities associated with Step 3 in the siting process

Assumptions

Schedule	Start Year	2	2011	Finish Year	3	2012	

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,900,000	$ 1,900,000	$ 475,000	$ 2,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	150			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title

COMMUNITY CAPACITY BUILDING – Community support for participation in Step 4/5/6 of the Siting process (detailed site characterization)

Description

The work package is designed to capture funding which will need to be provided to communities to support their participation in Step 4 of the siting process. The nature of funding provided to be outlined in a memorandum of understanding between the community(ies) involved at this stage and the NWMO. Use of funds is subject to third party audit.

Funding per year during the period 2013-1018 (detailed site characterization phase – Step 4)

a. Funding to eight communities to participate in process to decide 2 communities which will be the subject of detailed site characterization: Estimate: $85,000 in 2013

b. Funding for two communities to hire a third party expert or establish/maintain a peer review group to support community's participation in feasibility study (Step 3), community based advisory group and part or full FTE to work with NWMO during the detailed site characterization, conduct activities to inform residents and assess and demonstrate willingness in the community, conduct activities to inform residents in surrounding areas, including First Nations, Métis and Inuit as appropriate: Estimate $250,000 per year for each of 2 communities in each of 2013 - 2018

c. Establish or maintain a community office for the project: See budget for store front offices described elsewhere

d. Funding for affected Aboriginal peoples: $150,000 per year to be shared by Aboriginal communities surrounding each of the two potential host communities for the period 2013 – 2018. (Note: does not include national and provincial organizations)

e. Funding for set-up of multiparty group for conduct of regional study (involving community, region, Aboriginal and province representatives) and to pay for their normal operations, logistical support, development of communication materials and working groups. Includes development of regional plans to leverage the project: $300,000 per year (2013 – 2018) for each of two communities

f. COSTS NOT INCLUDED: Up front regional development payments to allow an exploration of capacity to capture benefits and initiate programs to increase this capacity and local sourcing. This may include strategic investment in commercial/industry sectors, educational and training programs for local workers, infrastructure and business development studies, etc. Focus on local community, surrounding communities, region and affected Aboriginal peoples. Estimate: $250,000 per year for each of the two regions during the period 2013 - 2018

g. NWMO staff travel costs to attend meetings in each of two communities (12 meetings per year), regional study organization for each community (4 meetings for each per year), potentially affected Aboriginal peoples (4 meetings per year with each of 4 Aboriginal groups in the surrounding area of each of the two potential host communities) - $300,000 per year per community for the period 2013 – 2018

Total of the above:

- *2013: $.827M*
- *2014: $1.516M*
- *2015: $1.545M*

Note some allowance for communities beginning this step in the siting process mid way through the year in 2013 has been made..

Deliverable

Support to communities to engage in various activities associated with Step 4/5/6 in the siting process

Assumptions

Schedule	Start Year	4	2013	Finish Year	9	2018

Type

Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,888,000	$ 3,888,000	$ 972,000	$ 4,860,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	50			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	CAPACITY BUILDING OF OTHERS – Non profit organizations/ academics								
Description	Includes funding to non-profit organizations and academics to enable them to participate in the site selection process leading up to the regulatory review stage and to follow and evaluate issues concerning the disposal of radioactive waste and its effect on the environment and people's health. · $200,000 per year, beginning in 2012 · Includes travel costs and out of pocket expenses associated with individuals attending an NWMO briefing, information session or topical workshop								
Deliverable									
Assumptions									
Schedule	Start Year	3	2012			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,400,000	$ 1,400,000	$ 350,000	$ 1,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	130			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	MANAGING COMMUNITY IMPACTS (Community Benefits)								
Description	Benefits to be defined for each of: · Host community · Surrounding communities · Region · Transportation communities as a large group with a shared interest · Losing potential host community Benefits to begin with triggering formal regulatory review process milestone. Full benefits to begin with granting of construction licence. Hosting agreement components may include: · The means by which the NWMO and the community will work together to seek regulatory approval to proceed to implement the project · The need for, and nature of, provision of resources and funding for technical and other assistance; · The need for, and nature of, any decision-making and/or advisory bodies to support the process · The mechanism to be used for dispute resolution · The approach for ensuring the long-term sustainability and well-being of the community through the project, outlining specific inclusions · The approach to managing the impacts association with the project As negotiated with the community, it may also include: · Upgrades to local roads and infrastructure · Emergency response, transportation monitoring, accident liability and transportation corridor training · Environmental oversight and monitoring agreement including oversight, monitoring, remediation, and emergency response in relation to environmental issues · Agreements with affected Aboriginal organizations · Environmental monitoring and research centre as part of Centre of Expertise (separate WED); baseline health studies; fund to support community based monitoring · Records centre as part of Centre of Expertise · Meeting and conference centre, local training and business centre, research center for independent environmental impact monitoring at university as part of Centre of Expertise · Funding for independent oversight · Advanced manufacturing and innovation training centre; Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence · Funding for school equipment and curricula · Community donations program · Local procurement program · Business development projects · Training – emergency response and radioprotection and related equipment · Economic assistance grant to offset impacts of transportation · Intergenerational fund · Property value protection Estimated total value of hosting agreement (above and beyond economic benefits which naturally flow from the project) is a contingent item to be negotiated with the community. · It is expected that a Milestone payment will be made upon the community making a compelling demonstration of willingness and being selected as preferred community in step 6. Will involve at a minimum host community, losing community and may involve surrounding communities/region.								
Deliverable									
Assumptions									
Schedule	Start Year	3	2012		Finish Year	9	2018		
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	20	50			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	MANAGING COMMUNITY IMPACTS (Community Benefits)								
Description	Benefits to be defined for each of: · Host community · Surrounding communities · Region · Transportation communities as a large group with a shared interest · Losing potential host community Benefits to begin with triggering formal regulatory review process milestone. Full benefits to begin with granting of construction licence. Hosting agreement components may include: · The means by which the NWMO and the community will work together to seek regulatory approval to proceed to implement the project · The need for, and nature of, provision of resources and funding for technical and other assistance; · The need for, and nature of, any decision-making and/or advisory bodies to support the process · The mechanism to be used for dispute resolution · The approach for ensuring the long-term sustainability and well-being of the community through the project, outlining specific inclusions · The approach to managing the impacts association with the project As negotiated with the community, it may also include: · Upgrades to local roads and infrastructure · Emergency response, transportation monitoring, accident liability and transportation corridor training · Environmental oversight and monitoring agreement including oversight, monitoring, remediation, and emergency response in relation to environmental issues · Agreements with affected Aboriginal organizations · Environmental monitoring and research centre as part of Centre of Expertise (separate WED); baseline health studies; fund to support community based monitoring · Records centre as part of Centre of Expertise · Meeting and conference centre, local training and business centre, research center for independent environmental impact monitoring at university as part of Centre of Expertise · Funding for independent oversight · Advanced manufacturing and innovation training centre; Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence · Funding for school equipment and curricula · Community donations program · Local procurement program · Business development projects · Training – emergency response and radioprotection and related equipment · Economic assistance grant to offset impacts of transportation · Intergenerational fund · Property value protection Estimated total value of hosting agreement (above and beyond economic benefits which naturally flow from the project) is a contingent item to be negotiated with the community. · It is expected that a Milestone payment will be made upon the community making a compelling demonstration of willingness and being selected as preferred community in step 6. Will involve at a minimum host community, losing community and may involve surrounding communities/region.								
Deliverable									
Assumptions									
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	30	30			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	MANAGING COMMUNITY IMPACTS (Community Benefits)								
Description	Benefits to be defined for each of: · Host community · Surrounding communities · Region · Transportation communities as a large group with a shared interest · Losing potential host community Benefits to begin with triggering formal regulatory review process milestone. Full benefits to begin with granting of construction licence. Hosting agreement components may include: · The means by which the NWMO and the community will work together to seek regulatory approval to proceed to implement the project · The need for, and nature of, provision of resources and funding for technical and other assistance; · The need for, and nature of, any decision-making and/or advisory bodies to support the process · The mechanism to be used for dispute resolution · The approach for ensuring the long-term sustainability and well-being of the community through the project, outlining specific inclusions · The approach to managing the impacts association with the project As negotiated with the community, it may also include: · Upgrades to local roads and infrastructure · Emergency response, transportation monitoring, accident liability and transportation corridor training · Environmental oversight and monitoring agreement including oversight, monitoring, remediation, and emergency response in relation to environmental issues · Agreements with affected Aboriginal organizations · Environmental monitoring and research centre as part of Centre of Expertise (separate WED); baseline health studies; fund to support community based monitoring · Records centre as part of Centre of Expertise · Meeting and conference centre, local training and business centre, research center for independent environmental impact monitoring at university as part of Centre of Expertise · Funding for independent oversight · Advanced manufacturing and innovation training centre; Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence · Funding for school equipment and curricula · Community donations program · Local procurement program · Business development projects · Training – emergency response and radioprotection and related equipment · Economic assistance grant to offset impacts of transportation · Intergenerational fund · Property value protection Estimated total value of hosting agreement (above and beyond economic benefits which naturally flow from the project) is a contingent item to be negotiated with the community. · It is expected that a Milestone payment will be made upon the community making a compelling demonstration of willingness and being selected as preferred community in step 6. Will involve at a minimum host community, losing community and may involve surrounding communities/region.								
Deliverable									
Assumptions									
Schedule	Start Year		16	2025		Finish Year		25	2034
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	40	30			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	MANAGING COMMUNITY IMPACTS (Community Benefits)								
Description	Benefits to be defined for each of: · Host community · Surrounding communities · Region · Transportation communities as a large group with a shared interest · Losing potential host community Benefits to begin with triggering formal regulatory review process milestone. Full benefits to begin with granting of construction licence. Hosting agreement components may include: · The means by which the NWMO and the community will work together to seek regulatory approval to proceed to implement the project · The need for, and nature of, provision of resources and funding for technical and other assistance; · The need for, and nature of, any decision-making and/or advisory bodies to support the process · The mechanism to be used for dispute resolution · The approach for ensuring the long-term sustainability and well-being of the community through the project, outlining specific inclusions · The approach to managing the impacts association with the project As negotiated with the community, it may also include: · Upgrades to local roads and infrastructure · Emergency response, transportation monitoring, accident liability and transportation corridor training · Environmental oversight and monitoring agreement including oversight, monitoring, remediation, and emergency response in relation to environmental issues · Agreements with affected Aboriginal organizations · Environmental monitoring and research centre as part of Centre of Expertise (separate WED); baseline health studies; fund to support community based monitoring · Records centre as part of Centre of Expertise · Meeting and conference centre, local training and business centre, research center for independent environmental impact monitoring at university as part of Centre of Expertise · Funding for independent oversight · Advanced manufacturing and innovation training centre; Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence · Funding for school equipment and curricula · Community donations program · Local procurement program · Business development projects · Training – emergency response and radioprotection and related equipment · Economic assistance grant to offset impacts of transportation · Intergenerational fund · Property value protection Estimated total value of hosting agreement (above and beyond economic benefits which naturally flow from the project) is a contingent item to be negotiated with the community. · It is expected that a Milestone payment will be made upon the community making a compelling demonstration of willingness and being selected as preferred community in step 6. Will involve at a minimum host community, losing community and may involve surrounding communities/region.								
Deliverable									
Assumptions									
Schedule	Start Year		26	2035		Finish Year	26	2035	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	160			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	CENTRE OF EXPERTISE (NEW)								
Description	· Assumes two centres of expertise will be launched, one in each of two communities involved in detailed site characterization. (As outlined in the siting document, centre of expertise will be established at the site, or nearby as determined with the community, initially to support the multi-year testing and assessment of the site on technical safety and community well-being related dimensions which is an important component of the siting process. It will be the home for an active technical and social research and technology demonstration program involving researchers and other experts in a wide variety of disciplines including rock science, engineering, environmental and socio-economic and cultural impact assessment. The centre of expertise will also be a focus for engaging members of the community to learn more about the project, to view the scientific and engineering work involved in site assessment in progress through public viewing galleries and interactive displays. Created as a small science centre focused on the design, construction and implementation of a deep geological repository and the wide variety of related activities, it will be designed not only as a meeting place and learning centre for the community but also as a destination for interested visitors from the region and beyond.) · Assumes one of these centres of expertise is developed into a national centre beginning in step 6 of the siting process. (As outlined in the siting document, should the site be ultimately selected to host the deep geological repository, the centre of expertise will be expanded to include and support the construction and operation of an underground demonstration facility designed to demonstrate the safety of the facilities before they are constructed and ultimately to support the operation of the deep repository over several decades. As has been the case for deep geological repositories for nuclear waste constructed in other countries, it will become a hub for knowledge sharing across Canada and internationally.) · As negotiated with the community, it may also include: o Records centre o Meeting and conference centre, o local training and business centre o research center for independent environmental impact monitoring o Advanced manufacturing and innovation training centre; o Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence o Ongoing research on Traditional Knowledge of area and development of Heritage Centre · Key Milestones: o 2014 - Begin construction on 2 sites as per commitments made in site selection process (Step 4). o 2018 - Expand facility at preferred site to meet community commitments (preferred site selected). o 2025 - Expand facility to support UDF and other commitments and DGR construction in 2030. o 2035 - Right size facility for operation phase of work and commitments to community.								
Deliverable									
Assumptions									
Schedule	Start Year		4	2013		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 10,000,000	$ 10,000,000	$ 2,500,000	$ 12,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	20	60			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	CENTRE OF EXPERTISE (NEW)								
Description	· Assumes two centres of expertise will be launched, one in each of two communities involved in detailed site characterization. (As outlined in the siting document, centre of expertise will be established at the site, or nearby as determined with the community, initially to support the multi-year testing and assessment of the site on technical safety and community well-being related dimensions which is an important component of the siting process. It will be the home for an active technical and social research and technology demonstration program involving researchers and other experts in a wide variety of disciplines including rock science, engineering, environmental and socio-economic and cultural impact assessment. The centre of expertise will also be a focus for engaging members of the community to learn more about the project, to view the scientific and engineering work involved in site assessment in progress through public viewing galleries and interactive displays. Created as a small science centre focused on the design, construction and implementation of a deep geological repository and the wide variety of related activities, it will be designed not only as a meeting place and learning centre for the community but also as a destination for interested visitors from the region and beyond.) · Assumes one of these centres of expertise is developed into a national centre beginning in step 6 of the siting process. (As outlined in the siting document, should the site be ultimately selected to host the deep geological repository, the centre of expertise will be expanded to include and support the construction and operation of an underground demonstration facility designed to demonstrate the safety of the facilities before they are constructed and ultimately to support the operation of the deep repository over several decades. As has been the case for deep geological repositories for nuclear waste constructed in other countries, it will become a hub for knowledge sharing across Canada and internationally.) · As negotiated with the community, it may also include: o Records centre o Meeting and conference centre, o local training and business centre o research center for independent environmental impact monitoring o Advanced manufacturing and innovation training centre; o Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence o Ongoing research on Traditional Knowledge of area and development of Heritage Centre · Key Milestones: o 2014 - Begin construction on 2 sites as per commitments made in site selection process (Step 4). o 2018 - Expand facility at preferred site to meet community commitments (preferred site selected). o 2025 - Expand facility to support UDF and other commitments and DGR construction in 2030. o 2035 - Right size facility for operation phase of work and commitments to community.								
Deliverable									
Assumptions									
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,000,000	$ 6,000,000	$ 1,500,000	$ 7,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	30	40			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	CENTRE OF EXPERTISE (NEW)								
Description	· Assumes two centres of expertise will be launched, one in each of two communities involved in detailed site characterization. (As outlined in the siting document, centre of expertise will be established at the site, or nearby as determined with the community, initially to support the multi-year testing and assessment of the site on technical safety and community well-being related dimensions which is an important component of the siting process. It will be the home for an active technical and social research and technology demonstration program involving researchers and other experts in a wide variety of disciplines including rock science, engineering, environmental and socio-economic and cultural impact assessment. The centre of expertise will also be a focus for engaging members of the community to learn more about the project, to view the scientific and engineering work involved in site assessment in progress through public viewing galleries and interactive displays. Created as a small science centre focused on the design, construction and implementation of a deep geological repository and the wide variety of related activities, it will be designed not only as a meeting place and learning centre for the community but also as a destination for interested visitors from the region and beyond.) · Assumes one of these centres of expertise is developed into a national centre beginning in step 6 of the siting process. (As outlined in the siting document, should the site be ultimately selected to host the deep geological repository, the centre of expertise will be expanded to include and support the construction and operation of an underground demonstration facility designed to demonstrate the safety of the facilities before they are constructed and ultimately to support the operation of the deep repository over several decades. As has been the case for deep geological repositories for nuclear waste constructed in other countries, it will become a hub for knowledge sharing across Canada and internationally.) · As negotiated with the community, it may also include: o Records centre o Meeting and conference centre, o local training and business centre o research center for independent environmental impact monitoring o Advanced manufacturing and innovation training centre; o Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence o Ongoing research on Traditional Knowledge of area and development of Heritage Centre · Key Milestones: o 2014 - Begin construction on 2 sites as per commitments made in site selection process (Step 4). o 2018 - Expand facility at preferred site to meet community commitments (preferred site selected). o 2025 - Expand facility to support UDF and other commitments and DGR construction in 2030. o 2035 - Right size facility for operation phase of work and commitments to community.								
Deliverable									
Assumptions									
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 12,000,000	$ 12,000,000	$ 3,000,000	$ 15,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	40	40			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	CENTRE OF EXPERTISE (NEW)								
Description	· Assumes two centres of expertise will be launched, one in each of two communities involved in detailed site characterization. (As outlined in the siting document, centre of expertise will be established at the site, or nearby as determined with the community, initially to support the multi-year testing and assessment of the site on technical safety and community well-being related dimensions which is an important component of the siting process. It will be the home for an active technical and social research and technology demonstration program involving researchers and other experts in a wide variety of disciplines including rock science, engineering, environmental and socio-economic and cultural impact assessment. The centre of expertise will also be a focus for engaging members of the community to learn more about the project, to view the scientific and engineering work involved in site assessment in progress through public viewing galleries and interactive displays. Created as a small science centre focused on the design, construction and implementation of a deep geological repository and the wide variety of related activities, it will be designed not only as a meeting place and learning centre for the community but also as a destination for interested visitors from the region and beyond.) · Assumes one of these centres of expertise is developed into a national centre beginning in step 6 of the siting process. (As outlined in the siting document, should the site be ultimately selected to host the deep geological repository, the centre of expertise will be expanded to include and support the construction and operation of an underground demonstration facility designed to demonstrate the safety of the facilities before they are constructed and ultimately to support the operation of the deep repository over several decades. As has been the case for deep geological repositories for nuclear waste constructed in other countries, it will become a hub for knowledge sharing across Canada and internationally.) · As negotiated with the community, it may also include: o Records centre o Meeting and conference centre, o local training and business centre o research center for independent environmental impact monitoring o Advanced manufacturing and innovation training centre; o Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence o Ongoing research on Traditional Knowledge of area and development of Heritage Centre · Key Milestones: o 2014 - Begin construction on 2 sites as per commitments made in site selection process (Step 4). o 2018 - Expand facility at preferred site to meet community commitments (preferred site selected). o 2025 - Expand facility to support UDF and other commitments and DGR construction in 2030. o 2035 - Right size facility for operation phase of work and commitments to community.								
Deliverable									
Assumptions									
Schedule	Start Year		26	2035			Finish Year	55	2064
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 15,000,000	$ 15,000,000	$ 3,750,000	$ 18,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	50	10			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	CENTRE OF EXPERTISE (NEW)								
Description	· Assumes two centres of expertise will be launched, one in each of two communities involved in detailed site characterization. (As outlined in the siting document, centre of expertise will be established at the site, or nearby as determined with the community, initially to support the multi-year testing and assessment of the site on technical safety and community well-being related dimensions which is an important component of the siting process. It will be the home for an active technical and social research and technology demonstration program involving researchers and other experts in a wide variety of disciplines including rock science, engineering, environmental and socio-economic and cultural impact assessment. The centre of expertise will also be a focus for engaging members of the community to learn more about the project, to view the scientific and engineering work involved in site assessment in progress through public viewing galleries and interactive displays. Created as a small science centre focused on the design, construction and implementation of a deep geological repository and the wide variety of related activities, it will be designed not only as a meeting place and learning centre for the community but also as a destination for interested visitors from the region and beyond.) · Assumes one of these centres of expertise is developed into a national centre beginning in step 6 of the siting process. (As outlined in the siting document, should the site be ultimately selected to host the deep geological repository, the centre of expertise will be expanded to include and support the construction and operation of an underground demonstration facility designed to demonstrate the safety of the facilities before they are constructed and ultimately to support the operation of the deep repository over several decades. As has been the case for deep geological repositories for nuclear waste constructed in other countries, it will become a hub for knowledge sharing across Canada and internationally.) · As negotiated with the community, it may also include: o Records centre o Meeting and conference centre, o local training and business centre o research center for independent environmental impact monitoring o Advanced manufacturing and innovation training centre; o Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence o Ongoing research on Traditional Knowledge of area and development of Heritage Centre · Key Milestones: o 2014 - Begin construction on 2 sites as per commitments made in site selection process (Step 4). o 2018 - Expand facility at preferred site to meet community commitments (preferred site selected). o 2025 - Expand facility to support UDF and other commitments and DGR construction in 2030. o 2035 - Right size facility for operation phase of work and commitments to community.								
Deliverable									
Assumptions									
Schedule	Start Year		56	2065		Finish Year	125	2134	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 7,000,000	$ 7,000,000	$ 1,750,000	$ 8,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	40			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	MUNICIPAL FORUM AND TOOL DEVELOPMENT								
Description	Joint conduct of research programs and development of tools and communication materials designed to support communities which are interested in hosting the project.								
Deliverable	Tools and communication materials targeted to communities and designed to support their exploration of interest in the APM project. Note that the specific work to be completed will be identified and shaped through dialogue with the Municipal Forum at its regular meetings. This work is expected to decrease over time as the siting process becomes more focussed on communities which have entered the siting process and, through dialogue and collaboration with the NWMO, will focus more directly on responding to their individual needs and requirements. Forecast of costs are: · $200,000 in 2011 · $100,000 in 2012, · $100,000 in 2013 · $50,000 in 2014								
Assumptions	It is assumed that the Municipal Forum will continue to meet at least until communities have been identified for detailed site characterization and regional study groups begin to be formed around them.								
Schedule	Start Year		2	2011			Finish Year	5	2014
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 450,000	$ 450,000	$ 112,500	$ 562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	180			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	EXPERT ADVICE, WORKSHOPS								
Description	The purpose of this work is to solicit expert advice and conduct topic specific workshops to support the development of components of the siting process, as it unfolds, that may be important to the credibility of the siting process and NWMO's participation in it. Forecast costs: · $200,000 in 2010								
Deliverable									
Assumptions									
Schedule	Start Year		1	2010		Finish Year	1	2010	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 200,000	$ 200,000	$ 50,000	$ 250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	120		**Prepared By:**	J. Facella	
WBS (Old)									

WBS Title ASSESSMENTS OF SITE SUITABILITY (SOCIAL ASPECTS)

Description

The focus of this work program is to assess, in a stepwise manner, the potential social, political, ethical, economic and cultural effects of the project on an interested community under the umbrella of "community well-being".

Step 1 and 2

- Development of a reference framework which elaborates on the community well-begin framework described in the siting document
- Consultant develops desk-top profile of community, describing the community on as many of the dimensions of the reference framework possible using publicly available data. This is intended for NWMO internal use in obtaining an early sense of the resources which may be required to implement the project in the community. The profile will also be used to help build the capacity of the NWMO to engage in early discussions and relationship building with the community: Estimate of cost is $50,000 per community
- NWMO staff costs to travel to the community, to walk through the community with community representatives for an early 'ground-truthing' of the profile.

Estimated cost:

- $357,000 in 2011

Step 3

- Contractor cost to add to the desktop profile with information held by the community and obtained during this step: Estimate of incremental cost $20,000 - $25,000 per community. Total $125,000 in each of 2011 and 2012
- NWMO may wish to conduct regional information sessions, or other broad engagement, to supplement the work lead by the community and funded as part of the community capacity building program – NO COST INCLUDED IN THIS WED
- Contractor development of abbreviated desktop community profile for surrounding communities. Estimate: $200,000 in each of 2011 and 2012
- Contractor development of high level profile for each region associated with potential host communities. Estimate: $200,000 in each of 2011 and 2012
- Cost associated with launching of Traditional Land Use Studies. Estimate: $100,00 in 2011 and $250,000 in 2012
- NWMO lead engagement among transportation communities to begin identification of social issues. Estimate: $50,000 in 2011 and $150,000 in 2012
- Field Studies (interviews). Estimate: $100,000 in 2012
- NWMO staff travel. Estimate $100,000 in 2011 and $100,000 in 2012

Estimated cost:

- $775,000 in 2011
- $1.13M in 2012

Step 4

- Field studies in communities. Estimate: $100,000 in 2013; $200,000 in 2014; $100,000 in 2015; expenditure at 2015 level each year until completion of EIS
- Field studies in surrounding communities. Estimate: $100,000 in 2013; $200,000 in 2014; $100,000 in 2015; expenditure at 2015 level each year until completion of EIS
- Field studies in regions. Estimate: $80,000 in 2013; $100,000 in 2014; $100,000 in 2015; expenditure at 2015 level each year until completion of EIS
- NWMO lead engagement. Estimate: $100,000 in 2013; $200,000 in 2014; $200,000 in 2015; expenditure at 2015 level each year until completion of EIS
- Regional Study Management. Estimate: $284,000 in 2011; $100,000 in 2012; $388,000 in 2013; $2.294M in 2014; $100,000 in 2015; expenditure at 2015 level each year until completion of EIS
- Traditional Land Use Studies (Phase 2). Estimate: $100,000 in 2014; $100,000 in 2015; expenditure at 2015 level each year until completion of EIS
- Staff travel. Estimate: $100,000 in 2013; $200,000 in 2014; $200,000 in 2015; expenditure at 2015 level each year until completion of EIS.

Estimated cost:

- $525,000 in 2013
- $1.1M in 2014
- $900,000 in 2015
- Note some level of spending is expected to be required through until completion of EIS

Deliverable Stepwise assessment of suitability of site, surrounding communities, region, transportation communities (as a large group with a shared interest).

Assumptions

- Assumes 4 communities surround each potential willing host community, including Aboriginal communities
- Assumes these studies are a foundation for relationship building and issue management with community, surrounding communities, regions, transportation communities. For this reason, it is assumed that expenditures in this area will need to continue at some level through until the completion of the EIS.
- $357K in step 2 (2011); $1.961M in Step 3 (2011-2012); $5.655M in Step 4 (2011-2015).

Schedule	Start Year	2	2011	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 7,973,000	$ 7,973,000	$ 1,993,250	$ 9,966,250

APM Cost Estimate

Work Element Definition Sheet

								NWMO Cost Code: 0170022-**11**	
WBS (New)	560	15	10	10	100			**Prepared By:**	P. Simmons
WBS (Old)									
	SITING SELECTION PROCESS								
WBS Title	**STAFF TRAVEL COSTS – NON ABORIGINAL**								
Description	Category includes for NWMO staff to attend, and provide/deliver speaking engagements and briefings on request to municipal councils, council committees (e.g. economic development) community groups and other accountable authorities in the 4 nuclear provinces interested in learning more about NWMO, APM site selection process on an ongoing basis. These requests must be initiated by the local accountable authority (e.g. municipal council), which do not include aboriginal councils and organizations (separate category). Costs include travel-related expenses for staff participating in speaking engagements/briefings, and on off-site meetings (briefings), and related costs (catering, meeting room, A/V, travel for delegates and accommodations if needed).								
Deliverable	Primary deliverable is primarily informing delegations and inquiring bodies through response and requests for information. Related to this deliverable (budgeted elsewhere) is the NWMO learn more program highlighted, reviewed and discussed at these speaking engagements. Secondary deliverable is the support of the NWMO brand as it relates to continued awareness of the siting process, and the dispensation of information and tools and products associated with the siting process. Third deliverable is the maintenance and building of relationships between municipal governments, associations, community groups, potential host communities and surrounding communities for long-term sustainability of site selection process and confidence in the NWMO.								
Assumptions	It is estimated that the NWMO will inform and respond to several non-aboriginal community meetings/briefings per year until 2025 (Aboriginal budgeted elsewhere). It is assumed that a number of these requests for information briefings from community organizations may lead to participation in the NWMO's "Learn More" program from which funding may be provided to municipalities for independent studies aimed to inform their consideration of interest in the project. Costs associated with the Learn More program are categorized and budgeted separately. The costs and activities, as outlined in this category, assist in building relationships with community leaders and members, increase awareness of APM and the siting process, and allow for information distribution in local communities and may encourage participation in the Learn More Program. The average number of inquiring communities may fluctuate and cannot reasonably be assumed to increase or decrease, but is assumed to drop after candidate sites are selected. The locations of the meetings, and pace at which groups move through the process cannot reasonably be assumed. Consequently, the average cost per meeting should be kept conservatively high versus low.								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	Current budget Y01 (2010) = $ 200,000 Y02 (2011) – Y03 (2012) – $180,000 x 2 years = $ 360,000 Y04 (2013) – Y16 (2025) – $125,000 x 13 years = $ 1,625,000 Y17 (2026) – Y26 (2034) - $75,000 x 9 years = $675,000								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,310,000	$ 1,310,000	$ 327,500	$ 1,637,500

APM Cost Estimate

Work Element Definition Sheet

								NWMO Cost Code: 0170022-**11**	
WBS (New)	560	15	10	20	30			**Prepared By:**	P. Simmons
WBS (Old)									
	SITING SELECTION PROCESS								
WBS Title	**STAFF TRAVEL COSTS – NON ABORIGINAL**								
Description	Category includes for NWMO staff to attend, and provide/deliver speaking engagements and briefings on request to municipal councils, council committees (e.g. economic development) community groups and other accountable authorities in the 4 nuclear provinces interested in learning more about NWMO, APM site selection process on an ongoing basis. These requests must be initiated by the local accountable authority (e.g. municipal council), which do not include aboriginal councils and organizations (separate category). Costs include travel-related expenses for staff participating in speaking engagements/briefings, and on off-site meetings (briefings), and related costs (catering, meeting room, A/V, travel for delegates and accommodations if needed).								
Deliverable	Primary deliverable is primarily informing delegations and inquiring bodies through response and requests for information. Related to this deliverable (budgeted elsewhere) is the NWMO learn more program highlighted, reviewed and discussed at these speaking engagements. Secondary deliverable is the support of the NWMO brand as it relates to continued awareness of the siting process, and the dispensation of information and tools and products associated with the siting process. Third deliverable is the maintenance and building of relationships between municipal governments, associations, community groups, potential host communities and surrounding communities for long-term sustainability of site selection process and confidence in the NWMO.								
Assumptions	It is estimated that the NWMO will inform and respond to several non-aboriginal community meetings/briefings per year until 2025 (Aboriginal budgeted elsewhere). It is assumed that a number of these requests for information briefings from community organizations may lead to participation in the NWMO's "Learn More" program from which funding may be provided to municipalities for independent studies aimed to inform their consideration of interest in the project. Costs associated with the Learn More program are categorized and budgeted separately. The costs and activities, as outlined in this category, assist in building relationships with community leaders and members, increase awareness of APM and the siting process, and allow for information distribution in local communities and may encourage participation in the Learn More Program. The average number of inquiring communities may fluctuate and cannot reasonably be assumed to increase or decrease, but is assumed to drop after candidate sites are selected. The locations of the meetings, and pace at which groups move through the process cannot reasonably be assumed. Consequently, the average cost per meeting should be kept conservatively high versus low.								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	Current budget Y01 (2010) = $ 200,000 Y02 (2011) – Y03 (2012) – $180,000 x 2 years = $ 360,000 Y04 (2013) – Y16 (2025) – $125,000 x 13 years = $ 1,625,000 Y17 (2026) – Y26 (2034) - $75,000 x 9 years = $675,000								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$ 187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

								NWMO Cost Code: 0170022-**11**	
WBS (New)	560	15	10	30	10			**Prepared By:**	P. Simmons
WBS (Old)									
	SITING SELECTION PROCESS								
WBS Title	**STAFF TRAVEL COSTS – NON ABORIGINAL**								
Description	Category includes for NWMO staff to attend, and provide/deliver speaking engagements and briefings on request to municipal councils, council committees (e.g. economic development) community groups and other accountable authorities in the 4 nuclear provinces interested in learning more about NWMO, APM site selection process on an ongoing basis. These requests must be initiated by the local accountable authority (e.g. municipal council), which do not include aboriginal councils and organizations (separate category). Costs include travel-related expenses for staff participating in speaking engagements/briefings, and on off-site meetings (briefings), and related costs (catering, meeting room, A/V, travel for delegates and accommodations if needed).								
Deliverable	Primary deliverable is primarily informing delegations and inquiring bodies through response and requests for information. Related to this deliverable (budgeted elsewhere) is the NWMO learn more program highlighted, reviewed and discussed at these speaking engagements. Secondary deliverable is the support of the NWMO brand as it relates to continued awareness of the siting process, and the dispensation of information and tools and products associated with the siting process. Third deliverable is the maintenance and building of relationships between municipal governments, associations, community groups, potential host communities and surrounding communities for long-term sustainability of site selection process and confidence in the NWMO.								
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Schedule	Start Year	16	2025	Finish Year	25	2034			
Type	Fixed								
Calculations and Notes:	Current budget Y01 (2010) = $ 200,000 Y02 (2011) – Y03 (2012) – $180,000 x 2 years = $ 360,000 Y04 (2013) – Y16 (2025) – $125,000 x 13 years = $ 1,625,000 Y17 (2026) – Y26 (2034) - $75,000 x 9 years = $675,000								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$ 187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	80			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	STAKEHOLDER MAPPING FOR SITING REGIONS								
Description	Identify key undividuals, groups and networks which may become involved in the site selection process and build an understanding of their issues, needs and concerns in order that these might be addresed prior to licensing.								
Deliverable	Strategic overview report for each of the involved regions, prepared by a contractor, and updated periodically in the period leading up to licensing.								
Assumptions									
Schedule	Start Year		2	2011		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 800,000	$ 800,000	$	200,000	$ 1,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	20	70			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	STAKEHOLDER MAPPING FOR SITING REGIONS								
Description	Identify key undividuals, groups and networks which may become involved in the site selection process and build an understanding of their issues, needs and concerns in order that these might be addresed prior to licensing.								
Deliverable	Strategic overview report for each of the involved regions, prepared by a contractor, and updated periodically in the period leading up to licensing.								
Assumptions									
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 600,000	$ 600,000	$ 150,000	$ 750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	10	10	90			**Prepared By:**	J. Facella/J. Robinson
WBS (Old)									
WBS Title	NATIONAL WORKSHOPS ON SOCIAL CONSIDERATIONS OF SITING								
Description	Workshops to raise awareness of APM siting process, and provide communities with access to information on APM project. Workshops designed to be responsive to topics identified by communities and municipal associations as being of great Interest.								
Deliverable	Two phases: - A full-day panel session in Halifax at the Spring 2011 conference of Federation of Canadian Municipalities, including presentations from Swedish councilors from host community. - Opportunities for individual communities to commence with representatives from Sweden.								
Assumptions	That we will cover costs of conference registrations, travel costs, meeting rooms and facilitation costs.								
Schedule	Start Year	2	2011	Finish Year	6	2015			
Type	Fixed								
Calculations	Assume travel and registration costs for: -15 communities bringing 5 members each. - 4 Swedish officials. Assume additional costs for conference facilities, meeting rooms, meals and facilitation.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 250,000	$ 250,000	$	62,500	$ 312,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	560	15	60	40	10			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	SUSTAINING RELATIONSHIPS/ COLLABORATION DURING OPERATIONS								
Description	The focus of this work program is to sustain relationships with the community throughout operation of the facility by continuing to engage the community at a grass roots level in decision-making through operations and involvement in ongoing monitoring and management of project effects. NWMO has committed to this ongoing collaboration in its published material. The funding outlined here is designed to cover NWMO costs (not associated with labour or communications material production) associated with ongoing involvement of community residents in monitoring of potential effects and other key decision areas throughout operations. These costs may include: catering for community meetings, rental of facilities for community meetings, hiring of a facilitator for community meetings if appropriate, and more.								
Deliverable	Support for ongoing community engagement and outreach								
Assumptions	Cost of public communication covered elsewhere								
Schedule	Start Year		26	2035			Finish Year	55	2064
Type	Fixed								
Calculations and Notes:	$100,000/ year through the period of operations (2035 – 2064)								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,000,000	$ 3,000,000	$ 750,000	$ 3,750,000

B.2 Alternate Case 7.2 Million Bundle Work Element Definition Sheets

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	50	10	10			**Prepared By:**	A. Murchison
WBS (Old)	552	20	2						
WBS Title	REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, APM SITING PHASE TECHNOLOGY WATCH								
Description	Provide overall management of the repository system development during repository siting. Tasks include: - Technology watch on alternative used fuel management approaches. - Identify and provide technical risk management recommendations to the executive								
Deliverable	- Management of: - Technology watch through external contractors on such topics as Re-processing & transmutation, very deep borehole disposal, alternative fuel management approaches, etc.,								
Assumptions	Duration of work: Y01 to Y09. Staff requirements found in REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, APM SITING PHASE DESIGN & COST UPDATE Description Y01 Y02 Y03 Y04 Y05 Y06 Y07 Y08 Y09 Year 2010 2011 2012 2013 2014 2015 2016 2017 2018 Watching Brief $52k $75k $75k $75k $75k $75k $75k $75k $75k Budget based on historical costs to place technology watch contracts.								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 652,000	$ 652,000	$ 163,000	$ 815,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	20	10	10			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	20	40					
WBS Title	DATABASE AND INFORMATION SYSTEMS								
Description	Develop the infrastructure for an integrated electronic geographic and geologic database and information management system. System design intended for spatial and temporal analysis, interpretation, integration and communication of site specific characterisation and monitoring data. Information System would be applied and, as required, up-graded throughout the repository siting process. It would further serve to archive site specific geosphere/biosphere data and create traceable data sets that would evolve as siting proceeded toward confirmation of the preferred site and UCF construction/operation. Databases would be accessible by a suite of analyses and visualization applications (GIS, Gocad, ...), which would likely evolve over the timeframe of the project. Interoperability is essential. Databases would be structured to include data information on transportation, natural environment, remote imaging, airborne geophysics, seismicity, geology, borehole data, municipal/ regional boundaries, aboriginal lands, surface hydrology, topography and groundwater resources. Results of geosphere model development and associated numerical simulations will also be archived in a suitable database. Database would facilitate internet access by project team members and other stakeholders, if appropriate.								
Deliverable	Integrated Electronic Information system and infrastructure to apply in support of repository siting, Environmental Assessment, conceptual geosphere model development, Performance and Safety Assessment.								
Assumptions	**Cost (Y01-Y09)**: - DBS Equipment start-up costs (software, server): $100k for Y02; - Annual Licensing fees and upgrades: $100k/a for Y03-Y09; Database/Information management system maintained through Geoscience and monitoring support beyond Y25.								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 800,000	$ -	$ 800,000	$ 200,000	$ 1,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	20	10	20			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	10						
WBS Title	GEOSCIENCE TECHNICAL SITING MANAGEMENT AND SUPPORT TO ENGAGEMENT								
Description	Provide technical siting management for geosphere characterisation activities related to the siting process for a Deep Geologic Repository. Requires the planning and co-ordination of field, laboratory and modelling studies, as well as, electronic information systems to support repository engineering, Safety Assessment and Environmental Assessment functions. Tasks include: - Management of Technical Siting activities (Initial Screening, Feasibility Studies, Detailed Characterization) - Providing support for community engagement activities. - Technical support for repository design/engineering, repository safety and environmental assessment. - The administration and formation of technical advisory and peer review panels. - Liaison with international geosphere radioactive waste management programs on issues related to collaborative RD&D activities and siting program status.								
Deliverable	- Site Characterisation and Monitoring plans throughout the siting process. - Technical Advisory/Expert panel reports.								
Assumptions	NWMO Staffing: Y01: 1 x NWMO-1 and 4.6 x NWMO-3: Travel of $15k Y02: 1 x NWMO-1 and 10.8 x NWMO-3; Travel of $30k Y03: 1 x NWMO-1 and 12.5 x NWMO-3; Travel of $35k Y04: 1 x NWMO-1 and 20.7 x NWMO-3; Travel of $55k Y05 to Y09: 1 x NWMO-1 and 25.2 x NWMO-3 Travel of $60k/a								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	Additional internal staffing required during detailed site characterization phase (Y05-Y09) to manage extra siting and monitoring efforts: 1 data management, 1 geology, 1 geo-synthesis, 1 hydrology, 1 rock mechanics (Total of 5 staff). Staffing scenario 2 assumed. Travel is assuming one trip per year per staff.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 24,722,160	$ -	$ 435,000	$ 25,157,160	$ 6,289,290	$ 31,446,450

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	20	10	30			**Prepared By:**	B. Belfadhel
WBS (Old)									

WBS Title INITIAL SCREENING

Description

An initial screening study will be undertaken when a community expresses interest in entering the site evaluation process. The initial screening is a desktop study based on readily available information. The five Initial Screening Criteria relate to a site having sufficient space, an absence of significant natural environment and heritage features, minimal possibility of future disruption due to human intrusion, and avoiding known geoscientific conditions that would compromise repository safety. The overall objective of initial screening is to allow sites or areas that clearly have the potential to host a used nuclear fuel repository to be moved forward in the process, while eliminating those sites or areas that are clearly unsuitable. The level of detail at which these various aspects will be assessed will depend on the amount of site information that will be available. A more detailed assessment will be conducted at the feasibility stage provided the community meets all the initial screening criteria and the community remains interested in participating in the site selection process.

Deliverable

- Geoscientific screening assessment reports for each community to identify suitability for desktop Feasibility Study.
- All data sets used in the screening assessment will be stored in the NWMO data management system accompanied with necessary metadata for future reference and traceability.
- Technical communication/presentation of screening study findings to community representatives.

Assumptions

- 15 communities have expressed interest in entering voluntary siting process.
- Information Management System infrastructure is operational.
- Screening assessment methodology is in place, one or more external service providers are familiar with the NWMO approach to screening and relevant geoscientific data are available.
- Staffing included in WED 560.15.20.10.20 entitled "Geoscience Technical Siting Management and Support to Engagement".

Cost:

- Purchased Services: Geoscience consultants to complete screening assessments and reporting at 14 communities (2010-2011):
- Initial screening costs average $50k/ community
- Y1: $317k (4 communities)
- Y2: $500k (10 communities)

Year 1 includes $67k of the detailed plan for initial screening, geotechnical feasibility studies and limited field investigation.

Schedule	Start Year	1	2010	Finish Year	2	2011
Type	Fixed					
Calculations and Notes:						

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 817,000	$ 817,000	$ 204,250	$ 1,021,250

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	20	10	40			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	50	20					
WBS Title	DESKTOP FEASIBILITY STUDIES								
Description	A feasibility study is initially conducted in the form of thorough desktop study to assess whether a proposed site has the potential to meet the detailed safety-related criteria based on geoscientific factors identified in NWMO site selection process. The study will be conducted using published available information. Some interested communities are expected to propose larger areas for consideration without having selected a specific site. In such cases, the feasibility study will initially examine these larger areas and identify a specific site or multiple sites from within that area that have the potential to meet the detailed safety-related criteria. Depending on the desktop study findings, the feasibility studies may potentially include preliminary field investigations, as described below. If field investigations are deemed not necessary, the site is moved forward for further consideration and compared with other sites to assess whether it is advanced to the detailed site characterization stage.								
Deliverable	- Desktop Site-specific Feasibility Study reports for 8 sites in 2011-2012 - All data sets used in the feasibility studies will be stored in the NWMO data management system accompanied with necessary metadata for future reference and traceability. - Technical communication/presentation of feasibility study findings to community representatives.								
Assumptions	- Procedure for completion of Desktop Feasibility Studies is available and external consultants are prepared to develop site-specific plans and undertake the studies in an efficient manner. - Desktop Feasibility Studies would be conducted at 8 Candidate sites. - Information Management System infrastructure is operational. - Work is done by external contractors. NWMO Staffing is included in WED 560.15.20.10.20 entitled "GEOSCIENCE TECHNICAL SITING MANAGEMENT AND SUPPORT TO ENGAGEMENT". **Cost:** - Y2: Complete desktop feasibility studies for four sites ($500K per site): $2,000K - Y3: Complete desktop feasibility studies for four additional sites ($500K per site): $2,000K								
Schedule	Start Year		2	2011		Finish Year	3	2012	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 4,000,000	$ 4,000,000	$ 1,000,000	$ 5,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	20	10	50			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	50	30					

WBS Title PRELIMINARY FIELD STUDIES IN SUPPORT OF FEASIBILITY ASSESSMENTS

Description

The objective of conducting preliminary field investigations is to increase confidence in the suitability of a particular site. Where required, this is an important final data gathering step, before the decision is made to proceed to detailed characterization at one or more sites. The first step in the decision making process is to assess the extent, nature and cost of the preliminary field studies that would be required to increase confidence in the suitability of the site. A preliminary field study plan would be prepared outlining the requirements and necessary approach. These field studies would be designed to focus on addressing site-specific safety-related criteria by investigating key features, in order to assess particular conditions. Preliminary field studies may include: i) airborne geophysical; ii) aerial photography; iii) reconnaissance level geologic/structural mapping; vi) surface based geophysical surveys; v) topographic surveys; vi) structural lineament analysis; vii) Landsat/Radarsat data analysis; viii) surface hydrology surveys, ix) groundwater resource/quality assessments and x) limited borehole drilling and surveys if justified.

Deliverables

- Site-specific Preliminary Field Study plans
- Preliminary Field Investigation Report and updated Feasibility study report
- All data sets developed during field studies will be stored in the NWMO data management system accompanied with necessary metadata for future reference and traceability.
- Technical communication/presentation of preliminary field study findings to community representatives.

Assumptions

- Desktop Feasibility Study identifies knowledge gaps and summarizes the benefits of undertaking preliminary field studies.
- Information Management System infrastructure is operational.
- Up to 4 preliminary field studies are completed between 2011 to 2013.
- Work is done by external contractors. NWMO Staffing is included in WED 560.15.20.10.20
- Community and Offsets & Benefits assumed to provide compensation to communities to permit early borehole activity.

Field studies per site will include: Site field study plan ($150K); Remote Imaging/Landsat/Radarsat ($50k); DEM/Lidar ($50k); Airborne Geophysics(500k); field geology and lineament mapping ($100K); 3 percussion boreholes including analysis ($1,500); Transportation/Access/Field Expenses/equipment: $500k; project coordination and data synthesis and update of feasibility study report ($500K); external advice and review ($150K). $ 3, 500K per site

Cost:

- Y02: Begin preliminary field investigations at one site: $400k
- Y03: Complete preliminary field investigations at one site and begin investigations at 2 additional sites: $5,725k
- Y04: Complete preliminary field investigations at three sites: $7,875k

Schedule	Start Year	2	2011		Finish Year	4	2013		

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 14,000,000	$ 14,000,000	$ 3,500,000	$ 17,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	20	10	60			**Prepared By:**	B. Belfadhel
WBS (Old)									

WBS Title	CHARACTERISATION AND MONITORING PLANS FOR 2 SITES
Description	Develop site-specific characterisation plans for up to 2 separate crystalline sites (10-20 km2). The plans will focus on the co-ordination of surface based and borehole geosphere characterization activities to confirm site suitability and provide input to the development of a Geoscientific Site Model. The plan would be designed to support Safety Assessment activities and Underground Characterisation Facility (UCF) engineering functions, through supporting geoscience numerical modelling tasks. As part of the plan geologic, geomechanical, hydrogeochemical, hydrogeologic and associated numerical modelling activities to confirm or revise the basis for the geoscientific models at the preferred sites, would be co-ordinated. Site characterisation activities would be designed to establish site specific baseline monitoring programs. The site characterisation plans would be reviewed and revised during the 5-year period to account for acquired knowledge and remaining needs. Development of the plan and its subsequent review would include stakeholdering with the potential host communities, government agencies and regulatory bodies.
Deliverable	- Phase I Detailed Site Characterisation and Monitoring Plans for two sites. - Phase II Detailed Site Characterisation and Monitoring Plans for two sites. - Phase III Detailed Site Characterisation and Monitoring Plans for two sites.
Assumptions	- Two sites both in crystalline rock (10 to 20 km2). - Work is done by external contractors. NWMO Staffing is included in 561.15.20.10.20 - Site Characterisation activities proceed according to three phases. - Cost includes peer-review of the plans. **Cost:** - Y04: Develop detailed site characterization and monitoring plans for first site: $900K - Y05: Develop detailed site characterization and monitoring plans for second site: $900K - Y06: Revise detailed site characterization and monitoring plans for both sites : $975K - Y08: Revise detailed site characterization and monitoring plans for both sites : $975K

Schedule	Start Year	4	2013	Finish Year	8	2017
Type	Fixed					
Calculations and Notes:	Additional planning effort required for larger characterization (x 2) footprint at both sites. Assuming x 1.5 factor for plans development throughout.					

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,750,000	$ 3,750,000	$ 937,500	$ 4,687,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	20	10	70			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	70	30					

WBS Title DETAILED SITE CHARACTERISATION (CRYSTALLINE SITE)

Description

Complete surface based geologic and geotechnical characterisation of a crystalline rock site approximately 10 to 20 km2 in area. Site characterisation activities would involve laboratory and field investigations to support Geoscience, Safety Assessment and Repository Engineering functions including the design of an Underground Characterisation Facility (UCF). Site specific monitoring programs designed to establish baseline conditions will be established and managed under WBS 560 15 40 40 and WBS 560 15 40 50. This monitoring information would serve to define impacts resulting from on-going site characterization activities and eventual development of an Underground Characterization Facility, if approved. The monitoring information will also support the Environmental Assessment process and licensing.

Characterisation activities would include detailed geologic mapping with a focus on nature and distribution of bedrock lithology and in particular the acquisition of fracture network statistics A network of borehole seismographs would be established to monitor micro-seismicity in the region around the sites. Field and laboratory activities would be described in a series of supporting reports for the purpose of creating a 3-dimensional Descriptive Site Geosphere Model DGSM. Database support activities would include application of GIS and Virtual Reality Technologies for integration and interpretation of multi-disciplinary data sets. Three-dimensional numerical analyses of the Site groundwater flow system would be conducted and documented. The simulations would explore flow system uncertainty based on field observation and boundary conditions at time scales relevant to repository construction and long-term safety. Model results would serve as basis for preliminary impact modelling and confirmation of potentially suitable repository scale preferred siting locations.

Airborne surveys (such as aerial photography, Lidar, EM) will be undertaken if required based on the extent of available information from the Feasibility Studies. Surface based investigations will include a coordinated campaign of geophysical surveys (such as 2D seismic, EM, Resistivity) and deep and shallow boreholes.

The drilling and analysis of boreholes is the most expensive component during detailed site characterization. The number of boreholes that will be required is site specific. However, based on the Swedish experience and the OPG-DGR project, it would be reasonable to assume that a full detailed site characterization would cost $173M per site. Site characterization activities at each site would likely involve: Geophysics 2D and Field geological mapping; drilling, testing and analysis of 35 cored boreholes; the drilling and testing of 35 percussion boreholes; external independent advice and review; and development and regular update of site descriptive model.

Activities and costs to undertake detailed characterization at a site with an average degree of complexity include:
Geophysics = $11M; 35 cored BH x $3.0M=$105M; 35 percussion BH x $1.0M = $35M; geosynthesis, Descriptive site model = $19.5M; and peer reviews = $3M.
These activities and costs are consistent with the Swedish experience where 2 crystalline sites have been investigated in detail. They are also consistent with recent OPG DGR experience.

Deliverable

- Descriptive Geosphere Site Model, including groundwater flow system modelling.
- Supporting geosphere characterisation documentation.
- Updated Site Database and VR simulations.

Assumptions

- Two crystalline sites are available for detailed investigation.
- Sites are investigated in parallel.
- Characterization activities are conducted by external contractors. NWMO Staffing is included in 561.15.20.10.20.
- Electronic database and Information systems are operational.
- Assumed total cost is $173M per site spread over 5 years based on Swedish experience.

Cost flow:

- Y05: $24M ($12M per site)
- Y06: $80M ($40M persite)
- Y07 to Y08 : $86M per year ($43M per site) and Y09: $70M ($35M per site)

Schedule Start Year 5 2014 Finish Year 9 2018

Type Fixed

Calculations and Notes: Number of boreholes increases by 1.75; Geophysics investigation increases by 2; Geophysics effort increases by 1.5; Descriptive Site model development effort increases by 1.5 and peer review effort increases by 2.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 346,000,000	$ 346,000,000	$ 86,500,000	$ 432,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	20	10	80			**Prepared By:**	B. Belfadhel
WBS (Old)									

WBS Title	GEOSPHERE MONITORING DURING DETAILED SITE CHARACTERIZATION AT 2 SITES
Description	Detailed geoscientific site characterization activities will be undertaken at up to 2 sites over several years (Y04-Y09). These activities are directed in part to obtain primary data on the geologic, hydrogeologic, hydrogeochemical and geomechanical characteristics of the sites for the purpose of further addressing their suitability and to support the development of the Descriptive Geoscientific Site Model (DGSM). The detailed site characterization plan also requires establishing permanent installations for the purpose of developing the baseline, or undisturbed conditions of the site and for monitoring the natural time-varying trends in specific geosphere properties and responses as well as potential changes associated with continued borehole characterization activities. Monitoring installations may be established in a step-wise fashion throughout the detailed site characterization program and will require an increasing level of geoscience support to acquire, evaluate, store and report the new data sets. During the detailed site characterization phase, geosphere monitoring installations will consist primarily of shallow groundwater monitoring wells (~ 100 m), multiple-level groundwater monitoring systems in deep boreholes (~ 1000 m), borehole seismographs and GPS stations. Groundwater monitoring will consist of periodic (ex: quarterly) measurements of hydraulic pressures and periodic collection of groundwater samples for hydrogeochemical analyses. Only routine maintenance of the monitoring well network and equipment is anticipated during this phase. Seismograph and GPS stations will include automatic data acquisition systems accessed remotely, but will require routine maintenance.
Deliverable	- Annual reports on baseline monitoring conditions, and evaluation of trends. - Provision of QA'd monitoring data to the electronic Information management system
Assumptions	- Two sites are undergoing detailed site characterization. - All monitoring installations are made operational as part of detailed characterization activities. - Groundwater pressure monitoring will take place quarterly and sampling will take place semi-annually - An electronic information management system is operational. - Local climate monitoring, such as rainfall and snow accumulation, as well as surface water monitoring is assumed to be undertaken under Biosphere Characterization for candidate sites. - Formal monitoring program begins in the year following the start of detailed site characterization **Purchase Services:** **Y06-Y09:** - Hydraulic pressure measurement, groundwater sample collection and reporting: Y06 $74k ($37k/site); Y07 $315k ($157.5k per site); Y08 $580k ($290k per site); Y09 $840k ($420k per site). - Monitor and maintain seismograph and GPS stations: $200k/a ($100k/a/site). - Analytical costs for both sites: Y06 $14.7k; Y07 $63k; Y08 $115.5k and Y09 $168k.

Schedule	Start Year	6	2015	Finish Year	9	2018
Type	Fixed					
Calculations and Notes:	Groundwater sampling and analyses will escalate throughout the period. By the end of the period, 20 multi-level wells will be available for hydraulic pressure profiling and groundwater sample collection where permeability conditions permit. Far-field monitoring activities on the entire installed network will only commence in the first year of the licensing phase (Y10) in WED 560.15.20.10.70. Monitoring during the characterization stage will gradually escalate throughout the period as more boreholes are drilled and instrumented as per the budget allocations in WED 561.15.20.10.70. The monitoring costs as a percentage of per site, full cost reflected in WED 561.30.20.20.20 escalate over the 4 year period from: as 7%, 30%, 55%, 80%. Geosphere monitoring effort increases as a function of more boreholes (x 1.75) only. No additional effort required for seismic/GPS monitoring.					

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,970,200	$ 2,970,200	$ 742,550	$ 3,712,750

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	30	10	10			**Prepared**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title SAFETY ASSESSMENT FOR SCREENING

Description

This task is to provide safety assessment support for the initial screening and feasibility assessments for prospective sites.

The overall approach is to apply information learned from the generic safety assessments for hypothetical sites to the potential sites.

The assessment will focus on identifying any key aspects of the site that would be of potential benefit or concern with respect to construction, transportation, operation or postclosure safety. These would follow the points noted in the NWMO siting guidelines.

Deliverable

- Screening and Feasibility Assessments for the prospective sites as required.
- Participation in information and engagement activities as required.

Assumptions

- The screening and feasibility assessments will be based primarily on information generated in WBS 560.20.30.10.10 (Illustrative Safety Assessment Studies for Hypothetical Sites) and on information generated in WBS 560.25.30.10.10 (Technical Support for APM Technical Program Objective #3 During Screening Phase).
- Initial screening is for 15 communities and feasibility assessments are for 8 communities.
- Preliminary field investigations are for 4 sites.
- The staffing model is consistent with the current status quo (i.e., more buy than make oriented).

The total NWMO Safety Assessment staff requirements are 0 FTE for Y1, 1.9 FTE for Y2 and 2.9 FTE for Y3 (see the Calculation Section below for more information and job categorization).

Funding for contractor support is $50K for Y2. Allowance is for analysis or data collection as needed to evaluate any site-specific issues identified during screening phase.

Overhead allowances (Other) are $0K for Y1, $50K for Y2 and $30K for Y3 (4 person-trips x 10 sites x 2k$/trip). This will cover travel and special presentation material.

Schedule	Start Year	2	2011	Finish Year	3	2012

Type Fixed

Calculations and Notes:

Biosphere and transportation Safety Assessment staffing requirements are not included here.

	Y1	Y2	Y3
Dir, NWMO-01	0.25	0.50	0.50
Mgr UF SA, NWMO-01	1.00	1.00	1.00
Sr Scientist, NWMO-03	0.75	0.75	0.75
Sci/Eng, NWMO-03	3.00	4.00	5.00
Total FTE	11.25	6.25	7.25
Utilization Factor	0.00	0.30	0.40
FTE for this WEDS	**0.00**	**1.88**	**2.90**

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 717,353	$ -	$ 130,000	$ 847,353	$ 211,838	$ 1,059,191

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	30	10	20			**Prepared By:**	N. Hunt, P. Gierszewski.
WBS (Old)									
WBS Title	BIOSPHERE CHARACTERIZATION FOR SCREENING								
Description	This task is to provide high level biosphere characterization data in support of the initial screening and feasibility assessments. The focus will be on determining whether there are Valued Ecosystem Components whose distribution / rarity might be such as to preclude acceptance of the Environmental Assessment for construction and operation of a repository at the prospective site. Valued Ecosystem Components (VECs) are features of the environment selected to be a focus of the Environmental Assessment study because of their ecological, social, cultural and economic value, and their potential vulnerability to the effects of a project. VECs are usually individual species or represent important groups of species within food webs. It is important that selected VECs represent meaningful measures of the environmental changes and effects that may be caused by the Project. Readily available biosphere data will be collected with respect to: · meterology · surface hydrology · land use · flora/fauna · environmental stresses · Aboriginal Traditional Knowledge (ATK)								
Deliverable	- Contribution to the screening and feasibility assessments as required								
Assumptions	- Initial screening is for 15 communities and feasibility assessments are for 8 communities. - Preliminary field investigations are for 4 sites. - Work would be primarily via desktop review, consultation with provincial or regional authorities (e.g. Conservation councils, Ministry of Natural Resources) and limited local field work. Local field work likely limited to verifying key features rather than surveys. - Initial contacts would be made with First Nations in the area. Intent would be to learn about environmental or spiritual features of the region. However it is recognized that sharing of traditional knowledge would likely require time to establish relationships, and that during this period the work would be primarily to initiate this task and gather any readily available information. NWMO Safety Assessment staffing for biosphere characterization and related activities is 0.25 NWMO-03 FTE for Y1, 1 NWMO-03 FTE for Y2 and 1 NWMO-03 FTE for Y3. Funding for contractor support is $0 for Y1, $160K for Y2 and $240K for Y3. Assumes approx. $300k for site biosphere data collection, and up to $100k for initial ATK discussions with local First Nations communities.								
Schedule	Start Year	1	2010			Finish Year	3	2012	
Type	Fixed								
Calculations and Notes:	Cost based on assuming a blanket contract with a contractor to provide support and summary of available information at all sites.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ 292,912	$ -	$ 400,000	$ 692,912	$ 173,228		$ 866,140

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	30	10	30			**Prepared By:**	N. Hunt, P. Gierszewski.
WBS (Old)									

WBS Title SAFETY ASSESSMENT FOR CANDIDATE SITES

Description

This task is to provide preclosure and postclosure safety assessments in support of candidate sites.

The approach will be to use the generic safety assessments for hypothetical sites from WBS 560.20.30.10.10 (Illustrative Safety Assessment Studies for Hypothetical Sites) as the basis for assessing and documenting the safety aspects of the candidate sites.

The preclosure assessments will address conventional and radiological safety for normal, upset and accident conditions. Anticipated effects on the natural environment during site construction and operation will also be considered.

The postclosure assessment will address the anticipated effects on human and non-human biota following decommissioning and abandonment. Both radiological and non-radiological contaminants will be considered.

Deliverable

Safety Assessment for Candidate Site A
Safety Assessment for Candidate Site B

Assumptions

- Two candidate sites in crystalline rock.
- Detailed geoscience information for the two sites is not available initially, but results from at least one deep borehole would be provided by Y5.
- The generic safety assessment deliverables produced as part of WBS 560.20.30.10.10 (Illustrative Safety Assessment Studies for Hypothetical Sites) provide a basis for producing safety assessments for the two candidate sites.
- The safety assessment staffing model is consistent with the current status quo (i.e., more buy than make oriented).

NWMO Safety Assessment staff requirements are 7.75 in Y4, 7.5 in each of Y5 and Y6, 6.75 in Y7, 7.0 in Y8 and 7.75 in Y9.

This includes the effort for management of contracts that support this activity in WBS 560.25.30.10.40 (Technical Support for APM Technical Program Objective #3 During Candidate Site Phase). See the Calculation Section below for more information and job categorization.

Funding for contractor support is $0.8M for Y4, $1.5M for Y5, $2.1M for Y6, $2.85M for Y7, $2.7M for Y8 and $2.7M for Y9. These are based on experience with APM Case Studies and experience with OPG's DGR analysis.

Costs for transportation safety assessments are in WBS 660.20.30.10.10 (Transportation Safety Assessment).

Overhead allowances (Other) have been estimated at $60k/a. This will cover travel (technical meetings, CNSC), software licences, graphics, and miscellaneous expenses.

Schedule	Start Year	4	2013	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Biosphere and transportation staffing requirements are not included here.

	Y4	Y5	Y6	Y7	Y8	Y9
Safety Assessment						
Dir	0.75	0.75	0.75	0.50	0.50	0.75
Mgr UF	1.00	1.00	1.00	1.00	1.00	1.00
Sr Scientist , NWMO-03	1.00	1.00	1.00	0.75	0.75	1.00
Sci/Eng, NWMO-03	5.00	4.75	4.75	4.50	4.75	5.00
Safety Assessment FTE	**7.75**	**7.50**	**7.50**	**6.75**	**7.00**	**7.75**

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ 6,672,301	$ -	$ 13,010,000	$ 19,682,301	$	4,920,575	$ 24,602,876

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	30	10	40			**Prepared**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title BIOSPHERE CHARACTERIZATION FOR CANDIDATE SITES

Description

This task is to develop a biosphere database for each Candidate Site, approximately 300 to 1000 km2 in area, principally with public domain information, to aid characterisation of terrestrial conditions and identify potential receptors/impacts resulting from a DGR construction/operation. The information so collected will be included in the Environmental Assessment performed as part of the Construction Licence process.

Reconnaissance level field activities would provide the basis for classification of land use; forest, wildlife and fishery resources; meteorological data; flora and fauna; soils; surface hydrology; and surface/sub-surface hydrologic interfaces. Areas of natural and/or environmental significance would be defined based on public domain and field data, as well as by consultation with potential host community. Information gathered would be entered into a biosphere GIS base information system for analysis, interpretation and communication. A conceptual Biosphere model would be developed that would serve as a basis for preliminary impact assessments. Biosphere field data would be compiled within an integrated report and visual materials prepared to allow stakeholder communication.

The task also includes identification/inclusion of Aboriginal Tribal Knowledge.

This is intended to provide a significant amount of site biosphere characterization to support the site selection. Further work at the selected preferred site would extend the dataset, but would not require this level of field effort.

Deliverable

- Biosphere Characterisation reports, including a conceptual Biosphere model, for two Candidate Sites.
- Biosphere Electronic (GIS) databases for two Candidate Sites.
- Supporting reports documenting reconnaissance field investigation and identification of natural/environmental areas of significance.
- Survey of Aboriginal Tribal Knowledge (english and local First Nations language versions).
- Participation in meetings and other communications related to biosphere characterization and preliminary impact analyses.

Assumptions

- 2 separate Candidate Sites (300-1000 km2).
- Sites are "green-field" (i.e., no significant existing site characterization available).
- Field work undertaken over 3 years/2 field seasons.
- Most meteorological information can be compiled from local stations.
- Electronic Information databases are operational.
- Protocals can be prepared to allow sharing of Aboriginal Tribal Knowledge.

Projected Costs are:

- NWMO Safety Assessment staff requirement is 1 NWMO-03 FTE/a
- Contractors to undertake Biosphere Characterisation Studies, preparation of reports and biosphere databases:
  - Project manager plus 4 FTE/a for 3 years per candidate site.
  - Sample analyses: $75k/a for 3 years per candidate site.
  - Equipment: $200k per candidate site.
  - Transportation/Access/Expenses: $330k per candidate site. This includes modest allowance for air transportation for animal population surveys.
  - The resulting expenses are approximately $6M total per site, or about $2M/a for 3 years per site.
- Note: the above assumes it takes 3 years to compile the data, covering two field seasons. This can be scheduled at any time once the Candidate Sites are selected given that the requirement is to have the information is available for use in the EA activities. It is assumed for scheduling purposes that the effort occurs at the first site from Y5 to Y7, and the second site from Y6 to Y8. This leaves Y4 for planning and Y9 for the final preferred site selection.
- Other costs will include:
  - $100k in Y4 for planning and literature review.
  - $200k in Y9 for assessment and summary reports.
  - $50k/a Y4 to Y9 for Aboriginal Tribal Knowledge discussions/surveys/translations.

Schedule	Start Year	4	2013	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 781,099	$ -	$ 12,600,000	$ 13,381,099	$ 3,345,275	$ 16,726,374

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	20	10	10		**Prepared By:**	A. Vorauer
WBS (Old)								

WBS Title	TECHNICAL SUPPORT FOR SITING AND ILLUSTRATIVE SAFETY ASSESSMENT STUDIES
Description	This element addresses technical activities from Y1-Y3 aimed at enhancing scientific understanding of geologic processes that may influence repository safety (APM Technical Program Objective 5). Knowledge gained will be applied in subsequent tasks pertaining to the selection of candidate sites, analysis support for the Environmental Assessment, creation of the Preliminary Safety Report, and creation of the Final Safety Report. This also includes participation in various international groups and collaborations with international organizations interested in similar topics.
Deliverable	Deliverables are specific to individual sub-objectives defined in APM Technical Program Objective 5 and will consist of reports and technical memoranda. These sub-objectives include: - 5a: Advance the understanding of factors affecting geosphere stability and its long-term stability for both crystalline and sedimentary settings. - 5b: Advance the understanding of the evolution of groundwater flow and the impact of glaciation on a deep geological repository. - 5c: Develop methods for conducting detailed geoscientific site investigations and evaluations at candidate sites in both crystalline and sedimentary settings.
Assumptions	NWMO staffing requirements for managing activities in support of APM Technical Program objectives are included in others WEDs ("Geoscience Technical Siting Management and Support to Engagement" and "Illustrative Safety Assessment Studies for Hypothetical Sites"). Funding for contractor support for Objective 5 is $1.732M for Y1, $2.235M for Y2, and $2.195M for Y3(1).

Schedule	Start Year	1	2010			Finish Year	3	2012
Type	Fixed							
Calculations and Notes:	1 Contractor funding costs extracted from "Technical RD Program 2011 - 2015_R4a"							

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,162,000	$ 6,162,000	$ 1,540,500	$ 7,702,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	30	10	10			**Prepared By:**	N. Hunt
WBS (Old)									

WBS Title ILLUSTRATIVE SAFETY ASSESSMENT STUDIES FOR HYPOTHETICAL SITES

Description

This captures all activities under Objective #1 in the Jan 2011 (Revision 4) version of the APM Technical Program with the exception of Design related items (i.e., 1a and 1g). The captured tasks support a CNSC pre-licensing review of the methodology, acquisition and testing of new computer codes, improvements to existing codes and improvements to the long-term safety case through container corrosion and geosphere glaciation studies. The information produced will assist in feasibility assessments for prospective sites. The results also provide a template for Safety Assessment reports to support site selection.

Deliverable

Deliverables are specific to individual sub-objectives and will consist of reports and technical memoranda. The principal sub-objectives are:

Objective #1: Prepare updated generic reference designs, cost estimates and safety cases for a deep geological repository in crystalline rock and in sedimentary rock.

1b) Complete an illustrative postclosure safety assessment for a deep geological repository in crystalline rock
1c) Initiate illustrative preclosure safety analyses and transportation risk assessment.
1d) Maintain and improve the system level safety assessment software
1e) Acquire and test thermal-hydraulic-mechanical modelling tools to evaluate and assess groundwater flow and geomechanical properties.
1f) Improve the long-term safety case for a deep geological repository for key components of the engineered barrier and the natural barrier systems.

Assumptions

- Engineering will provide reference used fuel containers and repository designs.
- Geoscience will provide the reference geosphere characteristics.
- The staffing model is consistent with the current status quo (i.e., more buy than make oriented).

The NWMO Geoscience staff requirements are 6.4 FTE for Y1 and 5.0 for Y2 to Y3.
The NWMO Safety Assessment staff requirements are 5.0 FTE for Y1, 4.4 FTE for Y2 and 4.4 FTE for Y3.
The NWMO Repository Engineering staff requirement is 1.75 FTE for each of Y1 to Y3.

These safety assessment staff estimates include the effort for management of technical support contracts in WBS 560 25 30 10 10 (Technical Support for APM Technical Program Objective #3 During Screening Phase). Note that the reason the staff estimates are for Y1 to Y3 while the contractor funding estimates are for Y1 to Y6 is due to changes to this WEDS implemented to match the Jan 2011 (Rev 4) version of the APM Technical Program document. These changes extended the funding into Y4 to Y6. Since the staff needed for Y4 to Y6 are accounted for in other WEDS it was decided not to update the staffing changes to minimize the cascading effect. The total staffing count remains unchanged.

Contractor costs are $2.017M for Y1, $2.489M for Y2, $2.550M for Y3, $1.750M for Y4, $0.75M for Y5 and $0.65M for Y6.

Overhead allowances (Other) have been estimated at $60k/a. This will cover travel (technical meetings, CNSC), software licences, graphics, and miscellaneous expenses.

Schedule	Start Year	1	2010	Finish Year	6	2015

Type Fixed

Calculations and Notes:

Biosphere and transportation staffing requirements are not included here.

	Y1	Y2	Y3
Geoscience			
Sci/Eng, NWMO-3	6.40	5.00	5.00
Geoscience FTE	**6.40**	**5.00**	**5.00**
Safety Assessment			
Dir, NWMO-01	0.25	0.50	0.50
Mgr UF SA, NWMO-01	1.00	1.00	1.00
Sr Scientist, NWMO-3	0.75	0.75	0.75
Sci/Eng, NWMO-3	3.00	4.00	5.00
FTE	5.00	6.25	7.25
Utilization Factor	1.00	0.70	0.60
Safety Assessment FTE	**5.00**	**4.38**	**4.35**
Repository Engineering			
Sci/Eng, NWMO-3	1.75	1.75	1.75
Repository Engineering FTE	**1.75**	**1.75**	**1.75**

	Y1	Y2	Y3	Y4	Y5	Y6
1b	$777	$1,140	$1,100	$700	$0	$0
1c	$82	$110	$100	$0	$0	$0
1d	$196	$89	$200	$200	$300	$300
1e	$91	$150	$150	$150	$0	$0
1f	$871	$1,000	$1,000	$700	$450	$350
total	$2,017	$2,489	$2,550	$1,750	$750	$650

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 4,896,973	$ -	$ 10,326,000	$ 15,222,973	$ 3,805,743	$ 19,028,716

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	40	10	10				**Prepared By:**	A. Khan
WBS (Old)	552	30	30							

WBS Title LIAISON WITH CNSC

Description Liaise with CNSC and other regulatory agencies prior to filing the Notice of Intent to apply for a Site Preparation/Construction License (Y01 - Y09)

Deliverable To maintain good relations with the regulator and to interface with the regulator to confirm the understanding of requirements to be used as inputs to design. This translates into a deliverable that includes identifying applicable regulatory documents, regulatory requirements and criteria, and the development of safety criteria. The deliverable also includes agreed processes, consultation with CNSC staff on feasibility study plans, consultation with CNSC staff on candidate site investigations, consultation with CNSC staff on process for choice of preferred site. A licensing plan will be prepared in Y09 and will incorporate the relevant information from interactions with the CNSC.

Assumptions It is assumed that:

1. NWMO Regulatory Affairs will lead regulatory interface activities to confirm the regulatory requirements to be used as inputs to design and safety assessments for such things as:
   - Security and safeguards (see WBS 560.20.40.10.30);
   - Geoscientific site characterization plans;
   - Human factors;
   - Emergency management;
   - Fire protection;
   - Mining; and
   - Other government requirements such as Transport Canada (see WBS 560.30.40.10.10).
2. NWMO Regulatory Affairs will arrange the Annual Technical Program Updates to be provided to the CNSC.
3. NWMO Regulatory Affairs will coordinate feedback to the CNSC on the development of regulatory documents.
4. NWMO Regulatory Affairs will support the Safety Assessment group in developing acceptable safety criteria.
5. NWMO Regulatory Affairs will support the Geoscience group in presenting the site characterization plans to CNSC staff. This is expected to occur around the Y04 time frame. Yearly updates on the plans are expected in Y05/Y06.
6. NWMO Regulatory Affairs will communicate NWMO requests to the CNSC in support of APM engagement activities with the general public and aboriginal communities as identified in the Service Arrangement between CNSC and NWMO, effective April 1, 2008 and in effect until March 31, 2014. During this time, interested communities may also request visits to the CNSC office (up to 10 visits per year).
7. NWMO Regulatory Affairs will prepare a Licensing Plan in Y08/Y09 time frame (as required by the licensing procedure, NWMO-PROC-RG-02) that documents the licensing prerequisites, the scope of the licensing tasks, a licensing schedule, a tabulation of resource requirements from other NWMO groups and contractors, and licensing risks.
8. The costs associated with and the resources needed to support the CNSC liaison varies across Y01 to Y09 since the major activities during this time will change and are captured in three separate WEDS; CNSC liaison (this WEDS), CNSC pre-licensing review (WBS 560.20.40.10.20) and preparation for the Environmental Assessment (WBS 560.30.40.10.20). The activities are expected to occur in the following time frames:
   - Y01 is considered the year that leads up to the CNSC pre-licensing review (see WBS 560.20.40.10.20) and includes the launch of the siting process part way into the year;
   - Y02-Y04 is the time associated with the CNSC pre-licensing review (see WBS 560.20.40.10.20) and the Service Arrangement noted above that includes CNSC arrangements for public engagement activities, including community visits to the CNSC offices;
   - Y05-Y06 is the time that follows the CNSC's review of the conceptual design(s) where a further understanding of design inputs, to meet regulatory requirements and to be used in the preliminary design, is expected. Also, the NWMO anticipates presenting site characterization plans and activities with CNSC staff; and
   - The years of Y07-Y09 are assumed to be focused on sharing, with the CNSC, preliminary site characterization results from site investigations in support of preparing for the Environmental Assessment (see WBS 560.30.40.10.20).
9. The costs associated with and the resources needed to support the CNSC liaison from years Y01 to Y09 are:

	Y01	Y02	Y03	Y04	Y05	Y06	Y07	Y08	Y09
CNSC Licensing Fees ($k)	125	450	450	495	480	480	340	340	340
NWMO-1 (FTE)	0.12	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.95
NWMO-3 (FTE)	0.25	0.25	1.2	1.2	2	2.25	1.75	1.75	2.95
Travel ($k)	8	8	8	8	8	8	8	8	8

Schedule Start Year 1 2010 Finish Year 9 2018

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

- **For information purposes only**, the total CNSC licensing fees for the three separate activities (this WEDs, WBS 560.20.40.10.20, and WBS 560.30.40.10.20) are as follows:

	Y01	Y02	Y03	Y04	Y05	Y06	Y07	Y08	Y09
CNSC Licensing Fees ($	370	1050	1050	755	480	480	745	745	745

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,649,261	$ -	$ 3,572,000	$ 6,221,261	$ 1,555,315	$ 7,776,577

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	40	10	20			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title CNSC Pre-licensing Review

Description Conduct a CNSC pre-licensing review as agreed to by the NWMO and the CNSC (Y01 – Y05)

Deliverable Obtain CNSC review results from their review of NWMO design concepts for the APM to identify any regulatory concerns with the concepts meeting regulatory requirements (as described in the Service Arrangement between CNSC and NWMO, effective April 1, 2008).

Assumptions It is assumed that:

1. NWMO Regulatory Affairs will compile the submissions that will be made to the CNSC in April 2011 and in April 2013 for their review (Report Title – CNSC Pre-licensing Review of Used Fuel Repository Conceptual Design and Postclosure Safety).
2. The April 2011 submission will be for Crystalline Rock and the April 2013 submission will be for Sedimentary Rock.
3. Input for these submissions will be obtained from:
   - Engineering Division;
   - Geosciences Division; and
   - Safety Assessment Division.
4. NWMO Regulatory Affairs will support the CNSC review as outlined in the APM Design Review Process documented in correspondence to the CNSC (APM-CORR-00531-0018).
5. The costs associated with and the resources needed to compile the submissions (not including time required by engineering/technical staff for their input into the submissions) and to support CNSC reviews are as follows:

	Y01	Y02	Y03	Y04	Y05
CNSC Licensing Fees ($k)	260	500	200	760	
NWMO-1 (FTE)	0.13	0.2	0.2	0.2	
NWMO-3 (FTE)	0.5	0.5	1.3	1.3	0.5
Travel ($k)	5	5	5	5	

Schedule	Start Year	1	2010	Finish Year	5 2014

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;

NWMO-3 values represent the FTE effort required by NWMO technical staff; and

Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 695,339	$ -	$ 1,740,000	$ 2,435,339	$ 608,835	$ 3,044,173

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	40	10	30			**Prepared By:**	A. Khan
WBS (Old)									
WBS Title	SECURITY AND SAFEGUARDS INPUT TO DESIGN								
Description	Liaise with CNSC specialists focused in the area of Security and Safeguards to ensure that regulatory requirements are well understood and appropriately used as inputs to facility design (Y01 – Y09)								
Deliverable	Security and Safeguards Design Inputs								
Assumptions	It is assumed that: 1. NWMO Regulatory Affairs will support activities to confirm that CNSC expectations in the area of Security and Safeguards will be met. This will be achieved by confirming that the facility will meet the Security Regulations as well as international agreements such as facilitating the IAEA's additional protocol. 2. The costs associated with and the resources needed to prepare the design inputs and interface with CNSC security and safeguards staff (not including time required by engineering/technical staff for their input) have been captured in the efforts assigned to liaison with the CNSC (see WBS 560.20.40.10.10).								
Schedule	Start Year	1	2010				Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars; NWMO-1 values represent the FTE effort required by NWMO management; NWMO-3 values represent the FTE effort required by NWMO technical staff; and Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	10	10			**Prepared By:**	A. Murchison
WBS (Old)	552	20	2						

WBS Title REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, APM SITING PHASE DESIGN & COST UPDATE

Description

Provide overall management of the repository system development during repository siting. Tasks include:

- Assemble and maintain management team responsible for container and repository system optimization;
- Develop/approve conceptual & preliminary design requirements for container and repository systems;
- Conduct integrated transportation, packaging plant and repository facility studies
- Oversight of demonstration of fabricability of key DGR components
- Preparation of APM reference design updates and cost update as required for funding
- Identify and provide technical risk management recommendations to the executive

Deliverable

- Management of:
  - o Updates of the repository system development plans.
  - o Status reports on the repository system development.
  - o Conceptual & Preliminary container designs.
  - o Fabricated full size UFC container.
  - o Demonstrated container fabrication and inspection specifications and procedures.
  - o Surveillance of demonstrated container placement methods and retrieval methods, equipment and procedures (generic URL).
  - o Optimised used fuel container and used-fuel packaging plant and repository facility designs and specifications.
  - o Surface based and underground characterisation requirements/information for engineering gathered and defined.
  - o Identification of technical risks that could impact licensing, schedule or costs as they may arise and provide recommendations to the executive of options available.
  - o Updated APM design & cost estimate in 2010/2011 and next updated APM design & cost estimate in 2014/2015.
  - o 2+ year activity once contract let (RFP preparation, tendering, contract assignment assignment starting 2014).
  - o Integrated repository conceptual design as required for construction license submission.

Assumptions

Duration of work: Y01 to Y09.

(work continues under REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, LICENSING PSAR, EA & CONSTRUCTION LICENSE)

Staff requirements are 2.25 fte NWMO-01 (Y01), 3.25 fte NWMO-01 (Y02-Y04) and 4 fte NWMO-01 (Y05-Y09)
UFC /UFPP design development (surface)
Underground repository design layout (mine)

Description	Y01	Y02	Y03	Y04	Y05	Y06	Y07	Y08	Y09
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
APM Cost Update	$2,250k	$600k	$400k	$400k	$2,000k	$4,000k	$600k	$0k	$0k

NWMO03 FTE Y01 3, Y02 5, Y03 to Y09 6

Contract costs based on recent experience for technology advancement contracts.

Schedule	Start Year	1	2010	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 13,556,674	$ -	$ 10,250,000	$ 23,806,674	$ 5,951,668	$ 29,758,342

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	10	20			**Prepared By:**	G. Kwong
WBS (Old)	552	20	10	10					
WBS Title	PREL CONTAINER DESIGN ENGINEERING								
Description	Tasks include: 1. Conduct an optimization study to assess a portfolio of UFC geometries in relation to the DGR size, UFPP throughputs, deposition constraints, thermal effects, sealing material requirements and industrial capabilities / practices for manufacturing the copper and steel UFCs. 2. Prepare conceptual level technical specifications and design drawings for fabrication demonstrations of both the Cu and steel UFC components. (UFC components include (i) the copper tube and lid; steel tube and lid; and steel basket(s).) Actual demonstration of component fabricability and material availability will be carried out under a separate work task. 3. If required, validate design basis through limited fabrication trials (fabrication effort per fabrication technology demonstration work element). 4. Conduct a study to evaluate the creep behaviour of the copper vessel (study includes creep modelling and physical test). 5. Carry out structural analyses of the conceptual steel UFC design. 6. Prepare preliminary specifications for steel vessel casting trials (steel casting to be retained as a fabrication alternative). Revise preliminary designs for both copper and steel UFCs incorporating all obtained results. 7. Support manufacturing trials as required to ensure fabricability with respect to specifications. 8. Provide independent review and advice on repository designs and development ideas.								
Deliverable	- Technical memoranda or technical reports for tasks # 1, 3, 4, 5, 6, and 7. - Preliminary engineering design package include conceptual level technical specifications and engineering drawings. - Final optimized design of a UFC by 2018 (Y09).								
Assumptions	Duration of work: Y01 to Y09. Note: Labour included in Repository Engineering Management: 0.5 NWMO-03 fte Y01 and 1.5 fte for Y02 to Y09 Purchased Services Cashflow: Y01-$0.259M Y02- Y04 $0.35M Y05-Y09-$0.2M								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,139,000	$ 2,139,000	$ 534,750	$ 2,673,750

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	10	30			**Prepared By:**	P. Maak
WBS (Old)	552	20	10	20					

WBS Title CONTAINER FABRICATION, INSPECTION & SEALING TECH DEV

Description

Develop and demonstrate methods for fabricating, sealing and inspecting the copper and steel used-fuel container (UFC) conceptual designs as defined in WBS 560.20.50.10.20, Preliminary Container Design Engineering. Tasks include:

- Identify qualified supply base
- Perform engineering assessment and test trials for evaluation technologies for fabricating, inspecting and sealing the copper and steel UFC designs.
- Identify preferred copper and steel UFC designs based on manufacturability and inspectability of the container components and the assembled UFC.

Deliverable

- Reports on development and demonstration of fabricating, inspecting and sealing the copper and steel UFC conceptual designs.
- Preliminary technical specifications for the fabrication, inspection and sealing methods.
- A preliminary list of potential suppliers for copper and steel UFCs from the raw materials to assembled UFCs.
- Input to WBS 560.20.50.10.20 for the development of the UFC conceptual designs.
- Demonstration of UFC fabrication, sealing and inspection by 2018 (Y09).
- Input to WBS 560.20.50.10.60 for the development UFPP conceptual designs.

Assumptions

Duration of work: Y01 to Y09

Contractor/consultants to develop technologies and prepare preliminary technical specifications for fabrication, inspection and sealing of the copper and steel UFCs: $2,000k for 5a (Y05 to Y09).

Assumes the availability of resources and equipment that can be adapted for fabricating, sealing and inspecting copper vessels.

Schedule	Start Year	1	2010	Finish Year	9	2018	

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 10,000,000	$ 10,000,000	$ 2,500,000	$ 12,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	10	50				**Prepared By:**	K. Birch
WBS (Old)	552	20	15	20						

WBS Title SITE DEPENDENT REPOSITORY DESIGNS

Description

Y1 - Y3:

The objective of the Site Dependent Repository Designs work program is to; (i) conduct sensitivity analyses on the 2010 APM design and cost updates, in order to reflect the variable conditions that may be expected at the potential candidate sites. These variables may include; rock strength, in-situ stresses, stratigraphy, area restrictions at surfaces, used fuel container design, etc. This sensitivity analysis would be conducted in support of selecting up to 2 candidate sites in 2013 for further assessment, and in support of a pre-licensing review of the reference designs. The effect of varying features such as depth, rock strength/type, UFC design on the overall cost of the project would be assessed ;

Review and assess whether alternative approaches (such as horizontal borehole, drill and blast methods for hard sedimentary rock, supercontainer with heavy ground support) provide an economic, technical or safety improvement over the current two reference conceptual concepts: the In-Floor Borehole (IFB) method for crystalline rock, and the Horizontal Tunnel Placement (HTP) method for sedimentary rock. This component of the assessment would be carried out a part of the sensitivity study.

Post Y4 - Y9:

From Years 4 to 9, the objective of this work package is to; (i) cunduct supplemantal conceptual designs for the two candidate sites selected for detailed site characterization; (ii) Acquire/modify/recommend specialized equipment for the conceptual underground design of the APM DGR in support of constructing and testing prototype equipment for further assessment in conducting the repository development studies (WBS 560.20.50.20.40); and (iii) Review alternative methodologies in optioneering studies for the DGR with respect to site specific conditions, such as stratigraphy, at the two candidate sites. These methods could include; (iii) Review alternative methodologies in optioneering studies for the DGR with respect to site specific conditions, such as stratigraphy, at the two candidate sites. These alternative methods could include:

- i.e. shaft vs. ramp multi-level repository; and
- placement methods (horizontal vs. vertical) excavation methods (drill and blast vs. mechanical) and related issues (i.e. resulting size openings).

Deliverable

- Optioneering reports on alternative methods to preferred methods identified in 2010 APM Conceptual Design Cost Updates.
- Sensitivity studies carried out on the variables which would be reflective of the potential sites.
- Reports describing the conceptual design alternatives (Horizontal borehole - supercontainer concept; drill and blast methods for hard sedimentary rock; etc.); advantages and disadvantages; and associated costs, and provide recommendations for further evaluation or termination of review, and to address, if necessary, identified gaps in technology.
- Recommendations for equipment development or equipment acquisition.
- Recommendations on timing of procurement activities required to meet in service dates.

Assumptions

The work that will be carried out under this WBS will be on conceptual designs for the 2 candidate sites based on the feasibility studies of the 10 potential sites in Y01 to Y03.

All Labour found in the Repository Engineering WEDs:

Year	Staff (fte)	cnslt ($M)
1	0.5	NWMO-03
2	0.5	NWMO-03
3	0.5	NWMO-03

Year	Staff (fte)	cnslt ($M)
4	0.50	$ 0.35
5	0.50	$ 0.35
6	0.50	$ 0.35
7	0.50	$ 0.25
8	0.50	$ 0.25
9	0.50	$ 0.25

Assumed travel related costs less than 10k per year. (2 trips per year) – in general some potential minor equipment purchases for laboratory studies.

Schedule Start Year 1 2010 Finish Year 9 2018

Type Fixed

Calculations and Notes:

- Note: Design/cost update to take place 2014/2015 and costs for site specific conceptual design are embedded in Repository Engineering System Development.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,360,000	$ 2,360,000	$ 590,000	$ 2,950,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	10	60			**Prepared By:**	P. Maak
WBS (Old)	552	20	20	10					

WBS Title UFPP CONCEPTUAL DESIGN, SITING

Description

Provide updated UFPP conceptual designs for selected UFC. Specific tasks include:

- Addressing all issues identified by SKB International through the 2009/2010 technology review, ie., exploring elimination of wet bay storage with dry storage to avoid re-wetting fuel as an example: if analysis indicates it's advantagous.
- Continue enhancing the relationship with SKB International to enhance technology transfer.
- Identify opportunities to simplify the plant design.
- Desktop studies/analysis related to plant design, optimization, logistics screening.
- Fuel bundle module to basket technology development.
- Review / analysis of critical process steps and develop technology risk mitigation strategies.
- Support the Safety Case.
- Perform engineering assessment and preliminary design studies to assess and update the generic UFPP design concepts for copper and steel UFC designs concepts as described in WBS 560.20.50.10.20.
- Develop & maintain preliminary technical specifications for UFPP equipments and processes.
- Update plant drawings as design evolves

Deliverable

- Preliminary optimized UFPP conceptual design by 2013 (Y04).
- Preliminary technical specifications for the UFPP components for the various UFPP design concepts.
- Final optimized UFPP conceptual design by 2018 (Y09).

Assumptions

Duration of work: Y01 to Y09.

Staff requirement accounting for Repository Engineering Management: 0.25 NWMO-03 fte for Y01, 1.0 NWMO-3 fte for Y02, 2.0 NWMO-03 fte for Y03 to Y09.

Contractor/consultants, see below:

Year	cnslt ($M)
1	$ -
2	$ 0.20
3	$ 0.40
4	$ 0.40
5 TO 6	$ 0.25
7 TO 9	$ 0.75

Schedule	Start Year	1	2010	Finish Year	9	2018

Type Fixed

Calculations and Notes:

New staff to augment the current team (mechanical engineer with automation / fabrication experience in high volume manufacturing for bundle transfer technology development

Technology for the fuel transfer operations will be bounded by the fuel module, fuel transfer station and the receiving basket (core competency to be developed in Canada)

Y2 - Wet Bay Study
Y3 - Fuel Transfer Technology Conceptual Advancement
Y4 - UFPP Optimization Study
Y5 - Fuel Handling Cell Review (Simplification)
Y6 - Plant Layout Review & Prototype Bundle Transfer Equipment
Y7 - Y9 - Fuel Bundle Transfer Prototype Module to Basket

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,750,000	$ 3,750,000	$ 937,500	$ 4,687,500

APM Cost Estimate

Work Element Definition Sheet

Siting

WBS (New)	561	20	50	10	70			**Prepared By:**	G. Kwong
WBS (Old)	552	20	30						
WBS Title	PLACEMENT SYSTEMS ENGINEERING, SPECS & PSAR INPUT								
Description	Tasks include: 1. Stay abreast with potential UFC placement methods / technologies and the latest sealing system design details in both crystalline and sedimentary DGR scenarios.								
Deliverable	TM to identify the recommended placement method based on technology watch results.								
Assumptions	Duration of work: Y01 toY18. Note: Labour included in Repository Engineering Management Task # 1: Y01-Y09, 0.1 fte/a, NWMO-3 to stay abreast with potential placement methods.								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

Siting

WBS (New)	561	20	50	10	80			**Prepared By:**	G. Kwong
WBS (Old)	552	20	35						
WBS Title	RETRIEVAL SYSTEMS ENGINEERING, SPECS & PSAR INPUT								
Description	Tasks include: 1. Stay abreast with feasible retrieval methods / technologies being considered in other national nuclear waste management programs. (i) Y01: NWMO-3 to participate in nuclear waste management R&R working group meetings and stay abreast with the latest retrieval technologies and strategies being considered in other national nuclear waste management programs. Issue a NWMO backgrounder on retrievability by Q4, Y01. (ii) Y02: issue a summary report on the processes and step associated with retrieving UFC from a DGR in Q1, Y02. Issue 2 technical reports on the technical details of retrieving UFC for reference repository designs in crystalline rock and in sedimentary rock; and develop a DVD to graphically illustrate the retrieval of UFC from a DGR by Q4, Y02. (iii) Y03: review retrievability options and revise the summary report by incorporating monitoring requirements to support retrieval of UFC from the repository. (iv) Y04: complete preliminary repository design optimization studies and update the summary report by incorporating retrieval methods of used fuel.								
Deliverable	TM to summarize the various viable retrieval processes and document research results. Summary report on the retrieval processes of UFC from a reference DGR.								
Assumptions	Duration of work: Y01 toY19. Note: Labour included in Repository Engineering Management Task # 1: Y01-Y09, 0.2 fte/a, 9 years. NWMO-3 to participate in nuclear waste management R&R working group meetings and stay abreast with the latest retrieval technologies and strategies being considered in other national nuclear waste management programs.								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	20	10			**Prepared By:**	A. Murchison
WBS (Old)	552	20	2						
WBS Title	REPOSITORY SYSTEM DEVELOPMENT MANAGEMENT, CONSTRUCTION LICENSE PHASE								
Description	Provide overall management of the repository system development during repository construction license application. Tasks include: - Maintain management team responsible for container and repository system optimization and licensing submission - Develop/approve preliminary and final design requirements for container and repository systems; - Conduct integrated transportation, packaging plant and repository facility studies; and - Plan and manage characterization development and demonstration activities - Support licensing and environmental assessment processes as required								
Deliverable	- Management of: o Design updates of the repository system development plans reflective of CNSC comments. o Status reports on the repository system development. o Detailed container design (site specific) o Demonstrated full size container fabrication and inspection specifications and procedures. (site specific) o Demonstrated container emplacement methods and retrieval methods, equipment and procedures (site specific). o Demonstrated sealing materials fabrication (ie., pucks, rings, blocks, pedestal as required) o Optimised used-fuel packaging plant and repository facility designs and specifications. o Identification of technical risks that could impact licensing, schedule or costs as they may arise and provide recommendations to the executive of options available o Long-term demonstration and monitoring tests: plans in progress. o Surface based and underground characterisation requirements/information for engineering defined and gathered								
Assumptions	Duration of work: Y10 to Y15. - Staff requirements are 4 fte/a for 5a based on: - Director APM Technical(Y10-Y15) 1 fte - Used Fuel Container Development Manager, NWMO-01 1 fte - Used Fuel Packaging Plant Manager, NWMO-01 1 fte. - Conventional Systems & Mining Engineer 1fte - Travel and expenses are $50k/a - Engineering contracts to advance engineering design to preliminary engineering stage. 3 year duration performed post CNSC construction license submission. (Y10-Y12) $4M per annum (Costs based on recent experience with the DGR project preliminary engineering contracts). - Preliminary engineering costs carried in the capital cost portion of the estimate (Prepared by SNC) . - NWMO-03 for preparation for construction contracts to provide owners oversight, review detailed design packages, etc. - NWMO-03 Y10 to Y12 16 FT, Y13 to Y14 19 FTE, Y15 21 FTE.								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 28,654,310	$ -	$ 12,300,000	$ 40,954,310	$ 10,238,578	$ 51,192,888

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	20	20			**Prepared By:**	P. Maak
WBS (Old)	552	20	10	30					
WBS Title	FABRICATION, INSPECTION & SEALING DEMONSTRATIONS								
Description	Engineering assessment and test trails would be carried out to develop and demonstrate suitable methods for fabricating, sealing and inspecting the reference used-fuel container (UFC) design, which has been selected for the preparation of PSAR, EA and construction license application of the deep geologic repository design for the preferred site. Trials are required to mitigate technology and licensing risk. Tasks include: - develop and demonstrate suitable methods for fabricating , sealing, inspecting and testing prototype UFCs based on the reference UFC design. - Complete the technical specifications for materials, equipments and procedures for fabricating, sealing and inspecting the UFC components and UFCs.								
Deliverable	- Reports describing the engineering assessment and demonstration trials on fabrication of UFC components. Reports describing the assembly, seal welding and inspection of prototype UFCs. - Technical specifications for the materials, equipment and procedures for fabricating, sealing and inspecting the reference UFC design (required for the preparation of the PSAR, EA and construction license application, input to WBS 560.20.50.20.30 and input to WBS 560.20.50.20.50). - Prototype UFCs for demonstration purposes. - A list of potential suppliers of the reference UFC from raw material to an assembled UFC.								
Assumptions	Duration of work: Y10 to Y15. Contractor/consultants to a) develop and demonstrate methods for fabricating, sealing and inspecting prototype UFCs, and b) prepare technical specifications for these methods: $5,000k/a for 6 a (Y10 to Y15). Assumes the availability of resources and equipment that can be adapted for fabrication, sealing and inspection of copper vessels. (i.e., if copper UFC design is selected as the reference UFC design for the PSAR, EA and license application). Assumes the development of fabrication and inspection technologies for inner load-bearing components of UFCs in North America. Staff requirement accounting for Repository Engineering Management: 3 fte/a, NWMO-3, 6 yeas (Y010 to Y15) to manage various projects in the manufacture, seal welding and inspection of UFC components and assembled prototype UFCs. Travel: 30k/a.								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	The cost calculations are conservatively assumed to be based on the assumption that the copper UFC is to be selected as the reference estimated costs for the copper UFC design.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 30,180,000	$ 30,180,000	$ 7,545,000	$ 37,725,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	20	30			**Prepared By:**	G. Kwong
WBS (Old)	552	20	10	40					
WBS Title	REFERENCE CONTAINER DESIGN & ENGINEERING								
Description	Tasks include: 1. Perform detailed engineering analyses as required to support PSAR, EA and licensing of the selected site. 2. Develop a reference UFC design by incorporating specific information of the selected site and the latest fabrication, inspection and sealing developments into the preliminary UFC design. Carry out structural analyses to confirm the structural integrity of the reference UFC. 3. Prepare detailed design documentation including construction drawings, detailed technical and welding specifications, fabrication, handling, and transport procedures, and inspection test plans for the reference UFC and its components. 4. Perform engineering analyses as required to support FSAR based on specific site information obtained from UCF and UFC placement demonstration. 5. Refine detailed design documents, engineering drawings, technical specifications, fabrication and inspection procedures for all UFC components.								
Deliverable	TM or TR to support FSAR. Revise detailed design documentations for all components of the reference UFC design.								
Assumptions	Duration of work: Y10 toY15. Note: Labour included in Repository Engineering Management: Task # 1: Y10 – Y12. 0.5 fte/a NWMO-3 to design engineering analyses required and to manage contracts. Contractor/consultants to conduct analyses to support PSAR, EA and licensing of the selected site: $ 1,000k/a for 3 a. Task # 2: Y10 - Y13. 0.7 fte/a NWMO-3 to develop reference UFC design manage contract. Consultant to perform task: $ 100K/a, 4 a. Task # 3: Y14 – Y15. 0.5 fte/a NWMO-3 to manage contract(s). Contractor/consultants to develop detailed design documents; fabrication and inspection plans and procedures: $ 500K/a for 2 a. Travel allowance: Y10 – Y15, $ 10K/a.								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 4,460,000	$ 4,460,000	$ 1,115,000	$ 5,575,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	20	40			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	60	20				

WBS Title CONDUCT REPOSITORY DEVELOPMENT STUDIES

Description

The objective of the Conduct Repository Development studies work program is to;

- Plan and carry out tests and full-scale demonstrations at surface based laboratories to resolve technology gaps, constructability issues and design analysis issues related to site specific repository design (WBS 560.20.50.10.10) and (WBS 560.20.50.20.10); and, based upon the development of plans and technical specifications in year 12 of this WBS.

- Modify existing equipment, including IFB drilling equipment and UFC placement systems, as needed and based on the full-scale surface demonstration program.

Deliverable

- Reports describing the implementation, results and interpretations of the individual test and demonstrations.
- Reports addressing the satisfactory resolution of technology gaps, constructability issues and design analysis issues identified in the preliminary design (WBS 560.20.50.10.10).

- Reports recommending changes to the preferred-site preliminary design for the repository facility, with emphasis on the placement room, container placement and sealing systems.

Assumptions

Duration of work: Y12 to Y15.
Note: Labour (1.0 FTE Y12 and 5.0 FTEs for each of years 13 to 15) are located in Repository Management Engineering WEDs (560.20.50.20.10):

Year	Staff (fte)	cnslt ($M)	Equip ($M)	Other (M)
12	1.0			
13	5.0	$ 1.0	$ 4.0	$ -
14	5.0	$ 1.0	$ 4.0	$ -
15	5.0	$ 1.0	$ 4.0	$ -

Schedule	Start Year	12	2021	Finish Year	15	2024

Type Fixed

Calculations and Notes:

- Buffer, backfill, pellet, UFC, placement, and demonstration of equipment including placement, radiation shielding, etc., under simulated DGR conditions.

- Instrumentation and analysis of data through numerical modelling with QA/QC on code

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 12,000,000	$ 3,000,000	$ 15,000,000	$ 3,750,000	$ 18,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	20	50			**Prepared By:**	P. Maak
WBS (Old)	552	20	20	20					
WBS Title	UFPP PRELIMINARY DESIGN FOR PSAR, EA AND CONSTRUCTION LICENSE APPLICATION								
Description	Following selection of a preferred repository site, a reference used-fuel container design will be selected that is suitable for the DGR design at this preferred repository site(input from WBS 560.20.50.20.30). In this WBS, a preliminary UFPP design will be developed based on this reference UFC design. The preliminary UFPP design documents, technical specifications and construction drawings of the UFPP components of this preliminary UFPP design will be developed to the details that are necessary for the preparation of the PSAR, EA and construction license application of the DGR and UFPP. The key components of a preliminary UFPP would include: - Equipment for the removing the modules from the transportation cask. - Equipment for handling modules in the module handling cell. - Equipment for removing bundles from the modules and placing bundles into the used-fuel baskets in the fuel handling cell. - Equipment for drying the inside of UFCs. - Equipment for replacing air with inert gas inside the UFCs. - Equipment for sealing and inspection of UFC seal weld (input from WBS 560.20.50.20.20 and WBS 560.20.50.20.30). - Equipment for machining the weld surface and cutting off the defective copper-vessel lids. - Equipment for loading, handling and transfer of UFCs in the UFPP. - Storage pool for modules; - Storage facility for empty UFC components and filled UFCs. - Electrical and ventilation facility.								
Deliverable	- Preliminary UFPP design documents and preliminary technical specifications of the UFPP components for the preparation of the PSAR, EA and construction license application.								
Assumptions	Duration of work: Y10 to Y15. Contractor/consultants to prepare preliminary design, documents and specifications for used-fuel packaging plant: $1,000k/a for 6 a (Y10 to Y15).								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	Staff requirement accounting for Repository Engineering Management: Staff requirement: 2 fte/a, NMWO-3, 6 years for managing projects related to the design of the UFPP.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,000,000	$ 6,000,000	$ 1,500,000	$ 7,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	20	60			**Prepared By:**	K. Birch
WBS (Old)	552	20	25						

WBS Title: SEALING MATERIALS ENGINEERING – FINALIZE SITE SPECIFIC DEVELOPMENT

Description:
The objective of this Sealing Materials Engineering work program is to;
- finalize the design of the buffer disk, buffer ring and backfill block for the selected site,
- develop performance requirements for the manufacturing equipment, and
- develop performance requirements for the plant for the production of rings, disks, buffer block and pellets.

Deliverable:
- Specifications for the bentonite products and manufacturing equipment,
- Demonstration of: (i) quality of supply of bentonite in North America due to potential variability in properties (i.e. montmorillonite content) which have an effect on hydraulic conductivity and swelling pressure; and (ii) quantity of bentonite, as well as aggregate, sand and clay from local sources.

Assumptions:

Year	Staff (FTE)	Sealing Materials Demonstration (Backfill)	Sealing Materials Demonstration (Blocks,rings)
Note: FTEs (1.0 for Y10 to Y12) are included in Management Repository (WBS 560.20.50.20.10).			
10		$0.5k	$2.0k
11		$0.5k	$2.0k
12		$0.5k	$2.0k

Schedule: Start Year 10 2019 Finish Year 12 2021

Type: Fixed

Calculations:
Note: Staff costed in Repository System Development Management Construction License Phase (WBS 560.20.50.20.10).

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 7,500,000	$ 7,500,000	$ 1,875,000	$ 9,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	20	70			**Prepared By:**	K. Birch
WBS (Old)	552	20	25						
WBS Title	SEALING MATERIALS ENGINEERING PROTOTYPE AQUISITION								
Description	The objective of this aspect of the Sealing Materials Engineering work program is to; - Aquire the prototype compaction equipment for the rings, disks and blocks in collaboration with international partners, and - Produce trial batches of the bentonite based products.								
Deliverable	- Acquire and / or construct compaction equipment prototypes in collaboration with international partners based on geometry of blocks, disks, rings as defined in the (i) preliminary design (WBS 560.20.50.10.10) and the (ii) site specific development of the repository sealing systems work program (WBS 560.20.50.20.60). - Manufacture and test prototype disks, rings and blocks produced. - Modify prototype system to accommodate deficiencies identified. - Research and development program to establish optimum processes to manufacture bentonite buffer, dense backfill blocks, and gap fill and light backfill pellets. - Preparation of conceptual designs for manufacturing systems for the production of bentonite buffer, dense backfill blocks, and gap fill and light backfill pellets. - Optimisation exercise to determine the most suitable rings, disks and blocks manufacturing system. - Preparation of revised specifications for sealing materials compaction equipment and compaction plant.								
Assumptions	Year Staff (FTE) Consultants Equipment Note: FTEs (1.0 FTEs for Y13 to Y15) are included in Repository System Development Management Construction License Phase (WBS 560.20.50.20.10). 13 $1.5M $7.5M 14 $1.5M $1.5M 15 $1.5M $1.5M								
Schedule	Start Year		13	2022		Finish Year	15	2024	
Type	Fixed								
Calculations									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 10,500,000	$ 4,500,000	$ 15,000,000	$ 3,750,000	$ 18,750,000

APM Cost Estimate

Work Element Definition Sheet

Licensing

WBS (New)	561	20	50	20	80			**Prepared By:**	G. Kwong
WBS (Old)	552	20	30						

WBS Title PLACEMENT SYSTEMS ENGINEERING, SPECS & PSAR INPUT

Description

Tasks include:

2. Conduct research and development, as required, to identify an optimal method for emplacing UFCs in the selected site.
3. Develop preliminary design documents including engineering drawings, technical specifications of the placement system and its components.
4. Perform engineering analyses as required to support PSAR, EA and licensing requirements of the placement system.
5. Construct a prototype system for the evaluation and demonstration of the preliminary UFC placement system.

Deliverable

Preliminary design documents including preliminary design requirements and engineering drawings.
TM to summarize analysis results to support PSAR, EA and licensing requirements.
A prototype placement system.
Detailed design documents including design requirements and description, engineering drawings, technical specifications; system commissioning / operating / maintenance procedures of the UFC placement system.

Assumptions

Duration of work: Y10 toY15.
Note: Labour included in Repository Engineering Management

Tasks #2 – 4: Y10 – Y13, 0.4 fte/a, NWMO-3 to manage project, Contractor / consultant to design and carry out application engineering activities to evaluate various potential placement methods as described: $1.25M/a, Y10 to Y13. Estimated costs include costs associated with the use of laboratory or workshop facilities for testing the placement system.

Task #5: Y14-Y15, 0.7 fte/a, NWMO-3 to coordinate the construction of a prototype placement system with a qualified contractor. Contractor to demonstrate the constructability and capability of the UFC placement system. $3.25M/a, 2 years. Estimated cost includes capital costs for the construction of equipment and/or facility required for testing and commissioning of the UFC placement system.

Placement/Development contracts: $500k/a

Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 14,500,000	$ 14,500,000	$ 3,625,000	$ 18,125,000

APM Cost Estimate

Work Element Definition Sheet

Licensing

WBS (New)	561	20	50	20	90			**Prepared By:**	G. Kwong
WBS (Old)	552	20	35						
WBS Title	RETRIEVAL SYSTEMS ENGINEERING, SPECS & PSAR INPUT								
Description	Tasks include: 2. Conduct research and development to develop a viable retrieval process for the retrieval of emplaced UFC (including the removal of both saturated and unsaturated bentonite around the emplaced UFC). 3. Develop preliminary design documents including engineering drawings, technical specifications of the retrieval system and its components. 4. Perform engineering analyses as required to support PSAR, EA and licensing requirements of the retrieval system. 5. Construct a prototype system for the evaluation and demonstration of the preliminary retrieval system.								
Deliverable	2 TRs including the technical details of the retrieval processes from a reference DGR design (both crystalline and sedimentary scenarios) DVD to graphically illustrate the retrieval of UFCs from a DGR. Preliminary design documents including design requirements and engineering drawings TM to summarize engineering analysis results to support PSAR, EA and licensing process.								
Assumptions	Duration of work: Y10 to Y13. Note: Labour included in Repository Engineering Management Tasks #2 – 4: Y10 – Y13, 0.5 fte/a, NWMO-3 to manage project, Contractor / consultant to carry out tasks as described: $2.25M/a, 4 years. Estimated costs include costs associated with the use of laboratory or workshop facilities for testing the retrieval system. Task #5: Y14-Y15, 0.5 fte/a, NWMO-3 to coordinate the construction of a prototype retrieval system with a qualified contractor. Contractor to demonstrate the constructability and capability of the retrieval system. $3.25M/a, 2 years. Estimated cost includes capital costs for the construction of equipment and/or facility required for testing the retrieval system.								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 15,500,000	$ 15,500,000	$ 3,875,000	$ 19,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	30	10			**Prepared By:**	A. Murchison
WBS (Old)	552	20	2						
WBS Title	REPOSITORY CONSTRUCTION MANAGEMENT, CONSTRUCTION UDF & OBTAIN FSR								
Description	Implementation of EPCM management of the repository system during construction. Tasks include: - Assemble and maintain an implementation team to oversee engineering EPC tendering and the implementation process. - Maintain management team responsible for container and repository system implementation; - Develop/approve final design requirements for container and repository systems; - Continue site baseline monitoring as required - Support Final Safety Report as required. - Support construction as required								
Deliverable	- Updates/finalization of the repository system plans. - Status reports on the repository system. - Site specific final container design. - Final container fabrication and inspection specifications and procedures. - Final container emplacement methods and retrieval methods, equipment and procedures (Site specific). - Final site specific DGR design, UFPP and related DGR systems. - Oversight of detailed engineering technical package. - Implementation contract for design, procurement, construct and commission contract. - Identification of technical risks that could impact licensing, schedule or costs as they may arise and provide recommendations to the executive of options available - Long-term demonstration and monitoring tests in progress.								
Assumptions	Duration of work: Y16 to Y25. - Staff requirements are 4 fte/a NWMO-01 for 10a based on: - Director APM Technical(Y16-Y25) 1 fte - Repository System Development Manager, Surface Systems (Y16-Y25) 1 fte - Repository System Development Manager, Sub-Surface Systems (Y16-Y25) 1 fte. - Conventional Systems & Mining Engineer 1fte - Assume EPC contract model - Detailed engineering of underground development, conventional mining structures, surface facilities, - NWMO-03 for construction contracts oversight, review of field changes and incorporation of any required changes to the design. - NWMO-03: Y16 15 fte, Y17 to Y18 16 fte, Y19 to Y20 14 fte, Y21 10 fte, Y22 to Y25 7fte. - EPC implementation contract model, preliminary & detailed engineering costs captured by SNC's capital estimate. - It is assumed that construction/licensing support will be required and $2M per year has been budgetted for external support contracts.								
	-Program Management Year 15 to Year 25 includes the augmented staff require for EPCM contract oversight.								
Schedule	Start Year	16	2025			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	- A $250k yearly engineering fee has been included for Y16-Y25 to resolve engineering discoveries that will arise through implementation.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 39,316,561	$ 10,000,000	$ 2,500,000	$ 51,816,561	$ 12,954,140	$ 64,770,702

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	30	20			**Prepared By:**	P. Maak
WBS (Old)									

WBS Title	DEVELOPMENT AND DEMONSTRATION OF SERIAL PRODUCTION OF UFC COMPONENTS AND UFCS
Description	Development and demonstration of serial production of UFC components and assembled UFCs of the reference UFC design are to be carried out in Canada or North America. The findings would be applied for establishment of the final UFC design for the preparation of the FSAR, EA and operating license application. Tasks include: - Develop and demonstrate serial production of UFC components. - Develop and demonstrate assembling of UFCs from the UFC components. - Complete the quality control plan and technical specifications (i.e., materials, equipments and procedures) for manufacturing and inspecting the UFC components and assembled UFCs. - Establish production capabilities, including qualification of the process equipment, procedures and technical personnel for serial production of the UFC components and assembled UFCs.
Deliverable	- Reports on demonstration trails for serial production of UFC components and assembled UFCs. - Final technical specifications (material and equipment) and qualified procedures for serial production of UFC components and assembled UFCs. - List of selected suppliers for UFC components and assembled UFCs and a final supply model. - Completely assembled and finished UFCs for demonstration purposes. - Input to support the final design of the reference UFC design in WBS 560.20.50.30.20 for the preparation of the FSAR, EA and operating licence application
Assumptions	Contractor/consultants to develop and demonstrate methods for manufacturing, sealing and inspecting prototype UFCs. Prepare quality control documents and technical specifications for these methods: $2,000k/a for 10a (Y16 to Y25). A baseline level of repeat container fabrication to maintain knowledge and capability has been budgeted.

Schedule	Start Year	16	2025	Finish Year	25	2034
Type	Fixed					
Calculations and Notes:	Staff requirement accounting for Repository Engineering Management: Staff requirement: 2 fte/a, NWMO-3, 10 years ((Y16 to Y25)					

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 20,000,000	$ 20,000,000	$ 5,000,000	$ 25,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	30	30			**Prepared By:**	G. Kwong
WBS (Old)	552	20	10	40					
WBS Title	REFERENCE CONTAINER DESIGN & ENGINEERING								
Description	Tasks include: 1. Validation of container design in underground facility. 2. Refine detailed design documents, engineering drawings, technical specifications, fabrication and inspection procedures for all UFC components.								
Deliverable	TM or TR to support FSAR. Revise detailed design documentations for all components of the reference UFC design.								
Assumptions	Duration of work: Y22 toY23. Note: Labour included in Repository Engineering Management: Task # 1: Y22-Y23. 0.5 fte /a NWMO-3 Validation of container design in underground facility. Contractor to conduct analyses: $ 700k/a for 2 a. Task # 2: Y23. Consultants to revise detailed design documents, engineering drawings, fabrication, inspection, test plans and procedures: $ 500k/a for 1 a.								
Schedule	Start Year		22	2031		Finish Year	23	2032	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 1,900,000	$ 1,900,000	$	475,000	$ 2,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	30	40			**Prepared By:**	J. Villagran
WBS (Old)	552	20	15	60	70				
WBS Title	TECH SPECS FOR REPOSITORY & UFPP								
Description	Tasks include: - Prepare the revised technical specifications for the final design of the used-fuel packaging plant (UFPP) and the repository facility based on feedback from the environmental assessment (EA) review process and additional underground characterisation data at the preferred site. - Prepare updated designs for the used-fuel packaging plant and the repository facility at the preferred site that address all of the significant issues raised during the EA and CNSC licensing processes. - Prepare technical input to the architect/engineer (AE) for the design/build procurement package.								
Deliverables	- Technical specifications for the repository facility and used fuel packaging plant final design. - Revised preliminary design for the used-fuel packaging plant and the repository facility that satisfy the technical specifications. - Technical inputs, including technical specifications and preliminary designs, to the procurement package for the design/build contractor.								
Assumptions	Duration of the work: Y16 to Y20. NWMO staff requirements to manage the specified tasks are 1 fte/a for 5a (Senior Technical Specialist) plus the following: - Specialist Consultant to provide technical inputs to the technical specifications and preliminary Engineering design for the UFPP: Purchased Services $200k/a for 2a, (Y16 to Y17). - Contractor/consultants to prepare revised preliminary Engineering designs and inputs to the repository facility design-build contract: Purchased Services, $500k/a for 3a (Y18 to Y20).								
Schedule	Start Year	16	2025			Finish Year	20	2029	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,900,000	$ 1,900,000	$ 475,000	$ 2,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	30	50			**Prepared By:**	P. Maak
WBS (Old)	552	20	20	30					

WBS Title UFPP Construction/Technology Demonstration

Description

After obtaining the construction license for the DGR and UFPP, prototype UFPP process equipment will be designed, procured,constructed and tested. The findings will be applied to develop and qualify the final production process equipment and procedures for the UFPP. The production equipment will be installed, tested and commissioned in the UFPP under WBSs 560 40 40 10 20 (receipt and transfer), . 560 40 40 10 30 (Package), and 560 40 40 10 40 (dispatch). The work activities described in this WBS can be performed in a Container Laboratory or at vendor locations.

The key process equipment in the UFPP includes:

- Equipment for the removing the modules from the transportation cask.
- Equipment for handling modules in the module handling cell.
- Equipment for removing bundles from the modules and placing bundles into the used-fuel baskets in the fuel handling cell (New equipment not commercially available).
- Equipment for drying the inside of UFCs.
- Equipment for replacing air with inert gas inside the UFCs.
- Equipment for sealing and inspection of UFCs (input from WBS 560.20.50.20.20 and WBS 560.20.50.20.30).
- Equipment for machining the weld surface and cutting off the defective copper-vessel lids.
- Equipment for loading, handling and transfer of UFCs in the UFPP.
- Inspection equipment
- Storage pool for modules (if required);
- Storage and monitoring facility for empty UFC components and filled UFCs.
- UFC dispatch area.
- Electrical and ventilation facility.

Deliverable

- Final technical specifications and design documents ready for procurement and construction of the production process equipment in a used-fuel packaging plant.
- Qualified process procedures for operation in a used-fuel packaging plant.

Assumptions

Duration of work: Y16 to Y25.

Contractor/consultants to i) prepare final design, documents and specifications for construction/procurement of the container-related process equipment for the used-fuel packaging plant: $3,000k/a for 5 a (Y17 to Y21).

Production equipment for manufacturing and inspection of copper vessels are available and are adapted to the used-fuel packaging plant. Some of the testing of equipment necessary for copper container sealing and inspection may be available at laboratories such as the SKB canister laboratory in Sweden.

Schedule	Start Year	16	2025	Finish Year	21	2030

Type Fixed

Calculations and Notes: Staff requirement accounting for Repository Engineering Management: Staff requirements are 3 fte/a, NMWO-3, 6 years.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 15,000,000	$ 15,000,000	$ 3,750,000	$ 18,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	30	60			**Prepared By:**	K. Birch
WBS (Old)	552	20	25						
WBS Title	SEALING MATERIALS ENGINEERING								
Description	The objective of the Sealing Materials Engineering work program is to; - further develop the design of the buffer disk, buffer ring and backfill block, - develop specifications for the manufacturing equipment, the procedures, and - develop the plant for the production of rings, disks, buffer block and pellets.								
Deliverable	- Conduct optimization studies on equipment and processes, and refine as required prior to production process at operation implementation.								
Assumptions	Year / Staff (fte) 16 2.0 17 2.0 18 2.0 19 1.0 20 1.0 All costs associated with this WBS are covered under Repository Construction Management, Construction UDF & Obtain FSR (WBS 560.20.50.30.10).								
Schedule	Start Year		16 2025				Finish Year	20 2029	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	30	70			**Prepared By:**	G. Kwong
WBS (Old)	552	20	30						
WBS Title	PLACEMENT SYSTEMS ENGINEERING, SPECS & FSAR INPUT								
Description	Tasks include: 6. Perform engineering analyses as required to support FSAR. 7. Develop detailed design documents, engineering drawings, technical specifications, system commissioning /operating / maintenance procedures of the UFC placement system.								
Deliverable	A prototype placement system. TM to conclude the capability of the placement system based on system evaluation results. TM to summarize design analysis results to support FSAR.								
Assumptions	Duration of work: Y14 toY18. Tasks #6 - 7: Y16-Y18, 0.3 fte/a, NWMO-3 to manage contract, consultant to carry out tasks as described: $1M/a, 3 years. Note: Labour included in Repository Engineering Management								
Schedule	Start Year		16	2025		Finish Year		18	2027
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,000,000	$ 3,000,000	$ 750,000	$ 3,750,000

APM Cost Estimate

Work Element Definition Sheet

Construction

WBS (New)	561	20	50	30	80			**Prepared By:**	G. Kwong
WBS (Old)	552	20	35						
WBS Title	RETRIEVAL SYSTEMS ENGINEERING, SPECS & FSAR INPUT								
Description	Tasks include: 6. Perform engineering analyses as required to support FSAR 7. Develop detailed design documents, engineering drawings, technical specifications, and retrieval procedures of the UFC retrieval system. 8. Carry out on site testing of the prototype system at the Underground Demonstration Facility and revise design documents as necessary to reflect testing outcomes.								
Deliverable	Construct a prototype retrieval system TM to summarize engineering analysis results to support FSAR. Detailed design documents including design requirements and descriptions, engineering drawings for construction, technical specifications; and retrieval procedures of the UFC retrieval system.								
Assumptions	Duration of work: Y14 toY19. Note: Labour included in Repository Engineering Management Tasks #6 - 8: Y16-Y19, 0.4 fte/a, NWMO-3 to manage contract, consultant to carry out tasks as described: $2M/a, 4 years.								
Schedule	Start Year		16	2025			Finish Year	19	2028
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 8,000,000	$ 8,000,000	$ 2,000,000	$ 10,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	40	10			**Prepared By:**	A. Murchison
WBS (Old)									
WBS Title	Repository Engineering Program & Project Costs - Operation								
Description	NWMO staff costs not covered under operations. Staff costs for : - Continuing UDF Demonstrations - Operations - Monitoring Systems & Program - DGR Operation Phase Work scope includes ongoing long term demonstration tests at the UDF and ongoing data collection of DGR performance monitoring activities to ensure DGR evolution is as predicted.								
Deliverable	Reports and summaries of system performance.								
Assumptions	Continuing UDF Demonstrations: 2 FTE/a NWMO-03 Y26 - Y30 & 1 FTE/a NWMO-03 Y31 - Y55. Monitoring Systems & Programs: 1 FTE/a NWMO-03 Y26 - Y55.								
Schedule	Start Year		26	2035		Finish Year	85	2094	
Type	Step-Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 16,272,900	$ -	$ -	$ 16,272,900	$ 4,068,225	$ 20,341,125

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	20	50	50	10			**Prepared By:**	A. Murchison
WBS (Old)									
WBS Title	Repository Engineering Program & Project Costs - Extended Operation/Monitoring								
Description	NWMO staff costs not covered under operations. Staff costs for: - Continued operations & maintenance of repository monitoring system and monitoring system data collection to ensure DGR evolution is as predicted.								
Deliverable	Reports summerizing the results of ongoing monitoring.								
Assumptions	1 NWMO-03 FTE/a from Y56 - Y125								
Schedule	Start Year		86	2095			Finish Year	155	2164
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 9,112,824	$ -	$ -	$ 9,112,824	$ 2,278,206	$ 11,391,030

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	20	10	10			**Prepared By:**	A. Vorauer
WBS (Old)									
WBS Title	TECHNICAL SUPPORT DURING CANDIDATE SITE PHASE								
Description	This element addresses largely a continuation of technical program activities from Y4-Y9 aimed at enhancing scientific understanding of geologic processes that may influence repository safety (APM Technical Program Objective 5). A specific focus is placed on supporting the selection of candidate sites. Much of the knowledge gained will also pertain to analysis support for the Environmental Assessment, the Preliminary Safety Report, and the Final Safety Report for the preferred site. This also includes membership in various international groups and collaborations with international organizations interested in similar topics.								
Deliverable	Deliverables are specific to individual sub-objectives defined in APM Technical Program Objective 5 and will consist of reports and technical memoranda. These sub-objectives include: - 5a: Advance the understanding of factors affecting geosphere stability and its long-term stability for both crystalline and sedimentary settings. - 5b: Advance the understanding of the evolution of groundwater flow and the impact of glaciation on a deep geological repository. - 5c: Develop methods for conducting detailed geoscientific site investigations and evaluations at candidate sites in both crystalline and sedimentary settings.								
Assumptions	NWMO Geoscience staffing requirements for managing activities in this WEDS are 3 FTE in each of Y4 to Y9. Funding for contractor support for Objective 5 is $2.095M for Y4, $1.275M for Y5 and $.7M for Y6 to Y9(1)								
Schedule	Start Year		4	2013			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	1 Contractor funding costs extracted from “Technical RD Program 2011-2015_R4a”. Y6 funding extrapolated to Y9.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,343,298	$ -	$ 6,170,000	$ 8,513,298	$ 2,128,324	$ 10,641,622

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	20	20	10			**Prepared By:**	A. Vorauer
WBS (Old)									
WBS Title	TECHNICAL SUPPORT DURING EA AND PSR PHASE								
Description	This element addresses largely a continuation of technical program activities during Y10 to Y15 aimed at enhancing scientific understanding of geologic processes that may influence repository safety (APM Technical Program Objective 5). A specific focus is placed on the preferred site and knowledge required to support development of the Environmental Assessment, the Preliminary Safety Report, and the Final Safety Report in the long-term. This also includes membership in various international groups and collaborations with international organizations interested in similar topics.								
Deliverable	Deliverables are specific to individual sub-objectives defined in APM Technical Program Objective 5 and will consist of reports and technical memoranda. These sub-objectives include: - 5a: Advance the understanding of factors affecting geosphere stability and its long-term stability for both crystalline and sedimentary settings. - 5b: Advance the understanding of the evolution of groundwater flow and the impact of glaciation on a deep geological repository. Within the sub-objectives above, the specific items addressed in this work element include:								
Assumptions	NWMO Geoscience staff required to manage the activities under this WED are accounted for in another WED (Geosphere Support and Monitoring at Preferred Site during Regulatory Process). Funding for contractor support for Objective 5: $500k/a(1).								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	(1) Funding estimate based in 2015 cost for Objective 5a and 5b and therefore assumes continuing support for participation in international underground laboratories (pre-UCF) and on-going improvements to geosphere-related modelling methodologies and tools.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,000,000	$ 3,000,000	$ 750,000	$ 3,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	30	10	10			Prepared By:	N. Hunt
WBS (Old)									

WBS Title TECHNICAL SUPPORT FOR APM TECHNICAL PROGRAM OBJECTIVE #3 DURING SCREENING PHASE

Description

This task captures all activities under Objective 3 of the Jan 2011 revision (Version 4) of the APM Technical Program. Objective 3 is part of the Confidence Building and Process Understanding section. Much of the knowledge gained here will also be applied in subsequent tasks pertaining to the selection of candidate sites, analysis support for the environmental assessment, creation of the Preliminary Safety Report and creation of the Final Safety Report.

APM Technical Program Objective #3 is:

- Further increase confidence in the deep geological repository safety case

Deliverable

Deliverables are specific to individual sub-objectives and will consist of reports and technical memoranda. The principal sub-objectives are:

Objective #3: Further increase confidence in the deep geological repository safety case:

3a) Maintain and improve process understanding.
3b) Support system model validation through integrated tests and international joint projects.
3c) Improve lifetime predictions and modelling of copper and steel used fuel containers in a deep geological repository.
3d) Provide technical support and modelling expertise to Canadian participation in international joint repository technology and demonstration projects.
3e) Demonstrate components of full-scale shaft seal and monitoring instrumentation by 2011 and support international monitoring projects.

Assumptions

NWMO staffing requirements for managing activities in this WEDS are included in WBS 560 20 30 10 10 (Illustrative Safety Assessment Studies for Hypothetical Sites).

Funding for contractor support for Objective 3 is $1,9152M for Y1, $2.099M for Y2 and $2.350M for Y3.

See the calculation section below for a more detailed breakdown.

Schedule	Start Year	1	2010		Finish Year	3	2012

Type Fixed

Calculations and Notes:

	(k$) Y01	Y02	Y03
(a)	$ 629	$ 778	$ 900
(b)	$ 21	$ 21	$ 150
(c)	$ 115	$ 100	$ 100
(d)	$ 1,100	$ 1,000	$ 1,000
(e)	$ 50	$ 200	$ 200
Sub Total	**$ 1,915**	**$ 2,099**	**$ 2,350**

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,364,000	$ 6,364,000	$ 1,591,000	$ 7,955,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	30	10	40			**Prepared By:**	N. Hunt, P. Gierszewski, B.
WBS (Old)									

WBS Title	TECHNICAL SUPPORT FOR APM TECHNICAL PROGRAM OBJECTIVE #3 DURING CANDIDATE SITE PHASE
Description	This task captures all activities under Objective 3 of the Jan 2011 revision (Version 4) of the APM Technical Program and is a continuation of efforts outlined in WBS 560 15 30 10 10 (Technical Support for APM Technical Program Objective #3 During Screening Phase). Much of the knowledge gained here will also be applied in subsequent tasks pertaining to analysis support for the Environmental Assessment, creation of the Preliminary Safety Report, and creation of the Final Safety Report. APM Technical Program Objective #3 is: - Further increase confidence in the deep geological repository safety case
Deliverable	Deliverables are specific to individual sub-objectives and will consist of reports and technical memoranda. The principal sub-objectives are: Objective #3: Further increase confidence in the deep geological repository safety case: 3a) Maintain and improve process understanding. 3b) Support system model validation through integrated tests and international joint projects. 3c) Improve lifetime predictions and modelling of copper and steel used fuel containers in a deep geological repository. 3d) Provide technical support and modelling expertise to Canadian participation in international joint repository technology and demonstration projects. 3e) Demonstrate components of full-scale shaft seal and monitoring instrumentation by 2011 and support international monitoring projects.
Assumptions	NWMO Repository Engineering staff requirement is 1.75 FTE in each of Y4 to Y9. NWMO Safety Assessment staff requirement is included in 560 15 30 10 30 (Safety Assessment for Candidate Sites). Funding for contractor support for is $2.850M for Y4, $3.300M for Y5, $3.300M for Y6, $3.700M for Y7, $3.400M for Y8 and $3.35M for Y9. See the calculation section below for a more detailed breakdown.

Schedule	Start Year	4	2013	Finish Year	9 2018
Type	Fixed				

Calculations and Notes:

	Y04	Y05	Y06	Y07	Y08	Y09
Repository Engineering						
Sci/Eng, NWMO-03	1.75	1.75	1.75	1.75	1.75	1.75
Repository Engineering FTE	**1.75**	**1.75**	**1.75**	**1.75**	**1.75**	**1.75**

($K)

	Y04	Y05	Y06	Y07	Y08	Y09
(a)	$ 900	$ 900	$ 900	$ 1,150	$ 1,150	$ 1,100
(b)	$ 300	$ 500	$ 500	$ 350	$ 350	$ 350
(c)	$ 250	$ 500	$ 500	$ 500	$ 200	$ 200
(d)	$ 1,200	$ 1,200	$ 1,200	$ 500	$ 500	$ 500
(e)	$ 200	$ 200	$ 200	$ 1,200	$ 1,200	$ 1,200
Sub Total	$ 2,850	$ 3,300	$ 3,300	$ 3,700	$ 3,400	$ 3,350

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,366,924	$ -	$ 19,900,000	$ 21,266,924	$ 5,316,731	$ 26,583,655

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	30	20	10			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	TECHNICAL SUPPORT DURING EA AND PSR PHASE								
Description	This task continues the research and development work started in WBS 560.25.30.10.40 (Technical Support for APM Technical Program Objective #3 During Candidate Site Phase), with specific focus on the selected site and the information needed to support production of the Environmental Assessment and Preliminary Safety Report. The work may also be longer-term to support the Final Safety Report. This also includes membership in various international groups and collaborations with international organizations interested in similar topics.								
Deliverable	Deliverables are specific to individual items defined in the work program and will consist of reports and technical memoranda. Given that the final site is selected at this point, the experimental program will focus on measurement of key assessment parameters using site specific materials and conditions to the extent practicable. Participation in integrated experiments that could be used to further support / calibrate computer models is also contemplated.								
Assumptions	- Data on characteristics and performance of waste forms other than CANDU bundles is provided by the organization that created the waste; - Biosphere information is provided in WBS 560.30.30.20.30 (Biosphere Characterization for EA and PSR). NWMO staff for managing Safety Assessment activities are included in WBS 560.30.30.20.10 (Safety Assessment for EA and PSR). Funding for contractor support: Safety Assessment: $1.65M in Y10, $1.4M in Y11, $1.3M in Y12, $1.0M in Y13-Y15. Engineering: $1.0M/a								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 13,350,000	$ 13,350,000	$ 3,337,500	$ 16,687,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	30	30	10			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title: TECHNICAL SUPPORT FOR OPERATING LICENCE APPLICATION

Description

This task is to confirm the behaviour of key processes for predicting the behaviour of a deep geologic repository at the specific conditions of the selected site. This work will extend the studies in WBS 560.25.30.20.10 (Technical Support During EA and PSR Phase).

Tests will be carried out at the selected site either underground in the UDF or aboveground in the biosphere at this site. The work will focus on:

- Measurement of relevant parameters using site-specific materials and conditions.
- In-situ integrated experiments that can be used to validate or calibrate computer models.

Most work will be carried to conclusion during the construction period to support the Operating Licence application; however, some experiments will involve the installation of test coupons or assemblies for long-term exposure tests (e.g. up to 100 years). Even though 100 years is still short relative to the repository design life, it is anticipated that these test results will:

- Help build confidence with the local community (over multiple generations).
- Check for any problems during the initial transient period with the hottest temperatures, driest materials, and most oxygen.
- Ensure that there is competent technical staff on-hand to deal with topical questions that may arise or, if necessary, retrieval.

Deliverable: Experimental result reports, including analysis and recommendations for models and for model parameters.

Assumptions

- Engineering demonstration projects are not included.
- Costs for constructing the UDF, including excavating the experimental rooms are not included.
- Costs for general operation support of the UDF (e.g. utilities, monitoring, ventilation, supplies) are included in UDF Operation and located in Repository Engineering.
- Costs associated with technical staff dedicated to support projects in the UDF are included, as are installation and instrumentation costs specific to a given experiment.

Costs are estimated as $3 M/a for 10 years (Y16 to Y25).
These costs are judged appropriate because, while the generic issues should be addressed by this point, this period is when the most detailed site-specific measurements are made. Also, the Construction Licence may have identified issues that must be resolved before an Operating Licence could be issued.

Although a specific support program at the UDF is not defined here, this rate of expenditure would be consistent with tests and experiments such as:

- Construction of specialised test facilities within the UDF, such as a radioactive materials (tracer) laboratory (instrumentation, glove box and ventilation), and acquisition of specialised instruments ($1M).
- Projects aimed at improving understanding of site-specific processes or topical issues (5 x $0.2M).
- 1 major in-situ test of the scale of the Buffer Container Experiment ($5 - $10M).
- Evaluation of material properties or behaviour under site-specific conditions, especially near-field transport parameters (e.g. CHEMLAB-type tests, SKB TR-01-10, Äspö Annual Report 2000, p.67) ($10M for 5 in-situ tests);
- Initiation of long-term material or container-type tests that will be left in place for time scales of 20-120 years to provide data on the behaviour of the materials on the longest possible time frame in support of future decisions regarding the repository closure ($3M).
- Geoscience tracer experiments, such as similar to the Moderately Fractured Rock Experiment, including some with radioactive tracers ($5M).

NWMO staff requirements for incorporation of test results into the safety assessment models are included WBS 560.30.30.30.10 (Safety Assessment for FSR).

Schedule	Start Year	16	2025	Finish Year	25	2034

Type: Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 30,000,000	$ 30,000,000	$ 7,500,000	$ 37,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	50	10	10			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	30					

WBS Title GENERIC REPOSITORY SEALING SYSTEMS

Description

The objectives of this work program is to develop repository-sealing systems for generic repository sealing system development as follows:

- Development of suite of material properties for both saturated and unsaturated conditions. These properties are required in support of; the modelling of the potential sites, and of the detailed modelling of the conceptual design of the two candidate sites (starting in 2013). The suite of material properties have been developed from standard geotechnical laboratory methods such as consolidation and triaxial testing, and from additional test methods such as the 2-component tests, and thermal conductivity assessments
- The reference buffer and backfill materials will be analyzed along with potential new bentonite/sand mixtures such as the reference shaft seal material, (the in-situ compacted 70 / 30 bentonite/ sand mix). The sealing systems include clay-based and cement-based sealing systems (e.g., buffer, backfills, grouts for bulkheads, boreholes, access cross-cuts and shafts).
- Support on “International Obligations” such as the SKB ASPO HRL & Mont Terri for collective “demonstration” technology.
- Development of numerical modelling codes and procedures, including validation and verification. The modelling would use the material properties determined for both saturated and unsaturated conditions. Examples of on-going NWMO sponsored modelling development include; the joint development of CODE_BRIGHT, and the task force on engineered barrier systems (EBS-TF).
- Assessment of the constructability of Conceptual Designs - Continued assessment of developed conceptual design related to sealing systems (placement of pellets adjacent to UFC, and in-situ compaction of shaft seal materials.
- Identification of technology development & demonstration (i.e. asphalt shaft seals) for Canadian concepts.

Deliverable

Generic Repository Sealing System Development

- Material property databases for variable site conditions
- Assessment of constructability of various concepts
- Validated numerical codes for use in preliminary conceptual design (WBS 560.20.50.10.10)

Assumptions

Duration of work: Y01 to Y03.

Note: Labour is located in Repository Management Engineering WEDs:

Year	(NWMO-3) (fte)	cnslt ($M)
1	1.0	$ 0.8
2	1.0	$ 0.8
3	1.0	$ 0.8

Costs captured in 561.25.30.10.10.

Assumed travel related costs less than 10k per year. (2 trips per year) – in general some potential minor equipment purchases for laboratory studies.

Schedule	Start Year	1	2010	Finish Year	3	2012	

Type Fixed

Calculations

- Linked to repository design WBS 560.20.50.10.10
- Links to instrumentation and monitoring
- Note: Costs included in "Technical Support for Siting & Illustrative Safety Assessment Studies".

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	50	10	20			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	30					

WBS Title CANDIDATE SITES REPOSITORY SEALING SYSTEMS, SITING

Description

The objectives of this work program is to develop repository-sealing systems for the candidate sites as follows:

- The work program would provide input into the selection of the preferred site from the 2 candidate sites, with the focus on site specific materials testing for compatibility of sealing materials with rock and ground water from two sites.

- Assess design improvements from years 1 to 3 (WED 561.25.50.10.10), including statistical variability of test results on bentonite.
- Identify sealing technology refinement opportunities specific to candidate sites.
- Commence long term testing programs on the two sites (buffer, backfill and concrete).
- Preliminary design requirements and specifications
- Reflect on International compliance proficiencies such as the SKB ASPO HRL & Mont Terri for collective “demonstration” technology.

- Continue with aspects of WBS 561.25.50.10.10, (i) long term testing programs on buffer and backfill, (ii) reflection on International compliance proficiencies such as the SKB ASPO HRL & Mont Terri for collective “demonstration” technology, and (iii) identification of sealing technology refinement opportunities specific to the preferred site.

Deliverable

Candidate Site-specific Repository Sealing System Development (years 4 to 9)

- Site specific reports on anticipated EBS performance for two candidate sites with recommendations.

Assumptions

Duration of work: Y04 to Y09.

Note: Labour is located in Repository Management Engineering WEDs:

Year	(NWMO-3) (fte)	cnslt ($M)
4	1.0	$ 1.0
5	1.0	$ 1.0
6	1.0	$ 1.0
7	1.0	$ 1.0
8	1.0	$ 1.0
9	1.0	$ 1.0

Costs captured in 561.25.30.10.40.

Assumed travel related costs less than 10k per year. (2 trips per year) – in general some potential minor equipment purchases for laboratory studies.

Schedule	Start Year	4	2013	Finish Year	9	2018

Type Fixed

Calculations

- Linked to repository design WBS 561.20.50.10.10.
- Links to instrumentation and monitoring.
- Note: Costs included in "Technical Support for Siting & Illustrative Safety Assessment Studies".

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	50	10	30			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	DEVELOPMENT OF REPOSITORY MONITORING STRATEGIES AND TECHNOLOGIES								
Description	The overarching task consists of monitoring a set of parameters suitable for assessing repository performance and ensuring that there are no significant effects on public safety or the environment. It includes the development of a strategy to monitor a set of selected parameters that characterize repository performance and can be used to assess the impact of a DGR facility on the hydrogeology, geochemistry and biological systems at the repository site. Specific objectives under this scope are: - Development of an overall monitoring strategy and identification of an approach suitable to meet APM strategic objectives. - Participating in collective international initiatives and projects for development of repository monitoring methods and technologies. - Review of available methods and technologies suitable for meeting the required monitoring functions. - Conducting work as required on dvelopment and demonstration of technologies identified as suitable to monitor the evolution and safety of an APM repository.								
Deliverables	- APM Monitoring Strategy document. - Partnership in an advanced international Monitoring project. - Monitoring Requirements document. - Assessment of available technologies. - Preliminary monitoring system designs. - Technical specifications for the procurement of demonstration monitoring systems.								
Assumptions	Duration of work: Y01 to Y09. Costs captured in 561.25.30.10.10 and 561.25.30.10.40. NWMO staff requirements to manage/execute the above tasks are 0.5 fte for 9a (Senior Technical Specialist) plus the following: - Specialist Consultant to conduct work in specific monitoring technologies, plus support to international monitoring programs: Purchased Services $200 k/a for 4a (Y02 to Y05). - Contractor/consultants to prepare Technical Specifications and preliminary Engineering designs for specific monitoring systems: Purchased Services $200k/a for 4a (Y06 to Y09).								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	50	20	10			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	30					
WBS Title	PREFERRED SITE REPOSITORY SEALING SYSTEMS, LICENSE PHASE								
Description	The objective of the preferred Site Repository Sealing Systems work program is to; - Demonstrate feasibility of concept in support of EA submission (year 12) – including long term demonstrations (consolidation, swelling pressure) - Final design requirements and specifications for the application of scaling materials at the repository level, and within the shafts.								
Deliverable	Preferred Site-specific Repository Sealing System Development (Years 10 to 12) for inclusion into final design specifications (WBS 560.20.50.20.10).								
Assumptions	Note: Labour is located in Repository Management Engineering WEDs: Year (NWMO-3) (fte) cnslt ($M) 10 1.0 $ 0.75 11 1.0 $ 0.50 12 1.0 $ -								
Schedule	Start Year		10	2019		Finish Year	12	2021	
Type	Fixed								
Calculations	- Linked to repository design WBS 560.20.50.20.10 - Links to instrumentation and monitoring								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,250,000	$ 1,250,000	$ 312,500	$ 1,562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	50	20	20			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	REPOSITORY MONITORING AND TECHNOLOGY DEVELOPMENT								
Description	Tasks include: - Update and expand as required the borehole network established for site characterization in order to monitor the long-term evolution of the site groundwater hydraulic network (e.g. groundwater pressure, temperature and chemistry). Implement a monitoring system suitable to assess the repository long term performance. - Monitoring a set of parameters selected as indicators of repository safety in order to establish a baseline. - Establish a database that will include Environmental parameters.								
Deliverables	- Technical specifications and optimized designs for monitoring systems. - Updated monitoring systems for groundwater flow and geosphere evolution, Environmental parameters, and repository safety and performance related parameters. - Procurement, installation and commissioning of Environmental monitoring systems. - Established baseline for surface, subsurface and environmental parameters at the selected repository site.								
Assumptions	Duration of work: Y10 to Y15. NWMO staff requirements to manage/execute the above tasks are 0.5 fte for 6a (Senior Technical Specialist) and 1 fte for 6a (Technical staff) to operate systems and conduct data acquisition for use by NWMO scientists (Y10 to Y15); plus the following: - Specialist Consultant to conduct work in specific monitoring technologies: Purchased services $200k/a for 6a (Y10 to Y15). - Contractor/consultant to prepare technical specifications and provide input to the procurement process for Environmental Monitoring systems and to assist with system installation and commissioning at the repository site: Purchased services $300k/a for 3 a (Y10 to Y12). - Purchase, installation and commissioning of Environmental Monitoring systems in the repository site and surrounding area, with an estimated total value of $3,000k ($1,000k/a Y10 to Y12).								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Step-Fixed								
Calculations and Notes:	The equipment costs do not include the purchase of a computer for the central database, which is included in the geosciences WEDS.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 3,000,000	$ 1,200,000	$ 4,200,000	$ 1,050,000	$ 5,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	50	30	40			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	60	30				

WBS Title PLAN UDF DEMONSTRATIONS and UDF SPECIFICATIONS

Description

The objective of the "Plan Underground Demonstration Facility (UDF) AND UDF Technical specifications" work program is to; finalize plans and prepare technical specifications for:

- short-term underground characterisation, design confirmation and commissioning tests for the repository facility systems for implementation in the UDF (links to WBS 560.20.50.20.40).
- long-term demonstration and monitoring tests to be located in the UDF and other parts of the repository

- The short-term confirmation studies include: container placement; container retrieval; borehole sealing; placement room sealing; access drift sealing; and shaft sealing.
- The long-term demonstration studies are focused on monitoring the performance of the engineered barrier system and near-field evolution of the repository environment over time.
- The long term studies will be conducted on full-scale container placement studies which would include the use of heated containers, and used-fuel containers containing used fuel bundles (The installation of these live UFCs would occur in Year 26 once the operating license is granted).

Deliverable

Technical specifications for:
- short-term underground characterisation, design confirmation and commissioning tests for the repository facility systems for implementation in the UDF.
- long-term demonstration and monitoring tests to be located in the UDF and other parts of the repository.
- Issue drawings and technical specifications for construction of the UDF.

Assumptions

Duration of work: Y18 to Y20.
Note: Labour is located in Repository Management Engineering WEDs:

Year	Staff (fte)	cnslt ($M)	Equip ($M)	Other (M)
18	2.0	$ 0.5	$ -	$ -
19	2.0	$ 1.0	$ -	$ -
20	2.0	$ 1.0	$ -	$ -

Schedule	Start Year	18	2027	Finish Year	20	2029

Type Fixed

Calculations and Notes:

- Refinement to equipment / design based on results of surface study program Repository development studies (WBS 560.20.50.20.40).

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,500,000	$ 2,500,000	$ 625,000	$ 3,125,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	50	30	50			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	60	40				

WBS Title CONDUCT UDF DEMONSTRATIONS - INITIATE

Description

The objective of the "Conduct Underground Demonstration Facility (UDF)" work program is to;
Initiate, conduct, analyse and report on the full-scale, underground repository technology demonstrations, including; placement and retrieval of containers, container sealing through the placement of disks, rings and gap fill pellets, placement room sealing through the installation of dense backfill blocks, light backfill pellets and concrete bulkheads; borehole sealing and shaft sealing. These demonstrations would confirm the performance of the materials during the installation processes.

- Initiate, conduct, analyse and report on commissioning tests conducted in the UDF for the specially developed equipment for placement and retrieval (WBS 560.20.50.20.80 and WBS 560.20.50.20.90).

- Initiate, monitor and periodically report on long-term demonstrations and monitoring tests in the UDF (Note: additional tests may be initiated at other locations in the repository). Monitoring tests include performance of the engineered barrier system and near-field evolution of the repository environment over time using simulated heated containers.

Deliverable

- Commissioned underground equipment, methods and procedures for excavation, drilling, repository construction and repository sealing systems installation.

- Confirmed repository design for the preferred site.
- Short-term underground characterisation data and analyses as input to Geoscience support (WBS 560.30.20.30.30) and final safety assessment report (WBS 560.20.50.30.10).

Assumptions

Duration of work: Y16 to Y20..
Note: Labour (2.0 FTEs for each of years 21 to 25) is located in Repository Management Engineering WEDs:

Year	Staff (fte)	cnslt ($M)	Equip ($M)
21		$ 2.0	$ -
22		$ 2.0	$ 5.0
23		$ 2.0	$ 5.0
24		$ 2.0	$ 5.0
25		$ 2.0	$ 5.0

It should be noted that costs related to the drifts, excavation of the shafts, perimeter access routes, and the excavation of the rooms within the UDF are covered under operations.

Contractors/consultants to procure equipment, install, conduct analyses and report on design confirmation and repository equipment commissioning tests and the resolution of any issues identified.

Schedule	Start Year	21	2030	Finish Year	25	2034

Type Fixed

Calculations and Notes:

Note: Equipment is assumed to be outside the scope of SNC's capital estimate. Equipment would be technology demonstration specific.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 20,000,000	$ 10,000,000	$ 30,000,000	$ 7,500,000	$ 37,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	50	30	60			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	MONITORING SYSTEMS DEVELOPMENT AND DEMONSTRATION								
Description	Tasks include: - Maintain/upgrade monitoring system as required. - Continue the monitoring of site baseline environmental parameters. - Update technical specifications and optimize design for UDF monitoring systems based on feedback from the licensing and EA review process. - Maintain and update repository performance database.								
Deliverables	- Upgraded systems and continued operation of Environmental Monitoring systems within the repository site and the surrounding area. - Updated database of relevant environmental and repository parameters.								
Assumptions	Duration of work: Y16 to Y20. NWMO staff requirements to manage/execute the above tasks are 0.5 fte for 5a (Senior Technical Specialist) and 1 fte for 5a (Technical staff) to operate monitoring systems, conduct data acquisition and manage the database for use by NWMO scientists; plus the following: - Specialist Consultant to conduct work in specific monitoring technologies and support to international monitoring programs: Purchased services $200k/a for 5a (Y16 to Y20). - Contractor/consultants to prepare technical specifications and provide input to system procurement of UDF monitoring systems: Purchased Services $400k/a for 1a (Y20).								
Schedule	Start Year		16	2025			Finish Year	20	2029
Type	Fixed								
Calculations and Notes:	Construction of the UDF will take place over this five-year period, with the UDF test rooms becoming available in Y21. Therefore, the initiation of experiments and system demonstrations will not start before Y21. The Monitoring tasks during this period will be limited to operation of the Environmental Monitoring system (on- and off-site) and to the updating of system designs for procurement, installation and commissioning in the period Y21 to Y25.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,400,000	$ 1,400,000	$ 350,000	$ 1,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	50	30	70			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	MONITORING SYSTEMS AND PROGRAM – DGR CONSTRUCTION PHASE								
Description	Tasks include: - Purchase, install and commission UDF Monitoring systems with an estimated total value of $1,000k. - Demonstrate function of monitoring system in the UDF. - Update designs for repository monitoring systems as required, based on experience from UDF operation and up to date technologies. - Procure and commission monitoring systems for the DGR. - Continue the monitoring of site parameters. - Update repository monitoring database.								
Deliverables	- Technical specifications, final designs and procurement packages for DGR monitoring systems. - Installed and commissioned monitoring systems in the UDF. - Demonstration of monitoring systems operation in the UDF. - Continued operation of repository monitoring systems. - Updated database of repository performance parameters.								
Assumptions	Duration of work: Y21 to Y25. NWMO staff requirements to manage/execute the above tasks are 1 fte for 5a (Senior Technical Specialist) and 1 fte for 5a (Technical staff) to operate systems, conduct data acquisition and manage the database for use by NWMO scientists; plus the following: - Specialist Consultant to conduct work in specific monitoring technologies 1 fte for 5a: Purchased services, $200k/a for 5a (Y21 to Y25). - Contractor/consultants to prepare system technical specifications, provide input to system procurement packages and assist with commission of repository monitoring systems: Purchased services $400k/a for 2a (Y21 to Y22) - Purchase/update of monitoring equipment for installation and commissioning in the UDF with an estimated total value of $1,000k. This equipment is for demonstration at the UDF of system components for the monitoring of RLTP and include detectors and sensors for measuring: - displacement, stress, - acoustic emission, - seismic motion, - water flow and water pressure, - temperature, and for the detection of tracers.								
Schedule	Start Year		21	2030		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 1,000,000	$ 1,800,000	$ 2,800,000	$ 700,000	$ 3,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	25	50	40	10			**Prepared By:**	K. Birch
WBS (Old)	552	20	15	60	40				

WBS Title CONTINUING UDF DEMONSTRATIONS - OPERATIONS

Description

The objective of the "Conduct Underground Demonstration Facility (UDF)" work program is to;

- Initiate, conduct, analyse and periodically report on long term underground demonstration tests using the initial used fuel containers produced from the used fuel packaging plant placed in an repository setting, for long term monitoring of the performance of the bentonite based sealing materials. Other aspects of long term performance monitoring covered under other WEDS.

Deliverable

- Complete demonstrations to either confirm final designs or revise design during operations of the DGR

Assumptions

Duration of work: Y26 to Y30, with continuation to year 55.

Note: Labour (2.0 FTEs Y26 to Y30 & 1.0 FTEs Y31 to Y55) is located in Repository Management Engineering WEDs:

Year	Staff (fte)	cnslt ($M)	Equip ($M)
26		$ 1.0	$ 1.0
27		$ 1.0	$ 1.0
28		$ 1.0	$ 1.0
29		$ 1.0	$ 1.0
30		$ 1.0	$ 1.0
Years 31		$ 0.5	$ -

Contractors/consultants to procure equipment, install, conduct analyses and report on design confirmation and repository equipment commissioning tests and the resolution of any issues identified.

Schedule	Start Year	26 2035	Finish Year	85 2094	
Type	Fixed				

Calculations and Notes:

Note: Container emplacement/retrieval UDF trials are accounted for in Repository Engineering Management & Emplacement/Retrieval WEDs.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 5,000,000	$ 32,500,000	$ 37,500,000	$ 9,375,000	$ 46,875,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	20	20	10			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	20	40					
WBS Title	DATABASE AND INFORMATION SYSTEMS								
Description	Develop the infrastructure for an integrated electronic geographic and geologic database and information management system. System design intended for spatial and temporal analysis, interpretation, integration and communication of site specific characterisation and monitoring data. Information System would be applied and, as required, up-graded throughout the repository siting process. It would further serve to archive site specific geosphere/biosphere data and create traceable data sets that would evolve as siting proceeded toward confirmation of the preferred site and UCF construction/operation. Databases would be accessible by a suite of analyses and visualization applications (GIS, Gocad, ...), which would likely evolve over the timeframe of the project. Interoperability is essential. Databases would be structured to include data information on transportation, natural environment, remote imaging, airborne geophysics, seismicity, geology, borehole data, municipal/ regional boundaries, aboriginal lands, surface hydrology, topography and groundwater resources. Results of geosphere model development and associated numerical simulations will also be archived in a suitable database. Database would facilitate internet access by project team members and other stakeholders, if appropriate.								
Deliverable	Integrated Electronic Information system and infrastructure to apply in support of repository siting, Environmental Assessment, conceptual geosphere model development, Performance and Safety Assessment.								
Assumptions	**Cost**: - Annual Licensing fees and upgrades: $100k/a for Y10-Y15; Database/Information management system maintained through Geoscience and monitoring support beyond Y25.								
Schedule	Start Year	10	2019				Finish Year	15	2024
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 600,000	$ -	$ 600,000	$ 150,000	$ 750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	20	20	20			**Prepared By:**	B. Belfadhel
WBS (Old)									

WBS Title GEOSPHERE SUPPORT AND MONITORING AT PREFERRED SITE DURING REGULATORY PROCESS

Description

During this period, geoscience staff will provide support to the regulatory process by addressing regulatory comments, preparation of licensing documentation and participating in other licensing activities.

Geosphere monitoring will continue at the preferred site during the regulatory process and prior to UDF construction. The objective of the continued monitoring is similar to that in WBS 560 15 40 40: continue monitoring the baseline or undisturbed conditions of the site to support performance assessment, engineering design and licensing. During this period it is assumed that no additional monitoring installations will be added, although some routine maintenance may be required. Certain monitoring installations may need to be completely refurbished or replaced during this pre-construction period to ensure on-going integrity of the monitoring program.

Maintenance of the Descriptive Geoscientific Site Model (DGSM) and associated flow system model will be supported throughout the regulatory process time period.

During this phase, geosphere monitoring installations will consist primarily of shallow groundwater monitoring wells (~ 100 m), multiple-level groundwater monitoring systems in deep boreholes (~ 1000 m), borehole seismographs and GPS stations. Groundwater monitoring will consist of periodic (ex: quarterly) measurements of hydraulic pressures and periodic (semi-annual) collection of groundwater samples for hydrogeochemical analyses for the purpose of establishing background conditions and variability. Seismograph and GPS stations will include automatic data acquisition systems accessed remotely.

Deliverable

- Annual reports on baseline monitoring conditions, and evaluation of trends.
- Provision of QA'd monitoring data to the electronic information management system
- Maintenance and updating of DGSM and associated numerical geosphere models.
- Supporting licensing activities, address regulatory comments, licensing documentation
- Support planning for UDF and DGR construction.

Assumptions

- One preferred site enters the regulatory process and licensing
- All monitoring installations are operational as part of detailed characterization activities.
- No new field or laboratory activities during the licensing phase.
- Monitoring installations (wells and seismographs) at the second site not selected will be gradually decommissioned during this period.
- An electronic information management system is operational.
- Local climate monitoring, such rainfall and snow accumulation, as well as surface water monitoring is assumed to be undertaken under biosphere monitoring.
- Formal monitoring program begins in the year following the end of detailed site characterization.

Information collected by the groundwater monitoring system would include, though not be limited to:

- Major ions, trace elements, tritium and gross beta radiation, drilling water tracers within groundwater samples.
- Selected isotopes, known to be potential contaminants associated with the repository
- Suite of metals
- Basic organic analysis

Hydraulic pressure measurements in the multi-level wells will be collected quarterly if possible and may be extended to semi-annually later in the period. Water samples will be collected from specific intervals in the mulit-level wells on a semi-annual basis. The information collected will be added to the baseline data collected during the Siting Phase to assess any long-term trends or changes in background conditions.

- The surface-based groundwater monitoring system would be maintained and refurbished as required as it will be needed throughout the construction and operation phases of the DGR.

NWMO Staff:

· Senior management at 1 NWMO-1/a (Y10-Y15)

· NWMO Specialists: 13 NWMO-3/a (Y10-Y15) required in geosynthesis (1), hard rock or sedimentary rock geology (2), hydrogeology (2) geosphere modelling(2), hydrogeochemistry(2), rock mechanics (1), geophysics (1) and data management (2).

· Travel/Expenses: $26k/a (Y10 to 15), assuming one trip per staff per year.

Purchased Services:

· Hydraulic pressure profiling: 35 multi-level wells [1xPS-4 at 700 hrs per quarter], travel, accomodation and reporting [PS-3 at 28 hrs per quarter] = $350k/a. Groundwater sample collection: 18 multi-level wells [1xPS-4 at 610 hrs semi-annual], travel, accomodation and reporting (PS-3 at 28 hrs semi-annual) = $175k/a.

· Analytical costs: $105k/a from Y10 to Y15; assuming 210 samples at $500/sample

· Monitor and maintain seismograph and GPS stations: $100k/a from Y10 toY15.

· Abandoning/grouting instrumented boreholes including development of decommissioning plan for second site (assuming 35 instrumented boreholes at $200k per borehole = $7M). For planning purposes assume abandonment of 9 boreholes per year in the last 4 years of the period (Y12 to Y15) at $1.75M/a.

· Address regulatory comments and update hydrogeological model at two intervals during the period accounting for monitoring results: $450k in Y12 and $450k in Y14 for a total effort of $900k

· Address regulatory comments and update Geomechanical models to support design (one time): $375k in Y14

· Address regulatory comments and maintain and update DGSM during period: $875k averaged over Y11 to Y15.

Equipment Replacement Provision:

One seismograph replacement during period: $150k (assume Y12)

One Westbay system replacements in a deep borehole, including removal and installation: $1M (assume Y15)

Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes:

Based on the DGR experience, for deep boreholes instrumented with a Westbay system it may take on average 20 hours per borehole to complete hydraulic pressure profiling measurements. It should be noted that the DGR-series boreholes include betrween 20 and 40 monitoring intervals each. This may be required in a sedimentary rock setting. By comparison, the groundwater monitoring wells at Forsmark, Sweden are instrumented with a maximum of 8 intervals that tend to target higher conductivity, fractured horizons, similar to the URL network in Pinawa. Based on the DGR experience, it may atke on average 35 hours per borehole to purge and collected groundwater samples, primarily from the shallower, US-series Westbay systems. The recent DGR experience has formed the basis for this cost estimate, including the seismic monitoring activity.

Updating of models (DGSM, hydrological and geomechanical) requires 1.5 more effort.

· Assuming more boreholes at second site need to be abandoned requires 1.75 more effort.

· Monitoring & analytical costs increase by 1.75.

· One additional Westbay system replaced.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 11,482,405	$ 1,150,000	$ 13,686,000	$ 26,318,405	$ 6,579,601	$ 32,898,007

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	20	30	10			**Prepared By:**	B. Belfadhel
WBS (Old)	552	15	20	40					
WBS Title	DATABASE AND INFORMATION SYSTEMS								
Description	Develop the infrastructure for an integrated electronic geographic and geologic database and information management system. System design intended for spatial and temporal analysis, interpretation, integration and communication of site specific characterisation and monitoring data. Information System would be applied and, as required, up-graded throughout the repository siting process. It would further serve to archive site specific geosphere/biosphere data and create traceable data sets that would evolve as siting proceeded toward confirmation of the preferred site and UCF construction/operation. Databases would be accessible by a suite of analyses and visualization applications (GIS, Gocad, ...), which would likely evolve over the timeframe of the project. Interoperability is essential. Databases would be structured to include data information on transportation, natural environment, remote imaging, airborne geophysics, seismicity, geology, borehole data, municipal/ regional boundaries, aboriginal lands, surface hydrology, topography and groundwater resources. Results of geosphere model development and associated numerical simulations will also be archived in a suitable database. Database would facilitate internet access by project team members and other stakeholders, if appropriate.								
Deliverable	Integrated Electronic Information system and infrastructure to apply in support of repository siting, Environmental Assessment, conceptual geosphere model development, Performance and Safety Assessment.								
Assumptions	**Cost**: - Annual Licensing fees and upgrades: $100k/a for Y16-Y25; Database/Information management system maintained through Geoscience and monitoring support beyond Y25.								
Schedule	Start Year	16	2025			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 1,000,000	$ -	$ 1,000,000	$ 250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	20	30	20			**Prepared By:**	B. Belfadhel
WBS (Old)	552	25	80						

WBS Title GEOSCIENCE SUPPORT AND MONITORING DURING UDF CONSTRUCTION

Description

Provide capability for geoscience characterisation and numerical analysis during the UDF construction period (Y16-Y20). During this period, the DGR's main shaft, service shaft and exhaust ventilation shaft, associated stations and services will be constructed including the access drifts and testing rooms of the Underground Demonstration Facility (UDF). Testing rooms will become available for trials following this period.

Work activities support DGSM refinement and confirmation, Repository Engineering and Safety Assessment functions. The main tasks are:

- Far-field hydrogeological and seismic monitoring and maintenance of the associated existing monitoring network;
- geologic mapping, hydrogeological, geochemical and geomechanical characterization activities during construction of shafts, access drifts (1&2) and UDF drifts and testing rooms;
- reporting and interpretation of hydrogeological/geologic site characterization and monitoring data gathered during UDF construction;
- maintenance and updating of the DGSM and associated hydrogeologic and geomechanical numerical models;
- planning, management and reporting of studies for the characterization of the shafts, access drifts and testing rooms EDZs; seepage monitoring; installation and monitoring of underground seismograph and microseismic network; excavation deformation monitoring; in-situ stress measurement.

Deliverable

- Geoscientific characterization and monitoring plans to support multi-year UDF and DGR construction activities.
- Annual monitoring reports on far-field and near-field conditions, including evaluation of trends.
- Provision of QA'd monitoring data to the electronic information management system.
- Update DGSM and reference hydrogeological and geomechanical numerical models.
- Geoscience reports describing updated geologic/hydrogeologic descriptive and numerical models in support of Repository Engineering and Safety Assessment.

Assumptions

- DGR design includes main shaft, service shaft and vent. All three will be excavated simultaneously.
- Shafts/vent sinking and station construction completed between Y16 and Y18; UDF and DGR access drifts completed by Y20.
- UDF and access drifts will be excavated at multiple faces concurrently.

NWMO Staff Requirements:
NWMO Staff:

- Senior management at 1 NWMO-1/a for 5 years (Y16-Y20).
- NWMO Specialists: 13 NWMO-3/a for 5 years (Y16-Y20) required in geosynthesis (1) hard rock or sedimentary rock geology (2), hydrogeology (2), geosphere modelling (2), hydrogeochemistry (2), rock mechanics (1), geophysics/seismicity (1), and data management (2).
- Travel/Expenses: $26k/a for 5 years (Y16 to Y20).

Purchased Services:

- Far field Monitoring:
  - o Quarterly hydraulic pressure profiling and semi-annual groundwater sample collection where possible and reporting over 5 years(as pe WED 561.30.20.20.20): $630k/a from Y16 to Y20: Pressure profiling @ $350k/a, Groundwater sampling @ $175k/a and Analytical cost @ $105k/a.
  - o Monitor and maintain existing seismograph and GPS stations: $100k/a from Y16 to Y20.
- Geoscience characterization during shafts/vent construction[1], to include mapping/imaging activities 24/7 during sinking of three shafts concurrently: $10M (Y17)
- Geoscience characterization during shaft station, access drifts 1 or 2, and UDF gallery excavations[2]: $2M (averaged over Y18 to Y20)
- Install one aboveground and one underground seismograph to support attenuation studies : $300k (Y19).
- Update hydrogeological model during the period accounting for monitoring: $450k in Y18.
- Update Geomechanical models to support design (one time): $375k in Y19.
- Maintain and update DGSM during period: $750k over the period ($150k/a from Y16 to Y20).

Equipment Replacement provision: One replacement seismograph during period: $150k (assume Y18).
Two Westbay system replacements in a deep borehole, including removal and installation [1] if needed: $1M (assume Y20).

Schedule	Start Year	16	2025	Finish Year	20	2029

Type Fixed

Calculations and Notes:

[1] Similar to OPG DGR plan, shaft/vent characterization activities include: wall imaging and mapping, EDZ mapping and geophysics, EDZ permeability testing, lateral coring and logging at selected locations, seepage collection, in-situ stress measurement, deformation monitoring, geochemical testing.

[2] Similar to OPG DGR plan, access drift and UDF characterization activities include: Wall imaging and mapping, EDZ and rock mass geophysical surveys, rock core and block sampling, seepage water monitoring, borehole hydraulic conductivity testing and instrumentation, micro seismic network installation, in-situ stress measurements, geomechanics testing and deformation monitoring system installation.

Far-field monitoring costs increase by 1.75 because of additional boreholes.
The additional vent shaft and access drifts for the larger repository footprint are assumed to occur at a later date.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 9,568,671	$ 1,150,000	$ 21,655,000	$ 32,373,671	$ 8,093,418	$ 40,467,089

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	20	30	30			**Prepared By:**	B. Belfadhel
WBS (Old)	552	25	80						

WBS Title: GEOSCIENCE SUPPORT AND MONITORING DURING UDF OPERATION

Description

The Underground Demonstration Facility (UDF) will be operational during the concurrent phase of DGR construction.

Provide capability for geoscience far-field and near-field monitoring, numerical analysis and geoscience-based confirmation tests during UDF operation (Y21-Y25). Work activities support Geoscience Repository Engineering and Safety Assessment functions. The main tasks are:

- Maintenance of the site hydrogeological and seismic monitoring networks;
- Geoscience verification activities and reporting during construction of DGR perimeter drifts and cross-cuts;
- Planning, execution and analyses of geoscience-based confirmation tests in the UDF and selected locations within the DGR access ways.
- Maintenance and updating of the DGSM and associated hydrogeologic and geomechanical numerical models during the period;

Deliverable

- Geoscientific verification and monitoring plan to support multi-year DGR construction activities.
- Plans, status and final analysis reports of geoscience-based confirmation tests.
- Annual monitoring reports on far-field and near-field conditions, including evaluation of trends.
- Provision of QA'd monitoring data to the electronic information management system.
- Update DGSM and reference hydrogeological and geomechanical numerical models.
- Geoscience reports updating geologic/hydrogeologic descriptive and numerical models in support of Repository Engineering and Safety Assessment.

Assumptions

- DGR excavations will include perimeter drifts 1 & 2 and perimeter cross-cuts A & B (7 km).

NWMO Staff:

· Senior management at 1 NWMO-1/a for 5 years (Y21-Y25).

· NWMO Specialists: 10 NWMO-3/a for 5 years (Y21-Y25) required in hard rock or sedimentary rock geology (2), hydrogeology (2), geosphere modelling(1), hydrogeochemistry (1), rock mechanics (1), geophysics/seismicity (1) and data management (2).

· Travel/Expenses: $20k/a for Y21 to Y25.

Purchase Services:

- Far field[1] hydraulic pressure measurements and groundwater sample collection where possible and reporting: $225k/a for Y21 to Y25.
- Analytical costs: $45k/a for Y21 to Y25.
- Monitor and maintain far field seismograph and GPS stations: $100k/a for Y21 to Y25.
- Geoscience verification activities[2] during DGR perimeter drift and cross-cut excavations (assume scaled (by excavation length) level of effort as per previous WED 561.30.20.30.20 on access drifts, UDF galleries and shaft stations excavations): $4M in Y21 and $2M in Y22.
- Geoscience-based confirmation tests[3]: $1M/a over the entire 5-year period to confirm parameters.
- Update hydrogeological model during the period accounting for monitoring results: $450k in Y23.
- Update Geomechanical models to support on-going construction: $375k in Y24.
- Maintain and update DGSM during period: $150k/a for Y21 to Y25.

Equipment: One replacement seismograph during period: $150k (assume Y23)
Two Westbay system replacement in a deep borehole, including removal and installation if needed: $1Mk (assume Y25)

Schedule	Start Year	21	2030	Finish Year	25	2034

Type: Fixed

Calculations and Notes:

[1] Level of effort in far field hydraulic pressure monitoring and sampling is assumed to be reduced by half during UDF/DGR operations as near field measurements from sub-surface collared wells are assumed acquired under the overall DGR monitoring activity.

[2] Wall imaging and mapping, EDZ and rock mass geophysical surveys, rock core and block sampling, seepage water monitoring, fracture infilling mineralogy, borehole groundwater water sampling, hydraulic conductivity testing and instrumentation at selected locations along the perimete access ways (away from emplacement rooms), in-situ stress measurements, geomechanics .

[3] Geoscience-based confirmation tests may include one or more of the following during the period: In-situ stress evolution during excavation to support geomechanical modelling, large scale stability test, rock mass creep, EDZ evolution and testing, field scale thermal properties, tracer transport parameter measurements in proximal fractures, microbial sampling in controlled environment, borehole-based long term diffusion and sorption experiments to support parameter upscaling.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 7,615,923	$ 1,150,000	$ 14,525,000	$ 23,290,923	$ 5,822,731	$ 29,113,654

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	20	40	10			**Prepared By:**	B. Belfadhel
WBS (Old)	552	25	80						

WBS Title: GEOSCIENCE SUPPORT AND MONITORING DURING DGR OPERATION

Description

- The operational period for the DGR occurs between Y26-Y85. During this period, emplacement rooms will be built successively in panels. Placement of containers and sealing of emplacement rooms will be ongoing in one panel as another is being excavated. Geoscience verification studies will be completed to supplement the descriptive geoscientific model throughout the operations period. Geoscience-based monitoring activities will take place throughout the period as well.

Deliverable

- Geoscientific verification plan to support multi-year DGR construction activities.
- Annual reports on far-field monitoring conditions, and evaluation of trends.
- Provision of QA'd monitoring data to the electronic information management system.
- Review and update DGSM and reference hydrogeological and geomechanical numerical models in support of Repository Engineering and Safety Assessment.

Assumptions

- DGR excavations will consist of emplacement rooms excavated in panels. Each panel will be excavated during approximately a 24/7 period by two separate mining crews. Each panel will require approximately 1900 m/a of excavation and will take about 4 years to complete.
- Near field monitoring activities are included in a separate WED.
- All long-term geoscience-based confirmation tests have been completed prior to the operational phase of the DGR.

NWMO Staff:

- Senior management at 1 NWMO-1/a (Y26-Y85).
- NWMO Specialists: 8 NWMO-3/a (Y26-Y85) required in hard rock geology (1), hydrogeology (1), geosphere modelling(1), hydrogeochemistry (1), rock mechanics (1), geophysics/seismicity (1) and data management (2).
- Travel/Expenses: $16k/a for Y26 to Y85.

Purchase Services:

- Far field hydraulic pressure measurements and groundwater sample collection where possible and reporting: $262k/a for Y26 to Y85.
- Analytical costs: $52k/a for Y26 to Y85.
- Monitor and maintain seismograph and GPS stations: $100k/a for Y26 to Y85.
- Geoscience verification activities[1] during DGR emplacement room excavation: $470k/a.
- Update hydrogeological model every 5 years during the period accounting for monitoring results: $450k every 5 years begining in Y30.
- Update Geomechanical models to support on-going construction: $375k every 5 years beginning in Y30.
- Review and update DGSM during period based on emplacement room verification activities: $75k/a.
- Equipment Replacement provision: One replacement seismograph every 5 years during period: $150k in Y30, Y35, Y40, Y45, Y50 and Y55.
- Two Westbay system replacement in a deep borehole, including removal and installation if needed: $1M every 10 years starting in Y35. This assumes that some broken or malfunctioning systems will not be replaced during the period and that some attrition will be allowed.
- Geoscience characterization during vent construction: $3M (Y45).
- Geoscience characterization during access drift 3/4: $1.5M averaged over Y46 - Y47.
- Geoscience characterization during perimeter drift: $4M in Y48 and $2M in Y49.

Schedule	Start Year	26	2035	Finish Year	85	2094

Type: Step-Fixed

Calculations and Notes:

[1] Wall imaging and mapping (1 mapping geologist, 8 hrs-day for 4 years), EDZ and rock mass geophysical surveys, rock core and block sampling, seepage water monitoring, mineralogical analyses, laboratory geomechanics testing (760k per panel over 4 years).

Main impact is greater routine monitoring of far-field borehole network and updating various models that cover larger DGR footprint.

Assume that in Y45, construction of 2nd stage placement room will begin with sinking of one ventillation shaft (Y45), access drifts 3 & 4 (Y46 to Y47) and perimeter drift and cross-cuts (Y48, Y49).

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 75,769,092	$ 6,900,000	$ 78,900,000	$ 161,569,092	$ 40,392,273	$ 201,961,365

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	20	50	10			**Prepared By:**	B. Belfadhel
WBS (Old)	552	25	80						
WBS Title	GEOSCIENCE SUPPORT DURING EXTENDED MONITORING								
Description	- This period of extended monitoring occurs from Y86 to Y155. During this period of extended monitoring, the facility will remain open and accessible.								
Deliverable	- Annual reports on far-field monitoring conditions, and evaluation of trends.								
Assumptions	Near-field monitoring activities are captured by another WED (ex: micro-seismic, deformation of access and perimeter tunnels, thermal, groundwater pressure measurement and sampling). NWMO Staff: requirements are 4 NWMO-3/a for 70 years based on: - Geoscience management (1 fte) - Geoscience specialist (1 fte) - Geoscience technologist (2 fte). - Travel: $8k/a throughout the period. Purchase Services: - Far field (surface-collared multi-level wells) hydraulic pressure measurements and groundwater sample collection where possible and reporting: $262k/a. - Analytical costs: $52k/a for the period. - Monitor and maintain seismograph and GPS stations: $100k/a for period. - Far-field monitoring equipment Replacement provision: One replacement seismograph: $150k every 5 years. - Two Westbay system replacements in a deep borehole, including removal and installation if needed: $1M every 10 years - Not all instruments will be able to be replaced or repaired and thus some attrition is to be expected. Future improvements in monitoring technologies and approaches will be evaluated and applied to the DGR as appropriate.								
Schedule	Start Year		86	2095		Finish Year	155	2164	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 36,451,296	$ 8,050,000	$ 29,540,000	$ 74,041,296	$ 18,510,324	$ 92,551,620

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	20	60	10			**Prepared By:**	B. Belfadhel
WBS (Old)	552	25	80						
WBS Title	GEOSCIENCE SUPPORT AND MONITORING DURING DGR DECOMMISSIONING								
Description	Provide capability for geoscience monitoring and numerical analysis during the facility decommissioning period (Y156-Y180). During this period, main access ways and shafts will progressively be backfilled and surface facilities removed. Work activities support geoscience Performance Assessment and post-closure Safety Assessment functions. The main tasks are: - Management and evaluation of the long-term monitoring system program. - Far-field monitoring of geoscience instrumentation (ex: groundwater monitoring wells, seismographs) to establish impacts of various decommissioning stages on geosphere responses and to acquire post-operational baseline conditions prior to abandonment. - Review and update of the Descriptive Geosphere Site Model and associated hydrogeologic and geomechanical models to support decommissioning license; - Planning and management of studies for the improvement and validation of the site numerical hydrogeologic and geomechanical models based on post-operational responses; - Assessment of topical issues as may be required; - Address regulatory comments;								
Deliverable	- Decommissioning plan for far-field monitoring network. - Annual monitoring reports on post-operational geosphere conditions, and evaluation of trends. - Review and update DGSM and reference hydrogeological and geomechanical numerical models in support of decommissioning license. - Update long-term monitoring data in the electronic information management system.								
Assumptions	- Facility will remain open (shafts and main access tunnels) throughout the early stages of decommissioning period (first 5 years to obtain license), but will be systematically closed during most of the period. - Electronic information management system is operational. NWMO Staff: requirements are 7 NWMO-3/a for 25 years based on: - Geoscience management (1 fte) - Geoscience specialists (3 fte) - Geoscience technologists (3 fte) - Travel: $14k/a Purchased Services: - Far field (surface-collared multi-level wells) hydraulic pressure measurements and groundwater sample collection where possible and reporting: $228k/a. - Analytical costs: $52k/a for the period. - Monitor and maintain seismograph and GPS stations: $100k/a for period. - Update hydrogeological model during first year decommissioning period: $450k in Y156. - Update Geomechanical model during first year decommissioning period: $375k in Y156. - Review and update DGSM during first year decommissioning period: $450k. Equipment Replacement Provision: It is anticipated that many monitoring instruments will not survive throughout the period. It is assumed that mal-functioning monitoring instruments will not be replaced during the decommissioning phase.								
Schedule	Start Year		156	2165		Finish Year	180	2189	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 25,061,295	$ -	$ 11,125,000	$ 36,186,295	$ 9,046,574	$ 45,232,869

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	20	70	10			**Prepared By:**	A. Vorauer	
WBS (Old)										
WBS Title	GEOSCIENCE SUPPORT AND MONITORING DURING DGR ABANDONMENT									
Description	Specific requirements and duration of an abandonment phase following completion of decommissioning activities are not well defined. However, a lump sum cost is associated with this WED to accommodate all potential abandonment activities of a technical nature including post-closure monitoring.									
Deliverable										
Assumptions	- Abandonment activity costs estimated at $50M.									
Schedule	Start Year			181	2190		Finish Year		181	2190
Type	Fixed									
Calculations and Notes:										

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 50,000,000	$ 50,000,000	$ 12,500,000	$ 62,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	20	10			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title: SAFETY ASSESSMENT FOR EA AND PSR

Description

This task is to provide preclosure and postclosure safety assessment contributions to both the Environmental Assessment (EA) and the Preliminary Safety Report (PSR). The EA and PSR documents will be submitted in support of the applications for a Licence to Prepare Site and for a Licence to Construct.

The preclosure assessment will address conventional and radiological safety for normal, upset and accident conditions associated with the operating and monitoring phases.

The postclosure assessment will address the anticipated effects on human and non-human biota following decommissioning and abandonment. Both radiological and non-radiological contaminants will be considered.

Deliverable

- Preclosure Safety Assessment report.
- Postclosure Safety Assessment report.
- Preliminary ALARA Assessment.
- Conventional Safety Assessment.
- Radiological Safety Assessment.
- Preclosure and postclosure contributions to the EA and the PSR.
- Updated computer codes and support documents.
- Updated datasets.
- Key supporting reports, for example: Reference Data; Features, Events and Processes; Normal Evolution scenario; Disruptive

Assumptions

- Assessment builds on report(s) produced at end of Y9 for the selected preferred site.
- Work is carried out iteratively, with interim version released in mid-Y11.
- Preliminary design fixed and available one year ahead of when final safety assessment reports are due. That is, by end Y11 if reports are to be completed by end Y12.
- Geosynthesis and Descriptive Geosphere Site Model reports available one year ahead of when final safety assessment reports are due.
- Preliminary ALARA assessment is primarily initial estimate of doses, and does not provide significant ALARA optimization. This will be addressed in Operating Licence stage.
- Conventional Safety Assessment detail is more consistent with dry storage facility Conventional Safety Assessment rather than a uranium mine.
- The staffing model is consistent with the current status quo (i.e., more buy than make oriented).
- Transportation safety assessment is covered under WBS 660.20.30.20.10 (Transportation Safety Assessment).

NWMO Safety Assessment staff requirements are 2 NWMO-01 FTE and 6.0 NWMO-03 FTE in each of Y10, Y11, and Y12 (see the Calculation Section below for more information and staff categorization). This includes the effort for management of contracts that support this activity in WBS 560.25.30.20.10 (Technical Support During EA and PSR Phase).

Funding for contractor support with preclosure and postclosure assessments (including review and comment) is $2.8M for Y10, $2.8M for Y11, $3.5M for Y12.

NWMO expenses are $40 K/a (~5 K$/a/FTE). This will cover software licences, travel (sites, conferences) and other costs (e.g. high speed computing).

Schedule: Start Year 10 2019 — Finish Year 12 2021

Type: Fixed

Calculations

Biosphere and transportation staffing requirements are not included here.

	Y10	Y11	Y12
Dir (NWMO-01)	1	1	1
Mgr UF NWM (NWMO-01)	1	1	1
Sr Scientist (NWMO-03)	1	1	1
Sci/Eng (NWMO-03)	5	5	5
Total FTE	**8**	**8**	**8**

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 3,671,413	$ -	$ 9,220,000	$ 12,891,413	$ 3,222,853	$ 16,114,267

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	20	20			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	SUPPORT FOR REVIEW AND HEARINGS FOR CONSTRUCTION LICENCE								
Description	This task is to support the public hearings and respond to review panel and regulatory questions on the Environmental Assessment (EA) and Preliminary Safety Report (PSR) submission. It is also anticipated that Safety Assessment staff will attend a variety of sessions with the public, elected representatives and aboriginal groups to provide information on the technical aspects of the project.								
Deliverable	Prepare responses to review questions. Presentation material for public and regulatory review. Participation in public review of EA and PSR materials.								
Assumptions	NWMO staffing requirements are 2 NWMO-01 FTE/a and 6 NWMO-03 FTE/a. This includes the effort for management of contracts that support this activity in WBS 560.25.30.20.10 (Technical Support During EA and PSR Phase). Funding for contractor support during the EA hearing is estimated at $400 K/a for 3 years.								
Schedule	Start Year		13	2022			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	OPG L&ILW DGR project estimate (2010) for Preclosure and Postclosure safety assessment contractor support during hearings is $360 K/a for two years. A similar value is assumed for APM, although more work will likely be carried out by NWMO staff than was case with DGR where most work was by contractors. Based on Darlington New Build EA Panel experience that there will be a significant number of questions raised during public review, and staff will be involved in preparing responses.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 3,671,413	$ -	$ 1,200,000	$ 4,871,413	$ 1,217,853	$ 6,089,267

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	20	30			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	BIOSPHERE CHARACTERIZATION FOR EA AND PSR								
Description	This task is for maintenance of the detailed biosphere characterization information created in WBS 560.15.30.10.40 (Biosphere Characterization for Candidate Sites) with specific focus on the selected site.								
Deliverable	Maintenance and update of Biosphere Characterization report. Maintenance and update of biosphere database. Participation in meetings and other communications related to biosphere characterization and impact analysis.								
Assumptions	- Biosphere characterization performed in WBS 560.15.30.10.40 (Biosphere Characterization for Candidate Sites) provides most of the information necessary to define the biosphere. However, it is anticipated that there will be some additional Environmental Assessment (EA) or Preliminary Safety Report (PSR) specific fieldwork identified as these documents are prepared, which is covered here. NWMO staff requirement is 1 NWMO-03 FTE/a for each of Y10 to Y12. Funding for contractor support is $200 K in each of Y10 to Y12.								
Schedule	Start Year		10	2019		Finish Year	12	2021	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 390,550	$ -	$ 600,000	$ 990,550	$ 247,637	$ 1,238,187

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	30	10			**Prepared By:**	N. Hunt, P.
WBS (Old)									Gierszewski

WBS Title SAFETY ASSESSMENT FOR FSR

Description

This task is to provide the preclosure and postclosure safety assessment contributions to the Final Safety Report (FSR). The FSR document will be submitted in support of the applications for a Licence to Operate.

The preclosure assessment will address conventional and radiological safety for normal, upset and accident conditions associated with the operating and monitoring phases. It will include a preliminary ALARA assessment, a Conventional Safety Assessment, and a Radon Assessment.

The postclosure assessment will address the anticipated effects on human and non-human biota following decommissioning and abandonment. Both radiological and non-radiological contaminants will be considered.

Deliverable

Contributions to the FSR include:

- Preclosure Safety Assessment report.
- Postclosure Safety Assessment report.
- ALARA Assessment.
- Conventional Safety Assessment.
- Radiological Safety Assessment.
- Natural Analogues.
- Updated computer codes and support documents.
- Updated datasets.
- Updated Features, Events and Processes document.

Assumptions

- The assessment will build on work performed for the Environmental Assessment (EA) and Preliminary Safety Report (PSR) in WBS 560.30.30.20.10 (Safety Assessment for EA and PSR); however, in this case additional information from the Underground Demonstration Facility (UDF) and the final decision will be used.
- Site specific information from UDF testing is available as required from WBS 560.25.30.30.10 (Technical Support for Operating License Application).
- Final design is fixed and available 2 years ahead of when the FSR is due.
- The regulatory review and approval period takes 2 years which implies the final version is to be completed by end Y23.
- The FSR take 3 years to complete for the interim version, with a further 2 years required for review and revision to produce the final version. This means the FSR work must start no later than Y19.
- The staffing model is consistent with the current status quo (i.e., more buy than make oriented).

NWMO Safety Assessment staff requirements are 8 FTE/a (2 NWMO-01 and 6 NWMO-03). This includes the management of contracts that support this activity in WBS 560.25.30.30.10 (Technical Support for Operating Licence Application).

Contractor support with preclosure and postclosure assessments (including review and comment) is $3 M/a for Y19 to Y23 (similar to the PSR stage).

NWMO expenses are $40 K/a (~$5 K/a/FTE). This will cover software licences, travel (sites, conferences) and other costs (e.g. high speed computing).

Schedule	Start Year		16	2025		Finish Year		23	2032

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 9,790,435	$ -	$ 15,320,000	$ 25,110,435	$ 6,277,609	$ 31,388,044

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	30	20			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title BIOSPHERE MONITORING

Description

This task is for the development and operation of a biosphere monitoring program.

Environmental Effects Monitoring is a process which will establish the baseline conditions of the biosphere and then monitor for changes to the baseline from the activities occurring at the facility site, whether this is construction, normal operations, emergency procedures or decommissioning. Any changes to the baseline will be investigated to determine the cause.

The monitoring program includes:

- Demonstration of compliance with targets set within the Environmental Management System Plan.
- Evaluation of any releases into the environment including assessment of the likely cause and determining mitigation / actions.

- Compliance Monitoring will be conducted to ensure that all Provincial regulatory requirements are met for effluent discharges, and on- and off-site air action levels are met.

A variety of measurements from off-site locations will also be collected on a regular basis for use with public health and monitoring assessments, including:

- Air – continual radioactivity monitoring at 10 locations with sampling each quarter
- Water – rain, drinking water, lakes, streams, rivers – 10 samples per event
- Soil – 20 soil samples per quarter
- Wildlife and Plants – 10 flora and fauna samples from various locations each quarter
- Produce – for example milk. – 5 samples from various local produce per quarter (on rotation)

Deliverable

The main deliverables are:

- Reporting of baseline condition changes and assessments of the likely reasons for the changes.
- Periodic reports on compliance with targets set out in the Environmental Management System Plan.
- Provision of environmental data and analysis for public information.
- Demonstration of compliance with legislation and regulations and provision of reports to the Ministry of the Environment as required.

Assumptions

- Baseline biosphere data are available from WBS 560.30.30.20.30 (Biosphere Characterization for EA and PSR).
- Excludes groundwater monitoring wells.

NWMO staff requirement is 1 NWMO-03 FTE/a as long as the program is running.

Contractor costs for data collection and sampling is $200 K/a as long as the program is running. This includes contractor staff costs, costs to install and maintain equipment, sample analysis costs, and report preparation.

Schedule	Start Year	16	2025		Finish Year	25	2034

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ 1,301,832	$ -	$ 2,000,000	$ 3,301,832	$ 825,458		$ 4,127,290

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	30	30			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	HUMAN HEALTH MONITORING								
Description	A regular assessment of public health will be conducted and may involve the following activities: - Identification of community health concerns - Public health implications - Site specific health outcomes The focus is on assessing the potential impacts of facility operations on the health of the people living in the area of the facility.								
Deliverable	The main deliverables for the Human Health monitoring are: - Evaluation of public health through analysis of collated data including generation of public health assessment reports. - Reports to regulators and any other interested parties								
Assumptions	- Monitoring of worker health is not included. - Public health evaluation is reviewed on an ongoing basis. A study is conducted every 5 years at a cost of $500 K/study.								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,000,000	$ 1,000,000	$ 250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	30	90			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	SUPPORT FOR REVIEW AND HEARINGS FOR OPERATING LICENCE								
Description	This task is to support the public hearings and respond to review panel and regulatory questions on the Final Safety Report (FSR) submission. It is also anticipated that Safety Assessment staff will attend a variety of sessions with the public, elected representatives and aboriginal groups to provide information on the technical aspects of the project.								
Deliverable	Prepare responses to review questions. Presentation material for public and regulatory review. Participation in public review of FSR materials.								
Assumptions	NWMO staffing requirements are 2 NWMO-01 and 6 NWMO-03 FTE/a. This includes the management of contracts that support this activity in WBS 560.25.30.30.10 (Technical Support for Operating Licence Application). Funding for contractor support during the Operating Licence review process is estimated at $400 K/a for 2 years.								
Schedule	Start Year	24	2033			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	Assumed similar level of effort as in supporting the Construction Licence application.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,447,609	$ -	$ 800,000	$ 3,247,609	$ 811,902	$ 4,059,511

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	40	10			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title OPERATIONS SAFETY ASSESSMENT

Description

This task is to provide safety assessment support during the facility operating period. Specific items include:

- Preparation of periodic safety assessment reports to support continuation of the site Operating Licence.
- Assessment of topical issues as may be required, including any follow-up issues from Operating Licence approval.
- Maintenance and improvement of the safety and performance assessment computer codes, including reference databases and tools, under a suitable QA system.
- Maintenance of the reference site numerical model developed in WBS 560.30.30.30.10 (Safety Assessment for FSR).
- Planning and management of technical support related to the development and validation of safety and performance assessment models and codes, and associated databases.
- Training of qualified staff to ensure continued capability to support the monitoring and eventual closure of the facility.
- Interpretation and application of experiments conducted in the Underground Demonstration Facility (UDF).

Deliverable

- Up-to-date reference repository safety assessment model.
- Periodic updates to the Final Safety Report (FSR) as required for supporting renewal of the site Operating Licence.
- Annual report describing ongoing results to further validate or improve the reference safety assessment model.

Assumptions

- The monitoring of geologic conditions around the site, and maintenance of the site hydrogeological reference numerical model is not addressed here.
- Costs do not include biosphere monitoring.
- Costs do not include monitoring of repository as needed to support operations.
- Costs do not include responsibility for conventional Health, Safety & Environmental program in support of operations.
- The cost for technical support work in the UDF and elsewhere (i.e., universities, international collaboration) is described in WBS 560.25.50.40.10 (Conduct UDF Demonstrations – Operations).

NWMO staff requirements are 5 FTE/a based on:

- safety assessment manager (1 NWMO-01)
- technical specialists in safety assessment (2 NWMO-03)
- analyst/engineers (2 NWMO-03)

Expenses are estimated as $400 K/a to provide consultant support (software support, technical analysis and peer review), and costs for travel to attend public meetings and to participate in international conferences and workshops.

Schedule	Start Year	26	2035	Finish Year	85	2094

Type Step-Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 44,525,124	$ -	$ 24,000,000	$ 68,525,124	$ 17,131,281	$ 85,656,405

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	40	20			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title BIOSPHERE MONITORING

Description

This task is for the development and operation of a biosphere monitoring program.

Environmental Effects Monitoring is a process which will establish the baseline conditions of the biosphere and then monitor for changes to the baseline from the activities occurring at the facility site, whether this is construction, normal operations, emergency procedures or decommissioning. Any changes to the baseline will be investigated to determine the cause.

The monitoring program includes:

- Demonstration of compliance with targets set within the Environmental Management System Plan.
- Evaluation of any releases into the environment including assessment of the likely cause and determining mitigation / actions.
- Compliance Monitoring will be conducted to ensure that all Provincial regulatory requirements are met for effluent discharges, and on- and off-site air action levels are met.

A variety of measurements from off-site locations will also be collected on a regular basis for use with public health and monitoring assessments, including:

- Air – continual radioactivity monitoring at 10 locations with sampling each quarter
- Water – rain, drinking water, lakes, streams, rivers – 10 samples per event
- Soil – 20 soil samples per quarter
- Wildlife and Plants – 10 flora and fauna samples from various locations each quarter
- Produce (e.g.; milk) – 5 samples from various local produce per quarter (on rotation)

Deliverable

The main deliverables are:

- Reporting of baseline condition changes and assessments of the likely reasons for the changes.
- Periodic reports on compliance with targets set out in the Environmental Management System Plan.
- Provision of environmental data and analysis for public information.
- Demonstration of compliance with legislation and regulations and provision of reports to the Ministry of the Environment as required.

Assumptions

- Biosphere data are available from WBS 560.30.30.30.20 (Biosphere Monitoring).
- Excludes groundwater monitoring wells.

NWMO staff requirement is 1 NWMO-03 FTE/a as long as the program is running.

Contractor costs for data collection and sampling are $200 K/a as long as the program is running. This includes contractor staff costs, costs to install and maintain equipment, sample analysis costs, and report preparation.

Schedule	Start Year	26	2035	Finish Year	85	2094	

Type Step-Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 7,810,992	$ -	$ 12,000,000	$ 19,810,992	$ 4,952,748	$ 24,763,740

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	40	30			**Prepared By:**	N. Hunt, P.
WBS (Old)									Gierszewski
WBS Title	HUMAN HEALTH MONITORING								
Description	A regular assessment of public health will be conducted and may involve the following activities: - Identification of community health concerns - Public health implications - Site specific health outcomes The focus is on assessing the potential impacts of facility operations on the health of the people living in the area of the facility.								
Deliverable	The main deliverables for the Human Health monitoring are: - Evaluation of public health through analysis of collated data including generation of public health assessment reports. - Reports to regulators and any other interested parties								
Assumptions	- Monitoring of worker health is not included. - Public health evaluation is reviewed on an ongoing basis. A study is conducted every 5 years at a cost of $500 K/study.								
Schedule	Start Year		26	2035			Finish Year	85	2094
Type	Fixed								
Calculations									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,000,000	$ 6,000,000	$ 1,500,000	$ 7,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	50	10			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	EXTENDED MONITORING								
Description	This task is to provide safety assessment activities during the Extended Monitoring period (Y86-Y155). Specific items include: - Preparation of periodic safety assessment reports to support continuation of the site Operating Licence. - Assessment of the repository performance against model predictions, and continual improvement in the reference repository safety assessment models. - Maintenance of safety and performance assessment computer codes, including reference databases and tools, under a suitable QA system. - Maintenance of the reference site numerical model developed in WBS 560.30.30.40.10 (Operations Safety Assessment). - Planning and management of technical support related to the continuous validation of safety and performance assessment models and codes, and in particular on the implications of continued monitoring on the long-term safety. - Training of qualified staff to ensure continued capability to support the monitoring and eventual closure of the facility.								
Deliverable	- Up-to-date reference repository safety assessment model. - Periodic updates to the FSR as required for supporting renewal of the site Operating Licence. - Annual report describing ongoing work to further validate or improve the reference safety assessment model, and specifically its conclusions with respect to the implications for continued monitoring and for repository closure.								
Assumptions	The following is not included here: - General operating costs of the Underground Demonstration Facility (UDF). - Groundwater monitoring. - Biosphere monitoring (compliance with environmental targets). NWMO staff requirements are 2 FTE/a based on: - technical specialist in safety assessment (1 NWMO-03) - analyst/software specialist (1 NWMO-03) Costs for consultants for software support, technical analysis support, ongoing peer review and for travel to public meetings and international conferences and workshops is estimated at $M 0.2/a. Cost for analysis of the long-term experiments is estimated at $M 0.2/a. It is assumed that no major new experiments are undertaken, but that that previously installed long-term experiments are continuously monitored and, per their experimental plan, eventually recovered for detailed analysis. Thus the costs are likely to be modest, with periodic spikes for the duration of a recovery and analysis campaign. In particular, it is expected that at least one long-term container test will have been emplaced and instrumented earlier, and will be recovered during this period. In addition, smaller experiments will focus on analysis of long-term exposed coupons or test assemblies to confirm model predictions on decade time-scales, and provide as much confidence as is possible for making a decision with respect to continued monitoring or closure. Thirdly, the experiments may increasingly focus on the influence of the extended monitoring itself on the repository (e.g. resaturation) and/or on concepts for remote monitoring of a closed and sealed repository.								
Schedule	Start Year	86	2095			Finish Year	155	2164	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 18,225,648	$ -	$ 28,000,000	$ 46,225,648	$ 11,556,412	$ 57,782,060

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	50	20			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	BIOSPHERE MONITORING								
Description	This task is for the development and operation of a biosphere monitoring program. Environmental Effects Monitoring is a process which will establish the baseline conditions of the biosphere and then monitor for changes to the baseline from the activities occurring at the facility site, whether this is construction, normal operations, emergency procedures or decommissioning. Any changes to the baseline will be investigated to determine the cause. The monitoring program includes: - Demonstration of compliance with targets set within the Environmental Management System Plan. - Evaluation of any releases into the environment including assessment of the likely cause and determining mitigation / actions. - Compliance Monitoring will be conducted to ensure that all Provincial regulatory requirements are met for effluent discharges, and on- and off-site air action levels are met. A variety of measurements from off-site locations will also be collected on a regular basis for use with public health and monitoring assessments, including: - Air – continual radioactivity monitoring at 10 locations with sampling each quarter - Water – rain, drinking water, lakes, streams, rivers – 10 samples per event - Soil – 20 soil samples per quarter - Wildlife and Plants – 10 flora and fauna samples from various locations each quarter - Produce (e.g.; milk) – 5 samples from various local produce per quarter (on rotation)								
Deliverable	The main deliverables are: - Reporting of baseline condition changes and assessments of the likely reasons for the changes. - Periodic reports on compliance with targets set out in the Environmental Management System Plan. - Provision of environmental data and analysis for public information. - Demonstration of compliance with legislation and regulations and provision of reports to the Ministry of the Environment as required.								
Assumptions	- Biosphere data are available from WBS 560.30.30.40.20 (Biosphere Monitoring). - Excludes groundwater monitoring wells. NWMO staff requirement is 1 NWMO-03 FTE/a as long as the program is running. Contractor costs for data collection and sampling is $200 K/a as long as the program is running. This includes contractor staff costs, costs to install and maintain equipment, sample analysis costs, and report preparation.								
Schedule	Start Year		86	2095			Finish Year	155	2164
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 9,112,824	$ -	$ 14,000,000	$ 23,112,824	$ 5,778,206	$ 28,891,030

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	50	40			**Prepared By:**	N. Hunt, P.
WBS (Old)									Gierszewski
WBS Title	HUMAN HEALTH MONITORING								
Description	A regular assessment of public health will be conducted and may involve the following activities: - Identification of community health concerns - Public health implications - Site specific health outcomes The focus is on assessing the potential impacts of facility operations on the health of the people living in the area of the facility.								
Deliverable	The main deliverables for the Human Health monitoring are: - Evaluation of public health through analysis of collated data including generation of public health assessment reports. - Reports to regulators and any other interested parties								
Assumptions	- Monitoring of worker health is not included. - Public health is reviewed on an ongoing basis. A study is conducted every 5 years at a cost of $500 K/study.								
Schedule	Start Year		86	2095			Finish Year	155	2164
Type	Fixed								
Calculations									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 7,000,000	$ 7,000,000	$ 1,750,000	$ 8,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	60	10			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									

WBS Title BIOSPHERE MONITORING

Description

This task is for the development and operation of a biosphere monitoring program.

Environmental Effects Monitoring is a process which will establish the baseline conditions of the biosphere and then monitor for changes to the baseline from the activities occurring at the facility site, whether this is construction, normal operations, emergency procedures or decommissioning. Any changes to the baseline will be investigated to determine the cause.

The monitoring program includes:

- Demonstration of compliance with targets set within the Environmental Management System Plan.
- Evaluation of any releases into the environment including assessment of the likely cause and determining mitigation / actions.

- Compliance Monitoring will be conducted to ensure that all Provincial regulatory requirements are met for effluent discharges, and on- and off-site air action levels are met.

A variety of measurements from off-site locations will also be collected on a regular basis for use with public health and monitoring assessments, including:

- Air – continual radioactivity monitoring at 10 locations with sampling each quarter
- Water – rain, drinking water, lakes, streams, rivers – 10 samples per event
- Soil – 20 soil samples per quarter
- Wildlife and Plants – 10 flora and fauna samples from various locations each quarter
- Produce (e.g.; milk) – 5 samples from various local produce per quarter (on rotation)

Deliverable

The main deliverables are:

- Reporting of baseline condition changes and assessments of the likely reasons for the changes.
- Periodic reports on compliance with targets set out in the Environmental Management System Plan.
- Provision of environmental data and analysis for public information.
- Demonstration of compliance with legislation and regulations and provision of reports to the Ministry of the Environment as required.

Assumptions

- Biosphere data are available from WBS 560.30.30.50.20 (Biosphere Monitoring).
- Excludes groundwater monitoring wells.

NWMO staff requirement is 1 NWMO-03 FTE/a as long as the program is running.

Contractor costs for data collection and sampling is $200 K/a as long as the program is running. This includes contractor staff costs, costs to install and maintain equipment, sample analysis costs, and report preparation.

Schedule	Start Year		156	2165		Finish Year		180	2189

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 3,254,580	$ -	$ 5,000,000	$ 8,254,580	$ 2,063,645	$ 10,318,225

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	60	20			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	DECOMMISSIONING								
Description	This task is for Safety Assessment support for the application for Decommissioning Licence and possible associated Environmental Assessment.								
Deliverable	Support to the Environmental Assessment (EA) as required. Preparation of updated safety assessment Final Safety Report (FSR).								
Assumptions	- The existing FSR will be updated with current data, but is otherwise sufficient to support the decommissioning EA/licence application. - Preparation for the EA/Licence application begins at the start of the Decommissioning and Closure stage. - The EA/Licence application takes 3 years to prepare and thereafter the hearing process takes 2 year to complete. - The EA addresses all issues related to obtaining the Decommissioning Licence and the Licence to Abandon. - Technical support activities are largely over (i.e., it is assumed that all issues have been sufficiently addressed in the >100 years of research that have taken place prior to the decision to close and abandon the facility). However $200 K/a funding is maintained with universities or contractors or international collaboration in order to address issues that may arise during the 25-year Decommissioning period. NWMO safety assessment staff requirements for the final wrap up of safety assessment activities and Decommissioning Licence application are 2 NWMO-03 FTE/a for 5 years, Y156 to Y160. Subsequently the effort is 1 NWMO-03 FTE/a to maintain the facility licence during the Decommissioning phase, and to ensure that the FSR remains consistent with the as-decommissioned facility. WEDS 560.30.40.50.40 (EA for CNSC Decommissioning Licence) states that the EA will require a support Manager and full time Technical Specialist, together with support from consultants and contractors engaged to perform technical studies and data analysis. These costs are included in that item and no additional safety assessment staff are required.								
Schedule	Start Year	156	2165			Finish Year	180	2189	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 3,905,496	$ -	$ -	$ 3,905,496	$ 976,374	$ 4,881,870

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	30	70	10			**Prepared By:**	N. Hunt, P. Gierszewski
WBS (Old)									
WBS Title	ABANDONMENT								
Description	This task is for Safety Assessment support for an application for abandonment of the facility.								
Deliverable	Preparation of updated safety assessment Final Safety Report (FSR)								
Assumptions	- The Environmental Assessment (EA) created in WEDS 560.30.40.50.40 (EA for CNSC Decommissioning Licence) addresses all EA issues related to obtaining the Decommissioning Licence and the Licence to Abandon. - The existing FSR will be updated with current data, but is otherwise sufficient to support the abandonment licence application. - The Updated FSR will include information obtained during the Decommissioning phase, including if necessary information on the actual seal installation characteristics, and the actual as-decommissioned facility. - Preparation for the Licence application begins 5 years prior to the end of the Decommissioning phase. - The application takes 3 years to complete and thereafter the hearing process takes 1 year to complete. NWMO staff requirements are 2 NWMO-03 FTE/a for 4 years. Contractor support costs are $400 K/a for 4 years.								
Schedule	Start Year		181	2190		Finish Year	184	2193	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ 1,041,466	$ -	$ 1,600,000	$ 2,641,466	$	660,366	$ 3,301,832

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	10	10			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	10					
WBS Title	OTHER GOVERNMENT APPROVALS - REQUIREMENTS								
Description	Identify those licenses, permits, approvals, and plans that will be required from federal, provincial and municipal agencies (other than the Canadian Nuclear Safety Commission and approval under CEAA) in order to site, construct or operate the facility. Determine the actions that will be necessary to obtain those licenses, permits and approvals. (Y01 – Y09)								
Deliverable	Listing of the necessary licenses, permits approvals, and plans needed as well as the actions required to obtain them.								
Assumptions	It is assumed that: 1. This will include at a minimum regulatory reviews from such agencies as Transport Canada, Natural Resources Canada, Fisheries and Oceans Canada, and the Canadian Transport Agency; and 2. The costs associated with and the resources needed to manage the liaison with the applicable federal, provincial and municipal agencies have been captured in the efforts assigned to liaison with the CNSC (see WBS 560.20.40.10.10).								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	10	20			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title PREPARATION FOR ENVIRONMENTAL ASSESSMENT

Description Prepare for the Environmental Assessment process by informally sharing the results of the site characterization activities with the CNSC (Y07 – Y09). Site characterization will be carried out as part of the Siting Process. The EA process can be initiated as soon as a site is selected.

Deliverable Informally submit the results of the site characterization activities to the CNSC

Assumptions It is assumed that:

1. As part of the siting process, surface/subsurface investigations will be conducted.
2. The work associated with the investigations is captured as part of the siting process (WBS 560.15.20.10.70, 560.15.20.10.80). The site characterization studies will cover such things as meteorology, flora, fauna, hydrology, geology, hydrogeology, etc.
3. The results will be documented in technical reports that will be shared with the CNSC.
4. This work will support the interactions with the CNSC as technical reports are submitted and reviewed by CNSC staff.
5. The studies are expected to start about 5 years (Y07) prior to the submission of the Environmental Impact Statement. The review of the site information is expected to occur over 3 years but is dependent on the number of candidate sites.
6. The early site characterization activities are expected to expedite the EA process.
7. The costs associated with and the resources needed to support the early environmental assessment interactions with the CNSC on the site characterization activities are as follows:

	Y07	Y08	Y09
CNSC Licensing Fees ($k)	405	405	405
NWMO-1	0.5	0.5	0.5
NWMO-3	0.5	0.5	0.5
Travel ($k)	2	2	2

Schedule Start Year 7 2016 Finish Year 9 2018

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 527,304	$ -	$ 1,221,000	$ 1,748,304	$ 437,076	$ 2,185,380

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	20	10			**Prepared By:**	A. Khan
WBS (Old)	552	30	50						

WBS Title SITE PREP. AND CONSTR. LICENCE (CNSC) APPLICATION

Description

Apply for a Site Preparation & Construction Licence from the Canadian Nuclear Safety Commission (Y10 –Y12) by implementing the licensing plan (see WBS 560.20.40.10.10). This includes:

1. Preparing and submitting a licence application and supporting documents that include all of the information required under Nuclear Safety Control Act and its associated regulations; and
2. Confirming that safety criteria used in design and safety assessments have been met.

Deliverable Class I Nuclear Facility Site Preparation & Construction Licence Application and Supporting Documents

Assumptions

It is assumed that:

1. A Letter of Intent will be submitted as soon as the site is selected. The project description will also be submitted.
2. A separate licence to prepare the site will not be required.
3. The Commission will issue a licence which will require CNSC approvals at identified stages of work.
4. The licence will be valid for the entire construction period; licence renewals will not be required.
5. An Environmental Assessment will be required before the CNSC can issue any licence (see WBS 560.30.40.20.30).
6. A licence application package will contain at a minimum the listing presented in the licensing procedure, NWMO-PROC-RG-0002 which includes such items as:
   - A Preliminary Safety Report (PSR) that includes preliminary safety assessments (see WBS 560.30.30.20.10) and relevant preliminary design details (see WBS 560.20.50.20.10);
   - Considerations for Radiation Protection and ALARA;
   - Considerations for Human Factors;
   - Considerations for Fire Protection;
   - Considerations for Security and Robustness;
   - Considerations for Safeguards;
   - Considerations to Operate and Maintain the Facility;
   - Description of the Organizational Management Structure;
   - Description of the Conventional Safety Program;
   - A Compliance Matrix;
   - A Quality Assurance Program (see WBS 560.90.70.20.10);
   - A Construction Program; and
   - A Preliminary Decommissioning Plan and Decommissioning Cost Estimate plan for Financial Guarantee.
7. The licensing process (from filling the project description and notice of intent through to issue of licence) is expected to require 5 years;
8. A Hearing plan will be produced to support the licencing review and Hearing activities (WBS 560.30.40.20.20);
9. The costs associated with and the resources needed to oversee the licensing process and to prepare the application and supporting documents (not including time required by engineering/technical staff for their input into the submissions) are as follows:

	Y10	Y11	Y12
CNSC Licensing Fees ($k)	900	900	900
NWMO-1 (FTE)	0.95	0.95	0.75
NWMO-3 (FTE)	2.95	2.95	2.25
Travel ($k)	10	10	10

Schedule	Start Year	10	2019	Finish Year	12	2021

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,647,577	$ -	$ 2,730,000	$ 4,377,577	$ 1,094,394	$ 5,471,972

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	20	20			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title LICENSING REVIEW INCLUDING PUBLIC HEARING

Description Provide required support during the application review process and attend the Public Hearing that will be held in support of obtaining the licence (Y13 – Y15). This will include:

1. Answering CNSC staff questions (as required);
2. Providing supplementary information as per a schedule and/or as required;
3. Preparing information needed for the Public Hearing; and
4. Attending and participating in the hearing prior to initial licence and possibly prior to any licence modifications or stages identified by the CNSC (e.g.: beginning of commissioning).

Deliverable Class I Nuclear Facility Site Preparation & Construction Licence issued by the CNSC

Assumptions It is assumed that:

1. A separate licence to prepare the site will not be required.
2. The Commission will issue a licence which will require CNSC approvals before identified stages of work.
3. The licence will be valid for the entire construction period; licence renewals will not be required.
4. Environmental Assessment submissions have been made (see WBS 560.30.40.20.30).
5. Submissions in support of the licence application have been made (see WBS 560.30.40.20.10).
6. The consultants used to support the Environmental Assessment will be available to answer CNSC staff questions and to attend the Public Hearing.
7. The costs associated with and the resources needed to support CNSC staff's review of the application (not including time required by engineering/technical staff) as well as to prepare for and attend the Public Hearing are as follows:

	Y13	Y14	Y15
CNSC Licensing Fees ($k)	2025	1980	1980
NWMO-1 (FTE)	0.75	0.85	0.85
NWMO-3 (FTE)	2.25	2.75	2.75
Travel ($k)	5	5	5
Purchased Services ($k)	854	854	854

Schedule	Start Year	13 2022	Finish Year	15 2024	

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;
NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff;
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars; and
Purchased services for the environmental assessment are calculated assuming that 1 FTE equals 1856 hours.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,551,234	$ -	$ 8,562,000	$ 10,113,234	$ 2,528,308	$ 12,641,542

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	20	30		**Prepared By:**	A. Khan	
WBS (Old)	552	55	20						

WBS Title ENVIRONMENTAL ASSESSMENT

Description

Prepare and submit the Environmental Impact Statement and Technical Support Documents required to support the Environmental Assessment that will be prepared by the Responsible Authority (Y10 – Y12). This includes:

- Liaising with the Responsible Authorities;
- Conducting a public involvement process;
- Performing any field work that might be required;
- Collecting and analysing the data; and
- Preparing the Environmental Impact Statement and the Technical Support Documents.

Deliverable

Environmental Impact Statement and Technical Support Documents for the Environmental Assessment (the Environmental Assessment itself will be prepared by the Responsible Authority or the Review Panel).

Assumptions

It is assumed that:

1. The Letter of Intent will be submitted as soon as the site is selected. The project description will also be submitted.
2. Provincial authorities will not conduct a separate Environmental & Socio-economic Impact Assessment.
3. The Responsible Authority will likely recommend that the Minister of the Environment refer the Environmental Assessment to a Joint Review Panel early in the EA Process.
4. The Review Panel will conduct the Public Hearing (see WBS 560.30.40.20.20).
5. The Review Panel will likely delegate the responsibility for data collection, field studies and the preparation of the Environmental Impact Statement and the Technical Support Documents to the proponent.
6. Documents will be submitted by Proponent.
7. Other information needed for the environmental assessment will be available, such as:

- The site characterization studies (meteorology, flora, fauna, hydrology, geology, hydrogeology, etc.) performed to evaluate the suitability of the site, all costs associated with performing these studies have been included under Geoscience (WBS 560.15.20.10.70, 560.15.20.10.80);
- The biosphere characterization studies performed to evaluate the suitability of the site, all costs associated with performing these studies have been included under Safety Assessment (WBS 560.30.30.20.30);
- The dose assessments for workers, members of the public and non-human biota prepared for the Preliminary Safety Assessment Report (WBS 560.30.30.20.10); and
- Conceptual design for the facility prepared under Repository System Development (WBS 560.20.50.20.10).

8. Intervener funding will be provided by CEAA from the funds available to that organization (i.e.: there will be no additional intervener funding provided by the Proponent).
9. All costs associated with the public involvement process are included under Public Affairs – Public Review and EA Approval (WBS XXX XX XX).
10. No revision of the Environmental Assessment will be required after completion of the work in the underground characterization facility. However there will be updated reports to the EA which provides new information about site conditions as observed in the UCF.
11. Preparation of technical documents and the Environmental Impact Statement (EIS) will start 2 years prior to the submission of the EIS and will use the relevant information gathered in the EA preparation phase (see WBS 560.30.40.10.20). The review of the EIS and the Public Hearing is expected to take 3 years to complete. The Hearing Plan will start 3 years prior to start of construction (see WBS 560.30.40.20.10). The EA process will include the following:

- Preparation of an EA Scoping Document (EA Guidelines);
- Hearing to make decisions related to the EA Guidelines;
- Preparation of Environmental Impact Statement Guidelines;
- Preparation of the Environmental Impact Statement;
- Submission of Environmental Impact Statement; and
- Review of Environmental Impact Statement which includes public engagement.

12. It is assumed that the EIS and other supporting documents as well as the Panel Public Hearing will likely cover the EA process and the CNSC licensing process (covered by WBS 560.30.40.20.20).
13. The costs associated with and the resources needed to support the environmental assessment are as follows:

	Y10	Y11	Y12
CNSC Licensing Fees ($k)	99	99	99
NWMO-1 (FTE)	1	1	1
NWMO-3 (FTE)	1.5	1.5	1
Travel ($k)	2	2	2
Purchased Services ($k)	4454	4454	4454

Schedule Start Year 10 2019 Finish Year 12 2021

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff;
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars; and

Purchased services for the environmental assessment are calculated assuming that 1 FTE equals 1856 hours.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,184,791	$ -	$ 13,665,000	$ 14,849,791	$ 3,712,448	$ 18,562,238

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	20	40			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	30					

WBS Title OTHER GOVERMENT APPROVALS - FEDERAL

Description

Obtain the federal permits, certificates or approvals (from agencies other than the Canadian Nuclear Safety Commission and approval under CEAA) that are required in order to construct or operate the facility (Y14 – Y25). Depending on the site selected for the facility, these may include:

1. Permits from Fisheries & Oceans Canada to allow:
   - the discharge of substances deleterious to fish,
   - the removal of fish habitat, or
   - the construction of roadways near water bodies.
2. License from Natural Resources Canada to Store Explosives (during construction); along with any other permits and approvals required for a given site.
3. Approval from Transport Canada following an assessment of impact on navigation, emergency response, etc.
4. Authorization from Canadian Transport Agency.

Deliverable

Permits, Certificates and Approvals required from federal regulatory agencies other than the Canadian Nuclear Safety Commission

Assumptions

The number and nature of the permits that may be required may depend on the location selected.

It is assumed that:

1. Most of the technical information that will be required to obtain federal permits, certificates or approvals (from agencies other than the Canadian Nuclear Safety Commission) will be available from either the environmental assessment or CNSC license applications. It is also assumed that this information will be available around the same time as the application for the Site Preparation and Construction Licence.
2. The environmental assessment must be completed before any federal permits, certificates or approvals can be issued.
3. Any required federal permits, certificates or approvals will be obtained as needed during construction or prior to the beginning of operations.
4. Some permits, certificates or approvals may need to be renewed on a yearly basis.
5. The effort required will be limited to that required to prepare and submit applications and liaise with regulatory agencies.
6. It is expected that other regulatory reviews from other government agencies will be conducted during the last two years in which the EA and licence application's supporting documents are being reviewed (Y14&Y15) (WBS 560.30.40.20.20). It is also expected a larger effort will be needed during the first year of construction licence (Y16). The effort needed in the subsequent years is captured as part of maintaining the Site Preparation and Construction Licence during construction (see WBS 560.30.40.30.10).
7. The costs associated with and the resources needed to manage the liaison with the applicable federal agencies are as follows (note that CNSC staff will also interface with Transport Canada):

	Y14	Y15	Y16
Licensing Fees ($k)	45	45	45
NWMO-1 (FTE)	0.1	0.1	0.1
NWMO-3 (FTE)	0.7	0.7	0.7
($k)	1	1	1

Schedule Start Year 14 2023 Finish Year 15 2024

Type Fixed

Calculations and Notes:

Licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 226,527	$ -	$ 92,000	$ 318,527	$ 79,632	$ 398,159

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	20	50			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	40					
WBS Title	OTHER GOVERNMENT APPROVALS - PROVINCIAL								
Description	Obtain the provincial permits, certificates or approvals that are required in order to construct or operate the facility (Y14 – Y25). These is likely to include: 1. Registering the construction project with the Ministry of Labour; 2. Obtaining Certificates of Approval for atmospheric emissions (operational & construction), liquid effluents (sewage, waste water), water works (domestic water, fire water) and waste disposal (domestic waste, construction waste & soil) from the Ministry of the Environment; 3. Complying with the MISA Regulations for liquid wastes; and 4. Registering as a Hazardous Waste Generator with the Ministry of the Environment. Other permits (e.g.: permit to cut timber on crown land, patent for water lots, permission to dump fill within a conservation area, permit to excavate or alter an archaeological or historic site, etc.) may be required on a site specific basis.								
Deliverable	Permits, Certificates and Approvals required from provincial regulatory agencies.								
Assumptions	The number and nature of the permits that may be required may depend on the location selected. It is assumed that there will be no need to conduct a separate environmental assessment under the Environmental Assessment Act (Ontario). Provincial authorities generally accept that nuclear facilities fall under the jurisdiction of the federal process. It is assumed that: 1. Permits, certificates or approvals will be required from provincial agencies for both the construction and operation of the facility; 2. The Technical Support Document for the Environmental Assessment will provide all of the required information on gaseous & liquid effluents and wastes, no additional data collection or modelling will be necessary; 3. The environmental assessment must be completed before provincial regulatory agencies will issue any permits, certificates or approvals for the construction/operation of the facility. 4. The costs associated with and the resources needed to manage the liaison with the applicable provincial agencies have already been captured in the estimates for liaison with the federal agencies (WBS 560.30.40.20.40).								
Schedule	Start Year	14	2023		Finish Year	15	2024		
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	20	60			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	50					
WBS Title	OTHER GOVERNMENT APPROVALS – MUNICIPAL/REGIONAL								
Description	Obtain the municipal permits or approvals required to construct or operate the facility (Y14 – Y25). The permits or approvals that will be required will depend on the location selected but are likely to include: 1. Official Plan/Zoning Variance; 2. Building Permit; along with any other municipal permits, approvals or inspections related to highways, roads, sidewalks, sewers, potable water, electricity, fire safety, fences, waste disposal, public health (e.g.: cafeterias), etc.								
Deliverable	Obtain the permits and approvals required from municipal authorities								
Assumptions	The number and nature of the permits that may be required will vary depending on the municipality in which the facility will be located. It is assumed that: 1. Permits, certificates or approvals will be required from municipality for both the construction and operation of the facility. 2. The Technical Support Document for the Environmental Assessment, the PSAR and the facility design documents will provide all of the information required to support applications for permits from the municipality. 3. The environmental assessment must be completed before provincial regulatory agencies will issue any permits, certificates or approvals for the construction/operation of the facility. 4. Municipal actions will not be challenged before a provincial oversight body (e.g.: the Ontario Municipal Board). 5. The costs associated with and the resources needed to manage the liaison with the applicable provincial agencies have already been captured in the estimates for liaison with the federal agencies (WBS 560.30.40.20.40).								
Schedule	Start Year		14	2023		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	30	10			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	30					

WBS Title OTHER GOVERMENT APPROVALS - FEDERAL

Description

Obtain the federal permits, certificates or approvals (from agencies other than the Canadian Nuclear Safety Commission and approval under CEAA) that are required in order to construct or operate the facility (Y14 – Y25). Depending on the site selected for the facility, these may include:

1. Permits from Fisheries & Oceans Canada to allow:
   - the discharge of substances deleterious to fish,
   - the removal of fish habitat, or
   - the construction of roadways near water bodies.
2. License from Natural Resources Canada to Store Explosives (during construction); along with any other permits and approvals required for a given site.
3. Approval from Transport Canada following an assessment of impact on navigation, emergency response, etc.
4. Authorization from Canadian Transport Agency.

Deliverable

Permits, Certificates and Approvals required from federal regulatory agencies other than the Canadian Nuclear Safety Commission

Assumptions

The number and nature of the permits that may be required may depend on the location selected.

It is assumed that:

1. Most of the technical information that will be required to obtain federal permits, certificates or approvals (from agencies other than the Canadian Nuclear Safety Commission) will be available from either the environmental assessment or CNSC license applications. It is also assumed that this information will be available around the same time as the application for the Site Preparation and Construction Licence.
2. The environmental assessment must be completed before any federal permits, certificates or approvals can be issued.
3. Any required federal permits, certificates or approvals will be obtained as needed during construction or prior to the beginning of operations.
4. Some permits, certificates or approvals may need to be renewed on a yearly basis.
5. The effort required will be limited to that required to prepare and submit applications and liaise with regulatory agencies.
6. It is expected that other regulatory reviews from other government agencies will be conducted during the last two years in which the EA and licence application's supporting documents are being reviewed (Y14&Y15) (WBS 560.30.40.20.40). It is also expected a larger effort will be needed during the first year of construction licence (Y16). The effort needed in the subsequent years is captured as part of maintaining the Site Preparation and Construction Licence during construction (WBS 560.30.40.30.40 and 560.30.40.30.50).
7. The costs associated with and the resources needed to manage the liaison with the applicable federal agencies are as follows (note that CNSC staff will also interface with Transport Canada):

	Y14	Y15	Y16
Licensing Fees ($k)	45	45	45
NWMO-1 (FTE)	0.1	0.1	0.1
NWMO-3 (FTE)	0.7	0.7	0.7
Travel ($k)	1	1	1

Schedule	Start Year	16	2025	Finish Year	25 2034

Type Fixed

Calculations and Notes:

Licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 113,264	$ -	$ 46,000	$ 159,264	$ 39,816	$ 199,079

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	30	20			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	40					

WBS Title OTHER GOVERNMENT APPROVALS - PROVINCIAL

Description

Obtain the provincial permits, certificates or approvals that are required in order to construct or operate the facility (Y14 – Y25). These is likely to include:

1. Registering the construction project with the Ministry of Labour;
2. Obtaining Certificates of Approval for atmospheric emissions (operational & construction), liquid effluents (sewage, waste water), water works (domestic water, fire water) and waste disposal (domestic waste, construction waste & soil) from the Ministry of the Environment;
3. Complying with the MISA Regulations for liquid wastes; and
4. Registering as a Hazardous Waste Generator with the Ministry of the Environment.

Other permits (e.g.: permit to cut timber on crown land, patent for water lots, permission to dump fill within a conservation area, permit to excavate or alter an archaeological or historic site, etc.) may be required on a site specific basis.

Deliverable Permits, Certificates and Approvals required from provincial regulatory agencies.

Assumptions

The number and nature of the permits that may be required may depend on the location selected.

It is assumed that there will be no need to conduct a separate environmental assessment under the Environmental Assessment Act (Ontario). Provincial authorities generally accept that nuclear facilities fall under the jurisdiction of the federal process.

It is assumed that:

1. Permits, certificates or approvals will be required from provincial agencies for both the construction and operation of the facility;
2. The Technical Support Document for the Environmental Assessment will provide all of the required information on gaseous & liquid effluents and wastes, no additional data collection or modelling will be necessary;
3. The environmental assessment must be completed before provincial regulatory agencies will issue any permits, certificates or approvals for the construction/operation of the facility.
4. The costs associated with and the resources needed to manage the liaison with the applicable provincial agencies have already been captured in the estimates for liaison with the federal agencies (WBS 560.30.40.30.10).

Schedule	Start Year	16	2025	Finish Year	25	2034	

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	30	30			**Prepared By:**	A. Khan
WBS (Old)	552	30	60	50					
WBS Title	OTHER GOVERNMENT APPROVALS – MUNICIPAL/REGIONAL								
Description	Obtain the municipal permits or approvals required to construct or operate the facility (Y14 – Y25). The permits or approvals that will be required will depend on the location selected but are likely to include: 1. Official Plan/Zoning Variance; 2. Building Permit; along with any other municipal permits, approvals or inspections related to highways, roads, sidewalks, sewers, potable water, electricity, fire safety, fences, waste disposal, public health (e.g.: cafeterias), etc.								
Deliverable	Obtain the permits and approvals required from municipal authorities								
Assumptions	The number and nature of the permits that may be required will vary depending on the municipality in which the facility will be located. It is assumed that: 1. Permits, certificates or approvals will be required from municipality for both the construction and operation of the facility. 2. The Technical Support Document for the Environmental Assessment, the PSAR and the facility design documents will provide all of the information required to support applications for permits from the municipality. 3. The environmental assessment must be completed before provincial regulatory agencies will issue any permits, certificates or approvals for the construction/operation of the facility. 4. Municipal actions will not be challenged before a provincial oversight body (e.g.: the Ontario Municipal Board). 5. The costs associated with and the resources needed to manage the liaison with the applicable provincial agencies have already been captured in the estimates for liaison with the federal agencies (WBS 560.30.40.30.10).								
Schedule	Start Year	16	2025			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	30	40			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title MAINTAIN CONSTRUCTION LICENCE DURING THE SITE PREPARATION AND CONSTRUCTION OF THE UNDERGROUND DEMONSTRATION

Description

Maintain the Site Preparation & Construction Licence from the Canadian Nuclear Safety Commission (Y16 – Y20) during the construction of the Underground Demonstration Facility (UDF). This includes:

1. Preparing and submitting reports to the CNSC according to the schedule specified in the licence;
2. Preparing and submitting unscheduled reports, if required, in accordance with the licence;
3. Seeking approvals as required by the Licence; and
4. Supporting CNSC staff activities during the course of the licence (also includes supporting CNSC compliance inspections).

Deliverable

Maintain the Class I Nuclear Facility Site Preparation & Construction Licence issued by the CNSC by submitting reports and seeking approvals as required. Also, prepare the licensing plan (for the operating licence) during this stage of the project.

Assumptions

It is assumed that:

1. The Commission will issue licence which will require CNSC approvals before identified stages of work (such as hold points identified in the licence).
2. The licence will be valid for the entire construction period; licence renewals will not be required.
3. Finalizing the site specific design and construction (i.e., the work performed under the licence) of the UDF will require 5 years.
4. Seeking CNSC approval to construct the initial components of the DGR will likely be required.
5. The licensing plan that will be executed for the operating licence application will be also prepared during this time.
6. The costs associated with and the resources needed to support compliance with the licence (not including technical support to address issues related to designs, plans and procedures), seeking CNSC approvals, and preparing the operating licensing plan are as follows:

	Y16	Y17	Y18	Y19	Y20
CNSC Licensing Fees ($k)	990	405	405	405	990
NWMO-1 (FTE)	0.85	0.75	0.75	0.95	0.95
NWMO-3 (FTE)	2.75	2.25	2.25	3.45	3.45
Travel ($k)	2	2	2	2	2

Schedule	Start Year	16	2025	Finish Year	20	2029

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;
NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,782,841	$ -	$ 3,205,000	$ 5,987,841	$ 1,496,960	$ 7,484,801

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	30	50			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title MAINTAIN THE CONSTRUCTION LICENCE DURING THE CONSTRUCTION OF THE DEEP GEOLOGICAL REPOSITORY (DGR) COMPONENTS

Description

Maintain the Site Preparation & Construction Licence from the Canadian Nuclear Safety Commission (Y21 – Y25) during the construction of the Deep Geological Repository (DGR) components. This includes:

1. Preparing and submitting reports to the CNSC according to the schedule specified in the licence;
2. Preparing and submitting unscheduled reports, if required, in accordance with the licence;
3. Seeking approvals as required by the licence; and
4. Supporting CNSC staff activities during the course of the licence (also includes supporting CNSC compliance inspections).

Deliverable

Maintain the Class I Nuclear Facility Site Preparation & Construction Licence issued by the CNSC by submitting reports and seeking approvals as required. Preparation of the Final Safety Analysis Report will also occur during this stage.

Assumptions

It is assumed that:

1. The Commission will issue licence which will require CNSC approvals before identified stages of work (such as hold points identified in the licence).
2. The licence will be valid for the entire construction period; licence renewals will not be required.
3. CNSC approvals, if required, will have been sought but some effort is expected during Y21 to ensure that all the required information has been provided to the CNSC. It is also likely that a round of CNSC comments will have to be addressed related to the results obtained from the UDF activities.
4. The assessments needed for the FSAR and to support the operating licence application will also be completed during this time (see WBS 560.30.30.30.10).
5. The costs associated with and the resources needed to support compliance with the licence (not including technical support to address issues related to designs, plans and procedures), seeking CNSC approvals, responding to comments, and obtaining assessments for the FSAR are as follows:

	Y21	Y22	Y23	Y24	Y25
CNSC Licensing Fees ($k)	990	405	405	405	990
NWMO-1 (FTE)	0.85	0.75	0.75	0.95	0.95
NWMO-3 (FTE)	2.75	2.25	2.25	3.45	3.45
Travel ($k)	2	2	2	2	2

Schedule	Start Year	21	2030	Finish Year	25	2034

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,782,841	$ -	$ 3,205,000	$ 5,987,841	$ 1,496,960	$ 7,484,801

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	30	60			**Prepared By:**	A. Khan
WBS (Old)	552	30	65						

WBS Title OPERATING LICENCE (CNSC) APPLICATION

Description Apply for an Operating Licence from the Canadian Nuclear Safety Commission (Y21 – Y23) by implementing the licensing plan (see WBS 560.30.40.30.40). This includes:

1. Preparing and submitting a licence application that includes all of the information required under the Nuclear Safety and Control Act and its associated regulations; and
2. Confirming that safety criteria used in the design and safety assessments have been met.

Deliverable Class I Nuclear Facility Operating Licence Application Package and Supporting Documents

Assumptions It is assumed that:

1. No amendments or additions to the Environmental Assessment submitted in conjunction with the application for a Site Preparation/Construction Licence will be required.
2. The Commission will issue a licence which will require CNSC approvals before identified stages of work.
3. A licence application package will contain at a minimum the listing presented in the licensing procedure, NWMO-PROC-RG-0002 which includes such items as follows:
   - A Final Safety Analysis Report (FSAR) that includes final safety assessments (see WBS 560.30.30.30.10) and represents the detailed design (see WBS 560.20.50.30.10);
   - Operating Policies and Principles;
   - Considerations for Radiation Protection and ALARA;
   - Considerations for Human Factors;
   - Third Party Review of Fire Protection Design and Installation;
   - Considerations for Security and Robustness;
   - Considerations for Safeguards;
   - Considerations to Operate and Maintain the Facility;
   - Description of the Organizational Management Structure;
   - Description of the Conventional Safety Program;
   - Compliance Matrix, confirming completion of all pre-requisites;
   - A Quality Assurance Program (see WBS 560.90.70.30.10);
   - A Commissioning Program; and
   - An Updated Decommissioning Plan and Decommissioning Cost Estimate plan for Financial Guarantee.
4. The costs associated with and the resources needed to oversee the licensing process and to prepare the application and supporting documents (not including time required by engineering/technical staff for their input into the submissions) are as follows:

	Y21	Y22	Y23
CNSC Licensing Fees ($k)	405	405	405
NWMO-1 (FTE)	0.7	0.5	0.5
NWMO-3 (FTE)	2	1.75	1.75
Travel ($k)	5	5	5

Schedule	Start Year	21 2030	Finish Year	23 2032	

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;
NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,092,307	$ -	$ 1,230,000	$ 2,322,307	$ 580,577	$ 2,902,884

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	30	70			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title LICENSING REVIEW INCLUDING PUBLIC HEARING

Description Provide required support during the application review process and attend Hearings needed to obtain the licence (Y24 – Y25). This

1. Answering CNSC questions (as required);
2. Providing supplementary information as per a schedule and/or as required;
3. Preparing information needed for the Public Hearing; and
4. Attending and participating in Public Hearings before the CNSC prior to initial licence and possibly prior to any licence modifications or stages identified by the CNSC (e.g.: beginning of active commissioning).

Deliverable Class I Nuclear Facility Operating Licence issued by the CNSC

Assumptions It is assumed that:

1. The Commission will issue a licence which may require CNSC approvals before identified stages of work (e.g., active commissioning).
2. Submissions in support of the licence application have been made (see WBS 560.30.40.30.60).
3. The Environmental Assessment completed for the Site Preparation and Construction Licence also covers the operation of the facility.
4. The costs associated with and the resources needed to support CNSC staff's review of the application (not including time required by engineering/technical staff) as well as to prepare for and attend the Public Hearing are as follows:

	Y24	Y25
CNSC	990	990
NWMO-1	0.7	0.7
NWMO-3	2	2
Travel ($k)	5	5

Schedule	Start Year	24	2033	Finish Year	25	2034

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 830,626	$ -	$ 1,990,000	$ 2,820,626	$ 705,157	$ 3,525,783

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	40	10		**Prepared By:**	A. Khan
WBS (Old)	552	30	70	10				

WBS Title MAINTAIN OPS LICENCE DURING OPERATIONS/APPLY TO RENEW LICENCE

Description

Renew and maintain the Class I Facility Operating License issued by the Canadian Nuclear Safety Commission (Y26 – Y85). This includes:

1. Preparing and submitting reports according to the schedule prescribed by the Operating Licence;
2. Preparing and submitting unscheduled reports, if required, in accordance with the licence;
3. Preparing and submitting an application for renewal of the Operating Licence that includes all of the information required under the Nuclear Safety and Control Act and its associated regulations; and
4. Supporting CNCS staff compliance activities as well as IAEA inspections during the course of the licence.

Deliverable Maintain Class I Facility Operating Licence issued by the CNSC during operation and submit licence renewal applications

Assumptions

It is assumed that:

1. The Operating Licence will be issued for 5-year terms continuing until the end of the Operations phase (60 years of operation beginning in year 26 (Y26 – Y85)).
2. The first year of the operating stage (Y26) will require additional resources and effort to complete active commissioning of the facility.
3. The terms of the licence are expected to require the submission of Reports to the CNSC.
4. No amendments or additions to the Environmental Assessment submitted in conjunction with the initial application for the Operating Licence will be required to support the application for renewal of the Operating Licence.
5. No significant amendments or additions to the FSAR submitted in conjunction with the initial application for the Operating License will be required to support the application for renewal of the Operating Licence, although periodic updates (prepared under WBS 560.30.30.40.10) in support of the renewal application will be submitted to the CNSC.
6. A midterm report will be made to the Commission at about the mid-point to every licence term starting with Y28 and then Y33, Y38, Y43, Y48, Y53, 58, 63, 68, 73, 78, and 83.
7. A licence renewal application will be compiled at 5-year intervals starting with Y29 and then Y34, Y39, Y44, Y49, etc. The application that will be compiled in Y84 is to support the application for an operating licence for the extended monitoring stage.
8. Licence renewal applications will contain at a minimum the information identified in the NWMO licensing procedure, NWMO-PROC-RG-0002. The main substance of which includes:

- Updated project requirements;
- Final Safety Report; and
- Operating Policies and Principles.

9. Regulatory Affairs will support the Transportation Group in interfacing with the CNSC for package and user certificate renewals as well as security requirements for transportation purposes. The effort and resources needed to prepare for renewals are captured in the transportation costs (see WBS 660.20.50.40.10).
10. The costs associated with and the resources needed to manage the licensing and to prepare applications for licence renewals with supporting documents (not including time required by engineering/technical staff for their input into the submissions and/or for resolving any issues that may arise during operations) are as follows for Y26 to Y81:

	Y26		Repeat every 5 years starting with Y27 and ending with Y81				
CNSC Licensing Fees ($k)	900		450	450	900	450	450
NWMO-1 (FTE)	0.95		0.75	0.75	0.75	0.25	0.75
NWMO-3 (FTE)	3.5		2.5	2.5	2.5	2.5	2.5
Travel ($k)	2		2	2	2	2	2

11. The costs associated with and the resources needed to manage the licensing and to prepare applications for licence renewals with supporting documents (not including time required by engineering/technical staff for their input into the submissions and/or for resolving any issues that may arise during operations) are as follows for Y82 to Y85:

	Y82	Y83	Y84	Y85
CNSC Licensing Fees ($k)	450	450	900	450
NWMO-1 (FTE)	0.75	0.75	0.75	0.25
NWMO-3 (FTE)	2.5	2.5	2.5	2.5
Travel ($k)	2	2	2	2

Schedule Start Year 26 2035 Finish Year 85 2094

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 25,678,454	$ -	$ 32,970,000	$ 58,648,454	$ 14,662,113	$ 73,310,567

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	40	20			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title LICENSING REVIEW INCLUDING PUBLIC HEARING

Description Provide required support during the application review process and attend Hearings needed to obtain the licence (Y30 – Y85). This includes:

1. Answering CNSC questions (as required);
2. Providing supplementary information as per a schedule and/or as required;
3. Preparing information needed for Public Hearing; and
4. Attending and participating in Public Hearings before the CNSC prior to initial licence and possibly prior to any licence modifications or stages identified by the CNSC (e.g.: beginning of commissioning).

Deliverable Class I Nuclear Facility Operating Licence issued by the CNSC.

Assumptions It is assumed that:

1. The licence term will be 5 years and that the licence will need to be renewed in 5-year intervals, beginning on Y30 and then Y35, Y40, Y45, and Y50. The licence renewal in Y55 is expected to be in support of the licence application for the extended monitoring stage.

2. Submissions in support of the licence applications will have been made (see WBS 560.30.40.40.10).
3. All activities will be identified and executed as described in a supporting hearing plan that is prepared by the Regulatory Affairs group.
4. The costs associated with and the resources needed to support CNSC staff's review of the application (not including time required by engineering/technical staff) as well as to prepare for and attend the Public Hearing will occur over three years on a five-year cycle as follows:

	Y29	Y30	Y31
	Y34	Y35	Y36
	Y39	Y40	Y41
	Y44	Y45	Y46
	Y49	Y50	Y51
	Y54	Y55	56
	Y59	Y60	Y61
	Y64	Y65	Y66
	Y69	Y70	Y71
	Y74	Y75	Y76
	Y79	Y80	Y81
	Y84	Y85	
CNSC Licensing Fees ($k)	900	900	450
NWMO-1 (FTE)	0.2	0.7	0.2
NWMO-3 (FTE)	1	1	1
Travel ($k)	4	4	2

Schedule Start Year 29 2038 Finish Year 85 2094

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported
NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 7,433,996	$ -	$ 26,668,000	$ 34,101,996	$ 8,525,499	$ 42,627,495

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	50	10			**Prepared By:**	A. Khan
WBS (Old)	552	30	70	20					
WBS Title	MAINTAIN/RENEW OPS LICENCE DURING EXTENDED MONITORING								
Description	Renew and maintain the Class I Facility Operating License issued by the Canadian Nuclear Safety Commission (Y86 – Y155). This includes: 1. Preparing and submitting reports according to the schedule prescribed by the Operating Licence; 2. Preparing and submitting unscheduled reports, if required, in accordance with the licence; 3. Preparing and submitting an application for renewal of the Operating Licence that includes all of the information required under the Nuclear Safety and Control Act and its associated regulations; and 4. Supporting CNSC staff compliance activities (as well as IAEA inspections) during the course of the licence.								
Deliverable	Maintain Class I Facility Operating Licence issued by the CNSC during extended monitoring and submit licence renewal applications								
Assumptions	It is assumed that: 1. During the extended monitoring phase (70 years of monitoring beginning in year 56 (Y86 – Y155), renewals may be required or an extended licence may be issued. Regulatory Affairs activities are assumed to be similar in either case since documents that form the licensing basis will have to be kept up-to-date and submitted to the CNSC for either situation. 2. The application for the first licence renewal to operate during the extended monitoring stage is expected to be submitted around the Y84 timeframe (see WBS 561.30.40.40.10). 3. It is assumed that appearances before the Commission will be required at five-year intervals, either to report to the Commission or to renew the licence. The first appearance to support the extended monitoring phase is expected to be in Y85 (see WBS 561.30.40.40.20). 4. The terms of the licence are expected to require the submission of routine Reports, as required by the CNSC. 5. No amendments or additions to the Environmental Assessment submitted in conjunction with the initial application for the Operating Licence will be required. 6. No amendments or additions to the FSAR submitted in conjunction with the initial application for the Operating Licence will be required, although periodic updates (covered under WBS 561.30.50.50.10) will be submitted to the CNSC. 7. The licence application will contain, at a minimum, the information identified in the NWMO licensing procedure, NWMO-PROC-RG-0002. Regular updates to these documents are expected to be submitted to the CNSC even if the licence does not need to be renewed. The main substance of which includes: - Updated project requirements; - Final Safety Report; and - Operating Policies and Principles. 8. The costs associated with and the resources needed to manage the licensing and to prepare supporting documents throughout the course of the monitoring phase (not including time required by engineering/technical staff for their input into the submissions and/or for resolving any issues that may arise during the monitoring phase) are expected to be covered by a staffing plan of:								

	Repeat every 5 years starting with Y86 and ending with Y154				
CNSC Licensing Fees ($k)	250	250	250	250	450
NWMO-1 (FTE)	1	1	1	1	1
NWMO-3 (FTE)	1	1	1	1	1
Travel ($k)					2

Schedule	Start Year	86	2095	Finish Year	155	2164
Type	Fixed					
Calculations and Notes:	CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars; NWMO-1 values represent the FTE effort required by NWMO management; NWMO-3 values represent the FTE effort required by NWMO technical staff; and Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.					

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 24,607,506	$ -	$ 20,328,000	$ 44,935,506	$ 11,233,877	$ 56,169,383

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	50	20			**Prepared By:**	A. Khan
WBS (Old)	552	30	75						

WBS Title DECOMMISSIONING LICENCE (CNSC) APPLICATION

Description Apply for a Decommissioning Licence from the Canadian Nuclear Safety Commission (Y152 –Y153) by preparing and implementing the licensing plan. This includes preparing and submitting a licence application and supporting documents that include all of the information required under Nuclear Safety Control Act and its associated regulations.

Deliverable Class I Nuclear Facility Decommissioning Licence Application and Supporting Documents

Assumptions It is assumed that:

1. The Commission will issue a licence which will be valid for 5 years.
1. An Environmental Assessment will be required before the CNSC can issue any licence (see WBS 561.30.40.50.40). It is expected that this process, from notice of intent to issue of licence, will require 5 years and the work will begin 5 years prior to the end of the Extended Monitoring period. It is also expected that the bulk of the licence application activities will occur during the years of Y152-Y153 followed by the licensing review and the hearing in Y154-Y155 (see WBS 561.30.40.50.30).

2. A licence plan will be prepared to capture the intent of the licensing procedure, NWMO-PROC-RG-0002 as it applies to decommissioning.

3. The topics expected to be covered as part of the licence application, many of which will be captured in detailed decommissioning planning, will include such items as:

- Considerations for Radiation Protection and ALARA;
- Considerations for Human Factors;
- Considerations for Fire Protection;
- Considerations for Security and Safeguards;
- Description of the Organizational Management Structure;
- Description of the Conventional Safety Program;
- A Compliance Matrix; and
- A Quality Assurance Program (see WBS 561.90.70.50.10).

4. The licensing process (from filling the project description and notice of intent through to issue of licence) is expected to require 5 years;

5. The costs associated with and the resources needed to oversee the licensing process and to prepare the application and supporting documents (not including time required by engineering/technical staff for their input into the submissions) are as follows:

	152	153
CNSC Licensing Fees ($k)	450	450
NWMO-1 (FTE)	0.5	0.5
NWMO-3 (FTE)	1	1
Travel ($k)	5	5

Schedule Start Year 152 2161 Finish Year 153 2162

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 481,719	$ -	$ 910,000	$ 1,391,719	$ 347,930	$ 1,739,649

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	50	30			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title LICENSING REVIEW INCLUDING PUBLIC HEARING

Description Provide required support during the application review process and attend Hearings needed to obtain the licence (Y154 – Y155). This includes:

1. Answering CNSC questions (as required);
2. Providing supplementary information as per a schedule and/or as required;
3. Preparing information needed for the Public Hearing; and
4. Attending and participating in Public Hearings before the CNSC prior to initial licence.

Deliverable Class I Nuclear Facility Decommissioning Licence issued by the CNSC

Assumptions It is assumed that:

1. Submissions in support of the licence application have been made (see WBS 561.30.40.50.20).
2. The Environmental Assessment for the Decommissioning of the facility has been completed (see WBS 561.30.40.50.40).
3. All activities will be identified and executed as described in a supporting hearing plan that is prepared by the Regulatory Affairs group.
4. The costs associated with and the resources needed to support CNSC staff's review of the application (not including time required by engineering/technical staff) as well as to prepare for and attend the Public Hearing are as follows:

	Y154	Y155
CNSC Licensing Fees ($k)	900	900
NWMO-1 (FTE)	0.5	0.5
NWMO-3 (FTE)	1	1
Travel ($k)	10	2

Schedule	Start Year	154	2163	Finish Year	155	2164

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 481,719	$ -	$ 1,812,000	$ 2,293,719	$ 573,430	$ 2,867,149

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	50	40			**Prepared By:**	A. Khan
WBS (Old)	552	55	30						

WBS Title EA FOR CNSC DECOMMISSIONING LICENCE

Description Prepare and submit the Environmental Impact Statement and Technical Support Documents required to support the Environmental Assessment prepared by the Responsible Authority. This includes:

- Liaising with the Responsible Authorities;
- Conducting a public involvement process;
- Performing any field work that might be required;
- Collecting and analyzing the data; and
- Preparing the Environmental Impact Statement and the Technical Support Documents.

Deliverable Environmental Impact Statement and the Technical Support Documents for the Environmental Assessment (the Environmental Assessment itself will be prepared by the Responsible Authority).

Assumptions It is assumed that:

1. Provincial authorities will not conduct a separate Environmental & Socio-economic Impact Assessment.
2. The Responsible Authority will not recommend that Minister of the Environment refer the Environmental Assessment to a Review Panel.
3. The scope of the EA will include an evaluation of different decommissioning technologies.
4. The Regulatory Authority will likely delegate the responsibility for data collection, field studies and the preparation of the Technical Support Documents to the proponent.
5. Preparations will begin 5 years prior to the end of operations-extended monitoring and the environmental assessment hearing process will require 2 years to complete with the hearing starting 1 year prior to start of decommissioning (see WBS 561.30.40.50.30).
6. The site characterization data (meteorology, flora, fauna, hydrology, geology, hydrogeology, etc.) and technical data collected over the lifetime of the project will be available, suitable and sufficient for the Environmental Assessment; all costs associated with collecting this data have been included under other work elements (WBS 561.30.20 series of WEDs).
7. The dose assessments for workers, members of the public and non-human biota prepared for the Final Safety Assessment Report will be available for inclusion in the Environmental Assessment.
8. The Environmental Assessment will address all issues related to the eventual 'abandonment' of the site and no revision of the Environmental Assessment will be required to support an Application for a Licence to Abandon. However there would be updated reports to EA that would provide new information on site conditions as observed throughout decommissioning and closure activities.
9. The EA process will include the following:
   - Preparation of an EA Scoping Document (EA Guidelines);
   - Hearing to make decisions related to the EA Guidelines;
   - Preparation of Environmental Impact Statement Guidelines;
   - Preparation of the Environmental Impact Statement;
   - Submission of Environmental Impact Statement; and
   - Review of Environmental Impact Statement which includes public engagement.
10. The Environmental Assessment process will require a support Manager and full-time Technical Specialist.
11. The Proponent will contract consultants to perform the technical studies and prepare the Technical Support Documents.
12. Collecting & analyzing the data, and preparing the Technical Support Documents will be contracted out and will be performed by a team of a Project Manager & 4 Senior Consultants with administrative support.
1. The review of the EIS and other supporting documents as well as the Panel Public Hearing will likely cover the EA process and the CNSC licensing process (covered by WBS 561.30.40.50.30).
2. The costs associated with and the resources needed to support the environmental assessment are as follows:

	Y151	Y152	Y153	Y154	Y155
CNSC Licensing Fees ($k)	450	450	450	900	900
NWMO-1 (FTE)	0.5	0.5	0.5	0.5	0.5
NWMO-3 (FTE)	1	1	1	1	1
Travel ($k)	2	2	2	2	2
Purchased	1782	1782	1782	1782	1782

Schedule Start Year 151 2160 Finish Year 155 2164

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,204,298	$ -	$ 12,070,000	$ 13,274,298	$ 3,318,574	$ 16,592,872

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	60	10			**Prepared By:**	A. Khan
WBS (Old)	552	30	80						

WBS Title LICENCE TO ABANDON (CNSC) APPLICATION

Description Apply for a Decommissioning Licence from the Canadian Nuclear Safety Commission (Y178 –Y179) by preparing and implementing the licensing plan. This includes preparing and submitting a licence application and supporting documents that include all of the information required under Nuclear Safety Control Act and its associated regulations.

Deliverable Class I Facility Licence to Abandon Application and Supporting Documents

Assumptions 'Abandonment' refers to the cessation of all licensed activities on the site rather than the termination of ownership or control of the site.

It is assumed that:

1. The Environmental Assessment prepared prior to decommissioning will satisfactorily address all issues related to abandonment.

2. The Regulatory Affairs group will prepare a licensing plan that covers the topics that need to be addressed in the licence application, many of which will be captured in a final decommissioning report, such as:

- The results of the decommissioning; and
- The results of the environmental monitoring programs.

3. Preparation of the licence application will be completed by the Regulatory Affairs group as outlined in the licensing plan during Y179.
4. The licensee (or its successors) will continue to own/control the site following abandonment.
5. The Licence to Abandon may impose ongoing requirements on the licensee (likely related to control, safeguards, and transfer of information/records) but it will not involve active regulatory oversight or continuing liaison with regulators.

1. The costs associated with and the resources needed to oversee the licensing process and to prepare the application and supporting documents (not including time required by engineering/technical staff for their input into the submissions) are as follows:

	Y178	Y179
CNSC Licensing Fees ($k)	450	450
NWMO-1 (FTE)	1	1
NWMO-3 (FTE)	1	1
Travel ($k)	4	4

Schedule	Start Year	178	2187	Finish Year	179	2188

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 703,072	$ -	$ 908,000	$ 1,611,072	$ 402,768	$ 2,013,840

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	60	20			**Prepared By:**	A. Khan
WBS (Old)									

WBS Title LICENSING REVIEW INCLUDING PUBLIC HEARING

Description

Provide required support during the application review process and attend Hearings needed to obtain the licence (Y180). This includes:

1. Answering CNSC questions (as required);
2. Providing supplementary information as per a schedule and/or as required;
3. Preparing information needed for the Public Hearing; and
4. Attending and participating in Public Hearings before the CNSC prior to initial licence.

Deliverable Class I Nuclear Facility Licence to Abandon issued by the CNSC

Assumptions

It is assumed that:

1. Submissions in support of the licence application have been made (see WBS 561.30.40.60.10).
2. The Environmental Assessment for the Decommissioning of the facility has been completed (see WBS 561.30.40.50.50).
3. All activities will be identified and executed as described in a supporting hearing plan that is prepared by the Regulatory Affairs group.
4. The costs associated with and the resources needed to support CNSC staff's review of the application (not including time required by engineering/technical staff) as well as to prepare for and attend the Public Hearing are as follows:

	180
CNSC Licensing Fees ($k)	450
NWMO-1 (FTE)	1
NWMO-3 (FTE)	1
Travel ($k)	4

Schedule	Start Year	180	2189	Finish Year	180	2189

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 351,536	$ -	$ 454,000	$ 805,536	$ 201,384	$ 1,006,920

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	60	30			**Prepared By:**	A. Khan
WBS (Old)	552	30	75						

WBS Title MAINTAIN DECOMMISSIONING LICENCE (CNSC)

Description

Maintain a Class I Facility Decommissioning Licence from the Canadian Nuclear Safety Commission (Y156 - Y180). This includes:

1. Preparing and submitting reports according to the schedule prescribed by the Decommissioning Licence;
2. Preparing and submitting unscheduled reports, if required, in accordance with the licence;
3. Preparing and submitting an application for renewal of the Decommissioning Licence that includes all of the information required under the Nuclear Safety and Control Act and its associated regulations; and
4. Supporting CNSC staff compliance activities (as well as IAEA inspections) during the course of the licence.

Deliverable Class I Facility Decommissioning Licence issued by CNSC

Assumptions

It is assumed that:

1. During the decommissioning phase (Y156 – Y180), renewals will be required at 5-year intervals. It is also expected that mid-term reports will be presented to the Commission. Therefore, the effort required to maintain the decommissioning licence is expected to cycle on 5-year intervals.
2. The application for the first licence renewal during this stage is expected to be submitted around the Y164 timeframe followed by Y174.
3. It is assumed that appearances before the Commission will be required at five-year intervals, either to report to the Commission or to renew the licence. The first appearance to support the extended decommissioning phase is expected to be in Y130.
4. A Detailed Decommissioning Plan, together with all of the necessary supporting plans and procedures, will continue to be available to support the licence application. All other information as specified in the licensing plan will also be available to continue to support the licence.
5. The terms of the licence are expected to require the submission of scheduled reports to the CNSC.
6. No amendments or additions to the Environmental Assessment submitted in conjunction with the initial application for the Decommissioning License will be required.
7. The costs associated with and the resources needed to oversee the licensing process and to prepare the application and supporting documents (not including time required by engineering/technical staff for their input into the submissions) are as follows:

	Repeat every 5 years starting with Y156 and ending with Y180				
CNSC Licensing Fees ($k)	250	250	250	250	450
NWMO-1 (FTE)	1	1	1	1	1
NWMO-3 (FTE)	1	1	1	1	1
Travel ($k)	1	1	1	1	2

Schedule Start Year 156 2165 Finish Year 180 2189

Type Fixed

Calculations and Notes:

CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 8,788,395	$ -	$ 7,280,000	$ 16,068,395	$ 4,017,099	$ 20,085,494

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	40	70	30		**Prepared By:**	A. Khan
WBS (Old)	552	30	75					

WBS Title LICENCE TO ABANDON (CNSC)

Description Maintain a Class I Facility Decommissioning Licence from the Canadian Nuclear Safety Commission (Y181 - Y185). This includes:

1. Preparing and submitting reports according to the schedule prescribed by the Licence to Abandon;
2. Maintaining records during the term of the licence;
3. Preparing to transfer records to national archives at the end of the licence term; and
4. Supporting CNSC staff activities (as well as IAEA inspections) during the course of the licence.

Deliverable Class I Facility Licence to Abandon issued by CNSC

Assumptions It is assumed that:

1. A licence to abandon will be issued with a licence term of 5 years.
2. During the course of the licence term, the licensee will submit scheduled reports to the CNSC.
3. Records needed to meet Canadian regulations and/or agreements will be maintained.
4. Plans to transfer these records to the appropriate Canadian authority will be made.
5. No amendments or additions to the Environmental Assessment submitted in conjunction with the initial application for the Decommissioning License will be required.
6. The costs associated with and the resources needed to support the licence are as follows:

	Y181	Y182	Y183	Y184	Y185
CNSC Licensing Fees ($k)	100	100	100	100	100
NWMO-1 (FTE)	1	1	1	1	1
Travel ($k)					2

Schedule Start Year 181 2190 Finish Year 185 2194

Type Fixed

Calculations and Notes: CNSC licensing fees are calculated assuming that 1 FTE equals 1800 hours and is charged at an hourly rate of $250. This total is reported in thousands of dollars;

NWMO-1 values represent the FTE effort required by NWMO management;
NWMO-3 values represent the FTE effort required by NWMO technical staff; and
Travel expenses are calculated assuming that 1 person-trip to Ottawa costs $1000. This total is also reported in thousands of dollars.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,106,763	$ -	$ 502,000	$ 1,608,763	$ 402,191	$ 2,010,954

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	50	20	10			**Prepared By:**	J. Villagran
WBS (Old)	552	20	15	60	50				
WBS Title	PROVIDE ENGINEERING INPUT TO **P**SAR								
Description	Tasks include: Prepare system descriptions and specifications to support the PSAR and the Environmental Assessment report for the repository facility construction licence application.								
Deliverable	Site-specific system design descriptions and system specifications Documentation of prototype tests and results where applicable.								
Assumptions	Duration of work three years: Y10 to Y12 NWMO staff requirements are 1fte/a for 3a (Senior Technical Specialist) to manage/direct the tasks specified below plus consultant services as described below: 4fte/a for 3a of specialist consultant to prepare site-specific preliminary designs, conduct the required data analysis and prepare technical documents in support of the PSAR and EA report. These preliminary design documents, system technical specifications and prototype test results will be inputs to the PSAR and EA reports. Purchased services: 500k$/a for 3a.								
Schedule	Start Year		10	2019		Finish Year	12	2021	
Type	Fixed								
Calculations									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,500,000	$ 1,500,000	$ 375,000	$ 1,875,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	50	20	20			**Prepared By:**	J. Villagran
WBS (Old)	552	20	15	60	60				
WBS Title	ENGINEERING SUPPORT DURING LICENSING REVIEW AND EA HEARINGS								
Description	Tasks include: - Prepare technical documents and descriptive material on repository technology and the preferred site-specific repository design for the EA process and the CNSC licensing process. - Prepare "less technical" documents on repository technology and the preferred site-specific repository design for the EA process and the CNSC licensing process. - Deliver presentations and respond to review questions on repository technology and the preferred site-specific repository design for the EA process and the CNSC licensing process.								
Deliverables	- Technical documents describing the repository technology and the preferred site-specific repository design. - Less-technical documents describing the repository technology and the preferred site-specific repository design.								
Assumptions	Duration of work: Y13 to Y15. NWMO staff requirements are 1 fte/a for 3a (Manager/Senior Technical Specialist) plus the following: - Senior Consultant writing, staff training: Purchased services: $200k/a for 3a(Y13 to Y15), - travel & expenses of $70k/a for 3a (Y13 to Y15), and - document production & distribution $100k/a for 3a (Y13 to Y15).								
Schedule	Start Year		13	2022		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	Making presentations and defending the DGR system design and safety in front of regulatory bodies will remain the role of senior NWMO staff. Consultants or external staff will be required to prepare supporting technical documents.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 810,000	$ 810,000	$ 202,500	$ 1,012,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	50	30	10			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	PROVIDE ENGINEERING INPUT TO FSAR								
Description	Tasks include: Prepare updated system descriptions and specifications to support the FSAR and the Environmental Assessment report for the repository facility operating licence application.								
Deliverables	Site-specific system final design descriptions and system specifications Documentation of prototype tests and results where applicable.								
Assumptions	Duration of work: Y21 to Y23. NWMO staff requirements are 1fte/a for 3a (Senior Technical Specialist) to manage/direct both the tasks specified above and the Consultants. Specialist consultants to prepare site-specific preliminary designs, conduct the required data analysis and prepare technical documents in support of the PSAR and EA report. These preliminary design documents, system technical specifications and prototype test results will be inputs to the PSAR and EA reports. Purchased services: 250k$/a for 3a.								
Schedule	Start Year		21	2030		Finish Year	23	2032	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$ 187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	50	30	20			**Prepared By:**	J. Villagran
WBS (Old)	552	20	40	20					
WBS Title	SAFEGUARDS INTERFACE IMPLEMENTATION								
Description	Tasks include: - Prepare designs for system interfaces with nuclear materials safeguard measures for packaging plant and repository to satisfy the specifications completed under WBS 550 20 40 10 (precursor). - Construct and field test prototypes of all non-standard interface systems and equipment. - Resolve any deficiencies in the performance and robustness of the systems and equipment. - Prepare final technical specifications and final designs.								
Deliverable	- Demonstrated function of the safeguards interface systems for nuclear materials safeguards measures and equipment. - Final technical specifications and designs for the safeguards interface systems.								
Assumptions	Duration of work: Y23 to Y25. NWMO staff requirements are 0 fte/a based on management and supervision being provided under WBS 561.20.50.30.10, except as noted. Consultant/contractor services to complete prototype design, to acquire prototype equipment, to conduct demonstration tests of nuclear safeguards interfaces, to resolve deficiencies and to document the final methods, designs and technical specifications: Purchased Services $500k/a for 3 a. Subsequent installation of safeguard equipment interfaces at the DGR facility will be executed in coordination the IAEA.								
Schedule	Start Year		23	2032		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	System design and procurement can be completed in two years and system demonstration can be conducted in the last year of the period.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,500,000	$ 1,500,000	$ 375,000	$ 1,875,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	50	30	30			**Prepared By:**	A. Murchison
WBS (Old)									
WBS Title	PRODUCE SPECS AND INPUT TO FSAR (FINAL SAFETY ASSESSMENT REPORT)								
Description	Prepare the descriptions, specifications and demonstration test results to support the final safety assessment report (FSAR) for repository facility construction.								
Deliverable	Descriptions, specifications and demonstration results to support to FSAR and the EA report for construction approval.								
Assumptions	Duration of work: Y16 to Y20. 2 NWMO-03 fte/a for Y16-Y20 Specialist consultant to prepare the input to the FSAR and EA on the repository facility and used-fuel packaging plant: 2 fte/a for 5 a. Staff are accounted for in WBS 561.20.50.30.10.								
Schedule	Start Year		16	2025			Finish Year	20	2029
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	50	40	10			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	MONITORING SYSTEMS AND PROGRAM – DGR OPERATION PHASE								
Description	Tasks include: - Continued operation and maintenance of monitoring system. - Data collection and database management.								
Deliverables	- Updated repository monitoring system. - Updated database for repository monitoring parameters.								
Assumptions	Duration of work: Y26 to Y55. NWMO staff requirements to manage/execute the above tasks are 1 fte for 30a (Technical staff) to operate systems and manage data acquisition and the monitoring database; plus the following: - Contractor/consultants to prepare technical specifications and provide input to equipment procurement process and to assist with the maintenance and expansion of repository monitoring systems: Purchased Services $150k/a for 30a (Y26 to Y55). - Purchase and commissioning of monitoring equipment as required for maintenance and upgrading of both the DGR and repository monitoring systems with an estimated average value of $1,000k/a								
Schedule	Start Year		26	2035			Finish Year	85	2094
Type	Step-Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 60,000,000	$ 9,000,000	$ 69,000,000	$ 17,250,000	$ 86,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	50	50	10			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	EXTENDED MONITORING PERIOD								
Description	Tasks include: - Continued operation and maintenance of repository monitoring systems, as required following the 30-year DGR operating period. - Data collection and database management.								
Deliverables	- Operation and maintenance of repository monitoring systems at the repository site and surrounding area. - Accessible and continuously updated database.								
Assumptions	Duration of work: Y56 to Y125. NWMO staff requirements to manage/execute the above tasks are 1 fte for 100a (Technical Specialist) to operate systems and manage data acquisition and the monitoring database, plus the following: - Contractor/consultant to provide input to equipment procurement process and assist with the maintenance and upgrading of repository monitoring systems. Purchased services: $100k/a for 100a (Y56 to Y155). - Purchase and commissioning of monitoring equipment as required for maintenance and updating of the repository monitoring system with an estimated average value of $250k/a for 100 a.								
Schedule	Start Year		86	2095		Finish Year	155	2164	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 17,500,000	$ 7,000,000	$ 24,500,000	$ 6,125,000	$ 30,625,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	30	50	60	10			**Prepared By:**	J. Villagran
WBS (Old)									
WBS Title	DECOMMISSIONING PERIOD								
Description	Tasks include: - Continued operation and maintenance of repository monitoring systems. - Progressive decommissioning and removal of systems as required, following the 100-year period of pre-closure monitoring. - Continued data collection and database management.								
Deliverables	- Operation and maintenance of repository monitoring systems at the repository site and surrounding area. - Management of decommissioning operations - Accessible and continuously updated database. - Monitoring systems removed from the repository.								
Assumptions	Duration of work: Y156 to Y180. NWMO staff requirements to manage/execute the above tasks are 1 fte for 10 a (Senior Engineer) to manage the decommissioning of repository monitoring systems and 1 fte for 25 a (Technical Specialist) to manage data acquisition as well as the database for the Environmental Monitoring system; plus the following: - Contractor/consultant to assist with equipment maintenance for the Environmental Monitoring systems. Purchased services: $100k/a for 25 a (Y126 to Y150). - Contractor/consultant to implement the process of decommissioning the repository monitoring systems. Purchased services: $400k/a for 10 a (Y126 to Y135). - Maintenance and updating of equipment as required for maintenance of the repository monitoring system and database, with an estimated average value of $150k/a for 25 a.								
Schedule	Start Year		156	2165			Finish Year	180	2189
Type	Fixed								
Calculations and Notes:	The listed assumptions include the continuation of the environmental monitoring (EM) program in areas surrounding the repository and a period of five years for decommissioning and removal of repository monitoring systems in advance of backfilling and sealing of repository tunnels and shafts.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ 3,750,000	$ 6,500,000	$ 10,250,000	$ 2,562,500	$ 12,812,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	90	50	10	10					**Prepared By:**	C. Vardy
WBS (Old)	552	90									
WBS Title	Common Services (Y01-Y09), Siting Phase										
Description	· The program management and administration of the DGR facility during Siting (Y01-Y09). This work will be undertaken by NWMO staff. Management functions covered and their scope include: · President's Office: Project implementation management, siting and public affairs. · Quality Program Mgmt will be covered under a unique set of work element definition sheets. · Safety Program Management: Management of health and safety programs. · Finance and Business Services: Account management, reporting, invoicing, contract payments, staff payments, buyer and IT support. · Human Resources: Recruitment, staff management, purchase of payroll services, general support. · Overheads miscellaneous expenses, IT costs, training, holidays, pension contributions, office accommodation and staff expenses. · Legal and Insurance – Internal and external legal counsel as well as conventional insurance coverage for work during the pre-operations phase.										
Deliverable	· An overall business, administrative and management function that will deliver the following: - President's Office: Program estimates, schedules, resource plans and management reports. - Finance and Business Services: Program finance, business planning/budgeting, systems development and maintenance, documentation, filing, work processing and strategic planning. - Human Resources: Personnel services to all areas of the program. - Insurance – Insurance against conventional risks.										
Assumptions	· The program management and administration of the DGR beyond the duration of this activity are costed elsewhere for the Operations Phase (Y30-Y59), etc., · Broadly, overall staffing levels are assumed to be for 35 NWMO-01 and 5 NWMO-03 (admin staff) for Y01-Y09. · These numbers do not include NWMO staff listed under Siting, Repository System Development, Safety Assessment, QA, Licensing & Approvals and Public Affairs. This work element includes a cost allowance for the overhead associated with these staff. Insurance premiums as per CTECK estimate for Y01-Y09 see below- right:										
Schedule	Start Year		1	2010			Finish Year		9	2018	
Type	Fixed										
Calculations and Notes:	· Detailed bottom up budgets were developed for the years 2010 - 2015 by function. These were extended through Y09 based on an anaysis of HC and changes in activities in the organization. · Basis of cost estimate was NWMO Business Plan common services. · NWMO staff numbers range from 24 to 33 based on the existing common services compliment and projected growth of NWMO.										

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 32,031,947	$ -	$ 32,374,851	$ 64,406,798	$ 16,101,700	$ 80,508,498

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	90	50	20	10			**Prepared By:**	C. Vardy
WBS (Old)	552	90							
WBS Title	Common Services (Y10-Y15), Construction License Phase								
Description	· The program management and administration of the DGR facility during Siting (Y10-Y15). This work will be undertaken by NWMO staff supplemented by Architect Engineering personnel. Management functions covered and their scope include: · President's Office: Project implementation management, siting and public affairs. · Technical Development Program Mgmt. – Engineering office, integration of siting, development and design, Directs Geoscience, Repository System Development & Safety Assessment Mgrs will be covered under a unique set of work element definition sheets. · Quality Program Mgmt will be covered under a unique set of work element definition sheets. · Safety Program Management: Management of health and safety programs will be covered under a unique set of work element definition sheets · Finance and Business Services: Account management, reporting, invoicing, contract payments, staff payments, buyer and IT support. · Human Resources: Recruitment, staff management, purchase of payroll services, general support. · Architect Engineer: Purchased services engineers responsible for development of outline design, preparation of specifications and management of design and build contractors. Provides procurement and project management services to the NWMO including schedule and cost control will be covered under a unique set of work element definition sheets. · Legal and Insurance – Internal and external legal counsel as well as conventional insurance coverage for work during the pre-operations phase.								
Deliverable	· An overall business, administrative and management function that will deliver the following: - President's Office: Program estimates, schedules, resource plans and management reports - Finance and Business Services: Program finance, business planning/budgeting, systems development and maintenance,documentation, filing, work processing and strategic planning - Human Resources: Personnel services to all areas of the program - Offsite overheads applicable to NWMO staff - Insurance – Insurance against conventional risks								
Assumptions	· The program management and administration of the DGR are costed elsewhere for the Operations Phase (Y30-Y59), etc., · Broadly, overall staffing levels are assumed range from 27 to 33 for Y10 -Y15 as outlined to the right (approx 9 NWMO1, 6 NWMO2 and 15 NWMO3) · These numbers do not include NWMO staff listed under Siting, Repository System Development, Safety Assessment, Licensing & Approvals and Public Affairs. This work element includes a cost allowance for the overhead associated with these staff. · Insurance premiums as per CTECK estimate over years 10-15 - see below-right:								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	· Detailed bottom up budgets were developed for the years 2010 - 2015 by function. These were extended through Y09 based on an anaysis of HC and changes in activities in the organization. · NWMO staff numbers range from 27 to 33 based on current common services HC and projected through Y15 based on project growth.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 27,437,036	$ -	$ 28,595,504	$ 56,032,540	$ 14,008,135	$ 70,040,675

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	90	50	30	10			**Prepared By:**	C. Vardy
WBS (Old)	552	90							

WBS Title: Common Services Y16-Y25, Construction Phase

Description

· The program management and administration of the DGR facility during Siting (Y10-Y15). This work will be undertaken by NWMO staff supplemented by Architect Engineering personnel. Management functions covered and their scope include:

· President's Office: Project implementation management, siting and public affairs.

· Technical Development Program Mgmt. – Engineering office, integration of siting, development and design, Directs Geoscience, Repository System Development & Safety Assessment Mgrs will be covered under a unique set of work element definition sheets.

· Quality Program Mgmt will be covered under a unique set of work element definition sheets.

· Safety Program Management: Management of health and safety programs will be covered under a unique set of work element definition sheets

· Finance and Business Services: Account management, reporting, invoicing, contract payments, staff payments, buyer and IT support.

· Human Resources: Recruitment, staff management, purchase of payroll services, general support.

· Architect Engineer: Purchased services engineers responsible for development of outline design, preparation of specifications and management of design and build contractors. Provides procurement and project management services to the NWMO including schedule and cost control will be covered under a unique set of work element definition sheets.

· Legal and Insurance – Internal and external legal counsel as well as conventional insurance coverage for work during the pre-operations phase.

Deliverable

· An overall business, administrative and management function that will deliver the following:
  - President's Office: Program estimates, schedules, resource plans and management reports
  - Finance and Business Services: Program finance, business planning/budgeting, systems development and maintenance,documentation, filing, work processing and strategic planning
  - Human Resources: Personnel services to all areas of the program
  - Offsite overheads applicable to NWMO staff
  - Insurance – Insurance against conventional risks

Assumptions

· The program management and administration of the DGR are costed elsewhere for the Operations Phase (Y30-Y59), etc.,

· Broadly, overall staffing levels are assumed range from 27 to 33 for Y10 -Y15 as outlined to the right (approx 9 NWMO1, 6 NWMO2 and 15 NWMO3)

· These numbers do not include NWMO staff listed under Siting, Repository System Development, Safety Assessment, Licensing & Approvals and Public Affairs. This work element includes a cost allowance for the overhead associated with these staff.

· Insurance premiums as per CTECK estimate over years 10-15 - see below-right:

Schedule	Start Year	10	2019	Finish Year	15	2024	

Type: Fixed

Calculations and Notes:

· Detailed bottom up budgets were developed for the years 2010 - 2015 by function. These were extended through Y09 based on an anaysis of HC and changes in activities in the organization.

· NWMO staff numbers range from 27 to 33 based on current common services HC and projected through Y15 based on project growth.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 32,812,159	$ -	$ 37,158,496	$ 69,970,655	$ 17,492,664	$ 87,463,318

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	90	70	10	10			**Prepared By:**	P. Hader
WBS (Old)	552	15	20	50					
WBS Title	QUALITY ASSURANCE PROGRAM SITING								
Description	Establish a Quality Assurance (QA) program consistent with ISO 9001 and 14001 requirements. Work Program would include: - Development and maintenance of QA training and guidance documents. - Conduct QA audits to verify implementation of QA program with project staff/contractors. - Conduct periodic reviews and revision of QA documents specific to site characterisation work program activities. - Conduct technical audits to verify and maintain Quality Control on site characterisation data/interpretation. - Maintain/implement/audit software QA program. - Conduct QA training for project staff and contractors. - Prepare annual QA program status reports. - QA Management System Audits (annual) and Management Review - Establishing QA guidelines early in the siting program will be important to ensure that work program expectations are conveyed to staff and external contractors. This is necessary to avoid program delays in re-qualifying data and/or analyses not satisfying QA requirements/expectations.								
Deliverable	- Maintenance of an ISO 9001/14001 based QA program. - Audit reports on implementation of QA program - Annual QA program status reports. - Quality Assurance training programs and manuals - Technical audits on site characterisation data/interpretation - QA of Route Options Studies and Route/Mode Selection Studies/Evaluations - QA of Conveyance Design – Concept - QA of Package Design - Preliminary								
Assumptions	- Purchase Information Technology Management System for use by QA program ($75 K, Y2). - ISO 9001/14001 accreditation is program standard. - QA program will be subsumed by Licence and PSAR activities in year 10. - QA Management Support @ 0.25 NWMO-01 fte/a for 2 years (Y1-2). - QA Management Support @ 0.33 NWMO-01 fte/a for 2 years (Y3-4) and 1 NWMO-01 fte/a for 5 years (Y5 to 9) - QA Specialist @ 0.5 NWMO-03 fte/a for 2 years (Y2-3) (Feasibility Studies in potential sites). - QA Specialists @ 1 NWMO-03 fte/a for 6 years (Y4 to 9). - Contracts: $15k (Y1), $50k/a for 2 years (Y2 to 3); $100k/a for 2 yrs (Y4-5) - Contracts: $250k/a for 4 years (Y6 to 9)								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	Assuming purchase of NWMO I.T. Management System for QA @ $75K (1/2 of $150K), shared between L&ILW DGR and APM DGR. Assuming site characterization of up to two sites between 2013 and 2018. Contracts are for program audits, assessments and evaluations which escalate in number from one in year one to twenty a year starting in year six.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,274,814	$ 75,000	$ 1,315,000	$ 3,664,814	$ 916,204	$ 4,581,018

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	90	70	20	10			**Prepared By:**	P. Hader
WBS (Old)	552	15	20	50					
WBS Title	QUALITY ASSURANCE PROGRAM LICENCE APPLICATION								
Description	Maintain a Quality Assurance (QA) program consistent with ISO 9001 and 14001 requirements. Work Program would include: - Maintenance of QA training and guidance documents. - Conduct QA audits to verify implementation of QA program with project staff/contractors. - Conduct periodic reviews and revision of QA documents specific to licensing PSAR, EA & construction license stage. - Conduct technical audits to verify and maintain Quality Control. - Maintain/implement/audit software QA program. - Conduct QA training for project staff and contractors. - Prepare annual QA program status reports. - QA Management System Audits (annual) and Management Review Note: Establishing QA guidelines early in the siting program will be important to ensure that work program expectations are conveyed to staff and external contractors. This is necessary to avoid program delays in re-qualifying data and/or analyses not satisfying QA requirements/expectations.								
Deliverable	- Maintenance of an ISO 9001/14001 based QA program. - Audit reports on implementation of QA program. - Annual QA program status reports. - Quality Assurance training programs and manuals. - Technical audits on site characterisation data/interpretation - QA of Conveyance Design – Preliminary QA of Package Design – Detail including Analytic Analysis and Evaluation - QA of Package Prototype – Manufacture, Testing and Evaluation.								
Assumptions	- Information Management System exists for use by QA program. - ISO 9001/14001 accreditation is program standard. - QA program will be subsumed by Construction UDF (we've been re-aligning the acronym to UDF for underground demonstration facility) & Obtain Construction License starting in year 15. - QA Management Support @ 1 fte/a for 6 years (Y10 to 15). - QA Specialist @ 1 fte/a for 6 years (Y10 to 15) (Licensing & PSAR Studies Support). - QA Specialist @ 1 fte/a for 2 years (Y14 to Y15) - Contracts: $150k/a for 1 years (Y10); $ 200k/a for 1 yrs (Y11) $250k/a for 4 yrs (Y12-15).								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	Contracts are for program audits, assessments and evaluations which escalate in number from twelve in year one to twenty a year starting in year two. Assume subsurface investigations are completed in year nine and quality assurance activities are somewhat decreased but rampup again for the environmental assessment.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ 2,369,581	$ -	$ 1,350,000	$ 3,719,581	$	929,895	$ 4,649,477

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	90	70	30	10			**Prepared By:**	P. Hader
WBS (Old)	552	15	20	50					
WBS Title	QUALITY ASSURANCE PROGRAM UDF and DGR CONSTRUCTION								
Description	Maintain a Quality Assurance (QA) program consistent with ISO 9001 and 14001 requirements. Work Program would include: - Maintenance of QA training and guidance documents. - Conduct QA audits to verify implementation of QA program with project staff/contractors. - Conduct periodic reviews and revision of QA documents specific to construction of UDF & SFAR stage - Maintain/implement/audit software QA program. - Conduct QA training for project staff and contractors. - Prepare annual QA program status reports. - QA Management System Audits (annual) and Management Review								
Deliverable	- Maintenance of an ISO 9001/14001 based QA program. - Audit reports on implementation of QA program. - Quarterly and Annual QA program status reports. - Quality Assurance training programs and manuals. - Technical audits on site characterisation data/interpretation - QA Package Prototype Manufacture, Testing and Evaluation.								
Assumptions	- Information Management System exists for use by QA program. - ISO 9001/14001 accreditation is program standard. - QA program will be subsumed by Construct DGR, Commissioning and Licensing in year 25. - Assume no change to the initial construction period activities (first 10 years). - Assume construction activities (additional rooms, boreholes) during the operations phase (WED 561.90.70.40.10). - QA Management Support NWMO-01 @ 1 fte/a for 10 years (Y16 to 25). - QA Specialists NWMO-03 @ 2 fte/a for 4 years (Y16 to 19); 3 fte/a for 6 years (Y20 to Y25). - Contracts: $250k/a for 10 years (Y16 to 25).								
Schedule	Start Year	16	2025			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	Contracts will be for quality inspections, testing, equipment calibration, oversight monitoring and audits. Quality Assurance FTE is increased in year 20 to support construction verification activities.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 5,598,289	$ -	$ 2,500,000	$ 8,098,289	$ 2,024,572	$ 10,122,862

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	90	70	40	10			**Prepared By:**	P. Hader
WBS (Old)	552	15	20	50					
WBS Title	QUALITY ASSURANCE PROGRAM, DGR OPERATIONS								
Description	Maintain a Quality Assurance (QA) program consistent with ISO 9001 and 14001 requirements. Work Program would include: - Maintenance of QA training and guidance documents. - Conduct QA audits to verify implementation of QA program with operations staff/contractors. - Conduct periodic reviews and revision of QA documents specific to operations - Maintain/implement/audit and action tracking software QA program. - Conduct QA training for operations staff and contractors. - Prepare monthly, quarterly and annual QA program status reports. - Maintain corrective action tracking system - QA Management System Audits (annual) and Management Review. - Construction of panels up to and includin 3 years prior to closure. • Borehole • Room Construction • Access tunnels								
Deliverable	- Maintenance of an ISO 9001/14001 based QA program. - Maintenance of "construction" QA plan/program including acceptence testing/inspection. - Audit reports on implementation of QA program. - Quarterly and Annual QA program status reports. - Quality Assurance training programs and manuals. - Technical audits on operations monitoring data/ interpretation. - QA Package Manufacture. - QA Transportation Services.								
Assumptions	- Information Management System implementation for use by QA program. - ISO 9001/14001 accreditation is program standard. - QA program will be subsumed by UF DGR Operations in year 26. - QA Management Support @ 1 NWMO-01 fte/a for 60 years (Y26 to 85). - QA Specialists @ 4 NWMO-03 fte/a for 8 years (Y26 to 33); 3 fte/a for 52 years (Y34 to Y85). - Contracts: $300k/a for 8 years (Y26 to 33), $250k/a for 52 years (Y34 to Y85).								
Schedule	Start Year	26	2035			Finish Year	85	2094	
Type	Fixed								
Calculations	Assume a new Information Management System is installed during commissioning. Assume Information Management system (QA) is upgraded/replaced in Year 56 (2065) at a cost of $150k. Assume additional contracted assistance in first years of operation (assume some extended commissioning activities). Assume Start Year 26 (2035) and end Year 85 (2094). Contracts will be for quality inspections, testing, equipment calibration, oversight monitoring and audits for package manufacturing, contracted services and transportation services. Contracts include: construction services, QA monitoring and audit (in addition to items listed under 36 million bundles scenario).								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 37,755,598	$ 150,000	$ 15,400,000	$ 53,305,598	$ 13,326,399	$ 66,631,997

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	90	70	50	10			**Prepared By:**	P. Hader
WBS (Old)	552	15	20	50					
WBS Title	QUALITY ASSURANCE PROGRAM, EXTENDED OPERATIONS								
Description	Maintain a Quality Assurance (QA) program consistent with ISO 9001 and 14001 requirements. Work Program would include: - Maintenance of QA training and guidance documents. - Conduct QA audits to verify implementation of QA program with monitoring staff. - Conduct periodic reviews and revision of QA documents specific to extended operations. - Conduct QA training for extended operations staff. - Prepare annual QA program status report. - Maintain corrective action tracking system. - QA Management System Audits (annual) and Management Review.								
Deliverable	- Maintenance of an ISO 9001/14001 based QA program. - Audit reports on implementation of QA program. - Annual QA program status reports. - Quality Assurance training programs and manuals for extended operations. - Technical audits on extended operations monitoring data/ interpretation.								
Assumptions	- Information Management System implementation for use by QA program. - ISO 9001/14001 accreditation is program standard. - Reduced QA program will be subsumed by UF DGR Extended Operations in year 86. - Assuming increased quality inspectors, testing, equipment calibration, oversight monitoring and audit due to larger facility. - QA Specialists @ 1.5 NWMO-03 fte/a for 70 years (Y86 to 155). - Contracts: $100k/a for 5 years (Y86 to 90), $50k/a for 65 years (Y91 to Y155).								
Schedule	Start Year		86	2095			Finish Year	155	2164
Type	Fixed								
Calculations and Notes:	Assume reduced staff levels and reduced training and oversight. Technical audits on a reduced frequency (one/18 -24 months) after first five years. Contracts will be for quality inspections, testing, equipment calibration, oversight monitoring and audits.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 13,669,236	$ -	$ 3,750,000	$ 17,419,236	$ 4,354,809	$ 21,774,045

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	90	70	60	10			**Prepared By:**	P. Hader
WBS (Old)	552	15	20	50					
WBS Title	QUALITY ASSURANCE PROGRAM, DECOMMISSIONING & CLOSURE								
Description	Maintain a Quality Assurance (QA) program consistent with ISO 9001 and 14001 requirements. Work Program would include: - Preparation of detailed QA plan for decommissioning activities (Phase 1). - Maintenance of QA training and guidance documents. - Conduct QA audits to verify implementation of QA program with decommissioning staff and contractors. - Conduct periodic reviews and revision of QA documents specific to decommissioning stage. - Implement and maintain audit and action tracking software QA program. - Conduct QA training for decommissioning staff and contractors. - Prepare monthly, quarterly and annual QA program status reports. - QA Management System Audits (annual) and Management Review								
Deliverable	- Maintenance of an ISO 9001/14001 based QA program. - Audit reports on implementation of QA program. - Quarterly and annual QA program status reports. - Quality Assurance training programs and manuals for decommissioning activities. - Technical audits on shaft sealing testing/ data/ interpretation. - QA shaft sealing materials acceptance, installation, and verification testing. - QA of instrumentation acceptance, installation and verification testing.								
Assumptions	- Information Management System for decommissioning work installed for use by QA program. - ISO 9001/14001 accreditation is program standard. - QA program will be created by Decommissioning and Closure Staff in year 156. - QA Management Support @ 1 NWMO-01 fte/a for 25 years (Y156 to 180). - QA Specialists @ 4 NWMO-03 fte/a for 12 years (Y126 to 137); 2 NWMO-03 fte/a for 13 years (Y168 to Y180). - Contracts: $250k/a for 12 years (Y156 to 167), $200k/a for 3 yrs (Y168 - Y170), $150k/a for 10 years (Y171-Y180). - New QA System $100k/a for 1 year (Y156).								
Schedule	Start Year		156	2165		Finish Year	180	2189	
Type	Fixed								
Calculations and Notes:	Contracts will be for quality inspections, testing, oversight monitoring, audits, and supplier audits. Expect decreased activity after the underground facility is closed.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 15,167,372	$ 100,000	$ 5,100,000	$ 20,367,372	$ 5,091,843	$ 25,459,215

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Building Relationships								
Description	Tasks include: General Tasks: - Critical to the success of Adaptive Phased Management (APM) is the involvement of the - Canadian public, including Aboriginal people, at all stages of implementation and in key - decisions through open, transparent and inclusive engagement processes - Through communications and earned media, build awareness among the Canadian public, including Aboriginal people about the NWMO, the management of used nuclear fuel and APM - Develop and maintain relationships with the federal government and with provincial and local governments in nuclear provinces to support their involvement in the implementation of APM and support for NWMO as implementer. - Develop and maintain relationships with national, provincial and regional Aboriginal governments in nuclear provinces to support their involvement in the implementation of APM. Continue to work on projects with Elders on Niigani (NWMO Aboriginal working group) and NWMO Elders Forum. Seek advice of Elders on interweaving of Aboriginal Traditional Knowledge and western science and respectful engagement of Aboriginal peoples. - Continue to work with Natural Resources Canada to implement a process to meet the NWMO's statutory obligations with respect to the Crown's duty to consult. - Implement communications and learning opportunities to inform young people of NWMO's work. - Regularly assess the effectiveness of website, engagement and communication vehicles to identify opportunities for improvement in future initiatives. Tasks Specific to Siting & Design Phase: - Develop relations and collaboration with municipal associations to advance understanding of local perspectives and to involve the municipal level in the design and implementation of APM. - Cultivate and maintain new relationships on a regional level as communities begin to engage in siting process and develop understanding of local and regional priorities								
Deliverables									
Assumptions									
Schedule	Start Year	1	2010		Finish Year	9	2018		
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 19,709,348	$ -	$ -	$ 19,709,348	$ 4,927,337	$ 24,636,686

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Building Relationships								
Description	Tasks include: General Tasks: - Critical to the success of Adaptive Phased Management (APM) is the involvement of the - Canadian public, including Aboriginal people, at all stages of implementation and in key - decisions through open, transparent and inclusive engagement processes - Through communications and earned media, build awareness among the Canadian public, including Aboriginal people about the NWMO, the management of used nuclear fuel and APM - Develop and maintain relationships with the federal government and with provincial and local governments in nuclear provinces to support their involvement in the implementation of APM and support for NWMO as implementer. - Develop and maintain relationships with national, provincial and regional Aboriginal governments in nuclear provinces to support their involvement in the implementation of APM. - Continue to work with Natural Resources Canada to implement a process to meet the NWMO's statutory obligations with respect to the Crown's duty to consult. - Implement communications and learning opportunities to inform young people of NWMO's work. - Regularly assess the effectiveness of website, engagement and communication vehicles to identify opportunities for improvement in future initiatives.								
Deliverables									
Assumptions									
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 23,978,052	$ -	$ -	$ 23,978,052	$ 5,994,513	$ 29,972,565

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Building Relationships								
Description	Tasks include: General Tasks: - Critical to the success of Adaptive Phased Management (APM) is the involvement of those who are potentially affected, - Through communications and earned media, build awareness among the potentially affected Canadian public, including - Develop and maintain relationships with the federal government and with potentially affected provincial and local governments - Develop and maintain relationships with,potentially affected provincial and regional Aboriginal governments to support their - Continue to work with Natural Resources Canada to implement a process to meet the NWMO's statutory obligations with - Implement communications and learning opportunities to inform young people of NWMO's work. - Regularly assess the effectiveness of website, engagement and communication vehicles to identify opportunities for Tasks Specific to Siting & Design Phase: - Develop relations and collaboration with municipal associations to advance understanding of local perspectives and to involve - Cultivate and maintain new relationships on a regional level as communities begin to engage in siting process and develop								
Deliverables									
Assumptions									
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 36,925,812	$ -	$ -	$ 36,925,812	$ 9,231,453	$ 46,157,265

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Building Relationships								
Description	Tasks include: General Tasks: - Critical to the success of Adaptive Phased Management (APM) is the involvement of those who are potentially affected, including those along the transportation route, at all stages of the implementation and in key decisions through open, transparent and inclusive engagement processes. - Through communications and earned media, build awareness among the potentially affected Canadian public, including Aboriginal people about the NWMO, the management of used nuclear fuel and APM. - Develop and maintain relationships with the federal government and with potentially affected provincial and local governments to support their involvement in the implementation of APM and support for NWMO as implementer. - Develop and maintain relationships with,potentially affected provincial and regional Aboriginal governments to support their involvement in the implementation of APM. Seek advice of Elders on interweaving of Aboriginal Traditional Knowledge and western science and respectful engagement of Aboriginal peoples. - Continue to work with Natural Resources Canada to implement a process to meet the NWMO's statutory obligations with respect to the Crown's duty to consult. - Implement communications and learning opportunities to inform young people of NWMO's work. - Regularly assess the effectiveness of website, engagement and communication vehicles to identify opportunities for improvement in future initiatives.								
Deliverables									
Assumptions									
Schedule	Start Year		26	2035		Finish Year	85	2094	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 99,345,246	$ -	$ -	$ 99,345,246	$ 24,836,312	$ 124,181,558

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	50	10			**Prepared By:**	CV/KS	
WBS (Old)										
WBS Title	TITLE: APM Social – Staffing – Building Relationships									
Description	Tasks include: General Tasks: - Critical to the success of Adaptive Phased Management (APM) is the involvement of those who are potentially affected, including those along the transportation route, at all stages of the implementation and in key decisions through open, transparent and inclusive engagement processes. - Through communications and earned media, build awareness among the potentially affected Canadian public, including Aboriginal people about the NWMO, the management of used nuclear fuel and APM. - Develop and maintain relationships with the federal government and with potentially affected provincial and local governments to support their involvement in the implementation of APM and support for NWMO as implementer. - Develop and maintain relationships with,potentially affected provincial and regional Aboriginal governments to support their involvement in the implementation of APM. Seek advice of Elders on interweaving of Aboriginal Traditional Knowledge and western science and respectful engagement of Aboriginal peoples. - Continue to work with Natural Resources Canada to implement a process to meet the NWMO's statutory obligations with respect to the Crown's duty to consult. - Implement communications and learning opportunities to inform young people of NWMO's work. - Regularly assess the effectiveness of website, engagement and communication vehicles to identify opportunities for improvement in future initiatives.									
Deliverables										
Assumptions										
Schedule	Start Year		86	2095			Finish Year	155	2164	
Type	Fixed									
Calculations and Notes:										

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 87,387,208	$ -	$ -	$ 87,387,208	$ 21,846,802	$ 109,234,010

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	60	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Building Relationships								
Description	Tasks include: General Tasks: - Critical to the success of Adaptive Phased Management (APM) is the involvement of those who are potentially affected, including those along the transportation route, at all stages of the implementation and in key decisions through open, transparent and inclusive engagement processes. - Through communications and earned media, build awareness among the potentially affected Canadian public, including Aboriginal people about the NWMO, the management of used nuclear fuel and APM. - Develop and maintain relationships with the federal government and with potentially affected provincial and local governments to support their involvement in the implementation of APM and support for NWMO as implementer. - Develop and maintain relationships with,potentially affected provincial and regional Aboriginal governments to support their involvement in the implementation of APM. Seek advice of Elders on interweaving of Aboriginal Traditional Knowledge and western science and respectful engagement of Aboriginal peoples. - Continue to work with Natural Resources Canada to implement a process to meet the NWMO's statutory obligations with respect to the Crown's duty to consult. - Implement communications and learning opportunities to inform young people of NWMO's work. - Regularly assess the effectiveness of website, engagement and communication vehicles to identify opportunities for improvement in future initiatives.								
Deliverables									
Assumptions									
Schedule	Start Year		156	2165		Finish Year	180	2189	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 18,283,456	$ -	$ -	$ 18,283,456	$ 4,570,864	$ 22,854,320

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	10	10	40			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Adapting to Change								
Description	Tasks include: - Complete and publish reviews of used fuel reprocessing and alternative waste management technologies. - Annually update and publish used fuel inventories and projections. - Continue to research citizen priorities and concerns relating to APM implementation. - Continue to assess developments in environmental and energy policies and the impact of new build nuclear reactors on APM in terms of volume and potential characteristics of different used fuel types to be managed. - Advance NWMO's understanding of insight from Aboriginal Traditional Knowledge that may guide implementation of APM. - Collaborate with interested academics in Canada and internationally to access the best knowledge and practices in social and community-based processes. - Participate in international projects and collaboration for sharing information and best practices.								
Deliverables									
Assumptions									
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 3,440,250	$ -	$ -	$ 3,440,250	$ 860,062	$ 4,300,312

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	10	20	30			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Adapting to Change								
Description	Tasks include: - Complete and publish reviews of used fuel reprocessing and alternative waste management technologies. - Annually update and publish used fuel inventories and projections. - Continue to research citizen priorities and concerns relating to APM implementation. - Continue to assess developments in environmental and energy policies and the impact of new build nuclear reactors on APM in terms of volume and potential characteristics of different used fuel types to be managed. - Advance NWMO's understanding of insight from Aboriginal Traditional Knowledge that may guide implementation of APM. - Collaborate with interested academics in Canada and internationally to access the best knowledge and practices in social and community-based processes. - Participate in international projects and collaboration for sharing information and best practices.								
Deliverables									
Assumptions									
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 2,241,427	$ -	$ -	$ 2,241,427	$ 560,357	$ 2,801,783

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	10	30	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Adapting to Change								
Description	Tasks include: - Complete and publish reviews of used fuel reprocessing and alternative waste management technologies. - Annually update and publish used fuel inventories and projections. - Continue to research citizen priorities and concerns relating to APM implementation. - Continue to assess developments in environmental and energy policies and the impact of new build nuclear reactors on APM in terms of volume and potential characteristics of different used fuel types to be managed. - Advance NWMO's understanding of insight from Aboriginal Traditional Knowledge that may guide implementation of APM. - Collaborate with interested academics in Canada and internationally to access the best knowledge and practices in social and community-based processes. - Participate in international projects and collaboration for sharing information and best practices.								
Deliverables									
Assumptions									
Schedule	Start Year	16	2025			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,289,166	$ -	$ -	$ 1,289,166	$ 322,292	$ 1,611,458

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	10	40	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Adapting to Change								
Description	Tasks include: - Complete and publish reviews of used fuel reprocessing and alternative waste management technologies. - Annually update and publish used fuel inventories and projections. - Continue to research citizen priorities and concerns relating to APM implementation. - Continue to assess developments in environmental and energy policies and the impact of new build nuclear reactors on APM in terms of volume and potential characteristics of different used fuel types to be managed. - Advance NWMO's understanding of insight from Aboriginal Traditional Knowledge that may guide implementation of APM. - Collaborate with interested academics in Canada and internationally to access the best knowledge and practices in social and community-based processes. - Participate in international projects and collaboration for sharing information and best practices.								
Deliverables	-								
Assumptions									
Schedule	Start Year		26	2035			Finish Year	85	2094
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 4,723,639	$ -	$ -	$ 4,723,639	$ 1,180,910	$ 5,904,549

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	10	50	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Adapting to Change								
Description	Tasks include: - Complete and publish reviews of used fuel reprocessing and alternative waste management technologies. - Annually update and publish used fuel inventories and projections. - Continue to research citizen priorities and concerns relating to APM implementation. - Continue to assess developments in environmental and energy policies and the impact of new build nuclear reactors on APM in terms of volume and potential characteristics of different used fuel types to be managed. - Advance NWMO's understanding of insight from Aboriginal Traditional Knowledge that may guide implementation of APM. - Collaborate with interested academics in Canada and internationally to access the best knowledge and practices in social and community-based processes. - Participate in international projects and collaboration for sharing information and best practices.								
Deliverables									
Assumptions									
Schedule	Start Year		86	2095			Finish Year	155	2164
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 5,510,912	$ -	$ -	$ 5,510,912	$ 1,377,728	$ 6,888,641

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	10	60	10			**Prepared By:**	CV/KS
WBS (Old)									
WBS Title	TITLE: APM Social – Staffing – Adapting to Change								
Description	Tasks include: - Complete and publish reviews of used fuel reprocessing and alternative waste management technologies. - Annually update and publish used fuel inventories and projections. - Continue to research citizen priorities and concerns relating to APM implementation. - Continue to assess developments in environmental and energy policies and the impact of new build nuclear reactors on APM in terms of volume and potential characteristics of different used fuel types to be managed. - Advance NWMO's understanding of insight from Aboriginal Traditional Knowledge that may guide implementation of APM. - Collaborate with interested academics in Canada and internationally to access the best knowledge and practices in social and community-based processes. - Participate in international projects and collaboration for sharing information and best practices.								
Deliverables									
Assumptions									
Schedule	Start Year		156	2165			Finish Year	180	2189
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,968,183	$ -	$ -	$ 1,968,183	$ 492,046	$ 2,460,229

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	20			**Prepared By:**	CV/KS
WBS (Old)									

WBS Title TITLE: APM Social – Staffing – Siting Process

Description

Tasks include:

General:

- NWMO will work to ensure that siting is inclusive, fair and transparent. The execution of the site selection process must meet the expectations of Canadians and address their key issues, such as the protection of humans and the environment, fairness and transportation considerations, and continue to build trust and confidence in the NWMO and its operations.

Tasks Specific to Siting Process Phase:

- Respond to community requests for capacity-building by administering "Learn More" program and delivering briefings on request.
- Conduct screenings and initiate feasibility studies and field upon request of communities.
- Select the 1-2 willing communities to move forward to detailed site characterization.
- Initiate Regional Studies with one or more communities interested in moving to detailed site evaluations.
- As required, provide dedicated regional NWMO staff/support in communities progressing through siting process.
- Administer community benefits for communities in advanced stages of siting process consistent with Board-approved principles and frameworks.
- For the communities selected for detailed site characterization, initiate the establishment of centres of expertise as hubs of technical and social support for the multi-year testing and assessment of the site and discussion of community well-being.
- Continue activities to build awareness of the APM siting process. Develop mobile exhibits and tools that are responsive to local needs to support community-based discussions of APM project and siting. Seek advice of municipal associations and Aboriginal organizations on design of information and tool kits to support community-driven siting process.
- Develop tools and methods for conducting detailed geoscientific site investigations and evaluations at candidate sites in both crystalline and sedimentary settings by 2012.
- Provide engineering design and preliminary safety assessments to support evaluation of candidate sites.

Deliverables

- Selection of preferred site. NWMO and community enter into formal hosting agreement
- Continued support to host community throughout EA & licensing process

Assumptions

Schedule	Start Year	1	2010	Finish Year	9	2018	

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 37,668,572	$ -	$ -	$ 37,668,572	$ 9,417,143	$ 47,085,715

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	20	20			**Prepared By:**	CV/KS
WBS (Old)									

WBS Title TITLE: APM Social – Staffing – Siting Process

Description

Tasks include:

General:

- NWMO will work to ensure that siting is inclusive, fair and transparent. The execution of the site selection process must meet the expectations of Canadians and address their key issues, such as the protection of humans and the environment, fairness and transportation considerations, and continue to build trust and confidence in the NWMO and its operations.

Tasks Specific to Siting Process Phase:

- Respond to community requests for capacity-building by administering "Learn More" program and delivering briefings on request.
- Conduct screenings and initiate feasibility studies and field upon request of communities.
- Select the 1-2 willing communities to move forward to detailed site characterization.
- Initiate Regional Studies with one or more communities interested in moving to detailed site evaluations.
- As required, provide dedicated regional NWMO staff/support in communities progressing through siting process.
- Administer community benefits for communities in advanced stages of siting process consistent with Board-approved principles and frameworks.
- For the communities selected for detailed site characterization, initiate the establishment of centres of expertise as hubs of technical and social support for the multi-year testing and assessment of the site and discussion of community well-being.
- Continue activities to build awareness of the APM siting process. Develop mobile exhibits and tools that are responsive to local needs to support community-based discussions of APM project and siting. Seek advice of municipal associations and Aboriginal organizations on design of information and tool kits to support community-driven siting process.
- Develop tools and methods for conducting detailed geoscientific site investigations and evaluations at candidate sites in both crystalline and sedimentary settings by 2012.
- Provide engineering design and preliminary safety assessments to support evaluation of candidate sites.

Deliverables

- Selection of preferred site. NWMO and community enter into formal hosting agreement
- Continued support to host community throughout EA & licensing process

Assumptions

Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 18,625,811	$ -	$ -	$ 18,625,811	$ 4,656,453	$ 23,282,264

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	100			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	PROVINCIAL STAKEHOLDER ENGAGEMENT								
Description	Ongoing involvement of provincial opinion leaders through briefings and periodic dialogue sessions focused on the implementation plan.								
Deliverable	Ensure understanding of project activities and forum for identification of issues that need to be addressed that may effect licensing.								
Assumptions									
Schedule	Start Year		2	2011		Finish Year	6	2015	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 900,000	$ 900,000	$ 225,000	$ 1,125,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**19**

WBS (New)	561	05	10	10	110			**Prepared By:**	P. Simmons
WBS (Old)									

BUILDING RELATIONS – Regional Engagement - Community Engagement (50k)

WBS Title **COMMUNITY, SERVICE and ADVOCACY BRIEFINGS**

Description

Category currently includes speaking engagements and briefings on request to community groups and their committees in the 4 nuclear-cycle provinces and includes local, regional, and provincial organizations. Community groups include the Canadian Association of Nuclear Host Communities (CANHC), Durham Nuclear Health Committee (DNHC), Pickering Community Advisory Committee (PCAC), Point Lepreau Community Liaison Committee (PLCLC), Community Consultation Advisory Group (CCAG – Bruce County); provincial groups include Chambers of Commerce; and regional groups include service clubs, smaller chambers of commerce and boards of trade, educational institutions among others. Costs include travel-related expenses for staff participating in speaking engagements/briefings, special events and award ceremonies (tickets and registration fees), on or off-site meetings/briefing related costs (catering, meeting room, A/V), sponsorships, and membership fees.

Deliverable

This category's primary deliverable is fostering and building relationships with community leaders and members, and increasing awareness of the NWMO and APM. The secondary deliverable is maintaining the brand, and relationships with groups already aware of the NWMO and providing updates and progress reports to those bodies. These costs and activities, as outlined, assist in the distribution of information, support brand recognition, and provide networking opportunities.

Assumptions

Currently the NWMO participates, on average, in 12 community organization meetings/briefings per year. As the siting process progresses and specific communities express interest in the project, it is expected that requests for briefings from community organizations will increase significantly in the potentially interested host communities and surrounding regions, and among communities along potential, or assumed, transportation routes, and in existing nuclear host communities and their respective regions.

Beyond the potentially interested host communities, it is reasonable to expect interest may also be expressed after the site selection process is initiated from transportation communities, first responder/emergency services groups, planning advisory groups and boards, and newly formed community groups responding to opportunity and local interest. In some cases these will be affiliated with the municipality expressing interest, in others it may be adjacent communities, or larger regional areas.

Membership in national, provincial, and local chambers of commerce (potentially several) is also assumed as being prudent and reasonable as are public-policy events, and related AGM's and special events. This requirement is expected to reduce by 50% once a site is selected.

Despite potentially being at Step 5 of the site selection process by 2018, the involvement and interaction with community groups large and small is not expected to diminish, in fact the opposite is more likely, and will continue through to the construction commencement of the APM DGR in 2035.

Schedule	Start Year	1	2010	Finish Year	9	2018

Type Fixed

Calculations and Notes:

- Estimated minimum 12 meetings per year in Ontario assumes: CANHC (2 – 1 in Ottawa, 1 in GTA), DNHC (4), PCAC (1), CCAG (2), Provincial Chamber of Commerce briefing (1), and 2 potential community organization briefings (e.g. educational institutions, planning boards).
- Comparable groups in other nuclear provinces, but at 50% = 6 meetings (fewer orgs.)
- Memberships with Chambers of commerce – National, provincial and select local.
- Cost per meeting: varies depending on location and duration. An estimated $2500 per meeting is reasonable for this purpose (each meeting requires 3 NWMO staff).
- In the assumptions the increase/frequency of meetings is expected to increase around 2018, and will continue to 2024 and reduce by 50% to 2035.
- With unknown changes to meeting frequency, as well as locations, or other resource requirements the annual estimates should reflect an a modest increase versus decrease until 2035.

Approved Y01 (2010) budget $50,000

Preliminary Estimates
- Y02 – Y09 (2011 – 2018) - 8 x $200,000 = $ 1,600,000
- Y10 - Y15 (2019 – 2024) - 6 x $200,000 = $1,200,000
- Y16 - Y25 (2025 – 2034) - 10 x $200,000 = $2,000,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,650,000	$ 1,650,000	$ 412,500	$ 2,062,500

APM Cost Estimate

Work Element Definition Sheet

								NWMO Cost Code: 0170020-**19**	
WBS (New)	561	05	10	20	100			**Prepared By:**	P. Simmons
WBS (Old)									
	BUILDING RELATIONS – Regional Engagement - Community Engagement (50k)								
WBS Title	**COMMUNITY, SERVICE and ADVOCACY BRIEFINGS**								

Description

Category currently includes speaking engagements and briefings on request to community groups and their committees in the 4 nuclear-cycle provinces and includes local, regional, and provincial organizations. Community groups include the Canadian Association of Nuclear Host Communities (CANHC), Durham Nuclear Health Committee (DNHC), Pickering Community Advisory Committee (PCAC), Point Lepreau Community Liaison Committee (PLCLC), Community Consultation Advisory Group (CCAG – Bruce County); provincial groups include Chambers of Commerce; and regional groups include service clubs, smaller chambers of commerce and boards of trade, educational institutions among others. Costs include travel-related expenses for staff participating in speaking engagements/briefings, special events and award ceremonies (tickets and registration fees), on or off-site meetings/briefing related costs (catering, meeting room, A/V), sponsorships, and membership fees.

Deliverable

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Membership in national, provincial, and local chambers of commerce (potentially several) is also assumed as being prudent and reasonable as are public-policy events, and related AGM's and special events. This requirement is expected to reduce by 50% once a site is selected.

Despite potentially being at Step 5 of the site selection process by 2018, the involvement and interaction with community groups large and small is not expected to diminish, in fact the opposite is more likely, and will continue through to the construction commencement of the APM DGR in 2035.

Schedule	Start Year	10	2019	Finish Year	15	2024
Type	Fixed					

Calculations and Notes:

- Estimated minimum 12 meetings per year in Ontario assumes: CANHC (2 – 1 in Ottawa, 1 in GTA), DNHC (4), PCAC (1), CCAG (2), Provincial Chamber of Commerce briefing (1), and 2 potential community organization briefings (e.g. educational institutions, planning boards).
- Comparable groups in other nuclear provinces, but at 50% = 6 meetings (fewer orgs.)
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- In the assumptions the increase/frequency of meetings is expected to increase around 2018, and will continue to 2024 and reduce by 50% to 2035.
- With unknown changes to meeting frequency, as well as locations, or other resource requirements the annual estimates should reflect an a modest increase versus decrease until 2035.

Approved Y01 (2010) budget $50,000

Preliminary Estimates
- Y02 – Y09 (2011 – 2018) - 8 x $200,000 = $ 1,600,000
- Y10 - Y15 (2019 – 2024) - 6 x $200,000 = $1,200,000
- Y16 - Y25 (2025 – 2034) - 10 x $200,000 = $2,000,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,200,000	$ 1,200,000	$ 300,000	$ 1,500,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**19**

WBS (New)	561	05	10	30	80			**Prepared By:**	P. Simmons
WBS (Old)									
	BUILDING RELATIONS – Regional Engagement - Community Engagement (50k)								
WBS Title	**COMMUNITY, SERVICE and ADVOCACY BRIEFINGS**								

Description

Category currently includes speaking engagements and briefings on request to community groups and their committees in the 4 nuclear-cycle provinces and includes local, regional, and provincial organizations. Community groups include the Canadian Association of Nuclear Host Communities (CANHC), Durham Nuclear Health Committee (DNHC), Pickering Community Advisory Committee (PCAC), Point Lepreau Community Liaison Committee (PLCLC), Community Consultation Advisory Group (CCAG – Bruce County); provincial groups include Chambers of Commerce; and regional groups include service clubs, smaller chambers of commerce and boards of trade, educational institutions among others. Costs include travel-related expenses for staff participating in speaking engagements/briefings, special events and award ceremonies (tickets and registration fees), on or off-site meetings/briefing related costs (catering, meeting room, A/V), sponsorships, and membership fees.

Deliverable

This category's primary deliverable is fostering and building relationships with community leaders and members, and increasing awareness of the NWMO and APM. The secondary deliverable is maintaining the brand, and relationships with groups already aware of the NWMO and providing updates and progress reports to those bodies. These costs and activities, as outlined, assist in the distribution of information, support brand recognition, and provide networking opportunities.

Assumptions

Currently the NWMO participates, on average, in 12 community organization meetings/briefings per year. As the siting process progresses and specific communities express interest in the project, it is expected that requests for briefings from community organizations will increase significantly in the potentially interested host communities and surrounding regions, and among communities along potential, or assumed, transportation routes, and in existing nuclear host communities and their respective regions.

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Membership in national, provincial, and local chambers of commerce (potentially several) is also assumed as being prudent and reasonable as are public-policy events, and related AGM's and special events. This requirement is expected to reduce by 50% once a site is selected.

Despite potentially being at Step 5 of the site selection process by 2018, the involvement and interaction with community groups large and small is not expected to diminish, in fact the opposite is more likely, and will continue through to the construction commencement of the APM DGR in 2035.

Schedule	Start Year	16	2025	Finish Year	25	2034
Type	Fixed					

Calculations and Notes:

- Estimated minimum 12 meetings per year in Ontario assumes: CANHC (2 – 1 in Ottawa, 1 in GTA), DNHC (4), PCAC (1), CCAG (2), Provincial Chamber of Commerce briefing (1), and 2 potential community organization briefings (e.g. educational institutions, planning boards).
- Comparable groups in other nuclear provinces, but at 50% = 6 meetings (fewer orgs.)
- Memberships with Chambers of commerce – National, provincial and select local.
- Cost per meeting: varies depending on location and duration. An estimated $2500 per meeting is reasonable for this purpose (each meeting requires 3 NWMO staff).
- In the assumptions the increase/frequency of meetings is expected to increase around 2018, and will continue to 2024 and reduce by 50% to 2035.
- With unknown changes to meeting frequency, as well as locations, or other resource requirements the annual estimates should reflect an a modest increase versus decrease until 2035.

Approved Y01 (2010) budget $50,000

Preliminary Estimates
- Y02 – Y09 (2011 – 2018) - 8 x $200,000 = $ 1,600,000
- Y10 - Y15 (2019 – 2024) - 6 x $200,000 = $1,200,000
- Y16 - Y25 (2025 – 2034) - 10 x $200,000 = $2,000,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,000,000	$ 2,000,000	$ 500,000	$ 2,500,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**21**

WBS (New)	561	05	10	10	120		**Prepared By:**	P. Simmons
WBS (Old)								

BUILDING RELATIONS – Regional Engagement – MUNCIPAL FORUM MEETINGS (150)

WBS Title **MUNICIPAL FORUM MEETINGS**

Description

Municipal Forum category includes those costs associated with the meetings and assemblies of the Municipal Forum, a group formed in late 2008 comprised of senior level municipal experts from the four nuclear-cycle provinces primarily drawn from the municipal associations, and who inform a research agenda for a large national infrastructure project, and who also provide advice and comment to related municipal-specific issues, and effectively communicating with the local level of government.

The Forum consists of 15 individual organizations whom are invited to participate at the meetings typically held up to 4 times per year.

The Municipal Forum convenes up to four times per year (avg. 3). To date the meetings have been held in Toronto (at the NWMO offices), and at a meeting facility in downtown Ottawa.

Deliverable

The category's primary deliverable is the provision of guidance to a research agenda as it relates to municipally related areas of interest, with a secondary deliverable of providing insight, comment and advice on existing and emerging local government policy areas potentially affecting the siting process including those policies emerging at a provincial government level.

The costs and activities, as outlined, assist in strengthening existing relationships with Municipal Forum members, facilitate effective NWMO liaison with municipal associations, and provide guidance on research aimed at yielding tools to assist municipalities in considering large economic development projects, such as APM.

A complementary deliverable to the inputs received from the Forum members on the siting process, is insight on effective communication techniques and best practices, and the reciprocal educating of the Forum members on APM and the NWMO including coordinated tours of the dry storage facilities. As primary contacts for members in their host provinces, first-hand experience is well-received and assists in awareness building.

Assumptions

Current commitment from the Forum members has been articulated and communicated through to the end of 2010 with tacit commitment beyond, e.g. into 2011. Election cycles can potentially affect membership on the Forum (e.g. failure to be re-elected in a municipal election, decision not to seek re-election), and the municipal election cycles are different in each province. This has an effect on the historical knowledge of the core Forum membership were membership to change.

As the siting process progresses, it is expected that the Forum membership and advisory direction will change and adapt to reflect the trends and patterns emerging both as a result of the siting process, but also as a result of local government relations, municipal-provincial relations and the effect and progress of the research directed by the Forum. For example, the methods of communicating to municipalities whom have expressed interest will evolve once the siting process has been officially been launched. Similarly, priority issues will emerge for local government in areas within their sphere of influence and jurisdiction such as emergency response, local transportation, and taxation. Regardless of the change the value of maintaining a relationship with municipal experts and especially those connected to municipal associations in a collective setting is clear.

Costs included in this category are primarily travel-related expenses for all Forum members and necessary and participating NWMO staff, as well as related expenses for off-site educational excursions for Forum Members (e.g. tour of Darlington Dry Storage Facility). Costs can also include the necessary on and off-site meeting expenses (catering, meeting room, A/V), and it is contemplated that one or more educational excursions is expected to be held per year. Finally, and depending on the issues being discussed and raised by Forum members additional expertise in the form of guest speakers at Forum meetings may be required/requested and the estimates include for that possibility in the form of per diems and travel and accommodation.

As the process gets closer to the time when 1 or more potential host communities are preparing to negotiate with the NWMO to be a potential host (Step 5), the Forum will likely be disbanded or significantly changed in scope to reflect, a. being at Step 5, and/or b. a new set of issues that prompt municipalities to turn to their Associations for guidance/interaction with the NWMO such as those affecting the potential transportation communities. Future meetings of Forum and their scope are not known and may include an evolved Forum dealing with newer and emerging municipal issues concerning communities on the transportation routes.

Schedule	Start Year	1	2010	Finish Year	9	2018

Type Fixed

Calculations and Notes:

- 4 meetings per year @ $20k per meeting = $80k for total meeting costs.
- 1-2 educational excursions = $3k (includes lengthened/extended accommodations, meals, group (bus) transportation, and catering costs).
- Potential travel to other provinces for meetings (e.g. SK, NB)
- Potential expenses/per diems for guest speakers
- Potential expenses for Forum Members to attend future, and other NWMO events such as an international Frum/expo in 2011.
- Current commitment for Forum is to end of 2010
- Tacit commitment for Forum to 2011

Current budget Y01 (2010) budget - $150,000

Y02 (2011) – Y04 (2013) 3 x $150,000 = $ 450,000
Y05 (2014) – Y09 (2018) 5 x $100,000 = $ 500,000
Y10 (2019) - Y25 (2034) 16 x $100,000 = $1,600,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,100,000	$ 1,100,000	$ 275,000	$ 1,375,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**21**

WBS (New)	561	05	10	20	110		**Prepared By:**	P. Simmons
WBS (Old)								

BUILDING RELATIONS – Regional Engagement – MUNCIPAL FORUM MEETINGS (150)

WBS Title **MUNICIPAL FORUM MEETINGS**

Description

Municipal Forum category includes those costs associated with the meetings and assemblies of the Municipal Forum, a group formed in late 2008 comprised of senior level municipal experts from the four nuclear-cycle provinces primarily drawn from the municipal associations, and who inform a research agenda for a large national infrastructure project, and who also provide advice and comment to related municipal-specific issues, and effectively communicating with the local level of government.

The Forum consists of 15 individual organizations whom are invited to participate at the meetings typically held up to 4 times per year.

The Municipal Forum convenes up to four times per year (avg. 3). To date the meetings have been held in Toronto (at the NWMO offices), and at a meeting facility in downtown Ottawa.

Deliverable

The category's primary deliverable is the provision of guidance to a research agenda as it relates to municipally related areas of interest, with a secondary deliverable of providing insight, comment and advice on existing and emerging local government policy areas potentially affecting the siting process including those policies emerging at a provincial government level.

The costs and activities, as outlined, assist in strengthening existing relationships with Municipal Forum members, facilitate effective NWMO liaison with municipal associations, and provide guidance on research aimed at yielding tools to assist municipalities in considering large economic development projects, such as APM.

A complementary deliverable to the inputs received from the Forum members on the siting process, is insight on effective communication techniques and best practices, and the reciprocal educating of the Forum members on APM and the NWMO including coordinated tours of the dry storage facilities. As primary contacts for members in their host provinces, first-hand experience is well-received and assists in awareness building.

Assumptions

Current commitment from the Forum members has been articulated and communicated through to the end of 2010 with tacit commitment beyond, e.g. into 2011. Election cycles can potentially affect membership on the Forum (e.g. failure to be re-elected in a municipal election, decision not to seek re-election), and the municipal election cycles are different in each province. This has an effect on the historical knowledge of the core Forum membership were membership to change.

As the siting process progresses, it is expected that the Forum membership and advisory direction will change and adapt to reflect the trends and patterns emerging both as a result of the siting process, but also as a result of local government relations, municipal-provincial relations and the effect and progress of the research directed by the Forum. For example, the methods of communicating to municipalities whom have expressed interest will evolve once the siting process has been officially been launched. Similarly, priority issues will emerge for local government in areas within their sphere of influence and jurisdiction such as emergency response, local transportation, and taxation. Regardless of the change the value of maintaining a relationship with municipal experts and especially those connected to municipal associations in a collective setting is clear.

Costs included in this category are primarily travel-related expenses for all Forum members and necessary and participating NWMO staff, as well as related expenses for off-site educational excursions for Forum Members (e.g. tour of Darlington Dry Storage Facility). Costs can also include the necessary on and off-site meeting expenses (catering, meeting room, A/V), and it is contemplated that one or more educational excursions is expected to be held per year. Finally, and depending on the issues being discussed and raised by Forum members additional expertise in the form of guest speakers at Forum meetings may be required/requested and the estimates include for that possibility in the form of per diems and travel and accommodation.

As the process gets closer to the time when 1 or more potential host communities are preparing to negotiate with the NWMO to be a potential host (Step 5), the Forum will likely be disbanded or significantly changed in scope to reflect, a. being at Step 5, and/or b. a new set of issues that prompt municipalities to turn to their Associations for guidance/interaction with the NWMO such as those affecting the potential transportation communities. Future meetings of Forum and their scope are not known and may include an evolved Forum dealing with newer and emerging municipal issues concerning communities on the transportation routes.

Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes:

- 4 meetings per year @ $20k per meeting = $80k for total meeting costs.
- 1-2 educational excursions = $3k (includes lengthened/extended accommodations, meals, group (bus) transportation, and catering costs).
- Potential travel to other provinces for meetings (e.g. SK, NB)
- Potential expenses/per diems for guest speakers
- Potential expenses for Forum Members to attend future, and other NWMO events such as an international Frum/expo in 2011.
- Current commitment for Forum is to end of 2010
- Tacit commitment for Forum to 2011

Current budget Y01 (2010) budget - $150,000

Y02 (2011) – Y04 (2013) 3 x $150,000 = $ 450,000
Y05 (2014) – Y09 (2018) 5 x $100,000 = $ 500,000
Y10 (2019) - Y25 (2034) 16 x $100,000 = $1,600,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 600,000	$ 600,000	$ 150,000	$ 750,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**21**

WBS (New)	561	05	10	30	90			**Prepared By:**	P. Simmons
WBS (Old)									

BUILDING RELATIONS – Regional Engagement – MUNCIPAL FORUM MEETINGS (150)

WBS Title **MUNICIPAL FORUM MEETINGS**

Description

Municipal Forum category includes those costs associated with the meetings and assemblies of the Municipal Forum, a group formed in late 2008 comprised of senior level municipal experts from the four nuclear-cycle provinces primarily drawn from the municipal associations, and who inform a research agenda for a large national infrastructure project, and who also provide advice and comment to related municipal-specific issues, and effectively communicating with the local level of government.

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Deliverable

The category's primary deliverable is the provision of guidance to a research agenda as it relates to municipally related areas of interest, with a secondary deliverable of providing insight, comment and advice on existing and emerging local government policy areas potentially affecting the siting process including those policies emerging at a provincial government level.

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As the siting process progresses, it is expected that the Forum membership and advisory direction will change and adapt to reflect the trends and patterns emerging both as a result of the siting process, but also as a result of local government relations, municipal-provincial relations and the effect and progress of the research directed by the Forum. For example, the methods of communicating to municipalities whom have expressed interest will evolve once the siting process has been officially been launched. Similarly, priority issues will emerge for local government in areas within their sphere of influence and jurisdiction such as emergency response, local transportation, and taxation. Regardless of the change the value of maintaining a relationship with municipal experts and especially those connected to municipal associations in a collective setting is clear.

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Schedule	Start Year	16	2025	Finish Year	25	2034

Type Fixed

Calculations and Notes:

- 4 meetings per year @ $20k per meeting = $80k for total meeting costs.
- 1-2 educational excursions = $3k (includes lengthened/extended accommodations, meals, group (bus) transportation, and catering costs).
- Potential travel to other provinces for meetings (e.g. SK, NB)
- Potential expenses/per diems for guest speakers
- Potential expenses for Forum Members to attend future, and other NWMO events such as an international Frum/expo in 2011.
- Current commitment for Forum is to end of 2010
- Tacit commitment for Forum to 2011

Current budget Y01 (2010) budget - $150,000

Y02 (2011) – Y04 (2013) 3 x $150,000 = $ 450,000
Y05 (2014) – Y09 (2018) 5 x $100,000 = $ 500,000
Y10 (2019) - Y25 (2034) 16 x $100,000 = $1,600,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,000,000	$ 1,000,000	$ 250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	140			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	GOVERNMENT RELATIONS MEETINGS								
Description	· Brief government officials and elected representatives from the nuclear provinces and federal government o Quarterly in-person briefings with Natural Resources Canada, every year o Annual in-person briefing with the Minister of Natural Resources Canada, or as required o Minimum of one annual in-person briefing with representatives from the lead provincial department/ministry for the NWMO file o Minimum of one annual cross-departmental briefing in each province and at the federal level o One-on-one briefings as required with Ministers of relevant portfolios at federal and provincial levels o One-on-one briefings as required with individual MPs, MPPs, MLAs, MNAs, if there is community interest within their riding o Contribute to Government of Canada delegations at the OECD Nuclear Energy Agency								
Deliverable	· Build relationships. · Build understanding of and support for the project and process. · Facilitate decision-making where required.								
Assumptions	· Costs involve travel, accommodation, meals and registration.								
Schedule	Start Year		6 2015			Finish Year	9 2018		
Type	Fixed								
Calculations and Notes:	· 2011 – 2015, $150k/year. · 2016 – 2064, same level of spending, $200K/year then $100k/year 2065 - 2100.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,350,000	$ 1,350,000	$ 337,500	$ 1,687,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	130			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	GOVERNMENT RELATIONS MEETINGS								
Description	· Brief government officials and elected representatives from the nuclear provinces and federal government o Quarterly in-person briefings with Natural Resources Canada, every year o Annual in-person briefing with the Minister of Natural Resources Canada, or as required o Minimum of one annual in-person briefing with representatives from the lead provincial department/ministry for the NWMO file o Minimum of one annual cross-departmental briefing in each province and at the federal level o One-on-one briefings as required with Ministers of relevant portfolios at federal and provincial levels o One-on-one briefings as required with individual MPs, MPPs, MLAs, MNAs, if there is community interest within their riding o Contribute to Government of Canada delegations at the OECD Nuclear Energy Agency								
Deliverable	· Build relationships. · Build understanding of and support for the project and process. · Facilitate decision-making where required.								
Assumptions	· Costs involve travel, accommodation, meals and registration.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	· 2016 – 2064, same level of spending, $200K/year then $100k/year 2065 - 2100.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,200,000	$ 1,200,000	$ 300,000	$ 1,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	110			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	GOVERNMENT RELATIONS MEETINGS								
Description	· Brief government officials and elected representatives from the nuclear provinces and federal government o Quarterly in-person briefings with Natural Resources Canada, every year o Annual in-person briefing with the Minister of Natural Resources Canada, or as required o Minimum of one annual in-person briefing with representatives from the lead provincial department/ministry for the NWMO file o Minimum of one annual cross-departmental briefing in each province and at the federal level o One-on-one briefings as required with Ministers of relevant portfolios at federal and provincial levels o One-on-one briefings as required with individual MPs, MPPs, MLAs, MNAs, if there is community interest within their riding o Contribute to Government of Canada delegations at the OECD Nuclear Energy Agency								
Deliverable	· Build relationships. · Build understanding of and support for the project and process. · Facilitate decision-making where required.								
Assumptions	· Costs involve travel, accommodation, meals and registration.								
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	· 2016 – 2064, same level of spending, $200K/year then $100k/year 2065 - 2100.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,000,000	$ 2,000,000	$ 500,000	$ 2,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	60			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	GOVERNMENT RELATIONS MEETINGS								
Description	· Brief government officials and elected representatives from the nuclear provinces and federal government o Quarterly in-person briefings with Natural Resources Canada, every year o Annual in-person briefing with the Minister of Natural Resources Canada, or as required o Minimum of one annual in-person briefing with representatives from the lead provincial department/ministry for the NWMO file o Minimum of one annual cross-departmental briefing in each province and at the federal level o One-on-one briefings as required with Ministers of relevant portfolios at federal and provincial levels o One-on-one briefings as required with individual MPs, MPPs, MLAs, MNAs, if there is community interest within their riding o Contribute to Government of Canada delegations at the OECD Nuclear Energy Agency								
Deliverable	· Build relationships. · Build understanding of and support for the project and process. · Facilitate decision-making where required.								
Assumptions	· Costs involve travel, accommodation, meals and registration.								
Schedule	Start Year		26	2035		Finish Year	85	2094	
Type	Fixed								
Calculations and Notes:	· 2016 – 2094, same level of spending, $200K/year then $100k/year 2095 - 2100.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 12,000,000	$ 12,000,000	$ 3,000,000	$ 15,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	50	30			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	GOVERNMENT RELATIONS MEETINGS								
Description	· Brief government officials and elected representatives from the nuclear provinces and federal government o Quarterly in-person briefings with Natural Resources Canada, every year o Annual in-person briefing with the Minister of Natural Resources Canada, or as required o Minimum of one annual in-person briefing with representatives from the lead provincial department/ministry for the NWMO file o Minimum of one annual cross-departmental briefing in each province and at the federal level o One-on-one briefings as required with Ministers of relevant portfolios at federal and provincial levels o One-on-one briefings as required with individual MPs, MPPs, MLAs, MNAs, if there is community interest within their riding o Contribute to Government of Canada delegations at the OECD Nuclear Energy Agency								
Deliverable	· Build relationships. · Build understanding of and support for the project and process. · Facilitate decision-making where required.								
Assumptions	· Costs involve travel, accommodation, meals and registration.								
Schedule	Start Year		86	2095			Finish Year	155	2164
Type	Fixed								
Calculations and Notes:	· 2016 – 2094, same level of spending, $200K/year then $100k/year 2095 - 2100.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,600,000	$ 3,600,000	$ 900,000	$ 4,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	150			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS								
Description	In alignment with the recommendations from the NWMO Youth Roundtable and the NWMO Implementation Plan in response to the Youth Roundtable, develop an NWMO education, outreach and capacity building strategy for young Canadians that incorporates both technical and social disciplines. This would include consideration of Youth Roundtable recommendations in such areas as: · Targeted outreach to relevant university clubs to provide information sessions; · Targeted outreach to key professors to explore opportunities to integrate the initiative in classroom dialogues/student projects; · Establishment of scholarships and grants across relevant disciplines; · Opportunities to sponsor youth participation at relevant national and international conferences; · Promotion of science learning through investment in science fairs, camps, clubs.								
Deliverable									
Assumptions									
Schedule	Start Year	2	2011	Finish Year	9	2018			
Type	Fixed								
Calculations and Notes:	· Y2 – Y85, $200K/year · Y86 - Y180 $50K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,600,000	$ 1,600,000	$ 400,000	$ 2,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	140			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS								
Description	In alignment with the recommendations from the NWMO Youth Roundtable and the NWMO Implementation Plan in response to the Youth Roundtable, develop an NWMO education, outreach and capacity building strategy for young Canadians that incorporates both technical and social disciplines. This would include consideration of Youth Roundtable recommendations in such areas as: · Targeted outreach to relevant university clubs to provide information sessions; · Targeted outreach to key professors to explore opportunities to integrate the initiative in classroom dialogues/student projects; · Establishment of scholarships and grants across relevant disciplines; · Opportunities to sponsor youth participation at relevant national and international conferences; · Promotion of science learning through investment in science fairs, camps, clubs.								
Deliverable									
Assumptions									
Schedule	Start Year	10	2019	Finish Year	15	2024			
Type	Fixed								
Calculations and Notes:	· Y2 – Y85, $200K/year · Y86 - Y180 $50K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,200,000	$ 1,200,000	$ 300,000	$ 1,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	120			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS								
Description	In alignment with the recommendations from the NWMO Youth Roundtable and the NWMO Implementation Plan in response to the Youth Roundtable, develop an NWMO education, outreach and capacity building strategy for young Canadians that incorporates both technical and social disciplines. This would include consideration of Youth Roundtable recommendations in such areas as: · Targeted outreach to relevant university clubs to provide information sessions; · Targeted outreach to key professors to explore opportunities to integrate the initiative in classroom dialogues/student projects; · Establishment of scholarships and grants across relevant disciplines; · Opportunities to sponsor youth participation at relevant national and international conferences; · Promotion of science learning through investment in science fairs, camps, clubs.								
Deliverable									
Assumptions									
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	· Y2 – Y85, $200K/year · Y86 - Y180 $50K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,000,000	$ 2,000,000	$ 500,000	$ 2,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	70			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS								
Description	In alignment with the recommendations from the NWMO Youth Roundtable and the NWMO Implementation Plan in response to the Youth Roundtable, develop an NWMO education, outreach and capacity building strategy for young Canadians that incorporates both technical and social disciplines. This would include consideration of Youth Roundtable recommendations in such areas as: · Targeted outreach to relevant university clubs to provide information sessions; · Targeted outreach to key professors to explore opportunities to integrate the initiative in classroom dialogues/student projects; · Establishment of scholarships and grants across relevant disciplines; · Opportunities to sponsor youth participation at relevant national and international conferences; · Promotion of science learning through investment in science fairs, camps, clubs.								
Deliverable									
Assumptions									
Schedule	Start Year		26	2035		Finish Year	85	2094	
Type	Fixed								
Calculations and Notes:	· Y2 – Y85, $200K/year · Y86 - Y180 $50K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 12,000,000	$ 12,000,000	$ 3,000,000	$ 15,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	50	40			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS								
Description	In alignment with the recommendations from the NWMO Youth Roundtable and the NWMO Implementation Plan in response to the Youth Roundtable, develop an NWMO education, outreach and capacity building strategy for young Canadians that incorporates both technical and social disciplines. This would include consideration of Youth Roundtable recommendations in such areas as: · Targeted outreach to relevant university clubs to provide information sessions; · Targeted outreach to key professors to explore opportunities to integrate the initiative in classroom dialogues/student projects; · Establishment of scholarships and grants across relevant disciplines; · Opportunities to sponsor youth participation at relevant national and international conferences; · Promotion of science learning through investment in science fairs, camps, clubs.								
Deliverable									
Assumptions									
Schedule	Start Year	86	2095			Finish Year	155	2164	
Type	Fixed								
Calculations and Notes:	· Y2 – Y85, $200K/year · Y86 - Y180 $50K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,500,000	$ 3,500,000	$ 875,000	$ 4,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	60	30			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	EDUCATION SUPPORT/CURRICULUM/SCHOLARSHIPS								
Description	In alignment with the recommendations from the NWMO Youth Roundtable and the NWMO Implementation Plan in response to the Youth Roundtable, develop an NWMO education, outreach and capacity building strategy for young Canadians that incorporates both technical and social disciplines. This would include consideration of Youth Roundtable recommendations in such areas as: · Targeted outreach to relevant university clubs to provide information sessions; · Targeted outreach to key professors to explore opportunities to integrate the initiative in classroom dialogues/student projects; · Establishment of scholarships and grants across relevant disciplines; · Opportunities to sponsor youth participation at relevant national and international conferences; · Promotion of science learning through investment in science fairs, camps, clubs.								
Deliverable									
Assumptions									
Schedule	Start Year		156	2165		Finish Year	180	2189	
Type	Fixed								
Calculations and Notes:	· Y2 – Y85, $200K/year · Y86 - Y180 $50K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,250,000	$ 1,250,000	$ 312,500	$ 1,562,500

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**20**

WBS (New)	561	05	10	10	130			**Prepared By:**	P. Simmons
WBS (Old)									

BUILDING RELATIONS – Regional Engagement - MUNICIPAL ASSOCIATIONS (50)

WBS Title **MUNICIPAL ASSOCIATIONS**

Description

Category is specific to local (municipal) government relationships and their Associations only and includes for all activities related to relationship building and maintenance with municipal and municipally-related associations and organizations in the 4 nuclear-cycle provinces and includes both national-municipal and provincial-municipal organizations and their affiliates.

Activities associated with this category may include, but are not limited to, staff travel, accommodation, presentations, booth/exhibit transport, and related expenses including materials and related logistical costs required for the following:

Briefings provided on request to municipal associations, their affiliates, or municipally-related organizations and groups (e.g. Executive or specific committees, Boards of Directors),

Costs and related fees to participate, and/or attend annual/semi-annual association conferences and/or trade shows in all nuclear provinces. Conference costs include staff registration fees as delegates or participants, exhibitor participation in trade shows (including booth logistics costs), exhibitor booth space at trade shows, approved sponsorships,

Attendance and participation at special events (e.g. municipal associations, municipal-professional and quasi-professional) such as sector specific meetings (e.g. AMCTO) upon invitation and request to attend only

Deliverable

The primary deliverable associated with the activities, as outlined above, assists in maintaining and strengthening existing, and building new, relationships with the municipal associations and their affiliated organizations, and the municipally-related professional organizations and their leadership, executive and membership body.

The secondary, but no less important, deliverable, is the opportunity to increase awareness including the distribution of information, gathering intelligence about communities and regions, and their relationships, providing support to NWMO brand recognition, and growing and cultivating networking opportunities.

Assumptions

It is estimated and assumed that the NWMO will attend 20 - 25 conferences/briefings per year on average until 2018 after which a temporary 10% decline in conferences can be expected. Maintaining relations with interested organizations interested is recommended and prudent; the various associations tend to provide support to one another. The decline is the result of being at the negotiation Step 5 with one or more communities, and who may not be members of all affiliated associations. Presence at association conferences or trade shows once 2 candidate sites are selected would need to be examined until re-entry/continued membership is deemed appropriate.

Based on a current inventory of known associations presently in contact with the NWMO it is reasonable to assume a marginal expansion into the professional associations and their municipal affiliates in the years to come.

Currently relationships exist with the following municipal associations (although not all have requested/invited NWMO presence at conferences in 2009/10)

SASKATCHEWAN – 5 (SUMA, SARM, SEDA, RMAA, UMAAS)
ONTARIO – 9 (AMO, NOMA & NWORC, FONOM, ROMA, OSUM, EDCO, OMAA, AMCTO)
QUEBEC – 4 (FMQ, UMQ, ADMQ, APDEQ)
NEW BRUNSWICK - 4 (UMNB, CNBA, AFMNB, AMANB)
CANADA/NATIONAL – 3 (FCM, CAMA, EDAC)
OTHER – MEA, PEO, MFOA.

Conference and trade show locations change annually, and will affect the total cost of participation (e.g. 2009 OSUM in Cornwall = train, 2010 OSUM in Stratford = car; 2009 FCM in BC vs. 2010 FCM in Ontario).

Conference fees and registration also change from 1 year to the next with increases known only the year of the event. Increases can vary from 10% to 25%. Consequently, no average conference fee/cost is applicable for these estimates. Cost of entry one year does not necessarily commute into the next year as booth logistics will vary (new larger exhibit, modules, and transport), sponsorship may be lower/higher and the number of staff attending the booth will be higher than in past years due potentially to the to the larger exhibit at certain conferences.

An average of 25 conferences per year is expected to 2018 after which they may become more discretionary (e.g. municipal administrators associations may not be necessary in provinces that do not include a community in Step 5). Nonetheless it is expected that relationships with all municipal associations up to 2018 with potential for minor expansion of professional associations (e.g. transportation, planners, etc.) after 2018 will occur resulting in potentially a net zero change (adding/dropping).

Assumed that 80% of conferences will require a display booth, 3-4 NWMO staff, accommodation, travel, expenses, auto rental, mid-range sponsorship, and associated costs for occasional additional registration of NWMO staff.

Schedule	Start Year	1	2010	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Conferences and Trades shows

Approved Y01 (2010) Budget $50,000

Sponsorship, staff attendance, and participation year-over-year supports an increase in annual estimated expenditures and includes the transport of the new exhibit and display in various configurations. Similar to other budget areas, an increase in requests to participate may be realized after 2018 to accommodate specialized associations conferences.

Y02 (2011) – Y05 (2014) 4 x $100,000 = $ 400,000
Y06 (2015) - Y9 (2018) 4 x $125,000 = $ 500,000
Y10 (2019) – Y36 (2034) 16 x $125,000 = $ 2,000,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 950,000	$ 950,000	$ 237,500	$ 1,187,500

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**20**

WBS (New)	561	05	10	20	120			**Prepared By:**	P. Simmons
WBS (Old)									

BUILDING RELATIONS – Regional Engagement - MUNICIPAL ASSOCIATIONS (50)

WBS Title **MUNICIPAL ASSOCIATIONS**

Description

Category is specific to local (municipal) government relationships and their Associations only and includes for all activities related to relationship building and maintenance with municipal and municipally-related associations and organizations in the 4 nuclear-cycle provinces and includes both national-municipal and provincial-municipal organizations and their affiliates.

Activities associated with this category may include, but are not limited to, staff travel, accommodation, presentations, booth/exhibit transport, and related expenses including materials and related logistical costs required for the following:

Briefings provided on request to municipal associations, their affiliates, or municipally-related organizations and groups (e.g. Executive or specific committees, Boards of Directors),

Costs and related fees to participate, and/or attend annual/semi-annual association conferences and/or trade shows in all nuclear provinces. Conference costs include staff registration fees as delegates or participants, exhibitor participation in trade shows (including booth logistics costs), exhibitor booth space at trade shows, approved sponsorships,

Attendance and participation at special events (e.g. municipal associations, municipal-professional and quasi-professional) such as sector specific meetings (e.g. AMCTO) upon invitation and request to attend only

Deliverable

The primary deliverable associated with the activities, as outlined above, assists in maintaining and strengthening existing, and building new, relationships with the municipal associations and their affiliated organizations, and the municipally-related professional organizations and their leadership, executive and membership body.

The secondary, but no less important, deliverable, is the opportunity to increase awareness including the distribution of information, gathering intelligence about communities and regions, and their relationships, providing support to NWMO brand recognition, and growing and cultivating networking opportunities.

Assumptions

It is estimated and assumed that the NWMO will attend 20 - 25 conferences/briefings per year on average until 2018 after which a temporary 10% decline in conferences can be expected. Maintaining relations with interested organizations interested is recommended and prudent; the various associations tend to provide support to one another. The decline is the result of being at the negotiation Step 5 with one or more communities, and who may not be members of all affiliated associations. Presence at association conferences or trade shows once 2 candidate sites are selected would need to be examined until re-entry/continued membership is deemed appropriate.

Based on a current inventory of known associations presently in contact with the NWMO it is reasonable to assume a marginal expansion into the professional associations and their municipal affiliates in the years to come.

Currently relationships exist with the following municipal associations (although not all have requested/invited NWMO presence at conferences in 2009/10)

SASKATCHEWAN – 5 (SUMA, SARM, SEDA, RMAA, UMAAS)
ONTARIO – 9 (AMO, NOMA & NWORC, FONOM, ROMA, OSUM, EDCO, OMAA, AMCTO)
QUEBEC – 4 (FMQ, UMQ, ADMQ, APDEQ)
NEW BRUNSWICK - 4 (UMNB, CNBA, AFMNB, AMANB)
CANADA/NATIONAL – 3 (FCM, CAMA, EDAC)
OTHER – MEA, PEO, MFOA.

Conference and trade show locations change annually, and will affect the total cost of participation (e.g. 2009 OSUM in Cornwall = train, 2010 OSUM in Stratford = car; 2009 FCM in BC vs. 2010 FCM in Ontario).

Conference fees and registration also change from 1 year to the next with increases known only the year of the event. Increases can vary from 10% to 25%. Consequently, no average conference fee/cost is applicable for these estimates. Cost of entry one year does not necessarily commute into the next year as booth logistics will vary (new larger exhibit, modules, and transport), sponsorship may be lower/higher and the number of staff attending the booth will be higher than in past years due potentially to the to the larger exhibit at certain conferences.

An average of 25 conferences per year is expected to 2018 after which they may become more discretionary (e.g. municipal administrators associations may not be necessary in provinces that do not include a community in Step 5). Nonetheless it is expected that relationships with all municipal associations up to 2018 with potential for minor expansion of professional associations (e.g. transportation, planners, etc.) after 2018 will occur resulting in potentially a net zero change (adding/dropping).

Assumed that 80% of conferences will require a display booth, 3-4 NWMO staff, accommodation, travel, expenses, auto rental, mid-range sponsorship, and associated costs for occasional additional registration of NWMO staff.

Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes:

Conferences and Trades shows

Approved Y01 (2010) Budget $50,000

Sponsorship, staff attendance, and participation year-over-year supports an increase in annual estimated expenditures and includes the transport of the new exhibit and display in various configurations. Similar to other budget areas, an increase in requests to participate may be realized after 2018 to accommodate specialized associations conferences.

Y02 (2011) – Y05 (2014) 4 x $100,000 = $ 400,000
Y06 (2015) - Y9 (2018) 4 x $125,000 = $ 500,000
Y10 (2019) – Y36 (2034) 16 x $125,000 = $ 2,000,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$ 187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**20**

WBS (New)	561	05	10	30	100			**Prepared By:**	P. Simmons
WBS (Old)									

BUILDING RELATIONS – Regional Engagement - MUNICIPAL ASSOCIATIONS (50)

WBS Title **MUNICIPAL ASSOCIATIONS**

Description

Category is specific to local (municipal) government relationships and their Associations only and includes for all activities related to relationship building and maintenance with municipal and municipally-related associations and organizations in the 4 nuclear-cycle provinces and includes both national-municipal and provincial-municipal organizations and their affiliates.

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Costs and related fees to participate, and/or attend annual/semi-annual association conferences and/or trade shows in all nuclear provinces. Conference costs include staff registration fees as delegates or participants, exhibitor participation in trade shows (including booth logistics costs), exhibitor booth space at trade shows, approved sponsorships,

Attendance and participation at special events (e.g. municipal associations, municipal-professional and quasi-professional) such as sector specific meetings (e.g. AMCTO) upon invitation and request to attend only

Deliverable

The primary deliverable associated with the activities, as outlined above, assists in maintaining and strengthening existing, and building new, relationships with the municipal associations and their affiliated organizations, and the municipally-related professional organizations and their leadership, executive and membership body.

The secondary, but no less important, deliverable, is the opportunity to increase awareness including the distribution of information, gathering intelligence about communities and regions, and their relationships, providing support to NWMO brand recognition, and growing and cultivating networking opportunities.

Assumptions

It is estimated and assumed that the NWMO will attend 20 - 25 conferences/briefings per year on average until 2018 after which a temporary 10% decline in conferences can be expected. Maintaining relations with interested organizations interested is recommended and prudent; the various associations tend to provide support to one another. The decline is the result of being at the negotiation Step 5 with one or more communities, and who may not be members of all affiliated associations. Presence at association conferences or trade shows once 2 candidate sites are selected would need to be examined until re-entry/continued membership is deemed appropriate.

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SASKATCHEWAN – 5 (SUMA, SARM, SEDA, RMAA, UMAAS)
ONTARIO – 9 (AMO, NOMA & NWORC, FONOM, ROMA, OSUM, EDCO, OMAA, AMCTO)
QUEBEC – 4 (FMQ, UMQ, ADMQ, APDEQ)
NEW BRUNSWICK - 4 (UMNB, CNBA, AFMNB, AMANB)
CANADA/NATIONAL – 3 (FCM, CAMA, EDAC)
OTHER – MEA, PEO, MFOA.

Conference and trade show locations change annually, and will affect the total cost of participation (e.g. 2009 OSUM in Cornwall = train, 2010 OSUM in Stratford = car; 2009 FCM in BC vs. 2010 FCM in Ontario).

Conference fees and registration also change from 1 year to the next with increases known only the year of the event. Increases can vary from 10% to 25%. Consequently, no average conference fee/cost is applicable for these estimates. Cost of entry one year does not necessarily commute into the next year as booth logistics will vary (new larger exhibit, modules, and transport), sponsorship may be lower/higher and the number of staff attending the booth will be higher than in past years due potentially to the to the larger exhibit at certain conferences.

An average of 25 conferences per year is expected to 2018 after which they may become more discretionary (e.g. municipal administrators associations may not be necessary in provinces that do not include a community in Step 5). Nonetheless it is expected that relationships with all municipal associations up to 2018 with potential for minor expansion of professional associations (e.g. transportation, planners, etc.) after 2018 will occur resulting in potentially a net zero change (adding/dropping).

Assumed that 80% of conferences will require a display booth, 3-4 NWMO staff, accommodation, travel, expenses, auto rental, mid-range sponsorship, and associated costs for occasional additional registration of NWMO staff.

Schedule	Start Year	16	2025	Finish Year	25	2034

Type Fixed

Calculations and Notes:

Conferences and Trades shows

Approved Y01 (2010) Budget $50,000

Sponsorship, staff attendance, and participation year-over-year supports an increase in annual estimated expenditures and includes the transport of the new exhibit and display in various configurations. Similar to other budget areas, an increase in requests to participate may be realized after 2018 to accommodate specialized associations conferences.

Y02 (2011) – Y05 (2014) 4 x $100,000 = $ 400,000
Y06 (2015) - Y9 (2018) 4 x $125,000 = $ 500,000
Y10 (2019) – Y36 (2034) 16 x $125,000 = $ 2,000,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,250,000	$ 1,250,000	$ 312,500	$ 1,562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	260			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRIENNIAL REPORT								
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.								
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely								
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.								
Schedule	Start Year	4	2013		Finish Year	9	2018		
Type	Fixed								
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 225,000	$ 225,000	$	56,250	$ 281,250

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	250			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRIENNIAL REPORT								
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.								
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely								
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 250,000	$ 250,000	$	62,500	$ 312,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	230			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title	TRIENNIAL REPORT
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.

Schedule	Start Year	16	2025	Finish Year	25 2034
Type	Fixed				
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.				

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 500,000	$ 500,000	$ 125,000	$ 625,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	180			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title	TRIENNIAL REPORT
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.

Schedule	Start Year	26	2035	Finish Year	85	2094
Type	Fixed					
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.					

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,500,000	$ 2,500,000	$ 625,000	$ 3,125,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	50	150			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRIENNIAL REPORT								
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.								
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely								
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.								
Schedule	Start Year	86	2095			Finish Year	155	2164	
Type	Fixed								
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 2,875,000	$ 2,875,000	$	718,750	$ 3,593,750

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	60	70			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRIENNIAL REPORT								
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.								
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely								
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.								
Schedule	Start Year	156	2165			Finish Year	180	2189	
Type	Fixed								
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 1,000,000	$ 1,000,000	$	250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	70	10			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title	TRIENNIAL REPORT
Description	To prepare Triennial Report as required by the Nuclear Fuel Waste Act every third year after the Government Decision on the management approach.
Deliverable	Triennial Reports for the following years: · 2011 to 2013 delivered in March 2014 · 2014 to 2016 delivered in March 2017 · 2017 to 2019 delivered in March 2020 · 2020 to 2022 delivered in March 2023 · And so on indefinitely
Assumptions	The Triennial Report will meet the requirements set out in the NFWA and repeated below: (a) a summary of [the NWMO's] activities respecting the management of nuclear fuel waste during the last three fiscal years, including an analysis of any significant socio-economic effects of those activities on a community's way of life or on its social, cultural or economic aspirations; (b) [the NWMO's] strategic plan for the next five fiscal years to implement the approach that the Governor in Council selects under section 15 or approves under subsection 20(5); (c) [the NWMO's] budget forecast for the next five fiscal years to implement the strategic plan; (d) the results of [the NWMO's] public consultations held during the last three fiscal years with respect to the matters set out in paragraphs (a) and (b); and (e) the comments of the Advisory Council on the matters referred to in paragraphs (a) to (d). The public consultations required to meet (d) above, specifically the review of the five-year strategic plan, will be conducted in the fall of the following years: 2013, 2016, 2019 and 2023. Public consultations related to issues beyond review of the 5-year strategic plan will be captured under individual program elements. Completion of (a) will not require resources new or additional to those required as part of the siting process. Completion of (e) will require hiring of external writer to support the Advisory Council, estimated at $25K per report. Costs related to translation, mailing, printing will be captured under the respective Communication program elements.

Schedule	Start Year	181 2190	Finish Year	181 2190	
Type	Fixed				
Calculations and Notes:	Public review of the 5-year strategic plan, in the form of directed discussion groups is estimated to be $100K per year (2013, 2016, 2019, 2022, etc.). Contract writer to assist Advisory Council in compiling comments, $25K per report.				

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 125,000	$ 125,000	$ 31,250	$ 156,250

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	20			**Prepared By:**	J. Robinson
WBS (Old)									

WBS Title EXHIBITS AND EDUCATION TOOLS

Description

Develop mobile exhibits and tools to facilitate community understanding of Adaptive Phased Management and the repository project. Exhibits will support engagement and capacity building initiatives in interested potential host communities.

Replicate existing modules to allow concurrent use in up to two communities/events.

Develop new modules to address issues such as transportation, community well-being, regulatory processes, Aboriginal Traditional Knowledge.

Regular review and update of existing modules as repository designs evolve. Update virtual DGR.
Maintenance of modules, e.g., repairs, upgrades, replace interactive components, etc.

Develop two community-specific fixed modules for use in communities to support feasibility studies.

Design and develop fixed exhibit in interested potential host community as part of Centre of Expertise.

Develop training module, education materials to support staff in the use of the exhibits.

Develop education kit to support visitor experience to the exhibit.

Deliverable

Y02 (2011) Replicate mobile exhibit for use for use at conferences and in communities potentially interested in hosting the project and neighbouring regions/communities.

Y02 (2011) develop two new modules (Transportation, to be determined).

Y04 to Y12 Two fixed exhibits in operation in two potential host communities that have sites undergoing detailed site investigations and socio-economic impact assessments.

Y04 Develop community-specific modules.
Y04 Education kit for visitors to the exhibit.

Y13 Museum-style exhibit in operation in Centre of Expertise.
Y13 Education kit for visitors to the museum-style exhibit.

Assumptions

Y01 to Y03: 2 mobile exhibits to support initial screening of 15 communities and feasibility studies in 10 potential sites

Y02, develop two new modules, $100K

Y03 to Y09 surface/subsurface investigations in two candidate sites, 2 fixed exhibits in community storefront office, with one module containing community-specific information. Design work for fixed exhibits begins in 2011 (Y02).

Y13 (2022) Exhibit in place in Centre of expertise.
Modules in mobile exhibits test concepts to be developed for museum-style exhibits.
Design work for museum-style exhibit begins in Y10.

Each new module (transportation, community specific information, etc.) costs approximately $42 to 47K based on Welcome Tower configuration and including content development, design, fabrication, computer interactive software and hardware, crating and initial installation in Toronto.

Changes to video components of virtual DGR are as follows:

- Add new chapter to video $10 to 12K ($ 4 to 6K programming plus content development)
- Add new video or illustration to system, programming cost $1 to 2K
- Revise DGR illustration/representation $ 1 to 5K programming cost

Cost for each new set of 7 mobile exhibit modules: $115-140K
Additional elements to create a more immersive environment for the virtual DGR display, $30K.

Cost of fixed exhibit in community, $200K each.

Schedule	Start Year	1	2010	Finish Year	9	2018	

Type Fixed

Calculations and Notes:

2011 (Y02) Replicate exhibit, update existing exhibit elements and develop supporting education materials $180K
2011 (Y02) Develop two new modules $100K
2011(Y02) Begin design and development of fixed exhibit for two communities, $400K
2011 (Y02) Total $680K
2012 (Y03) Fixed Exhibit development completed $80K
2013 (Y04) Exhibit maintenance and update, $75K
2014 (Y05) Exhibit maintenance and update, $50K
2015 (Y06) Exhibit maintenance and update, $50K

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,067,745	$ 1,067,745	$ 266,936	$ 1,334,681

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	270			**Prepared By:**	J. Robinson
WBS (Old)									

WBS Title	EXHIBITS AND EDUCATION TOOLS
Description	Develop mobile exhibits and tools to facilitate community understanding of Adaptive Phased Management and the repository project. Exhibits will support engagement and capacity building initiatives in interested potential host communities. Replicate existing modules to allow concurrent use in up to two communities/events. Develop new modules to address issues such as transportation, community well-being, regulatory processes, Aboriginal Traditional Knowledge. Regular review and update of existing modules as repository designs evolve. Update virtual DGR. Maintenance of modules, e.g., repairs, upgrades, replace interactive components, etc. Develop two community-specific fixed modules for use in communities to support feasibility studies. Design and develop fixed exhibit in interested potential host community as part of Centre of Expertise. Develop training module, education materials to support staff in the use of the exhibits. Develop education kit to support visitor experience to the exhibit.
Deliverable	Y02 (2011) Replicate mobile exhibit for use for use at conferences and in communities potentially interested in hosting the project and neighbouring regions/communities. Y02 (2011) develop two new modules (Transportation, to be determined). Y04 to Y12 Two fixed exhibits in operation in two potential host communities that have sites undergoing detailed site investigations and socio-economic impact assessments. Y04 Develop community-specific modules. Y04 Education kit for visitors to the exhibit. Y13 Museum-style exhibit in operation in Centre of Expertise. Y13 Education kit for visitors to the museum-style exhibit.
Assumptions	Y01 to Y03: 2 mobile exhibits to support initial screening of 15 communities and feasibility studies in 10 potential sites Y02, develop two new modules, $100K Y03 to Y09 surface/subsurface investigations in two candidate sites, 2 fixed exhibits in community storefront office, with one module containing community-specific information. Design work for fixed exhibits begins in 2011 (Y02). Y13 (2022) Exhibit in place in Centre of expertise. Modules in mobile exhibits test concepts to be developed for museum-style exhibits. Design work for museum-style exhibit begins in Y10. Each new module (transportation, community specific information, etc.) costs approximately $42 to 47K based on Welcome Tower configuration and including content development, design, fabrication, computer interactive software and hardware, crating and initial installation in Toronto. Changes to video components of virtual DGR are as follows: · Add new chapter to video $10 to 12K ($ 4 to 6K programming plus content development) · Add new video or illustration to system, programming cost $1 to 2K · Revise DGR illustration/representation $ 1 to 5K programming cost Cost for each new set of 7 mobile exhibit modules: $115-140K Additional elements to create a more immersive environment for the virtual DGR display, $30K. Cost of fixed exhibit in community, $200K each.

Schedule	Start Year	10	2019	Finish Year	15	2024
Type	Fixed					

Calculations and Notes:	2011 (Y02) Replicate exhibit, update existing exhibit elements and develop supporting education materials $180K 2011 (Y02) Develop two new modules $100K 2011(Y02) Begin design and development of fixed exhibit for two communities, $400K 2011 (Y02) Total $680K 2012 (Y03) Fixed Exhibit development completed $80K 2013 (Y04) Exhibit maintenance and update, $75K 2014 (Y05) Exhibit maintenance and update, $50K 2015 (Y06) Exhibit maintenance and update, $50K

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 300,000	$ 300,000	$ 75,000	$ 375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	160			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CONTRACTED WRITING								
Description	Support the NWMO's communication and engagement activities that seek to: – To raise the profile and enhance the image and reputation of the Nuclear Waste Management Organization (NWMO) among interested parties. – To build awareness and understanding for the important work that is being undertaken by the NWMO, in particular the siting process. – To build confidence and trust in the NWMO and its activities.								
Deliverable	Professional Writing/Copy-Editing, as required								
Assumptions	Work involves contracting external consultants to provide writing/copy-editing service to the NWMO: · Support required is consistent year to year (i.e. copy editing of Annual Report/Implementation Plan etc.)								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $165K; 2011 $125k; 2012 - 2014 $165/a. · 2015-2094, same level of spending, 165k/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,445,000	$ 1,445,000	$ 361,250	$ 1,806,250

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	150			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CONTRACTED WRITING								
Description	Support the NWMO's communication and engagement activities that seek to: – To raise the profile and enhance the image and reputation of the Nuclear Waste Management Organization (NWMO) among interested parties. – To build awareness and understanding for the important work that is being undertaken by the NWMO, in particular the siting process. – To build confidence and trust in the NWMO and its activities.								
Deliverable	Professional Writing/Copy-Editing, as required								
Assumptions	Work involves contracting external consultants to provide writing/copy-editing service to the NWMO: · Support required is consistent year to year (i.e. copy editing of Annual Report/Implementation Plan etc.)								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $165K; 2011 $125k; 2012 - 2014 $165/a. · 2015-2094, same level of spending, 165k/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 990,000	$ 990,000	$ 247,500	$ 1,237,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	130			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CONTRACTED WRITING								
Description	Support the NWMO's communication and engagement activities that seek to: – To raise the profile and enhance the image and reputation of the Nuclear Waste Management Organization (NWMO) among interested parties. – To build awareness and understanding for the important work that is being undertaken by the NWMO, in particular the siting process. – To build confidence and trust in the NWMO and its activities.								
Deliverable	Professional Writing/Copy-Editing, as required								
Assumptions	Work involves contracting external consultants to provide writing/copy-editing service to the NWMO: · Support required is consistent year to year (i.e. copy editing of Annual Report/Implementation Plan etc.)								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $165K; 2011 $125k; 2012 - 2014 $165/a. · 2015-2094, same level of spending, 165k/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,650,000	$ 1,650,000	$ 412,500	$ 2,062,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	80			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CONTRACTED WRITING								
Description	Support the NWMO's communication and engagement activities that seek to: – To raise the profile and enhance the image and reputation of the Nuclear Waste Management Organization (NWMO) among interested parties. – To build awareness and understanding for the important work that is being undertaken by the NWMO, in particular the siting process. – To build confidence and trust in the NWMO and its activities.								
Deliverable	Professional Writing/Copy-Editing, as required								
Assumptions	Work involves contracting external consultants to provide writing/copy-editing service to the NWMO: · Support required is consistent year to year (i.e. copy editing of Annual Report/Implementation Plan etc.)								
Schedule	Start Year		26	2035		Finish Year	85	2094	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $165K; 2011 $125k; 2012 - 2014 $165/a. · 2015-2094, same level of spending, 165k/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 9,900,000	$ 9,900,000	$ 2,475,000	$ 12,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	170			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA MONITORING								
Description	Support the NWMO's communication and engagement by tracking media on a consistent and on-going basis.								
Deliverable	Engage media monitoring services to provide copies of media references of the NWMO in print or electronic formats.								
Assumptions	Media monitoring activities will increase as the NWMO generates more media attention on a local level through the implementation of the siting process.								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $65K/year; 2011 $50k/year; 2012 & 2014 $65k/year · 2015-2094, same level of spending, 65K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 570,000	$ 570,000	$ 142,500		$ 712,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	160			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA MONITORING								
Description	Support the NWMO's communication and engagement by tracking media on a consistent and on-going basis.								
Deliverable	Engage media monitoring services to provide copies of media references of the NWMO in print or electronic formats.								
Assumptions	Media monitoring activities will increase as the NWMO generates more media attention on a local level through the implementation of the siting process.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $65K/year; 2011 $50k/year; 2012 & 2014 $65k/year · 2015-2094, same level of spending, 65K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 390,000	$ 390,000	$ 97,500	$ 487,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	140			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA MONITORING								
Description	Support the NWMO's communication and engagement by tracking media on a consistent and on-going basis.								
Deliverable	Engage media monitoring services to provide copies of media references of the NWMO in print or electronic formats.								
Assumptions	Media monitoring activities will increase as the NWMO generates more media attention on a local level through the implementation of the siting process.								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $65K/year; 2011 $50k/year; 2012 & 2014 $65k/year · 2015-2094, same level of spending, 65K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 650,000	$ 650,000	$ 162,500	$ 812,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	90			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA MONITORING								
Description	Support the NWMO's communication and engagement by tracking media on a consistent and on-going basis.								
Deliverable	Engage media monitoring services to provide copies of media references of the NWMO in print or electronic formats.								
Assumptions	Media monitoring activities will increase as the NWMO generates more media attention on a local level through the implementation of the siting process.								
Schedule	Start Year		26	2035		Finish Year	85	2094	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $65K/year; 2011 $50k/year; 2012 & 2014 $65k/year · 2015-2094, same level of spending, 65K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,900,000	$ 3,900,000	$ 975,000	$ 4,875,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	180			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	WEBSITE MAINTENANCE								
Description	Maintenance, hosting and refinements to nwmo.ca on an on-going basis.								
Deliverable	Hosting agreement established and maintained with a web-hosting company on an annual basis. Review and update the website as necessary.								
Assumptions	Annual hosting agreement with web-hosting company. Every 3 years, the NWMO will also contract with a web development company to conduct a complete overhaul of nwmo.ca to ensure that the site incorporates latest technology and continues to be interesting and impactful.								
Schedule	Start Year		1	2010		Finish Year		9	2018
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $25K · Board approved budget 2011 $25K · Board approved budget 2012-2014 $40K/year · 2015-2094, same level of spending, $40K/year and 100K every third year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 390,000	$ 390,000	$ 97,500	$ 487,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	170			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	WEBSITE MAINTENANCE								
Description	Maintenance, hosting and refinements to nwmo.ca on an on-going basis.								
Deliverable	Hosting agreement established and maintained with a web-hosting company on an annual basis. Review and update the website as necessary.								
Assumptions	Annual hosting agreement with web-hosting company. Every 3 years, the NWMO will also contract with a web development company to conduct a complete overhaul of nwmo.ca to ensure that the site incorporates latest technology and continues to be interesting and impactful.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $25K · Board approved budget 2011 $25K · Board approved budget 2012-2014 $40K/year · 2015-2094, same level of spending, $40K/year and 100K every third year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 360,000	$ 360,000	$ 90,000	$ 450,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	150			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	WEBSITE MAINTENANCE								
Description	Maintenance, hosting and refinements to nwmo.ca on an on-going basis.								
Deliverable	Hosting agreement established and maintained with a web-hosting company on an annual basis. Review and update the website as necessary.								
Assumptions	Annual hosting agreement with web-hosting company. Every 3 years, the NWMO will also contract with a web development company to conduct a complete overhaul of nwmo.ca to ensure that the site incorporates latest technology and continues to be interesting and impactful.								
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $25K · Board approved budget 2011 $25K · Board approved budget 2012-2014 $40K/year · 2015-2094, same level of spending, $40K/year and 100K every third year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 580,000	$ 580,000	$ 145,000	$ 725,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	100			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	WEBSITE MAINTENANCE								
Description	Maintenance, hosting and refinements to nwmo.ca on an on-going basis.								
Deliverable	Hosting agreement established and maintained with a web-hosting company on an annual basis. Review and update the website as necessary.								
Assumptions	Annual hosting agreement with web-hosting company. Every 3 years, the NWMO will also contract with a web development company to conduct a complete overhaul of nwmo.ca to ensure that the site incorporates latest technology and continues to be interesting and impactful.								
Schedule	Start Year		26	2035		Finish Year	85	2094	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $25K · Board approved budget 2011 $25K · Board approved budget 2012-2014 $40K/year · 2015-2094, same level of spending, $40K/year and 100K every third year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,600,000	$ 3,600,000	$ 900,000	$ 4,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	190			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	DIRECTED COMMUNICATIONS								
Description	Support the NWMO's communication and engagement activities through the development of various corporate communication collateral including: · Backgrounders · Fact Sheets · Trade Show Booths · Newsletters · Etc.								
Deliverable	The communication collateral will bridge print, web development, graphic design, video and social media to provide written, digital and multimedia communications solutions that are aligned with and contribute to the overall NWMO communications strategy.								
Assumptions	The NWMO will continue to develop corporate communication material at the same level as it has. More and different types of information will need to be made available as the NWMO begins to work with communities on a local basis as part of the siting process.								
Schedule	Start Year		1	2010			Finish Year	9 2018	
Type	Fixed								
Calculations and Notes:	· 2010 560K · 2011 360K · 2012 360K · 2013 360K · 2014 360K · 2015-2094, same level of spending, 360K/year · 2095-2164 - Y155 $100K/yr · 2165-2189 $200K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,430,000	$ 3,430,000	$ 857,500	$ 4,287,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	180			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	DIRECTED COMMUNICATIONS								
Description	Support the NWMO's communication and engagement activities through the development of various corporate communication collateral including: · Backgrounders · Fact Sheets · Trade Show Booths · Newsletters · Etc.								
Deliverable	The communication collateral will bridge print, web development, graphic design, video and social media to provide written, digital and multimedia communications solutions that are aligned with and contribute to the overall NWMO communications strategy.								
Assumptions	The NWMO will continue to develop corporate communication material at the same level as it has. More and different types of information will need to be made available as the NWMO begins to work with communities on a local basis as part of the siting process.								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	· 2010 560K · 2011 360K · 2012 360K · 2013 360K · 2014 360K · 2015-2094, same level of spending, 360K/year · 2095-2164 - Y155 $100K/yr · 2165-2189 $200K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,160,000	$ 2,160,000	$ 540,000	$ 2,700,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	160			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	DIRECTED COMMUNICATIONS								
Description	Support the NWMO's communication and engagement activities through the development of various corporate communication collateral including: · Backgrounders · Fact Sheets · Trade Show Booths · Newsletters · Etc.								
Deliverable	The communication collateral will bridge print, web development, graphic design, video and social media to provide written, digital and multimedia communications solutions that are aligned with and contribute to the overall NWMO communications strategy.								
Assumptions	The NWMO will continue to develop corporate communication material at the same level as it has. More and different types of information will need to be made available as the NWMO begins to work with communities on a local basis as part of the siting process.								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	· 2010 560K · 2011 360K · 2012 360K · 2013 360K · 2014 360K · 2015-2094, same level of spending, 360K/year · 2095-2164 - Y155 $100K/yr · 2165-2189 $200K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,600,000	$ 3,600,000	$ 900,000	$ 4,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	110			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	DIRECTED COMMUNICATIONS								
Description	Support the NWMO's communication and engagement activities through the development of various corporate communication collateral including: · Backgrounders · Fact Sheets · Trade Show Booths · Newsletters · Etc.								
Deliverable	The communication collateral will bridge print, web development, graphic design, video and social media to provide written, digital and multimedia communications solutions that are aligned with and contribute to the overall NWMO communications strategy.								
Assumptions	The NWMO will continue to develop corporate communication material at the same level as it has. More and different types of information will need to be made available as the NWMO begins to work with communities on a local basis as part of the siting process.								
Schedule	Start Year		26	2035			Finish Year	85	2094
Type	Fixed								
Calculations and Notes:	· 2010 560K · 2011 360K · 2012 360K · 2013 360K · 2014 360K · 2015-2094, same level of spending, 360K/year · 2095-2164 - Y155 $100K/yr · 2165-2189 $200K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 21,600,000	$ 21,600,000	$ 5,400,000	$ 27,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	50	80			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	DIRECTED COMMUNICATIONS								
Description	Support the NWMO's communication and engagement activities through the development of various corporate communication collateral including: · Backgrounders · Fact Sheets · Trade Show Booths · Newsletters · Etc.								
Deliverable	The communication collateral will bridge print, web development, graphic design, video and social media to provide written, digital and multimedia communications solutions that are aligned with and contribute to the overall NWMO communications strategy.								
Assumptions	The NWMO will continue to develop corporate communication material at the same level as it has. More and different types of information will need to be made available as the NWMO begins to work with communities on a local basis as part of the siting process.								
Schedule	Start Year		86	2095			Finish Year	155	2164
Type	Fixed								
Calculations and Notes:	· 2010 560K · 2011 360K · 2012 360K · 2013 360K · 2014 360K · 2015-2094, same level of spending, 360K/year · 2095-2164 - Y155 $100K/yr · 2165-2189 $200K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 7,000,000	$ 7,000,000	$ 1,750,000	$ 8,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	60	40			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	DIRECTED COMMUNICATIONS								
Description	Support the NWMO's communication and engagement activities through the development of various corporate communication collateral including: · Backgrounders · Fact Sheets · Trade Show Booths · Newsletters · Etc.								
Deliverable	The communication collateral will bridge print, web development, graphic design, video and social media to provide written, digital and multimedia communications solutions that are aligned with and contribute to the overall NWMO communications strategy.								
Assumptions	The NWMO will continue to develop corporate communication material at the same level as it has. More and different types of information will need to be made available as the NWMO begins to work with communities on a local basis as part of the siting process.								
Schedule	Start Year		156	2165			Finish Year	180	2189
Type	Fixed								
Calculations and Notes:	· 2010 560K · 2011 360K · 2012 360K · 2013 360K · 2014 360K · 2015-2094, same level of spending, 360K/year · 2095-2164 - Y155 $100K/yr · 2165-2189 $200K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 5,000,000	$ 5,000,000	$ 1,250,000	$ 6,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	200			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	TRANSLATION								
Description	Translation of all NWMO communication material.								
Deliverable	Translate all NWMO communication material into French. (i.e. print/audio/visual/website) into French.								
Assumptions	Assumes that the level of translation remains the same on an annual basis. The company should consider whether hiring a translator on full-time is more cost-efficient. Depending on the communities that the NWMO works with on a local basis, translation into other languages may be required. Does not assume aboriginal translation.								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	· 2010, 220K · 2011, $50k; 2012-2094, 120K/year · 2095 - 2189 $40K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,110,000	$ 1,110,000	$ 277,500	$ 1,387,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	190			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	TRANSLATION								
Description	Translation of all NWMO communication material.								
Deliverable	Translate all NWMO communication material into French. (i.e. print/audio/visual/website) into French.								
Assumptions	Assumes that the level of translation remains the same on an annual basis. The company should consider whether hiring a translator on full-time is more cost-efficient. Depending on the communities that the NWMO works with on a local basis, translation into other languages may be required. Does not assume aboriginal translation.								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	· 2010, 220K · 2011, $50k; 2012-2094, 120K/year · 2095 - 2189 $40K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 720,000	$ 720,000	$ 180,000	$ 900,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	170			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	TRANSLATION								
Description	Translation of all NWMO communication material.								
Deliverable	Translate all NWMO communication material into French. (i.e. print/audio/visual/website) into French.								
Assumptions	Assumes that the level of translation remains the same on an annual basis. The company should consider whether hiring a translator on full-time is more cost-efficient. Depending on the communities that the NWMO works with on a local basis, translation into other languages may be required. Does not assume aboriginal translation.								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	· 2010, 220K · 2011, $50k; 2012-2094, 120K/year · 2095 - 2189 $40K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,200,000	$ 1,200,000	$ 300,000	$ 1,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	120			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	TRANSLATION								
Description	Translation of all NWMO communication material.								
Deliverable	Translate all NWMO communication material into French. (i.e. print/audio/visual/website) into French.								
Assumptions	Assumes that the level of translation remains the same on an annual basis. The company should consider whether hiring a translator on full-time is more cost-efficient. Depending on the communities that the NWMO works with on a local basis, translation into other languages may be required. Does not assume aboriginal translation.								
Schedule	Start Year		26	2035			Finish Year	85	2094
Type	Fixed								
Calculations and Notes:	· 2010, 220K · 2011, $50k; 2012-2094, 120K/year · 2095 - 2189 $40K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 7,200,000	$ 7,200,000	$ 1,800,000	$ 9,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	50	90			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	TRANSLATION								
Description	Translation of all NWMO communication material.								
Deliverable	Translate all NWMO communication material into French. (i.e. print/audio/visual/website) into French.								
Assumptions	Assumes that the level of translation remains the same on an annual basis. The company should consider whether hiring a translator on full-time is more cost-efficient. Depending on the communities that the NWMO works with on a local basis, translation into other languages may be required. Does not assume aboriginal translation.								
Schedule	Start Year		86	2095			Finish Year	155	2164
Type	Fixed								
Calculations and Notes:	· 2010, 220K · 2011, $50k; 2012-2094, 120K/year · 2095 - 2189 $40K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,800,000	$ 2,800,000	$ 700,000	$ 3,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	60	50			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	TRANSLATION								
Description	Translation of all NWMO communication material.								
Deliverable	Translate all NWMO communication material into French. (i.e. print/audio/visual/website) into French.								
Assumptions	Assumes that the level of translation remains the same on an annual basis. The company should consider whether hiring a translator on full-time is more cost-efficient. Depending on the communities that the NWMO works with on a local basis, translation into other languages may be required. Does not assume aboriginal translation.								
Schedule	Start Year		156	2165			Finish Year	180	2189
Type	Fixed								
Calculations and Notes:	· 2010, 220K · 2011, $50k; 2012-2094, 120K/year · 2095 - 2189 $40K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,000,000	$ 1,000,000	$ 250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	210			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA RELATIONS								
Description	Media relations activities to support the NWMO's communication and engagement activities.								
Deliverable	Development and execution of media relations activities on a corporate and local basis.								
Assumptions	Assumes that as the NWMO works more closely with communities and regions, more detailed media relations plans will be developed and executed.								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $50K; 2011 $126K; 2012 - 2014 $50K. · 2015-2094, same level of spending, 50K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 426,000	$ 426,000	$ 106,500	$ 532,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	200			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA RELATIONS								
Description	Media relations activities to support the NWMO's communication and engagement activities.								
Deliverable	Development and execution of media relations activities on a corporate and local basis.								
Assumptions	Assumes that as the NWMO works more closely with communities and regions, more detailed media relations plans will be developed and executed.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $50K; 2011 $126K; 2012 - 2014 $50K. · 2015-2094, same level of spending, 50K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 300,000	$ 300,000	$ 75,000	$ 375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	180			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA RELATIONS								
Description	Media relations activities to support the NWMO's communication and engagement activities.								
Deliverable	Development and execution of media relations activities on a corporate and local basis.								
Assumptions	Assumes that as the NWMO works more closely with communities and regions, more detailed media relations plans will be developed and executed.								
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $50K; 2011 $126K; 2012 - 2014 $50K. · 2015-2094, same level of spending, 50K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 500,000	$ 500,000	$ 125,000	$ 625,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	130			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MEDIA RELATIONS								
Description	Media relations activities to support the NWMO's communication and engagement activities.								
Deliverable	Development and execution of media relations activities on a corporate and local basis.								
Assumptions	Assumes that as the NWMO works more closely with communities and regions, more detailed media relations plans will be developed and executed.								
Schedule	Start Year		26	2035		Finish Year	85	2094	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $50K; 2011 $126K; 2012 - 2014 $50K. · 2015-2094, same level of spending, 50K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,000,000	$ 3,000,000	$ 750,000	$ 3,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	220			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CORPORATE CITIZENSHIP								
Description	The Nuclear Waste Management Organization (NWMO) has developed and implemented a Corporate Citizenship Program to enhance the organization's brand and image.								
Deliverable	Develop the focus for the Corporate Citizenship Program on an annual basis including themes for support.								
Assumptions	The NWMO's organizational mandate straddles both national and local parameters · The APM project is framed as a national infrastructure project but its impact is felt at the local level The scope for NWMO's corporate citizenship investments are anchored around identifying initiatives that build our brand nationally, and earn our reputation locally through a series of investments · 2008-2010: focused on 4 provinces; going forward, recognition that the scope of geographical focus may shift · Fluid framework to allow for regional expansion where we are active								
Schedule	Start Year		1	2010		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010-2014 200K/year · 2015-2094, same level of spending, 200K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,800,000	$ 1,800,000	$ 450,000	$ 2,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	210			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CORPORATE CITIZENSHIP								
Description	The Nuclear Waste Management Organization (NWMO) has developed and implemented a Corporate Citizenship Program to enhance the organization's brand and image.								
Deliverable	Develop the focus for the Corporate Citizenship Program on an annual basis including themes for support.								
Assumptions	The NWMO's organizational mandate straddles both national and local parameters · The APM project is framed as a national infrastructure project but its impact is felt at the local level The scope for NWMO's corporate citizenship investments are anchored around identifying initiatives that build our brand nationally, and earn our reputation locally through a series of investments · 2008-2010: focused on 4 provinces; going forward, recognition that the scope of geographical focus may shift · Fluid framework to allow for regional expansion where we are active								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010-2014 200K/year · 2015-2094, same level of spending, 200K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,200,000	$ 1,200,000	$ 300,000	$ 1,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	190			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CORPORATE CITIZENSHIP								
Description	The Nuclear Waste Management Organization (NWMO) has developed and implemented a Corporate Citizenship Program to enhance the organization's brand and image.								
Deliverable	Develop the focus for the Corporate Citizenship Program on an annual basis including themes for support.								
Assumptions	The NWMO's organizational mandate straddles both national and local parameters · The APM project is framed as a national infrastructure project but its impact is felt at the local level The scope for NWMO's corporate citizenship investments are anchored around identifying initiatives that build our brand nationally, and earn our reputation locally through a series of investments · 2008-2010: focused on 4 provinces; going forward, recognition that the scope of geographical focus may shift · Fluid framework to allow for regional expansion where we are active								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010-2014 200K/year · 2015-2094, same level of spending, 200K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,000,000	$ 2,000,000	$ 500,000	$ 2,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	140			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	CORPORATE CITIZENSHIP								
Description	The Nuclear Waste Management Organization (NWMO) has developed and implemented a Corporate Citizenship Program to enhance the organization's brand and image.								
Deliverable	Develop the focus for the Corporate Citizenship Program on an annual basis including themes for support.								
Assumptions	The NWMO's organizational mandate straddles both national and local parameters · The APM project is framed as a national infrastructure project but its impact is felt at the local level The scope for NWMO's corporate citizenship investments are anchored around identifying initiatives that build our brand nationally, and earn our reputation locally through a series of investments · 2008-2010: focused on 4 provinces; going forward, recognition that the scope of geographical focus may shift · Fluid framework to allow for regional expansion where we are active								
Schedule	Start Year		26	2035			Finish Year	85	2094
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010-2014 200K/year · 2015-2094, same level of spending, 200K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 12,000,000	$ 12,000,000	$ 3,000,000	$ 15,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	230			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MAILING								
Description	Cost of postage for NWMO mailings.								
Deliverable	The NWMO has a suite of corporate communication material that is mailed to those individuals on the NWMO mailing list.								
Assumptions	Assumes mailing of Annual Report, 4 newsletters, Implementation Plan (2) etc. Costs are expected to rise with the cost of postage rising as well as the number of people on the NWMO mailing list.								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	· 2010 $50K; 2011 $40K; 2012 - 2014 $50K/year · 2015-2094, same level of spending, 50K/year · Y86 - Y180 $10K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 440,000	$ 440,000	$ 110,000	$ 550,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	220			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MAILING								
Description	Cost of postage for NWMO mailings.								
Deliverable	The NWMO has a suite of corporate communication material that is mailed to those individuals on the NWMO mailing list.								
Assumptions	Assumes mailing of Annual Report, 4 newsletters, Implementation Plan (2) etc. Costs are expected to rise with the cost of postage rising as well as the number of people on the NWMO mailing list.								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	· 2010 $50K; 2011 $40K; 2012 - 2014 $50K/year · 2015-2094, same level of spending, 50K/year · Y86 - Y180 $10K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 300,000	$ 300,000	$	75,000	$ 375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	200			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MAILING								
Description	Cost of postage for NWMO mailings.								
Deliverable	The NWMO has a suite of corporate communication material that is mailed to those individuals on the NWMO mailing list.								
Assumptions	Assumes mailing of Annual Report, 4 newsletters, Implementation Plan (2) etc. Costs are expected to rise with the cost of postage rising as well as the number of people on the NWMO mailing list.								
Schedule	Start Year			16	2025		Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	· 2010 $50K; 2011 $40K; 2012 - 2014 $50K/year · 2015-2094, same level of spending, 50K/year · Y86 - Y180 $10K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 500,000	$ 500,000	$ 125,000	$ 625,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	150			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MAILING								
Description	Cost of postage for NWMO mailings.								
Deliverable	The NWMO has a suite of corporate communication material that is mailed to those individuals on the NWMO mailing list.								
Assumptions	Assumes mailing of Annual Report, 4 newsletters, Implementation Plan (2) etc. Costs are expected to rise with the cost of postage rising as well as the number of people on the NWMO mailing list.								
Schedule	Start Year			26	2035		Finish Year	85	2094
Type	Fixed								
Calculations and Notes:	· 2010 $50K; 2011 $40K; 2012 - 2014 $50K/year · 2015-2094, same level of spending, 50K/year · Y86 - Y180 $10K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,000,000	$ 3,000,000	$ 750,000	$ 3,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	50	120			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MAILING								
Description	Cost of postage for NWMO mailings.								
Deliverable	The NWMO has a suite of corporate communication material that is mailed to those individuals on the NWMO mailing list.								
Assumptions	Assumes mailing of Annual Report, 4 newsletters, Implementation Plan (2) etc. Costs are expected to rise with the cost of postage rising as well as the number of people on the NWMO mailing list.								
Schedule	Start Year			86	2095		Finish Year	155	2164
Type	Fixed								
Calculations and Notes:	· 2010 $50K; 2011 $40K; 2012 - 2014 $50K/year · 2015-2094, same level of spending, 50K/year · Y86 - Y180 $10K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 700,000	$ 700,000	$ 175,000	$ 875,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	60	60			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	MAILING								
Description	Cost of postage for NWMO mailings.								
Deliverable	The NWMO has a suite of corporate communication material that is mailed to those individuals on the NWMO mailing list.								
Assumptions	Assumes mailing of Annual Report, 4 newsletters, Implementation Plan (2) etc. Costs are expected to rise with the cost of postage rising as well as the number of people on the NWMO mailing list.								
Schedule	Start Year			156	2165		Finish Year	180	2189
Type	Fixed								
Calculations and Notes:	· 2010 $50K; 2011 $40K; 2012 - 2014 $50K/year · 2015-2094, same level of spending, 50K/year · Y86 - Y180 $10K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 250,000	$ 250,000	$ 62,500	$ 312,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	240			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	PREMIUM PROGRAM								
Description	NWMO program of small gifts, giveaways promotional products at conferences, trade shows etc. Intended to support the organization's communications and engagement activities.								
Deliverable	Develop a comprehensive premium program with a suite of giveaways (pens, clothing etc.)								
Assumptions	Assumes that the premium program will be constant but that more products may be required due to increased level of activities at the local community level as part of siting.								
Schedule	Start Year		1	2010		Finish Year		9	2018
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $75K; 2011 $50K; 2012 - 2014 $75K/year · 2015-2094, same level of spending, 75K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 650,000	$ 650,000	$ 162,500	$ 812,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	230			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	PREMIUM PROGRAM								
Description	NWMO program of small gifts, giveaways promotional products at conferences, trade shows etc. Intended to support the organization's communications and engagement activities.								
Deliverable	Develop a comprehensive premium program with a suite of giveaways (pens, clothing etc.)								
Assumptions	Assumes that the premium program will be constant but that more products may be required due to increased level of activities at the local community level as part of siting.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $75K; 2011 $50K; 2012 - 2014 $75K/year · 2015-2094, same level of spending, 75K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 450,000	$ 450,000	$ 112,500	$ 562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	210			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	PREMIUM PROGRAM								
Description	NWMO program of small gifts, giveaways promotional products at conferences, trade shows etc. Intended to support the organization's communications and engagement activities.								
Deliverable	Develop a comprehensive premium program with a suite of giveaways (pens, clothing etc.)								
Assumptions	Assumes that the premium program will be constant but that more products may be required due to increased level of activities at the local community level as part of siting.								
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $75K; 2011 $50K; 2012 - 2014 $75K/year · 2015-2094, same level of spending, 75K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$ 187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	160			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	PREMIUM PROGRAM								
Description	NWMO program of small gifts, giveaways promotional products at conferences, trade shows etc. Intended to support the organization's communications and engagement activities.								
Deliverable	Develop a comprehensive premium program with a suite of giveaways (pens, clothing etc.)								
Assumptions	Assumes that the premium program will be constant but that more products may be required due to increased level of activities at the local community level as part of siting.								
Schedule	Start Year		26	2035		Finish Year	85	2094	
Type	Fixed								
Calculations and Notes:	· Board approved budget 2010 $75K; 2011 $50K; 2012 - 2014 $75K/year · 2015-2094, same level of spending, 75K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 4,500,000	$ 4,500,000	$ 1,125,000	$ 5,625,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	250			**Prepared By:**	J Robinson
WBS (Old)									
WBS Title	YOUTH COMMUNICATIONS								
Description	The NWMO has established a program to engage youth on the work of the NWMO and the long-term management of used nuclear fuel due to the multi-generational nature of the long term management of used nuclear fuel.								
Deliverable	Annual Youth Engagement Program								
Assumptions	Assumes that as the NWMO works more closely with communities and regions, a more detailed local youth engagement program will be developed and executed.								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	2010, 160K 2011-2034 100K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 960,000	$ 960,000	$ 240,000	$ 1,200,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	240			**Prepared By:**	J Robinson
WBS (Old)									
WBS Title	YOUTH COMMUNICATIONS								
Description	The NWMO has established a program to engage youth on the work of the NWMO and the long-term management of used nuclear fuel due to the multi-generational nature of the long term management of used nuclear fuel.								
Deliverable	Annual Youth Engagement Program								
Assumptions	Assumes that as the NWMO works more closely with communities and regions, a more detailed local youth engagement program will be developed and executed.								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	2010, 160K 2011-2034 100K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 600,000	$ 600,000	$ 150,000	$ 750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	220			**Prepared By:**	J Robinson
WBS (Old)									
WBS Title	YOUTH COMMUNICATIONS								
Description	The NWMO has established a program to engage youth on the work of the NWMO and the long-term management of used nuclear fuel due to the multi-generational nature of the long term management of used nuclear fuel.								
Deliverable	Annual Youth Engagement Program								
Assumptions	Assumes that as the NWMO works more closely with communities and regions, a more detailed local youth engagement program will be developed and executed.								
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	2010, 160K 2011-2034 100K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,000,000	$ 1,000,000	$ 250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	90			**Prepared By:**	J. Robinson, P. Patton
WBS (Old)									
WBS Title	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION								
Description	Develop culturally-appropriate communication material that will be used to assist Aboriginal peoples in communities affected through the site selection process in understanding the NWMO, the long-term management of used nuclear fuel, to ensure that affected Aboriginal peoples are involved and able to make informed decisions.								
Deliverable	- Individual communication products for general use that explain the various components of the NWMO's work – DVD, brochures. - Translation of appropriate materials into Aboriginal languages common to the potential host community region - Y2-3: Engage with Aboriginal peoples in the areas of potential host communities involved in Feasibility Study to ensure that communication material is culturally appropriate; development of materials - Y4 onwards: communication materials development specific to Aboriginal communities in areas undergoing Detailed Analysis - Translators travelling with NWMO when engaging community members								
Assumptions	- Consultant/contractors with expertise to assisting in designing culturally appropriate material - Translators in appropriate languages - Development, printing and production of written, visual, web-based and interactive communication products - Independent contractors to Aboriginal communities to assist communities in reviewing and developing appropriate material - Translation services will continue in construction and operation to assist NWMO in communicating with local communities								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	Y1-Y15: $125,000 per year Y16-Y85: $100,000 Y86 - Y155 $10K/yr Y156 - Y180 $25K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,125,000	$ 1,125,000	$ 281,250	$ 1,406,250

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	90			**Prepared By:**	J. Robinson, P. Patton
WBS (Old)									
WBS Title	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION								
Description	Develop culturally-appropriate communication material that will be used to assist Aboriginal peoples in communities affected through the site selection process in understanding the NWMO, the long-term management of used nuclear fuel, to ensure that affected Aboriginal peoples are involved and able to make informed decisions.								
Deliverable	- Individual communication products for general use that explain the various components of the NWMO's work – DVD, brochures. - Translation of appropriate materials into Aboriginal languages common to the potential host community region - Y2-3: Engage with Aboriginal peoples in the areas of potential host communities involved in Feasibility Study to ensure that communication material is culturally appropriate; development of materials - Y4 onwards: communication materials development specific to Aboriginal communities in areas undergoing Detailed Analysis - Translators travelling with NWMO when engaging community members								
Assumptions	- Consultant/contractors with expertise to assisting in designing culturally appropriate material - Translators in appropriate languages - Development, printing and production of written, visual, web-based and interactive communication products - Independent contractors to Aboriginal communities to assist communities in reviewing and developing appropriate material - Translation services will continue in construction and operation to assist NWMO in communicating with local communities								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	Y1-Y15: $125,000 per year Y16-Y85: $100,000 Y86 - Y155 $10K/yr Y156 - Y180 $25K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 600,000	$ 600,000	$ 150,000	$ 750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	70			**Prepared By:**	J. Robinson, P. Patton
WBS (Old)									
WBS Title	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION								
Description	Develop culturally-appropriate communication material that will be used to assist Aboriginal peoples in communities affected through the site selection process in understanding the NWMO, the long-term management of used nuclear fuel, to ensure that affected Aboriginal peoples are involved and able to make informed decisions.								
Deliverable	- Individual communication products for general use that explain the various components of the NWMO's work – DVD, brochures. - Translation of appropriate materials into Aboriginal languages common to the potential host community region - Y2-3: Engage with Aboriginal peoples in the areas of potential host communities involved in Feasibility Study to ensure that communication material is culturally appropriate; development of materials - Y4 onwards: communication materials development specific to Aboriginal communities in areas undergoing Detailed Analysis - Translators travelling with NWMO when engaging community members								
Assumptions	- Consultant/contractors with expertise to assisting in designing culturally appropriate material - Translators in appropriate languages - Development, printing and production of written, visual, web-based and interactive communication products - Independent contractors to Aboriginal communities to assist communities in reviewing and developing appropriate material - Translation services will continue in construction and operation to assist NWMO in communicating with local communities								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	Y1-Y15: $125,000 per year Y16-Y85: $100,000 Y86 - Y155 $10K/yr Y156 - Y180 $25K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,000,000	$ 1,000,000	$ 250,000	$ 1,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	40	20			**Prepared By:**	J. Robinson, P. Patton
WBS (Old)									
WBS Title	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION								
Description	Develop culturally-appropriate communication material that will be used to assist Aboriginal peoples in communities affected through the site selection process in understanding the NWMO, the long-term management of used nuclear fuel, to ensure that affected Aboriginal peoples are involved and able to make informed decisions.								
Deliverable	- Individual communication products for general use that explain the various components of the NWMO's work – DVD, brochures. - Translation of appropriate materials into Aboriginal languages common to the potential host community region - Y2-3: Engage with Aboriginal peoples in the areas of potential host communities involved in Feasibility Study to ensure that communication material is culturally appropriate; development of materials - Y4 onwards: communication materials development specific to Aboriginal communities in areas undergoing Detailed Analysis - Translators travelling with NWMO when engaging community members								
Assumptions	- Consultant/contractors with expertise to assisting in designing culturally appropriate material - Translators in appropriate languages - Development, printing and production of written, visual, web-based and interactive communication products - Independent contractors to Aboriginal communities to assist communities in reviewing and developing appropriate material - Translation services will continue in construction and operation to assist NWMO in communicating with local communities								
Schedule	Start Year		26	2035			Finish Year	85	2094
Type	Fixed								
Calculations and Notes:	Y1-Y15: $125,000 per year Y16-Y85: $100,000 Y86 - Y155 $10K/yr Y156 - Y180 $25K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,000,000	$ 6,000,000	$ 1,500,000	$ 7,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	50	20			**Prepared By:**	J. Robinson, P. Patton
WBS (Old)									
WBS Title	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION								
Description	Develop culturally-appropriate communication material that will be used to assist Aboriginal peoples in communities affected through the site selection process in understanding the NWMO, the long-term management of used nuclear fuel, to ensure that affected Aboriginal peoples are involved and able to make informed decisions.								
Deliverable	- Individual communication products for general use that explain the various components of the NWMO's work – DVD, brochures. - Translation of appropriate materials into Aboriginal languages common to the potential host community region - Y2-3: Engage with Aboriginal peoples in the areas of potential host communities involved in Feasibility Study to ensure that communication material is culturally appropriate; development of materials - Y4 onwards: communication materials development specific to Aboriginal communities in areas undergoing Detailed Analysis - Translators travelling with NWMO when engaging community members								
Assumptions	- Consultant/contractors with expertise to assisting in designing culturally appropriate material - Translators in appropriate languages - Development, printing and production of written, visual, web-based and interactive communication products - Independent contractors to Aboriginal communities to assist communities in reviewing and developing appropriate material - Translation services will continue in construction and operation to assist NWMO in communicating with local communities								
Schedule	Start Year		86	2095			Finish Year	155	2164
Type	Fixed								
Calculations and Notes:	Y1-Y15: $125,000 per year Y16-Y85: $100,000 Y86 - Y155 $10K/yr Y156 - Y180 $25K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 700,000	$ 700,000	$ 175,000	$ 875,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	60	20			**Prepared By:**	J. Robinson, P. Patton
WBS (Old)									
WBS Title	ABORIGINAL COMMUNICATIONS – MATERIAL PRODUCTION								
Description	Develop culturally-appropriate communication material that will be used to assist Aboriginal peoples in communities affected through the site selection process in understanding the NWMO, the long-term management of used nuclear fuel, to ensure that affected Aboriginal peoples are involved and able to make informed decisions.								
Deliverable	- Individual communication products for general use that explain the various components of the NWMO's work – DVD, brochures. - Translation of appropriate materials into Aboriginal languages common to the potential host community region - Y2-3: Engage with Aboriginal peoples in the areas of potential host communities involved in Feasibility Study to ensure that communication material is culturally appropriate; development of materials - Y4 onwards: communication materials development specific to Aboriginal communities in areas undergoing Detailed Analysis - Translators travelling with NWMO when engaging community members								
Assumptions	- Consultant/contractors with expertise to assisting in designing culturally appropriate material - Translators in appropriate languages - Development, printing and production of written, visual, web-based and interactive communication products - Independent contractors to Aboriginal communities to assist communities in reviewing and developing appropriate material - Translation services will continue in construction and operation to assist NWMO in communicating with local communities								
Schedule	Start Year		156	2165			Finish Year	180	2189
Type	Fixed								
Calculations and Notes:	Y1-Y15: $125,000 per year Y16-Y85: $100,000 Y86 - Y155 $10K/yr Y156 - Y180 $25K/yr								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 625,000	$ 625,000	$ 156,250	$ 781,250

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	40			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	NATIONAL ABORIGINAL ORGANIZATIONS								
Description	Maintain relationships with National Aboriginal Organizations to ensure internal capacity to understand the NWMO's work, to engage with the NWMO on an ongoing basis to provide insight on all phases of the project and to support their member organizations in being involved with the NWMO. National Aboriginal organizations will want to ensure that the NWMO and Crown fulfill the duty to consult and accommodate in an appropriate and respectful manner and that Aboriginal and treaty rights are protected. Support to national Aboriginal organizations will require consistent contact/liaison with the NWMO and internal capacity regarding the long-term management of used nuclear fuel.								
Deliverable	- Annual briefings and training of national Aboriginal organization core staff. - Consistent liaison mechanism with organizations - Organization input to NWMO documents and projects as requested over time								
Assumptions	- National Aboriginal organizations have limited capacity to sustain involvement on this subject over the very long term - NWMO will need to make considerable effort to ensure consistent liaison - Funds will be required to ensure that national Aboriginal organizations are able to devote the effort needed to maintain a consistent liaison with the NWMO; this will normally be interpreted as the need for partial funding of a liaison person and associated administrative expenses. - National organizations will request funds to conduct independent research and/or observation to ensure fulfillment of duty to consult and accommodate - Funds will be required through at least the beginning of the project Y1-6 and may be required over an extended period at least to completion of the Environmental Assessment and license (Y25-2034)								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	Individual organization funding for part of on FTE along with travel, overhead expenses, research/independent observation, training sessions with NWMO: Y1-Y2 (2010-2011): $520K – Years of capacity building, support and monitoring NWMO commitments & action Y3-5 (2012-2014): $460K - Years of capacity building, support and monitoring NWMO commitments & action Y 6-Y9 (2015-2018): $530K per year – Negotiation of agreements and EA process will be scrutinized closely Y10-Y15 (2019-2024): $340K per year - Negotiation of agreements and EA process will be scrutinized closely Y16-Y25 (2025-2034): $225K per year – Monitoring and observation								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 4,540,000	$ 4,540,000	$ 1,135,000	$ 5,675,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	40			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	NATIONAL ABORIGINAL ORGANIZATIONS								
Description	Maintain relationships with National Aboriginal Organizations to ensure internal capacity to understand the NWMO's work, to engage with the NWMO on an ongoing basis to provide insight on all phases of the project and to support their member organizations in being involved with the NWMO. National Aboriginal organizations will want to ensure that the NWMO and Crown fulfill the duty to consult and accommodate in an appropriate and respectful manner and that Aboriginal and treaty rights are protected. Support to national Aboriginal organizations will require consistent contact/liaison with the NWMO and internal capacity regarding the long-term management of used nuclear fuel.								
Deliverable	- Annual briefings and training of national Aboriginal organization core staff. - Consistent liaison mechanism with organizations - Organization input to NWMO documents and projects as requested over time								
Assumptions	- National Aboriginal organizations have limited capacity to sustain involvement on this subject over the very long term - NWMO will need to make considerable effort to ensure consistent liaison - Funds will be required to ensure that national Aboriginal organizations are able to devote the effort needed to maintain a consistent liaison with the NWMO; this will normally be interpreted as the need for partial funding of a liaison person and associated administrative expenses. - National organizations will request funds to conduct independent research and/or observation to ensure fulfillment of duty to consult and accommodate - Funds will be required through at least the beginning of the project Y1-6 and may be required over an extended period at least to completion of the Environmental Assessment and license (Y25-2034)								
Schedule	Start Year	10	2019			Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:	Individual organization funding for part of on FTE along with travel, overhead expenses, research/independent observation, training sessions with NWMO: Y1-Y2 (2010-2011): $520K – Years of capacity building, support and monitoring NWMO commitments & action Y3-5 (2012-2014): $460K - Years of capacity building, support and monitoring NWMO commitments & action Y 6-Y9 (2015-2018): $530K per year – Negotiation of agreements and EA process will be scrutinized closely Y10-Y15 (2019-2024): $340K per year - Negotiation of agreements and EA process will be scrutinized closely Y16-Y25 (2025-2034): $225K per year – Monitoring and observation								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,040,000	$ 2,040,000	$ 510,000	$ 2,550,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	20			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	NATIONAL ABORIGINAL ORGANIZATIONS								
Description	Maintain relationships with National Aboriginal Organizations to ensure internal capacity to understand the NWMO's work, to engage with the NWMO on an ongoing basis to provide insight on all phases of the project and to support their member organizations in being involved with the NWMO. National Aboriginal organizations will want to ensure that the NWMO and Crown fulfill the duty to consult and accommodate in an appropriate and respectful manner and that Aboriginal and treaty rights are protected. Support to national Aboriginal organizations will require consistent contact/liaison with the NWMO and internal capacity regarding the long-term management of used nuclear fuel.								
Deliverable	- Annual briefings and training of national Aboriginal organization core staff. - Consistent liaison mechanism with organizations - Organization input to NWMO documents and projects as requested over time								
Assumptions	- National Aboriginal organizations have limited capacity to sustain involvement on this subject over the very long term - NWMO will need to make considerable effort to ensure consistent liaison - Funds will be required to ensure that national Aboriginal organizations are able to devote the effort needed to maintain a consistent liaison with the NWMO; this will normally be interpreted as the need for partial funding of a liaison person and associated administrative expenses. - National organizations will request funds to conduct independent research and/or observation to ensure fulfillment of duty to consult and accommodate - Funds will be required through at least the beginning of the project Y1-6 and may be required over an extended period at least to completion of the Environmental Assessment and license (Y25-2034)								
Schedule	Start Year	16	2025			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	Individual organization funding for part of on FTE along with travel, overhead expenses, research/independent observation, training sessions with NWMO: Y1-Y2 (2010-2011): $520K – Years of capacity building, support and monitoring NWMO commitments & action Y3-5 (2012-2014): $460K - Years of capacity building, support and monitoring NWMO commitments & action Y 6-Y9 (2015-2018): $530K per year – Negotiation of agreements and EA process will be scrutinized closely Y10-Y15 (2019-2024): $340K per year - Negotiation of agreements and EA process will be scrutinized closely Y16-Y25 (2025-2034): $225K per year – Monitoring and observation								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,250,000	$ 2,250,000	$ 562,500	$ 2,812,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	50			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL PROVINICAL ORGANIZATIONS								
Description	Maintain relationships with provincial Aboriginal Organizations to ensure internal capacity to understand the NWMO's work, to engage with the NWMO on an ongoing basis to provide insight on all phases of the project and to support their member organizations in being involved with the NWMO. Provincial Aboriginal organizations will want to ensure that the NWMO and Crown fulfill the duty to consult and accommodate in an appropriate and respectful manner and that Aboriginal and treaty rights are protected. Support to provincial Aboriginal organizations will require consistent contact/liaison with the NWMO and internal capacity regarding the long-term management of used nuclear fuel.								
Deliverable	- Annual briefings and training of provincial Aboriginal organization core staff. - Input to NWMO documents and projects as requested over time - Annual update of provincial membership to apprise of NWMO work								
Assumptions	- Provincial Aboriginal organizations have limited capacity to sustain involvement on this subject over the very long term - NWMO will need to make considerable effort to ensure consistent liaison - Funds will be required to ensure that provincial Aboriginal organizations are able to devote the effort needed to maintain a consistent liaison with the NWMO; this will normally be interpreted as the partial funding of a liaison person and associated administrative expenses. - Funds will be required through at least the beginning of the project and may be required over an extended period at least to completion of the Environmental Assessment and license (Y34) - Provincial/regional organizations will request funds to conduct independent research and/or observation to ensure fulfillment of duty to consult and accommodate - Initially funds will be needed in all four provinces Y1-Y4; in Y4 funds will be needed for the provinces in which the potential site communities are located and at a minimum the 3 nuclear energy production provinces for the purposes of the transportation network; assume minimum 3 provinces Note: This has not provided for substantive involvement beyond the four nuclear provinces								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	Individual organization funding for part of on FTE along with travel, overhead expenses, research/independent observation, training sessions with NWMO: Y1 (2010) $590K; Y2 (2011) $882K; Years of capacity building, support and monitoring NWMO commitments & action Y3-9 (2012-2018): $652K per year; Years of capacity building, support and monitoring NWMO commitments & action; Negotiation of agreements and EA process will be scrutinized closely Y10-Y15 (2019- 2024): $492K per year; Negotiation of agreements and EA process will be scrutinized closely Y16-25 (2025-2034): $417K per year; Monitoring and observation								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,036,000	$ 6,036,000	$ 1,509,000	$ 7,545,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	50			**Prepared By:**	P. Patton
WBS (Old)									

WBS Title	ABORIGINAL PROVINICAL ORGANIZATIONS
Description	Maintain relationships with provincial Aboriginal Organizations to ensure internal capacity to understand the NWMO's work, to engage with the NWMO on an ongoing basis to provide insight on all phases of the project and to support their member organizations in being involved with the NWMO. Provincial Aboriginal organizations will want to ensure that the NWMO and Crown fulfill the duty to consult and accommodate in an appropriate and respectful manner and that Aboriginal and treaty rights are protected. Support to provincial Aboriginal organizations will require consistent contact/liaison with the NWMO and internal capacity regarding the long-term management of used nuclear fuel.
Deliverable	- Annual briefings and training of provincial Aboriginal organization core staff. - Input to NWMO documents and projects as requested over time - Annual update of provincial membership to apprise of NWMO work
Assumptions	- Provincial Aboriginal organizations have limited capacity to sustain involvement on this subject over the very long term - NWMO will need to make considerable effort to ensure consistent liaison - Funds will be required to ensure that provincial Aboriginal organizations are able to devote the effort needed to maintain a consistent liaison with the NWMO; this will normally be interpreted as the partial funding of a liaison person and associated administrative expenses. - Funds will be required through at least the beginning of the project and may be required over an extended period at least to completion of the Environmental Assessment and license (Y34) - Provincial/regional organizations will request funds to conduct independent research and/or observation to ensure fulfillment of duty to consult and accommodate - Initially funds will be needed in all four provinces Y1-Y4; in Y4 funds will be needed for the provinces in which the potential site communities are located and at a minimum the 3 nuclear energy production provinces for the purposes of the transportation network; assume minimum 3 provinces Note: This has not provided for substantive involvement beyond the four nuclear provinces
Schedule	Start Year 10 2019 Finish Year 15 2024
Type	Fixed
Calculations and Notes:	Individual organization funding for part of on FTE along with travel, overhead expenses, research/independent observation, training sessions with NWMO: Y1 (2010) $590K; Y2 (2011) $882K; Years of capacity building, support and monitoring NWMO commitments & action Y3-9 (2012-2018): $652K per year; Years of capacity building, support and monitoring NWMO commitments & action; Negotiation of agreements and EA process will be scrutinized closely Y10-Y15 (2019- 2024): $492K per year; Negotiation of agreements and EA process will be scrutinized closely Y16-25 (2025-2034): $417K per year; Monitoring and observation

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,952,000	$ 2,952,000	$ 738,000	$ 3,690,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	30			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL PROVINICAL ORGANIZATIONS								
Description	Maintain relationships with provincial Aboriginal Organizations to ensure internal capacity to understand the NWMO's work, to engage with the NWMO on an ongoing basis to provide insight on all phases of the project and to support their member organizations in being involved with the NWMO. Provincial Aboriginal organizations will want to ensure that the NWMO and Crown fulfill the duty to consult and accommodate in an appropriate and respectful manner and that Aboriginal and treaty rights are protected. Support to provincial Aboriginal organizations will require consistent contact/liaison with the NWMO and internal capacity regarding the long-term management of used nuclear fuel.								
Deliverable	- Annual briefings and training of provincial Aboriginal organization core staff. - Input to NWMO documents and projects as requested over time - Annual update of provincial membership to apprise of NWMO work								
Assumptions	- Provincial Aboriginal organizations have limited capacity to sustain involvement on this subject over the very long term - NWMO will need to make considerable effort to ensure consistent liaison - Funds will be required to ensure that provincial Aboriginal organizations are able to devote the effort needed to maintain a consistent liaison with the NWMO; this will normally be interpreted as the partial funding of a liaison person and associated administrative expenses. - Funds will be required through at least the beginning of the project and may be required over an extended period at least to completion of the Environmental Assessment and license (Y34) - Provincial/regional organizations will request funds to conduct independent research and/or observation to ensure fulfillment of duty to consult and accommodate - Initially funds will be needed in all four provinces Y1-Y4; in Y4 funds will be needed for the provinces in which the potential site communities are located and at a minimum the 3 nuclear energy production provinces for the purposes of the transportation network; assume minimum 3 provinces Note: This has not provided for substantive involvement beyond the four nuclear provinces								
Schedule	Start Year	16	2025	Finish Year	25	2034			
Type	Fixed								
Calculations and Notes:	Individual organization funding for part of on FTE along with travel, overhead expenses, research/independent observation, training sessions with NWMO: Y1 (2010) $590K; Y2 (2011) $882K; Years of capacity building, support and monitoring NWMO commitments & action Y3-9 (2012-2018): $652K per year; Years of capacity building, support and monitoring NWMO commitments & action; Negotiation of agreements and EA process will be scrutinized closely Y10-Y15 (2019- 2024): $492K per year; Negotiation of agreements and EA process will be scrutinized closely Y16-25 (2025-2034): $417K per year; Monitoring and observation								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 4,170,000	$ 4,170,000	$ 1,042,500	$ 5,212,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	60			**Prepared By:**	P. Patton
WBS (Old)									

WBS Title	ABORIGINAL YOUTH INITIATIVES
Description	Aboriginal youth will be involved in a gradual progression of learning and understanding used fuel management beginning with a learning program conducted with the youth of the Elders Forum. As the NWMO works closely with potential host communities and the surrounding Aboriginal communities, the Aboriginal youth in these communities will become involved through the Elders Forum youth and will learn from their experience, gradually taking a leadership role in their own communities through involvement with the Elders Forum. A program of involvement of Aboriginal youth in vicinity of communities in site selection will be important for the long term sustainability of intergenerational transfer of knowledge. Over time the program will involve capacity building projects and summer employment projects to help youth in potentially affected Aboriginal communities understand used fuel management and the APM project. Community Elders will be involved in the guidance and involvement of youth. An annual Aboriginal youth scholarship program to be included in the program development.
Deliverable	- Initial learning sessions for youth of the NWMO Elders Forum - As the Elders Forum transitions to be representative of the Aboriginal communities in the vicinity of potential host communities, information sessions for community youth - Annual scholarship program
Assumptions	- The Elders Forum will wish to continue with a program of development of the youth members to provide for a transition to the youth of the affected Aboriginal communities - Youth involvement should continue through EA licensing

Schedule	Start Year	1	2010	Finish Year	9	2018	
Type	Fixed						
Calculations and Notes:	Y1 (2010): $125K; Y2 (2011): $61K; Projects will be conducted through initiatives of youth of Elders Forum Y3-5: (2012-2014): $175K per year: : Summer Program with youth of Elders Forum assisting youth in affected areas Y 6-25 (2015-2034): $175K per year; Youth liaison program/group with affected Aboriginal communities including involvement of Elders with youth						

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,411,000	$ 1,411,000	$ 352,750	$ 1,763,750

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	60			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL YOUTH INITIATIVES								
Description	Aboriginal youth will be involved in a gradual progression of learning and understanding used fuel management beginning with a learning program conducted with the youth of the Elders Forum. As the NWMO works closely with potential host communities and the surrounding Aboriginal communities, the Aboriginal youth in these communities will become involved through the Elders Forum youth and will learn from their experience, gradually taking a leadership role in their own communities through involvement with the Elders Forum. A program of involvement of Aboriginal youth in vicinity of communities in site selection will be important for the long term sustainability of intergenerational transfer of knowledge. Over time the program will involve capacity building projects and summer employment projects to help youth in potentially affected Aboriginal communities understand used fuel management and the APM project. Community Elders will be involved in the guidance and involvement of youth. An annual Aboriginal youth scholarship program to be included in the program development.								
Deliverable	- Initial learning sessions for youth of the NWMO Elders Forum - As the Elders Forum transitions to be representative of the Aboriginal communities in the vicinity of potential host communities, information sessions for community youth - Annual scholarship program								
Assumptions	- The Elders Forum will wish to continue with a program of development of the youth members to provide for a transition to the youth of the affected Aboriginal communities - Youth involvement should continue through EA licensing								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	Y1 (2010): $125K; Y2 (2011): $61K; Projects will be conducted through initiatives of youth of Elders Forum Y3-5: (2012-2014): $175K per year: : Summer Program with youth of Elders Forum assisting youth in affected areas Y 6-25 (2015-2034): $175K per year; Youth liaison program/group with affected Aboriginal communities including involvement of Elders with youth								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,050,000	$ 1,050,000	$ 262,500	$ 1,312,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	40			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL YOUTH INITIATIVES								
Description	Aboriginal youth will be involved in a gradual progression of learning and understanding used fuel management beginning with a learning program conducted with the youth of the Elders Forum. As the NWMO works closely with potential host communities and the surrounding Aboriginal communities, the Aboriginal youth in these communities will become involved through the Elders Forum youth and will learn from their experience, gradually taking a leadership role in their own communities through involvement with the Elders Forum. A program of involvement of Aboriginal youth in vicinity of communities in site selection will be important for the long term sustainability of intergenerational transfer of knowledge. Over time the program will involve capacity building projects and summer employment projects to help youth in potentially affected Aboriginal communities understand used fuel management and the APM project. Community Elders will be involved in the guidance and involvement of youth. An annual Aboriginal youth scholarship program to be included in the program development.								
Deliverable	- Initial learning sessions for youth of the NWMO Elders Forum - As the Elders Forum transitions to be representative of the Aboriginal communities in the vicinity of potential host communities, information sessions for community youth - Annual scholarship program								
Assumptions	- The Elders Forum will wish to continue with a program of development of the youth members to provide for a transition to the youth of the affected Aboriginal communities - Youth involvement should continue through EA licensing								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	Y1 (2010): $125K; Y2 (2011): $61K; Projects will be conducted through initiatives of youth of Elders Forum Y3-5: (2012-2014): $175K per year: : Summer Program with youth of Elders Forum assisting youth in affected areas Y 6-25 (2015-2034): $175K per year; Youth liaison program/group with affected Aboriginal communities including involvement of Elders with youth								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,750,000	$ 1,750,000	$ 437,500	$ 2,187,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	70			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL AWARENESS BUILDING								
Description	The APM project will require providing ongoing information briefings and general information/awareness programs among Aboriginal people in the provinces where site selection takes place and in general through national Aboriginal organizations. Opportunities to conduct awareness building activities will generally be sought through annual assemblies of national, provincial and regional organizations. Speaking engagements and briefings on request will also be conducted.								
Deliverable	- Tradeshow attendance at annual assembly of provincial and national Aboriginal organizations in affected provinces - Tradeshow attendance on request at regional assemblies								
Assumptions	- National and provincial organizations will request attendance of NWMO at annual assembly to keep members informed on APM - Requests will increase once communities enter Feasibility Study step in siting - Attendance at tradeshows will generate interest in regional areas for NWMO attendance at tradeshows								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	$50K per year 4 national organizations 10 provincial organizations 10 additional requests per year Tradeshow registration fees and staff travel expenses								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 450,000	$ 450,000	$ 112,500	$ 562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	70			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL AWARENESS BUILDING								
Description	The APM project will require providing ongoing information briefings and general information/awareness programs among Aboriginal people in the provinces where site selection takes place and in general through national Aboriginal organizations. Opportunities to conduct awareness building activities will generally be sought through annual assemblies of national, provincial and regional organizations. Speaking engagements and briefings on request will also be conducted.								
Deliverable	- Tradeshow attendance at annual assembly of provincial and national Aboriginal organizations in affected provinces - Tradeshow attendance on request at regional assemblies								
Assumptions	- National and provincial organizations will request attendance of NWMO at annual assembly to keep members informed on APM - Requests will increase once communities enter Feasibility Study step in siting - Attendance at tradeshows will generate interest in regional areas for NWMO attendance at tradeshows								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	$50K per year 4 national organizations 10 provincial organizations 10 additional requests per year Tradeshow registration fees and staff travel expenses								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 300,000	$ 300,000	$ 75,000	$ 375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	50			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL AWARENESS BUILDING								
Description	The APM project will require providing ongoing information briefings and general information/awareness programs among Aboriginal people in the provinces where site selection takes place and in general through national Aboriginal organizations. Opportunities to conduct awareness building activities will generally be sought through annual assemblies of national, provincial and regional organizations. Speaking engagements and briefings on request will also be conducted.								
Deliverable	- Tradeshow attendance at annual assembly of provincial and national Aboriginal organizations in affected provinces - Tradeshow attendance on request at regional assemblies								
Assumptions	- National and provincial organizations will request attendance of NWMO at annual assembly to keep members informed on APM - Requests will increase once communities enter Feasibility Study step in siting - Attendance at tradeshows will generate interest in regional areas for NWMO attendance at tradeshows								
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:	$50K per year 4 national organizations 10 provincial organizations 10 additional requests per year Tradeshow registration fees and staff travel expenses								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 500,000	$ 500,000	$ 125,000	$ 625,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	30			**Prepared By:**	P. Patton
WBS (Old)									

WBS Title ABORIGINAL ENGAGEMENT – ELDERS FORUM, NIIGANI

Description

Elders Forum

The NWMO Elders Forum provides advice to the NWMO in its relationships with Aboriginal peoples and in understanding Aboriginal culture, protocols, practices and Traditional Knowledge. The members of the Elders Forum represent a broad range of interests including, but not limited to, Aboriginal Traditional Knowledge, political affairs, community development, health and welfare, Aboriginal communications, cultural life of community and relationships, community protocols, treaty and historical relationships and youth interests.

· Members of the Elders Forum are residents of each of the four nuclear provinces Saskatchewan, Ontario, Quebec and New Brunswick. The NWMO may also choose, from time-to-time, to accept recommendations of a member from one of Canada's other provinces or territories and the NWMO may, at its discretion, appoint additional members to the Elders Forum.

· Each Elder is invited to ask a young person to accompany him/her to Forum meetings to provide support and, in keeping with Aboriginal cultural teachings, attend Forum meetings to learn from Elders.

· Members are invited to participate in the Elders Forum to bring an Aboriginal perspective to the work of the NWMO.

Niigani

· Niigani membership is composed of 5 Elders and 5 youth, a Chairperson and a Secretary/Facilitator and is chosen by the Elders Forum members from among the Forum membership.

· The NWMO may, from time-to-time at its discretion, appoint additional members to Niigani from among the members of the Elders Forum.

The NWMO recognizes the importance of the continuity of the membership of the Elders Forum while acknowledging that as the APM Site Selection process evolves the membership of the Elders Forum will gradually change to reflect the Aboriginal groups in the vicinity of a potential willing host community, estimated to take place in 2011-2012. In the Feasibility Study step of site selection, the Elders Forum will transition to include Elders representative of the siting communities and in the Detailed Analysis step the Elders Forum will again transition to be representative of the communities in this step. Throughout these transitions the Elders Forum will maintain a select number of representatives that bring a perspective of national and provincial Aboriginal issues.

Once a site has been selected, the negotiation with local Aboriginal communities will determine the nature of an Elders advisory group to the project.

- In first two years of siting (2010-2011), Niigani members will initially provide assistance to NWMO in introductions to Aboriginal peoples in areas of potential host communities.

- During Feasibility Study and Detailed Study years of siting (2012-2024), Niigani members will include Elders from communities involved in these steps who will assist NWMO in understanding the Traditional Knowledge and culture/protocols/practices of their communities and will assist in building relationships with their communities.

Deliverable

- Annual meeting of the Elders Forum: Y1-15
- 3-5 Niigani meetings annually: Y1-15
- Niigani members will assist NWMO in establishing meetings with local, provincial, regional groups and will attend events, tradeshows, meetings along with NWMO

Assumptions

- Elders Forum and Niigani members will assist in program for Aboriginal youth involvement and Traditional Knowledge projects
- Elders Forum will meet a minimum of 1X per year with the possibility of meeting 2X meetings per year if necessary
- Niigani will meet 3-5X per year including an annual meeting with the NWMO Board and Advisory Council
- Niigani members will receive an honorarium for meetings attended along with coverage of travel expenses
- Expense will continue at least to completion of Environmental Assessment and License (Y15)

Schedule	Start Year	1	2010	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Y1 (2010): $705K
Y2 (2011): $627K; Y3-Y5 (2012 - 2014): $604K/year;
Y 6-Y15 (2015-2024): $632K per year

Description:
Elders Forum:
Y1 (2010):$170K;
Y2-Y9 (2011-2018): $180K;
Y10-15 (2019-2024): $200K per year (assumes need for community Elders to be involved and provide insight on project to interested Aboriginal people)

Niigani meeting & assistance:
Y 1: $495K per year (Includes: Niigani Community Involvement Project);
Y2 (2011):$460K (Includes: Niigani Community Involvement Project):
Y3-15 (2012-2024): $382 K per year

Staff travel: Y1: $40K; Y2-5: $42K; Y6-15: $50k

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 5,616,000	$ 5,616,000	$ 1,404,000	$ 7,020,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	30			**Prepared By:**	P. Patton
WBS (Old)									

WBS Title ABORIGINAL ENGAGEMENT – ELDERS FORUM, NIIGANI

Description

Elders Forum

The NWMO Elders Forum provides advice to the NWMO in its relationships with Aboriginal peoples and in understanding Aboriginal culture, protocols, practices and Traditional Knowledge. The members of the Elders Forum represent a broad range of interests including, but not limited to, Aboriginal Traditional Knowledge, political affairs, community development, health and welfare, Aboriginal communications, cultural life of community and relationships, community protocols, treaty and historical relationships and youth interests.

· Members of the Elders Forum are residents of each of the four nuclear provinces Saskatchewan, Ontario, Quebec and New Brunswick. The NWMO may also choose, from time-to-time, to accept recommendations of a member from one of Canada's other provinces or territories and the NWMO may, at its discretion, appoint additional members to the Elders Forum.

· Each Elder is invited to ask a young person to accompany him/her to Forum meetings to provide support and, in keeping with Aboriginal cultural teachings, attend Forum meetings to learn from Elders.

· Members are invited to participate in the Elders Forum to bring an Aboriginal perspective to the work of the NWMO.

Niigani

· Niigani membership is composed of 5 Elders and 5 youth, a Chairperson and a Secretary/Facilitator and is chosen by the Elders Forum members from among the Forum membership.

· The NWMO may, from time-to-time at its discretion, appoint additional members to Niigani from among the members of the Elders Forum.

The NWMO recognizes the importance of the continuity of the membership of the Elders Forum while acknowledging that as the APM Site Selection process evolves the membership of the Elders Forum will gradually change to reflect the Aboriginal groups in the vicinity of a potential willing host community, estimated to take place in 2011-2012. In the Feasibility Study step of site selection, the Elders Forum will transition to include Elders representative of the siting communities and in the Detailed Analysis step the Elders Forum will again transition to be representative of the communities in this step. Throughout these transitions the Elders Forum will maintain a select number of representatives that bring a perspective of national and provincial Aboriginal issues.

Once a site has been selected, the negotiation with local Aboriginal communities will determine the nature of an Elders advisory group to the project.

- In first two years of siting (2010-2011), Niigani members will initially provide assistance to NWMO in introductions to Aboriginal peoples in areas of potential host communities.

- During Feasibility Study and Detailed Study years of siting (2012-2024), Niigani members will include Elders from communities involved in these steps who will assist NWMO in understanding the Traditional Knowledge and culture/protocols/practices of their communities and will assist in building relationships with their communities.

Deliverable

- Annual meeting of the Elders Forum: Y1-15
- 3-5 Niigani meetings annually: Y1-15
- Niigani members will assist NWMO in establishing meetings with local, provincial, regional groups and will attend events, tradeshows, meetings along with NWMO

Assumptions

- Elders Forum and Niigani members will assist in program for Aboriginal youth involvement and Traditional Knowledge projects
- Elders Forum will meet a minimum of 1X per year with the possibility of meeting 2X meetings per year if necessary
- Niigani will meet 3-5X per year including an annual meeting with the NWMO Board and Advisory Council
- Niigani members will receive an honorarium for meetings attended along with coverage of travel expenses
- Expense will continue at least to completion of Environmental Assessment and License (Y15)

Schedule	Start Year	10	2019	Finish Year	15	2024

Type Fixed

Calculations and Notes:

Y1 (2010): $705K
Y2 (2011): $627K; Y3-Y5 (2012 - 2014): $604K/year;
Y 6-Y15 (2015-2024): $632K per year

Description:
Elders Forum:
Y1 (2010):$170K;
Y2-Y9 (2011-2018): $180K;
Y10-15 (2019-2024): $200K per year (assumes need for community Elders to be involved and provide insight on project to interested Aboriginal people)

Niigani meeting & assistance:
Y 1: $495K per year (Includes: Niigani Community Involvement Project);
Y2 (2011):$460K (Includes: Niigani Community Involvement Project):
Y3-15 (2012-2024): $382 K per year

Staff travel: Y1: $40K; Y2-5: $42K; Y6-15: $50k

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,672,000	$ 3,672,000	$ 918,000	$ 4,590,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	80			**Prepared By:**	P. Patton	
WBS (Old)										
WBS Title	STAFF TRAVEL COSTS – ABORIGINAL									
Description	Staff travel will be necessary for the purposes of meeting with Aboriginal communities through the site selection process to build confidence in APM, to involve national, provincial, regional and local Aboriginal groups to build awareness and confidence in the NWMO and APM on an ongoing basis. Travel will also include meetings with Aboriginal groups, organizations and individuals and speaking engagements on request. Costs include travel-related expenses for staff participating in speaking engagements/briefings, off-site meetings, and related costs (catering, meeting room, A/V, travel for delegates and accommodations if needed.)									
Deliverable	- Provision of information on APM and site selection process in response to requests for this information - Support to NWMO brand in building confidence in APM - Maintenance and building of relationships between Aboriginal organizations, potential host communities and surrounding Aboriginal communities for long-term sustainability of site selection process and confidence in NWMO									
Assumptions	- Regular meetings/briefings with Aboriginal organizations, groups, communities and individuals will build confidence in NWMO and APM									
Schedule	Start Year		1	2010			Finish Year	9	2018	
Type	Fixed									
Calculations and Notes:	National organizations meetings/briefings Provincial organizations meetings/briefings Regional organizations meetings/briefings Travel to local communities Meetings/briefings on request Y1 (2010): 200K Y2 (2011): 187K; Y3 (2012): $191K Y4-25 (2013-2034): 125K per year									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 1,328,000	$ 1,328,000	$ 332,000		$ 1,660,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	80			**Prepared By:**	P. Patton	
WBS (Old)										
WBS Title	STAFF TRAVEL COSTS – ABORIGINAL									
Description	Staff travel will be necessary for the purposes of meeting with Aboriginal communities through the site selection process to build confidence in APM, to involve national, provincial, regional and local Aboriginal groups to build awareness and confidence in the NWMO and APM on an ongoing basis. Travel will also include meetings with Aboriginal groups, organizations and individuals and speaking engagements on request. Costs include travel-related expenses for staff participating in speaking engagements/briefings, off-site meetings, and related costs (catering, meeting room, A/V, travel for delegates and accommodations if needed.)									
Deliverable	- Provision of information on APM and site selection process in response to requests for this information - Support to NWMO brand in building confidence in APM - Maintenance and building of relationships between Aboriginal organizations, potential host communities and surrounding Aboriginal communities for long-term sustainability of site selection process and confidence in NWMO									
Assumptions	- Regular meetings/briefings with Aboriginal organizations, groups, communities and individuals will build confidence in NWMO and APM									
Schedule	Start Year		10	2019			Finish Year	15	2024	
Type	Fixed									
Calculations and Notes:	National organizations meetings/briefings Provincial organizations meetings/briefings Regional organizations meetings/briefings Travel to local communities Meetings/briefings on request Y1 (2010): 200K Y2 (2011): 187K; Y3 (2012): $191K Y4-25 (2013-2034): 125K per year									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$	187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	30	60			**Prepared By:**	P. Patton	
WBS (Old)										
WBS Title	STAFF TRAVEL COSTS – ABORIGINAL									
Description	Staff travel will be necessary for the purposes of meeting with Aboriginal communities through the site selection process to build confidence in APM, to involve national, provincial, regional and local Aboriginal groups to build awareness and confidence in the NWMO and APM on an ongoing basis. Travel will also include meetings with Aboriginal groups, organizations and individuals and speaking engagements on request. Costs include travel-related expenses for staff participating in speaking engagements/briefings, off-site meetings, and related costs (catering, meeting room, A/V, travel for delegates and accommodations if needed.)									
Deliverable	- Provision of information on APM and site selection process in response to requests for this information - Support to NWMO brand in building confidence in APM - Maintenance and building of relationships between Aboriginal organizations, potential host communities and surrounding Aboriginal communities for long-term sustainability of site selection process and confidence in NWMO									
Assumptions	- Regular meetings/briefings with Aboriginal organizations, groups, communities and individuals will build confidence in NWMO and APM									
Schedule	Start Year		16	2025			Finish Year	25	2034	
Type	Fixed									
Calculations and Notes:	National organizations meetings/briefings Provincial organizations meetings/briefings Regional organizations meetings/briefings Travel to local communities Meetings/briefings on request Y1 (2010): 200K Y2 (2011): 187K; Y3 (2012): $191K Y4-25 (2013-2034): 125K per year									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 1,250,000	$ 1,250,000	$	312,500	$ 1,562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	10	270			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRACKING PUBLIC OPINION								
Description	This work program is designed to assist NWMO to: · identify changes in citizen values and concerns which may affect support (passive or active) for NWMO's policies, plans or activities in a timely way · identify opportunities to re-align policies, plans and activities to better reflect the evolving values, preferences and concerns of Canadians · identify opportunities to refine NWMO brand · Identify emerging issues/challenges · Demonstrate ongoing support of Canadians for NWMO policies and plans to Federal and Provincial government policy makers · Benchmark NWMO progress in building acceptability among communities and opinion leaders in Canada with that experienced by waste organizations in other countries and be similar projects within Canada. On a yearly basis, this work may involve: nationally representative telephone survey; conduct of focus groups on targeted issues; purchase of and/or participation in syndicated studies; use of existing online or mail panel; tracking of relevant publicly available research conducted within Canada or by waste organizations in other countries. The program anticipates expenditure of $200,000 each year until Environmental Assessment successfully completed.								
Deliverable	1) Yearly survey of the attitudes of Canadians on key topics of importance to sustaining and building acceptance for NWMO activities 2) Yearly summary report of findings from the broad range of inputs outlined above timed to support internal NWMO business planning 3) Communication testing								
Assumptions	It is assumed that there will be sufficient activity over the course of the year, either with respect to the NWMO siting process or in the general policy environment in which NWMO operates, to warrant a yearly survey. If activity is less intense than anticipated, the survey might be conducted every 18 months rather than every 12 months and in its stead qualitative research would be conducted.								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	Notes Consider the following addition to the program: - Bi-Annual workshop of a cross section of citizens to input to NWMO policies and plans - Bi-Annual workshop of provincial opinion leaders to input to NWMO policies and plans - Note that additional funding would be required to support these activities								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 1,800,000	$ 1,800,000	$ 450,000		$ 2,250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	05	10	20	260			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	TRACKING PUBLIC OPINION								
Description	This work program is designed to assist NWMO to: · identify changes in citizen values and concerns which may affect support (passive or active) for NWMO's policies, plans or activities in a timely way · identify opportunities to re-align policies, plans and activities to better reflect the evolving values, preferences and concerns of Canadians · identify opportunities to refine NWMO brand · Identify emerging issues/challenges · Demonstrate ongoing support of Canadians for NWMO policies and plans to Federal and Provincial government policy makers · Benchmark NWMO progress in building acceptability among communities and opinion leaders in Canada with that experienced by waste organizations in other countries and be similar projects within Canada. On a yearly basis, this work may involve: nationally representative telephone survey; conduct of focus groups on targeted issues; purchase of and/or participation in syndicated studies; use of existing online or mail panel; tracking of relevant publicly available research conducted within Canada or by waste organizations in other countries. The program anticipates expenditure of $200,000 each year until Environmental Assessment successfully completed.								
Deliverable	1) Yearly survey of the attitudes of Canadians on key topics of importance to sustaining and building acceptance for NWMO activities 2) Yearly summary report of findings from the broad range of inputs outlined above timed to support internal NWMO business planning 3) Communication testing								
Assumptions	It is assumed that there will be sufficient activity over the course of the year, either with respect to the NWMO siting process or in the general policy environment in which NWMO operates, to warrant a yearly survey. If activity is less intense than anticipated, the survey might be conducted every 18 months rather than every 12 months and in its stead qualitative research would be conducted.								
Schedule	Start Year		10	2019			Finish Year	13	2022
Type	Fixed								
Calculations and Notes:	Notes Consider the following addition to the program: - Bi-Annual workshop of a cross section of citizens to input to NWMO policies and plans - Bi-Annual workshop of provincial opinion leaders to input to NWMO policies and plans - Note that additional funding would be required to support these activities								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 800,000	$ 800,000	$ 200,000		$ 1,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	10	10	30			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title TRACKING BEST PRACTICES AND EXTERNAL ADVICE

Description

This work program is designed to assist the NWMO:

- keep track of best practices and evolving experience in a number of key success areas:
  - o Approaches to community engagement and dialogue and best practice design
  - o Awareness building, design of information materials and communication planning
  - o Approaches to development of tools and design and implementation of sustainability pans which capture the long-term vision a community has for itself
  - o Approaches to assessment of environmental, social, economic and cultural effects
  - o Approaches to and issues associated with ethics and their application to NWMO work
  - o Approaches to various siting related issues such as hosting agreements, community engagement, communications, and dispute resolution
  - o Approaches to engaging Aboriginal peoples and application of Aboriginal Traditional Knowledge
- participate in international information and experience sharing, and development of international best practice, as part of the Nuclear Energy Agency's Forum on Stakeholder Confidence. (Estimated at $10,000 per year) Includes review of materials published by the Forum.
- Facilitate limited participation in initiatives which explore these issues and discuss experience and best practices such as C2D2 and International Institute for Public Participation
- At any given point in time be up to date with respect to evolving societal expectation in this area in order to:
  - o inform the design of NWMO activities and plans;
  - o support accountable authorities in potentially interested communities in the engagement of their own citizens to explore interest and ultimately to assess and demonstrate willingness
  - o Inform the design of NWMO sponsored community and region based research designed to support the social, economic and cultural impact (community well-being) assessment and analysis
  - o Assist in capacity building of NWMO relationship managers, and other NWMO staff, to engage with and support communities in this area.

The program anticipates expenditure of:

- $200,000 in 2011
- $200,000 in 2012
- $150,000 in 2013
- $150,000 in 2014
- $125,000 in 2015

Deliverable

- Consulting advice
- Yearly summary report of findings from the broad range of inputs outlined above, timed to support internal NWMO business planning and engagement plan design (internal)
- Preparation of case studies of projects of particular interest with a focus on the engagement approaches used (internal)
- Development of information sheets and tools to support communities in engaging their residents for publishing on the NWMO website (internal, in collaboration with Communications staff)
- Yearly workshop of practitioners to review and explore best practice and input to NWMO's plans going forward (Estimated at $100,000 per year)
- Ad hoc expert advice including commissioning of papers designed to explore key topics of interest (Estimated at $60,000)
- Sponsorship of a conference such as C2D2 or other, or a discussion session at a conference (Estimated at $30,000 per year)

Assumptions

- Using appropriate processes, and encouraging communities to use appropriate processes will help build and sustain public acceptance of NWMO's policies, plans and activities
- It will be important to the documentation required to support the EA and licencing process to be able to demonstrate that appropriate processes were used in these areas and that these processes meaningfully influenced proposals and decisions made.

Schedule	Start Year	1	2010	Finish Year	9	2018	

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,200,000	$ 1,200,000	$ 300,000	$ 1,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	10	20	20			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title TRACKING BEST PRACTICES AND EXTERNAL ADVICE

Description

This work program is designed to assist the NWMO:

- keep track of best practices and evolving experience in a number of key success areas:
  - o Approaches to community engagement and dialogue and best practice design
  - o Awareness building, design of information materials and communication planning
  - o Approaches to development of tools and design and implementation of sustainability pans which capture the long-term vision a community has for itself
  - o Approaches to assessment of environmental, social, economic and cultural effects
  - o Approaches to and issues associated with ethics and their application to NWMO work
  - o Approaches to various siting related issues such as hosting agreements, community engagement, communications, and dispute resolution
  - o Approaches to engaging Aboriginal peoples and application of Aboriginal Traditional Knowledge
- participate in international information and experience sharing, and development of international best practice, as part of the Nuclear Energy Agency's Forum on Stakeholder Confidence. (Estimated at $10,000 per year) Includes review of materials published by the Forum.
- Facilitate limited participation in initiatives which explore these issues and discuss experience and best practices such as C2D2 and International Institute for Public Participation
- At any given point in time be up to date with respect to evolving societal expectation in this area in order to:
  - o inform the design of NWMO activities and plans;
  - o support accountable authorities in potentially interested communities in the engagement of their own citizens to explore interest and ultimately to assess and demonstrate willingness
  - o Inform the design of NWMO sponsored community and region based research designed to support the social, economic and cultural impact (community well-being) assessment and analysis
  - o Assist in capacity building of NWMO relationship managers, and other NWMO staff, to engage with and support communities in this area.

The program anticipates expenditure of:

- $200,000 in 2011
- $200,000 in 2012
- $150,000 in 2013
- $150,000 in 2014
- $125,000 in 2015

Deliverable

- Consulting advice
- Yearly summary report of findings from the broad range of inputs outlined above, timed to support internal NWMO business planning and engagement plan design (internal)
- Preparation of case studies of projects of particular interest with a focus on the engagement approaches used (internal)
- Development of information sheets and tools to support communities in engaging their residents for publishing on the NWMO website (internal, in collaboration with Communications staff)
- Yearly workshop of practitioners to review and explore best practice and input to NWMO's plans going forward (Estimated at $100,000 per year)
- Ad hoc expert advice including commissioning of papers designed to explore key topics of interest (Estimated at $60,000)
- Sponsorship of a conference such as C2D2 or other, or a discussion session at a conference (Estimated at $30,000 per year)

Assumptions

- Using appropriate processes, and encouraging communities to use appropriate processes will help build and sustain public acceptance of NWMO's policies, plans and activities
- It will be important to the documentation required to support the EA and licencing process to be able to demonstrate that appropriate processes were used in these areas and that these processes meaningfully influenced proposals and decisions made.

Schedule	Start Year	10	2019	Finish Year	11	2020	

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 250,000	$ 250,000	$ 62,500	$ 312,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	10	10	20			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	ETHICAL FRAMEWORK FOR APM IMPLEMENTATION								
Description	This work program is designed to: - Demonstrate the importance of ethical considerations in NWMO's decision making through a yearly reflection of past performance in this area included as standard in the Annual Report. - Demonstrate NWMO's commitment to general societal capacity building in this area through continued partnership in the Canadian Business Ethics Research Network (CBERN) (Estimated at $25,000 per year) and through participation in Annual General meeting ($5,000) and general project support for the period 2010 to 2020. - Track practices used by other waste organizations to use as a benchmark through desktop research (internal) - Ad hoc expert advice (Estimated at $40,000 per year beginning in 2010 through to the end of the successful completion of Environmental Assessment The program anticipates expenditure of $70,000 per year for the duration of the program.								
Deliverable	- Participation in and support for Canadian Business Ethics Research Network - Internal yearly reflection on ethical performance and assessment of need to evolve ethical framework as work proceeds and new issues arise - Third party input and review to help guide NWMO policies, plans and activities.								
Assumptions	- Using processes which encourage explicit consideration of ethical considerations throughout NWMO's work, and against which NWMO can publicly report, will help build and sustain public and government acceptance of NWMO's policies, plans and activities - It will be important to the documentation required to support the EA and licencing process to be able to demonstrate that ethical considerations were appropriately addressed in decision making throughout the siting process. - Early third party guidance, which can begin to be documented publically, will help build and sustain public and government acceptance of NWMO's policies, plans and activities and provide NWMO forewarning of issues and maximum flexibility to address them in the early stages.								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	CBERN - $25,000 per year sponsorship. CBERN - $5,000 per year participation in annual general meeting. Other - $40,000 expert advice. Expenditure per year through to end of Environmental Assessment process.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 630,000	$ 630,000	$ 157,500	$ 787,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	10	20	10			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title ETHICAL FRAMEWORK FOR APM IMPLEMENTATION

Description

This work program is designed to:

- Demonstrate the importance of ethical considerations in NWMO's decision making through a yearly reflection of past performance in this area included as standard in the Annual Report.
- Demonstrate NWMO's commitment to general societal capacity building in this area through continued partnership in the Canadian Business Ethics Research Network (CBERN) (Estimated at $25,000 per year) and through participation in Annual General meeting ($5,000) and general project support for the period 2010 to 2020.
- Track practices used by other waste organizations to use as a benchmark through desktop research (internal)
- Ad hoc expert advice (Estimated at $40,000 per year beginning in 2010 through to the end of the successful completion of Environmental Assessment

The program anticipates expenditure of $70,000 per year for the duration of the program.

Deliverable

- Participation in and support for Canadian Business Ethics Research Network
- Internal yearly reflection on ethical performance and assessment of need to evolve ethical framework as work proceeds and new issues arise
- Third party input and review to help guide NWMO policies, plans and activities.

Assumptions

- Using processes which encourage explicit consideration of ethical considerations throughout NWMO's work, and against which NWMO can publicly report, will help build and sustain public and government acceptance of NWMO's policies, plans and activities
- It will be important to the documentation required to support the EA and licencing process to be able to demonstrate that ethical considerations were appropriately addressed in decision making throughout the siting process.
- Early third party guidance, which can begin to be documented publically, will help build and sustain public and government acceptance of NWMO's policies, plans and activities and provide NWMO forewarning of issues and maximum flexibility to address them in the early stages.

Schedule	Start Year	10	2019	Finish Year	11	2020

Type Fixed

Calculations and Notes:

CBERN - $25,000 per year sponsorship.
CBERN - $5,000 per year participation in annual general meeting.
Other - $40,000 expert advice.
Expenditure per year through to end of Environmental Assessment process.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 140,000	$ 140,000	$	35,000	$ 175,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	10	10	10			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL TRADITIONAL KNOWLEDGE								
Description	Aboriginal Traditional Knowledge includes important knowledge about the land and ecology stemming from long contact with the land. It also includes knowledge about developing and maintaining effective and meaningful relationships between generations and within and between communities. Traditional Knowledge provides rules for protecting the land while using it; clarifying and enhancing relationships amongst users; assisting in the development of technologies to meet the subsistence, health, trade and ritual needs of local people; and helping to create a world view that incorporates and makes sense of all of these in the context of a long-term, holistic perspective in decision-making. Appropriate consideration and respect must be given to factors such as: · spiritual and physical aspects of the land, people, wildlife and their habitat; · the relationships between various aspects of the environment, including humans; · the aboriginal sense of responsibility and stewardship; · the health, trade and spiritual needs of people; · aspects of traditional community life such as cultural oriented activities, the wide range of volunteer activities, recreational activities, housework and subsistence activities; and the impact of our actions seven generations or more in the future. This work program is to support NWMO in ongoing understanding and interweaving of Traditional Knowledge through a workshop, desktop research and related preparatory work. This work program is designed to engage those involved as holders of Traditional Knowledge or experts in this field to assist in the inclusion of Traditional Knowledge in assessment of potential host sites for social, economic and cultural impact (community well-being related) assessment. Activities conducted through this work program include: a. Desktop research on traditional uses of land in territories of siting communities in order to identify important fishing, hunting, ceremonial and burial sites b. Track evolving practices used by other organizations, as appropriate, to use as a benchmark through desktop research, including preparation of case studies concerning national resource management initiatives of interest c. Monitor impact benefit agreements within Canada and in North America d. Convene a workshop of practitioners to provide advice and counsel to NWMO with respect to its future activities – meeting to be conducted in 2012, 2013, 2016, 2018 - Assist in capacity building of NWMO relationship managers, and other NWMO staff, to engage with and support communities in this area. - Cultural sensitivity training of NWMO staff to understand traditional practices, protocols and cultures of Aboriginal peoples in siting areas. *Estimate of expenditures begins in 2010 and concludes at end of detailed site characterization (2018)*								
Deliverable	- Desktop research on traditional uses of land - Project with Niigani Elders 2011 (Workshop) - Workshop of practitioners to provide advice and counsel to NWMO with respect to its future activities –2012, 2013, 2016, 2018 - Program to develop appropriate cultural training of NWMO staff and project teams associated with APM to understand cultural protocols, practices, governance and traditional laws of Aboriginal peoples in siting areas								
Assumptions	- Information is publicly available for the purposes of desktop research or can be gathered with involvement of local Aboriginal people. - Traditional peoples in siting areas will provide insight to their local Traditional Knowledge and land use. - Work on a detailed Traditional Land Use Study will be conducted separately as part of the siting steps and will take place in the Feasibility Study and Detailed Analysis steps with Aboriginal communities and through the EA.								
Schedule	Start Year		1	2010			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:	Y1 – Y2(2010-2011): $210 $125K (project with Niigani) $45K Staff training $10K Cultural training NWMO staff $30 Staff travel Y3- Y15 (2012-2024): $210 $125K per year (Workshop, Research projects) $45K Staff training $10K Cultural sensitivity training NWMO staff $30 Staff travel								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,890,000	$ 1,890,000	$ 472,500	$ 2,362,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	10	10	20	40			**Prepared By:**	P. Patton
WBS (Old)									
WBS Title	ABORIGINAL TRADITIONAL KNOWLEDGE								
Description	Aboriginal Traditional Knowledge includes important knowledge about the land and ecology stemming from long contact with the land. It also includes knowledge about developing and maintaining effective and meaningful relationships between generations and within and between communities. Traditional Knowledge provides rules for protecting the land while using it; clarifying and enhancing relationships amongst users; assisting in the development of technologies to meet the subsistence, health, trade and ritual needs of local people; and helping to create a world view that incorporates and makes sense of all of these in the context of a long-term, holistic perspective in decision-making. Appropriate consideration and respect must be given to factors such as: · spiritual and physical aspects of the land, people, wildlife and their habitat; · the relationships between various aspects of the environment, including humans; · the aboriginal sense of responsibility and stewardship; · the health, trade and spiritual needs of people; · aspects of traditional community life such as cultural oriented activities, the wide range of volunteer activities, recreational activities, housework and subsistence activities; and the impact of our actions seven generations or more in the future. This work program is to support NWMO in ongoing understanding and interweaving of Traditional Knowledge through a workshop, desktop research and related preparatory work. This work program is designed to engage those involved as holders of Traditional Knowledge or experts in this field to assist in the inclusion of Traditional Knowledge in assessment of potential host sites for social, economic and cultural impact (community well-being related) assessment. Activities conducted through this work program include: a. Desktop research on traditional uses of land in territories of siting communities in order to identify important fishing, hunting, ceremonial and burial sites b. Track evolving practices used by other organizations, as appropriate, to use as a benchmark through desktop research, including preparation of case studies concerning national resource management initiatives of interest c. Monitor impact benefit agreements within Canada and in North America d. Convene a workshop of practitioners to provide advice and counsel to NWMO with respect to its future activities – meeting to be conducted in 2012, 2013, 2016, 2018 - Assist in capacity building of NWMO relationship managers, and other NWMO staff, to engage with and support communities in this area. - Cultural sensitivity training of NWMO staff to understand traditional practices, protocols and cultures of Aboriginal peoples in siting areas. *Estimate of expenditures begins in 2010 and concludes at end of detailed site characterization (2018)*								
Deliverable	- Desktop research on traditional uses of land - Project with Niigani Elders 2011 (Workshop) - Workshop of practitioners to provide advice and counsel to NWMO with respect to its future activities –2012, 2013, 2016, 2018 - Program to develop appropriate cultural training of NWMO staff and project teams associated with APM to understand cultural protocols, practices, governance and traditional laws of Aboriginal peoples in siting areas								
Assumptions	- Information is publicly available for the purposes of desktop research or can be gathered with involvement of local Aboriginal people. - Traditional peoples in siting areas will provide insight to their local Traditional Knowledge and land use. - Work on a detailed Traditional Land Use Study will be conducted separately as part of the siting steps and will take place in the Feasibility Study and Detailed Analysis steps with Aboriginal communities and through the EA.								
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:	Y1 – Y2(2010-2011): $210 $125K (project with Niigani) $45K Staff training $10K Cultural training NWMO staff $30 Staff travel Y3- Y15 (2012-2024): $210 $125K per year (Workshop, Research projects) $45K Staff training $10K Cultural sensitivity training NWMO staff $30 Staff travel								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,260,000	$ 1,260,000	$ 315,000	$ 1,575,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**21**

WBS (New)	561	15	10	10	110			**Prepared By:**	P. Simmons
WBS (Old)									
	SITE SELECTION PROCESS								
WBS Title	**STORE FRONT NWMO OFFICES**								

Description

Category includes all those expenses (non-staffing related) associated with the operation of 'store front' offices and regional office in communities involved in the site selection process from Step 3 through to selection of host community, and operation of the DGR.

Store front operation is both 'in community' and 'regional' and is a liaison office for the NWMO to provide information, displays, and other related public relations activities including municipal/local government relations.

Deliverable

This category's primary deliverable is the provision of a store front operation/liaison in communities.

A complementary deliverable is the ongoing relationship building/maintenance, NWMO brand support, and community presence.

Assumptions

The Feasibility stage (Step 3 a. or b.) triggers a store front operation. Only those communities moving from Step 2 into Step 3 will be candidates for a store front/community liaison office.

2010 – screenings begin (no storefronts).

2011 – screenings continue.
Store fronts are only initiated at feasibility stage.
The screenings initiated in late 2010, and 2011, are assumed to lead to 4 feasibility studies (stages a or b) in 2011. Other screened communities should they enter during this period are assumed to begin opting out, or be screened out. It is also assumed that the timing of the feasibility studies will be 50% early in the year, 50% latter part of year. Each of the feasibility communities (4) will receive a store front operation in 2011.

2012 – Assumed that more communities may enter screening stage, and 4 more feasibility studies may be initiated. Assumed that 4 more store fronts will be required in 2012 in addition to the 4 initiated in 2011. Dissimilar to 2011, however, is that the all store fronts in 2012 will be required at the beginning of the year for the duration of the year (total store fronts required in 2012 = 8).

All feasibility stage store fronts are assumed to remain in operation during 2012 – early closure of a store front may come from self-elimination by the community or clear revelation of suboptimal conditions.

In 2013, 2 candidate sites are assumed to emerge from all completed feasibility studies. Any remaining feasibility communities (lower ranked) will see the removal/closure of store front operations.

Store fronts in 2013 = 2 per candidate site = 4.

The candidate sites selected from the feasibility studies will host 2 store front operations – 1 in the host community, the other in the 'region.' The 'region' is the proposed site location in each candidate community, and also the proposed location of the Centre of Expertise (C of E) assumed to commence operation in 2014.

It is assumed that each of the 2 candidate sites will require 2 store fronts (total of 4) between 2013- 2018. Once the preferred site is selected, 2 of the 4 store fronts will close. The remaining 2 will continue through to construction of the full Centre of Expertise c/w underground Lab. The local store front (in community) will remain in operation until 2035. The Centre of Expertise/lab morphs into the 2nd store front/information centre - n**o Centre of Expertise** costs are included in these estimates.

Store front(s) will be staffed (staffing FTE's budgeted elsewhere), and resourced with supplies, material, and displays. Storefront assumed to be min. 1500 ft2. Leased, utilities, taxes, overhead, travel - $ 60,000 per store front (staff not included). Assumed that marginally frequent travel of staff between NWMO office (Toronto) and candidate site communities will be required.

Schedule	Start Year	1	2010	Finish Year	9	2018	
Type	Fixed						

Calculations and Notes:

Current approved budget Y02 (2010) = $0

Y02 (2011) 2 x $60,000 for full year ($120,000) $120,000

Y03 (2012) 4 x $60,000 for full year = $ 240,000
4 x $60,000 (full year from 2011) = $240,000 $ 480,000

Y04 (2013) 2 x $60,000 x in ea. candidate site (2)) (C of E initiated in each community) $ 240,000
Y05 (2014) 1 x $60,000 x ea. candidate (2) C of E under development $ 240,000
Y06 (2015) 1 x $60,000 x ea. candidate site (2), C of E morphs into '2nd store front' $ 120,000
Y07 (2016) « « $ 120,000
Y08 (2017) « « $ 120,000
Y09 (2018) « « $ 120,000

Y10 (2019) to Y15 (2024) Preferred site selected = 1 local storefront, 1 at Centre of Expertise
1 x $60,000 = $ 60,000 x 6 years = $360,000

Y16 (2025) – Y21 (2030) Preferred site – 1 local store front, 1 at Centre of Expertise/UG lab.
1 x $ 60,000 x 6yrs = $ 360,000

Y22 (2031) – Y26 (2034) 1 local store front, Centre of expertise/UG lab remains until operations begin in 2035 (5 years).
1 x $60,000 x 4yrs = $ 240,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,560,000	$ 1,560,000	$ 390,000	$ 1,950,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**21**

WBS (New)	561	15	10	20	40			**Prepared By:**	P. Simmons
WBS (Old)									
	SITE SELECTION PROCESS								
WBS Title	**STORE FRONT NWMO OFFICES**								

Description

Category includes all those expenses (non-staffing related) associated with the operation of 'store front' offices and regional office in communities involved in the site selection process from Step 3 through to selection of host community, and operation of the DGR.

Store front operation is both 'in community' and 'regional' and is a liaison office for the NWMO to provide information, displays, and other related public relations activities including municipal/local government relations.

Deliverable

This category's primary deliverable is the provision of a store front operation/liaison in communities.

A complementary deliverable is the ongoing relationship building/maintenance, NWMO brand support, and community presence.

Assumptions

The Feasibility stage (Step 3 a. or b.) triggers a store front operation. Only those communities moving from Step 2 into Step 3 will be candidates for a store front/community liaison office.

2010 – screenings begin (no storefronts).

2011 – screenings continue.
Store fronts are only initiated at feasibility stage.
The screenings initiated in late 2010, and 2011, are assumed to lead to 4 feasibility studies (stages a or b) in 2011. Other screened communities should they enter during this period are assumed to begin opting out, or be screened out. It is also assumed that the timing of the feasibility studies will be 50% early in the year, 50% latter part of year. Each of the feasibility communities (4) will receive a store front operation in 2011.

2012 – Assumed that more communities may enter screening stage, and 4 more feasibility studies may be initiated. Assumed that 4 more store fronts will be required in 2012 in addition to the 4 initiated in 2011. Dissimilar to 2011, however, is that the all store fronts in 2012 will be required at the beginning of the year for the duration of the year (total store fronts required in 2012 = 8).

All feasibility stage store fronts are assumed to remain in operation during 2012 – early closure of a store front may come from self-elimination by the community or clear revelation of suboptimal conditions.

In 2013, 2 candidate sites are assumed to emerge from all completed feasibility studies. Any remaining feasibility communities (lower ranked) will see the removal/closure of store front operations.

Store fronts in 2013 = 2 per candidate site = 4.

The candidate sites selected from the feasibility studies will host 2 store front operations – 1 in the host community, the other in the 'region.' The 'region' is the proposed site location in each candidate community, and also the proposed location of the Centre of Expertise (C of E) assumed to commence operation in 2014.

It is assumed that each of the 2 candidate sites will require 2 store fronts (total of 4) between 2013- 2018. Once the preferred site is selected, 2 of the 4 store fronts will close. The remaining 2 will continue through to construction of the full Centre of Expertise c/w underground Lab. The local store front (in community) will remain in operation until 2035. The Centre of Expertise/lab morphs into the 2nd store front/information centre - n**o Centre of Expertise** costs are included in these estimates.

Store front(s) will be staffed (staffing FTE's budgeted elsewhere), and resourced with supplies, material, and displays. Storefront assumed to be min. 1500 ft2. Leased, utilities, taxes, overhead, travel - $ 60,000 per store front (staff not included). Assumed that marginally frequent travel of staff between NWMO office (Toronto) and candidate site communities will be required.

Schedule	Start Year	10	2019	Finish Year	15	2024
Type	Fixed					

Calculations and Notes:

Current approved budget Y02 (2010) = $0

Y02 (2011)	2 x $60,000 for full year ($120,000)	$120,000
Y03 (2012)	4 x $60,000 for full year = $ 240,000	
	4 x $60,000 (full year from 2011) = $240,000	$ 480,000
Y04 (2013)	2 x $60,000 x in ea. candidate site (2)) (C of E initiated in each community)	$ 240,000
Y05 (2014)	1 x $60,000 x ea. candidate (2) C of E under development	$ 240,000
Y06 (2015)	1 x $60,000 x ea. candidate site (2), C of E morphs into '2nd store front'	$ 120,000
Y07 (2016)	« «	$ 120,000
Y08 (2017)	« «	$ 120,000
Y09 (2018)	« «	$ 120,000

Y10 (2019) to Y15 (2024) Preferred site selected = 1 local storefront, 1 at Centre of Expertise
1 x $60,000 = $ 60,000 x 6 years = $360,000

Y16 (2025) – Y21 (2030) Preferred site – 1 local store front, 1 at Centre of Expertise/UG lab.
1 x $ 60,000 x 6yrs = $ 360,000

Y22 (2031) – Y26 (2034) 1 local store front, Centre of expertise/UG lab remains until operations begin in 2035 (5 years).
1 x $60,000 x 4yrs = $ 240,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 2,160,000	$ 2,160,000	$ 540,000	$ 2,700,000

APM Cost Estimate

Work Element Definition Sheet

NWMO Cost Code: 0170020-**21**

WBS (New)	561	15	10	30	20			**Prepared By:**	P. Simmons
WBS (Old)									
	SITE SELECTION PROCESS								
WBS Title	**STORE FRONT NWMO OFFICES**								

Description

Category includes all those expenses (non-staffing related) associated with the operation of 'store front' offices and regional office in communities involved in the site selection process from Step 3 through to selection of host community, and operation of the DGR.

Store front operation is both 'in community' and 'regional' and is a liaison office for the NWMO to provide information, displays, and other related public relations activities including municipal/local government relations.

Deliverable

This category's primary deliverable is the provision of a store front operation/liaison in communities.

A complementary deliverable is the ongoing relationship building/maintenance, NWMO brand support, and community presence.

Assumptions

The Feasibility stage (Step 3 a. or b.) triggers a store front operation. Only those communities moving from Step 2 into Step 3 will be candidates for a store front/community liaison office.

2010 – screenings begin (no storefronts).

2011 – screenings continue.
Store fronts are only initiated at feasibility stage.
The screenings initiated in late 2010, and 2011, are assumed to lead to 4 feasibility studies (stages a or b) in 2011. Other screened communities should they enter during this period are assumed to begin opting out, or be screened out. It is also assumed that the timing of the feasibility studies will be 50% early in the year, 50% latter part of year. Each of the feasibility communities (4) will receive a store front operation in 2011.

2012 – Assumed that more communities may enter screening stage, and 4 more feasibility studies may be initiated. Assumed that 4 more store fronts will be required in 2012 in addition to the 4 initiated in 2011. Dissimilar to 2011, however, is that the all store fronts in 2012 will be required at the beginning of the year for the duration of the year (total store fronts required in 2012 = 8).

All feasibility stage store fronts are assumed to remain in operation during 2012 – early closure of a store front may come from self-elimination by the community or clear revelation of suboptimal conditions.

In 2013, 2 candidate sites are assumed to emerge from all completed feasibility studies. Any remaining feasibility communities (lower ranked) will see the removal/closure of store front operations.
Store fronts in 2013 = 2 per candidate site = 4.

The candidate sites selected from the feasibility studies will host 2 store front operations – 1 in the host community, the other in the 'region.' The 'region' is the proposed site location in each candidate community, and also the proposed location of the Centre of Expertise (C of E) assumed to commence operation in 2014.

It is assumed that each of the 2 candidate sites will require 2 store fronts (total of 4) between 2013- 2018. Once the preferred site is selected, 2 of the 4 store fronts will close. The remaining 2 will continue through to construction of the full Centre of Expertise c/w underground Lab. The local store front (in community) will remain in operation until 2035. The Centre of Expertise/lab morphs into the 2nd store front/information centre - n**o Centre of Expertise** costs are included in these estimates.

Store front(s) will be staffed (staffing FTE's budgeted elsewhere), and resourced with supplies, material, and displays. Storefront assumed to be min. 1500 ft2. Leased, utilities, taxes, overhead, travel - $ 60,000 per store front (staff not included). Assumed that marginally frequent travel of staff between NWMO office (Toronto) and candidate site communities will be required.

Schedule	Start Year	16	2025	Finish Year	25	2034

Type

Fixed

Calculations and Notes:

Current approved budget Y02 (2010) = $0

Y02 (2011)	2 x $60,000 for full year ($120,000)	$120,000
Y03 (2012)	4 x $60,000 for full year = $ 240,000 4 x $60,000 (full year from 2011) = $240,000	$ 480,000
Y04 (2013)	2 x $60,000 x in ea. candidate site (2)) (C of E initiated in each community)	$ 240,000
Y05 (2014)	1 x $60,000 x ea. candidate (2) C of E under development	$ 240,000
Y06 (2015)	1 x $60,000 x ea. candidate site (2), C of E morphs into '2nd store front'	$ 120,000
Y07 (2016)	« «	$ 120,000
Y08 (2017)	« «	$ 120,000
Y09 (2018)	« «	$ 120,000

Y10 (2019) to Y15 (2024) Preferred site selected = 1 local storefront, 1 at Centre of Expertise
1 x $60,000 = $ 60,000 x 6 years = $360,000

Y16 (2025) – Y21 (2030) Preferred site – 1 local store front, 1 at Centre of Expertise/UG lab.
1 x $ 60,000 x 6yrs = $ 360,000

Y22 (2031) – Y26 (2034) 1 local store front, Centre of expertise/UG lab remains until operations begin in 2035 (5 years).
1 x $60,000 x 4yrs = $ 240,000

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,120,000	$ 3,120,000	$ 780,000	$ 3,900,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	10		**Prepared By:**	K.
WBS (Old)	552	40	10					
WBS Title	SITE ACQUISITION AND IMPROVEMENTS							
Description	Option to purchase sites and eventual purchase of land to house the DGR.							
Deliverable	Layout of the facilities and services on the selected site. Purchase land and mineral rights for the site, access route and township. Preparation of the site, including clearing and rough grading. Preparation of the site access route. Provision of initial site security facilities. Site improvements including landscaping and final grading/drainage. Provision of on-site road and rail transportation routes and parking.							
Assumptions	Land requirements will be 3150 hectares, 3 km x 2km for DGR footprint, 25 km x 20 m access route and 5 km x 5 km for the township. Land cost $5000 per hectare, including mineral rights costs. (NOTE: Per Ian P. recent experience for crown land purchase was $1,000 per hectare) Land registration and legal fees, 50% of land cost. Site is a flat green area situated in the Canadian Shield, within 25 km of an existing highway. Access road will be 10 m wide and 25 km in length Rail access to the site is not required. Surface preparation is calculated for surface facilities footprint only @ 6 km2							
Schedule	Start Year	1	2010		Finish Year	9	2018	
Type	Step-Fixed							
Calculations and Notes:								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,054,607	$ -	$ 15,075,000	$ 16,129,607	$ 4,032,402	$ 20,162,009

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	20	10			**Prepared By:**	A. Murchison
WBS (Old)	552	40	10						
WBS Title	SITE ACQUISITION AND IMPROVEMENTS								
Description	Option to purchase sites and eventual purchase of land to house the DGR.								
Deliverable	Layout of the facilities and services on the selected site. Purchase land and mineral rights for the site, access route and township. Preparation of the site, including clearing and rough grading. Preparation of the site access route. Provision of initial site security facilities. Site improvements including landscaping and final grading/drainage. Provision of on-site road and rail transportation routes and parking.								
Assumptions	Land requirements will be 3150 hectares, 3 km x 2km for DGR footprint, 25 km x 20 m access route and 5 km x 5 km for the township. Land cost $5000 per hectare, including mineral rights costs. (NOTE: Per Ian P. recent experience for crown land purchase was $1,000 per hectare) Land registration and legal fees, 50% of land cost. Site is a flat green area situated in the Canadian Shield, within 25 km of an existing highway. Access road will be 10 m wide and 25 km in length Rail access to the site is not required. Surface preparation is calculated for surface facilities footprint only @ 6 km2								
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Step-Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ 1,406,143	$ -	$ 18,000,000	$ 19,406,143	$ 4,851,536	$ 24,257,679

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	170			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	PRODUCTION, TRANSLATION OF SITING PROCESS DOC								
Description	Siting Document								
Deliverable	Design, production and translation of the Siting Document								
Assumptions	50 pages in length, design completed internally, production (printing) and translation done externally								
Schedule	Start Year		1	2010			Finish Year	9 2018	
Type	Fixed								
Calculations and Notes:	2010 100K (will be less because design is being done internally)								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 100,000	$ 100,000	$ 25,000	$ 125,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	140			**Prepared By:**	K. Shaver
WBS (Old)									
WBS Title	DVDs FOR SITING								
Description	NWMO Core Video								
Deliverable	Update the NWMO core video to reflect initiation of the site selection process.								
Assumptions	The core video needs to be updated. Not an entire re-write.								
Schedule	Start Year		1	2010		Finish Year	4	2013	
Type	Fixed								
Calculations and Notes:	2010 - 2015: $40K/year								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 240,000	$ 240,000	$ 60,000	$ 300,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	70			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	THIRD PARTY REVIEWS								
Description	Expenses associated with conduct of a review of NWMO's site assessment work by a Third Party Review group of experts, as documented in the site selection process document.								
Deliverable									
Assumptions									
Schedule	Start Year		2	2011		Finish Year	13	2022	
Type	Fixed								
Calculations and Notes:	Reviews will be triggered by communities as they reach key steps in the site selection process. The pace and manner of moving through these steps will be determined by the community. Trigger points in the process are: completion of initial screening in Step 2 (Third Party Review is optional), completion of preliminary assessment (feasibility study) in Step 3, and completion of detailed site characterization in step 4. All work will be completed prior to initiation of Environmental Assessment process.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 650,000	$ 650,000	$	162,500	$ 812,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	30			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title COMMUNITY CAPACITY BUILDING – Community support for participation in Step 1 and Step 2 of the Siting process (information and initial

Description

The work package is designed to capture funding which will need to be provided to communities (regions, band councils etc. as outlined in siting document) to support their participation in the early steps of the siting process (Step 1 and Step 2)

1. Communities
   a. Travel costs associated for a small group of community representatives to travel to an NWMO briefing in a nearby regional hub or NWMO offices: Estimate $10,000 per community
   b. Proposals to hire a third party expert to review material published to date, in order to answer questions the community representatives may have about the safety of the project and the basis for confidence at this early stage: Estimate $15,000 per community
   c. Travel expenses associated with trip to visit an interim waste storage site by a small representative delegation: Estimate maximum $20,000 per community
   d. Hire a third party expert to review NWMO's evaluation of the suitability of the community based on readily available information and a short list of initial screening criteria (Step 2): Estimate $15,000 per community
   e. Should initial screening suggest community has potential to be suitable for the project the community, as represented by accountable authorities, may request and receive resources (funding and information, if desired) to develop and/or augment an existing sustainability plan which captures the long-term vision the community has for itself: Estimate $40,000 per community
   f. Should initial screening suggest community has potential to be suitable for the project, the community as represented by accountable authorities, may request and receive resources (funding and information, if desired) to engage citizens and begin to explore interest in hosting the project: Estimate $20,000 per community

Total of above per community: Potentially $120,000.

Note, uncertainties include: number of activities a community will choose to participate in; length of time a community will wish to take to complete all the tasks; number of communities who will enter the process and request funding and drop out before initial screening. Assumption for cost estimating purposes is that all tasks are completed in the calendar year noted.

NOT INCLUDED IN COST ESTIMATE: Other support which communities may request:
   g. Funding to support a community based advisory or liaison group to work with NWMO to conduct the initial screening: Estimate $25,000 for each community
   h. Funding to support an FTE or partial FTE municipal staff: Estimate $40,000 - $80,000 per community
   i. Honorarium/reimbursement for attending meetings for public and elected politicians and out of pocket expenses

2. COVERED IN A SEPARATE WED: Funding national and provincial Aboriginal organizations:
   j. National organizations: Activities similar to a-h although completed at a non-site specific level and also develop information and communication material about the project to inform Aboriginal peoples.
   k. Provincial organizations: Activities similar to a-h although completed at a non-site specific level.

3. Funding regional level:
   l. No Funding planned at the regional level at this point in the process

4. Non-profit organizations and academics: See separate WED sheet

5. NWMO staff travel costs associated with trips to community in order to plan for, deliver and support (participate) community in capacity building activity and other relationship building. Note that each trip may involve a stay of one week or more:
   a. Estimate $5,000 associated with each community
   b. Estimate $5,000 associated with each community
   c. Estimate $5,000 associated with each community
   d. Estimate $5,000 associated with each community
   e. Estimate $10,000 (2 or 3 trips) associated with each community
   f. Estimate $10,000 (2 or 3 trips) associated with each community
   g. Estimate $10,000 (2 or 3 trips) associated with each community
   h. Estimate $40,000 associated with each community
   i.
   j. Estimate $18,000 (6 trips) associated with each of 5 national organizations
   k. Estimate $18,000 (6 trips) associated with each of 7 provincial organizations in 2010
   l. $0

Total of above per community: Potentially $255,000.

Deliverable Support to communities to engage in various activities associated with Step 1 and Step 2 in the siting process

Assumptions Assumes a 50% take-up rate on published capacity building program; assumes interested communities complete Steps 1 and 2 by end of 2011.

Schedule	Start Year	1	2010	Finish Year	3	2012

Type Fixed

Calculations and Notes: Costs reflect commitments made in Learn More Program - Early Steps published on the website.

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 867,000	$ 867,000	$ 216,750	$ 1,083,750

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	60			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title COMMUNITY CAPACITY BUILDING – Community support for participation in Step 3 of the Siting process (feasibility study)

Description

The work package is designed to capture funding which will need to be provided to communities to support their participation in Step 3 of the siting process. The nature of funding provided to be outlined in a memorandum of understanding between the community(ies) involved at this stage and the NWMO. Use of funds is subject to third party audit.

1. Communities
   a. Travel expenses associated with trip to Sweden (or Carlsbad) to visit research facilities and to meet with community leaders involving a small representative delegation from the community: Estimate maximum $40,000 per community

   b. Hire a third party expert or establish a peer review group to support community's participation in feasibility study (Step 3), community based advisory group and part or full FTE to work with NWMO to conduct the feasibility study, develop information and communication material about the project to inform citizens and foster dialogue, conduct activities to inform residents and assess interest in surrounding areas, including First Nations, Métis and Inuit as appropriate: Estimate $150,000 per year

   c. Establish a community office for the project: See budget for store front offices described elsewhere

Total of above per community:
2011: $200,000
2012: $624,000
Note, assumptions and uncertainties include: Only 4 of 8 communities which begin this step will remain through to the end of the step, meaning that more resources will be devoted to these communities during this step than to the communities which drop out

2. Funding available to accountable authorities in potentially affected surrounding areas, including First Nations, Métis and Inuit, as appropriate, to support their participation.

   d. Travel costs associated for a small group of community representatives to travel to an NWMO briefing in a nearby regional hub or NWMO offices: Estimate $10,000 per community

   e. Proposals to hire a third party expert to review material published to date, in order to answer questions the community representatives may have about the safety of the project and the basis for confidence at this early stage: Estimate $15,000 per community

   f. Travel expenses associated with trip to visit an interim waste storage site by a small representative delegation: Estimate maximum $20,000 per community

   g. Hire a third party expert

   h. Develop information and communication material about the project to inform Aboriginal peoples and support their exploration of interest in hosting the project

   i. Funding to support a partial FTE municipal staff and honorarium/reimbursement for attending meetings for public and elected politicians.

2011: $204,000
2012: $624,000

3. Funding to region
   j. Included in above.

4. COSTS FOR THIS ITEM OUTLINED IN A SEPARATE WED. Funding national and provincial Aboriginal organizations:
   k. National organizations: Activities similar to a-b although completed at a non-site specific level.
   l. Provincial organizations: Activities similar to a-b although completed at a non-site specific level.

5. NWMO travel costs associated with trips to community in order to plan for, deliver and support (participate) community in capacity building activity and other relationship building:

- Communities: Assume 6 trips to each at $7,000 each.
- Surrounding communities: Assume 4 trips to each
- INCLUDED IN OTHER WED: Estimate $18,000 (6 trips) associated with each of: 5 national organizations in 2012 ($90,000)

- INCLUDED IN OTHER WED: Estimate $18,000 (6 trips) associated with each of: 6 provincial organizations in 2012 ($108,000)

Total of above:
2011: $100,000
2012: $100,000

Deliverable Support to communities to engage in various activities associated with Step 3 in the siting process

Assumptions

Schedule	Start Year	2	2011	Finish Year	3	2012

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,900,000	$ 1,900,000	$ 475,000	$ 2,375,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	150			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title

COMMUNITY CAPACITY BUILDING – Community support for participation in Step 4/5/6 of the Siting process (detailed site characterization)

Description

The work package is designed to capture funding which will need to be provided to communities to support their participation in Step 4 of the siting process. The nature of funding provided to be outlined in a memorandum of understanding between the community(ies) involved at this stage and the NWMO. Use of funds is subject to third party audit.

Funding per year during the period 2013-1018 (detailed site characterization phase – Step 4)

a. Funding to eight communities to participate in process to decide 2 communities which will be the subject of detailed site characterization: Estimate: $85,000 in 2013

b. Funding for two communities to hire a third party expert or establish/maintain a peer review group to support community's participation in feasibility study (Step 3), community based advisory group and part or full FTE to work with NWMO during the detailed site characterization, conduct activities to inform residents and assess and demonstrate willingness in the community, conduct activities to inform residents in surrounding areas, including First Nations, Métis and Inuit as appropriate: Estimate $250,000 per year for each of 2 communities in each of 2013 - 2018

c. Establish or maintain a community office for the project: See budget for store front offices described elsewhere

d. Funding for affected Aboriginal peoples: $150,000 per year to be shared by Aboriginal communities surrounding each of the two potential host communities for the period 2013 – 2018. (Note: does not include national and provincial organizations)

e. Funding for set-up of multiparty group for conduct of regional study (involving community, region, Aboriginal and province representatives) and to pay for their normal operations, logistical support, development of communication materials and working groups. Includes development of regional plans to leverage the project: $300,000 per year (2013 – 2018) for each of two communities

f. COSTS NOT INCLUDED: Up front regional development payments to allow an exploration of capacity to capture benefits and initiate programs to increase this capacity and local sourcing. This may include strategic investment in commercial/industry sectors, educational and training programs for local workers, infrastructure and business development studies, etc. Focus on local community, surrounding communities, region and affected Aboriginal peoples. Estimate: $250,000 per year for each of the two regions during the period 2013 - 2018

g. NWMO staff travel costs to attend meetings in each of two communities (12 meetings per year), regional study organization for each community (4 meetings for each per year), potentially affected Aboriginal peoples (4 meetings per year with each of 4 Aboriginal groups in the surrounding area of each of the two potential host communities) - $300,000 per year per community for the period 2013 – 2018

Total of the above:

- *2013: $1.040M*
- *2014: $1.732M*
- *2015: $1.767M*

Note some allowance for communities beginning this step in the siting process mid way through the year in 2013 has been made.

Deliverable

Support to communities to engage in various activities associated with Step 4/5/6 in the siting process

Assumptions

Schedule	Start Year	4	2013	Finish Year	9	2018

Type

Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 3,888,000	$ 3,888,000	$ 972,000	$ 4,860,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	50			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	CAPACITY BUILDING OF OTHERS – Non profit organizations/ academics								
Description	Includes funding to non-profit organizations and academics to enable them to participate in the site selection process leading up to the regulatory review stage and to follow and evaluate issues concerning the disposal of radioactive waste and its effect on the environment and people's health. · $200,000 per year, beginning in 2012 · Includes travel costs and out of pocket expenses associated with individuals attending an NWMO briefing, information session or topical workshop								
Deliverable									
Assumptions									
Schedule	Start Year		3	2012			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,400,000	$ 1,400,000	$ 350,000	$ 1,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	130			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	MANAGING COMMUNITY IMPACTS (Community Benefits)								
Description	Benefits to be defined for each of: · Host community · Surrounding communities · Region · Transportation communities as a large group with a shared interest · Losing potential host community Benefits to begin with triggering formal regulatory review process milestone. Full benefits to begin with granting of construction licence. Hosting agreement components may include: · The means by which the NWMO and the community will work together to seek regulatory approval to proceed to implement the project · The need for, and nature of, provision of resources and funding for technical and other assistance; · The need for, and nature of, any decision-making and/or advisory bodies to support the process · The mechanism to be used for dispute resolution · The approach for ensuring the long-term sustainability and well-being of the community through the project, outlining specific inclusions · The approach to managing the impacts association with the project As negotiated with the community, it may also include: · Upgrades to local roads and infrastructure · Emergency response, transportation monitoring, accident liability and transportation corridor training · Environmental oversight and monitoring agreement including oversight, monitoring, remediation, and emergency response in relation to environmental issues · Agreements with affected Aboriginal organizations · Environmental monitoring and research centre as part of Centre of Expertise (separate WED); baseline health studies; fund to support community based monitoring · Records centre as part of Centre of Expertise · Meeting and conference centre, local training and business centre, research center for independent environmental impact monitoring at university as part of Centre of Expertise · Funding for independent oversight · Advanced manufacturing and innovation training centre; Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence · Funding for school equipment and curricula · Community donations program · Local procurement program · Business development projects · Training – emergency response and radioprotection and related equipment · Economic assistance grant to offset impacts of transportation · Intergenerational fund · Property value protection Estimated total value of hosting agreement (above and beyond economic benefits which naturally flow from the project) is a contingent item to be negotiated with the community. · It is expected that a Milestone payment will be made upon the community making a compelling demonstration of willingness and being selected as preferred community in step 6. Will involve at a minimum host community, losing community and may involve surrounding communities/region.								
Deliverable									
Assumptions									
Schedule	Start Year		3	2012		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	20	50			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	MANAGING COMMUNITY IMPACTS (Community Benefits)								
Description	Benefits to be defined for each of: · Host community · Surrounding communities · Region · Transportation communities as a large group with a shared interest · Losing potential host community Benefits to begin with triggering formal regulatory review process milestone. Full benefits to begin with granting of construction licence. Hosting agreement components may include: · The means by which the NWMO and the community will work together to seek regulatory approval to proceed to implement the project · The need for, and nature of, provision of resources and funding for technical and other assistance; · The need for, and nature of, any decision-making and/or advisory bodies to support the process · The mechanism to be used for dispute resolution · The approach for ensuring the long-term sustainability and well-being of the community through the project, outlining specific inclusions · The approach to managing the impacts association with the project As negotiated with the community, it may also include: · Upgrades to local roads and infrastructure · Emergency response, transportation monitoring, accident liability and transportation corridor training · Environmental oversight and monitoring agreement including oversight, monitoring, remediation, and emergency response in relation to environmental issues · Agreements with affected Aboriginal organizations · Environmental monitoring and research centre as part of Centre of Expertise (separate WED); baseline health studies; fund to support community based monitoring · Records centre as part of Centre of Expertise · Meeting and conference centre, local training and business centre, research center for independent environmental impact monitoring at university as part of Centre of Expertise · Funding for independent oversight · Advanced manufacturing and innovation training centre; Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence · Funding for school equipment and curricula · Community donations program · Local procurement program · Business development projects · Training – emergency response and radioprotection and related equipment · Economic assistance grant to offset impacts of transportation · Intergenerational fund · Property value protection Estimated total value of hosting agreement (above and beyond economic benefits which naturally flow from the project) is a contingent item to be negotiated with the community. · It is expected that a Milestone payment will be made upon the community making a compelling demonstration of willingness and being selected as preferred community in step 6. Will involve at a minimum host community, losing community and may involve surrounding communities/region.								
Deliverable									
Assumptions									
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	30	30			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	MANAGING COMMUNITY IMPACTS (Community Benefits)								
Description	Benefits to be defined for each of: · Host community · Surrounding communities · Region · Transportation communities as a large group with a shared interest · Losing potential host community Benefits to begin with triggering formal regulatory review process milestone. Full benefits to begin with granting of construction licence. Hosting agreement components may include: · The means by which the NWMO and the community will work together to seek regulatory approval to proceed to implement the project · The need for, and nature of, provision of resources and funding for technical and other assistance; · The need for, and nature of, any decision-making and/or advisory bodies to support the process · The mechanism to be used for dispute resolution · The approach for ensuring the long-term sustainability and well-being of the community through the project, outlining specific inclusions · The approach to managing the impacts association with the project As negotiated with the community, it may also include: · Upgrades to local roads and infrastructure · Emergency response, transportation monitoring, accident liability and transportation corridor training · Environmental oversight and monitoring agreement including oversight, monitoring, remediation, and emergency response in relation to environmental issues · Agreements with affected Aboriginal organizations · Environmental monitoring and research centre as part of Centre of Expertise (separate WED); baseline health studies; fund to support community based monitoring · Records centre as part of Centre of Expertise · Meeting and conference centre, local training and business centre, research center for independent environmental impact monitoring at university as part of Centre of Expertise · Funding for independent oversight · Advanced manufacturing and innovation training centre; Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence · Funding for school equipment and curricula · Community donations program · Local procurement program · Business development projects · Training – emergency response and radioprotection and related equipment · Economic assistance grant to offset impacts of transportation · Intergenerational fund · Property value protection Estimated total value of hosting agreement (above and beyond economic benefits which naturally flow from the project) is a contingent item to be negotiated with the community. · It is expected that a Milestone payment will be made upon the community making a compelling demonstration of willingness and being selected as preferred community in step 6. Will involve at a minimum host community, losing community and may involve surrounding communities/region.								
Deliverable									
Assumptions									
Schedule	Start Year		16	2025		Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	40	30			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	MANAGING COMMUNITY IMPACTS (Community Benefits)								
Description	Benefits to be defined for each of: · Host community · Surrounding communities · Region · Transportation communities as a large group with a shared interest · Losing potential host community Benefits to begin with triggering formal regulatory review process milestone. Full benefits to begin with granting of construction licence. Hosting agreement components may include: · The means by which the NWMO and the community will work together to seek regulatory approval to proceed to implement the project · The need for, and nature of, provision of resources and funding for technical and other assistance; · The need for, and nature of, any decision-making and/or advisory bodies to support the process · The mechanism to be used for dispute resolution · The approach for ensuring the long-term sustainability and well-being of the community through the project, outlining specific inclusions · The approach to managing the impacts association with the project As negotiated with the community, it may also include: · Upgrades to local roads and infrastructure · Emergency response, transportation monitoring, accident liability and transportation corridor training · Environmental oversight and monitoring agreement including oversight, monitoring, remediation, and emergency response in relation to environmental issues · Agreements with affected Aboriginal organizations · Environmental monitoring and research centre as part of Centre of Expertise (separate WED); baseline health studies; fund to support community based monitoring · Records centre as part of Centre of Expertise · Meeting and conference centre, local training and business centre, research center for independent environmental impact monitoring at university as part of Centre of Expertise · Funding for independent oversight · Advanced manufacturing and innovation training centre; Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence · Funding for school equipment and curricula · Community donations program · Local procurement program · Business development projects · Training – emergency response and radioprotection and related equipment · Economic assistance grant to offset impacts of transportation · Intergenerational fund · Property value protection Estimated total value of hosting agreement (above and beyond economic benefits which naturally flow from the project) is a contingent item to be negotiated with the community. · It is expected that a Milestone payment will be made upon the community making a compelling demonstration of willingness and being selected as preferred community in step 6. Will involve at a minimum host community, losing community and may involve surrounding communities/region.								
Deliverable									
Assumptions									
Schedule	Start Year		26	2035		Finish Year	26	2035	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ -	$ -	$ -	$ -

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	160			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	CENTRE OF EXPERTISE (NEW)								
Description	· Assumes two centres of expertise will be launched, one in each of two communities involved in detailed site characterization. (As outlined in the siting document, centre of expertise will be established at the site, or nearby as determined with the community, initially to support the multi-year testing and assessment of the site on technical safety and community well-being related dimensions which is an important component of the siting process. It will be the home for an active technical and social research and technology demonstration program involving researchers and other experts in a wide variety of disciplines including rock science, engineering, environmental and socio-economic and cultural impact assessment. The centre of expertise will also be a focus for engaging members of the community to learn more about the project, to view the scientific and engineering work involved in site assessment in progress through public viewing galleries and interactive displays. Created as a small science centre focused on the design, construction and implementation of a deep geological repository and the wide variety of related activities, it will be designed not only as a meeting place and learning centre for the community but also as a destination for interested visitors from the region and beyond.) · Assumes one of these centres of expertise is developed into a national centre beginning in step 6 of the siting process. (As outlined in the siting document, should the site be ultimately selected to host the deep geological repository, the centre of expertise will be expanded to include and support the construction and operation of an underground demonstration facility designed to demonstrate the safety of the facilities before they are constructed and ultimately to support the operation of the deep repository over several decades. As has been the case for deep geological repositories for nuclear waste constructed in other countries, it will become a hub for knowledge sharing across Canada and internationally.) · As negotiated with the community, it may also include: o Records centre o Meeting and conference centre, o local training and business centre o research center for independent environmental impact monitoring o Advanced manufacturing and innovation training centre; o Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence o Ongoing research on Traditional Knowledge of area and development of Heritage Centre · Key Milestones: o 2014 - Begin construction on 2 sites as per commitments made in site selection process (Step 4). o 2018 - Expand facility at preferred site to meet community commitments (preferred site selected). o 2025 - Expand facility to support UDF and other commitments and DGR construction in 2030. o 2035 - Right size facility for operation phase of work and commitments to community.								
Deliverable									
Assumptions									
Schedule	Start Year		4	2013		Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 10,000,000	$ 10,000,000	$ 2,500,000	$ 12,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	20	60			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	CENTRE OF EXPERTISE (NEW)								
Description	· Assumes two centres of expertise will be launched, one in each of two communities involved in detailed site characterization. (As outlined in the siting document, centre of expertise will be established at the site, or nearby as determined with the community, initially to support the multi-year testing and assessment of the site on technical safety and community well-being related dimensions which is an important component of the siting process. It will be the home for an active technical and social research and technology demonstration program involving researchers and other experts in a wide variety of disciplines including rock science, engineering, environmental and socio-economic and cultural impact assessment. The centre of expertise will also be a focus for engaging members of the community to learn more about the project, to view the scientific and engineering work involved in site assessment in progress through public viewing galleries and interactive displays. Created as a small science centre focused on the design, construction and implementation of a deep geological repository and the wide variety of related activities, it will be designed not only as a meeting place and learning centre for the community but also as a destination for interested visitors from the region and beyond.) · Assumes one of these centres of expertise is developed into a national centre beginning in step 6 of the siting process. (As outlined in the siting document, should the site be ultimately selected to host the deep geological repository, the centre of expertise will be expanded to include and support the construction and operation of an underground demonstration facility designed to demonstrate the safety of the facilities before they are constructed and ultimately to support the operation of the deep repository over several decades. As has been the case for deep geological repositories for nuclear waste constructed in other countries, it will become a hub for knowledge sharing across Canada and internationally.) · As negotiated with the community, it may also include: o Records centre o Meeting and conference centre, o local training and business centre o research center for independent environmental impact monitoring o Advanced manufacturing and innovation training centre; o Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence o Ongoing research on Traditional Knowledge of area and development of Heritage Centre · Key Milestones: o 2014 - Begin construction on 2 sites as per commitments made in site selection process (Step 4). o 2018 - Expand facility at preferred site to meet community commitments (preferred site selected). o 2025 - Expand facility to support UDF and other commitments and DGR construction in 2030. o 2035 - Right size facility for operation phase of work and commitments to community.								
Deliverable									
Assumptions									
Schedule	Start Year		10	2019		Finish Year	15	2024	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,000,000	$ 6,000,000	$ 1,500,000	$ 7,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	30	40			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	CENTRE OF EXPERTISE (NEW)								
Description	· Assumes two centres of expertise will be launched, one in each of two communities involved in detailed site characterization. (As outlined in the siting document, centre of expertise will be established at the site, or nearby as determined with the community, initially to support the multi-year testing and assessment of the site on technical safety and community well-being related dimensions which is an important component of the siting process. It will be the home for an active technical and social research and technology demonstration program involving researchers and other experts in a wide variety of disciplines including rock science, engineering, environmental and socio-economic and cultural impact assessment. The centre of expertise will also be a focus for engaging members of the community to learn more about the project, to view the scientific and engineering work involved in site assessment in progress through public viewing galleries and interactive displays. Created as a small science centre focused on the design, construction and implementation of a deep geological repository and the wide variety of related activities, it will be designed not only as a meeting place and learning centre for the community but also as a destination for interested visitors from the region and beyond.) · Assumes one of these centres of expertise is developed into a national centre beginning in step 6 of the siting process. (As outlined in the siting document, should the site be ultimately selected to host the deep geological repository, the centre of expertise will be expanded to include and support the construction and operation of an underground demonstration facility designed to demonstrate the safety of the facilities before they are constructed and ultimately to support the operation of the deep repository over several decades. As has been the case for deep geological repositories for nuclear waste constructed in other countries, it will become a hub for knowledge sharing across Canada and internationally.) · As negotiated with the community, it may also include: o Records centre o Meeting and conference centre, o local training and business centre o research center for independent environmental impact monitoring o Advanced manufacturing and innovation training centre; o Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence o Ongoing research on Traditional Knowledge of area and development of Heritage Centre · Key Milestones: o 2014 - Begin construction on 2 sites as per commitments made in site selection process (Step 4). o 2018 - Expand facility at preferred site to meet community commitments (preferred site selected). o 2025 - Expand facility to support UDF and other commitments and DGR construction in 2030. o 2035 - Right size facility for operation phase of work and commitments to community.								
Deliverable									
Assumptions									
Schedule	Start Year		16	2025			Finish Year	25	2034
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 12,000,000	$ 12,000,000	$ 3,000,000	$ 15,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	40	40			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	CENTRE OF EXPERTISE (NEW)								
Description	· Assumes two centres of expertise will be launched, one in each of two communities involved in detailed site characterization. (As outlined in the siting document, centre of expertise will be established at the site, or nearby as determined with the community, initially to support the multi-year testing and assessment of the site on technical safety and community well-being related dimensions which is an important component of the siting process. It will be the home for an active technical and social research and technology demonstration program involving researchers and other experts in a wide variety of disciplines including rock science, engineering, environmental and socio-economic and cultural impact assessment. The centre of expertise will also be a focus for engaging members of the community to learn more about the project, to view the scientific and engineering work involved in site assessment in progress through public viewing galleries and interactive displays. Created as a small science centre focused on the design, construction and implementation of a deep geological repository and the wide variety of related activities, it will be designed not only as a meeting place and learning centre for the community but also as a destination for interested visitors from the region and beyond.) · Assumes one of these centres of expertise is developed into a national centre beginning in step 6 of the siting process. (As outlined in the siting document, should the site be ultimately selected to host the deep geological repository, the centre of expertise will be expanded to include and support the construction and operation of an underground demonstration facility designed to demonstrate the safety of the facilities before they are constructed and ultimately to support the operation of the deep repository over several decades. As has been the case for deep geological repositories for nuclear waste constructed in other countries, it will become a hub for knowledge sharing across Canada and internationally.) · As negotiated with the community, it may also include: o Records centre o Meeting and conference centre, o local training and business centre o research center for independent environmental impact monitoring o Advanced manufacturing and innovation training centre; o Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence o Ongoing research on Traditional Knowledge of area and development of Heritage Centre · Key Milestones: o 2014 - Begin construction on 2 sites as per commitments made in site selection process (Step 4). o 2018 - Expand facility at preferred site to meet community commitments (preferred site selected). o 2025 - Expand facility to support UDF and other commitments and DGR construction in 2030. o 2035 - Right size facility for operation phase of work and commitments to community.								
Deliverable									
Assumptions									
Schedule	Start Year		26	2035			Finish Year	85	2094
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 30,000,000	$ 30,000,000	$ 7,500,000	$ 37,500,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	50	10			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	CENTRE OF EXPERTISE (NEW)								
Description	· Assumes two centres of expertise will be launched, one in each of two communities involved in detailed site characterization. (As outlined in the siting document, centre of expertise will be established at the site, or nearby as determined with the community, initially to support the multi-year testing and assessment of the site on technical safety and community well-being related dimensions which is an important component of the siting process. It will be the home for an active technical and social research and technology demonstration program involving researchers and other experts in a wide variety of disciplines including rock science, engineering, environmental and socio-economic and cultural impact assessment. The centre of expertise will also be a focus for engaging members of the community to learn more about the project, to view the scientific and engineering work involved in site assessment in progress through public viewing galleries and interactive displays. Created as a small science centre focused on the design, construction and implementation of a deep geological repository and the wide variety of related activities, it will be designed not only as a meeting place and learning centre for the community but also as a destination for interested visitors from the region and beyond.) · Assumes one of these centres of expertise is developed into a national centre beginning in step 6 of the siting process. (As outlined in the siting document, should the site be ultimately selected to host the deep geological repository, the centre of expertise will be expanded to include and support the construction and operation of an underground demonstration facility designed to demonstrate the safety of the facilities before they are constructed and ultimately to support the operation of the deep repository over several decades. As has been the case for deep geological repositories for nuclear waste constructed in other countries, it will become a hub for knowledge sharing across Canada and internationally.) · As negotiated with the community, it may also include: o Records centre o Meeting and conference centre, o local training and business centre o research center for independent environmental impact monitoring o Advanced manufacturing and innovation training centre; o Environmental/ hazardous materials education and training programs or other; centre for hazardous waste management excellence o Ongoing research on Traditional Knowledge of area and development of Heritage Centre · Key Milestones: o 2014 - Begin construction on 2 sites as per commitments made in site selection process (Step 4). o 2018 - Expand facility at preferred site to meet community commitments (preferred site selected). o 2025 - Expand facility to support UDF and other commitments and DGR construction in 2030. o 2035 - Right size facility for operation phase of work and commitments to community.								
Deliverable									
Assumptions									
Schedule	Start Year		86	2095			Finish Year	155	2164
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 7,000,000	$ 7,000,000	$ 1,750,000	$ 8,750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	40			**Prepared By:**	J. Facella
WBS (Old)									

WBS Title MUNICIPAL FORUM AND TOOL DEVELOPMENT

Description Joint conduct of research programs and development of tools and communication materials designed to support communities which are interested in hosting the project.

Deliverable Tools and communication materials targeted to communities and designed to support their exploration of interest in the APM project.

Note that the specific work to be completed will be identified and shaped through dialogue with the Municipal Forum at its regular meetings.

This work is expected to decrease over time as the siting process becomes more focussed on communities which have entered the siting process and, through dialogue and collaboration with the NWMO, will focus more directly on responding to their individual needs and requirements. Forecast of costs are:

- $200,000 in 2011
- $100,000 in 2012,
- $100,000 in 2013
- $50,000 in 2014

Assumptions It is assumed that the Municipal Forum will continue to meet at least until communities have been identified for detailed site characterization and regional study groups begin to be formed around them.

Schedule	Start Year	2 2011	Finish Year	5 2014	

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 450,000	$ 450,000	$ 112,500	$ 562,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	180			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	EXPERT ADVICE, WORKSHOPS								
Description	The purpose of this work is to solicit expert advice and conduct topic specific workshops to support the development of components of the siting process, as it unfolds, that may be important to the credibility of the siting process and NWMO's participation in it. Forecast costs: · $200,000 in 2010								
Deliverable									
Assumptions									
Schedule	Start Year		1	2010		Finish Year	1	2010	
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 200,000	$ 200,000	$ 50,000	$ 250,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	120		**Prepared By:**	J. Facella	
WBS (Old)									

WBS Title ASSESSMENTS OF SITE SUITABILITY (SOCIAL ASPECTS)

Description

The focus of this work program is to assess, in a stepwise manner, the potential social, political, ethical, economic and cultural effects of the project on an interested community under the umbrella of "community well-being".

Step 1 and 2

- Development of a reference framework which elaborates on the community well-begin framework described in the siting document
- Consultant develops desk-top profile of community, describing the community on as many of the dimensions of the reference framework possible using publicly available data. This is intended for NWMO internal use in obtaining an early sense of the resources which may be required to implement the project in the community. The profile will also be used to help build the capacity of the NWMO to engage in early discussions and relationship building with the community: Estimate of cost is $50,000 per community
- NWMO staff costs to travel to the community, to walk through the community with community representatives for an early 'ground-truthing' of the profile.

Estimated cost:

- $357,000 in 2011

Step 3

- Contractor cost to add to the desktop profile with information held by the community and obtained during this step: Estimate of incremental cost $20,000 - $25,000 per community. Total $125,000 in each of 2011 and 2012
- NWMO may wish to conduct regional information sessions, or other broad engagement, to supplement the work lead by the community and funded as part of the community capacity building program – NO COST INCLUDED IN THIS WED
- Contractor development of abbreviated desktop community profile for surrounding communities. Estimate: $200,000 in each of 2011 and 2012
- Contractor development of high level profile for each region associated with potential host communities. Estimate: $200,000 in each of 2011 and 2012
- Cost associated with launching of Traditional Land Use Studies. Estimate: $100,00 in 2011 and $250,000 in 2012
- NWMO lead engagement among transportation communities to begin identification of social issues. Estimate: $50,000 in 2011 and $150,000 in 2012
- Field Studies (interviews). Estimate: $100,000 in 2012
- NWMO staff travel. Estimate $100,000 in 2011 and $100,000 in 2012

Estimated cost:

- $775,000 in 2011
- $1.13M in 2012

Step 4

- Field studies in communities. Estimate: $100,000 in 2013; $200,000 in 2014; $100,000 in 2015; expenditure at 2015 level each year until completion of EIS
- Field studies in surrounding communities. Estimate: $100,000 in 2013; $200,000 in 2014; $100,000 in 2015; expenditure at 2015 level each year until completion of EIS
- Field studies in regions. Estimate: $80,000 in 2013; $100,000 in 2014; $100,000 in 2015; expenditure at 2015 level each year until completion of EIS
- NWMO lead engagement. Estimate: $100,000 in 2013; $200,000 in 2014; $200,000 in 2015; expenditure at 2015 level each year until completion of EIS
- Regional Study Management. Estimate: $284,000 in 2011; $100,000 in 2012; $388,000 in 2013; $2.294M in 2014; $100,000 in 2015; expenditure at 2015 level each year until completion of EIS
- Traditional Land Use Studies (Phase 2). Estimate: $100,000 in 2014; $100,000 in 2015; expenditure at 2015 level each year until completion of EIS
- Staff travel. Estimate: $100,000 in 2013; $200,000 in 2014; $200,000 in 2015; expenditure at 2015 level each year until completion of EIS.

Estimated cost:

- $525,000 in 2013
- $1.1M in 2014
- $900,000 in 2015
- Note some level of spending is expected to be required through until completion of EIS

Deliverable

Stepwise assessment of suitability of site, surrounding communities, region, transportation communities (as a large group with a shared interest).

Assumptions

- Assumes 4 communities surround each potential willing host community, including Aboriginal communities
- Assumes these studies are a foundation for relationship building and issue management with community, surrounding communities, regions, transportation communities. For this reason, it is assumed that expenditures in this area will need to continue at some level through until the completion of the EIS.
- $357K in step 2 (2011); $1.961M in Step 3 (2011-2012); $5.655M in Step 4 (2011-2015).

Schedule	Start Year	2	2011	Finish Year	9	2018

Type Fixed

Calculations and Notes:

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 7,973,000	$ 7,973,000	$ 1,993,250	$ 9,966,250

APM Cost Estimate

Work Element Definition Sheet

								NWMO Cost Code: 0170022-**11**	
WBS (New)	561	15	10	10	100			**Prepared By:**	P. Simmons
WBS (Old)									
	SITING SELECTION PROCESS								
WBS Title	**STAFF TRAVEL COSTS – NON ABORIGINAL**								
Description	Category includes for NWMO staff to attend, and provide/deliver speaking engagements and briefings on request to municipal councils, council committees (e.g. economic development) community groups and other accountable authorities in the 4 nuclear provinces interested in learning more about NWMO, APM site selection process on an ongoing basis. These requests must be initiated by the local accountable authority (e.g. municipal council), which do not include aboriginal councils and organizations (separate category). Costs include travel-related expenses for staff participating in speaking engagements/briefings, and on off-site meetings (briefings), and related costs (catering, meeting room, A/V, travel for delegates and accommodations if needed).								
Deliverable	Primary deliverable is primarily informing delegations and inquiring bodies through response and requests for information. Related to this deliverable (budgeted elsewhere) is the NWMO learn more program highlighted, reviewed and discussed at these speaking engagements. Secondary deliverable is the support of the NWMO brand as it relates to continued awareness of the siting process, and the dispensation of information and tools and products associated with the siting process. Third deliverable is the maintenance and building of relationships between municipal governments, associations, community groups, potential host communities and surrounding communities for long-term sustainability of site selection process and confidence in the NWMO.								
Assumptions	It is estimated that the NWMO will inform and respond to several non-aboriginal community meetings/briefings per year until 2025 (Aboriginal budgeted elsewhere). It is assumed that a number of these requests for information briefings from community organizations may lead to participation in the NWMO's "Learn More" program from which funding may be provided to municipalities for independent studies aimed to inform their consideration of interest in the project. Costs associated with the Learn More program are categorized and budgeted separately. The costs and activities, as outlined in this category, assist in building relationships with community leaders and members, increase awareness of APM and the siting process, and allow for information distribution in local communities and may encourage participation in the Learn More Program. The average number of inquiring communities may fluctuate and cannot reasonably be assumed to increase or decrease, but is assumed to drop after candidate sites are selected. The locations of the meetings, and pace at which groups move through the process cannot reasonably be assumed. Consequently, the average cost per meeting should be kept conservatively high versus low.								
Schedule	Start Year	1	2010			Finish Year	9	2018	
Type	Fixed								
Calculations and Notes:	Current budget Y01 (2010) = $ 200,000 Y02 (2011) – Y03 (2012) – $180,000 x 2 years = $ 360,000 Y04 (2013) – Y16 (2025) – $125,000 x 13 years = $ 1,625,000 Y17 (2026) – Y26 (2034) - $75,000 x 9 years = $675,000								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 1,310,000	$ 1,310,000	$ 327,500	$ 1,637,500

APM Cost Estimate

Work Element Definition Sheet

								NWMO Cost Code: 0170022-**11**	
WBS (New)	561	15	10	20	30			**Prepared By:**	P. Simmons
WBS (Old)									
	SITING SELECTION PROCESS								
WBS Title	**STAFF TRAVEL COSTS – NON ABORIGINAL**								
Description	Category includes for NWMO staff to attend, and provide/deliver speaking engagements and briefings on request to municipal councils, council committees (e.g. economic development) community groups and other accountable authorities in the 4 nuclear provinces interested in learning more about NWMO, APM site selection process on an ongoing basis. These requests must be initiated by the local accountable authority (e.g. municipal council), which do not include aboriginal councils and organizations (separate category). Costs include travel-related expenses for staff participating in speaking engagements/briefings, and on off-site meetings (briefings), and related costs (catering, meeting room, A/V, travel for delegates and accommodations if needed).								
Deliverable	Primary deliverable is primarily informing delegations and inquiring bodies through response and requests for information. Related to this deliverable (budgeted elsewhere) is the NWMO learn more program highlighted, reviewed and discussed at these speaking engagements. Secondary deliverable is the support of the NWMO brand as it relates to continued awareness of the siting process, and the dispensation of information and tools and products associated with the siting process. Third deliverable is the maintenance and building of relationships between municipal governments, associations, community groups, potential host communities and surrounding communities for long-term sustainability of site selection process and confidence in the NWMO.								
Assumptions	It is estimated that the NWMO will inform and respond to several non-aboriginal community meetings/briefings per year until 2025 (Aboriginal budgeted elsewhere). It is assumed that a number of these requests for information briefings from community organizations may lead to participation in the NWMO's "Learn More" program from which funding may be provided to municipalities for independent studies aimed to inform their consideration of interest in the project. Costs associated with the Learn More program are categorized and budgeted separately. The costs and activities, as outlined in this category, assist in building relationships with community leaders and members, increase awareness of APM and the siting process, and allow for information distribution in local communities and may encourage participation in the Learn More Program. The average number of inquiring communities may fluctuate and cannot reasonably be assumed to increase or decrease, but is assumed to drop after candidate sites are selected. The locations of the meetings, and pace at which groups move through the process cannot reasonably be assumed. Consequently, the average cost per meeting should be kept conservatively high versus low.								
Schedule	Start Year	10	2019		Finish Year	15	2024		
Type	Fixed								
Calculations and Notes:	Current budget Y01 (2010) = $ 200,000 Y02 (2011) – Y03 (2012) – $180,000 x 2 years = $ 360,000 Y04 (2013) – Y16 (2025) – $125,000 x 13 years = $ 1,625,000 Y17 (2026) – Y26 (2034) - $75,000 x 9 years = $675,000								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$ 187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

								NWMO Cost Code: 0170022-**11**	
WBS (New)	561	15	10	30	10			**Prepared By:**	P. Simmons
WBS (Old)									
	SITING SELECTION PROCESS								
WBS Title	**STAFF TRAVEL COSTS – NON ABORIGINAL**								
Description	Category includes for NWMO staff to attend, and provide/deliver speaking engagements and briefings on request to municipal councils, council committees (e.g. economic development) community groups and other accountable authorities in the 4 nuclear provinces interested in learning more about NWMO, APM site selection process on an ongoing basis. These requests must be initiated by the local accountable authority (e.g. municipal council), which do not include aboriginal councils and organizations (separate category). Costs include travel-related expenses for staff participating in speaking engagements/briefings, and on off-site meetings (briefings), and related costs (catering, meeting room, A/V, travel for delegates and accommodations if needed).								
Deliverable	Primary deliverable is primarily informing delegations and inquiring bodies through response and requests for information. Related to this deliverable (budgeted elsewhere) is the NWMO learn more program highlighted, reviewed and discussed at these speaking engagements. Secondary deliverable is the support of the NWMO brand as it relates to continued awareness of the siting process, and the dispensation of information and tools and products associated with the siting process. Third deliverable is the maintenance and building of relationships between municipal governments, associations, community groups, potential host communities and surrounding communities for long-term sustainability of site selection process and confidence in the NWMO.								
Assumptions	It is estimated that the NWMO will inform and respond to several non-aboriginal community meetings/briefings per year until 2025 (Aboriginal budgeted elsewhere). It is assumed that a number of these requests for information briefings from community organizations may lead to participation in the NWMO's "Learn More" program from which funding may be provided to municipalities for independent studies aimed to inform their consideration of interest in the project. Costs associated with the Learn More program are categorized and budgeted separately. The costs and activities, as outlined in this category, assist in building relationships with community leaders and members, increase awareness of APM and the siting process, and allow for information distribution in local communities and may encourage participation in the Learn More Program. The average number of inquiring communities may fluctuate and cannot reasonably be assumed to increase or decrease, but is assumed to drop after candidate sites are selected. The locations of the meetings, and pace at which groups move through the process cannot reasonably be assumed. Consequently, the average cost per meeting should be kept conservatively high versus low.								
Schedule	Start Year	16	2025			Finish Year	25	2034	
Type	Fixed								
Calculations and Notes:	Current budget Y01 (2010) = $ 200,000 Y02 (2011) – Y03 (2012) – $180,000 x 2 years = $ 360,000 Y04 (2013) – Y16 (2025) – $125,000 x 13 years = $ 1,625,000 Y17 (2026) – Y26 (2034) - $75,000 x 9 years = $675,000								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 750,000	$ 750,000	$ 187,500	$ 937,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	80			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	STAKEHOLDER MAPPING FOR SITING REGIONS								
Description	Identify key undividuals, groups and networks which may become involved in the site selection process and build an understanding of their issues, needs and concerns in order that these might be addresed prior to licensing.								
Deliverable	Strategic overview report for each of the involved regions, prepared by a contractor, and updated periodically in the period leading up to licensing.								
Assumptions									
Schedule	Start Year		2	2011			Finish Year	9	2018
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 800,000	$ 800,000	$ 200,000	$ 1,000,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	20	70			**Prepared By:**	J. Robinson
WBS (Old)									
WBS Title	STAKEHOLDER MAPPING FOR SITING REGIONS								
Description	Identify key undividuals, groups and networks which may become involved in the site selection process and build an understanding of their issues, needs and concerns in order that these might be addresed prior to licensing.								
Deliverable	Strategic overview report for each of the involved regions, prepared by a contractor, and updated periodically in the period leading up to licensing.								
Assumptions									
Schedule	Start Year		10	2019			Finish Year	15	2024
Type	Fixed								
Calculations and Notes:									

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 600,000	$ 600,000	$ 150,000	$ 750,000

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	10	10	90			**Prepared By:**	J. Facella/J. Robinson
WBS (Old)									
WBS Title	NATIONAL WORKSHOPS ON SOCIAL CONSIDERATIONS OF SITING								
Description	Workshops to raise awareness of APM siting process, and provide communities with access to information on APM project. Workshops designed to be responsive to topics identified by communities and municipal associations as being of great Interest.								
Deliverable	Two phases: - A full-day panel session in Halifax at the Spring 2011 conference of Federation of Canadian Municipalities, including presentations from Swedish councilors from host community. - Opportunities for individual communities to commence with representatives from Sweden.								
Assumptions	That we will cover costs of conference registrations, travel costs, meeting rooms and facilitation costs.								
Schedule	Start Year	2	2011	Finish Year	6	2015			
Type	Fixed								
Calculations and Notes:	Assume travel and registration costs for: -15 communities bringing 5 members each. - 4 Swedish officials. Assume additional costs for conference facilities, meeting rooms, meals and facilitation.								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance	25%	Total Cost
$ -	$ -	$ 250,000	$ 250,000	$	62,500	$ 312,500

APM Cost Estimate

Work Element Definition Sheet

WBS (New)	561	15	60	40	10			**Prepared By:**	J. Facella
WBS (Old)									
WBS Title	SUSTAINING RELATIONSHIPS/ COLLABORATION DURING OPERATIONS								
Description	The focus of this work program is to sustain relationships with the community throughout operation of the facility by continuing to engage the community at a grass roots level in decision-making through operations and involvement in ongoing monitoring and management of project effects. NWMO has committed to this ongoing collaboration in its published material. The funding outlined here is designed to cover NWMO costs (not associated with labour or communications material production) associated with ongoing involvement of community residents in monitoring of potential effects and other key decision areas throughout operations. These costs may include: catering for community meetings, rental of facilities for community meetings, hiring of a facilitator for community meetings if appropriate, and more.								
Deliverable	Support for ongoing community engagement and outreach								
Assumptions	Cost of public communication covered elsewhere								
Schedule	Start Year		26	2035			Finish Year	85	2094
Type	Fixed								
Calculations and Notes:	$100,000/ year through the period of operations (2035 – 2094)								

Labour Costs	Material Costs	Other Costs	Subtotal	Allowance 25%	Total Cost
$ -	$ -	$ 6,000,000	$ 6,000,000	$ 1,500,000	$ 7,500,000