Husky Energy's

White Rose Extension Project

Appendices to the Registration

Appendix A

Graving Dock Geotechnical and Environmental Report

Memo



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То:	Gordon Philips Husky Energy	From:	Paul D. Deering, P.Eng., P.Geo Carolyn Anstey-Moore, P.Geo.
File:	121613435		
Doc. No.	001-A-13FEB12	Date:	February 13, 2012
	To: File: Doc. No.	To:Gordon Philips Husky EnergyFile:121613435Doc. No.001-A-13FEB12	To:Gordon Philips Husky EnergyFrom:File:121613435Date:Doc. No.001-A-13FEB12Date:

Reference: Interim Progress Report – Site A Results Geotechnical and Environmental Services Stage 2 - Geotechnical / Environmental Site Investigation Proposed GBS Construction Site Argentia, NL

This interim progress report provides a summary of the filed work completed and findings of the Stage 2 geotechnical and environmental site investigation at Site A. It is understood that a final comprehensive report will be provided at the completion of the project.

The scope of work completed was in general accordance with our proposal issued to Husky Energy dated October 28, 2011 to include the following:

- Complete geotechnical boreholes and install monitoring wells at five (5) locations within the proposed site.
- Boreholes will be drilled to a minimum depth determined by the conditions encountered and filed production. Soils would be continuously sampled through the drilled depth.
- Install a monitoring well in each borehole to measure the water levels and collect groundwater samples for environmental analysis.
- Complete geotechnical laboratory testing on the recovered soil samples to help characterize the soil conditions and environmental laboratory testing program on the soil and groundwater samples to determine the presence of any environmental contaminants.

METHOD OF INVESTIGATION

The field work for Site A was completed from the period of November 30, 2011 to January 24, 2012 and consisted of drilling five (5) boreholes to depths varying from 24.4 m to 28.9 m below the ground surface. The boreholes were completed using a CME-75 rubber tire-mounted drill rig supplied by Logan Geotech Inc. Upon completion,

One Team. Infinite Solutions.

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February 13, 2011 Page 2 of 5 Reference: Interim Progress Report – Site A Results Geotechnical and Environmental Services Stage 2 - Geotechnical / Environmental Site Investigation Proposed GBS Construction Site, Argentia, NL

monitoring wells were installed in the boreholes, except BH-A3, for water level monitoring.

The field work was conducted under the supervision of technical staff from Stantec who kept detailed records of subsurface conditions and recovered representative samples of the materials encountered. During borehole advancement, soils were continuously sampled using a 50 mm OD split spoon sampler during the performance of the Standard Penetration Test (SPT). The soils were classified in accordance with the Unified Soil Classification System (USCS) ASTM D2487 and D2488.

The borehole locations were selected by Stantec and Husky and were established in the field using a handheld GPS unit with an approximate accuracy of ± 6 m. The attached Drawing No. 121613435-GE-SITE A-01 shows the borehole locations.

SUMMARIZED SITE CONDITIONS

Soil and Bedrock Conditions

The subsurface conditions encountered in the boreholes are described in detail on the attached Borehole Records, with the strata summarized below. In addition two stratigraphic profiles referred to as Section 3 and 4 are also attached for reference. The locations of the profiles in plan are shown on Drawing No. 121613435-GE-SITE_A-02.

An explanation of the Symbols and Terms used Borehole Records are attached. Results of soil laboratory tests including gradation by sieve analysis and water content tests, are also attached and reported on the test pit and borehole records where appropriate. Bedrock was not encountered in any of the boreholes. Water levels as measured in the monitoring wells vary from 1.55 to 5.49 m depth.

Environmental Conditions

A laboratory analysis schedule for Site A is presented in the Table 1 below.

Potential Environment Concern	Sample Matrix	
Fotential Environment Concern	Soil	GW
Potential for petroleum hydrocarbon impacts related to historic site usage.	TPH/BTEX (7)	TPH/BTEX (4)
Potential for polychlorinated biphenyls (PCBs) impacts related to historic site usage.	PCBs (3)	PCBs (3)
Potential for polycyclic aromatic hydrocarbons (PAHs) impacts related to historic site usage.	PAHs (3)	PAHs (3)
Potential for volatile organic compounds (VOCs) impacts related to historic site usage.	VOCs (3)	VOCs (3)

Table 1: Laboratory Analysis Schedule (Site A)

February 13, 2011 Page 3 of 5 **Reference:**

Interim Progress Report – Site A Results Geotechnical and Environmental Services Stage 2 - Geotechnical / Environmental Site Investigation Proposed GBS Construction Site, Argentia, NL

Detential Environment Concern	Sample Matrix	
Potential Environment Concern	Soil	GW
Potential for semi volatile organic compounds (SVOCs) impacts related to historic site usage.	SVOCs (3)	SVOCs (3)
Potential for metals impacts related to historic site usage.	Metals (3)	RCAP-MS (4)

Results of the laboratory analysis of soil samples obtained from this site are presented in Tables A.1 to A.6 attached.

Based on results to date, with the exception of the concentration of total petroleum hydrocarbons (TPH) in soil sample BH-A5-SS9, and the concentration of copper detected in soil sample BH-A1-SS3, the other parameters analyzed in soil at the site were either not detected or were detected at concentrations below applicable guidelines.

The concentration of TPH in soil sample BH-A5-SS9 exceeded the Atlantic PIRI Tier I guideline of 450 mg/kg for gasoline impacts in soil on a commercial site, returning a value of 4,200 mg/kg. Note this concentration also exceeds the 1,000 mg/kg threshold criteria for disposal at a municipal landfill and therefore any surplus material removed from the impacted area during construction excavation would require disposal at a licenced soil treatment facility.

The concentration of copper in soil sample BH-A1-SS3 exceeded the applicable generic Tier I Canadian Council of Ministers of the Environment (CCME) Soil Quality Guideline (SQG) for an industrial site guideline of 91 mg/kg, returning a concentration of 220 mg/kg. Subsequently, this soil sample was analyzed for copper leachate in order to further evaluate the environmental significance and disposal/treatment requirements for any surplus material removed from the impacted area during construction excavation. The concentration of copper in soil sample BH-A1-SS3 exceeded the applicable Newfoundland and Labrador Department of Environment Pollution Prevention Division for Leachable Toxic Waste, Testing and Disposal criteria of 100 ug/L, returning a concentration of 2,200 ug/L. Thus indicating that any surplus material removed from the location of soil sample BH-A1-SS3 ecceeded at a municipal landfill.

The generic CCME SQG for copper of 91 mg/kg is based on the most conservative pathway/receptor specific guideline for this parameter, which is for the protection of ecological health (nutrient and energy cycling check and ecological soil contact). However, this terrestrial ecological guideline is only valid for surface soils less than 1.5 m depth. Soil sample BH-A1-SS3 was collected from 1.2 to 1.8 m depth and is

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therefore considered a subsurface soil for which this Tier I value is not considered applicable. The copper SQG developed specifically for the protection of human health on an industrial site is 16,000 mg/kg, and is considered more suitable for this evaluation. The concentration of copper identified at the site (220 mg/kg) does not exceed this SQG human health guideline, and therefore copper in soil is not considered an environmental issue at the site.

In addition, a concentration of benzene of 0.032 mg/kg was reported in the VOCs analysis for a laboratory QA/QC duplicate sample of soil sample BH-A1-SS3. While this measured concentration marginally exceeds the applicable CCME industrial site SQG for this parameter, it is not deemed a concern since the concentration was not repeatable in the primary sample and was near the detection limit for the analytical method, which would reduce accuracy and precision.

Results of the laboratory analysis of groundwater samples obtained from this site are presented in Tables B.1 to B.6 attached. Analytical results for petroleum hydrocarbons, PCBs, metals, general chemistry, and VOCs have been returned; while analytical results for PAHs and SVOCs are pending.

Based on results to date, with the exception of the concentration of dissolved chloride in groundwater sample BH-A4, the other parameters analyzed in groundwater at the site were either not detected or were detected at concentrations below applicable guidelines.

The concentration of dissolved chloride in groundwater sampled from BH-A4 exceeded the Ontario MOE (Ministry of the Environment) guideline of 2,300 mg/L, returning a concentration of 3,400 mg/L. Further, a concentration of dissolved chloride of 3,500 mg/L was reported in the analysis for a laboratory QA/QC duplicate sample of groundwater sample BH-A4 which also exceeded the applicable guideline. The concentration of chloride identified in the groundwater collected from BH-A4 is not considered to have any environmental significance, but rather is thought to reflect saline conditions associated with the boreholes coastal location. The saline condition of the groundwater present in BH-A4 is also reflected in relatively high detected levels of conductivity and total dissolved solids.

Hydraulic Response Testing

Hydraulic response (bail-down) tests were carried out on the four monitor wells (i.e., BH-a1, BH-A2, BH-A4, and BH-A5) to determine the permeability of the underlying overburden and bedrock stratigraphy at each location. Bail down tests were conducted by removing a volume of water from each well and recording the water levels in the well at specific time intervals as the water levels recovered. Analysis of the bail down test

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data for each test well was performed using the Hvorslev and Bouwer & Rice analysis methods and was conducted with the aid of the computer program AquiferTest, version 3.5 (Waterloo Hydrogeologic Inc.). Plots of analysis of bail-down data are attached and determined hydraulic conductivity values for each monitor well are tabulated below.

БЦ	Hydraulic Conductivity (m/s)			
БП	Hvorslev	Bouwer & Rice	Mean	
BH-A1	2.8E-7	3.2E-7	3.0E-7	
BH-A2	4.4E-7	3.6E-7	4.0E-7	
BH-A4	6.1E-8	5.6E-8	5.9E-8	
BH-A5	3.7E-7	2.8E-7	3.3E-7	

 Table 2:
 Laboratory Analysis Schedule (Site A)

Results of analysis of test data indicate mean hydraulic conductivity values for the four monitor wells ranging from 3.0x10⁻⁷ m/s for BH-A1 to 5.9x10⁻⁸ m/s for BH-A4 and are attached to this memorandum. These results are in general agreement with the observed overburden stratigraphy identified in the boreholes at the site and are generally within the range of typical values expected for wells screened in a combination of silty sand overburden.

CLOSURE

We trust that the information presented in this memorandum meets your current requirements. If you have any questions or require any additional information, please contact the undersigned at your convenience.

STANTEC CONSULTING LTD.

nn

Paul D. Deering, P.Eng., P.Geo. Senior Geotechnical Engineer

Attachments

INTERIM PROGRESS REPORT, GEOTECHNICAL AND ENVIRONMENTAL SERVICES STAGE 2 - GEOTECHNICAL / ENVIRONMENTAL SITE INVESTIGATION PROPOSED GBS CONSTRUCTION SITE, ARGENTIA, NL

ATTACHMENT 1

SITE DRAWINGS & STRATIGRAPHIC PROFILES







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	EXPLORATION S	UMMARY ON	I THIS FIGURE	<u>.</u>
	Exploration ID	Surl Elevati	ace on (m) [Total Depth (m)
	BH-A1	5.	13	26.51
	BH-A3 BH-A5	3.	73 73	24.38 29.11
	DIFAJ	1.	15	29.11
	1. Soil conditions pr	resented on this	figure are known	only at the borehole
	Note: This drawing	illustrates supp	orting information	specific to a
	Stantec Consulting	Ltd. report and	must not be used	for other purposes.
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		Stante	ec Consu	Iting Ltd.
		607 Torba St. John's	ay Road s NL A1A 4Y6	-
		Tel: (709 Fax: (709) 576-1458 9) 576-2126	
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INTERIM PROGRESS REPORT, GEOTECHNICAL AND ENVIRONMENTAL SERVICES STAGE 2 - GEOTECHNICAL / ENVIRONMENTAL SITE INVESTIGATION PROPOSED GBS CONSTRUCTION SITE, ARGENTIA, NL

ATTACHMENT 2

SYMBOLS AND TERMS

USED ON BOREHOLE AND TEST PIT RECORDS

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Topsoil	- mixture of soil and humus capable of supporting vegetative growth
Peat	- mixture of visible and invisible fragments of decayed organic matter
Till	- unstratified glacial deposit which may range from clay to boulders
Fill	- material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured	- having cracks, and hence a blocky structure
Varved	- composed of regular alternating layers of silt and clay
Stratified	- composed of alternating successions of different soil types, e.g. silt and sand
Layer	- > 75 mm in thickness
Seam	- 2 mm to 75 mm in thickness
Parting	- < 2 mm in thickness

Terminology describing soil types:

The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488). The classification excludes particles larger than 76 mm (3 inches). The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

Trace, or occasional	Less than 10%
Some	10-20%
Frequent	> 20%

Terminology describing compactness of cohesionless soils:

The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test N-Value (also known as N-Index). A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
Very Loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

Terminology describing consistency of cohesive soils:

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests.

O an alla (an an	Undrained Shear Strength		
Consistency	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	
Soft	0.25 - 0.5	12.5 - 25	
Firm	0.5 - 1.0	25 - 50	
Stiff	1.0 - 2.0	50 – 100	
Very Stiff	2.0 - 4.0	100 - 200	
Hard	>4.0	>200	



Page 1 of 3

ROCK DESCRIPTION

Terminology describing rock quality:

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RQD	Rock Mass Quality	
0-25	Very Poor Quality - Very Severely Fractured, Crushed	
25-50	Poor Quality- Severely Fractured, Shattered or Very Blocky	
50-75	Fair Quality - Fractured, Blocky	
75-90	Good Quality - Moderately Jointed, Sound	
90-100	Excellent Quality - Intact, Very Sound	

Rock quality classification is based on a modified core recovery percentage (RQD) in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. RQD was originally intended to be done on N-size core; however, it can be used on different core sizes if the bulk of the fractures caused by drilling stresses are easily distinguishable from *in situ* fractures. The terminology describing rock mass quality based on RQD is subjective and is underlain by the presumption that sound strong rock is of higher engineering value than fractured weak rock.

Terminology describing rock mass:

Spacing (mm)	Joint Classification	Bedding, Laminations, Bands
> 6000	Extremely Wide	-
2000-6000	Very Wide	Very Thick
600-2000	Wide	Thick
200-600	Moderate	Medium
60-200	Close	Thin
20-60	Very Close	Very Thin
<20	Extremely Close	Laminated
<6	-	Thinly Laminated

Terminology describing rock strength:

Strength Classification	Grade	Unconfined Compressive Strength (MPa)
Extremely Weak	R0	< 1
Very Weak	R1	1 – 5
Weak	R2	5 – 25
Medium Strong	R3	25 – 50
Strong	R4	50 - 100
Very Strong	R5	100 – 250
Extremely Strong	R6	> 250

Terminology describing rock weathering:

Term	Symbol	Description
Fresh	W1	No visible signs of rock weathering. Slight discolouration along major discontinuities
Slightly Weathered	W2	Discoloration indicates weathering of rock on discontinuity surfaces. All the rock material may be discoloured.
Moderately Weathered	W3	Less than half the rock is decomposed and/or disintegrated into soil.
Highly Weathered	W4	More than half the rock is decomposed and/or disintegrated into soil.
Completely Weathered	W5	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.

Solid Core Recovery (SCR):

Solid core recovery is defined as the cumulative length of all solid (at full diameter) core in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

Fracture Index (FI):

Fracture Index is defined as the number of naturally occurring fractures occurring per 0.3 m length of core. The Fracture Index is reported as a simple count of fractures. For > 25 fractures / 0.3 m length, the Fracture Index is reported as >25.







inferred

RECOVERY

WS

HQ, NQ, BQ, etc.

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery (or total core recovery - TCR) is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

N-VALUE

Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil. For split spoon samples where insufficient penetration was achieved and N-values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N value corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

DYNAMIC CONE PENETRATION TEST (DCPT)

Wash sample

Rock core samples obtained with the use of

standard size diamond coring bits.

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to A size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (305 mm) into the soil. The DCPT is used as a probe to assess soil variability.

OTHER TESTS

S	Sieve analysis
Н	Hydrometer analysis
k	Laboratory permeability
Y	Unit weight
Gs	Specific gravity of soil particles
CD	Consolidated drained triaxial
	Consolidated undrained triaxial with pore pressure
	measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
С	Consolidation
Qu	Unconfined compression
	Point Load Index (Ip on Borehole Record equals
I _p	$I_p(50)$ in which the index is corrected to a reference
	diameter of 50 mm)

Ţ	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
Ŷ	Falling head permeability test using casing
Ţ	Falling head permeability test using well point or piezometer



INTERIM PROGRESS REPORT, GEOTECHNICAL AND ENVIRONMENTAL SERVICES STAGE 2 - GEOTECHNICAL / ENVIRONMENTAL SITE INVESTIGATION PROPOSED GBS CONSTRUCTION SITE, ARGENTIA, NL

ATTACHMENT 3

BOREHOLE RECORDS

CI PH LO D.	Sta LIENT _ ROJECT OCATION ATES (mr	HUSKY ENERGY STAGE 2 GEOTECHNICAI ARGENTIA, NL n-dd-yy): BORING 1-6-12	L/EN to	B VIF 1-1	OR RONI		HO <u>NTA</u>	LE R L SITE 5241 (ATER I	E INV 680 1	BOREHOLE No. BH-A1 PAGE 1 of 2 PROJECT No. 121613435 DRILLING METHOD Casing m E 231252 m FL 2.69 m 1-10-12 DATUM Geodetic
DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	ТҮРЕ	NUMBER	RECOVERY(mm) B OR TCR % 7	N-VALUE	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa 10 20 30 40 50 WATER CONTENT & ATTERBERG W P W WL LIMITS I O TEST, BLOWS/0.3m + STANDARD PENETRATION TEST, BLOWS/0.3m • CAST IRON
- 0 -	5.13	Compact, brown, silty SAND with gravel (SM); some cobbles: FILL - surface partially frozen - some wood debris			SS SS SS	1 2 3	254 152 152	66 45 9	s	10 20 30 40 50 WELL HEAD BENTONITE
- 2 -	3.1	Loose to compact, brown, GRAVEL with sand (GW-GP) to SAND with gravel (SW- SP); occasional cobbles: FILL		×××××××××××××××××××××××××××××××××××××	SS SS SS	4 5 6	76 52 152	9 9 13	-	
- 4 -	0.9	Dense to very dense, brown to grey, silty SAND with gravel (SM) to a well graded SAND with silt and			SS SS	7 8	203 152	13 54	_	
- 6		gravel (SW-SM); occasional to some cobbles.		0	SS SS	9	279 178	74 56	S	
- 7 -					SS	11	610	56	-	50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2
- 9 - -10		- 105 mm to 280 mm size cobbles recovered between SS12 and SS13.		N. 0	SS	12	305	108/380	s	O SILICA SAND PACK
-11-	-6.6	 150 mm size cobbles recovered between SS13 and SS14. Dense to very dense, reddish brown to 	0 2 2 7 7 7 7		ss	13	127	100/127	-	
-13		red, fine grained, silty SAND (SM) with localized seams and layers od sandy SILT (ML). occasional cobbles			SS	14	229	191/432	-	
-14 					SS	15	406	83	sн	△ Unconfined Compression Test
		C	R	A	F٦					 ☐ Field Vane Test ☐ (Remolded) ◇ Fall Cone Test ♦ (Remolded) ∨ Hand Penetrometer Test ▲ Torvane

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DEPTH (m)	ELEVATION (m)	DESCRIPTION Continued from Previous Page	STRATA PLOT	WATER LEVEL	ТҮРЕ	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa 10 20 30 40 50 + + + + WATER CONTENT & ATTERBERG W P W WL LIMITS
-15 -16 -17 -17 -18 -19 -19 -20	-11.0	Very dense, reddish brown, clayey SAND with gravel (SC); occasional cobbles. Hard, reddish brown, Lean CLAY (CL).			<u>SS</u> <u>SS</u> SS	16	203 75 229	131/229 80/75 241/432 73	SH	
-21 -22 -22	-16.0	Very dense, brown, poorly graded SAND with silt and gravel (SP-SM) to a well-graded SAND with silt and sand (SW-SM); occasional cobbles			SS SS SS	20	178	129	S	S O MM DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
-24 - -25 - -26	-21.4	End of Borehole	> 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	No. 1999 - N. 19	SS SS	22	152	208	S	→ ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●
-27 -28 -29 -29 -30-			△ Unconfined Compression Test							
		D)R	A	FT	Γ				 □ Field Vane Test ● (Remolded) ◇ Fall Cone Test ◆ (Remolded) ○ Hand Penetrometer Test N Torvane

C	Sta	HUSKY ENERGY STAGE 2 GEOTECHNICAI ARGENTIA. NL	L/EN	B	OF	RE ME		LE R		CO VES) GA'	<u>TIO</u> 23	DN	53 m		BC PA PF DI	ORE AGE ROJE RILI 75	HOI 1 ECT _INC H	LE N L No. G MF W	of of TH	BH-A2 2 121613435 OD Casing	-
D	ATES (mr	n-dd-yy): BORING <u>1-11-12</u>	to	1-2	24-12	2	_ N _ W	 /ATER I	LEVE	EL	4	E .59	<u>23</u> m	1.	-24-1	12	D/	ZE ATU	M.	G	}eoc	letic	-
DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	ТҮРЕ	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE	OTHER TESTS	U WA LIM DYI STA	INDR 1 TER C ITS NAMIC		ED S		AR ST ERBEI I TEST	TREN 30 H RG W H , BLOW ST, BLC	GTH 4 P VS/0.3	- kPa ⊦0 ₩ ⊖ m .3m	50 ₩L ₩L		e P CC	STANDPIPE/ 'IEZOMETER)NSTRUCTION DETAILS	
- 0 -	7.74	Compact to very dense, brown, silty									1	0	2	20	3	80	40)	50		┢		F
		SAND with gravel (SM) to a		X	ss	1	457	94	s		0								>>•			BENTONITE	
- 1 -		sand (GW-GM)); occasional cobbles:		8		2	205	130/381	-						<u> </u>								
		FILL - surface layer frozen		X	SS	3	178	21	-					•							=		
2-		- some organics in fill material		8 8	SS	4	229	58	s		Ō								>>				
- 3 -				8 X	SS	5	229	77							<u> </u>				>>				
				X	SS	6	229	104											>>				
- 4 -				X	SS	7	279	116	s		<u>o</u>						<u> </u>		>>) 			
	2.9			₹ Į	SS	8	229	167											>>				
- 5 -		Very dense, grey to brown, silty SAND with gravel (SM); occasional	0 0 0		SS	9	305	145											>>		=		
		cobbles	> C > 0	Ż: Ģ	ss	10	305	57	s			0							>>				
			2 0		SS	11	152	53											>>				Ē
- 7 -	0.7	Very dense brown poorly graded																					
		GRAVEL with silt and sand	000	·c					-														
- 8 -		(GP-GM); occasioanl cobbles			SS	12	152	49															
				.e .e																			
- 9 -			200		SS	13	279	59	s			0							>>		=		
-10-	-2.3		0																				
		(SM) to clayey SAND (SC);																				No. 10 SLOT PVC	Ē
-11		occasional cobbles			SS	14	406	47											•			SCREEN IN No. 2 SILICA SAND	
																						РАСК	
-12-						15	432	198/432	-												=		
12	_5 /						152	1701732															
	-5.4	Hard, reddish brown, Lean CLAY																					
-14-		with sand (CL), occasional coddles			ss	16	483	62	1										>>				
-15-				1	<u> </u>	<u> </u>					ΔU	ncoi	nfine	d Co	ompre	ssion	Test	<u>: :</u> :	::		<u> </u>	<u> </u>	F
		C)R	A	F1	Γ					□ F ◇ F ▽ H	ield all C land	Vane one Pene	e Tes Test etror	st t meter	■ (F ◆ (F Test	Remo Remo	lded) lded) Torv	ane				

C. Pl	Sta	HUSKY ENERGY STAGE 2 GEOTECHNICAI ARGENTIA, NL	./EN	B		E ME		LE R		C VE	DRI STI) GA		N 135	3 n		B P P D	OR AG RO RO	EHC E_ IEC LIN	DLE 2 T N NG N HW	No. _ of Io. METH	BH-A2 2 121613435 HOD Casing
D	ATES (mr	n-dd-yy): BORING <u>1-11-12</u>	to	1-2	4-12		_ N _ W	ATER I	LEVE	EL	4	E I.59	<u>23</u>	1-	<u>24-</u>	12	- 5 . D	IZE DAT	UM		Geo	detic
DEPTH (m)	ELEVATION (m)	DESCRIPTION Continued from Previous Page	STRATA PLOT	WATER LEVEL	ТҮРЕ	NUMBER	RECOVERY (mm) DR TCR % ITAME	N-VALUE OR RQD %	OTHER TESTS	W/ LIN DY	UNDF		ED SI 2 INT & I ETRAT		TEST	TREN 30 	NGTH V _P WS/0. OWS/	H - kl 40 W 	Pa 5 ₩ ★	0 /_	C	STANDPIPE/ PIEZOMETER ONSTRUCTION DETAILS
-15-													2			30	4			50		
					SS	17	432	63											>>	>•		
-16-																						
									+													
-1/-					SS	18	610	79	SH			a							>>	>•		
-18-																						
					SS	19	381	162/381	-													
-19-	-11.5																		<u> </u>			
	11.5	Very dense, brown, poorly graded	P 0																			
-20-		SAND with silt and gravel (SP-SM); occasional cobbles and boulders	Þ		SS	20	229	121/229	SН		<u> </u>		<u> </u>	Ö	<u> </u>					_		50 mm DIAMETER
			2	-																		No. 10 SLOT PVC
-21-			P a																			SCREEN IN No. 2
			Þ		ss	21	_0	100/75														PACK
-22-		- 330 mm size boulder recovered at	>								· · ·								<u> </u>			
		21.8 III.	P 0																			
-23-			Þ		SS	22	305	183			<u> </u>								>>	>•		
			>																			
-24-									_													
~			Þ		SS	23	279	251/432														
_25			þ																			
-26-			0						-													
			Þ		SS	24	305	161/432														
-27-) 7	4																		
			Q 5		66	25	205	100/422	C 11													
-28-			5		33	23	303	190/432	ЗП		· · · ·											
			[
-29-			0		SS	26	279	107	-										<u>,</u>			END CAP
+	-21.7	End of Borehole	0				_,,				· · · ·				<u> </u>		· · · ·				****	
-30-										<u> :</u>	<u></u> ι	Jncor	fined	L Co	mpre	essio	n Tes	st	<u>: :</u>			I F
		C	R	A	FT	-						ield \ all C	/ane one 1 -	Tes Fest	st	■ (I ◆ (I	Remo	olde olde	d) d)			
-29- - -30-	-21.7	End of Borehole)R	Α	SS	26	279	107	-			Jncor Field V	one 1	d Co Test	mpre	essio ■ (I ◆ (I	n Tes Remo	st oldeo	d)			END CAP

C	Sta	HUSKY ENERGY STAGE 2 GEOTECHNICAI	/EN	B		E	HO	LE R		BOREHOLE No. BH-A3 PAGE 1 of 2 PROJECT No. 121613435
L L	OCATION	ARGENTIA, NL	4-	10	1(1)	1	_ N	5241	730 1	m E 231479 m SIZE HW
D	ATES (mi	n-dd-yy): BORING 12-7-11	to	12-	16-1		_ W	ATER I	LEVE	EL <u>N/A</u> DATUM <u>Geodetic</u>
DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	ТҮРЕ	NUMBER	RECOVERY (mm) DR TCR %	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - KPa 10 20 30 40 50 WATER CONTENT & ATTERBERG W P W L PIEZOMETER LIMITS
- 0 -	3.73		ļ							10 20 30 40 50
		Compact, grey, poorly-graded SAND with gravel (SP); occasional to some	р. (2	SS	1	205	27	S	o •
- 1 -		cobbles	Þ	C	SS	2	75	25		
			D		SS	3	150	25		
- 2 -	1.5	Compact to dense brown poorly		7	SS	4	205	33	s	
		graded GRAVEL with sand (GP),	0000	¢	SS	5	-0	100/25	-	
- 3 -		some cobbles. - 75 to 200 mm size cobbles recovered	000	4	SS	6	610	35	s	Q
	-0.4	between SS4 and SS8.	°°°	i K	SS	7	150	125/150	-	
		Loose to compact, brown, fine grained, poorly graded GRAVEL with	0	4	SS	8	205	18	s	
- 5 -		sand (GP);	0.0	¢						
			0.0	ç	SS	9	0	16		
- 6 -			0	c	SS	10	125	12		
- 			0.0	¢	SS	11	100	7		
			0.0		SS	12	150	4		
- 8 -			0	ç	SS	13	150	5		
	-5.1		° °		SS	14	610	6	s	• 0
- 9 -		Very loose to loose, brown,			SS	15	610	3	-	
		(SP-SM)			SS	16	610	4	s	•
-10-	-6.3	Loose to compact, brown,	, , , , , , , , , , , , , , , , , , ,	4	SS	17	150	24	-	
-11-		(GP)	0.0	د د	SS	18	50	6		
			0.00	c	SS	19	75	4	-	
-12-			0	, ç	SS	20	0	7		
12			° . • • •		SS	21	50	5		
			0.0	ڊ د	SS	22	50	4	-	
-14-	-10.1	Very loose to loose, brown, silty			SS	23	205	3	s	■
		SAND (SM). - Layer grades to a well-graded SAND			SS	24	100	7		
-15-		C) R		FT	•		<u> </u>	<u>-1</u>	L : : : : L : : L : : : L : L : : L :

CI PH LC	Sta LIENT ROJECT DCATION ATES (mr	HUSKY ENERGY STAGE 2 GEOTECHNICAL ARGENTIA, NL n-dd-yy): BORING 12-7-11	/EN to		OF RON1	RE ME	HO	LE R L SITE 5241	EC INV 730 I	C VE m EL	R	D IG# . E_ N/	АТ /А	IO 231	N 47	9 m		B P P D SI D	OREH AGE ROJEC RILLI ZE _ ATUN	IOLE I 2 CT No NG M HW 1	No of . ETH] 2 12 OD	BH-A3 	35 ng	-
DEPTH (m)	ELEVATION (m)	DESCRIPTION Continued from Previous Page	STRATA PLOT	WATER LEVEL	ТҮРЕ	NUMBER	RECOVERY (mm) OR TCR %	N-VALUE G	OTHER TESTS	U WA LIN DY ST.				20 SH 20 17 & A TRATI ETRA 20		R ST	REN 30 	GTH P VS/0.3 DWS/0 40	- kPa 40 	50 W _L -1 *	e P CC	STAN PIEZO DNSTF DET	DPIPE/ Meter Ruction Ails	J	
-15 -16 -17 -18 -19 -20 -21 -22 -21 -22 -23 -24 -23 -24 -25 -25 -26 -27 -27 -28	-13.6	with gravel (SW) at 16.8 m. Dense to very dense, brown, fine grained, silty SAND (SM) to a sandy SILT(ML). occasional cobbles Hard, reddish brown, lean CLAY with sand (CL) to a sandy CLAY (CL). End of Borehole Borehole terminated at 24.38m due to hole instability/collapse			SS SS SS SS SS SS SS SS	25 26 27 28 29 30 31 31 32 33	50 205 405 305 355 455 455 405	2 9 7 19 46 150 78 77 69	S																
-29		C	R		F1							Unc Fiel Fall Har	confi d Va Coi nd P	ned ane T ene	Con Test est	npre:	ssion ■ (F ● (F Test	Tes Remo Remo	lded) Torva	ne					

CI PH LC	Sta LIENT ROJECT DCATION ATES (mr	HUSKY ENERGY STAGE 2 GEOTECHNICAL ARGENTIA, NL n-dd-yy): BORING 12-16-11	/EN to	B VIR 1-5	OR RONI	XE	HO	LE R L SITE 5241	EC INV 596 I	CORDBOREHOLE No.BH-A4PAGE1of2PROJECT No.121613435IVESTIGATIONDRILLING METHODCasingImE231408 mSIZEHWVEL2.5 m12-17-11DATUMGeodetic
DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	ТҮРЕ	NUMBER	RECOVERY (mm) OR TCR %	N-VALUE	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa 10 20 30 40 50 WATER CONTENT & ATTERBERG W P W WL LIMITS
- 0 -	3.74	Loose to compact, brown, poorly-graded SAND with gravel	>o		SS	1	355	2		10 20 30 40 50 Per Well HEAD BENTONITE
- 1 -		(SP); occasional to some cobbles	ף ו		ss	2	405	14	s	
	1.9		0		ss	3	330	16		
2		Compact to dense, brown, well-graded GRAVEL with sand		q q q ⊈	ss	4	150	31	-	
- 3 -		(gw), occasional cobbles.			SS	5	150	38	-	
			0.0	ç	SS	6	330	99	S	
- 4 -			0.0	e e	SS	7	230	38	-	
- 5 -	-1.1	Compact, brown, well-graded SAND		4	ss	8 9	305	27	s	
		with gravel (SW)	Þ		ss	10	230	28		
6-			7 0							
- 7 -			Р. a							
	-3.9	Compact, brown, well-graded	ب ۱		SS	11	455	185/355	-	
8-		GRAVEL with sand (gw), occasional cobbles.	0.0.0	ç						
- 9 -			0.00	ç					-	
			000	ç	SS	12	175	27	S	0
-10-	-6.9		000	ę						50 mm DIAMETER No. 10 SLOT PVC
-11-	0.2	Compact, grey, poorly-graded SAND with gravel (SP); occasional cobbles	P. 0	4	ss	13	205	15		SCREEN IN No. 2
										PACK
			D P		ss	14	230	12		
-13-			Þ							
			0							
- 14-			P 0		ss	15	230	14		
-15-										Unconfined Compression Test
		D	R	A	F1					 ↓ Field Vane Test ↓ Fall Cone Test ↓ (Remolded) ↓ Hand Penetrometer Test ↓ Torvane

CI PH LC D.	Sta LIENT _ ROJECT OCATION ATES (mi	HUSKY ENERGY STAGE 2 GEOTECHNICAI ARGENTIA, NL m-dd-yy): BORING 12-16-11			OR RONI 5-12	¦E ∣ ME		LE R L SITE 5241 : VATER J	EC E IN 596 I	OF VEST m EL -	? [[][(_ F 2) GATI(3 <u>2</u> ; .5 m	<u>ON</u> <u>314</u>	1 12-	<u>m</u> 17-	 11	BO PA PR DR SIZ DA	REH GE _ OJEC ILLI ZE TUM	OLE 2 .T N NG M HW 1	, No. 0f Jo METH V Geo	BH-A4 2 121613435 10D Casing detic	-
DEPTH (m)	ELEVATION (m)	DESCRIPTION Continued from Previous Page	STRATA PLOT	WATER LEVEL	ТҮРЕ	NUMBER	RECOVERY(mm) K	N-VALUE Si OR RQD %	OTHER TESTS	UNI WATEI LIMITS DYNAI STANE		AINED S 0 ONTENT 8 PENETR4 D PENETI	20 20 4 & AT ATIC RAT 20		STF 3 BERC EST, F TEST 3(3 W P 3 W P BLOWS	TH - 40 	kPa) 5 √ V) 3m ●	50 V _L 1	e F CC	STANDPIPE/ PIEZOMETER DNSTRUCTION DETAILS	
-16	-12.5	Compact, black, SILT (ML).		2	SS	16	150	14				•										
-17-	-14.2	 organic odour. wash water truned black in this layer. 			SS	17	100	15	-			•										
-19	-15.8	Very dense, brown, poorly graded SAND with gravel (SP)	0 0 7 0	2	SS	18	280	107	S			0		· · · · · · · · · · · · · · · · · · ·				>	>•			
-20-		Hard, reddish brown, sandy lean CLAY with gravel (CL) to a gravelly lean CLAY (CL); occasional cobbles			SS	19	150	117	-									~~>>	>●		50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2	
-22-					SS	20	305	87	SH		0	 						>:	>•		SILICA SAND PACK	
-23-	-20.1	Very dense. brown, poorly graded			SS	21	255	76	-									>>	>•			
-25	-20.8	SAND with silt and gravel (SP-SM); occasional cobbles		2	SS	22	150	100/150	-						· · · · · · · · · · · · · · · · · · ·				- X		2 END CAP	
-26														· · · · · · · · · · · · · · · · · · ·								
-28														· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·							
-29																		· · · · · · · · · · · · · · · · · · ·				
-30-		C)R	۲À	FT	Γ] Fi) Fi) Fi	nconfine eld Van all Cone and Per	ed C e T Te	Com est est	pres	sion T ■ (Rei ● (Re Test	est mold molc	led) led) forvan				

C. PI	Sta	HUSKY ENERGY STAGE 2 GEOTECHNICAL ARGENTIA, NL	/EN	ENVIRONMENTAL SITE INVESTIGATION N 5241707 m E 231383 m											BOREHOLE No. BH-A5 PAGE 1 of 2 PROJECT No. 121613435 DRILLING METHOD Casing SIZE HW						
D	ATES (mr	n-dd-yy): BORING11-30-11	to	12-	-7-11		W	ATER I	LEVE	EL _(5.02	m	12-	7-1	1	DA	TUN	1 _	Geo	odetic	_
DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	ТҮРЕ	NUMBER	RECOVERY(mm) V: OR TCR %	N-VALUE	OTHER TESTS	UNDF WATER C LIMITS DYNAMIC STANDAF		ED SH 2 ENT & / ETRAT		R STF 3 RBERC EST, F	RENG 0 3 W _F BLOWS	5/0.3m	kPa	50 W _L H	C	STANDPIPE/ PIEZOMETER ONSTRUCTION DETAILS	
- 0 -	7.73	Lassa to compact brown silty SAND		<u> </u>		\square		<u> </u>	-		10 T : :	2	0	30)	40		50		WELL HEAD	┢
		with gravel (SM) to a poorly graded		×××	SS	1	230	10			•									BENTONITE	
- 1 -		GRAVEL with sand (GP-GM);		×××	SS	2	150	12									::: :::				E
		occasional coboles. FILL		XXXX	SS	3	230	7	s	•											
- 2 -		-some wood debris		XXXX																50 mm DIAMETER	ł
				××××	SS	4	125	17				٠								No. 10 SLOT PVC SCREEN IN No. 2	
- 3 -				××××		-											<u> </u>			SILICA SAND	E
				××××	55	3	0	14												PACK	E
- 4 -				××××	SS	6	0	10													
				××××																	
- 5 -	2.6	Compact to very dense, brown, poorly		××	SS	7	330	30											E		Ē
		graded SAND with gravel (SP).	0		SS	8	150	39								•					Ē
- 6 -		occasional cobbles	2	⊥	SS	9	355	85	_												Ē
			Ø																		E
	0.3		, a	· • · ·	ss	10	330	102/380	- S												
		Dense to very dense, grey, poorly graded GRAVEL with sand (GP):	0		SS	11	305	61									>	>	E		
		occasional cobbles	0.0	ć	SS	12	330	58	s	0											Ē
9-9-			0.0.0	ç ç	00	12	175														
	-1.7	Compact to very dense, brown, poorly		а. И	55	13	1/5	31	-												
-10-		graded SAND with silt and gravel	0 0 0 0	¢	SS	14	100	15				•									
		(SP-SM) to a silty SAND (SM);	00	Ċ																	E
-11-			000		SS	15	0	33				::			•						E
			0		ss	16	255	82	s		0						>	>•			
-12-			000	4																	
	-5.1		P 0 0	¢	SS	17	610	46									•				
-13-		Very dense, brown, poorly graded	P. 0		SS	18	355	110	s	0		<u> </u>					>	>•		50 mm DIAMETER	<u>ا</u>
		(GP-GM); trace cobbles	0.0	ڊ																No. 10 SLOT PVC	Ē
-14-			; ;; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	ç	SS	19	455	112				::		::			>	>•		SCREEN IN NO. 2	
	-7.0	Dance to your dance gray fine to	, o , o	4					-											PACK	E
-15-		Dense to very dense, grey, lille to		ч 		<u> </u>		<u>I</u>	<u> </u>		I : : Jncor	i i nfined	L : : I Corr	npres	sion	Test	<u>:::</u>	: 1:		<u>.(</u>	Ŧ
		D)R	Α	FT	J				∐ F ⊘F ▽F	ield ^v all C land	Vane one T Pene	Test Fest strome	eter 1	∎ (Re ♦ (Re Γest	emold emold T I	led) led) ⁻ orvar	ne			

CI PH LO	StantecBOREHOLE RECORDBOREHOLE PAGE 2CLIENTHUSKY ENERGYPROJECTPROJECT MUSKY ENERGYPROJECTSTAGE 2 GEOTECHNICAL/ENVIRONMENTAL SITE INVESTIGATIONDRILLINGLOCATIONARGENTIA, NLN 5241707 mE 231383 mDATES (mm-dd-yy): BORING11-30-11 to 12-7-11WATER LEVEL6.02 m 12-7-11DATES (mm-dd-yy): BORING11-30-11 to 12-7-11WATER LEVEL6.02 m 12-7-11											LE No	BH-A5 2 121613435 OD Casing letic								
DEPTH (m)	ELEVATION (m)	DESCRIPTION Continued from Previous Page	STRATA PLOT	WATER LEVEL	ТҮРЕ	NUMBER	RECOVERY (mm) OR TCR %	N-VALUE S OR RQD %	OTHER TESTS	U WA ¹ LIMI DYN STA			ED S 2 ENT & ETRAT NETR 2	R S RBEI	30 	NGTH V _P WS/0. OWS/	H - kF 40 W O 3m 0.3m	2a 50 ₩1 ★ €	F CC	STANDPIPE/ IEZOMETER INSTRUCTION DETAILS	
-15 - -16 - -17		medium grained silty SAND (SM)			SS SS SS	20	610	53	S			0				·	2	>>			
-18 - -19 -					SS	22	610	2		•											
-20 -21 -22	-13.1	Hard, reddish brown, lean CLAY with sand (CL); trace gravel			SS SS	23 24	610 610	31										•			
-23 -24					SS	26	610	37	-							•				50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK	
-25 26-	-17.8	Very dense, brown, poorly graded SAND with silt and gravel (SP-SM) to a well-graded SAND with silt and sand (SW-SM); occasional cobbles			SS	28	75	100/150													
-28-	-21.4		> 2 > 2 > 0		SS	29 30		100/150	-											END CAP	
-30-	30 BRAFT ↓ Unconfined Compression Test □ Field Vane Test ↓ (Remolded) ♦ Fall Cone Test ♦ (Remolded) ♦ Fall Cone Test ↓ (Remolded)																				

STANTEC GEOTECH BOREHOLE/MONITOR WELL 2/13/12 3:14:27 PM

INTERIM PROGRESS REPORT, GEOTECHNICAL AND ENVIRONMENTAL SERVICES STAGE 2 - GEOTECHNICAL / ENVIRONMENTAL SITE INVESTIGATION PROPOSED GBS CONSTRUCTION SITE, ARGENTIA, NL

ATTACHMENT 4

GEOTECHNICAL LABORATORY RESULTS

(GRADATION AND MOISTURE CONTENT)



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INTERIM PROGRESS REPORT, GEOTECHNICAL AND ENVIRONMENTAL SERVICES STAGE 2 - GEOTECHNICAL / ENVIRONMENTAL SITE INVESTIGATION PROPOSED GBS CONSTRUCTION SITE, ARGENTIA, NL

ATTACHMENT 5

ENVIRONMENTAL LABORATORY RESULTS

 Table B.1 Results of Laboratory Analysis of Petroleum Hydrocarbons in Groundwater

 Site A, Environmental Investigation

 Site Selection GBS, Husky Energy Ltd.

 Stantec Project No. 121613435.300

			BTEX Param	neters (mg/kg)			Resemblance				
Sample I.D.	Sample Date	Benzene	Toluene	Ethylbenzene	Xylenes	C ₆ -C ₁₀	>C ₁₀ -C ₁₆	>C ₁₆ -C ₃₄	>C ₃₄ -C ₅₀	Modified TPH ²	Comment
BHA1	3-Feb-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
BHA2	3-Feb-12	ND	ND	ND	ND	ND	0.87	ND	0.14	1.0	-
BHA4	3-Feb-12	ND	ND	ND	ND	0.079	ND	ND	ND	ND	-
BHA5	3-Feb-12	0.0030	ND	ND	ND	0.086	0.063	ND	ND	0.15	-
	RDL	0.001	0.001	0.001	0.002	0.01	0.05	0.05	0.1	0.1	-
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	-
	Guidelines ¹	6.9	20	20	20	-	-	-	-	20	-

Notes:

1 = Atlantic Partners in RBCA (Risk-Based Corrective Action) Implementation (PIRI) Tier I Risk-Based Screening Levels (RBSLs) for a commercial receptor with

non-potable groundwater, coarse grained soil, and gasoline, fuel oil, and lube oil (March 2007)

 $2 = TPH - C_6 - C_{32}$ (excluding BTEX).

RDL = Reportable Detection Limit.

ND = Not detected above standard RDL.

"-" = Not analyzed, not applicable or no applicable guideline.

Table B.2 Results of Laboratory Analysis of Volatile Organic Compounds in Groundwater Site A, Environmental Investigation Site Selection GBS, Husky Energy Ltd. Stantec Project No. 121613435.300

Parameter	Units	RDL	Guideline ¹	BHA1	BHA4	BHA5
Chlorobenzenes						
1,2-Dichlorobenzene	ug/L	0.50	4,600	ND	ND	ND
1,3-Dichlorobenzene	ug/L	1.0	9,600	ND	ND	ND
1,4-Dichlorobenzene	ug/L	1.0	8	ND	ND	ND
Chlorobenzene	ug/L	1.0	630	ND	ND	ND
Volatile Organics						
1,1,1-Trichloroethane	ug/L	1.0	640	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	1.0	3.2	ND	ND	ND
1,1,2-Trichloroethane	ug/L	1.0	4.7	ND	ND	ND
1,1-Dichloroethane	ug/L	2.0	320	ND	ND	ND
1,1-Dichloroethylene	ug/L	0.50	1.6	ND	ND	ND
1,2-Dichloroethane	ug/L	1.0	1.6	ND	ND	ND
1,2-Dichloropropane	ug/L	1.0	16	ND	ND	ND
Benzene	ug/L	1.0	44	ND	ND	4.6
Bromodichloromethane	ug/L	1.0	85,000	ND	ND	ND
Bromoform	ug/L	1.0	380	ND	ND	ND
Bromomethane	ug/L	3.0	5.6	ND	ND	ND
Carbon Tetrachloride	ug/L	1.0	0.79	ND	ND	ND
Chloroethane	ug/L	8.0	-	ND	ND	ND
Chloroform	ug/L	1.0	2.4	ND	ND	ND
Chloromethane	ug/L	8.0	-	ND	ND	ND
cis-1,2-Dichloroethylene	ug/L	2.0	1.6	ND	ND	ND
cis-1,3-Dichloropropene	ug/L	2.0	-	ND	ND	ND
Dibromochloromethane	ug/L	1.0	82,000	ND	ND	ND
Ethylbenzene	ug/L	1.0	2,300	ND	ND	ND
Ethylene Dibromide	ug/L	1.0	0.25	ND	ND	ND
Methylene Chloride(Dichloromethar	ug/L	3.0	610	ND	ND	ND
o-Xylene	ug/L	1.0	-	ND	ND	ND
p+m-Xylene	ug/L	2.0	-	ND	ND	ND
Styrene	ug/L	1.0	1,300	ND	ND	ND
Tetrachloroethylene	ug/L	1.0	1.6	ND	ND	ND
Toluene	ug/L	1.0	18,000	ND	ND	ND
trans-1,2-Dichloroethylene	ug/L	2.0	1.6	ND	ND	ND
trans-1,3-Dichloropropene	ug/L	1.0	-	ND	ND	ND
Trichloroethylene	ug/L	1.0	1.6	ND	ND	ND
Trichlorofluoromethane (FREON 1)	ug/L	8.0	2,500	ND	ND	ND
Vinyl Chloride	ug/L	0.50	0.5	ND	ND	ND

Notes:

¹ = Ontario Ministry of the Environment (MOE) Soil, Groundwater, and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act: Table 3 - Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition for Industrial/Commercial Property Use (April 2011)

"-" = not analysed, not applicable or no applicable guideline

ND = Not Detected above RDL

RDL = Reportable Detection Limit

Bold/Shaded = value exceeds applicable criteria

Table B.3 Results of Laboratory Analysis of Polychlorinated Biphenyls in GroundwaterSite A, Environmental InvestigationSite Selection GBS, Husky Energy Ltd.Stantec Project No. 121613435.300

Sample ID	Sampling Date	Total PCBs (ug/L)
BH A1	3-Feb-12	ND
BH A1 Lab-Dup	3-Feb-12	ND
BH A4	3-Feb-12	ND
BH A5	3-Feb-12	ND
	0.05	
	0.2	

Notes:

1 = Ontario Ministry of the Environment (MOE) Soil, Groundwater, and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act: Table 3 - Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition for Industrial/Commercial Property Use (April 2011)

ND = Not Detected above the RDL.

RDL = Reportable Detection Limit.

"-" = Not analysed, not applicable or no applicable guideline.

Table B.4 Results of Laboratory Analysis of Dissolved Metals in Groundwater Site A, Environmental Investigation Site Selection GBS, Husky Energy Ltd. Stantec Project No. 121613435.300

Parameter	Units	RDL	Guideline ¹	BHA1	BHA4	BHA5
Aluminum (Al)	ug/L	5.0	-	ND	5.5	ND
Antimony (Sb)	ug/L	1.0	20,000	ND	ND	ND
Arsenic (As)	ug/L	1.0	1,900	ND	1.9	1.4
Barium (Ba)	ug/L	1.0	29,000	109	173	91.6
Beryllium (Be)	ug/L	1.0	29	ND	ND	ND
Bismuth (Bi)	ug/L	2.0	-	ND	ND	ND
Boron (B)	ug/L	50	45,000	69	875	116
Cadmium (Cd)	ug/L	0.017	2.7	ND	ND	ND
Calcium (Ca)	ug/L	100	-	69,700	165,000	54,800
Chromium (Cr)	ug/L	1.0	810	ND	ND	ND
Cobalt (Co)	ug/L	0.40	66	1.58	0.54	1.18
Copper (Cu)	ug/L	2.0	87	ND	ND	ND
Iron (Fe)	ug/L	50	-	296	ND	3,850
Lead (Pb)	ug/L	0.50	25	ND	ND	ND
Magnesium (Mg)	ug/L	100	-	22,500	229,000	28,100
Manganese (Mn)	ug/L	2.0	-	8,310	1,950	5,920
Molybdenum (Mo)	ug/L	2.0	9,200	ND	8.3	2.1
Nickel (Ni)	ug/L	2.0	490	ND	ND	ND
Phosphorus (P)	ug/L	100.0	-	ND	ND	ND
Potassium (K)	ug/L	0.1	-	6,000	60,300	7,760
Selenium (Se)	ug/L	1.0	63	ND	ND	ND
Silver (Ag)	ug/L	0.10	1.5	ND	ND	ND
Sodium (Na)	ug/L	100	2,300,000	78,000	1,550,000	112,000
Strontium (Sr)	ug/L	2.0	-	316	2,490	324
Thallium (TI)	ug/L	0.10	510	ND	ND	ND
Tin (Sn)	ug/L	2.0	-	ND	ND	ND
Titanium (Ti)	ug/L	2.0	-	ND	ND	ND
Uranium (U)	ug/L	0.10	420	0.38	6.19	0.38
Vanadium (V)	ug/L	2.0	250	ND	ND	ND
Zinc (Zn)	ug/L	5.0	1,100	6.1	ND	ND

Notes:

¹ = Ontario Ministry of the Environment (MOE) Soil, Groundwater, and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act: Table 3 - Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition for Industrial/Commercial Property Use (April 2011)

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RDL = Reportable Detection Limit

Bold/Shaded = value exceeds applicable criteria

Table B.5 Results of Laboratory Analysis of General Chemistry in GroundwaterSite A, Environmental InvestigationSite Selection GBS, Husky Energy Ltd.Stantec Project No. 121613435.300

Parameters	Units	RDL	Guideline ¹	BH A1	BH A4	BH A4 Lab-Dup	BH A5	BH A5 Lab-Dup
Anion Sum	me/L	N/A	-	10.0	110	-	11.0	-
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1.0	-	331	241	-	161	-
Calculated TDS	mg/L	1.0	-	532	5980	-	603	-
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.0	-	1.2	2.3	-	ND	-
Cation Sum	me/L	N/A	-	8.91	96.2	-	10.3	-
Hardness (CaCO3)	mg/L	1.0	-	270	1400	-	250	-
Ion Balance (% Difference)	%	N/A	-	5.96	6.58	-	3.24	-
Langelier Index (@ 20C)	N/A	-	-	0.489	0.793	-	-0.141	-
Langelier Index (@ 4C)	N/A	-	-	0.241	0.554	-	-0.389	-
Nitrate (N)	mg/L	0.050	-	ND	ND	-	ND	-
Saturation pH (@ 20C)	N/A	-	-	7.11	7.22	-	7.54	-
Saturation pH (@ 4C)	N/A	-	-	7.36	7.46	-	7.79	-
Total Alkalinity (Total as CaCO3)	mg/L	25	-	330	240	240	160	-
Dissolved Chloride (Cl)	mg/L	1.0	2,300	78	3400	3500	260	-
Colour	TCU	5.0	-	20	ND	ND	130	-
Nitrate + Nitrite	mg/L	0.050	-	ND	ND	ND	ND	-
Nitrite (N)	mg/L	0.010	-	0.011	ND	ND	ND	-
Nitrogen (Ammonia Nitrogen)	mg/L	0.050	-	0.35	2.5	-	0.62	0.59
Total Organic Carbon (C)	mg/L	5.0	-	13(1)	ND (1)	-	6.3 (1)	-
Orthophosphate (P)	mg/L	0.010	-	ND	ND	ND	ND	-
рН	рН	N/A	-	7.60	8.01	-	7.40	-
Reactive Silica (SiO2)	mg/L	0.50	-	12	5.4	5.3	11	-
Dissolved Sulphate (SO4)	mg/L	10	-	57	370	370	24	-
Turbidity	NTU	0.50	-	170	49	-	65	-
Conductivity	uS/cm	1.0	-	930	11000	-	1200	-

Notes:

¹ = Ontario Ministry of the Environment (MOE) Soil, Groundwater, and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act: Table 3 - Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition for Industrial/Commercial Property Use (April 2011)

"-" = not analysed, not applicable or no applicable guideline

ND = Not Detected above the RDL

RDL = Reportable Detection Limit

Lab-Dup = Laboratory QA/QC duplicate sample

Bold/Shaded = value exceeds applicable criteria

INTERIM PROGRESS REPORT, GEOTECHNICAL AND ENVIRONMENTAL SERVICES STAGE 2 - GEOTECHNICAL / ENVIRONMENTAL SITE INVESTIGATION PROPOSED GBS CONSTRUCTION SITE, ARGENTIA, NL

ATTACHMENT 6

HYDRAULIC RESPONSE TESTING















