PHASE 2 INITIAL BOREHOLE DRILLING AND TESTING AT IG_BH04/05/06 - IGNACE AREA

WP01 Site Demobilization Report – Site Infrastructure for IG_BH05

APM-REP-01332-0312 **October 2022**

Golder Associates Ltd.

nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

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REPORT

PHASE 2 INITIAL BOREHOLE DRILLING AND TESTING AT IG_BH04/05/06. IGNACE AREA

WP01 Site Demobilization Report - Site Infrastructure for IG_BH05

Submitted to:

Nuclear Waste Management Organization
4th Floor
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NWMO Report: APM-REP-01332-0312

October 3, 2022

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WP01 SITE DEMOBILIZATION REPORT
SITE INFRASTRUCTURE FOR IG_BH05

CLIENT INFORMATION

Project Name:	Phase 2 Initial Borehole Drilling and Testing, Ignace Area
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Client:	Nuclear Waste Management Organization (NWMO) 22 St. Clair Avenue East, 4th Floor Toronto, Ontario M4T 2S3

Client Contact:	Geoff Crann	Warwick Watt
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Issue/Revision Index

Issue Code	Revision					Revision Details
	No.	By	Reviewed	Approved	Date	
RR	0	SH	GWS	JLC	2021-12-20	Draft for review and comment
RR	1	SH	GWS	JLC	2022-01-19	Revised draft for review and comment
RR	2	KRM	GWS	JLC	2022-07-05	Revised draft added spring walkover activities - added survey data and letter - Updated template to new colours
RI	3	KRM	GWS	JLC	2022-07-11	FINAL - Added Signatures - Addressed NWMO comment in section 4.2
RI	4	KRM	GWS	JLC	2022-09-14	Re-Issue - Updated reference to ground surface reference datum at IG_BH05
RI	5	KRM	GWS	JLC	2022-10-03	Revised based on NWMO Comments - Added Datum Correction Memo as Appendix C. Referenced Appendix C in Section 3.8

Issue Codes: RR = Released for Review and Comments, RI = Released for Information

SIGNATURES

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Reviewed by: _____

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APPENDICES

1.0 INTRODUCTION

The Phase 2 Borehole Drilling and Testing at IG_BH04/05/06 project is part of the Phase 2 Geoscientific Preliminary Field Investigations of the Nuclear Waste Management Organization's (NWMO) Adaptive Phased Management Site Selection Phase.

This project involves testing of deep borehole IG_BH04 and the drilling and testing of deep boreholes IG_BH05 and IG_BH06 in the Ignace area within the identified Revell Potential Repository Area. The work comprises a total of 11 work packages and is being carried out by a team led by Golder Associates Ltd. (Golder) on behalf of the NWMO.

Work Package WP01 (WP01) addresses site establishment and site infrastructure activities for the drilling and testing of boreholes IG_BH04, IG_BH05, and IG_BH06. The overall program at IG_BH05 is described in the Borehole Characterization Plan for IG_BH05 (Golder 2021a).

The Ignace area is located a direct distance of approximately 21 km southeast of the Wabigoon Lake Ojibway Nation and a direct distance of 43 km northwest of the Town of Ignace. Access to the area is via Highway 17 and primary logging roads, as shown on Figure 1.

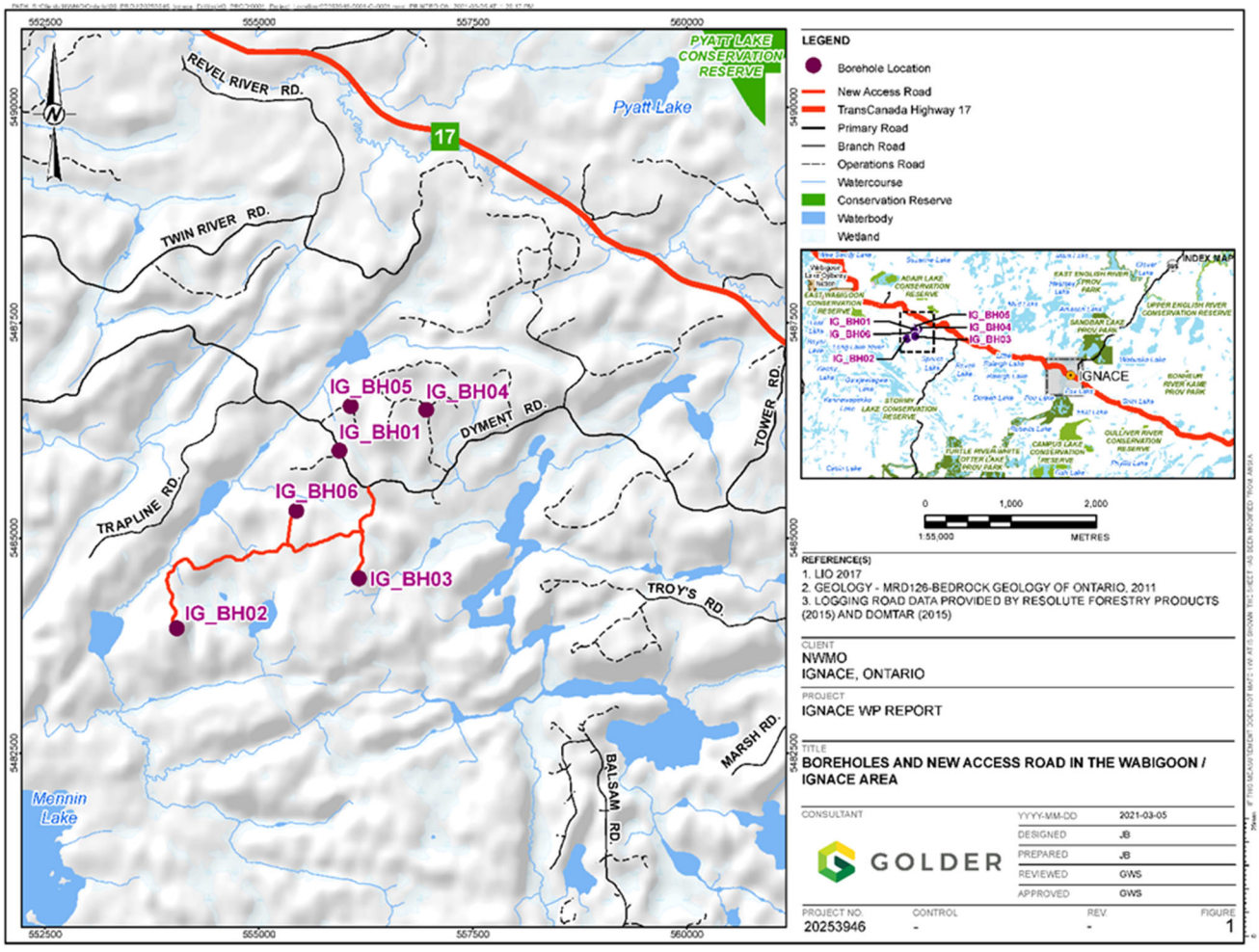

Figure 1: The Ignace Area - access roads and drill sites for IG_BH04, IG_BH05, and IG_BH06

2.0 OBJECTIVE

As stated in the WP01 Test Plan (Golder 2021b), a site decommissioning technical report is to be submitted for each of the drill sites to document the dismantling and demobilization of site infrastructure.

Section 9.5 of the WP01 Test Plan (Golder 2021b), states that the overall objectives of demobilization and decommissioning are as follows:

- To remove all equipment and infrastructure from the site upon completion of borehole drilling and testing in a timely manner;
- To ensure no refuse or waste is left behind either on the site or in the immediate surroundings;
- To remove any potentially impacted fill material from the site, such as petroleum hydrocarbons, drilling mud, or other substances;
- To leave the site in a physically and environmentally acceptable state; and,
- To perform the demobilization safely, and to document the manner in which demobilization was performed.

This report describes the site demobilization and decommissioning activities performed at borehole IG_BH05. An aerial photo of the IG_BH05 site while in operation during May 2021 is provided in Appendix A (Photo 1).

3.0 DEMOBILIZATION AND DECOMISSIONING ACTIVITIES

The demobilization of site facilities from IG_BH05 was carried out by Obish Construction LP (Obish) and their subcontractors, and the demobilization of the drilling infrastructure was carried out by Rodren Drilling Ltd. (Rodren) all under the supervision of Golder.

The demobilization and decommissioning activities at IG_BH05 took place during the following periods and comprised the following general activities.

- August 2021 – Drilling, water management and core logging infrastructure was transferred from IG_BH05 to IG_BH06, once drilling and flushing of IG_BH05 was completed.
- October 2021 – A recycling bin was demobilized from IG_BH05.
- November 2021 – A diesel generator was transferred from IG_BH05 to IG_BH06; the workover rig and water management infrastructure was demobilized from IG_BH05; the majority of the main site infrastructure was demobilized from IG_BH05; and the majority of site clean-up and decommissioning activities were completed.
- December 2021 – The IG_BH05 wellhead was surveyed, and a site demobilization inspection was completed by Golder with an NWMO representative.
- June 2022 – Stained gravel, debris, and perimeter silt fence were collected and removed. A final site decommissioning inspection was completed by Golder with a NWMO representative.

Further details of these activities are provided in the subsections below.

3.1 Drilling Equipment

3.1.1 August 2021 - Transfer to IG_BH06

Drilling Equipment and Support Infrastructure

On August 11 to 16, and August 23, 2021 Rodren, Obish, and Atlas Dewatering (Atlas) transferred the following drilling equipment and support infrastructure from IG_BH05 to IG_BH06:

- August 11, 2021 - Rodren transferred extra rig mats to IG_BH06.
- August 12, 2021 - Rodren transferred drilling tools, supplies and HQ drill rods.
- August 13, 2021 - Rodren transferred drilling tools, supplies and HQ drill rods.
- August 14, 2021 - Rodren transferred the EF-100 drilling rig, one rod sloop, one core extraction shack, one centrifuge (AMC SRU), one seacan containing wastewater and fluorescein tanks using a flat deck transport truck, a bulldozer, and a skid-steer.
- August 15, 2021 - Rodren transferred one fuel tank.
- August 16, 2021 - Obish transferred the WP03 Core Logging Seacan using a flat deck transport truck, (replacement seacan transported from IG_BH04 to IG_BH05 by Obish this day as well).
- August 23, 2021 - Atlas transferred the two 28,350 litre (7,500 US gallon) Baker tanks using a speciality transport truck.

3.1.2 November 2021 – Off-Site Demobilization

Work-Over Rig

A skid mounted Discovery Diamond Drill model EF-75 was transferred from IG_BH04 on August 14, 2021 and used for WP06 and WP09 activities at IG_BH05. All field activities requiring the EF-75 were completed on November 14, 2021.

The EF-75 was demobilized by Rodren from IG_BH05 on November 16, 2021 using a flat deck transport truck to Rodren's facility in Winnipeg, Manitoba (Appendix A, Photo 2).

Secondary Containment Disposal and Rig Matting

Beneath the workover rig was a secondary containment system with a central sump which captured any drill fluid spills that could potentially occur in the drill rig or drill fluid circulation system. Rig matting was placed over top of the secondary containment system, to provide a level and solid foundation for the drill rig infrastructure.

The rig mats were removed from the drill pad on November 18, 2021 and stacked on-site in preparation for off-site demobilization. On November 23, 2021 the rig mats were loaded onto a transport truck and transported off-site to Rodren's facility in Winnipeg, Manitoba.

The secondary containment system was disassembled and placed into the waste bin on November 18, 2021 and disposed off-site by Obish's subcontractor, B&M Delivery, on November 24, 2021 (Appendix A, Photo 3).

Other Drilling Equipment and Support Infrastructure

On November 16, 17 and 19, 2021 Rodren and Obish, demobilized the following infrastructure from IG_BH05.

- November 16, 2021 - Rodren loaded one fuel tank and the two tanks used for wastewater and fluorescein onto a flatbed truck using a skid-steer. The load was transported off-site to Rodren's facility in Winnipeg, Manitoba.
- November 17, 2021 - Rodren loaded one drill rod sloop from IG_BH05 and a load of bundled drill roads onto a flatbed truck using a skid-steer. The load was transported off-site to Rodren's facility in Winnipeg, Manitoba. A 6 x 2.5 m (20' x 8') seacan was demobilized by Secure Store to Secure Store facility in Thunder Bay, Ontario. The seacan was used as a storage of the field supplies.
- November 19, 2021 - One 6 x 2.5 m (20' x 8') seacan was demobilized by Secure Store, a subcontractor of Obish, to the Secure Store facility in Thunder Bay, Ontario. The seacan was used to house the wastewater and fluorescein tanks.

3.2 Site Trailers

3.2.1 Office Trailers

A 12 x 3 m (40' x 10') mobile office trailer was set up on the north side of the site and two 9.75 x 3 m (32' x 10') mobile office trailers were set up on the northeast corner of the site. The office trailers functioned as field offices for Golder, NWMO/WLON, and Rodren, respectively.

The office trailers were equipped with heaters which were fuelled with exterior propane tanks. The propane tanks were disconnected and removed by Morgan Fuels (an Obish subcontractor) on November 16, 2021.

The Golder and Rodren office trailers were demobilized from IG_BH05 on November 17, 2021 and the NWMO/WLON office trailer was demobilized on November 17, 2021 by Secure Store (Appendix A, Photo 4).

3.2.2 Core Logging and Storage Seacans

Two 12 x 2.5 m (40' x 8') modified seacans were placed at the east corner of site near the drill rig and functioned as a working space for all the work package activities. One seacan was designated as the WP03 Core Logging Seacan and the other was designated as the WP02 Core Storage Seacan. Upon completion of drilling and testing at IG_BH05, the WP03 Core Logging Seacan was transported to IG_BH06 by Secure Store, and a replacement seacan was transported to IG_BH05 from IG_BH04. Both seacans were moved on August 16, 2021.

On November 17, 2021 one of the modified seacans and two 6 x 2.5 m (20' x 8') seacans were demobilized from IG_BH05 by Secure Store. The remaining modified seacan was demobilized by Secure Store on November 19, 2021.

3.2.3 Washroom Trailer

A heated and self-contained washroom trailer was placed near the west side of the site adjacent to the site gate. The washroom trailer was divided into two units with separate entrances, each containing one toilet and one sink. The self-contained washroom trailer was demobilized off-site from IG_BH05 by Obish subcontractor, Balla Bros, on November 16, 2021.

3.3 Security Fencing

Approximately 220 m (704') of 2.5 m (8') tall fencing was originally installed around the perimeter of the site in May 2021 to define the work area, provide security, and to discourage wildlife from entering the site. A lockable gate was installed on the west side of the site, to allow worker access to the site from the parking lot.

In addition to the perimeter fencing, approximately 70 m (230') of 1.8 m (6') tall fencing was installed around the drill rig area to define an interior exclusion zone.

Obish took down all perimeter and interior fencing at IG_BH05 on November 16 to 18, 2021 and transported the fencing off-site on November 18, 2021 (Appendix A, Photo 5).

3.4 Power and Lighting

Fediuk Electric Inc. (Fediuk) from Dryden, Ontario was retained by Obish to disconnect and dismantle the power generation and distribution system at IG_BH05.

3.4.1 Power Distribution

Power from the main site generator was distributed to the site facilities via double jacketed electrical cables. The majority of the power lines were mounted to the site perimeter fence. In areas where the electrical lines passed through a trafficable area, they were buried underground inside ABS conduit.

On November 16, 2021 the site power system was decommissioned and all above ground infrastructure was removed by Fediuk.

On November 18, 2021 all underground electrical conduit infrastructure including PVC piping, grounding wires, and grounding plates were excavated and removed by Obish from IG_BH05 (Appendix A, Photo 6).

3.4.2 Power Generation

IG_BH05 was powered by a Cummins mobile diesel generator (model C60D6R), which supplied 40.2 kW of 120 V single-phase output. It was used to power the site office trailers, core logging, and storage seacans, washroom trailer, and a portable power system on the drill pad.

A 4,500 L double-walled fuel storage tank was located adjacent to the generator, so that refuelling of the generator could be performed directly from the fuel storage tank. The fuel tank and generator were placed inside two separate secondary containment berms side by side with containment capacity of 5,460 L each, sufficient to contain the maximum amount of fuel and oil in the system. The fuel tank was surrounded by concrete barricades to protect it from vehicular traffic and heavy machinery.

On November 16, 2021 Obish removed the concrete barricades and demobilized them from site.

On November 17, 2021 the Cummins mobile diesel generator was transferred from IG_BH05 to IG_BH06 by Obish as the generator at IG_BH06 was diagnosed as faulty by Fediuk earlier that day. The generator from IG_BH06 was demobilized from site and returned to United Rentals by Obish. On November 18, 2021 Mastrangelo Fuels (an Obish subcontractor) drained the remaining fuel from the fuel storage tank. On November 19, 2021 the fuel storage tank was loaded onto a Mastrangelo Fuels flatbed truck and demobilized from site.

The secondary containment berms were disassembled and delivered in a pick-up truck by the Golder site supervisor to the Golder Mississauga office on November 21, 2021 for re-use at another Golder project site.

3.4.3 Site Illumination

Three 4-kW Wacker Neuson Metrolite LTV4 diesel powered light towers with LED lights were installed at the site to provide outside illumination during work at night. Obish demobilized all three light towers from IG_BH05 on November 16, 2021.

3.5 Site Communications

Cellular signals from the local mobile network were amplified for all site workers through the use of a Uniden cellular signal booster. Internet service for the site was provided through the local cellular network with two Bell Canada ZTE MF288 Turbo Hub cellular internet receivers. Emergency satellite communications were provided by a handheld Garmin In-Reach SE.

Following the demobilization of the site, all units were returned to the Golder Mississauga office on November 21, 2021.

3.6 Solid Waste

Solid waste was managed using one garbage bin and one recycling bin located near the front entrance to the site, for ease of access by the garbage and recycling truck. The bins were both located inside the fenced area and had lids which could be secured to prevent access by animals. The bins were supplied by Obish subcontractor, B&M Deliveries (B&M), who transported waste material to the Town of Dryden Landfill Site for disposal on a monthly basis or upon request by the Site Supervisor.

Following a disagreement between B&M and Golder, the recycling and garbage bins were removed from IG_BH05 on October 5, 2021 and November 9, 2021 respectively.

For the purpose of demobilization, an empty roll-off garbage bin was delivered to IG_BH05 by B&M on November 16, 2021. The filled roll-off garbage bin was demobilized from IG_BH05 by B&M on November 24, 2021.

3.7 Borehole Casing

A threaded HWT extension casing with a lockable lid was installed at IG_BH05 by a Rodren welder on November 19, 2021. On November 20, 2021 Rodren completed final surface grading of IG_BH05 with a bulldozer (Appendix A, Photo 7).

After grading was completed, security fencing provided by the NWMO was installed around the borehole and the casing lid was secured with locks provided by the NWMO.

3.8 Borehole Survey

A final as-built survey of the borehole was performed by Rugged Geomatics Inc. on December 2, 2021, after the IG_BH05 borehole casing was installed. Rugged Geomatics provided the results of this as-built survey in a letter dated January 12, 2022 which is attached in Appendix B.

In August 2022, while preparing the IG_BH05 WP09 data report, Golder identified a discrepancy in the position of the **ground surface elevation reference datum** stated in the WP02 data report issued in June 2022 relative to the survey results provided by Rugged Geomatics (referenced above).

Golder reviewed multiple data sources and concluded that the surveyed position of the HWT (PQ) surface casing reported in the letter from Rugged Geomatics was inadvertently mistaken to be the position of the HWT (PQ) surface casing as it was during drilling, testing and Westbay installation. However, prior to being surveyed by Rugged Geomatics in December 2022, this original casing was extended after the installation of the Westbay system in order to complete the well head with a monopod bracket and protective casing.

The original position of the HWT (PQ) surface casing prior to it being extended was also surveyed, and was identified by Rugged Geomatics as survey point 20052 “bh5 welded joint of pqt casing”.

Using that information, Golder calculated the correct ground surface elevation reference datum for IG_BH05 relative to the original position of the HWT (PQ) casing. Golder prepared a memo detailing the IG_BH05 datum correction which is provided in Appendix C.

The Universal Transverse Mercator (UTM) zone 15 coordinates and geodetic elevations (CGVD2013 datum) survey results from the Rugged Geomatics as-built survey are provided in the table below, along with the corrected ground surface datum coordinates as calculated by Golder.

Table 1: IG_BH05 Borehole Casing Elevations

Shot Point Description	Northing	Easting	Elevation (CGVD2013)
IG_BH05 – Ground surface (located approximately 6m from collar)	5486531.39	556066.00	432.60
IG_BH05 – Top of surface (HWT) casing	5486536.28	556069.39	433.60
IG_BH05 – Top of PQT casing	5486536.26	556069.38	433.67
IG_BH05 – Welded joint of PQT casing	5486536.07	556069.23	433.05
IG_BH05 – Sump box	5486535.98	556069.17	432.78
IG_BH05 – Corrected ground surface elevation reference datum	5486535.85	556069.05	432.29

4.0 SITE INSPECTIONS

4.1 Demobilization Inspection - November 2021

Following completion of all site demobilization and decommissioning activities, a site walkover inspection of IG_BH05 was performed on November 30, 2021 by Shady Hashem, Golder's site supervisor, and Adrian Kowalchuk, a site representative from the NWMO.

The objective of the inspection was to check for the presence of any litter which may still be present. A grid pattern was walked around the entire site, and it was confirmed that there was no litter or staining visible at the site. Due to the snow cover, a final post-thaw inspection will be conducted in spring 2022 to check for any litter or stains that could have been obscured by the snow.

4.2 Final Inspection - June 2022

Golder returned to IG_BH05 on June 28, 2022 to complete final site clean-up and decommissioning activities in post-thaw conditions. The NWMO's Geoff Crann met on-site with Warren Willis, Golder's site supervisor, and a labourer from Obish. Sandbags, general debris, garbage, gravel with minor staining, and the perimeter silt fence were collected and removed from the site.

At the end of the day, a final walkover was completed by Geoff Crann and Warren Willis, and it was confirmed there was no litter or staining observed, the site conditions were acceptable, and no additional work was required.

4.3 Site Decommissioning Checklist

The completion of demobilization and decommissioning activities were documented as they took place, and the results were recorded on a site decommissioning checklist. The checklist was signed off by Golder representatives upon completion and is provided in Appendix D.

5.0 FINAL SITE CONDITIONS

An aerial photo of the IG_BH05 drill site was taken following demobilization on December 10, 2021 by Geoff Crann of the NWMO (Appendix A, Photo 8).

An additional aerial photo of the IG_BH05 drill site was be taken in post-thaw conditions on June 28, 2022 by Geoff Crann of the NWMO (Appendix A, Photo 9).

6.0 REFERENCES

Golder (Golder Associates Ltd.), 2021a. Phase 2 Initial Borehole Drilling and Testing at IG_BH04/05/06, Ignace Area. Borehole Characterization Plan for IG_BH05 (NWMO Document: APM-PLAN-01332-0274), April 2021.

Golder, 2021b. WP01 Test Plan - Site Infrastructure for IG_BH04/05/06 (NWMO Document: APM-PLAN-01332-0373), March 2021.

APPENDIX A

IG_BH05 Site Demobilization Photos

Photo 1 - Overhead drone photo of the commissioned IG_BH05 site, taken on May 9, 2021.

Photo 2 – Loading the Rodren drill rig onto a flat bed trailer for demobilization – November 16, 2021

Photo 3 – Rig mats removed from IG_BH05 drill pad, secondary containment in process of being removed - November 18, 2021

Photo 4 – Demobilization of office trailer from IG_BH05 – November 17, 2021

Photo 5 – Demobilization of perimeter fencing from IG_BH05 – November 18, 2021

Photo 6 – Underground electrical conduit excavation and removal – November 18, 2021

Photo 7 – Final site condition with final wellhead casing installed, NWMO supplied locks in place, grading complete - November 20, 2021

Photo 8 – Aerial drone photo of IG_BH05 following demobilization – December 10, 2021.

Photo 9 – Aerial drone photo of IG_BH05 following post-thaw clean-up and inspection – June 28, 2022.

APPENDIX B

IG_BH05 As-Built Survey Letter

RUGGED GEOMATICS
ONTARIO LAND SURVEYORS

2022 01 12

Kyle Matter
Construction Project Manager
Golder Associates Ltd.
6925 Century Avenue
Suite 100
Mississauga, Ontario
L5N 7K2

Dear Mr. Matter;

RE: As-built Survey
Borehole IG_BH05
Nuclear Waste Management Organization
Dyment Site
Our File No. SK18128

Below please find the UTM Zone 15 Coordinates and geodetic elevations(CGVD**2013** Datum) for various components of the borehole. Golder's Shady Hashem, P. Eng. instructed us on site during the survey with respect to coding and identification of the points below. The coordinate for a ground shot in close proximity to the drill hole is also included.

Point	**Easting**	**Northing**	**Elevation**	**code**
20056	556066.00	5486531.39	432.60	ground
20050	556069.39	5486536.28	433.60	bh5 top casing
20051	556069.38	5486536.26	433.67	bh5 top pqt casing
20052	556069.23	5486536.07	433.05	bh5 welded joint of pqt casing
20054	556069.17	5486535.98	432.78	bh5 sumpbox

Thanking you for the opportunity to be of service, I remain

Yours Very Truly,

Eric Rody, B.Sc., OLS, CLS

Unit 3, 619 Ninth Street North, Kenora, Ont. P9N 2S9
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APPENDIX C

IG_BH05 Data Correction Memo

TECHNICAL MEMORANDUM

DATE September 27, 2022 **Project No.** 20253946

TO Warwick Watt
Nuclear Waste Management Organization

CC Andrew Verok, Matt Bowman, Kyle Matter, Jennifer Hlookoff, Natacha Lugo Bizarro

FROM George Schneider, Joe Carvalho, Natalie Solis **EMAIL george.schneider@wsp.com**

CORRECTION TO REFERENCE GROUND SURFACE ELEVATION DATUM – IG_BH05 – PHASE 2 INITIAL BOREHOLE DRILLING AND TESTING AT IG_BH04/05/06, IGNACE AREA

Mr. Watt

While the WP09 team was preparing the data report for IG_BH05, we came across a discrepancy in the position of the **ground surface elevation reference datum** stated in the WP02 data report issued in June 2022 relative to the survey results provided by Rugged Geomatics in their letter dated January 11, 2022.

In an effort to resolve this discrepancy, we took a very close look at the following data sources, which we have annotated with comments and provided as attachments to this memorandum.

- Attachment 1 – Drilling Equipment Dimensions and Nomenclature from IG_BH05 WP02 Test Plan
- Attachment 2 – Collar and Casing Coordinates and Construction Schematic from IG_BH05 WP02 Data Report
- Attachment 3 – Summary Completion Log Sketch from the Westbay Completion Report
- Attachment 4 – Sketch of Extension to IG_BH05 surface casing and Westbay riser pipe (by Site Supervisor)
- Attachment 5 – Rugged Geomatics Survey Letter
- Attachment 6 – Composite sketch of reference points – Pre-extension (during drilling, testing and Westbay install) and Post-extension (as surveyed)

Based on our review of the above noted attachments, we have concluded that the surveyed position of the HWT (PQ) surface casing reported in the letter from Rugged Geomatics was inadvertently mistaken to be the position of the HWT (PQ) surface casing as it was during drilling, testing and Westbay installation. However, prior to being surveyed by Rugged Geomatics in December 2022, this original casing was extended after the installation of the Westbay system in order to complete the well head with a monopod bracket and protective casing.

The original position of the HWT (PQ) surface casing prior to it being extended was also surveyed, and was identified by Rugged Geomatics as survey point 20052 “bh5 welded joint of pqt casing”.

Using that information, we have calculated the correct **ground surface elevation reference datum for IG_BH05** relative to the original position of the HWT (PQ) casing.

The calculation is presented in Table 1 (attached) and the corrected coordinates are as follows.

Easting (m)	Northing (m)	Elevation (masl)	Note
556069.05	5486535.85	432.29	Updated (corrected) Calculated Ground Surface Reference Datum
556069.23	5486536.09	432.93	Previous (incorrect) Calculated Ground Surface Reference Datum
-0.18	-0.24	-0.64	Difference

CGVD 2013 datum

We have corrected this datum in the IG_BH05 WP09 data deliverable (revision R4b) and will be re-issuing it to the NWMO, and we have used the corrected datum in the draft IG_BH05 WP09 data report, which will be issued shortly.

We will be informing our Work Package Leads of this correction to the datum, and ask them to identify which data packages and reports are affected and propose corrective actions.

This incident has been entered as a non-conformance in our Quality Management System. This preliminary investigation has already yielded some valuable lessons learned, which can inform future investigations and help prevent a similar occurrence.

If you have any questions, please contact the undersigned.

Golder Associates Ltd.

George Schneider, M.Sc., P.Geo.
Senior Geoscientist - Principal

Joe Carvalho, Ph.D., P.Eng.
Mining & Rock Engineering - Principal

Natalie Solis, P.Eng.
Project Manager

GWS/JLC/NAS

Distribution: WSP Golder, Westbay Instruments, NWMO

Attachments: Table 1 – Calculation of Original Ground Surface Reference Datum Position from Rugged Geomatics Survey Data IG_BH05

Attachments 1 to 6

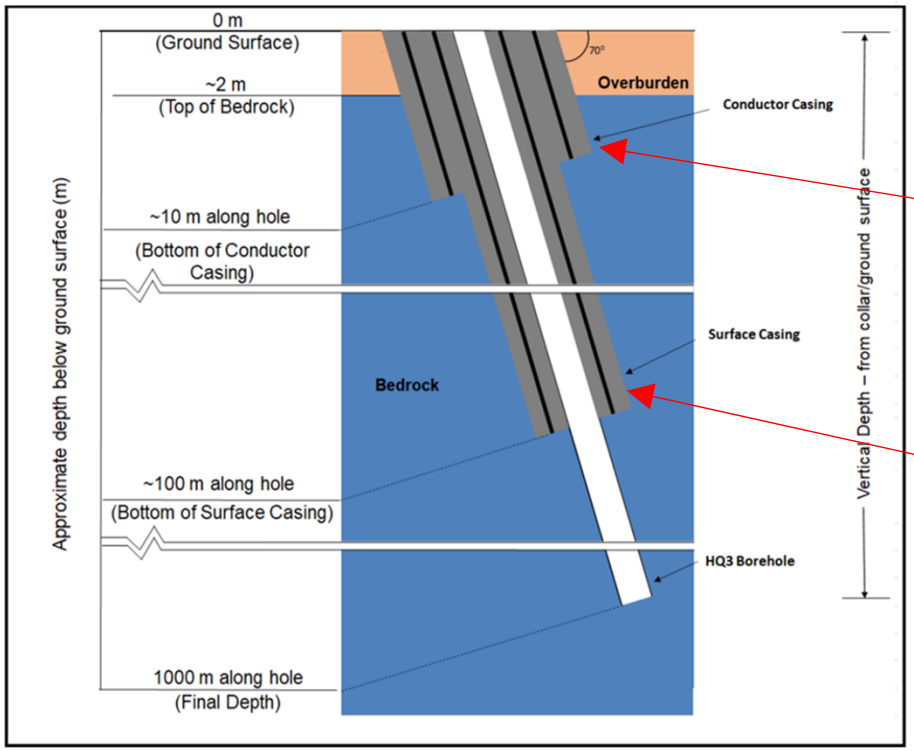
https://golderassociates.sharepoint.com/sites/142487/project files/5 qaqc/07 qaqc ncrs/10 ncr gnd surface reference datum/bh05 gen memo/20253946 elev ref datum correction 27sep2022 r2a.docx

Attachment 1 – Drilling Equipment Dimensions and Nomenclature from IG_BH05 WP02 Test Plan

Table 3: Dimensions of all Drilling Equipment and Core

Rod/Casing Size	Outer Diameter (mm)	Inner Diameter (mm)	Hole Size (mm)	Approximate Depth in Borehole
PWT Casing	139.70	127.00	N/A	surface to ~10 m into bedrock
PWT Shoe Bit	143.76	122.94	143.76	surface to ~10 m into bedrock
PQ Casing (Rods)	114.30	101.60	N/A	up to 100 m into bedrock[1]
PQ Shoe Bit	117.50	100.5	117.50	up to 100 m into bedrock[1]
PQ Casing Advancer Pilot Bit	121.0	94.2	121.0	up to 100 m into bedrock[1]
HQ Rods	88.90	77.80	N/A	0 – 1000 m
HQ3 Bit	96.00	61.10	96.00	0 – 1000 m
HQ3 Core	61.10	N/A	N/A	0 – 1000 m

[1]Final depth will depend on the bedrock conditions encountered.



PWT Conductor Casing

HWT (PQ) Surface Casing

Figure 2: Borehole Schematic

Attachment 2 - Comments on Collar and Casing Coordinates and Construction Schematic from IG_BH05 WP02 Data Report

A – Calculated incorrectly – Golder initially used the wrong survey data point in the calculation of the reference elevation

B – Sump weld - surveyed correctly by Rugged but not used

C – Incorrectly labelled by Rugged – this is the top of extended Westbay riser pipe as surveyed by Rugged

D - Top of HWT (PQ) surface casing as surveyed by Rugged after extension was added – this is where the error originated – should have used survey of the "casing joint"

Table 5: IG_BH05 Final Surveyed Collar and Casing Coordinates Previous (incorrect) Table 5

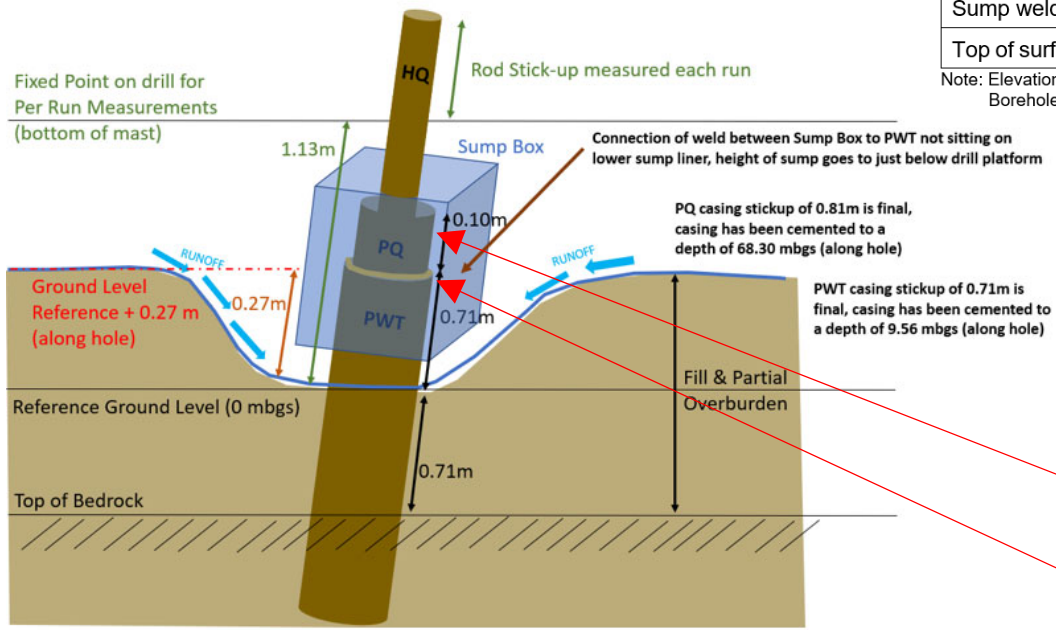
Point	Northing (m)	Easting (m)	Elevation (m)	Comment
Borehole Collar - Reference Ground Level (RP for drilling)	5486536.09	556069.23	432.93	Calculated E, N & Elev
Sump weld	5486535.98	556069.17	432.78	Provided E, N & Elev
Top of conductor (PWT) casing	5486536.28	556069.39	433.60	Provided E, N & Elev
Top of surface (PQ) casing	5486536.26	556069.38	433.67	Provided E, N & Elev

Note: Elevations are Geodetic and referred to the CGVD2013 Datum and coordinates are referred to UTM Zone 15, NAD 83 (CSRS).
Borehole Collar – Reference Ground Level refers to the pre-drilling ground surface level and has since been regraded

Table 5: IG_BH05 Final Surveyed Collar and Casing Coordinates Updated (correct) Table 5

Point	Northing (m)	Easting (m)	Elevation (m)	Comment
Borehole Collar - Reference Ground Level (RP for drilling)	5486535.85	556069.05	432.29	Calculated E, N & Elev
Sump weld	5486535.98	556069.17	432.78	Provided E, N & Elev
Top of surface (PQ) casing	5486536.07	556069.23	433.05	Provided E, N & Elev

Note: Elevations are Geodetic and referred to the CGVD2013 Datum and coordinates are referred to UTM Zone 15, NAD 83 (CSRS).
Borehole Collar – Reference Ground Level refers to the pre-drilling ground surface level and has since been regraded



HWT (PQ) Surface Casing

PWT Conductor Casing

Figure 12: IG_BH05 Borehole Construction Schematic prior to PQ Surface casing extension

Borehole Orientation

The borehole was planned to be drilled with an azimuth and inclination of 220° / -70° with no correction made for deviation as the drilling progressed.

Attachment 3 – Comments on the Summary Completion Log Sketch from the Westbay Completion Report

Summary Completion Log

Company: Golder/NWMO
Well: IG_BH05
Site: Ignace,ON
Project: Groundwater Characterization Study

Job No: WB981
Author: TK/DL

Elevation datum used (provided by Golder from WP02 – needs to be correct)

Well Information

Reference Datum: Ground Level
Elevation of Datum: 432.93 masl
MP Casing Top: 0.00 m.
MP Casing Length: 994.45 m.

Borehole Depth: 1000.63 m.
Borehole Inclination: 70 degrees
Borehole Diameter: 98.00 mm

Well Description:
Plastic MP38 System
Other References:
Revision after Oct 14,2021 meeting
Approval on R3 via e-mail on Oct 25

File Information

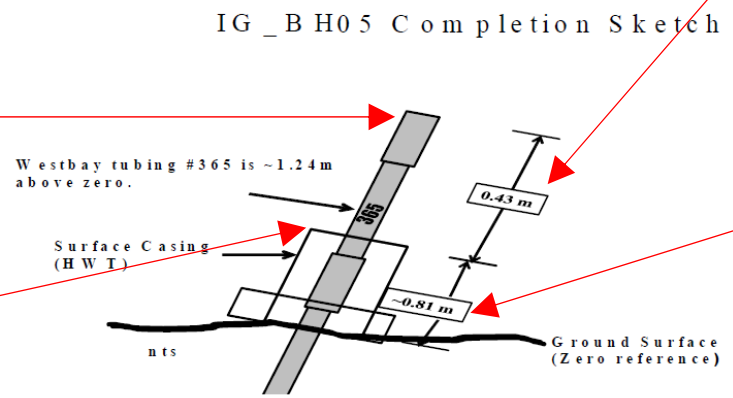
File Name: IGBH05AB.WWD
Report Date: Wed Nov 24 08:46:28 2021

File Date: Nov 24 08:43:06 2021

Distance along hole between original HWT casing and top of Westbay riser pipe (0.43 m)

Sketch of Wellhead Completion

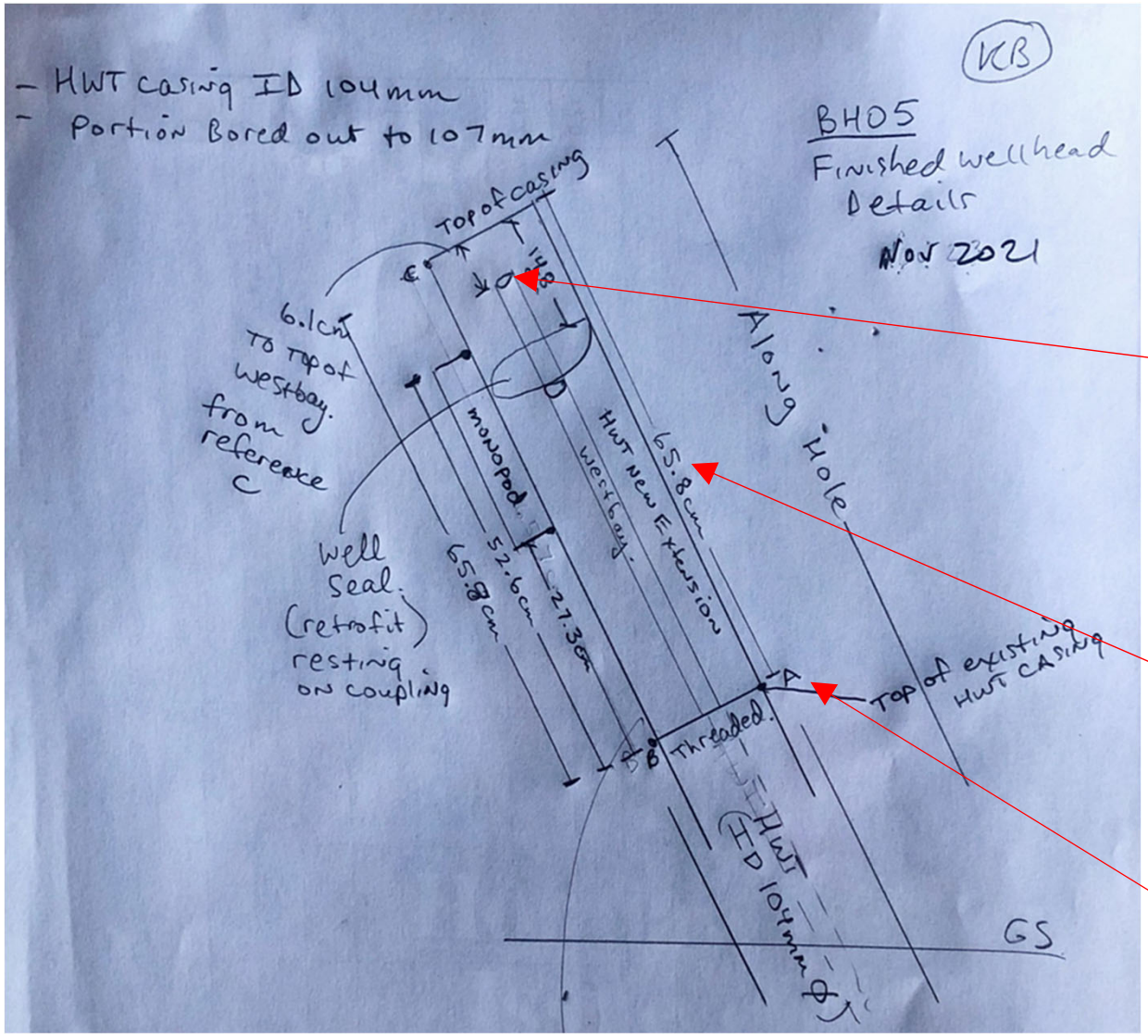
Top of Westbay riser pipe (before extension was added)



Distance along hole between original HWT casing and ground surface reference point (0.81m)

HWT (PQ) Surface Casing

Attachment 4 – Sketch of Extension to IG_BH05 surface casing and Westbay riser pipe (by Site Supervisor)



Top of Westbay riser pipe (after extension was added)
Net length of extension = 0. 167 m

Length of HWT extension added = 0.658 m

Top of HWT (PQ) Surface Casing during drilling and testing, prior to extension added – this is the surveyed reference point to use

Attachment 5 – Comments on Rugged Geomatics Survey Letter (2022-01-12)

RE: As-built Survey
Borehole IG_BH05
Nuclear Waste Management Organization
Dyment Site
Our File No. SK18128

Below please find the UTM Zone 15 Coordinates and geodetic elevations(CGVD**2013** Datum) for various components of the borehole. Golder's Shady Hashem, P. Eng. instructed us on site during the survey with respect to coding and identification of the points below. The coordinate for a ground shot in close proximity to the drill hole is also included.

Point	Easting	Northing	Elevation	code
20056	556066.00	5486531.39	432.60	ground
20050	556069.39	5486536.28	433.60	bh5 top casing
20051	556069.38	5486536.26	433.67	bh5 top pqt casing
20052	556069.23	5486536.07	433.05	bh5 welded joint of pqt casing
20054	556069.17	5486535.98	432.78	bh5 sumpbox

Ground = nearby ground surface shot – not used

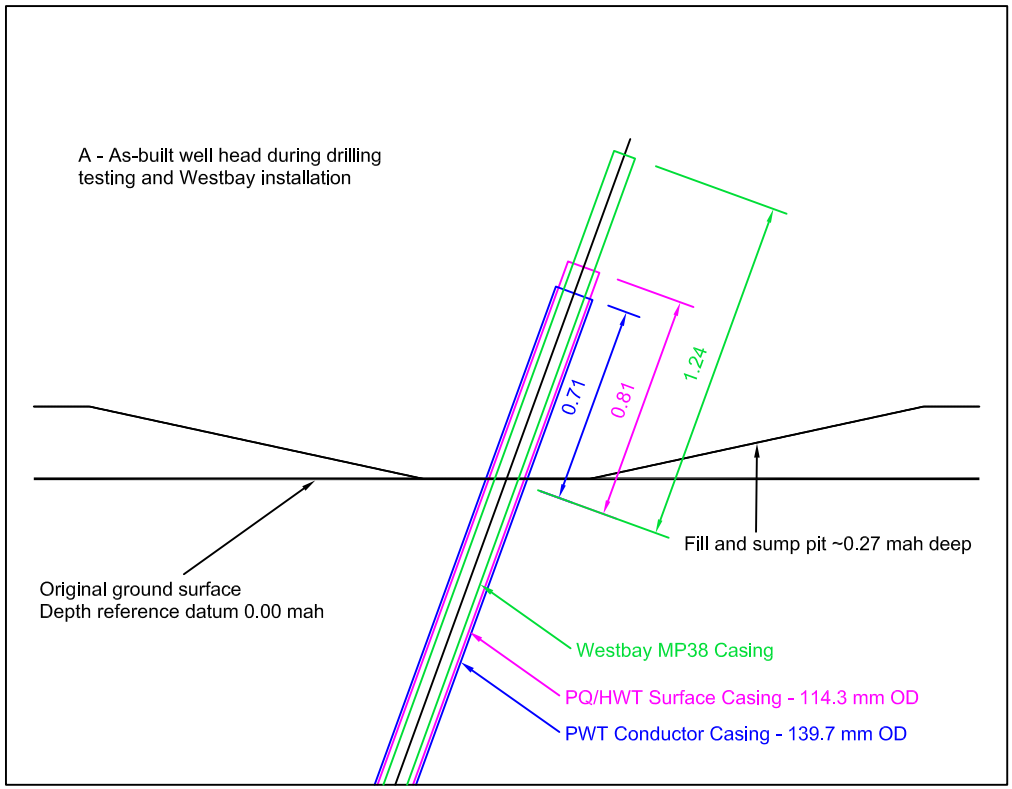
bh5 top casing = top of extended Westbay pipe

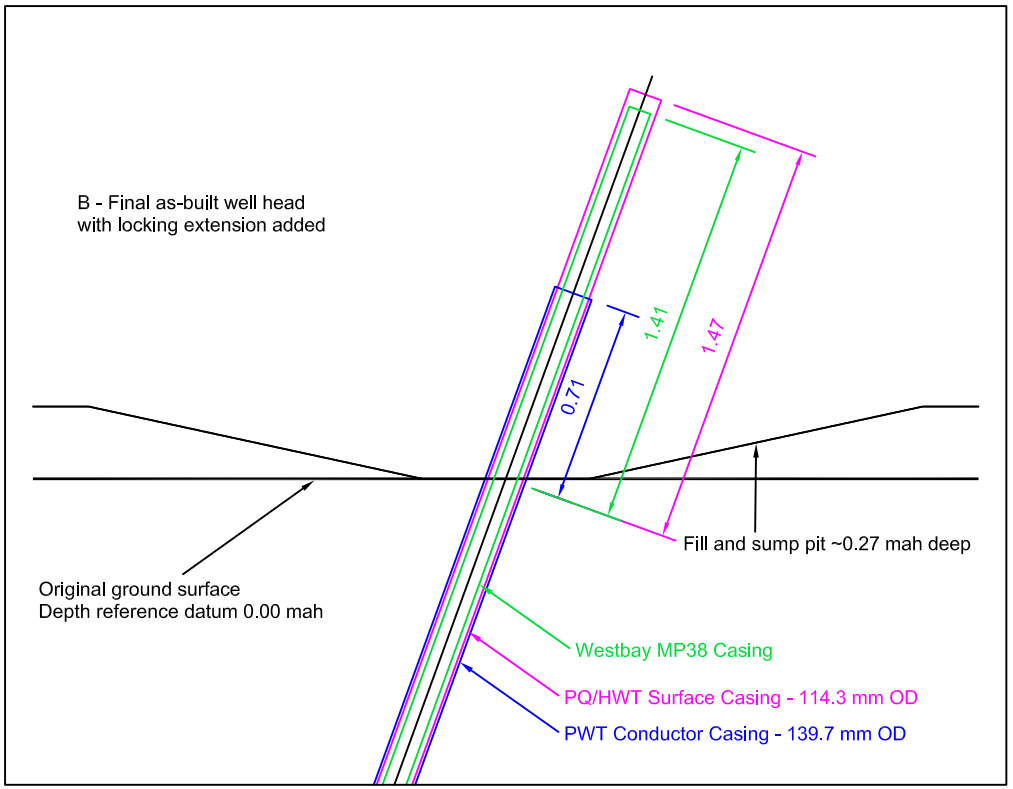
bh5 top pqt casing = top of extended HWT (PQ) surface casing

bh5 welded joint of pqt casing = top of original HWT (PQ) surface casing (prior to casing extension) – this is the surveyed reference point to use

bh05 sump box = welded points on the PWT conductor casing where the sump box was located

Attachment 6 - Composite sketch of reference points - Pre-extension (during drilling, testing and Westbay install) and Post-extension (as surveyed)





APPENDIX D

IG_BH05 Site Decommissioning Checklist

BOREHOLE: IG_BH05

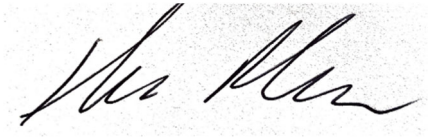
Item No.	Item	General Requirements	Date Completed	Checked by	Approved by	Comments
1.0	**SITE PREPARATION**					
1.1	Drill pad	Drill pad cleaned of debris and adequately graded.	Nov 23, 2021	KB	KRM	Nov 18 – Drill mats were stacked & liner removed Nov 20 – Drill pad graded with Rodren dozer Nov 23 – Drill mats removed from site
1.3	General site levelling	General site cleaned of debris and adequately graded.	June 28, 2022	WW	KRM	June 28 – Final walkover with the NWMO's Geoff Crann. All areas of concern were addressed.
1.4	General Site Condition	Site is free of oil sheens and staining.	June 28, 2022	WW	KRM	June 28 – Final walkover with the NWMO's Geoff Crann. All areas of concern were addressed.
2.0	**FENCING**					
2.1	Silt fencing	Silt fencing remains in place.	Nov 20, 2021	KB	KRM	Silt fence is NWMO responsibility
2.2	Snow fencing	Snow fencing remains in place.	N/A	N/A	N/A	No snow fencing at site
2.3	Modulok security fencing	Security fencing dismantled and removed from site.	Nov 18, 2021	KB	KRM	Nov 16 – Disassembly started Nov 18 – Disassembly completed; fence demobbed
3.0	**OFFICE TRAILERS**					
3.1	Trailer 1 (Golder)	Trailer removed from site.	Nov 17, 2021	KB	KRM	Propane tanks for heating office trailers removed by Morgan fuel on Nov 16 (3 tanks)
3.2	Trailer 2 (NWMO)	Trailer removed from site.	Nov 18, 2021	KB	KRM	
3.3	Trailer 3 (Rodren)	Trailer removed from site.	Nov 17, 2021	KB	KRM	

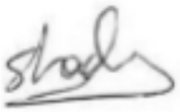
Item No.	Item	General Requirements	Date Completed	Checked by	Approved by	Comments
4.0	**CORE LOGGING AND STORAGE**					
4.1	Core Logging Shipping Container	Core Logging Shipping Container removed from site.	Nov 17, 2021	KB	KRM	
4.2	Core Logging Table	Core logging table put away for storage.	N/A	N/A	N/A	Core logging table transferred to IG_BH06 on August 16, 2021
4.3	Camera Racking	Camera tracking put away for storage.	N/A	N/A	N/A	Core logging table transferred to IG_BH06 on August 16, 2021
4.4	Core Storage Shipping container	Core storage shipping container removed from site.	Nov 19, 2021	KB	KRM	
4.5	Commercial Refrigerator	Refrigerators removed from site.	N/A	N/A	N/A	Refrigerator transferred to IG_BH06 on August 16, 2021
5.0	**COMMUNICATIONS**					
5.1	Satellite phone / Emergency System	Satellite phone / emergency system removed from site.	Nov 21, 2021	KM	KRM	Nov 15 - Garmin in Reach device was packed up Nov 21 - Delivered to Golder Mississauga
5.2	Cellular internet	Cellular Internet Wi-Fi network removed from site.	Nov 21, 2021	KB	KRM	Nov 15 – Internet disconnect & packed up Nov 21 - Delivered to Golder Mississauga
6.0	**GENERATOR**					
6.1	Generator	Generator removed from site.	Nov 17, 2021	KB	KRM	Moved to IG_BH06, Genset from IG_BH06 off-site
6.2	Secondary containment	Secondary spill containment removed from site.	Nov 17, 2021	KB	KRM	
6.3	Power distribution	Power distribution cables and panels removed from site.	Nov 18, 2021	KB	KRM	Nov 16 – Electrical Decommissioning Nov 18 – Underground electrical conduit & grounding plates removed
7.0	**LIGHT TOWERS**					
7.1	Light Tower (3)	All light towers removed from site.	Nov 16, 2021	KB	KRM	

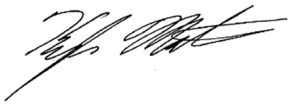
Item No.	Item	General Requirements	Date Completed	Checked by	Approved by	Comments
7.2	Secondary containment	All secondary spill containments for light towers removed from site.	Nov 17, 2021	KB	KRM	
8.0	**FUEL STORAGE**					
8.1	Fuel tank	Fuel Tank removed from site.	Nov 19, 2021	KB	KRM	Final drainage completed Nov 18, 2021
8.2	Secondary containment	Secondary spill containment removed from site.	Nov 20, 2021	KB	KRM	
8.3	Protective barricade	Protective barricades removed from site.	Nov 16, 2021	KB	KRM	All concrete jersey barriers removed from site
9.0	**SANITARY FACILITIES**					
9.1	Washroom	Washroom removed from site.	Nov 16, 2021	KB	KRM	
9.2	Water tank	Water tank removed from site.	N/A	N/A	N/A	No water tank, washroom is 1 unit
9.3	Septic tank	Septic tank removed from site.	N/A	N/A	N/A	No septic tank, washroom is 1 unit
9.3	Temporary Washroom Facilities	Temporary washroom facilities removed from site.	Nov 19, 2021	KB	KRM	Nov 14 – Delivered to site Nov 19 – Demobilized from site
10.0	**GARBAGE BINS**					
10.1	Garbage Bin	Garbage bin removed from site.	Nov 9, 2021 Nov 24, 2021	KB	KRM	Nov 9 – B&M Garbage bin demobilized from site Nov 16 – 10m3 roll-off delivered to site Nov 24 – pick-up of roll-off bin
10.2	Recycling Bin	Recycle bin removed from site.	Oct 5, 2021	KB	KRM	Demobilized by B&M
11.0	**WELL HEAD**					
11.1	Well Head Survey	Well head casing reference and Westbay casing is surveyed to benchmark.	Dec 2, 2021	SH	KRM	Survey completed by Rugged Geomatics

Item No.	Item	General Requirements	Date Completed	Checked by	Approved by	Comments
11.2	Well Head Security	Well head protective casing is installed, painted for visibility, and locked for security.	Nov 19, 2021	KB	KRM	Nov 19 – Casing installed; locks installed Painting is the responsibility of the NWMO.
12.0	**OTHER**					
12.1	Site Condition	Final inspection for garbage and debris (snow covered)	Dec 2, 2021	SH	KRM	Inspection completed by SH
12.2	Post-Thaw Site Condition	Post-thaw inspection for garbage and debris.	June 28, 2022	WW	KRM	June 28 – Final walkover with the NWMO's Geoff Crann. All areas of concern were addressed.

Checklist Approval – Post-Winter Demobilization

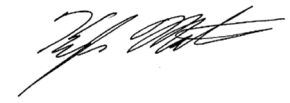
Checked by:  2021-11-23
Kirk Bourdeau, WP01 Site Supervisor Date:

Checked by:  2021-12-10
Shady Hashem, WP01 Site Supervisor Date:

Approved by:  2021-12-10
Kyle Matter, WP01 Lead Date:

Final Checklist Approval – Post-Thaw Activities Completed

Checked by:  2022-07-04
Warren Willis WP01 Site Supervisor Date

Approved by:  2022-07-04
Kyle Matter, WP01 Lead Date

golder.com