



White Rose Extension Project

Registration
WH-DWH-RP-0013

August 2012



Malcolm Maclean
Vice President, Developments, Atlantic Region

Bus: (709) 724-3900
Fax: (709) 724-3915

Suite 901, Scotia Centre
235 Water Street
St. John's, NL, Canada
A1C 1B6

August 3rd, 2012

Director, Environmental Assessment Division
Department of Environment and Conservation
West Block, Confederation Building
P.O. Box 8700
St. John's, NL
A1B 4J6

Doc. No.: HUS-GOV-DG-LTR-00003

Attention: Mr. Bas Cleary

Dear Mr. Cleary:

Subject: Registration of Husky Energy's White Rose Extension Project

In response to your letter advising Husky Energy that the White Rose Extension Project (WREP) was an undertaking requiring environmental review under the Environmental Assessment Regulations, attached is the WREP Registration (six hardcopies and one electronic copy on CD).

As you are aware, the Project Description for the WREP was submitted to the C-NLOPB on May 28th, 2012. A draft Scoping Document was issued by the C-NLOPB on June 7th, 2012. The draft Scoping Document declared that the WREP was subject to a screening-level assessment under the Canadian Environmental Assessment Act (CEAA) (Reference number 68249).

On July 6th, 2012, the Government of Canada released new regulations required to implement CEAA 2012 (CEA Agency 2012). Screening-type assessments of projects not designated are no longer required when CEAA 2012 comes into force. However, the WREP was designated a transitional screening project, which is to be assessed under the old CEAA.

In addition, the WREP will undergo review by the C-NLOPB when Husky submits a Development Application. The Development Application will include a Canada-Newfoundland and Labrador Benefits Plan Amendment, Development Plan Amendment, Concept Safety Analysis and Socio-economic Impact Statement (SEIS) for all aspects of the project, on land and offshore. The environmental assessment currently being prepared for the CEAA process will meet the requirements of an Environmental Impact Statement, a further requirement of the Development Application.

As was required of previous oil and gas projects with a land-based component, Husky recognizes the necessity of an Environmental Protection Plan and an Employment Equity Plan. Husky will be preparing these plans within the next year. Husky will also continue to consult with stakeholders as part of the CEAA process as well as in relation to the Socioeconomic Impact Statement (SEIS) report that will be completed as required under the Atlantic Accord legislation.

Yours sincerely,

HUSKY OIL OPERATIONS LIMITED



Malcolm Maclean
VP, Developments, Atlantic Region

DP/jp

Attachments: WREP Registration

cc: Don Williams, Kathy Knox, Margaret Allan

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List of Acronyms and Units

Acronym/Unit	Definition
AMA	Argentia Management Authority
ARG	Argentia Remediation Group
BTEX	Benzene, toluene, ethylbenzene and toluenes
Bund wall	An engineered retaining wall
CCME	Canadian Council of Ministers of the Environment
CEAA	<i>Canadian Environmental Assessment Act</i>
CEA Agency	Canadian Environmental Assessment Agency
CGS	Concrete gravity structure
C-NLOPB	Canada-Newfoundland Offshore Petroleum Board
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
ERA	Ecological Risk Assessment
ESA	Environmental Site Assessment
FEED	Front-end Engineering and Design
FPSO	Floating production, storage and offloading vessel
Husky	Husky Oil Operations Limited, operator of the White Rose field
km	kilometres
km/h	kilometres per hour
m	metre
m ²	square metre
m ³	cubic metre
mbgs	metres below ground surface
mg/kg	milligram per kilogram
mg/L	milligram per litre
mm	millimetre
m/s	metres per second
NFSA	Northside Fuel Storage Area
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyls
PEL	Probable effect level
PIRI	Partnership in RBCA Implementation
ppm	part per million
PWGSC	Public Works and Government Services Canada

Acronym/Unit	Definition
RBCA	Risk-based Corrective Action
RMO	Remedial action objectives
SARA	<i>Species at Risk Act</i>
SEIS	Socio-economic Impact Statement
SQG	Sediment quality guideline
SVOC	Semi-volatile organic compounds
TPH	Total petroleum hydrocarbon
VOC	Volatile organic compound
WHP	Wellhead platform
WREP	White Rose Extension Project

1.0 Name of Undertaking

The White Rose Extension Project (WREP)

2.0 Proponent

2.1 Name of Corporate Body

Husky Oil Operations Limited

2.2 Address

Suite 901, Scotia Centre

235 Water Street

St. John's, NL, A1C 1B6

2.3 Officer

Malcolm Maclean
Vice President, Developments, Atlantic Region
Husky Energy
Suite 901, Scotia Centre
235 Water Street
St. John's, NL A1C 1B6
Phone: (709) 724-4601
Email: malcolm.maclean@huskyenergy.com

2.4 Principal Contact Person for Purposes of Environmental Assessment

Don Williams
HSEQ Lead, Projects
Husky Energy
Suite 901 Scotia Centre
235 Water Street
St. John's, NL
A1C 1B6
Phone: (709) 724-4608
Email: Don.F.Williams@huskyenergy.com

3.0 The Undertaking

3.1 Nature of the Undertaking

Husky Oil Operations Limited (Husky), on behalf of co-venturers Suncor Energy Inc. and Nalcor Energy – Oil and Gas Inc., is pleased to submit this Registration for the White Rose Extension Project (WREP). The current focus of the WREP is on the development of West White Rose Pool, delineated in 2006. Husky and its co-venturers are considering two development options for the WREP: a wellhead platform (WHP) development option (Figure 3-1) or a subsea drill centre development option. Both development options will be tied back to the existing *SeaRose* floating production, storage and offloading (FPSO) vessel. Future development opportunities for the WREP will be evaluated by Husky and its co-venturers.

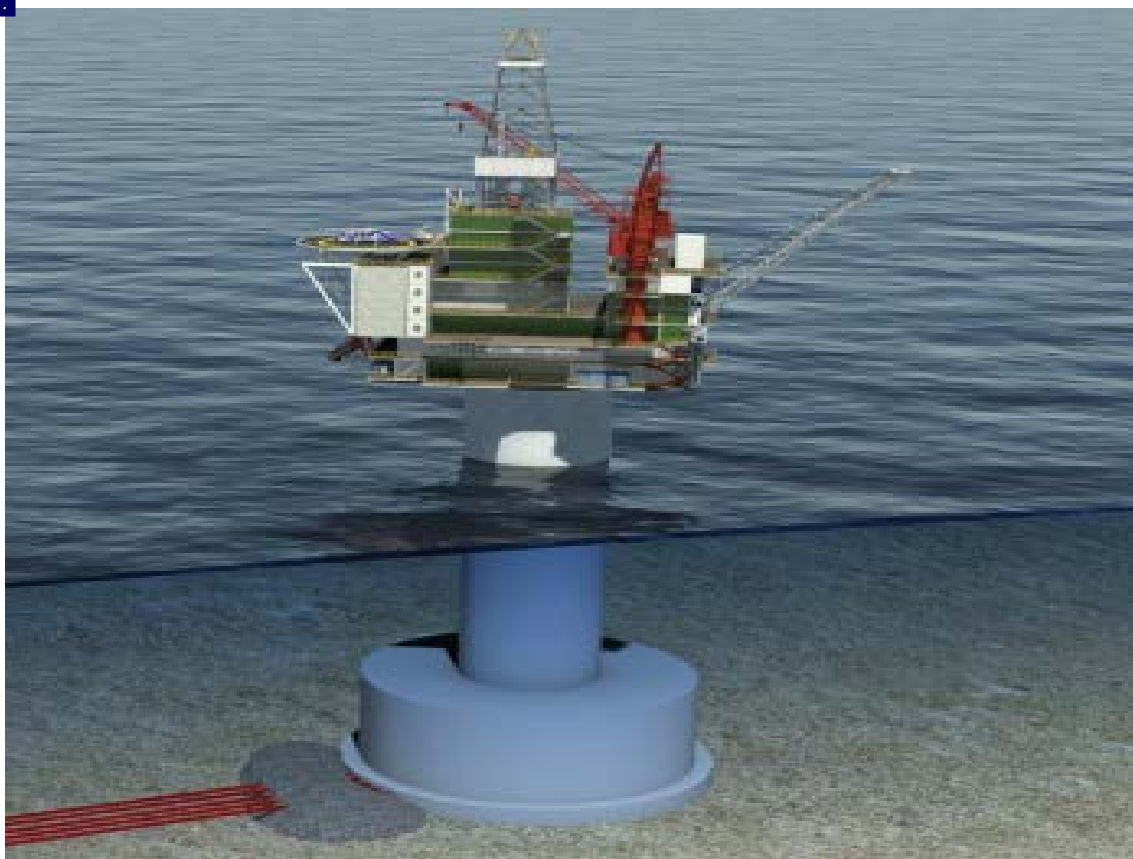


Figure 3-1 Typical Wellhead Platform

This Registration is focused on the construction of the WHP and its tow-out to the White Rose field. A full description of the WREP can be obtained on the Canada Newfoundland and Labrador Petroleum Board (C-NLOPB) website (<http://www.cnlopb.nl.ca/pdfs/whiterose/projdesc.pdf>).

The WHP will consist of a concrete gravity structure (CGS) with a topsides consisting of drilling facilities, wellheads and support services such as accommodations for 120 to 130 persons, utilities, flare boom and a helideck. The topsides will be constructed at an

existing fabrication facility and is therefore not considered part of this Registration. The primary function of the WHP is drilling. There will be no oil storage in the CGS. The productive life of the WHP facility is currently planned to be 25 years.

The CGS will be constructed in the dry, meaning all concrete construction will be completed in a purpose-built de-watered graving dock. Upon completion of the CGS, the CGS structure will be floated to one of two potential deep-water sites in Placentia Bay, where it will be mated with the topsides structure. The WHP will then be towed to and installed in the western portion of the White Rose field and tied back to the *SeaRose FPSO*.

3.2 Purpose/Rationale/Need for the Undertaking

Husky intends to develop the WREP to access known reserves within the White Rose field, using existing infrastructure as much as possible. Husky and its co-venturers are evaluating options for development of the WREP resources, including subsea tiebacks (e.g., drill centres), a WHP, or a combination of both. All development options will be tied back to the existing *SeaRose FPSO*. The WREP is an amendment to the White Rose Oilfield Development Application, approved in 2001.

If the WREP is developed using a WHP, it will include engineering, procurement, construction, fabrication, installation, commissioning, development drilling, operations and maintenance and decommissioning activities.

3.3 Other Environmental Assessment Processes

A Project Description for the WREP was submitted to the C-NLOPB on May 28, 2012. A draft Scoping Document was issued by the C-NLOPB on June 7, 2012 (<http://www.cnlopb.nl.ca/pdfs/whiterose/drscopdoc.pdf>). The draft Scoping Document declared that the WREP was subject to a screening-level assessment under the *Canadian Environmental Assessment Act* (CEAA) (Reference number 68249).

On July 6, 2012, the Government of Canada released new regulations required to implement CEAA 2012 (CEA Agency 2012). Screening-type assessments of projects not designated are no longer required when CEAA 2012 comes into force. However, the WREP was designated a transitional screening project, which is to be assessed under the old CEAA.

The White Rose project underwent an environmental assessment in 2000 pursuant to CEAA as a Comprehensive Study. In 2007, a further environmental assessment was undertaken on activities associated with construction of up to five additional subsea drill centres and associated flowlines under the *Husky White Rose Development Project: New Drill Centre Construction and Operations Program Environmental Assessment Addendum*. These previous environmental assessments encompass the location, construction and operation of the proposed subsea drill centres within the WREP. The proposed offshore infrastructure will be connected to existing infrastructure within the previous environmental assessment study area and no portion of the proposed offshore infrastructure will be located outside the boundaries of that area.

In addition, the WREP will undergo review by the C-NLOPB when Husky submits a Development Application. The Development Application will include a Canada-Newfoundland and Labrador Benefits Plan Amendment, Development Plan Amendment, Concept Safety Analysis and Socio-economic Impact Statement (SEIS), for all aspects of the WREP, on land and offshore. The environmental assessment currently being prepared for the CEAA process will meet the requirements of an Environmental Impact Statement, a further requirement of the Development Application.

3.4 Stakeholder Consultation

Husky recognizes the importance of public consultation and developed a consultation plan to engage stakeholders in its environmental and socio-economic assessments of the WREP. Husky has met and will continue to meet with various stakeholders to provide information on the WREP and solicit feedback from stakeholders.

Husky has provided an overview presentation on the WREP to several government agencies including:

- Environment Canada
- Fisheries and Oceans Canada (DFO)
- Transport Canada
- Provincial Department of Environment and Conservation
 - Environmental Assessment Division
 - Pollution Prevention Division
 - Water Resources Management Division
- Service NL
- C-NLOPB
- Town of Placentia.

Each of these agencies have had input into the content of the Project Description, Environmental Assessment and/or Registration document. Further consultation meetings are scheduled for the summer of 2012.

Husky and its consultants have engaged government scientists to ensure an ongoing exchange of information that could be useful in the preparation of the environmental assessment (and SEIS). Husky has met with One Ocean, the Food, Fish and Allied Workers and individual local fishers to exchange information that can assist in the preparation of the environmental assessment. Husky also met with relevant community representatives and social groups to share knowledge and assist in the preparation of the SEIS.

Husky conducted three open houses in Placentia, Marystown and St. John's in June 2012. The open houses provided an opportunity for Husky to present information on key components of the WREP and for stakeholders to discuss the WREP directly with Husky. The open houses were accessible to any interested member of the public and were advertised in local newspapers and on local radio to encourage maximum participation. Husky also met with local community leaders to discuss their interests and concerns in regard to the WREP.

In general, some issues surrounding the WREP that were identified as important by attendees at all open house sessions included:

- Maximizing benefits to local industry and to the Province
- Making sure that local businesses are aware of procurement opportunities
- Maximizing employment of a local workforce
- Diversity of the WREP workforce
- Minimizing effects on the environment, particularly on fish and Placentia Bay
- Keeping residents of affected communities informed about WREP progress.

Many open house attendees stated that they believe that Husky is taking all of the necessary steps to minimize negative effects of the WREP. Suggestions for ways that Husky can address public concerns regarding the proposed development of the WREP included:

- Careful research, planning and implementation of the WREP to minimize negative effects
- Keep the public informed and communicate employment and business opportunities
- Providing WREP information online and keeping this information updated
- Working with educational institutions (College of the North Atlantic, Marine Institute) to prepare students for WREP employment
- Communicating with local vendors regarding business opportunities.

4.0 Description of the Undertaking

4.1 Geographical Location

The WHP development option will require the dry-build construction of a CGS in a purpose-built graving dock. A thorough review of potential onshore CGS construction sites on the island of Newfoundland was undertaken and Argentia was identified as the most suitable location for the construction of the CGS. Argentia is located along the western coast of the Avalon Peninsula of Newfoundland and Labrador. It is located approximately 130 km west of the City of St. John's and 150 km south of the Town of Clarenville. Access to the property is via Provincial Highway Route 100. Argentia Harbour borders the south-eastern edge of the site (Figure 4-1).

The site selection process considered geophysical (e.g., topography, bathymetry), biophysical (e.g., marine climate, ice), geotechnical (e.g., excavation, bearing capacity), environmental (e.g., green field, contamination) and existing infrastructure (e.g., roads, power) criteria, among others. Sites were eliminated based on these criteria limiting potential economic feasibility.

The CGS construction site is on lands administered by the Argentia Management Authority (AMA), but is also within the municipal boundary of the Town of Placentia. In 1999, the AMA completed the land transfer agreement with Public Works and government Service Canada (PWGSC) for transfer of ownership of the southside and backlands area of the former US Naval Facility to the AMA. All remaining Government of Canada property from the former naval facility was transferred to the AMA from PWGSC in 2002, specifically ownership of the north side of Argentia, the port facility and the Government of Canada portion of the Northeast Arm recreation camp. PWGSC remained responsible for the remediation of all US Navy contamination in Argentia under the Argentia Environmental Remediation Project (AMA undated).

The AMA is also the parent organization for a property management and service division, Argentia Property Services Inc., and a port ownership and management division, Argentia Port Corporation Inc. These divisions manage and maintain Argentia's infrastructure. Husky has contractual arrangements in place with the AMA for the construction of the graving dock site should the WHP development option be selected. Husky, in its lease agreement option with the AMA, has assumed environmental responsibility for its lease area.

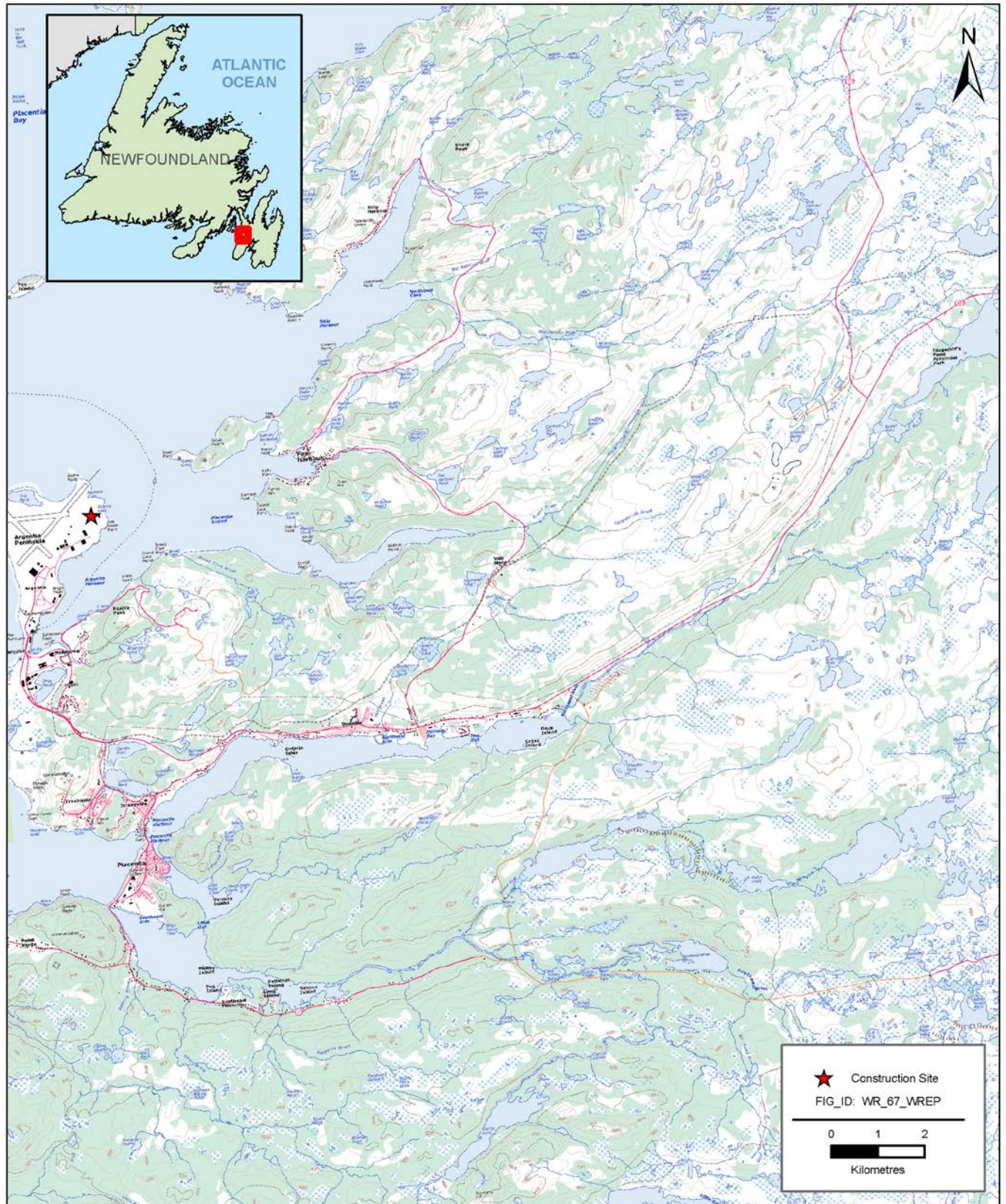


Figure 4-1 Argenta, Avalon Peninsula, Newfoundland and Labrador

Two potential CGS construction locations at Argentia were selected for further geotechnical and environmental evaluation. The initial stage of the detailed investigation (Stantec 2011) involved a desktop review of available data for both sites at Argentia. The detailed investigation included a review of previous geotechnical and environmental investigations, identification of data gaps in the current knowledge of subsurface conditions, and recommendations for additional field investigation to further characterize the geotechnical and environmental conditions at the two proposed sites. Over 60 historical reports, documents, and drawings exist for the Argentia area that vary from subsurface investigations conducted by the US Department of the Navy in the 1950s to recent (2011) environmental site remediation reports.

Husky initiated an extensive environmental and geotechnical investigation of the two sites at Argentia. Based on an analysis of the site-specific data from the two sites in Argentia, the CGS construction site is proposed at the northeast portion of the Northside Peninsula, bordering Argentia Harbour (Figure 4-2; yellow box in Figure 4-3; and Figure 4-4). The details provided below are specific to the proposed activities at Site A. Site B was located on the southeast side of Argentia Harbour and presented geotechnical challenges in terms of site excavation and environmental risk associated with dredging marine sediments.

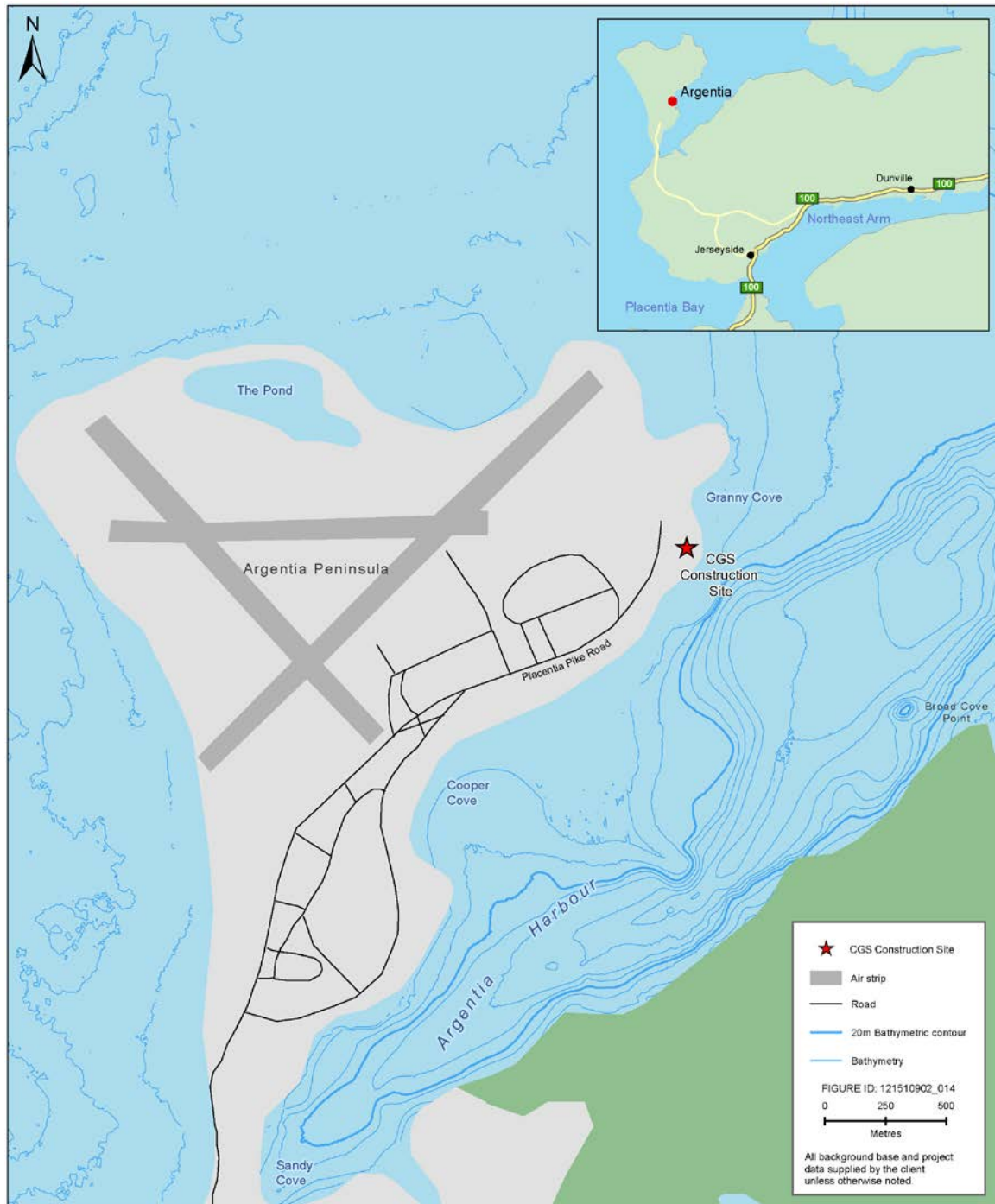


Figure 4-2 Road Access to the Graving Dock Location on the Northside, Argentina



Source: Google Earth 2012

Figure 4-3 Potential Graving Dock Construction Site on the Argentia Peninsula



Figure 4-4 Aerial Photo of Potential Graving Dock Construction Site

4.2 Physical Features

The overall construction site area will be approximately 15 hectares. Land clearing or watercourse diversion will not be required for the CGS graving dock construction. General excavating and grading activities will be required.

4.2.1 Road Construction, Upgrades and Parking

The graving dock site will maximize the use of existing access roads. The road system that currently exists is within 500 m of the graving dock site. Such infrastructure will be extended into the site in a manner compatible with the final site layout. Any required repairs and construction will also be made to the existing roads to prepare them for industrial use.

4.2.2 Water Supply

The graving dock site will maximize the use of the existing water supply. An existing source of potable, fire, and industrial water is located near the construction site. If necessary, additional water supply infrastructure will be extended into the area in a manner compatible with the final site layout. There is no intention to use groundwater from the site. Sewage will be treated on-site prior to ocean disposal.

4.2.3 Power Supply

The graving dock site will maximize the use of the existing grid power. Although grid power will be the primary source of electricity, there will be an emergency generator on site with a capacity of approximately 750 kilowatts. This will be used in the case of a grid black-out to provide on-site power for services such as the concrete batching plant and emergency lighting around the site.

The graving dock site location is within 500 m of existing overhead power lines. These lines will be extended into the site and then fed to a site distribution system. The same will be done for telephone lines.

4.2.4 Building Construction

Potential support facilities will include a concrete batching plant, offices, a mess hall, a medical clinic, temporary sheds, lay down areas and storage areas. The construction site will be fully fenced with a security-controlled entrance. All buildings will be temporary and set on concrete sleepers or trailers above ground. Facilities will be placed and constructed on environmentally and geotechnically suitable locations with soils, groundwater and air quality tested as required. An estimated 4 to 6 m of excavated material will be spread over the existing grade of the site. Appropriate soil and air quality sampling will be conducted prior to building construction to ensure no unacceptable risk to workers.

At this time, Husky does not anticipate the need for a labour camp.

4.2.5 Graving Dock

4.2.5.1 Excavation

The proposed graving dock will be excavated behind the natural coastal shoreline to a depth of approximately 20 m below sea level. Appropriate retaining walls around the graving dock and bund will be constructed using rock berm with an impervious core, steel sheet pile wall, or a combination of both. The use of sloped or reinforced sides will depend on the specific site requirements. In the event sheet piles are installed along the inside of the berm, they will be removed during the flooding of the graving dock prior to the float out of the CGS. The graving dock area will be less than 5 hectares flooded area when the bund is removed.

The floor area of the dock at the toe of the bund will be approximately 140 m x 140 m, with a total volume of up to 1,000,000 m³, depending on final slope design (Figure 4-5). The graving dock will be excavated using traditional earth-moving equipment. Where bedrock is encountered that cannot be removed using earth-moving equipment, blasting may be required.

The excavated material will be used around the site and within the Argentia Peninsula as approved by the AMA and relevant regulatory authorities. Material suitable for shoreline protection, for example, may be used along the Argentia Peninsula to mitigate shoreline erosion. The opportunity also exists to use suitable surplus materials in other industrial locations on the Argentia Peninsula for infilling and levelling. The Pond is also being investigated for disposal of excess excavation material. An appropriate material testing program will be developed in conjunction with regulatory authorities to ensure all material is handled and used or disposed of in an environmentally responsible and safe manner. Details on The Pond can be found in Section 5.3.1.

Environmental samples of soil and groundwater from the construction site indicate little risk to the environment or human health as a result of planned activities (see Section 4.2.5.2). However, confirmatory soil sampling will be conducted during the FEED stage of engineering and during excavation of the graving dock. A soil sampling plan will be developed and submitted to the DOEC as part of an environmental protection plan. If contamination is detected above applicable guidelines, the material will be moved to a quarantined area and treated, as necessary. Excavation and aeration was considered the preferred remediation method for the Northside fuel storage area (NFSA). In fact, the act of excavation, transport and stockpiling of soil essentially resulted in the reduction of contaminant levels to meet the objectives of the remediation (Dillon 2011).

During the design of the graving dock and its associated construction site, consideration will be given to designing the facility as a permanent graving dock, which could be used for the construction of future CGSs or for other industrial applications. Design of the graving dock for future use could include provision for a gated system allowing the graving dock to be flooded and drained as required.

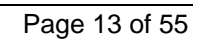


Figure 4-5 Conceptual Site Layout for Graving Dock

4.2.5.2 History of Environmental Sampling and Remediation near Site A

The Environmental Site Assessment (ESA) process to establish general environmental conditions on the former United States Naval Argentia property began in 1993 and included combined Phase I/II Assessments. As a follow-up, in 1995 Public Works and Government Services Canada (PWGSC), commissioned a property-wide Phase III/IV Assessment to further characterize the nature and extent of contaminants identified as part of the Phase I/II ESAs. This work included historical reviews; extensive soil and groundwater testing; determination of human health and/or ecological risk; and, the development of remedial action plans to address identified issues of concern. Additional ESAs were completed under the direction of PWGSC to further assess environmental contamination identified in various areas of the United States Naval property. In addition, in 1996/1997 PWGSC initiated a 10-year, \$106 million environmental remediation program on the property including demolition and removal of large underground fuel storage tanks with associated pipelines, free product recovery, excavation and disposal/treatment of contaminated soil, installation of a Multi-Phase Vapour Extraction system, containment and stabilization of a large coastal landfill, removal of pond debris, in-situ capping of contaminated pond sediments, construction of on-site hazardous waste containment facility, infrastructure upgrades, removal/disposal of hazardous wastes including unexploded ordinance, systematic dismantling/removal of large buildings, and excavation/mining of a former landfill site referred to locally as the Million Dollar Hole.

A focal point of the remediation effort was directed at the former bulk fuel farm area (NFSA) in the northeast area of the Peninsula, near the proposed graving dock construction site. There were twenty-four aviation fuel tanks and some associated infrastructure removed in the early 1990's and remaining infrastructure was removed as part of demolition and remediation activities from 2005 to 2007 under the direction of PWGSC. As part of the site-wide 1993/94 and 1995 ESAs, 64 test pits, 62 monitor wells, and 15 boreholes with related soil and groundwater sampling were completed at the NFSA site, with the primary emphasis on petroleum hydrocarbon contamination. The majority of these test locations was located within or in the immediate vicinity of the former tank farm, and adjacent to the boundary of the proposed CGS graving dock construction site.

Another 22 monitor wells were installed between 2000 and 2003 in an effort to further delineate the extent of petroleum hydrocarbon impacts. Full-scale remediation, applying excavation/aeration (land farming) techniques was initiated in 2005 and completed in 2007, with the primary objective to remove/capture free product and remove vapours through volatilization. Various contaminant sources, including leaking tanks and pipelines were removed and approximately 175,000 m³ of impacted soil was treated to reduce petroleum hydrocarbon levels to below the risk based remedial objectives established for the site (i.e., 2,800 mg/kg in soil and 11 mg/L in groundwater for total petroleum hydrocarbons, and 4.4 mg/kg in soil and 6.9 mg/L in groundwater for benzene). On-going post-remediation monitoring, involving free product measurement and petroleum hydrocarbon groundwater sampling in several sentry monitor and recovery wells in the remediated area, has not identified any issues of concern.

A total of 373 water samples were tested for TPH/BTEX analysis (242 in 2005 and 131 in 2006). Analytical data were compared to the risk based TPH and benzene remedial objectives concentrations (11 and 6.9 mg/L respectively). Based on the general absence of petroleum hydrocarbons, treatment of the water was deemed to be unnecessary. As indicated, with the exception of a single sample on the south side of the excavation, there were no exceedances to the ROs for either benzene or TPH, and similar to soils, benzene was rarely observed above laboratory detection limit. Based on the general absence of petroleum hydrocarbons, treatment of the water was deemed to be unnecessary. The 2011 Dillon NFSA Closure Report indicates that all contaminant sources (i.e., leaking tanks and pipeline) have been removed and petroleum hydrocarbon impacted soil has been remediated to below site specific remedial objectives near the footprint of Site A. However, an additional subsurface investigation was recommended to verify results and confirm prescribed human health and ecological risk based remedial objectives and existing concentrations of petroleum hydrocarbons in soil and groundwater within the site area are acceptable for the proposed site development. Areas of impacted soil above the remedial objectives remain in the vicinity of former tank T539 (and possibly under former T125), located immediately adjacent to the northwest boundary of the site. The Closure Report indicates that based on the depth of impacts, the relatively low hydraulic gradient and the distance from any receptor (i.e., Argentia Harbour), it is unlikely that remaining contamination in these areas will cause adverse environmental affect. Husky's own environmental sampling at Site A has confirmed the conclusions of the Closure Report.

NFSA soil has not been influenced by the thermal remediation project at Argentia (K. Knight, PWGSC, pers. comm.). Soil from the NFSA was not thermally treated, only land-farmed. Polychlorinated biphenyls (PCBs) were never an issue at the NFSA (which have been confirmed by recent sampling) and dioxins and furans are therefore not expected.

4.2.5.3 Husky's Environmental Sampling at Site A

Husky and its consultants have reviewed the history of the environmental sampling and remediation near Site A and have completed a recent investigation of groundwater and soils testing to confirm the suitability of the site for the purpose of graving dock construction.

A Stage 2 geotechnical and environmental investigation of soil and groundwater was completed on Site A (Stantec 2012a). The program consisted of drilling five boreholes to depths varying from 24.4 m to 28.9 m below the ground surface (mbgs) (Figure 4-6). Upon completion, monitoring wells were installed in the boreholes, except BH-A3, for water level monitoring.

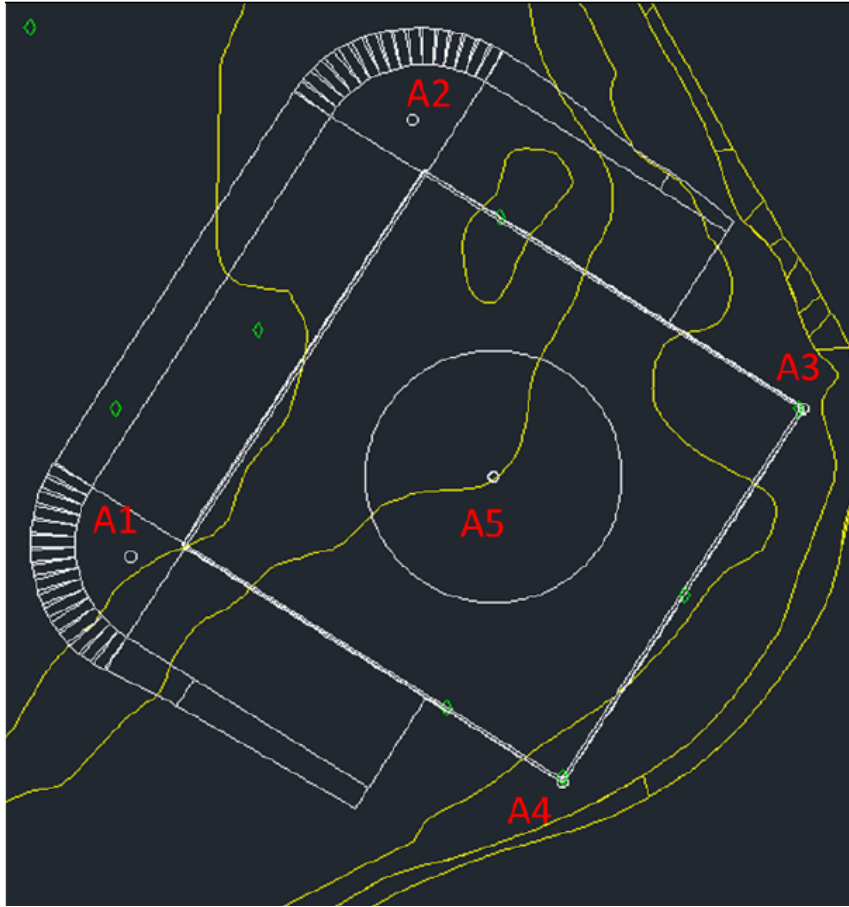


Figure 4-6 Borehole Location Plan-Site A

Fill materials were encountered at or near the surface at all test pit and monitor well locations and ranged in thickness from 1.0 to 4.0 m. Fill material generally comprised loose to dense brown sand and gravel with varying percentages of silt, cobbles and boulders. Also roots and wood debris were encountered at various depths in the test pits. Beneath the fill material, a till layer consisting of a brown to grey brown silty sand and gravel with cobbles and boulders was encountered to the termination of the depths of the test pits. Bedrock was not encountered in any of the boreholes.

Groundwater seepage was observed in the test pits excavated on the site ranging from approximately 5.5 to 6.0 mbgs. Test pits are not normally left open long enough for groundwater levels to stabilize in the excavations, therefore groundwater level estimates at these locations have to be considered with caution.

The full geotechnical and environmental investigation report is available as Appendix A.

From the borehole samples, a laboratory analysis schedule for Site A is presented in Table 4-1. A complete set of chemistry data is provided in Appendix B.

Table 4-1 Laboratory Analysis Schedule (Site A)

Potential Environment Concern	Sample Matrix	
	Soil	Groundwater
Potential for petroleum hydrocarbon impacts related to historic site usage	TPH/BTEX (7)	TPH/BTEX (4)
Potential for 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)
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 (3)

With the exception of the concentration of total petroleum hydrocarbons (TPH) in one soil sample and the concentration of copper detected in one soil sample, the other parameters analyzed in soil at the site were either not detected or were detected at concentrations below applicable commercial site guidelines.

A concentration of TPH (gasoline range/fuel oil fraction) of 4,200 mg/kg was identified in a soil sample collected from BH-A5 at a depth of 6.0 to 6.7 m mbgs. This concentration of TPH in soil exceeds the Atlantic Partnership in RBCA Implementation (PIRI) Tier I guideline of 450 mg/kg for gasoline impacts in soil on a commercial site. In addition, 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 licensed soil treatment facility, or treatment on site prior to use (PWGSC used soil farming and biopile techniques to treat soils from the areas during remediation of the NFSA area).

The concentration of copper in soil from BH-A1 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 the soil sample exceeded the applicable Newfoundland and Labrador Department of Environment and Conservation Pollution Prevention Division for Leachable Toxic Waste, Testing and Disposal criteria of 100 µg/L, returning a concentration of 2,200 µg/L. These leachate results indicate that any surplus material removed from the location of BH-A1 may not be suitable for disposal at a municipal landfill and would require disposal at a licensed soil treatment facility, or treatment on site prior to use.

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 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 (0.03 mg/kg), 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.

With the exception of the concentration of dissolved chloride and ammonia 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 Ministry of the Environment guideline of 2,300 mg/L, returning a concentration of 3,400 mg/L. 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 coastal location of the borehole. The saline condition of the groundwater present in BH-A4 is also reflected in relatively high detected levels of conductivity and total dissolved solids. Ammonia (nitrogen) concentration of 2.5 mg/l was returned from BH-A4 against a Provincial water and sewage discharge guideline of 2.0 mg/l.

If the more stringent residential guidelines were deemed to be applicable to the work site, chromium and benzene were found to exceed the residential guideline at one location and TPH would exceed the residential guideline (39 mg/kg) in four of the seven samples (see Appendix B).

Based on the results of the Stage 2 investigation, a Phase II ESA was completed at the proposed CGS Construction Site A (Stantec 2012b). The Phase II ESA involved the excavation of test pits with associated soil sampling and analysis for petroleum hydrocarbon and was completed to further delineate the extent of petroleum hydrocarbon impacted soil identified in BH-A5. The locations of these test pits with respect to the recent Stage 2 boreholes and historical sampling and area of remediation are shown in Figure 4-7. Test pits were dug to the depth of groundwater seepage, which corresponded to the depth of contamination at BH-A5.

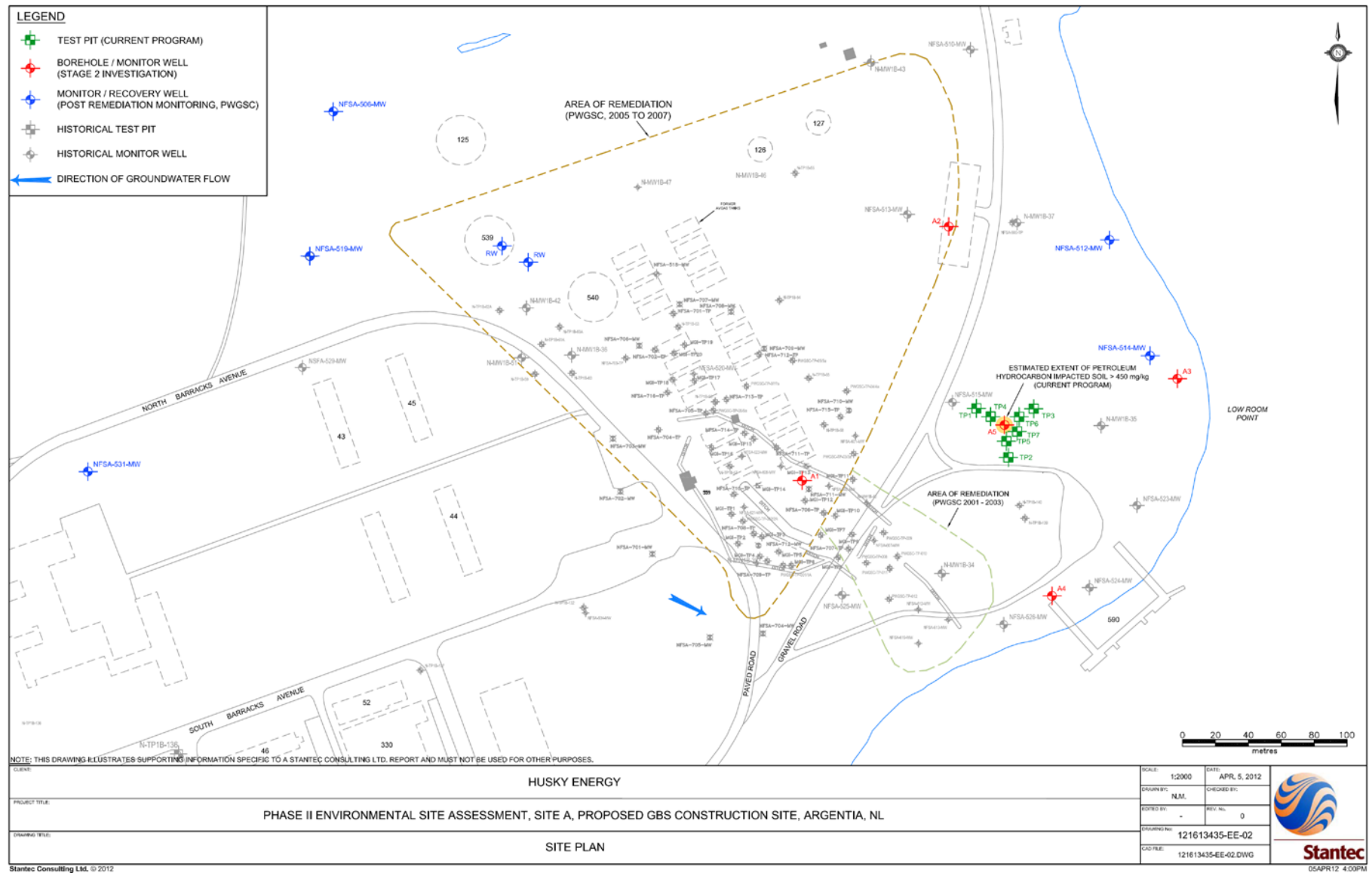


Figure 4-7 Environmental Site Assessment Site Plan

The nearest historic monitoring well to BH-A5 is NFSA-515-MW, which is approximately 25 to 30 m north of BH-A5. Soil and groundwater analysis completed at the time of installation of this monitoring well by the Argentia Remediation Group (ARG) in 1995 indicated no detectable concentrations of petroleum hydrocarbons. Similarly, no detectable concentrations of petroleum hydrocarbons were detected at monitor wells NFSA-514-MW and N-MW1B-35, located approximately 50 and 100 m east and down gradient of BH-A5, respectively. No analytical data has been found for test pits N-TP1B-139 and 140 located approximately 30 m to the south of BH-A5, but no field evidence of impacts were noted in the logs for these test pits. Based on historical data, impacts identified in BH-A5 appear limited in extent. The NFSA remediation was completed from 2005 to 2007, so soil conditions would have improved since the historical data were collected.

Husky intends on conducting further environmental and geotechnical sampling at the graving dock during the FEED stage of the WREP.

The conclusions of this Phase II ESA (Stantec 2012b) are summarized as follows:

- The stratigraphy observed on the site was generally similar at all test pits and comprised loose to dense brown sand and gravel with varying percentages of silt, cobbles and boulders fill. Also roots and wood debris were encountered at various depths in the test pits. Beneath the fill material, a till layer consisting of a brown to grey brown silty sand and gravel with cobbles and boulders was encountered to the termination of the depths of the test pits. No bedrock was encountered in any of the test pits excavated on the site.
- Groundwater was encountered at depths ranging from 5.5 to 6.0 mbgs in the test pits completed at this site. Based on site topography and site observations, the direction of regional groundwater flow at the site is inferred to be east towards Argentia Harbour.
- No free liquid phase petroleum hydrocarbons were observed at the site during the current investigation or the previous Phase II ESA.
- Concentrations of TPH were detected in three of the soil samples, with concentrations ranging from 26 mg/kg in soil sample TP7 BS6 to 330 mg/kg in soil sample TP3 BS6. However, the detected concentrations of TPH in the soil samples were below the applicable Atlantic PIRI Tier I guideline of 450 mg/kg for gasoline impacts in soil on a commercial site. Benzene, toluene, ethylbenzene and xylene (BTEX) parameters were not detected in any of the seven soil samples analyzed.
- The estimated area with TPH concentrations in soil above 450 mg/kg in this area is approximately 45 m². Based on field evidence of impacts and soil laboratory it is expected that approximately 45 m³ of impacted soil in the vicinity of BH-A5 exceeds the Atlantic PIRI Tier I guideline of 450 mg/kg for gasoline impacts in soil on a commercial site. This volume of impacted material 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 licensed soil treatment facility, or treatment on site.

The complete Environmental Site Assessment Report (Stantec 2012b) is attached as Appendix C.

4.2.5.4 Site Dewatering and Disposal

The final design of the graving dock will dictate the method and degree of drainage required to maintain a dry facility during the construction of the CGS.

To estimate the degree of dewatering that maybe required from the excavation of Site A, 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 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.). Results of the hydraulic conductivity testing are presented in Table 4-2.

Table 4-2 Estimates of Hydraulic Conductivity

BH	Hydraulic Conductivity (m/s)		
	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

Mean hydraulic conductivity values for the four monitor wells ranging from 5.9×10^{-8} m/s for BH-A4 to 3.0×10^{-7} m/s for BH-A1. For purposes of estimating groundwater seepage into the proposed dry dock excavation, an average K value of 2.2×10^{-7} m/s is used on the bail down test data. 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.

Further work is being conducted to evaluate the expected volume of groundwater flow into the graving dock, once excavated. The expected zone of influence is approximately 20 hectares. There are no known users of groundwater on the Argentia Peninsula. Appropriate retaining structures and pumps will be designed to minimize the water infiltration and to remove the excess water. Water removed from the graving dock will be pumped to a lined 2,700 m² settling pond, where it will be aerated and tested against applicable regulations prior to ocean disposal. This settling pond will also be used to contain and test runoff from the site prior to ocean disposal, once the graving dock construction is complete. Water will be treated as required prior to discharge to ensure compliance with provincial and federal requirements.

Contaminated groundwater is not expected to be drawn from adjacent land during the graving dock excavation. Adjacent land has been remediated and during the remediation, groundwater testing indicated the general absence of free phase separated product (Dillon 2011). Groundwater monitoring from 8 monitoring wells around the perimeter of NFSA (see Figure 4-7) in August 2011 revealed petroleum hydrocarbons in five wells ranging from 0.04mg/L to 1.3 mg/L. The impacts are sporadic occurrences and reflective of residual non-point source impacts (K. Knight, PWGSC, pers. comm.).

4.2.6 The Pond

Material excavated from the graving dock is intended to be used as much as possible around the Northside of the Argentia Peninsula for purposes of infilling and shoreline protection. The actual proportion of material suitable for use on the Peninsula cannot be known until excavation begins and the material is tested. However, before the material is used on site, it will be tested for environmental and geotechnical suitability. Material that is either not suitable or not needed on site, is intended to be disposed of in The Pond, provided it meets established criteria and the activity is in compliance with the Provincial Policy for Infilling Bodies of Water, should it be applicable. The Pond is not within 15 meters of the high water mark of Placentia Bay (highest line of beached kelp). Nonetheless, Husky is committed to testing and treating material as required to ensure proper disposal of excavated and dredged material.

If it is assumed that all the material to be excavated from the graving dock (1,000,000 m³) is unsuitable for use elsewhere on the Argentia Peninsula and all the material to be dredged (165,000 m³; Section 4.3.3.1) is disposed of in The Pond, the material volume would exceed the water volume presently in The Pond, but the material volume would not exceed the volume of the natural topography of The Pond. A recent survey by C-Core has estimated a volume within the crater of The Pond is approximately 1,242,000 m³. If all the material currently estimated to be excavated and dredged was disposed of in The Pond, it would result in complete infilling of The Pond.

An assessment of disposal options for the excavated and dredged material is provided in Section 4.2.7. Sections below provide an overview of the historical and more recent assessment of water and sediment chemistry in The Pond. A biophysical description of The Pond is provided in Section 5.3.1.

4.2.6.1 History of the Environmental Sampling and Remediation Studies at The Pond

The Argentia Remediation Group (ARG) studied the contaminant levels in The Pond and identified TPH and PAH contamination likely resulting from subsurface transport and runway runoff and metals contamination possibly from air emissions. Water samples also showed signs of copper and nickel contamination from sediment and subsurface transport (ARG 1995).

As a follow-up, the Argentia Remediation Group conducted an ecological risk assessment (ERA). The ERA concluded that terrestrial and avian species are not expected to be at risk from The Pond, but there was potential for sub-lethal effects on fish and other aquatic biota from PAHs (ARG 1998).

As part of the ERA, The Pond was assessed to determine whether remedial action was warranted to reduce exposure (ARG 1998). In the assessment of whether remediation

was warranted, remedial action objectives (RMOs) were set. RMOs are the levels above which, sediments would be considered for remediation. The RMOs for each contaminant assessed and the corresponding sediment chemistry results from The Pond are summarized in Table 4-3. One sample from The Pond exceeded the total PAH RMO of 11.4 mg/kg at a concentration of 18.9 ppm. Based on this review, it was determined that additional remediation was not required.

Table 4-3 Remedial Action Objective for The Pond

Parameter	RMO (ppm)	Concentration (ppm)
Lead	187	<1 to 71
TPH	1,900	<30.2 to 1,600
Total PAH	11.4	0 to 18.9
PCB	1.7	<0.05 to 1.7
Source: ARG 1998		

4.2.6.2 Husky's Environmental Sampling at The Pond

Recognizing the history of The Pond, Husky completed a recent investigation of water and sediment contamination in The Pond. The locations for eight sediment and water stations were randomly selected throughout The Pond and all samples were tested for available metals, PAHs, PCBs, TPH and BTEX. A complete data set is provided as Appendix D.

The PAH fluoranthene was found to exceed the CCME marine probable effect level (PEL) (1.494 mg/kg) at 1 sediment station reporting a concentration of 2.6 mg/kg. As well, pyrene was reported at 1.8 mg/kg from the sediments at the same station, which exceeds the CCME PEL of 1.398 mg/kg. Marine PELs are used for comparison following the Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2007), however freshwater guidelines are also provided for comparison in Appendix D.

Total PCBs were reported from 4 of the 8 sediment samples ranging from 0.25 to 0.38 mg/kg, which exceeds the CCME PEL of 0.189 mg/kg.

The CCME PEL guideline for copper (108 mg/kg) was exceeded in the sediment of one station, reporting a concentration of 130 mg/kg.

Analysis of pond sediment samples for TPH revealed the presence of lube oil range hydrocarbons ($>C_{21}$ - $<C_{32}$) at all eight stations, ranging from 170 to 500 mg/kg. One station reported fuel oil range hydrocarbons at 130 mg/kg ($>C_{10}$ - C_{16}) and 54 mg/kg ($>C_{16}$ - C_{21}). BTEX compounds were not detected in any of the sediment samples. None of the TPH results exceed the Atlantic RBCA guidelines for commercial sites or the CCME soil quality guidelines.

Eight water samples were also taken at random locations throughout The Pond and all were tested for available metals, PAHs, PCBs, TPH and BTEX.

BTEX, TPH and PCBs were not detected in any of the eight water samples.

Only one PAH was reported and it was phenanthrene at the reportable detection limit of 0.01 µg/L. Of the metals with guidelines, only mercury exceeded the CCME PEL guideline of 0.016 µg/L at two stations with concentrations of 1.2 and 0.14 µg/L. Eight additional samples were collected approximately two months after the initial eight and mercury was not detectable in either sample.

The Pond water chemistry results were compared to the maximum content in Schedule A of the Newfoundland and Labrador *Environmental Control Water and Sewage Regulations* (2003); however, none of the parameters exceeded the guidelines of these regulations (see Appendix D).

4.2.7 Material Disposal Options

Husky has evaluated the options for disposal of the soil and rock excavated from the graving dock and the tow-out corridor. Disposal at sea was evaluated and initially discussed with Environment Canada. An existing ocean disposal location could not be identified within Placentia Bay. Further consultations with DFO and Placentia Bay fish harvesters encouraged Husky to evaluate on-land disposal options. There was concern around the perception of disposal of material from the Argentia Peninsula in the marine environment, regardless of the actual environmental risk.

Husky has also heard concerns from other stakeholders about the on-land disposal options. Residents and authorities in the Placentia area have asked about the expected increase in traffic as a result of CGS construction at Argentia. Given the volume of material to be excavated from the graving dock (1,000,000 m³) and the capacity restrictions for highway-certified dump trucks (6 m³), approximately 1,000 trucks per day would be required to carry material from the Argentia Peninsula.

In an effort to minimize the environmental footprint and disturbance to all stakeholders as much as possible, Husky has committed to ensuring proper disposal and use of the excavated and dredged material within the Argentia Peninsula. Husky has assumed environmental responsibility for the material from the AMA, and will test and treat the material as required, for the designated use.

Disposed of material in The Pond can be considered disposal for beneficial use since it would essentially be capping the contaminated sediments in The Pond with cleaner sediments (see Section 4.3.2.1), thereby reducing the ecological risk. Capping of sediments in The Pond was one method of remediation considered during the ERA of The Pond (ARG 1998). Husky has presented the case for use of The Pond for disposal of excavated and dredged material to Environment Canada, DFO and local stakeholders. No objection has been raised to date.

4.3 Construction

4.3.1 Concrete Gravity Structure Construction

The CGS will be constructed in the dry, which means completing the concrete substructure in the graving dock, prior to towing to the deep-water site for topsides mating. The primary materials for the CGS are cement, sand, gravel and steel rebar for

the concrete, and structural steel and pipe for the shaft. The current estimate of the required volume of concrete is approximately 55,000 m³. Slip-forming and other standard CGS construction methods will be used for the caisson and central shaft construction after completion of the base slab (Figure 4-8). The CGS as currently designed, is less than 50 percent of the size of the Hibernia (165,000 m³ base, 37,000 tonne topsides) and Hebron (120,000 m³ base 40,000 tonne topsides) gravity base structures.

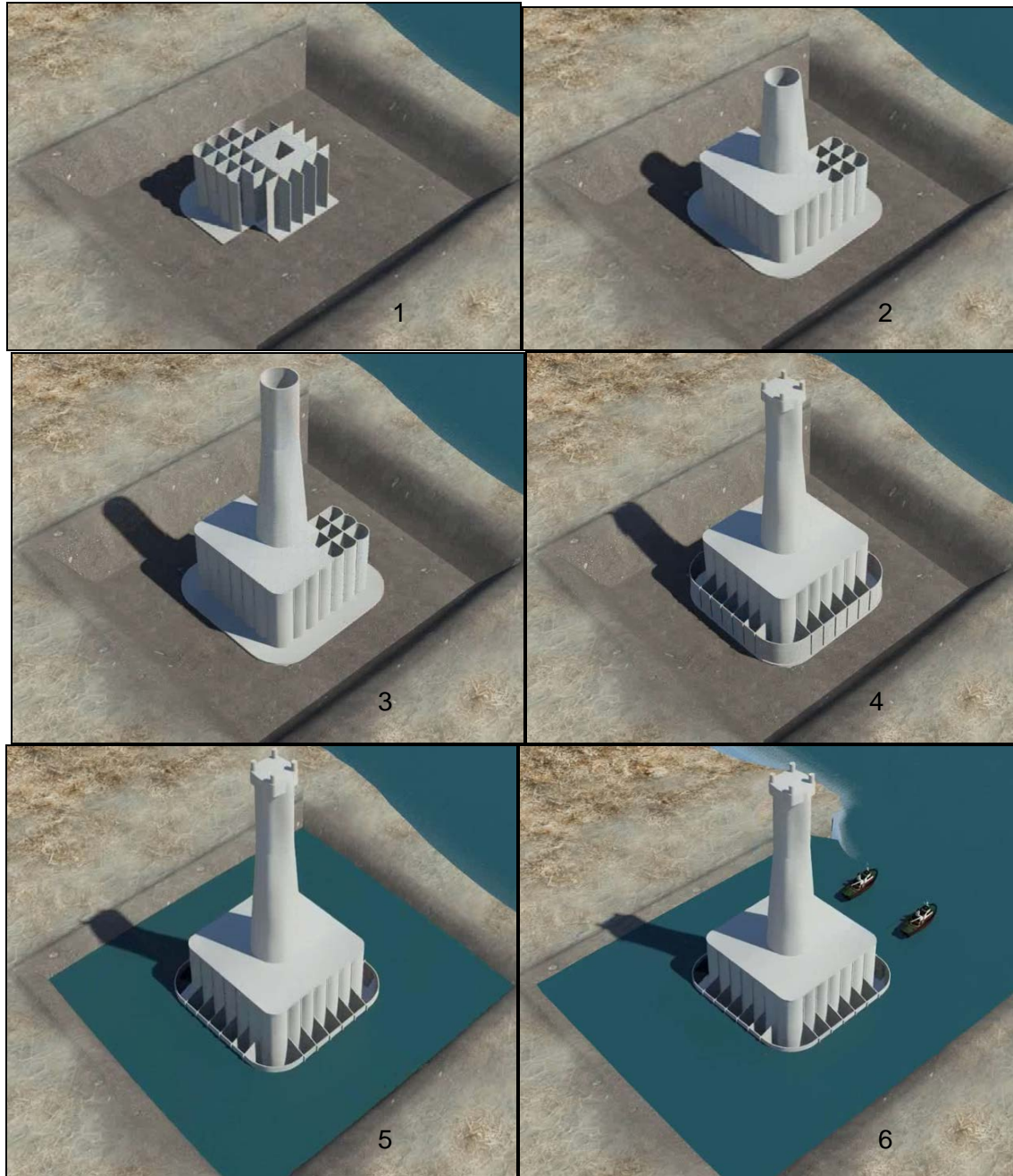


Figure 4-8 Construction of the Concrete Gravity Structure

A concrete batch plant will be used on site for concrete production. Washwater from the cleaning of cement mixers, trucks and concrete delivery systems will be directed to a closed system rinsing/settling basin. In the event that water from the closed settling system is to be released, it will be tested prior to release for parameters related to any concrete additives to be used in the production of concrete (e.g., total hydrocarbons, pH and total suspended solids). The water to be released will meet the limits specified in Schedule A of the *Environmental Control Water and Sewage Regulations*. Aggregate for the high-strength concrete will be obtained from an existing, permitted quarry in the Province with an existing capacity for the order. The current volume of aggregate required is estimated at 64,000 tonne. Over the estimated 20 to 24 months required to construct the CGS, aggregate could be delivered by road at a rate of 12 to 15 trucks per day, depending on the location of the aggregate source. Marine transportation of aggregate will also be considered, given a suitable loading site near the producing quarry.

The selection of the quarry will be subject to testing of the aggregate to ensure it is suitable for the high-strength concrete required for the CGS. Caisson and shaft supports will be cast into the concrete for future use when completing the mechanical fit-out of the CGS. Sourcing aggregate from the dredge spoils in the CGS tow-out channel is not a feasible option because the dredging is planned four to six months prior to the CGS tow-out to ensure the channel does not fill back in prior to tow-out. A reliable channel cannot be dredged during construction of the CGS, approximately two years prior to tow-out.

The mechanical fit-out of the CGS will consist of prefabricated components that will be installed at various phases of the base slab, caisson and shaft construction. The typical mechanical components are seawater ballast pipework, deep-water pump caissons, disposal caissons, risers, J-tubes and conductor guide frames.

4.3.2 Shoreline Dredging

4.3.2.1 Overview of Dredging Activities

Once the CGS is completed, the graving dock will initially be flooded to equalize the hydrostatic pressure, then a combination of land-based excavation equipment and a coastal dredger will be used to remove the shoreline berm, after which the CGS float-out will occur. The dredger will be used to create an exit channel from the graving dock to a water depth of approximately 18 to 20 m to accommodate the draft of the CGS. It is currently estimated that this excavation/dredging work will take between six and eight weeks to complete. During this period, the marine activities from the dredging operation will be closely coordinated with the Port of Argentia. From the geotechnical work completed to date, in-water blasting is not expected to be required near the shoreline of the graving dock.

Shoreline dredging activities can be executed with the use of a cutter suction dredge or a backhoe dredger. Earth-moving equipment will be required to lower the level of the shoreline to the minimum dredging depth of the cutter suction dredge. Once the soil is loosened by the cutter suction dredge, the soil will be sucked into the dredger and pumped through a floating pipeline from the stern of the barge to the shoreline where it will be connected to a land-based pipeline for discharge to The Pond on the tip of the Argentia Peninsula. If a backhoe dredger is used it will deposit the excavated material into a transportation barge alongside the dredger. The barge will transport the dredged

material to quayside for offloading and transportation to The Pond by earth moving equipment.

Dredged material being disposed of in The Pond can be considered disposal for beneficial use since it would essentially be capping the contaminated sediments in The Pond with cleaner sediments (see Section 4.3.3.2). Capping of sediments in The Pond was one method of remediation considered during the ERA of The Pond (ARG 1998).

DFO has been consulted about the dredging requirements for tow-out of the CGS. A final determination of the requirements for habitat compensation and monitoring is pending their review of Husky's *Argentia* fish habitat report, which has yet to be submitted to DFO. The pending changes to the *Fisheries Act* and new requirements for habitat compensation will also have to be considered.

4.3.2.2 Sediment Chemistry in the Nearshore Dredge Area

Samples from the four boreholes along the shoreline of the graving dock were too coarse to retain for chemical analysis. Several attempts with different recovery techniques were unsuccessful. The soils from seabed to -19 m were described as very loose gravel, some sand and trace silt.

Surficial sediment samples from 20 locations within the area planned to be dredged, at various water depths, were tested for available metals, PAHs, PCBs, TPH and BTEX.

BTEX (benzene, toluene, ethylbenzene and xylene) compounds were not detected in the marine sediment samples.

Total PAH levels were reportable in 13 of the 20 samples ranging in concentrations from 0.01 to 4.16 mg/kg. Three samples exceeded the marine sediment CCME PEL guideline of 0.544 mg/kg for phenanthrene, with concentrations of 0.55, 0.57 and 0.58 mg/kg. The commercial or industrial use soil quality CCME Guideline for phenanthrene is 50 mg/kg.

Hydrocarbons were not detected in the 10 shallow subtidal (1 to 2 m) sediment samples collected close to the shoreline. However, hydrocarbons were detected in all 10 samples from the deeper water (13 to 20 m) sediment samples, with TPH concentrations ranging from 93 to 460 mg/kg. All samples were below the Atlantic RBCA guidelines for commercial sites (7,400 mg/kg), but 5 of the 20 samples exceeded the residential use guideline of 140 mg/kg.

PCBs were detected at 1 of 20 stations at a concentration of 0.19 mg/kg, which is marginally above the CCME PEL of 0.189 mg/kg, but not above the CCME SQG of 33 mg/kg for commercial and industrial use.

Of the 26 metals tested, none were above the CCME marine sediment PEL or SQG.

A complete data set for sediment and water samples collected by Husky are attached as Appendix E.

4.3.3 Tow-out channel Dredging

4.3.3.1 Overview of Dredging Activities

Husky has completed a bathymetric survey of the CGS tow-out route to ensure adequate water depth exists for the draft of the CGS. The survey identified that dredging will be required in two sections of the tow-out channel (as noted in Figure 4-9). At Corridor 1, approximately 25 m³ of sediment is required to be dredged over an area roughly 280 m² and at Corridor 2, approximately 165,000 m³ is required to be dredged over an area roughly 215,000 m². It is anticipated that dredging could be completed in four to six weeks using a trailing suction hopper dredger.



Source: Google Earth 2012

Figure 4-9 Corridors Requiring Dredging along the Concrete Gravity Structure Tow-out Route

As part of the WREP environmental assessment, a site-specific sediment suspension model (AMEC 2012) demonstrated that using this dredge method, suspended sediment levels will not exceed the *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (CCME 2002). Suspended sediment concentrations above 25 mg/L are expected to persist for no more than 4 hours within an area of approximately 0.7 km², in all wind scenarios. Concentrations above 10 mg/L would persist for approximately six hours, and total suspended solid levels above 5 mg/L would last for about 10 hours for a single dredging operation. Dredging activities are planned during late 2015 or early 2016 to minimize the impact on local fish and fisheries. A trailing suction hopper dredger will transfer the sediment into the hopper of the vessel. The soft material within the tow-

out corridors could be removed easily with a trailing suction hopper dredger, and if necessary, the assistance of a backhoe dredger for harder material may be required. In the event bedrock is encountered, drilling and blasting, a rock hammer or a rock saw will be required in order to dredge. Planned boreholes during the summer of 2012 will confirm whether such measures will be necessary along the tow-out route. If blasting is required, the operation will strictly adhere to the *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters*. A monitoring protocol for marine mammals will be established in the affected area prior to blasting. A safety zone will also be enforced during the operation and Husky will investigate the use of blasting mats and bubble curtains to mitigate the spread of the blast.

Once full, the vessel will transit to quayside where it is connected to a temporary land-based pipeline and the material is pumped ashore. Dredged sediment can be pumped through the temporary land-based pipeline for discharge to The Pond. These pipelines can be extended and repositioned in such a way that the sediment will be placed evenly over The Pond area. At the end of the pipeline, earth-moving equipment will be used for the final spreading and leveling of the material, if necessary.

The marine logistics associated with the dredging operation will be coordinated with the Port of Argentia. As previously stated, The Pond at the head of the Argentia Peninsula has been evaluated as the primary spoils disposal site. Disposal at sea has also been evaluated and based on consultations with fish harvesters, Environment Canada and DFO, Husky has determined that The Pond is the preferred option. During the construction of the CGS and its subsequent float-out, there will be no requirement for a breakwater.

4.3.3.2 Sediment Chemistry along the Concrete Gravity Structure Tow-out Route

Husky has conducted extensive sampling within the areas to be dredged to test sediment chemistry and to assess effects to fish habitat. A fish habitat report will be submitted to DFO for review.

Ten surficial substrate samples within dredge corridors 1 and 2 (Figure 4-9) were primarily sand with fractions of silt and clay. Each sample was tested for available metals, PAHs, PCBs, TPH and BTEX. BTEX compounds were not detected in the marine sediment samples.

One sample reported detectable concentrations of hydrocarbons from dredge corridor 1 at a concentration of 24 mg/kg. Two samples from dredge corridor 2 reported TPH concentrations of 19 and 32 mg/kg. Each of these three reports of hydrocarbon were in the lube oil range ($>C_{21}<C_{32}$) and all were below applicable guidelines.

PAHs were detected in both samples from dredge corridor 2, with total PAH concentrations of 0.47 and 0.96 mg/kg, respectively. Individual PAHs were below CCME marine PEL guidelines and commercial/industrial SQG.

In dredge corridor 1, PAHs were reported in three of eight samples, with phenanthrene being detected at concentrations of 0.013, 0.007, and 0.010 mg/kg. The phenanthrene CCME PEL is 0.544 mg/kg and for commercial/industrial SQG is 50 mg/kg.

Total PCBs were not detected in either dredge corridor.

Of the 26 metals tested, none were above the CCME PEL or SQG (Appendix E).

4.3.4 Topsides Facilities

The topsides will consist of drilling facilities, wellheads and support services such as accommodations for 120 to 130 persons, utilities and a helideck. The topsides will be constructed at an existing fabrication facility and is therefore not considered part of this Registration.

Upon completion of the fabrication and commissioning work, the topsides structure will be loaded onto a heavy-lift transportation vessel, and transported to the deep-water mating site in Placentia Bay.

4.3.5 Tow-out to Deep-water Site

Once construction of the CGS is complete, the structure will be floated out of the graving dock and towed to a deep-water site in Placentia Bay for installation of the topsides. Two potential deep-water sites have been identified, west of Red Island and west of Merasheen Island (Figure 4-10). A decision between the two potential mating sites will be made after further site evaluation, including local stakeholder consultation, to obtain all necessary information about the tow-out route and the deep-water location.



Figure 4-10 Potential Deep-water Mating Sites

Husky anticipates that four tugs, each of a capacity between 12,000 and 15,000 horsepower, will be used for the transit. Upon arrival at the deep-water site, the tow tugs will hold the structure at the required location while four moorings are connected to the structure and tightened to maintain position for the installation of the topsides. The tow tugs will then be disconnected.

The CGS will be ballasted to a predetermined depth for the installation of the topsides. The initial ballasting will use water to achieve the required draft for the CGS. Once installation of the topsides is complete, a transition from water ballast to solid ballast will occur at the deep-water mating site; this activity will be integrated with the topsides/CGS hook-up.

4.3.6 Topsides Mating

Two methods for the installation of a topsides structure are contemplated; float-over or heavy lift with the use of a single or dual crane heavy-lift vessel. The method that will be used will be determined during FEED.

The position of the CGS will be maintained by four pre-installed seabed anchors, which will be connected to mooring points on the CGS by anchor chain approximately 1,500 m each in length. Husky does not anticipate the need for cables connected to the land. Each leg of the overall mooring system will be comprised of a seabed anchor, pennant wire and buoy for deployment and recovery of the anchor, a chain connecting the anchor to the CGS and a tension pontoon aligned with the chain. These moorings will be set and marked just prior to the float out of the CGS from the graving dock. The mooring systems will be recovered and removed from the deep-water site once the topsides facility has been mated with the CGS and is under tow to the offshore site. The CGS itself will not be in contact with the seafloor.

During the mating operation and inshore hook-up work, the Port of Argentia will be used as a logistics base for the supply of materials, equipment and personnel. There will be limited marine traffic between the deep-water site and the Port of Argentia throughout the time that the WHP is at the deep-water site.

During the topsides mating, there will be an accommodation vessel for the estimated 100 workers engaged in this component of the work. At all times, the accommodation vessel will have an assistant tug of approximately 5,000 horsepower, with a supply boat of similar size used for logistic runs to the Port of Argentia. Regulated marine vessel discharges can be expected at the deep-water mating site. Air emissions can be expected from the topsides standby generator, as well as from the various support vessels. All waste material will be sorted, recycled and disposed of on land.

Husky anticipates the logistics vessel will visit the Port of Argentia approximately three to four times per week. The transit time will be approximately two hours.

4.3.7 Tow-out and Offshore Installation of the Wellhead Platform

Upon completion of the topsides mating and associated hook-up between the CGS and the topsides, the WHP's designated towing draft will be established by water ballast/deballast activities. Once the towing draft has been established, the structure will remain at this draft until it arrives at the offshore location in the White Rose field. The WHP draft is expected to be approximately 115 m.

The WHP will be towed at the maximum possible water depth to minimize wave action on the topside facilities and the best time to do so is from the end of May through to September. A tow-out route (based on existing bathymetry) to accommodate the WHP draft is illustrated in Figure 4-11. The tow-out route will be surveyed in advance to provide the level of information required to establish an accurate final route for tow-out of the structure. Detailed contingency planning will be developed to manage the tow in the event of bad weather. Continuous weather forecasting will be undertaken during the tow.

For tow-out of the WHP, four ocean-going tugs, each with a capacity of a minimum of 17,000 horsepower, will be connected to towing points on the CGS structure. The four moorings at the deep-water site will be disconnected and the tow to the White Rose field will commence.

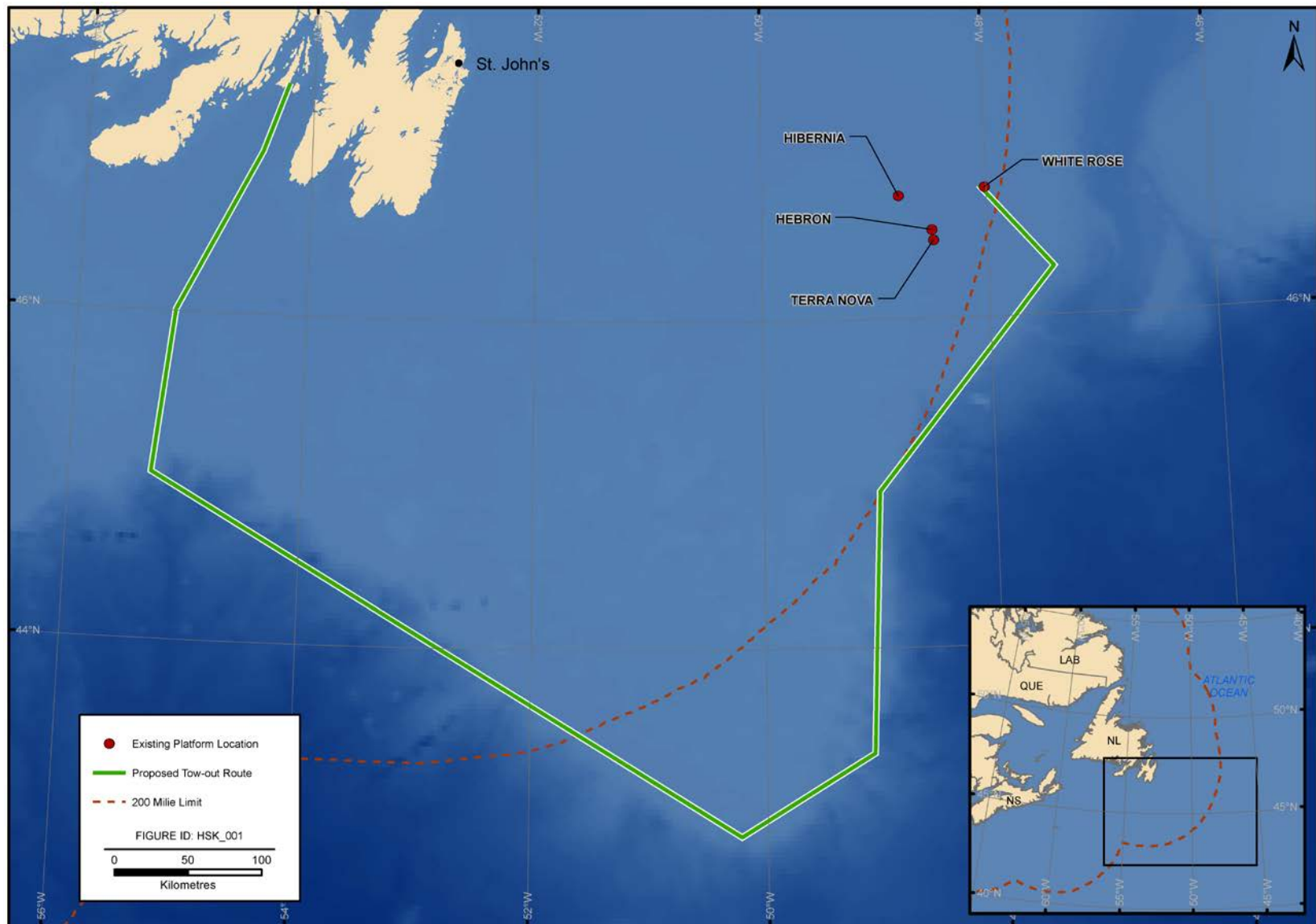


Figure 4-11 Potential Tow-out Route from Placentia Bay to the Wellhead Platform Location

4.3.8 Construction Period

The total construction period for the WHP is estimated to take 30 to 38 months and includes:

1. Excavation of the graving dock is estimated to take approximately 6 to 8 months
2. Construction of the CGS is estimated to take approximately 20 to 24 months
3. Dredging of the shoreline near the graving dock is estimated to take 6 to 8 weeks
4. Dredging of the tow-out route is estimated to take 4 to 6 weeks
5. CGS towing from Argentina to the deep-water site is estimated to take 2 to 4 days
6. Mating with the topsides is estimated to take approximately 6 to 8 weeks
7. Tow-out to the White Rose field is estimated to take approximately 12 to 15 days

The proposed date of first physical construction-related activity on site is April 2013.

4.3.9 Potential Sources of Pollutants

Husky will ensure compliance with applicable Provincial and Federal regulations and guidelines through a detailed project-specific environmental protection plan (EPP).

Potential sources of pollutants during the construction period(s), including airborne emissions, liquid effluents and solid waste materials include:

- Air emissions from excavation and construction equipment and from topsides commissioning. The estimated emissions during graving dock excavation, CGS concrete production and tow-out and topsides mating are provided in Tables 4-4 to 4-6, respectively.

Table 4-4 Criteria Air Contaminants Emissions Estimates for Graving Dock Facility Excavation

Activity	Total Emissions (tonnes)				
	CO	NO _x	SO ₂	PM	THC ^(A)
Mobilization and Demobilization	0.45	1.21	0.15	0.06	0.08
Site Clearing	0.53	1.71	0.23	0.10	0.08
Mass Excavation	41.6	115.9	15.5	6.20	4.22
Wall Construction	1.33	5.75	0.87	0.15	0.17
Final Grading	0.32	0.91	0.12	0.05	0.04
General Service	2.40	3.29	0.49	0.44	0.36
Transportation	8.14	1.37	0.007	0.035	0.454
TOTAL	46.6	128.7	17.3	7.01	4.97
(A) THC = Total hydrocarbon					

Table 4-5 Criteria Air Contaminants Emission Estimates Resulting from Concrete Production

Equipment	Total Emissions (tonnes)				
	CO	NO _x	SO ₂	PM	THC ^(A)
Conc. Plant (150 cubic yards/hr)	0.144	0.643	0.090	0.040	0.040
Conc. Truck	0.364	1.61	0.225	0.113	0.100
Conc. Pump (assume 75 m ³ /hr)	0.181	0.619	0.083	0.046	0.043
TOTAL	0.689	2.87	0.398	0.199	0.183
(A) THC = Total hydrocarbon					

Table 4-6 Criteria Air Contaminants Emission Estimates Related to the Tow-out of the Concrete Gravity Structure and Topsides Mating

Vessel	Total Emissions (tonnes)					
	CO	NO _x	SO ₂	PM ₁₀	PM _{2.5}	THC ^(A)
Heavy Lift Transportation Vessel	0.945	12.0	9.88	0.619	0.498	0.430
Tugs	1.18	15.0	12.4	0.773	0.623	0.537
Dual-Crane Heavy Lift Vessel	155.9	1,984	1,630	102.1	82.2	70.9
Accommodation Vessel	3.17	40.3	33.1	2.07	1.67	1.44
Assistant Tug	23.6	300.7	247.0	15.5	12.5	10.7
Supply Boat	0.525	6.68	5.49	0.344	0.277	0.239
Tugs	5.02	63.9	52.5	3.29	2.65	2.28
TOTAL	190	2,423	1,990	125	100	87
(A) THC = Total hydrocarbon						

- Concrete batch plant discharges will be controlled, treated and discharged as follows:
 - Wastewater from the cleaning of mixers, mixer trucks and concrete delivery systems will be directed to a closed system rinsing/settling basin.
 - In the event that water from the closed settling system is to be released, it will be tested prior to release, for parameters related to any concrete additives to be used in the production of concrete (e.g., total hydrocarbons, pH, and total suspended solids). The water to be released will meet the limits specified in Schedule A of the *Environmental Control Water and Sewage Regulations*.
 - If water to be released does not meet discharge criteria, it will be further treated until these discharge criteria have been met.
 - Settling basin will be cleaned on an as required basis to ensure that the retention capacity is maintained at all times.
 - The batch plant will be equipped with a dust collection system (e.g., baghouse) to mitigate releases of particulate matter.

- Possible dewatering of the graving dock
 - Water from the graving dock will be collected, assessed and if necessary, held in an engineered settling pond onsite to satisfy all regulatory requirements before being discharged into the marine environment (see Section 4.2.5.4).
- Water from The Pond
 - To ensure compliance with the applicable regulations for wastewater discharge, water from The Pond will be tested prior to discharge to the marine environment. If the water is suitable, the water will be pumped from the surface of The Pond to ensure minimal suspension of solids. Pumping would cease prior to disturbance of the sediments in The Pond or at any point where allowable discharge limits may be exceeded. Any discharge requiring filtration will be filtered through geo-membrane in a purpose-built rock weir or pumped to a purpose-built settling pond to ensure compliance with total suspended solids limits.
- Construction, domestic and sanitary waste disposal
 - Construction and domestic waste will be transported to a suitable facility to ensure proper disposal.

Husky will develop a site-specific environmental protection plan for the activities associated with graving dock excavation and CSG construction at Argentinia under the WHP development option. Husky will adhere to all policies and regulatory requirements associated with the construction of the WHP.

4.3.10 Potential Sources of Resource Conflicts

Stakeholder consultations with Argentinia area fish harvesters have confirmed that the potential causes of resource conflicts associated with the WREP include:

- Dredging activities in the nearshore area and along the tow-out route to the deep-water mating site
- The necessary safety zone at the deep water mating site for six to eight weeks
- Potential in-water blasting.

Dredging activities are planned for late 2015 or early 2016, during a period of limited fishing activity, which will mitigate the interaction. Vessel traffic associated with the WREP will be negligible in comparison to the routine vessel traffic currently in the area.

A full assessment of these interactions is being prepared for the C-NLOPB/CEAA environmental assessment.

4.4 Operation

The graving dock and associated infrastructure will be in use for the 27 to 34 months estimated to complete the graving dock excavation, construction and removal of the CGS. Husky does not plan to continue operation of the graving dock facility. A

description of potential pollutants and resource conflicts during construction are covered under Sections 4.3.8 and 4.3.9.

4.5 Occupations, Education and Housing

Husky is committed to hiring residents of Newfoundland and Labrador and Canada for all stages of the WREP. Should the WREP proceed, hiring plans and policies will be put in place to ensure that first consideration for training and employment opportunities are to residents of Newfoundland and Labrador and Canada. Husky is also committed to equity employment. A WREP-specific Employment Equity Plan will also be developed.

The anticipated direct and indirect labour requirement for the graving dock excavation is 85,000 person-hours and 1,600,000 person-hours for CGS construction. Excavation and construction opportunities will provide work for heavy equipment operators, sheet metal workers, crane operations, truck drivers, welders, cement finishers, electricians, pipe fitters and construction inspectors.

Graving dock construction is expected to take six to eight months and require a total labour force of approximately 138 persons over that period (Table 4-7).

Table 4-7 Number of People and Skills Required for Graving Dock Construction

NOC Code	NOC Description	# of People
724	Electrical trades and electrical power line and telecommunications workers	16
731	Machinery and Transportation Equipment Mechanics (Except Motor Vehicle)	9
737	Crane Operators, Drillers and Blasters	23
751	Motor Vehicle and transit drivers	4
752	Heavy Equipment Operators	54
761	Trades Helpers and Labourers	32
	Total	138

The peak work force requirement during the graving dock excavation is provided per quarter in Table 4-8.

Table 4-8 Peak Employment per Quarter; People and Skills Required for Graving Dock Construction

2013		
Qtr2	Qtr3	Qtr4
36	73	55

CGS construction is expected to take 20 to 24 months and require a total labour force of approximately 670 persons over the period, but not all at once (Table 4-9).

Table 4-9 Number of People and Skills Required for Concrete Gravity Structure Construction

NOC	NOC Description	# of People
7236	Ironworkers	153
7282	Concrete Finishers	104
724	Electrical trades and electrical power line and telecommunications workers	10
725	Plumbers, Pipefitters and Gas Fitters	8
7271	Carpenters and Cabinetmakers	107
731	Machinery and Transportation Equipment Mechanics (Except Motor Vehicle)	10
733	Other Mechanics and related repairers	5
737	Crane Operators, Drillers and Blasters	5
751	Motor Vehicle and transit drivers	27
752	Heavy Equipment Operators	53
753	Other transport equipment operators and related maintenance workers	54
761	Trades Helpers and Labourers	134
	Total	670

The peak work force requirement during the CGS construction is provided per quarter in Table 4-10. However, due to the rotational effect of trade based labour during the slipforming construction process, the maximum work force on site at one time is approximately 400.

Table 4-10 Peak Employment per Quarter; People and Skills Required for Concrete Gravity Structure Construction

2013			2014				2015				2016			
Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4
0	0	109	336	530	623	610	543	477	234	159	84	0	0	0

The population of the Argentia area in 2006 was approximately 8,500, which represented a decline of 9.2 percent since 2001 when the population was over 9,000. Between 2006 and 2011, the population of the Argentia Area continued to decline; the 2011 population of approximately 7,600 represents a further decline of over 8.0 percent (Husky SEIS, in prep.). Census 2011 data indicate continued population decline for the majority of communities in the Argentia Area. The communities of Long Harbour-Mount

Arlington Heights and Whitbourne-Markland; however, have grown between 2006 and 2011, by 41.0 and 7.0 percent, respectively (Statistics Canada 2006, 2012).

Employment related to the WREP could lead to population increases during construction of the WHP at Argentia. However, any construction-phase population increase will be short-term, as construction of the CGS is expected to occur over a period of 20 to 24 months. As such, it is likely that there will be little in-migration of employees accompanied by families during this phase. Any in-migration of families and school-age children should be accommodated by existing educational services and facilities. The number of students at local schools has decreased in recent years and the capacity will likely be able to meet any additional demands related to the WREP. With advance notice from Husky regarding labour force demand, labour sourcing and accommodation arrangements, it is likely that local education and training institutions should be able to meet any short-term demands on education and training services. Husky will collaborate with training institutions such as the College of the North Atlantic to align training programs with WREP timelines and labour force requirements.

Demands from the WREP construction phase will be much smaller than those from Hibernia, Terra Nova or White Rose and those expected for Hebron. In all those cases, project-related demands were accommodated without difficulty, and it is therefore expected that any increased demand resulting from the WREP can be accommodated by existing provincial post-secondary institutions. Husky will continue to work with the Province's post-secondary institutions to support training and education programs designed to meet the demand of the provincial oil and gas industry.

There is potential for the WREP to affect housing in the Argentia Area, particularly during the construction phase as a result of any related population increase. The Argentia Area housing market has experienced some pressure related to increased development, primarily the Vale Long Harbour Nickel Processing Plant. Residential development in the Town of Long Harbour – Mount Arlington Heights has increased to meet demand. The Town of Placentia also has new construction ongoing and is considering increased residential development in response to existing demands. It is unlikely that a development at the scale of the WREP will put substantially increased pressure on housing in the Argentia Area. While the WREP may contribute somewhat to increased demand on housing and accommodation in the area, it is likely that any additional demand arising from the WREP will be absorbed by the housing market.

With Vale's construction expected to be completed by May, 2013 (MacDonald 2012), it is anticipated that cumulative demand on the local housing market will ease before CGS construction begins at Argentia in 2014. The availability of Argentia Area housing and accommodations will likely increase with the completion of construction at Long Harbour; it is also anticipated a portion of the existing construction labour force currently working on the Vale facility will gain employment during WREP construction at Argentia, reducing WREP-related increases on demand for local housing.

Further detail on the socio-economic effects of the WREP will be provided in the SEIS that will be part of the Development Application submitted to the C-NLOPB.

4.6 White Rose Extension Project-related Documents

Husky and its contractors have been conducting WREP-related surveys at Argentia since November 2011. A list of WREP-related documents generated by Husky is provided in Table 4-11.

Table 4-11 Husky-initiated Surveys near Argentia

Title	Scope
Geotechnical/Environmental Site Investigation of proposed CGS Construction Sites	<p>Drill geotechnical boreholes and install monitoring wells within the proposed site</p> <p>Excavate test pits for soil sampling and analysis to delineate the extent of petroleum hydrocarbon impacted soil.</p> <p>Install monitoring wells at five locations within the proposed site to measure the water levels and collect groundwater samples for environmental analysis.</p> <p>Geotechnical laboratory testing of soil samples to help characterize the soil conditions and determine the presence of any environmental contaminants</p>
Assessment Groundwater Seepage into Dry Dock	Short-term Constant Rate Aquifer Testing and First-order Estimate of the proposed site
Cost Estimate Review	Base cost estimate for graving dock site, site utilities, bund removal and dredging
Preliminary Geotechnical Site Assessments	Preliminary geotechnical site assessments of four short listed sites
Placentia Bay LiDAR and Multibeam Mapping	General topography and shallow water bathymetry with LiDAR
Argentia Near-Shore Survey	Bathymetry map of Argentia Harbour shoreline in way of CGS construction site
Argentia Site A Topographical Survey	Detailed Topographical survey of the Husky Lease area
Argentia Acoustic Survey	Acoustic Survey of the Argentia Harbour area Atlanticat Survey
Near shore Geotechnical and Environmental Sampling Program	<p>Drill geotechnical boreholes near shore adjacent to prospective sites</p> <p>Geotechnical laboratory testing of soil samples to help characterize the soil conditions and determine the presence of any environmental contaminants</p>
3D and GIS Engineering Services	Compile all bathymetry and topographical data into seamless 3D model
Dry Dock Estimates	Conceptual Estimate Graving Dock Facility for CGS Construction based on Argentia Sites

Title	Scope
Survey of The Pond, adjacent lands and Shoreline	Acoustic survey of The Pond and additional shoreline areas of interest Topographic Survey of The Pond Shoreline, access road to The Pond, and additional area north-east of graving dock site
Argentia Vibrocorer Sampling Program	Vibrocorer sampling within proposed dredging corridors of the proposed float-out route
WHP Design Validation	Perform an independent WHP construction site identification study of additional areas in Newfoundland that could potentially accommodate the dry build construction of the CGS
Potential NL Graving Dock Sites	Phase 1 WHP construction site identification study and site selection workshops.
Assessment of Dry Build Construction Sites proposed by SMEs	Additional Phase 1 WHP construction site selection workshops to evaluate alternative areas proposed by the WHP Design Validation Study

5.0 Environmental Setting

5.1 Physical Environment Setting

The proposed graving dock site in Argentia is flat with very slight undulations with elevations ranging from 3 to 5 m above sea level. The soil conditions at this site comprise fill and discontinuous organic soils overlying native soils. The native soils within the depths investigated varied from clean, fine-grained, poorly graded sand to silty sand with gravel. Occasional cobbles and boulders were noted to occur throughout the stratum. Bedrock was not encountered within the depths investigated. Generally, the water table at this site was found to be within 1 to 3 m of the ground's surface.

The average annual wind speed for Placentia Bay is recorded at approximately 27 km/h, with the prevailing direction being west in the fall/winter months and southwest in the spring/summer months. The annual average maximum wind speed in Placentia Bay is approximately 106 km/h. The mean temperature for Placentia Bay ranges from -4.3°C in February to 15.6°C in August. The mean temperature ranges from -1.6°C in February to 14.8°C in August.

Monthly rainfall values typically average at least 90 mm, except during the winter months (January through March), when the peak snowfalls occur. On average, the rainiest season for Placentia Bay is in the fall months (September to November), when monthly rainfall is usually between 125 to 150 mm.

While eastern Newfoundland often receives the most freezing precipitation events in all of Canada, these occurrences are less frequent over Placentia Bay. The average annual freezing precipitation (freezing rain/drizzle, ice pellets and sleet) for the Placentia Bay area is 34.8 hours. Thunderstorms occur far less over Placentia Bay than the surrounding land area, but have the potential to occur throughout the year, particularly in the summer months; hail is typically associated with thunderstorms.

In Argentia, the highest frequency of greater than 10 km visibility occurs in the fall. Meanwhile, the greatest occurrence of reduced visibilities occurs during the late spring and early summer. Poor visibility conditions (less than 2 km) increase through the spring and peak in July, occurring over 30 percent of the time.

5.2 Atmospheric Environment

Come By Chance is the air quality monitoring site located closest to Argentia. The background concentrations indicate that the area meets the air quality regulations of the province, and attains the National Ambient Air Quality Objectives of Canada (ExxonMobil Canada Properties 2011). The closest industrial sites to Argentia are the North Atlantic Refining Limited refinery at Come By Chance and the Newfoundland Transshipment Terminal at Whiffen Head. The nickel processing facility operated by Vale Newfoundland & Labrador Limited is currently under construction at Long Harbour. The refinery at Come By Chance is the dominant source of emissions in the airshed.

5.3 Onshore Environment

5.3.1 The Pond

The northside of the Argentia Peninsula has one water body, called The Pond, measuring approximately 15 hectares surface area (Figure 5-1). It is elongated in the east-west direction and is 775 m long by 300 m wide, with a mean water depth of 7 m (maximum depth is 14 m) and a water volume of 1,038,250 m³ (ARG 1995). The substrate is primarily fines/clay (anoxic) and the surface area of the bottom is approximately 148,300 m². The Pond appears to have been altered from its natural marine environment and used for waste disposal. The Pond is present in known historical photos; however; it was open to the ocean via a channel (Figure 5-2). Between 1941 and 1943, it was used for the disposal of an estimated 8.5 million cubic feet of peat excavated during construction of the nearby runway (http://www.heritage.nf.ca/law/argentina_base.html#peat); as illustrated in Figure 5-3.



Figure 5-1 The Pond – Looking East



Figure 5-2 Argentia Peninsula Aerial Photo Showing the Open Channel of The Pond circa 1939



Figure 5-3 Argentia Peninsula Aerial Photo Showing Peat Disposal in The Pond

The Pond's water is brackish, with a probable seawater intrusion from Placentia Bay through the gravel ridge between The Pond and the ocean and by waves and spray overtopping the gravel divider during severe storms or high tide events (ARG 1995). It is believed to be hydraulically connected through a cobble barasway/berm, with in-flow through a groundwater stream at the southeast end of The Pond (ARG 1995).

A debris survey by divers was conducted in The Pond in 2003 and found dory remnants, concrete pipe and blocks, creosote wooden piles, corroded steel pipe, car battery, wire, sheet metal, steel and aluminum boxes, remnants of drums, tires and decking. PWGSC have intentions of removing selected items of debris prior to any further commercial/industrial use of The Pond (K. Knight PWGSC, pers. comm.). Remaining debris would be buried by the excavation material from the graving dock, rather than being removed and buried offsite.

Few species and individual fish are present in The Pond, as concluded in the study conducted by PWGSC in 1998 (ARG 1998). Under the direction of DFO, Husky also conducted a fish survey of The Pond in June 2012 using gillnets and baited char and minnow traps and the only observed species were 3, three-spine stickleback (*Gasterosteus aculeatus*).

DFO has been consulted about use of The Pond for excavated and dredge spoil material disposal. A final determination of the requirement for habitat compensation is pending their review of Husky's Argentinia fish habitat report, which has yet to be submitted to DFO. Husky anticipates that habitat compensation will not be required for The Pond, given the lack of fish present and the poor quality of the habitat. The pending changes to the *Fisheries Act* and new requirements for habitat compensation will also have to be considered.

5.3.2 Terrestrial Habitat

Since the area is an exposed brownfield site, few terrestrial mammals are found on the Argentinia Peninsula. Otter, muskrat and moose may be resident in the Argentinia area, but not on the Argentinia Peninsula (VBNC 2002). Furbearers located onshore near Argentinia include small rodents such as rats and mice, meadow vole, snowshoe hare, mink, fox and masked shrew (ARG 1995; VBNC 2002). Rats, mice and meadow voles may be found on the Argentinia Peninsula (VBNC 2002). Numerous species of birds inhabit the Argentinia Peninsula. In summer, gannet, alcid and gull nesting and shearwater foraging communities characterize the inshore zone of Placentia Bay; a substantial waterfowl population occurs in the nearshore waters of Placentia Bay in the winter (VBNC 2002). No known species at risk reside, feed, stage or overwinter on the Argentinia Peninsula (VBNC 2002).

There are numerous breeding pairs of Bald Eagle on Merasheen Island (Argentinia Assessment Group et al. 1997). One of the deepwater mating sites being evaluated is west of Merasheen Island.

5.4 Marine Environment

The coastline of Placentia Bay is irregular with many bays, inlets and islands. The eastern Placentia Bay shoreline running from Little Harbour to Argentinia is dominated by rocky headlands, gravel pocket beaches and rock platforms (CEA Agency 2008). The bathymetry of Placentia Bay is also very irregular with many banks and troughs. Merasheen Island, Long Island and Red Island divide the inner bay into three channels. The eastern channel between the eastern shores of the bay and the eastern shores of Red and Long Island is the widest, the deepest and the least obstructed by shoals (LGL 2007).

These nearshore rock/gravel/sand habitats and their attendant marine algae shelter a variety of species that could include anemones, barnacles and sponges, sea urchins, sand dollars, mussels, scallop, hermit crabs, lobsters and small numbers of cod, flounder and plaice (LGL 2007). A benthic fish habitat video survey and sediment collection program is currently being conducted for the nearshore area. The results of this program will be incorporated into the WREP environmental assessment.

Cod is the most important species harvested in Northwest Atlantic Fisheries Organization (NAFO) Unit Area 3PSc (Placentia Bay), accounting for just over half of the catch by weight between 2005 and 2010, followed by snow crab (16.3 percent) and herring (approximately 10 percent). Although snow crab comprised only 16 percent of the overall quantity of harvest, given its high product value it accounted for over 35 percent of the landed value during 2005 to 2010. The 10 top species, together, comprise more than 97 percent of the total quantity of the harvest in these years. In terms of value, cod and snow crab together made up nearly 80 percent of the average annual value. Although the herring fishery is important (especially as bait), it does not have the same economic value as the other large fisheries. While lobster accounts for only a small percentage by weight of the overall 2005 to 2010 catch (less than 1 percent), given its consistently high value, this species remains very important to many area fishers (just over 5 percent of the total catch value).

The fisheries in Placentia Bay are conducted year-round, although in recent years the overall catch has been much less evenly distributed throughout the year compared to a decade ago. Since the 3PSc groundfishery reopened in the mid-1990s, the peak harvesting months in terms of quantity of harvest have been June and July and this is still very much the case in 2012. This pattern is influenced by the cod fishing activities, which generally occur throughout all months except April. However, May and June are the two highest months by value, owing to the large harvest of high-value snow crab in May. For Atlantic cod, June and July accounted for more than 55 percent of the total cod catch during 2005 to 2010, but there is also a fairly strong fishery in the fall and early winter period, while the snow crab fisheries are concentrated in the May to July period. The herring fishery has a spring and late fall/winter component, with most taken in December. Lobster, following the open season for this species (typically mid- to late April to late June) in this area (LFA 10), is strongly focused in those months. Capelin are harvested in June and July, although this species fishery usually takes place in a very short period (six to eight days) during the season.

5.5 Species at Risk

Fish species at risk that could occur in Placentia Bay include the following Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed species: Atlantic cod (Newfoundland and Labrador population, Southern population); American plaice (Newfoundland and Labrador and Maritime populations); American eel; and Atlantic salmon.

Harlequin Duck (*Species at Risk Act* (SARA)-listed as Special Concern) occur in the waters off Cape St. Mary's Seabird Ecological Reserve (Section 5.1.5.1). Between 1998 and 2008, there have been incidental sightings of Red Knot *rufa* subspecies (COSEWIC-assessed as endangered) along the Cape Shore of Placentia Bay (Garland and Thomas 2009). There are no known critical nesting, feeding, staging or overwintering areas of at-risk bird and mammal species in the immediate vicinity of the nearshore area.

Marine mammals species at risk that may occur in Placentia Bay include the SARA listed blue and fin whale and the COSEWIC-assessed harbour porpoise (Northwest Atlantic population). The leatherback sea turtle is listed as a Schedule 1 species under SARA and may also be present in Placentia Bay.

5.6 Sensitive Areas

As part of the fish habitat survey conducted by Husky, eelgrass was observed near the graving dock site in Argentia Harbour. The quantity of eelgrass that could be affected by dredging operations will be discussed in the environmental assessment. Eelgrass is primarily a subtidal species that penetrates to some extent into the intertidal zone. It is common on mud flats that are exposed at low tide, in estuaries and shallow, protected bays (Kelly et al. 2009). Habitat provided by eelgrass along the coast is highly productive and a haven for juvenile fish of many species, with most fish found in the 3 to 5 m zone (DFO 2010). Catto et al. (1999) identified extensive eelgrass beds in Placentia Bay.

The arrival of capelin to the head of Placentia Bay generally occurs in June and July (VBNC 2002). Capelin spawning on beaches near Argentia has been reported historically (VBNC 2002). The size of the substrate on a beach will determine its suitability for capelin spawning. Capelin appear to prefer gravel 5 to 15 mm in diameter but will spawn on substrate as small as 2 mm diameter and as large as 25 mm diameter (VBNC 2002). There are several capelin spawning beaches throughout Placentia Bay. Typical capelin beaches are located at Fox Harbour (north of Argentia) and Point Verde, southern Ship Cove and Gooseberry Cove (along the Cape Shore south of Argentia) (Catto et al. 1999).

There are major seabird colonies at or near the mouth of Placentia Bay, with smaller colonies located on inner islands and along the coastlines of Placentia Bay. Cape St. Mary's Seabird Ecological Reserve (an Important Bird Area), is located at the mouth of Placentia Bay and is the most important breeding area in Placentia Bay. Cape St. Mary's was established as an ecological reserve in 1983 and covers 64 km² (54 km² of this is in the marine environment). During the breeding season, it is home to 24,000 Northern Gannet, 20,000 Black-legged Kittiwake, 20,000 Common Murre and 2,000 Thick-billed Murre. In addition, greater than 100 pairs of Razorbill and greater than 60 pairs of Black Guillemot nest at the Reserve, as do Double-crested and Great Cormorant and Northern Fulmar (Newfoundland and Labrador Department of Environment and Conservation 2011). The adjacent marine environment is an important wintering site for thousands of sea ducks, including Harlequin Duck, Common Eider, scoter and Long-tailed Duck.

6.0 Approval of the Undertaking

A list the main permits, licences, approvals, and other forms of authorization required for the undertaking is provided in Table 6-1.

Table 6-1 Primary Permits, Licences, Approvals and other Authorizations required for the White Rose Extension Project

Regulatory Agency	Permit and/or Regulatory Approval	Activity Requiring Regulatory Approval
Government of Canada		
Fisheries and Oceans Canada	Approval under Section 36 of the <i>Fisheries Act</i>	Waste water discharge to the marine environment
Fisheries and Oceans Canada	Approval under Section 35(2) of the <i>Fisheries Act</i>	Dredging activities, nearshore and in tow-out corridors
Environment Canada	Section 35 of the <i>Migratory Birds Convention Act</i>	Waste water discharge to the marine environment
Transport Canada	Approval under <i>Navigable Waters Protection Act</i>	Mating topsides at the deep-water site Dredging activities, nearshore and in tow-out corridors
Government of Newfoundland and Labrador		
Water Resources Division	Alteration to a Body of Water (Schedule A to H). This application form is required as well as the appropriate Schedule application form (see below).	Any activity in or near any body of water including infilling, dredging, pumping out of a waterbody
Water Resources Division	Alteration to a Body of Water - Schedule H - Other Alterations	Other works within 15 m of a waterbody
Water Resources Division	Certificate of Approval for Site Drainage	Water run-off from the WREP site
Water Resources Division	Water Use Authorization	Water withdrawal and/or operation for use during construction
Water Resources Division	Certificate of Approval for Water and Sewerage Works	Water and sewage distribution system Operation of a sewage treatment plant
Forestry Resources	Commercial Operating Permit	Construction Activities
Government Services	Certificate of Approval for Waste Management System	Waste Management Activities Rock disposal areas Dredge spoils disposal

Regulatory Agency	Permit and/or Regulatory Approval	Activity Requiring Regulatory Approval
Government Services	National Building Code Form (FC/NBC - Long Form) or Request for Approval of Plans (FC/NBC - Short Form)	Buildings on Site
Government Services	Building Accessibility Exemption	Building on Site
Mines and Energy	Magazine License	Storage of explosives onsite
Department of Environment and Conservation	Certificates of Approval for the Construction and/or Operation of various industrial facilities	Facilities with air emissions and/or effluent discharge may be required to obtain a Certificate of Approval for the construction and operation of the facility (e.g., batch plant)
Government Services	Fuel storage system registration - Storage and Handling of Gasoline and Associated Products	All tanks onsite
Canada–Newfoundland and Labrador Offshore Petroleum Board		
C-NLOPB	Decision Report on the Development Application	Construction of the WHP and operation offshore

7.0 Schedule

The WREP development schedule reflects the current preliminary timeline projected to achieve first oil within the fourth quarter of 2016, under the WHP option (Figure 7-1). The WREP is designed to support production by the *SeaRose FPSO* for the life of the White Rose field.

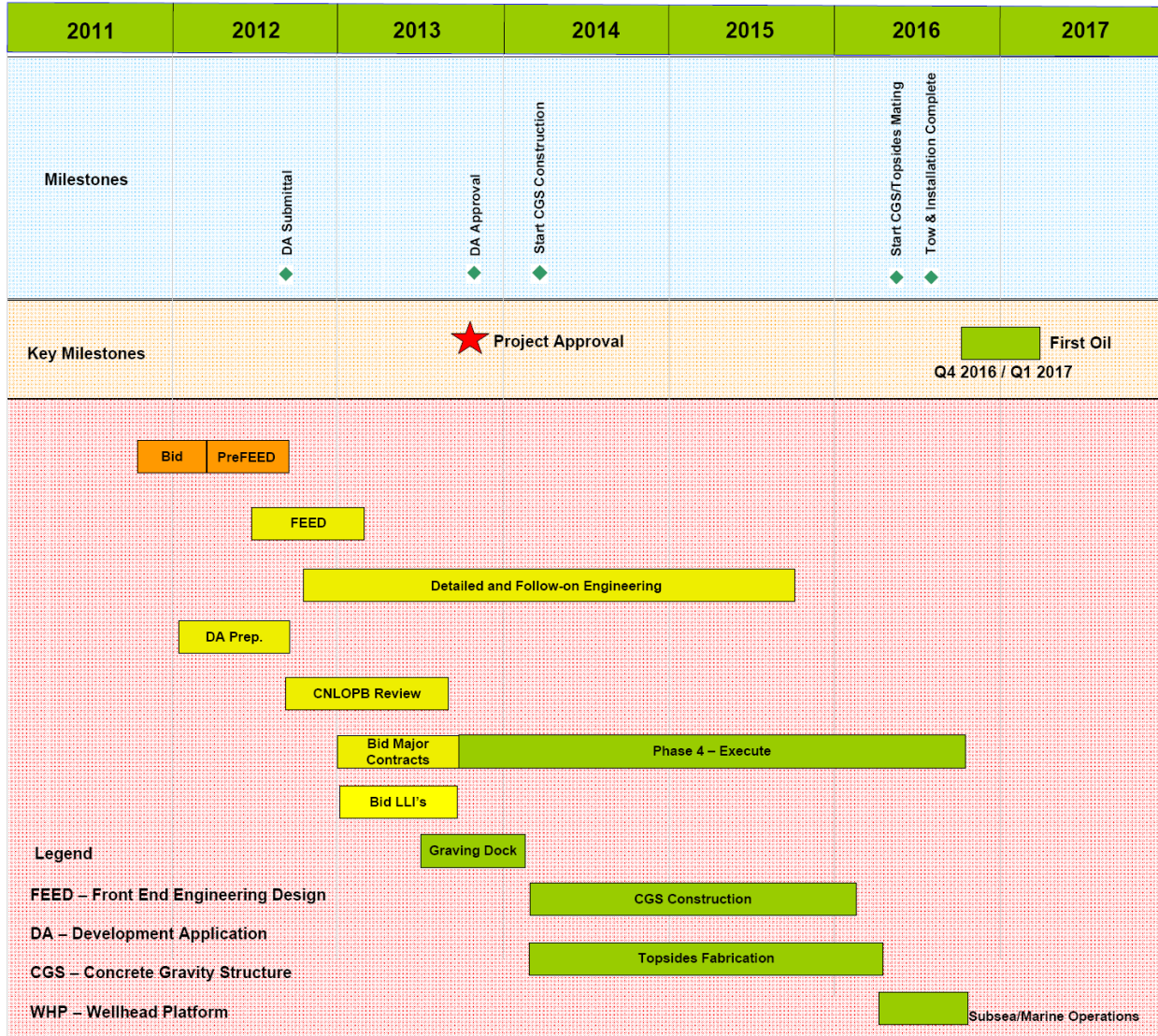


Figure 7-1 Proposed Schedule for Wellhead Platform Development Option

A summary of the duration of each construction phase is provided in Section 4.3.8. Assuming all approvals are in place, site work for the graving dock would begin in April 2013 to ensure the target for first oil is achieved. The latest date that construction could begin would be July 2013, without jeopardizing the WREP schedule.

7.1 Pre-Front-end Engineering and Design

The major focus within pre-FEED is to identify, screen and select the preferred development option for the development of the identified resources and to provide information to support regulatory submissions. It is currently estimated that pre-FEED will start in the second quarter and will conclude by the third quarter of 2012.

7.2 Front-end Engineering and Design

The major focus within FEED will be to fully define the scope of the WREP, complete detailed execution plans and refine engineering, cost estimates and schedules for the selected development option. It is currently estimated that FEED will commence in the third quarter of 2012 and will conclude by the first quarter of 2013.

7.3 Detailed Design and Follow-on Engineering

It is currently estimated that detailed design and engineering work will commence in the fourth quarter of 2012, culminating in award of the various contracts during 2013. The detailed design and engineering will be replaced by follow-on engineering, which will be managed by the respective contractors responsible for the construction of the WREP components.

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9.0 Funding

This undertaking is wholly funded by private means.

The estimated capital cost of the graving dock excavation and CGS construction is estimated at approximately \$450 million.

Date

Signature of Husky's Officer

