PHASE 2 INITIAL BOREHOLE DRILLING AND TESTING, SOUTH BRUCE

WP08 Data Report: Temporary Well Sealing for SB_BH02

APM-REP-01332-0338

June 2023

Geofirma Engineering



NUCLEAR WASTE SOCIÉTÉ DE GESTION MANAGEMENT DES DÉCHETS ORGANIZATION NUCLÉAIRES

Nuclear Waste Management Organization 22 St. Clair Avenue East, 4th Floor

22 St. Clair Avenue East, 4th Floor Toronto, Ontario M4T 2S3 Canada

Tel: 416-934-9814 Web: www.nwmo.ca

Phase 2 Initial Borehole Drilling and Testing, South Bruce

WP08 Data Report: Temporary Well Sealing for SB_BH02

Revision: 0 (Final)

NWMO Document: APM-REP-01332-0338

Prepared for:

Nuclear Waste Management Organization 22 St. Clair Avenue East. 4th Floor Toronto, ON, M4T 2S3

Prepared by:



Project Number: 20-211-1 Document ID: SB_BH02_WP08_Data_Report_R0.docx

June 29, 2023

Title:	WP08 Data Report: Temporary Well Sealing for SB_BH02				
Client:	Nuclear Waste Management Or	ganization			
Project Number:	20-211-1				
Document ID:	SB_BH02_WP08_Data_Report	_R0.docx			
Revision Number:	0 (Final)	Date: June 29, 2023			
NWMO Document	APM-REP-01332-0338				
Prepared by:	Chris Morgan, M.A.Sc., P.Geo.				
Reviewed by:	Kevin Tateishi, M.Sc., G.I.T.				
Approved by:	Chris Morgan, Geoscientist, M./ Sean Sterling, Principal, M.Sc.,	A.Sc., P.Geo. P.Eng., P.Geo.			

Revision Tracking Table

Revision	Revision Release Date	Description of Modifications/Edits
R0A	April 25, 2023	Initial draft release to NWMO for review
R0	June 29, 2023	Final release after disposition of NWMO comments



TABLE OF CONTENTS

1	INTRODUCTION	.1
	1.1 Background	.1
	1.2 Geologic Setting	. 1
	1.3 Technical Objectives	. 3
2	DESCRIPTION OF ACTIVITIES	. 4
	2.1 Temporary Borehole Sealing During Drilling	.4
	2.2 Temporary Borehole Sealing After Drilling	.4
	2.2.1 Selection of Seal Locations	. 4
	2.2.2 Inspection and Installation of Packers	. 7
	2.2.3 Inspection and Installation of Bridge Plug	. 8
	2.3 Removal of Temporary Seals	. 8
	2.4 Data Quality Assurance and Quality Control (QA/QC)	. 9
3	CONCLUSIONS	10
4	REFERENCES	11



LIST OF TABLES

Table 1	Summary of Cement Plugs at SB BH02 During Drilling	4
Table 2	Packer and Bridge Plug Seal Locations for SB_BH02	5
Table 3	Packer Inflation Summary for SB_BH02	7
Table 4	Bridge Plug Installation Summary for SB_BH02	8

LIST OF FIGURES

Figure 1	Location of Borehole SB BH02	2
Figure 2	SB BH02 Seal Configuration with Select Supporting WP03, WP05, WP06, and WP07	
0	Data	6

APPENDICES

Appendix A	Weatherford Product	Information Sheets

Appendix B Weatherford Equipment Inspection Records



1 INTRODUCTION

1.1 Background

Geofirma Engineering Ltd. (Geofirma) was retained by the Nuclear Waste Management Organization (NWMO) to complete a drilling and testing program for two deep bedrock boreholes (SB_BH01 & SB_BH02) as part of the NWMO's Phase 2 Geoscientific Preliminary Field Investigations. The full scope of the drilling and testing program for SB_BH02 is described in the Initial Borehole Characterization Plan.

NWMO's process is called the Adaptive Phased Management (APM) plan and comprises multiple phases.

Phase 1 of NWMO's APM plan included preliminary desktop studies using available geoscientific information and a set of key geoscientific characteristics and factors that can be realistically assessed at the desktop phase of the Preliminary Assessment. The Phase 1 Preliminary Assessment of the South Bruce area identified the Cobourg Formation as the preferred host formation for a deep geological repository for used nuclear fuel. The Initial Borehole Drilling and Testing study is a key component of the Phase 2 Geoscientific Preliminary Field Investigations for the NWMO's APM plan.

Borehole SB_BH02 is located approximately 5.5 km northwest of the community of Teeswater, Ontario, and was drilled to 900.57 m below ground surface (m BGS). SB_BH02 was drilled through the entire sedimentary bedrock sequence to approximately 14 m into the Precambrian basement. SB_BH02 is located approximately 2.5 km west of SB_BH01.

1.2 Geologic Setting

The sequence of rocks encountered in the SB_BH02 borehole consist of Paleozoic-aged strata that were deposited within the Michigan Basin northwest of the Algonquin Arch in Southwestern Ontario. The Michigan Basin is a circular-shaped cratonic basin that is composed primarily of shallow marine carbonates, evaporites, and shales that were deposited while eastern North America was in tropical latitudes during the Paleozoic Era (Armstrong and Carter 2006, 2010). West of the Algonquin Arch, strata from the Michigan Basin tend to gradually dip westward into the Michigan Basin. Borehole SB_BH02 was drilled through the entire Paleozoic sequence to approximately 14 m into the Precambrian basement, which is composed of high-grade metamorphic rocks of the Grenville Province.





1.3 Technical Objectives

The main objectives of WP08 temporary well sealing activities at SB_BH02 were:

- To minimize the cross connection between borehole intervals with significant changes in formation pressure or groundwater chemistry;
- To stabilize the borehole if sub-optimal drilling conditions are encountered (e.g. high-angle fracturing parallel to the borehole);
- To provide an effective borehole seal that can remain in place over long period of time (i.e. days to several years); and
- To ensure the seal is removable (i.e. temporary) such that at any given time the complete borehole column may be accessed for further testing or permanent abandonment.





2 DESCRIPTION OF ACTIVITIES

All Work Package 8 (WP08) temporary borehole sealing activities were completed following procedures described in a project-specific Temporary Borehole Sealing Test Plan. WP08 activities were completed by Vital Drilling and were supervised by Geofirma staff. Data collected as part of WP08 activities, including sealing equipment inspections and installation records were recorded in the Data Quality Confirmation (DQC) Workbook.

2.1 Temporary Borehole Sealing During Drilling

Five cement plugs were completed during drilling at SB_BH02 to minimize water production during air hammering and reduce cement losses to the formation during casing installation (Table 1). Two cement plugs were completed prior to installation of the intermediate casing and three more were completed prior to installation of the production casing. All cement plugs were completed by Integral Pumping Services under supervision of Geofirma staff. Detailed descriptions of the cement plug depths, cement volumes, and methods are described in the SB_BH02 Drilling (WP02) Data Report (Geofirma 2023).

Cement Plug #	Date Cemented	Top Depth (m BGS)	Bottom Depth (m BGS)	Cement Volume (m ³)	Rational for Cementing
Plug 1	26-Oct-2021	49.88	77.23	2.0	Reduce water production during air
Plug 2	1-Nov-2021	49.88	72.53	1.2	during installation of intermediate casing
Plug 3	2-Dec-2021	78.82	204.69	4.0	Reduce water production during air
Plug 4	7-Dec-2021	105.54	204.54	7.0	hammering and reduce cement losses
Plug 5	14-Dec-2021	78.82	204.54	5.0	during installation of production casing

Table 1 Summary of Cement Plugs at SB_BH02 Durin	ng Drilling
--	-------------

2.2 Temporary Borehole Sealing After Drilling

2.2.1 Selection of Seal Locations

The locations of temporary seals were selected by the Geofirma WP08 Lead and confirmed by the NWMO. A total of five locations were selected for sealing in SB_BH02, using a combination of four packers and one bridge plug (Table 2).

Figure 2 shows the locations of packers and bridge plugs that were installed to temporarily seal SB_BH2. The locations of the seals were selected to minimize vertical cross-connection between intervals of different water chemistry and formation pressures within the borehole. Water chemistry information was obtained from opportunistic groundwater sampling (WP07) and geophysical logs (WP05), and formation pressures were obtained from straddle packer hydraulic testing (WP06). Geophysical logs (e.g. ATV and mechanical caliper) were also used to ensure that the packers were set at locations where they would provide a good seal.



Table 2 Packer and Bridge Plug Seal Locations for SB_BH02

Sealing Equipment	Seat Depth Midpoint (m BGS)	Seal Length (m) ¹	Serial Number	Installation Date	Selection Rational
Packer 1	850.00	1.27	RN04353	21-Sep-2022	Isolate the Shadow Lake and Precambrian from subnormal pressures in the overlying
					Ordovician strata.
Packer 2	785.00	1.27	RN07111	22-Sep-2022	Isolate strong subnormal (under) pressures in the Ordovician shales, Cobourg, Sherman Fall, and Kirkfield formations from moderate subnormal pressures in the Coboconk and Gull River formations.
Packer 3	455.00	1.27	RN04116	25-Sep-2022	Isolate normal pressures and permeable intervals in the lower Silurian that were sampled during OGW5 and OGW6 from subnormal pressures in the underlying Ordovician shales and limestones. Slight overpressures (relative to fresh water hydrostatic) were also observed in the Cabot Head, Manitoulin, and upper part of the Queenston formations.
Packer 4	320.00	1.27	RN05735	26-Sep-2022	Isolate the upper Salina Group interval from permeable zones sampled during OGW5 and OGW6.
Bridge Plug 1	201.58	0.66	RN05019	28-Sep-2022	Approximately 3.5 m above the bottom of production casing. Isolated the cased interval from the open hole.

1. Element seal length from Weatherford Inspection sheets



Depth			w	P05 Geophysica	l Logs		WP06 Fm. Pressure	
1m:4000m	eriod	WP03 Formations,	Gamma	Caliper 3-Arm	Fluid Cond.	WP07 OGW	0 kPa 10000	Packer & Bridge Plug
(m along core axis)	å	Members	0 API 200	Caliper - ATV 110 mm 170	1 mS/cm 1000	Intervais	0 kPa 10000	Locations
- 0 -		Overburden (Quaternary)	and the second s					
50		Lucas		-				
_ 50 _	c	Amherstburg		m				
- 100 -	evonial		Manufact					
		Bois Blanc	and and an					
- 150 -		Bass Islands	The second secon					
		Dass Islands						Bridge Plug @201.6m
200			- And	2				
- 250 -				<u> </u>			•	
		Salina Group		2				
- 300 -	Silurian		5 					Packer @ 320 m
e e	05		MMU	<u>}</u>				
— 350 —		41 80	4	~				
		Guelph, Goat		2	1			
400 -		Gasport, Lions Head &		4	Ż			
450 -		Cabot Head		5	ł			Packer @ 455 m
		Manitoulin	the second secon	8				
- 500 -		Queenston		2				
				لأبجم	_ ζ			
- 550 -			NIN States	5				
		Georgian Bay		E I				
- 600 -				<u>}</u> -				
650	cian	Blue Mountain		à finn				
- 050 -	Ordovi	Cobourg (Collingwood)		<u> </u>	/		1	
- 700 -		Cobourg (Lower)	Warmer		/			
		Shormon Fall	M July				-	
- 750 -		Sherman Fail			1			
-		Kirkfield	1. mart		4			Packer @ 785 m
800 -		Coboconk	www	f				
- 850 -		Gull River	-toul -				i \	Packer @ 850 m
	brian	Shadow Lake	A THE AND A THE					
- 900 -	reCam	PreCambrian			<u> </u>			
	<u> </u>							

Figure 2 SB_BH02 Seal Configuration with Select Supporting WP03, WP05, WP06, and WP07 Data



2.2.2 Inspection and Installation of Packers

Four Weatherford Single Set Pull Release (SSPR) Injection Production Packers (IPP) were used to provide the seals in the open section of the borehole. Product information sheets for the packers and bridge plugs that were used for sealing activities are provided in Appendix A.

The IPP were inspected by the manufacturer prior to delivery at the site. Records of the manufacturer inspections are provided in Appendix B and the subsequent onsite inspections by Geofirma staff were recorded in the WP08 DQC Workbook.

Installation of the IPP were completed by Vital Drilling staff following operating instructions that were provided by Weatherford. Since the packers were installed at a relatively shallow depth, Weatherford provided specialized instructions for each targeted seal depth. Downhole Keller pressure transducers were used to monitor tubing and annulus pressures during installation. Installation procedures that were provided by Weatherford IPP are summarized below:

- Complete surface inspection of packer element and setting tool. Attach both to the tubing.
- Run in at a moderate rate and do not allow drill tubing to rotate. Avoid sudden stops: the momentum of the fluid in the tubing can inflate the element a small amount at each stop. The tubing should be kept at ~3.5 MPa under balance so that the packer sealing check valve functions properly, however, be careful not to prematurely inflate the packer.
- After reaching the targeted depth (determined by calculated stick up for tubing string), pump clean traced fluid at a slow pump rate until the tubing overbalance pressure (above hydrostatic) reaches 5 MPa. Hold for 10 minutes to allow packer element to conform to the shape of the hole.
- Slowly increase inflation pressure another 5 MPa (10 MPa total) above annulus pressure.
- When the desired inflation pressure (△P) is reached (minimum 8.3 MPa) lock in the packer pressure by bleeding off the pressure as quickly as possible.

After seating the packer, successful inflation was verified by completing compression and pull tests. During these tests, the weight of the tubing string monitored as it was lifted (pull test) and lowered (compression test) between 5-30 cm from the neutral setting position. The total movement on the tubing string for each compression/pull test was specified by Weatherford prior to packer installation.

Table 3 provides a summary of the inflation data for the four IPPs (Packers 1 through 4) that were installed at SB_BH02. Records of the packer inflation and inflation verification procedure were also recorded in the WP08 DQC workbook.

Sealing Equipment	Seat Depth Midpoint (m BGS)	Hydrostatic Pressure at Depth (MPa)	Step 1 Inflation Pressure (MPa)	Final Inflation Pressure (MPa)	Final Inflation ∆P (MPa)	Inflation Verification
Packer 1	850.00	8.97	13.90	18.90	9.93	Passed compression and pull tests
Packer 2	785.00	8.25	13.28	18.48	10.23	Passed compression and pull tests
Packer 3	455.00	4.80	10.40	15.48	10.68	Passed compression and pull tests
Packer 4	320.00	3.38	8.96	13.88	10.50	Passed compression and pull tests

Table 3Packer Inflation Summary for SB_BH02



2.2.3 Inspection and Installation of Bridge Plug

A single Weatherford WRH heavy duty wireline set retrievable bridge plug was installed at 201.58 m BGS, near the bottom of the production casing, to seal off the casing from the open borehole below. At SB_BH02 the bridge plug was installed using the tubing setting tool instead of the conventional wireline setting tool.

The bridge plug was inspected by the manufacturer prior to delivery at the site. Record of the manufacturer inspection of the bridge plug is provided in Appendix B and the subsequent onsite inspection by Geofirma staff was recorded in the WP08 DQC Workbook.

Installation of the WRH bridge plug was completed by Vital Drilling staff following operating instructions that were provided by Weatherford. Installation procedures for the Weatherford WRH bridge plug are summarized below:

- Complete surface inspection of bridge plug and attach to tubing-conveyed setting tool.
- Slowly run in tubing to the targeted set depth.
- Upon reaching the targeted set depth, set the bridge plug using the tubing setting tool:
 - Slowly increase the tubing pressure to compress the bridge plug, increase pressure in ~3000 kPA steps and hold for 2 min at each step.
 - Once at ~ 14000 kPa, a shear pin on the bridge plug releases, setting the plug and relieving pressure from the tubing.
 - The tubing conveyed setting tool is then retrieved.

Table 4 provides a summary of the installation data for the bridge plug that was installed at SB_BH02. Record of the bridge plug installation is also recorded in the WP08 DQC workbook.

Sealing Equipment	Seat Depth Midpoint (m BGS)	Setting Step #1	Initial Step Pressure (MPa)	Final Step Pressure (MPa)	Step Duration (minutes)	Comments
Bridge Plug 1	201.58	1	3.14	3.11	3	
		2	6.77	6.75	2	
		3	9.52	9.48	2	
		4	11.85	11.35	2	
		5	~14.00	<0.10	1	Shear pin releases, installation of bridge plug completed

Table 4	Bridge Plug Insta	allation Summary	/ for SB_	BH02
---------	-------------------	------------------	-----------	------

Note: pressures reported in table tubing gauge pressure

2.3 Removal of Temporary Seals

None of the temporary seals that were installed in SB_BH02 (four IPPs and bridge plug) were removed by Geofirma or Geofirma's subcontractors. At the time of writing this report, all five sealing elements were still installed in SB_BH02.



.

2.4 Data Quality Assurance and Quality Control (QA/QC)

Temporary borehole sealing (WP08) activities were completed following procedures and data quality requirements outlined in the WP08 Test Plan and the Project Quality Plan. All field data associated with WP08 activities were recorded directly into a purpose-built Data Quality Confirmation (DQC) workbook.



3 CONCLUSIONS

Geofirma Engineering Ltd. completed temporary well sealing activities at the borehole SB_BH02 as part of Work Package 8 (WP08) for the NWMO's Phase 2 Initial Borehole Drilling and Testing Program. Temporary well sealing activities were completed between October 26, 2021, and September 28, 2022.

Five cement plugs were completed during drilling of SB_BH02 to minimize water production during air hammering (hole opening) and to reduce cement losses during installation of the intermediate and production casings. The cement plugs were completed by Integral Pumping Services between October 26 to December 14, 2021.

Five sealing elements were used to seal SB_BH02 after completion of drilling and testing activities. Four Single Set Pull Release (SSPR) Injection Production Packers (IPP) were installed in the open borehole between September 21-26, 2022, and one Weatherford WRH heavy duty wireline set retrievable bridge plug was installed near the bottom of the production casing on September 21, 2022.

The locations of the sealing elements were selected to minimize vertical cross-connection between intervals of different water chemistry and formation pressures within the borehole. The bridge plug was set at 201.58 m and the IPP packers were set at 320 m, 455 m, 785 m, and 850 m below ground surface. Installation of the bridge plug and packers was completed by Vital Drilling under supervision of Geofirma staff.

None of the temporary seals that were installed in SB_BH02 (four IPPs and bridge plug) were removed by Geofirma or Geofirma's subcontractors. At the time of writing this report, all five sealing elements were still installed in SB_BH02.



4 REFERENCES

Armstrong, D.K. & Carter T.R., 2006. An Updated Guide to the Subsurface Paleozoic Stratigraphy of Southern Ontario. Open File Report 6191. Ontario Geological Survey.

Armstrong, D.K. and Carter T.R, 2010. Special volume 7: the Subsurface Paleozoic Stratigraphy of Southern Ontario (Open file report, 0826-9580; 6191). Ministry of Energy, Northern Development and Mines

Geofirma Engineering Ltd. 2023. WP02 Data Report: Borehole Drilling and Coring at SB_BH02, Phase 2 Initial Borehole Drilling and Testing, South Bruce Area, Prepared for: Nuclear Waste Management Organization, Toronto, Ontario. Revision 0





WP08 Data Report: Temporary Well Sealing for SB_BH02

Appendix A

Weatherford Product Information Sheets





Inflatable Packers

Injection Production Packer (IPP[™]) Single-Set Pull-Release

Weatherford's single-set pull-release injection production packer (*IPP*) is a fieldproven and extremely versatile downhole service tool that can be installed in either cased or open hole, on a temporary or long-term basis. This packer is designed to be inflated, deflated, and retrieved one time per run; however, it can be redressed at the rig site for additional runs. With a relatively small OD, the packer can be run through restricted IDs and then set in larger openings. The standard elastomers are suitable for severe-service applications.

The packer is run in the well on coiled tubing or threaded pipe (drillpipe or work string) and requires only axial movement to operate. It is inflated with application of work-string hydraulic pressure. To deflate and retrieve the tool, the work string is pulled upward to shear the releasing pins. Then axial tension is reduced on the work string, which allows the pressure between the element and the annulus to equalize. An additional pull causes the element to deflate. When the element is completely deflated, the packer can be retrieved.

Applications

- Especially suitable for deviated or horizontal applications
- Suitable for use in vertical applications
- Can be used for open- or cased-hole zonal isolation
- Acts as a permanent or retrievable bridge plug
- Serves as a retainer for squeezing or treating formations below the tool
- Useful in locating casing or liner leaks
- Ideal for short-term production tests
- Useful for isolating casing patches



Injection Production Packer (IPP[™]) Single-Set Pull-Release

Features, Advantages and Benefits

- Relatively small OD allows the packer to pass through restrictions so that it can be inflated and set in larger openings where mechanical packers and bridge plugs cannot be used.
- With a hydraulically activated inflation valve, the packer can be set without manipulation.
- Only axial work-string movement is required to equalize and deflate the tool for retrieval; therefore, the tool can be run on coiled tubing.
- Versatile design allows the packer to be run in open or cased hole.
- Elements are fully reinforced with strip or cable. The strip is standard for cased-hole use; when a portion of the ribs is exposed, it provides additional holding force. The strip element can be used in open hole as well, but cable reinforcement is preferred by many for its ability to achieve more settings.
- Elements can be inflated with cement for permanent installation.
- The packer can be redressed at the rig site for additional runs, saving time.
- Each element is manufactured from application-specific elastomers known for their superior strength and resistance to high temperatures and corrosive fluids and gases.
- Elements can be adapted to different mandrel sizes, making the packer suitable for use in a variety of applications.



Injection Production Packer (IPP[™]) Single-Set Pull-Release

Specifications

Dimensions and Element Types

Element OD		Mandrel ID		Element Seal		Element Type
(in.)	(<i>mm</i>)	(in.)	(<i>mm</i>)	(in.)	(mm)	(Cable/Strip)
3.50	89	1.25	32	48.00	1,219	C/S
4.25	108	2.00	51	48.00	1,219	C/S
4.63	117	2.00	51	48.00	1,219	C/S
		2.50	64			S
5.00	127	2.00	51	48.00	1,219	C/S
5.50	140	2.00	51	48.00 1,	1 210	C/S
		2.50	64		1,219	
6.25	159	2.00	51	48.00	1,219	С
		2.50	64			
6.75	171	2.00	51	48.00	1,219	С
	171	2.50	64			
6.88	175	2.00	51	48.00	1,219	9
		2.50	64	48.00	1,219	5
7.50	190	2.50*	64*	48.00	1,219	C/S
7.88	200	2.50*	64*	48.00	1,219	С
9.00	229	2.50*	64*	48.00	1,219	S
9.25	235	2.50*	64*	48.00	1,219	С
10.50	267	2.50*	64*	48.00	1,219	S

* Can be run on standard 2 1/2-in. ID chassis or heavy-duty 2 1/2-in. chassis.

Corresponding Chassis and Element Sizes

IPP Ch	Chassis ID Element Size		nt Size	
(in.)	(mm)	(in.)	(mm)	Connections
1-1/4	31.8	3.50	88.9	2 3/8-in. EUE box up × 2 3/8-in. EUE pin down
2	50.8	4.25 and larger	108 and larger	2 3/8-in. EUE box up × 2 7/8-in. EUE pin down
2-1/2	63.5	4.63 and larger	118 and larger	2 7/8-in. EUE box up × 3 ½-in. EUE pin down



Injection Production Packer (IPPTM) Single-Set Pull-Release

Options

- Elements are available in a variety of sizes, ranging from 3 1/2- to 10 1/2-in. OD, and can be changed to fit various hole sizes.
- Elements can be constructed with fully covered or partially exposed steel rib reinforcement (strip) or fully covered cable reinforcement. Strip elements may incorporate an exposed rib section to provide anchoring in the wellbore when required.
- A delayed-opening feature, available for some sizes, allows the packer to be run where other hydraulic events will occur first.

Related Products

Weatherford provides a variety of complementary tools for use with this packer:

- Hydraulic disconnect with retrieval overshot
- J disconnect with retrieval overshot
- J circulating valves
- Bar/ball valves
- Rotation or tension/compression circulating valves
- Sleeve-type circulating valves
- Pump-down/shear-out plugs
- Solid-shear plugs
- Dump valve



WRH Bridge Plug Heavy-duty Wireline-set Retrievable Bridge Plug

The Weatherford WRH Heavy-duty Wireline-set Retrievable Bridge Plug is capable of holding differential pressure up to 10,000 psi (69 MPa) from above or 6,500 psi (45 MPa) from below. It may be set using conventional wireline or hydraulic packer setting tools.

A compact design makes the WRH easy to retrieve on tubing, coil tubing or sandline. When the retrieval tool engages the top of the bridge plug, an equalizing valve opens before the plug is released, preventing the bridge plug from moving with differential pressure.

CASING		WRH BRIDGE PLUG		
O.D. in/ <i>mm</i>	WEIGHT lb/ft / <i>kg/m</i>	MAXIMUM O.D. in/ <i>mm</i>	PRODUCT REFERENCE	
3 1/2 88.9	7.7 - 9.2 11.5 - 13.7	2.867 <i>72.82</i>	35WRP.1001	
	10.2 <i>15.2</i>	2.781 <i>70.64</i>	35WRP.1002	
4 1/2 114.3	9.5 - 13.5 14.1 - 20.1	3.771 <i>95.78</i>	43WRP.1001	
5 1/2 168.0	13.5 - 15.5 20.1 - 23.1	4.781 121.44	45WRP.1005	
	15.5 - 20 <i>23.1 - 29.8</i>	4.641 <i>117.88</i>	45WRP.1003	
	20 - 23 29.8 - 34.2	4.500 114.30	45WRP.1001	
	26 <i>38.7</i>	4.25 107.95	45WRP.1007	
7 177.8	17 - 20 <i>25.3 - 29.8</i>	6.266 1 <i>59.16</i>	47WRP.1009	
	23 - 26 34.2 - 38.7	6.078 154.38	47WRP.1007	
	26 - 29 38.7 - 43.2	5.968 1 <i>51.59</i>	47WRP.1005	
	32 - 35 47.6 - 52.1	5.812 1 <i>47.62</i>	47WRP.1003	
	38 56.6	5.656 1 <i>43.66</i>	47WRP.1001	
8 5/8 219.08	20 - 28 29.8 - 41.7	7.781 1 <i>97.64</i>	49WRP.1005	
	32 - 40 47.6 - 59.5	7.531 <i>191.29</i>	49WRP.1003	
	44 - 49 65.5 - 72.9	7.312 1 <i>85.72</i>	49WRP.1001	
9 5/8 244.5	29.3 - 36 43.6 - 53.6	8.593 218.26	51WRP.1005	
	40 - 47 59.5 - 69.9	8.437 214.30	51WRP.1003	
	47 - 53.5 69.9 - 79.6	8.218 208.74	51WRP.1001	

Weatherford Completion Systems 300, 333 - 5th Avenue SW Calgary, Alberta T2P 3B6 Canada 403/269-7788 Main 403/262-3928 Fax





Applications

Acidizing, fracturing and cementing operations. Casing pressure testing. Wellhead repair or replacement. Zonal isolation.

Features

- Wireline, hydraulic or tubing set
- Caged, bi-directional carbide slips
- Equalizing valve opens before plug is released
- Straight pull release
- Overshot washes to gauge ring for easy retrieval
- Rotational safety release
 mechanism
- Optional sandline or coiled tubing retrieval
- Swab-resistant packing element system
- Compact design for tight doglegs, short lubricators
- Holds differential pressure up to 10,000 psi (69 MPa) from above and 6,500 psi (45 MPa) from below

© 2003 Weatherford Inc. All rights reserved. Document number wrh_030110_cdn

Weatherford products and services are subject to Weatherford's standard terms and conditions. Unless otherwise noted, trademarks and service marks noted herein are the property of Weatherford. Specifications are subject to change without notice. WP08 Data Report: Temporary Well Sealing for SB_BH02

Appendix B

Weatherford Equipment Inspection Records













<u>. S</u>.

Weatherford

ψų, Mil

> CALIPER SHEET 'HYF' DIFFERENTIAL SETTING TOOL



P-HYF

Weatherford

CALIPER SHEET WIRELINE SET RETRIEVABLE BRIDGE PLUG

