



# **Project Registration**

In accordance with the Requirements of the Newfoundland and Labrador Environmental Protection Act

**for the**

## **Construction of a Crude Oil Storage Tank(s) and Berm at Garden Hill South**

**PDIP Ref. GHS-0001-PLN-2-REP-0005  
Rev. 0**

**Submitted by**

**PDI Production Inc.**  
2nd Floor Baine Johnston Centre  
Suite 201  
10 Fort William Place  
St John's, NL  
A1C 1K4

**April 2008**

This document is confidential. Neither the whole nor any part of this document may be disclosed to any third party without the prior written consent of PDI Production (PDIP) Inc. All rights reserved. Neither the whole nor any part of this document may be reproduced, stored in any retrieval system or transmitted in any form or by any means (electronic, mechanical, reprographic, recording or otherwise) without the prior written consent of PDI Production Inc, the copyright owner.



## Report Approval Cover Sheet

<b>Report Title:</b>	<b>Project Registration for the Construction of a Crude Oil Storage Tank(s) and Berm at Garden Hill South</b>
<b>Project Name:</b>	Garden Hill South General
<b>Client:</b>	N/A
<b>Client Ref:</b>	N/A
<b>PDIP Ref:</b>	GHS-0001-PLN-2-REP-0005

### Approval Record

Rev. No.	Date	Prepared	Reviewed	Approved
Rev. 0	April 11, 2008	V.P. Mercer	K. Boone	A. Minty

This document is confidential. Neither the whole nor any part of this document may be disclosed to any third party without the prior written consent of PDI Production (PDIP) Inc. All rights reserved. Neither the whole nor any part of this document may be reproduced, stored in any retrieval system or transmitted in any form or by any means (electronic, mechanical, reprographic, recording or otherwise) without the prior written consent of PDI Production Inc, the copyright owner.



## Report Record of Revision

<b>Report Title:</b>	<b>Project Registration for the Construction of a Crude Oil Storage Tank(s) and Berm at Garden Hill South</b>
<b>Project Name:</b>	Garden Hill South General
<b>Client:</b>	N/A
<b>Client Ref:</b>	N/A
<b>PDIP Ref:</b>	<b>GHS-0001-PLN-2-REP-0005</b>

## Record of Revision

<b>Rev. No.</b>	<b>Date</b>	<b>Revision Details</b>
Rev. 0	April 11, 2008	Original

# Contents

Report Approval Cover Sheet	i
Report Record of Revision	ii
Contents	iii
<b>1. NAME OF UNDERTAKING</b>	<b>1</b>
<b>2. PROPONENT</b>	<b>1</b>
2.1 Proponent Name and Contact Information	1
2.2 Proponent Profile	1
<b>3. THE UNDERTAKING</b>	<b>3</b>
3.1 Nature of the Undertaking	3
3.2 Rationale for the Undertaking	3
<b>4. DESCRIPTION OF THE UNDERTAKING</b>	<b>4</b>
4.1 Geographic Location	4
4.2 Physical Features of Existing Site	5
4.3 Biological Features of Existing Site	7
4.4 Physical Features of Undertaking	7
4.5 Construction	9
4.6 Operation	9
4.7 Potential Pollution Sources	10
4.8 Potential Resource Conflicts	10
4.9 Occupations	10
<b>5. APPROVAL OF THE UNDERTAKING</b>	<b>11</b>
<b>6. SCHEDULE</b>	<b>12</b>
<b>7. FUNDING</b>	<b>12</b>

## **8. REFERENCES**

**13**

**APPENDIX 1: PDIP's Environmental Policy Statement**

**APPENDIX 2: Garden Hill South Contingency for Event of a Spill of Oil or Other Pollutant**

**APPENDIX 3: PDIP's Human Resources Statement**

## 1. Name of Undertaking

Construction of a Crude Oil Storage Tank(s) and Berm at Garden Hill South

## 2. Proponent

### 2.1 Proponent Name and Contact Information

Name of Corporate Body: PDI Production Inc.

Address: Suite 201, Baine Johnston Centre  
10 Fort William Place  
St John's, NL, A1C 1K4  
[www.pdip.ca](http://www.pdip.ca)

Chief Executive Officer: Mr. Alan Minty,  
Suite 201, Baine Johnston Centre  
10 Fort William Place  
St John's, NL, A1C 1K4  
telephone: (709) 754-8162  
fax: (709) 754-8170  
email: [alan.minty@pdip.ca](mailto:alan.minty@pdip.ca)

Principal contact persons for purposes of environmental assessment:

Operations Manager: Mr. Mick Hibbert  
PDI Production Inc.  
Suite 201, Baine Johnston Centre  
10 Fort William Place  
St John's, NL, A1C 1K4  
telephone: (709) 754-8149  
fax: (709) 754-8170  
email: [mick.hibbert@pdip.ca](mailto:mick.hibbert@pdip.ca)

Environment Manager: Ms. Vanessa Pennell Mercer  
PDI Production Inc.  
Suite 201, Baine Johnston Centre  
10 Fort William Place  
St John's, NL, A1C 1K4  
telephone: (709) 754-8165  
fax: (709) 754-8170  
email: [vpennellmercer@pdip.ca](mailto:vpennellmercer@pdip.ca)

### 2.2 Proponent Profile

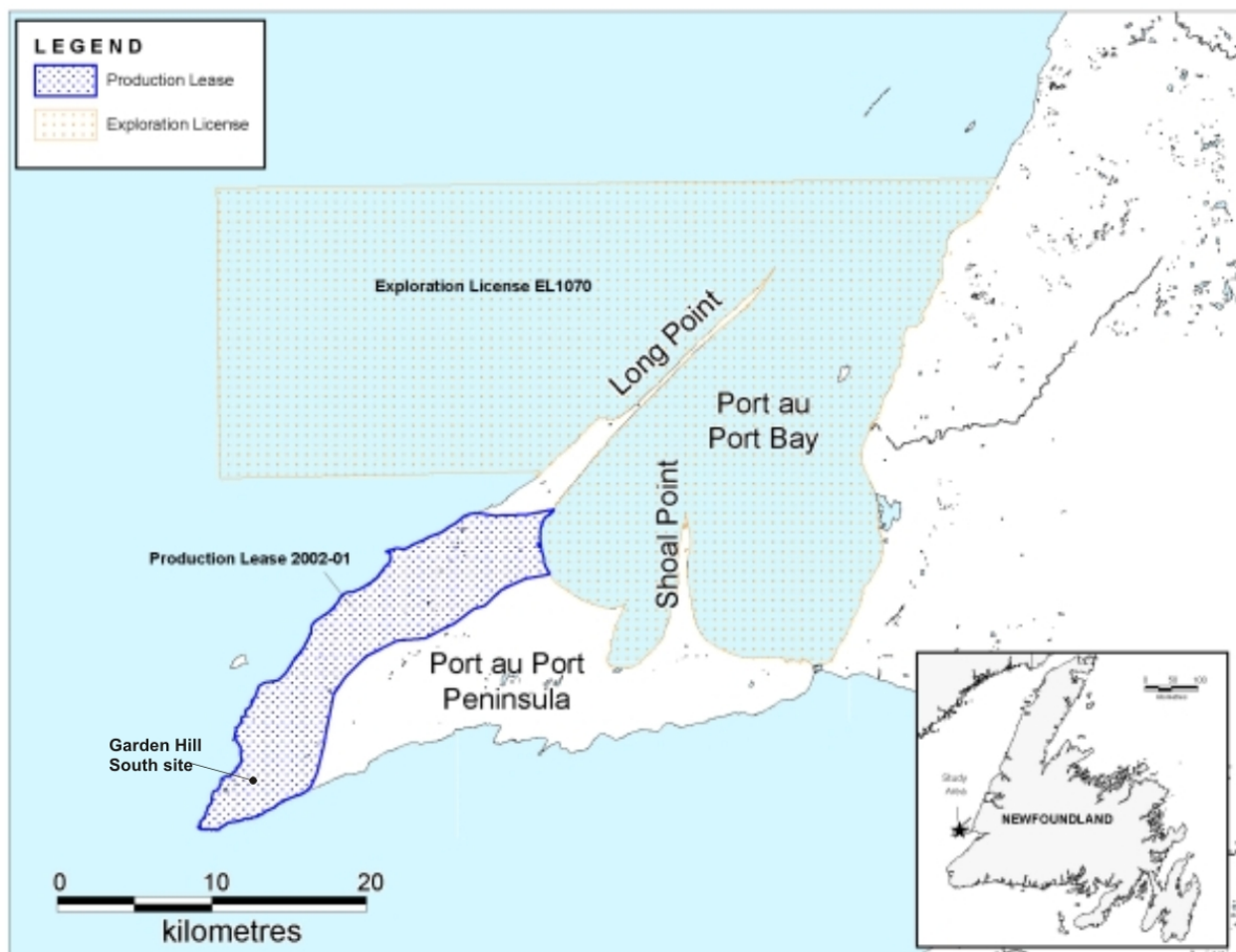
PDI Production Inc. (PDIP), headquartered in St. John's, Newfoundland and Labrador, is an independent oil and gas company committed to the identification, development and operation of value-creating hydrocarbon opportunities. PDIP is the operator of the "Garden Hill Project" in western Newfoundland. PDIP currently holds interests in the following assets on the Port au Port Peninsula (see Figure 2-1):

- Offshore exploration license EL-1070, which includes the “Shoal Point Prospect” and a portion of the “Lourdes Prospect”; and
- Onshore petroleum lease 2002-01, which includes the Garden Hill South (GHS) discovery where PDIP have already re-entered an existing well, and Garden Hill North where existing seismic surveys indicate the potential for commercial hydrocarbon bearing reservoirs.

The company manages detailed design, construction, operations and decommissioning, and provides these services throughout the asset life cycle of an oil and gas project.

PDIP's operations are guided by a number of objectives:

- Investment in local people and resources, wherever possible;
- Management of its operations to the highest safety, design and environmental standards (see Appendix 1 for PDIP's Environmental Policy Statement);
- Development of alliances with leading companies to continually improve efficiency, productivity and decision-making; and
- Continual identification and acquisition of opportunities with the potential to create significant value for shareholders.



**Figure 2-1: PDIP's Interests on the Port au Port Peninsula**

### **3. The Undertaking**

#### **3.1 Nature of the Undertaking**

In 2001, Canadian Imperial Venture Corporation (CIVC) submitted an environmental registration for oil and gas activities at Garden Hill South (referenced by the Department of Environment and Conservation as document #971). The project was subsequently released from further assessment [Ref. 1].

Activities described in CIVC's registration document include:

- Drilling and completing a new well (including procurement of goods and services)
- Producing oil
- Transporting produced oil to market by truck
- Utilizing produced natural gas for heat and energy on site
- Flaring excess natural gas
- Constructing necessary production and process equipment
- Operations and maintenance
- Waste management

PDIP has since taken over operatorship of the GHS oil and gas project and subsequently re-established operations at the site in 2006 with the re-entry of the existing Port au Port #1 - Sidetrack #2 (PAP#1 – ST#2) wellbore.

In addition to the activities outlined above, in order to progress with the development of the site, PDIP require additional storage capacity for produced crude oil on site. To meet this requirement, PDIP plan to construct an aboveground storage tank to hold approximately 10,000 bbl with the potential to construct a second tank with similar capacity. In addition, PDIP plan to construct a properly designed containment berm to house the tank(s).

This Registration Document, which satisfies the requirements of Newfoundland and Labrador's Environmental Assessment Regulations, 2003 under the Environmental Protection Act, is submitted to the Department of Environment and Conservation (DOEC) to initiate the provincial environmental assessment process.

#### **3.2 Rationale for the Undertaking**

PDIP is currently preparing to drill a new horizontal production well (PAP#1 - ST#3) at GHS on the Port au Port Peninsula. After the initial testing phase, the new well is expected to produce over 2,000 bbl of crude oil per day. As described in the original registration document [Ref. 1], the intent is for produced crude to be stored at site and then transported to market (or to a transshipment facility) utilizing road tankers as outlined in the original registration document.

Existing crude storage at site consists of eight temporary above ground storage tanks with a combined capacity of approximately 3,000 bbl. As this is only a little more than a day's production at the anticipated rate, PDIP require additional storage capacity in order to ensure sustained continuous production.

To meet this requirement, PDIP plan to construct an aboveground storage tank with a useable capacity of approximately 10,000 bbl with an appropriately designed berm. The addition of this tank will result in a combined storage capacity of approximately 13,000 bbl (approximately 2.07 million litres). Longer term plans include further development of the site and therefore PDIP may wish to construct a second similarly sized tank. For this reason, the proposed containment berm will be designed to handle 2 x 10,000 bbl storage tanks.



## 4. Description of the Undertaking

### 4.1 Geographic Location

The proposed location for the crude oil storage tank is at the GHS oil and gas site on the Port au Port Peninsula in Western Newfoundland. The site is located within the town boundary of Cape St. George, off Route 460, as shown in Figure 4-1 approximately 60 km west of the town of Stephenville. The geographical coordinates for the Port au Port #1 well, located on the site are as follows (UTM coordinates, NAD 27):

Northing:	5,372,856.003
Easting:	335,490.317



Figure 4-1: Location of Proposed Storage Tank(s) and Berm on Port au Port Peninsula, NL

## 4.2 Physical Features of Existing Site

### 4.2.1 Area to be Affected (Physical Description)

The GHS site has an area of about 2.7 ha and is composed of broken class A aggregate that has been flattened into a road-like surface. The site boundaries are surrounded by a chain link fence that is 2.4 m high, with 2 main access gates on the west side of the site (near the road) and an emergency exit located on each of the west and east sides. The site is accessed from Route 460, the main highway connecting the town of Cape St. George to Mainland, Three Rock Cove and Lourdes.

Currently the site contains two water wells (only one in service), a concrete drill pad, the wellhead for the PAP#1 well, as well as a number of temporary site buildings and eight temporary storage tanks located inside a containment berm. Photographs of the existing site are shown in Figure 4-2, which includes details of site infrastructure, and in Figure 4-3.

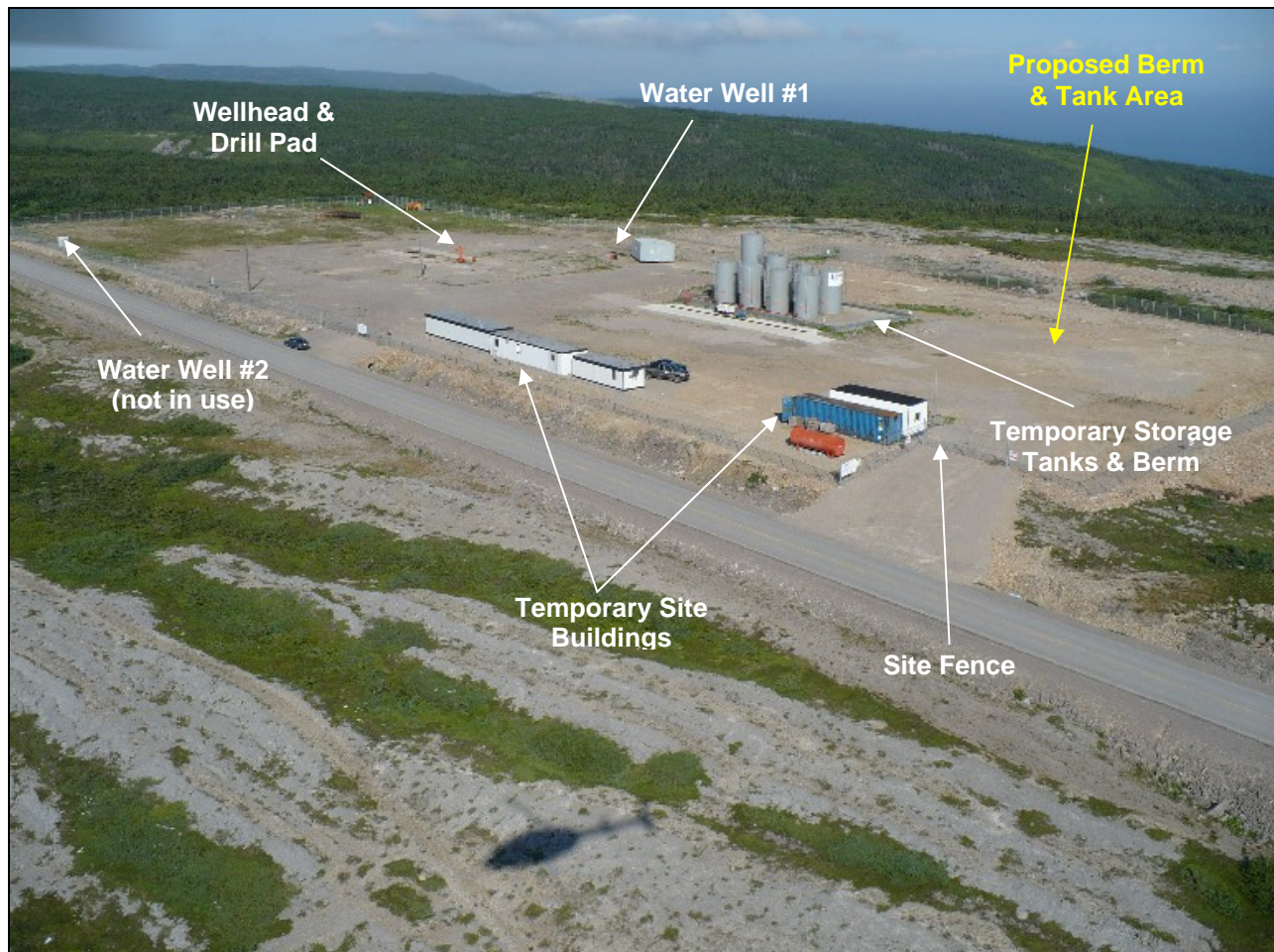


Figure 4-2: GHS Site (Dated August 2007)





**Figure 4-3: GHS Site (Dated August 2007)**

#### 4.2.2 Geology

Bedrock at the Garden Hill site consists of competent carbonates of the Lower Ordovician (approximately 470-490 Ma) St. George Group. In this region, surface exposures of the St. George Group consist of an approximately 500 m thick succession of thick-bedded shallow marine limestone and dolomite [Ref. 2].

#### 4.2.3 Climate

The area's climate is governed by the movement of low and high pressure regimes within the prevailing westerly flow of the upper atmosphere. This flow is induced by temperature gradients that span from tropical to polar regions, and westerlies are strongest during the winter when these gradients are most intense.

In winter, the peninsula is affected by cold arctic air flowing from the Quebec North Shore as it crosses the relatively warm waters of the Gulf of St. Lawrence (prior to the formation of ice). The cold air picks up heat and moisture from these waters resulting in streamers of snow showers that hit the west coast of Newfoundland.

Intense low-pressure systems frequently slow down or stall under an upper air low-pressure centre as they move through Newfoundland. Depending on the position, overall intensity, and size of the system, this may result in an extended period of unchanging weather conditions that may range from relatively benign to heavy.

By summer, the main storm tracks have moved further north resulting in less frequent and weaker low-pressure systems. Increasing solar radiation throughout the spring causes the atmosphere to warm and the north-south temperature contrast to decrease. This lowers the kinetic energy of the westerly flow aloft and decreases the potential energy available for storm development.

With low-pressure systems normally passing to the north of the region in combination with the northwest shoulder of the sub-tropical high to the south, the prevailing flow across the Gulf of St. Lawrence is from the south to southwest during the summer season. Wind speed is lower during the summer and gale or storm force winds are relatively infrequent. There is also a corresponding decrease in significant wave height.

The prevailing south to south-westerly flow during late spring and early summer tends to be moist and relatively warmer than the underlying waters of the Gulf. Cooling from below coupled with mixing of air in the near-surface layer often produces advection fog, which can persist for days at a time. The incidence of advection fog and the frequency of poor visibility are normally highest during July.

Winds in the area occur most often from the west to northwest from November to March. In April, winds most often occur from the southwest to northwest. South to southwest winds dominate from May to August. Southwest to west winds are predominant in September and October. The strongest 1-h sustained winds in the area (approximately 25 m/s) occur in December and January. Lowest maximum wind speeds are in July [Ref. 1].

#### **4.3 Biological Features of Existing Site**

GHS is an existing industrial site as described in Section 4.2.1 and no vegetation is present on the site. There are no nearby water bodies and no potential for fish or fish habitat. There is no sensitive wildlife habitat in the area and the site is completely surrounded by a fence to prevent wildlife from entering the site.

#### **4.4 Physical Features of Undertaking**

The proposed undertaking will result in the construction of an aboveground storage tank and containment berm at GHS, in a vacant corner of the site as shown in Figure 4-2 above. A second tank of similar size may be constructed in this berm at a later date.

##### Storage Tank(s)

The design of the proposed storage tank is not complete; however, it will comply with *Newfoundland and Labrador Storage and Handling of Gasoline and Associated Products (GAP) Regulations, 2003* under the *Environmental Protection Act* which require that it is designed and constructed according to American Petroleum Institute Standard 650 (API 650). The useable capacity will be 10,000 bbl and the approximate diameter and height will be 14 m and 11 m respectively.

The design and construction of the tank will also comply with the *National Fire Code (NFC)*, as well as other applicable standards and regulations. In addition, the tank will be registered with the Department of Environment and Conservation as required under the *GAP Regulations*.

## Berm

The proposed berm will be constructed in accordance with the *GAP Regulations*, which requires that:

*"the bermed area shall retain not less than 110% of the capacity of the largest tank or 100% of the capacity of the largest tank plus 10% of the aggregate capacity of all the other tanks, whichever is greater if the bermed area contains more than one storage tank".*

Therefore, to account for PDIP's longer term plans which may involve the addition of a second 10,000 bbl storage tank (total 20,000 bbl), the effective capacity of the berm will be a minimum of 11,000 bbl.

In addition, it will be ensured that the berm will meet the permeability requirements of the *GAP Regulations* which state that:

*"the base and walls of the berm must have an impermeable lining of clay, concrete, solid masonry or other material designed, constructed and maintained to be liquid tight to a permeability of 25 litres per (square) metre per day", and that*

*"a method for eliminating water accumulations inside the berm must be incorporated in its design and construction".*

To meet the above requirements, it is planned that the proposed berm will be earthen with a man-made impermeable (geomembrane) liner. The berm will contain a valve(s) that can be opened to drain water but that will remain closed during normal operations in order to meet the requirements of the *NFC*. It will also be ensured that the design and construction of the berm will meet all other requirements of the *NFC*, as well as other relevant codes and regulations. The footprint of the berm will be left to the discretion of the engineer in charge of detailed design, however it must account for the required volume, spacing requirements under the *NFC*, and site restrictions. Space restrictions at site indicate that the footprint can not be greater than about 3250 m<sup>2</sup>. An illustration of the berm and tanks, accounting for spacing requirements of the *NFC* is shown in Figure 4-4 below.

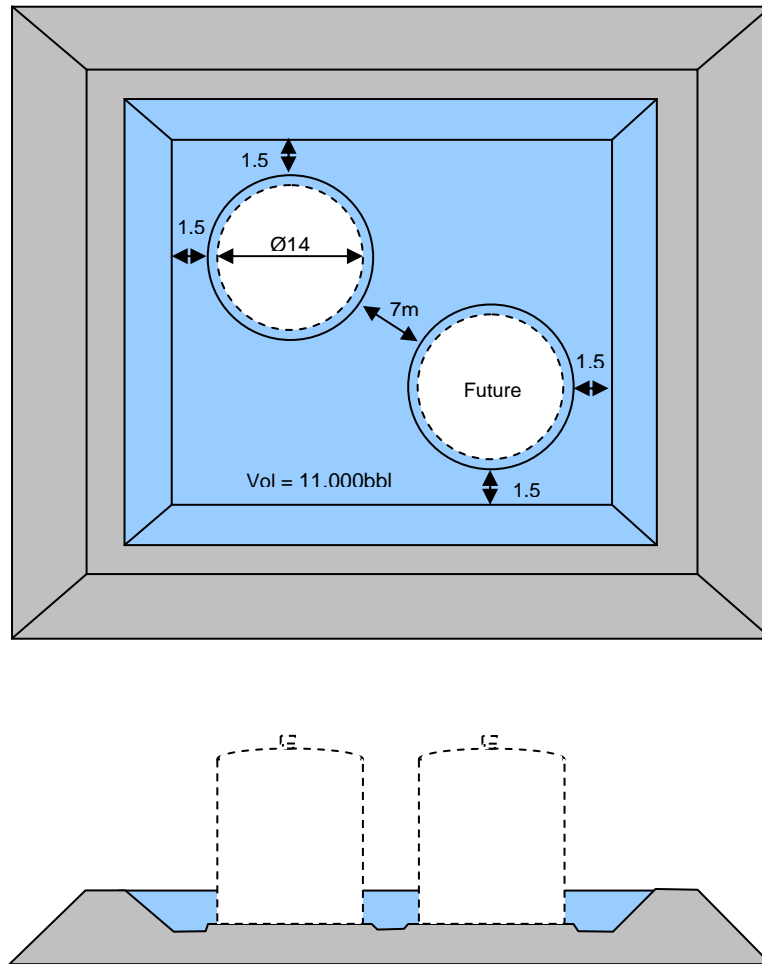


Figure 4-4: Containment Berm Schematic

#### 4.5 Construction

There are two main construction phases associated with this project. The first phase involves the civil works associated with the construction of the berm including grading and levelling of the land and construction of the earthen berm including installation of the man-made geomembrane liner. The second phase involves constructing and assembling the tank inside the berm at site. (Note that tank fabrication will occur offsite at the chosen contractor's shop prior to delivery).

It is expected that construction activities will utilize heavy equipment typically associated with construction activities.

#### 4.6 Operation

Operation of the proposed crude storage tank will be in compliance with the *GAP Regulations* and the *NFC*. Operations will consist of loading the tank with crude oil produced from the GHS site and subsequently unloading the tank into road tankers for oil export to market. Regular testing (in line with the *GAP Regulations*) will occur to ensure that there is no spillage from the tank.

Berm operation will consist of draining any collected water (i.e. rainfall) through the berm drainage system once it has been visually confirmed that no oil is present (as per PDIP's oil spill contingency plan). Snow will be removed from the berm as required.

#### **4.7 Potential Pollution Sources**

##### **4.7.1 Construction Phase**

During the construction phase of the project, pollution sources are expected to be comparable to those of any other construction project and will be managed in a similar manner. Pollution sources are expected to be limited to the following:

- Noise - A minimal amount of noise associated with construction activities and equipment is expected during working hours. Noise sources and levels are not expected to be significant.
- Emissions - Sources of emissions during construction include the exhaust from vehicles and other equipment to be utilized at site. In addition, a small amount of emissions will be produced during welding.
- Waste – Solid waste generated from construction activities will include scrap metal, waste stone and concrete, as well as food wastes, plastics and paper products. Solid waste will be reused or recycled where appropriate. Other solid waste will be stored at site for disposal by a local contractor.
- Effluents – There are no major effluents associated with the construction phase expected sewage which will be handled by the existing sewage system at site.

##### **4.7.2 Operation**

The main potential source of pollution during the operation of the storage tank would be from spilled oil, however as a secondary containment berm will also be installed any spilled oil would likely not reach the surrounding environment. In the event that there is a spill of oil, PDIP's oil spill contingency plan is to be followed (see Appendix 2).

In addition, it is expected that there will be a small amount of air emissions from the tank vents which are open to atmosphere.

#### **4.8 Potential Resource Conflicts**

There are no resource conflicts anticipated as there is no sensitive wildlife, vegetation, or water bodies (including fish and fish habitat) in the area. The area is already developed as an industrial site and the site is fully fenced. All proposed project activities will occur within the developed site boundaries.

#### **4.9 Occupations**

The proponent will engage the services of local contractors and skilled workers to the greatest extent possible, and is committed to the principles of employment equity and maximum economic benefit to local communities. A statement of PDIP's Human Resources Policy is included in Appendix 3.

The estimated numbers and types of occupations<sup>1</sup> created by the proposed project are provided in Table 4-1.

---

<sup>1</sup> As per the National Occupational Classification 2006

**Table 4-1: Breakdown of Occupations Expected for the Undertaking**

Activity	Occupation	NOC Code	Approximate Number of People
Project Coordination & Support (for all work below)	Mechanical Engineering Technician	2232	1
	Mechanical Engineer	2132	1
	Environmental Engineer	2131	1
	Administrative Assistants	1411	3
	GHS Site Management	8615	2
Permits & Permissions	Mechanical Engineering Technician	2232	1
	Environmental Engineer	2131	1
Engineering & Design	Mechanical Engineers	2132	2
	Civil Engineer	2131	1
	Drafters	2253	2
Fabrication & Construction	Construction Manager	0711	1
	Mechanical Engineer	2132	1
	Structural Engineer	2131	1
	Quality Assurance Engineer	2141	1
	Crane Operator	7371	1
	Labourers	7611	4
	Welder	7263	7
	Heavy Equipment Operators	7421	2
Testing & Inspection	Tank Painters	9496	4
	Mechanical Engineer	2132	1

## 5. Approval of the Undertaking

Approvals, permits and authorizations required for this proposed undertaking are outlined in Table 5-1 below.

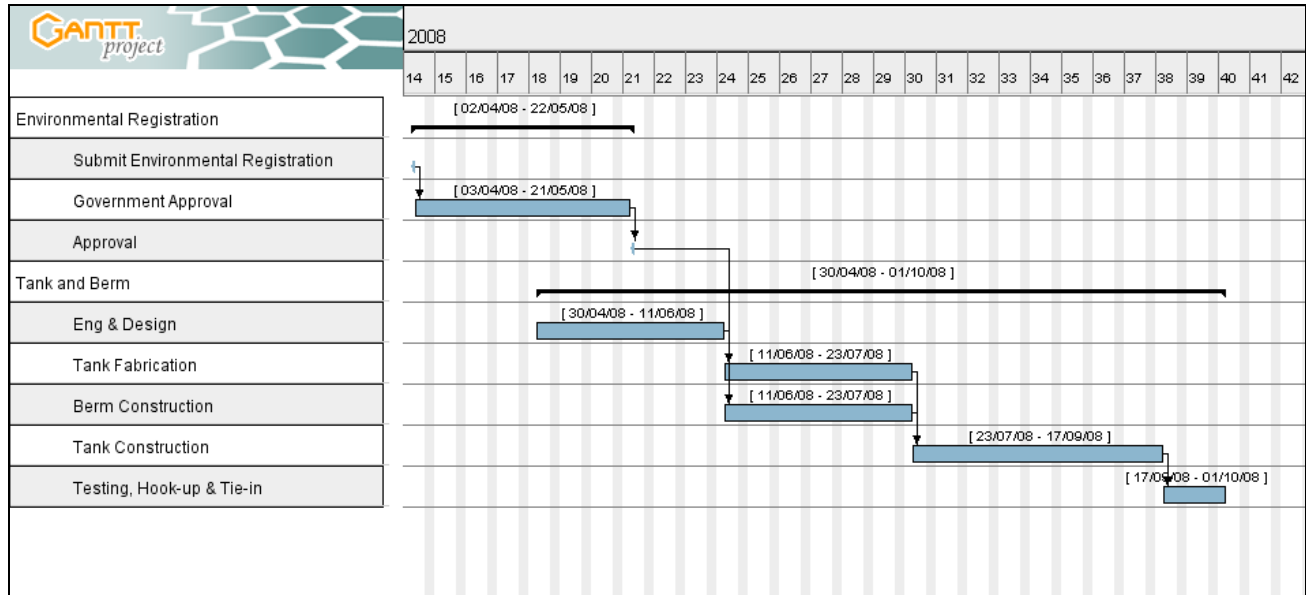
**Table 5-1: Required Permits and Permissions for the Undertaking**

Permit, Approval, Authorization Required	Applicable Legislation	Relevant Activity	Responsible Agency
<b>Provincial Government</b>			
Authorization to Proceed to Permitting (environmental assessment release)	<i>Environmental Protection Act, Environmental Assessment Regulations</i>	Proceed to Permitting	Department of Environment and Conservation
Storage Tank System Registration	Gasoline and Associated Products Regulations	Construction of Storage Tank	Department of Government Services (on behalf of Department of Environment and Conservation)
<b>Municipal Government</b>			
Building Permit		Construction of Tank & Berm	Town of Cape St. George



## 6. Schedule

Civil works associated with the construction of the berm are tentatively scheduled to commence in June 2008 and will last approximately 6 weeks. The construction of the tank will follow in August 2008 and will last approximately 8 weeks.



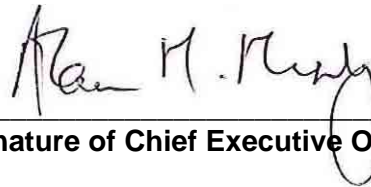
**Figure 6-1: Tentative Schedule for the Undertaking**

## 7. Funding

The cost associated with the design and construction of the berm with a single tank (and associated equipment) is expected to be in the range of \$600,000. The addition of a second tank will increase the total cost to about \$950,000. No grants, loans or capital funds from government agencies have been requested.

11 April 2008

Date



Signature of Chief Executive Officer

## **8. References**

1. Canadian Imperial Venture Corporation, 2001, Garden Hill Drilling and Production - Stage 1 Environmental Registration. Government of Newfoundland Department of Environment and Conservation Registration Reference #971. PDIP Ref. GHS-0001-TIP-0028-OTH.
2. Knight, I. and James, N.P., 1987, The stratigraphy of the Lower Ordovician St. George Group, western Newfoundland: the interaction between eustasy and tectonics, Canadian Journal of Earth Sciences, v. 24, p. 1927-1951.

## **APPENDIX 1:**

### **PDIP's Environmental Policy Statement**

## **Appendix 1: PDIP's Environmental Policy Statement**

### **Mission Statement**

To provide operating services for the development of hydrocarbon assets, working to the highest design, safety and environmental standards and investing in local people to deliver returns.

### **Environmental Statement**

PDIP are environmentally responsible corporate citizens and hold personal safety, resource conservation, and protection of the environment in high regard. PDIP endeavour to undertake operations in a manner that minimizes interaction with the surrounding natural environment. Their facilities, equipment, and operating practices meet or exceed all applicable regulations and codes, and conform to good oilfield practice, and all contractors are required to adhere to the same principles.

PDIP make every effort to minimize waste produced and always ensure that any waste produced while carrying out activities is disposed of in accordance with relevant regulations. PDIP aim to reuse and recycle wherever possible and ensure that domestic waste generated during activities is stored and removed by an appropriate waste management contractor. Hazardous wastes are removed from project areas using appropriate waste management contractors and are treated and disposed of in accordance with relevant regulations.

It is PDIP's aim to achieve zero spills. In order to meet this objective, PDIP ensure that only qualified personnel operate equipment at site, by employing suitably qualified personnel and providing additional training whenever required. As well, to ensure the long life of equipment and infrastructure, regular maintenance and servicing are carried out to help reduce the risk of spills and leaks. PDIP also recognise, however, that in some cases, despite using the best available preventative measures, a spill may occur. For this reason, PDIP have also developed a spill contingency plan describing the response measures to undertake in the event of a release of oil or other pollutant to the environment.

## **APPENDIX 2:**

### **Contingency for Event of a Spill of Oil or Other Pollutant**

This document is confidential. Neither the whole nor any part of this document may be disclosed to any third party without the prior written consent of PDI Production (PDIP) Inc. All rights reserved. Neither the whole nor any part of this document may be reproduced, stored in any retrieval system or transmitted in any form or by any means (electronic, mechanical, reprographic, recording or otherwise) without the prior written consent of PDI Production Inc, the copyright owner.



## Procedure Cover Sheet

<b>Document No:</b>	GHS-0001-ECS-2-PRO-0005
<b>Title:</b>	Contingency Plan for Event of a Spill of Oil or Other Pollutant
<b>Project Name:</b>	Port au Port Project
<b>PDIP Ref:</b>	GHS/0001
<b>Pages (including cover):</b>	19

## Record of Revision

Rev. No.	Date	Revision	Prepared	Reviewed	Approved
0	2 <sup>nd</sup> Nov 2006		Vanessa Pennell Mercer	Alison Pegram	Damian Minty
1	13 <sup>th</sup> Nov 2006	Incorporating comments received from DNR and DOEC.	Alison Pegram	Vanessa Pennell Mercer	Damian Minty
2	22 <sup>nd</sup> Nov 2006	Incorporating additional information required under GAP regulations.	Alison Pegram	Vanessa Pennell Mercer	Damian Minty
3	7 <sup>th</sup> Dec 2006	Added Appendix A	Vanessa Pennell Mercer	Kelly Boone	Alison Pegram
4	20 <sup>th</sup> Nov 2007	General update for drilling of PAP#1 ST#3.	B Saunders	A Pegram	M Hibbert

# Contents

Procedure Cover Sheet	i
Contents	ii
List of Appendices	iv
<b>1. INTRODUCTION</b>	<b>1</b>
<b>2. DEFINITIONS</b>	<b>1</b>
2.1 Category 1 Incident	1
2.2 Category 2 Emergency	2
2.3 Leak/Leakage	2
2.4 Spill	2
<b>3. EMERGENCY MANAGEMENT ROLES</b>	<b>3</b>
3.1 Site HSE Designate	3
3.2 PDIP Operations Manager	3
<b>4. OIL SPILL AND POLLUTION CAUSES AND PREVENTION MEASURES</b>	<b>3</b>
4.1 Causes	3
4.2 Prevention Measures	4
4.3 Remediation Equipment	5
<b>5. SPILL RESPONSE PROCEDURES</b>	<b>5</b>
5.1 General	5
5.2 Actions by Personnel Noticing a Spill	6
5.3 Actions by the HSE Designate	6
5.4 Actions by the Operations Manager	7
<b>6. REMEDIATION MEASURES</b>	<b>8</b>
6.1 Contained Spills	8

<b>6.2</b>	<b>Uncontained Spills</b>	<b>8</b>
<b>7.</b>	<b>REPORTING OF RELEASES</b>	<b>9</b>
<b>8.</b>	<b>SUMMARY OF RESPONSIBILITIES</b>	<b>10</b>
<b>8.1</b>	<b>HSE Designate</b>	<b>10</b>
<b>8.2</b>	<b>Operations Manager</b>	<b>11</b>
<b>9.</b>	<b>REFERENCES</b>	<b>11</b>



## List of Appendices

**Appendix A:      Contact Details for Heavy Equipment Operators, Environmental Consultants  
and Other Oil Spill Response Support**

## 1. Introduction

PDI Production Inc. (PDIP) is committed to operating in an environmentally responsible manner and endeavours to undertake operations that minimise interaction with the surrounding natural environment. PDIP, therefore, aims to achieve zero spills. However, PDIP also recognises that in some cases, despite using the best available preventative measures, a spill could occur.

This contingency plan describes actions to be taken in the event of a spill of oil or other pollutant at the Garden Hill South (GHS) site. This plan is supplementary to PDIP's GHS Emergency Management Plan (EMP) (Ref. 1) and is to be read in conjunction with the EMP.

This plan considers PDIP's response to oil spills primarily in terms of mitigating risks to the environment. Mitigation of the risk to personnel from a hydrocarbon release is addressed in a separate GHS contingency plan (Ref. 2).

This plan takes account of:

- PDIP's oil spill response arrangements and planning.
- Requirements with regard to reporting of oil spills to the Department of Natural Resources.
- Requirements of the Department of Environment and Conservation with regard to the reporting and remediation of oil spills.

The purpose of this plan is to:

- Detail measures provided to prevent and remediate releases of oil or other pollutants at the GHS site.
- Provide an unambiguous list of actions to be taken by PDIP and its contractors in the event of a release.
- Clarify communication lines and reporting requirements regarding a release of oil or other pollutant resulting from operations associated with the GHS site.
- Detail responsibilities of individuals in relation to the response to and reporting, if required, of releases.

## 2. Definitions

### 2.1 Category 1 Incident

A Category 1 Incident is any incident (or combination of incidents) that imposes a threat to personnel, the environment or facilities, but that can be comfortably managed with the resources available on-site. A Category 1 Incident can be characterised by all of the following conditions:

- Either there are no casualties, or there is a single casualty that is not serious. (For example, an injury that can be treated on-site or by a doctor at a convenient time.)
- There is no significant pollution. (For example, an oil spill that remains within a spill containment area.)
- There is no fire (or explosion) involving hydrocarbons, and no potential to escalate to a hydrocarbon fire (or explosion).
- There is no requirement to involve local authorities.
- There is no significant damage to equipment.

## 2.2 Category 2 Emergency

A Category 2 Emergency is any incident, or combination of incidents, that imposes a threat to personnel, the environment or facilities, and that requires off-site support, typically from a PDIP Emergency Management Support Team (EMST) and/or from external emergency services. A Category 2 Emergency can be characterised by any of the following conditions:

- There are multiple casualties.
- There is a single casualty that involves serious injury. (For example, an injury that requires treatment in hospital.)
- There is a well control incident or loss of well control.
- There is significant pollution. (For example, an oil spill that occurs outside containment areas.)
- There is a fire (or explosion) involving hydrocarbons, or with potential to escalate to a hydrocarbon fire (or explosion).
- There is a requirement to involve local authorities.
- There is significant damage to equipment.

## 2.3 Leak/Leakage

Newfoundland and Labrador Regulations 58/03 (Storage and Handling of Gasoline and Associated Products Regulations, 2003) (Ref. 3) define a leak as 'a discharge of gasoline or associated products from a storage tank system, pipeline, tank vessel, tank car or tank vehicle, other than through the usual function for which the storage tank system or pipeline was designed'.

## 2.4 Spill

Newfoundland and Labrador Regulations 58/03 (Storage and Handling of Gasoline and Associated Products Regulations, 2003) (Ref. 3) define a spill as 'a loss of gasoline or associated products in excess of 70 litres from a storage tank system, pipeline, tank vessel or vehicle onto or into the soil or water'.

### **3. Emergency Management Roles**

#### **3.1 Site HSE Designate**

During operations at the GHS site, there will always be someone on-site nominated to be responsible for HSE issues (termed the 'HSE Designate'). This will usually be the PDIP GHS Site Superintendent, if on site, or the PDIP GHS Site Supervisor. However, when both the PDIP GHS Site Superintendent and the PDIP GHS Site Supervisor are absent, a suitably qualified person from PDIP's prime contractor's team will be assigned the position of HSE Designate.

In the event that the HSE Designate is a PDIP HSE Designate and is incapacitated as a result of an incident, responsibilities of HSE Designate will be assumed by the HSE representative of PDIP's prime contractor. If the HSE Designate is the site HSE representative of PDIP's prime contractor (because the PDIP GHS Site Superintendent and GHS Site Supervisor are off-site) and is incapacitated because of the incident, responsibilities of HSE Designate will be assumed by the GHS Site Superintendent (who lives locally and is on 24-hour call).

#### **3.2 PDIP Operations Manager**

The PDIP Operations Manager is based at PDIP's offices in St. John's and provides support to the site HSE Designate. In particular, in the event of a Category 2 Emergency, the PDIP Operations Manager will, if necessary, mobilize an EMST.

### **4. Oil Spill and Pollution Causes and Prevention Measures**

#### **4.1 Causes**

Oil or other pollutants could be spilled or released at the GHS site as a result of accidents, equipment failures or procedural irregularities associated with surface or subsurface equipment containing oil or other hazardous materials. Potential incidents that could give rise to a release include, but are not limited to, the following:

- Process equipment failures.
- Loss of well control.
- Operator errors.
- Maintenance errors.
- Blocked drains from containment sumps.
- Failure of on-site oil containment facilities (e.g. break in a berm)
- Accidents associated with loading of road tankers at site.
- Other accidents associated with road tankers on site.
- Storage tank failures (e.g. rupture).

## 4.2 Prevention Measures

PDIP take all reasonable measures to prevent spills of oil or other pollutants. A number of pollution prevention measures have been developed and incorporated into the site layout and plant design, in order to minimize the potential for environmental impact in the event of spills of oil or other pollutants.

### 4.2.1 Production Equipment

Pressure vessels to be utilised on site during well test and early production operations are contained units, which will minimise the potential for a release of hydrocarbons. In addition, the contractor providing production equipment and personnel on site will utilise drip trays under the production pipes and provide pails under sample points to collect any oil and prevent spillage.

### 4.2.2 Loading Pan

Government of Newfoundland Regulations require oil loading facilities to be designed to mitigate oil spills during loading operations.

Therefore, the GHS tanker loading facility includes a “loading pan” that incorporates a sump positioned in a catchment area located between the loading arms and tanker parking position in order to be directly under the most likely cause of a spill. To be effective at mitigating spills from loading operations, the catchment area (the area that will drain under gravity to a sump) encloses both the loading arms and the road tanker.

The sump has been designed with sufficient capacity to contain oil from a worst-case spill (taken to be three times the volume transferred to the tanker in one minute).

### 4.2.3 Storage Tank Berm

The GHS tank farm consists of eight storage tanks (with capacities of between 336 and 538bbl, and a total capacity of approximately 3220bbl), located inside a berm. The berm is designed to provide containment of liquids that leak from the storage tanks.

Regulations require the berm to provide containment for the greater of (Ref. 3):

- 110% of the capacity of the largest tank, or
- 100% of the capacity of the largest tank, plus 10% of the aggregate capacity of all the other tanks.

In addition, the base and walls of the berm are required to be liquid tight to a permeability of 25 litres/metre<sup>2</sup>/day (Ref. 3).

Based on the requirements defined in the regulations, the capacity of the berm at GHS is required to be 807bbl.

The GHS berm is 32m in length, 16.2m wide and 0.8m deep. It therefore has a volume of 414.7m<sup>3</sup>. Because some of the volume of the berm is occupied by the base (the lower 0.8m) of the eight tanks, however, its effective capacity is less than this.

The circumferences of the tanks at GHS vary slightly, but the tanks are all 11.5m or less in circumference. Based on this, the effective capacity ( $V_{BE}$ ) of the berm is conservatively calculated as follows:

$$V_{BE} = 414.7 - \pi \left( \frac{11.5}{2\pi} \right)^2 * 0.8 * 8$$

$$V_{BE} = 414.7m^3 - 67.3m^3$$

$$V_{BE} = 347m^3$$

The capacity of the berm at GHS is approximately  $347m^3$ , or 2180 bbl. Therefore, the capacity of the berm is significantly higher than the required capacity (807bbl).

### **4.3 Remediation Equipment**

Two spill kits are provided at the GHS site, one adjacent to the main surface equipment and one on the tanker loading pan. Each kit consists of a 45 imperial gallon, 16-gauge steel drum, complete with full removal cover and two closing rings, containing:

- One 44 litre bag of Oclansorb
- 50 Hi-Point pads 2/8"x17"x19"
- One spark resistant poly-shovel
- Five 4-mil yellow heavy duty disposal bags 30" x 48" printed "Caution Waste Material"
- Five 4" x 4' Sorb Sox
- Five 4" x 8' Sorb Sox
- One pair of chemical resistant gloves

## **5. Spill Response Procedures**

### **5.1 General**

If there is a spill, the priority is to ensure the safety of personnel. Therefore, any response strategy must only be undertaken if it is safe to do so and provided the appropriate precautions are taken. This plan describes PDIP's response to oil spills primarily in terms of mitigating the environmental consequences of a hydrocarbon release. Mitigation of the risk to personnel from a hydrocarbon release is addressed in Ref. 2.

A spill that has not resulted in significant pollution is classed as a Category 1 Incident. A spill that has resulted in significant pollution (such as an oil spill that occurs outside containment areas) is classed as a Category 2 Emergency.

The objective of responding to a Category 1 spill is to prevent it developing into a Category 2 Emergency. Also, in case it does, nevertheless, develop into a Category 2 Emergency, to reduce the resultant risk to the environment.

The immediate response to a spill of pollutant at the GHS site will be by site personnel and the site HSE Designate will be responsible for managing the incident or emergency. If the spill becomes a Category 2 Emergency, however, additional support may be required from a professional emergency response organization, the emergency services or an EMST (or all). Sections 5.2 and 5.3 discuss the immediate response to a spill at the GHS site. Section 5.4 describes the responsibilities of the PDIP Operations Manager. Spill clean-up measures are considered in Section 6.

## 5.2 Actions by Personnel Noticing a Spill

Any person on-site discovering a spill should immediately consider the following actions:

- Taking appropriate actions to ensure the safety of personnel.
- If safe to do so, taking initial actions to stop, or limit the size of, the spill, giving due consideration to the fact the spill may be toxic, flammable and/or corrosive.
- Confirming, as soon as possible, that the HSE Designate is aware of the situation and providing, if possible, information on the source of the spill, fluid released and approximate spill size.

## 5.3 Actions by the HSE Designate

Once aware that a spill of pollutant has occurred, the HSE designate should consider taking the following actions:

- Assessing the situation and determining the source, size and nature of the spill.
- Ensuring safety of all personnel at the GHS site, including those who will be exposed to the immediate effects of the incident, as well as personnel exposed to the spill during any mitigation and clean-up actions. Consideration should be given to the fact that the spill may be toxic, flammable and/or corrosive and therefore:
  - Appropriate personal protective equipment (PPE) should be provided and worn.
  - Additional precautions may be required, e.g. standing upwind of a gaseous release.
- Taking immediate action, if it is safe to do so and has not already been achieved, to isolate the release. If necessary, this may involve safely suspending activities at site, which may include:
  - Suspension of drilling activities.
  - Shut down of the well and well testing activities.
  - Termination of tanker loading operations.
- Assessing whether the spill is a Category 1 Incident or a Category 2 Emergency and informing the Operations Manager. Contact details are as follows:

Mick Hibbert (Primary Contact):	Office (709) 754 8149
	Fax (709) 754 8170

Cell (709) 691 0539

Home (709) 722 5398

Brian Hickey (1st Alternative):

Office (709) 754 8154

Fax (709) 754 8170

Cell (709) 689 0297

Home (709) 739 7260

Ali Chaisson (2<sup>nd</sup> Alternative)

Office (709) 754 8168

Fax (709) 754 8170

Cell (709) 737 6337

Home (709) 722 6337

- Contacting the emergency services, if required, using one or more of the following telephone numbers :

- Fire Service (Lourdes) (709) 642-2222
- Fire Service (Stephenville) (709) 643-2176
- Fire Service (Stephenville Airport) (709) 643-8437 or 8438
- RCMP (Stephenville) (709) 643-2118

Note that there is a requirement to notify the authorities in the event of a leak or a spill (see Section 7).

- Ensuring that appropriate remediation measures (described in Section 6) are undertaken.

Once appropriate remediation measures have been taken, the HSE Designate should update the Emergency Response Log (noting the time, date, approximate volume of substance spilled, etc).

#### 5.4 Actions by the Operations Manager

Once the PDIP Operations Manager is aware that a spill has occurred, they should consider taking the following actions in the event of a Category 2 Emergency:

- Mobilizing the EMST.
- In the case of a surface release of well fluids due to loss of well control, any actions required of the PDIP Operations Manager by the GHS Contingency Plan for Well Control Incident and Loss of Well Control (Ref. 5).
- Any actions required of the PDIP Operations Manager by any other relevant GHS contingency plans.
- Providing a press release via appropriate channels.
- Notifying the relevant authorities such as the Department of Natural Resources. (There may be an obligation to notify the Government in the event of a leak or a spill, see Section 7).
- Ensuring that a detailed spill report is prepared (see Section 7) and filed at PDIP headquarters along with other relevant information.



- Ensuring that any reporting requirements relating to insurance are fulfilled in a timely manner.

## **6. Remediation Measures**

Specific remediation measures required in the event of a release are largely dependent upon whether the release is contained (by oil spill prevention measures provided, and therefore does not contact soil or water) or uncontained. Appropriate measures for each type of release are described here.

### **6.1 Contained Spills**

Spill containment measures are provided on site, where practicable, in areas where there is potential for a significant release (e.g. tanker loading pan and the berm surrounding the tank farm).

The first response for small spills in these areas should be the use of spill kits provided on-site. Contaminated liquid will be stored on-site in a sealed container until there is sufficient waste to warrant disposal by an appropriate waste management contractor.

For larger spills, waste management contractors should be mobilized immediately to pump out the spilled fluids and clean the affected area.

Contact details for PDIP's waste management contractors are as follows:

Pardy's Waste Management and Industrial Services  
P.O. Box 285  
Pasadena, NL  
A0L 1K0  
Contact: Derek Pardy  
Office Tel: 709-686-2013  
Cell: 709-632-4672  
Fax: 709-686-2512

Crosbie Industrial Services Ltd.  
P.O. 8338  
St. John's, NL  
A1B 3N7  
Contact: Steve Power  
Office Tel: 709-722-8212  
Cell: 709-685-1315  
Fax: 709-739-0602

### **6.2 Uncontained Spills**

For spills occurring in locations for which spill containment measures are not provided, or in the unlikely event that the containment measures are not adequate to contain the spill, the HSE Designate is responsible for the cleanup operation, but will also receive support, as required, from the PDIP Operations Manager.

Actions that should be considered, and taken where appropriate, include:

- Determining extent of contamination.
- Determining whether or not a spill kit is appropriate for cleanup.
- If a spill kit is not appropriate, arranging for removal of contaminated soil using appropriate measures based on the size of the spill and type of soil (i.e. manual or mechanical measures). A list of heavy equipment operators who may be utilised in clean up operations if mechanical measures are required can be found in Appendix A.
- Initiating a soil sampling program, where appropriate, to ensure that, following clean-up, the hydrocarbon concentration in soil in the affected area is in compliance with relevant regulations, guidelines or standards. If hydrocarbon levels are still too high, additional soil should be removed and the sampling program repeated.
- In the case of severe spills, a ground water monitoring program may be required.

Clean-up, as detailed above, is required for any hydrocarbon contamination of soil or water, including incidental surface staining.

Remediation of any release into the environment must also comply with the requirements of the Department of Environment and Conservation's Guidance Document "Management of Impacted Sites". This includes a requirement, for any significant release or any release with the potential to impact drinking water, ecological habitat or indoor air or to migrate off-site, to employ an Environmental Consultant to oversee remediation activities. Contact information for various consultants can be found in Appendix A.

## 7. Reporting of Releases

Government of Newfoundland Regulations (Ref. 3) define:

- A **leak/leakage** as 'a discharge of gasoline or associated products from a storage tank system, pipeline, tank vessel, tank car or tank vehicle, other than through the usual function for which the storage tank system or pipeline was designed'.
- A **spill** as 'a loss of gasoline or associated products in excess of 70 litres from a storage tank system, pipeline, tank vessel or vehicle onto or into the soil or water'.

The Ref. 3 regulations require that the government be notified of any leaks and of releases (spills) greater than 70 litres. In such cases, the PDIP Operations Manager shall be responsible for notifying the following:

- Environmental Emergency Response  
Telephone: (800) 563 9089 (24hr)/(709) 772 2083 (alternative)
- Environmental Protection Officer, Government Service Centre, Corner Brook  
Telephone: (709) 637 2448/2449  
Fax: (709) 637 2681

- Pollution Prevention, Department of Environment and Conservation  
Telephone: (709) 729 2556/2555  
Fax: (709) 729 6969

In addition, for releases greater than 70 litres, a report should be prepared under the direction of the PDIP Operations Manager that contains the following information:

- a. Procedures taken to notify the Government and copies of all information that was forwarded.
- b. The type, size, location and cause of the spill.
- c. Details of the method(s) used to contain the spill (if appropriate).
- d. Details of remediation undertaken.
- e. Details of the involvement of the Emergency Management Support Team (Ref. 1), if applicable.
- f. Any measure taken to prevent a similar problem in the future (e.g., additional maintenance of faulty equipment or a change in procedure).
- g. Lessons learned.

The Operations Manager should also ensure that a copy of the report is filed at PDIP headquarters, along with other relevant information pertaining to the spill.

In addition, it is the Operations Manager's responsibility to ensure that any reporting requirements relating to insurance are fulfilled in a timely manner.

## **8. Summary of Responsibilities**

This section summarises the responsibilities of key personnel relating to the response to and reporting of spills outlined in this plan.

### **8.1 HSE Designate**

The HSE Designate is the person on site who has responsibility for implementing the initial response to the release. Once informed of the situation, he is responsible for:

- Assessing the situation and determining the source, size and nature of the release.
- Assessing the potential for the incident to threaten the health and safety of personnel, ensuring that personnel involved in the response wear suitable clothing and take appropriate precautions and, if necessary, organising an evacuation of non-essential personnel.
- Taking immediate actions, if it is safe to do so and has not already been done, to isolate the release.

- If necessary, safely suspending activities at site, including, as appropriate, suspension of well intervention activities, shutting in the well and abandoning tanker loading operations.
- Assessing whether the spill is a Category 1 Incident or Category 2 Emergency and informing the Operations Manager.
- Contacting the emergency services and/or external contractors and consultants if required to assist in the immediate response or remediation.
- Overseeing remediation activities, including clean-up, disposal and restoration.
- Updating the Emergency Response Log.

## 8.2 Operations Manager

The PDIP Operations Manager provides support to the HSE Designate, particularly in the event of a Category 2 Emergency, and is responsible for:

- Mobilizing, if necessary, and directing the Emergency Management Support Team.
- Notifying the Government in the event of a leak or 'spill' (release greater than 70 litres).
- In the case of a surface release of well fluids due to loss of well control, considering any actions required of the PDIP Operations Manager by the GHS Contingency Plan for Well Control Incident and Loss of Well Control (Ref. 5).
- Considering any actions required of the PDIP Operations Manager by any other relevant GHS contingency plans.
- Liaising with the media, including preparation of statements and press releases.
- Ensuring, in the event of a spill, that a detailed spill report is prepared (see Section 7) and filed at PDIP headquarters along with other relevant information.
- Ensuring that any reporting requirements relating to insurance are fulfilled in a timely manner.

## 9. References

1. Garden Hill South Emergency Management Plan, GHS-0001-ECS-2-PRO-0001.
2. GHS Contingency Plan for Event of Hydrocarbon Release, GHS-0001-ECS-2-PRO-0006.
3. NEWFOUNDLAND AND LABRADOR REGULATION 58/03 (Storage and Handling of Gasoline and Associated Products Regulations, 2003) under the Environmental Protection Act.  
<http://www.hoa.gov.nl.ca/hoa/regulations/rc030058.htm>

4. Garden Hill South – Concept Design for a Road Tanker Loading Pan, PDIP Technical Document, Rev 0, 28<sup>th</sup> September 2006 (PDIP Ref. TD-0006, Rev.0)
5. GHS Contingency Plan for Well Control Incident or Loss of Well Control, GHS-0001-ECS-2-PRO-0007.

# **Appendix A:**

## **Contact Details for Heavy Equipment Operators, Environmental Consultants and Other Oil Spill Response Support**

**Heavy Equipment Contractors**

Harvey & Company Ltd. 18 Maple Valley Rd. Corner Brook, NL A2H 6E6  Ph: 709.639.2960 Or: 1-888-427-8393	Humber Arm Contracting Mount Moriah Corner Brook, NL  Ph: 709.785.1540
K & F Excavating and Equipment Ltd. Watson's Pond Corner Brook, NL A2H 5W7  Ph: 709.634.9337	Murley G & F Excavations Ltd. 165 Main Street, Mount Moriah Corner Brook, NL Ph: 709.785.2958  Frenchman's Cove Benoit's Cove, NL Ph: 709.789.3492
West Coast Excavating & Equipment Co. Ltd 19 Maple Valley Rd. Corner Brook, NL A2H 3C4  Ph: 709.639.9423	West Coast Sand and Gravel 50 Main Street Corner Brook, NL A2H 1C4  Ph: 709.639.7727
Convoy Services Ltd 316 O'Connell Drive Corner Brook, NL A2H 6V9  Ph: 709.639.1431	Whalen Enterprises Ltd 241 Carolina Avenue Stephenville, NL A2N 2A6  Ph: 709.643.3388

**Environmental Consultants**

Anderson Engineering Consultants Ltd Millbrook Mall Corner Brook, NL A1C 4B5  Ph: 709.634.9944	ALL-TECH Environmental Services Ltd Corner Brook, NL  Ph:709.640.2581
Jacques Whitford Limited 607 Torbay Road St. John's, NL A1A 4Y6  Ph: 709.576.1458	CBCL Limited 38 Main Street Corner Brook, NL A2H 6Z7  Ph:709.639.4225

**Additional Oil Spill Response Support and Equipment**

L & C Construction Ltd. Stentafor Avenue Pasadena, NL  Ph: 709.686-2828	SERT Centre Fisheries and Marine Institute of Memorial University of Newfoundland 7 Tennessee Drive Stephenville, Newfoundland A2N 2Y3  Ph: 709.643.5550
---	---



### **APPENDIX 3:**

## **PDIP's Human Resources Policy Statement**

### **Appendix 3: PDIP's Human Resources Policy Statement**

PDIP is committed to bringing maximum benefits associated with the Port au Port operations to Newfoundland and Labrador, through incorporation of local resources for work associated with our oil and gas operations where commercially achievable. PDIP seek to strengthen the involvement of Newfoundlanders, particularly those in Western Newfoundland, and strive to provide these individuals and companies with full opportunity to participate in PDIP's activities on the Port au Port peninsula.

The recruitment and hiring process will be open and fair, with first consideration to qualified individuals resident in Western Newfoundland and then the remainder of the Province. When specialized knowledge or experience is required and when qualified Canadian workers are not available, foreign workers will be hired.

Goods and services will be procured through competitive tender on the basis of free, open and international competition, with:

- full and fair opportunity for all interested Newfoundland and Canadian companies.
- first consideration given to Newfoundland, and in particular Western Newfoundland, suppliers where they are competitive in terms of fair market price, quality, and delivery.
- encouragement of the development of long-term industrial support for the oil and gas industry in Western Newfoundland and Canada.

PDIP encourage and foster a non-discriminatory environment for the employment of all properly qualified persons. PDIP's goal is to achieve a level of diversity in employment that is at least proportional to the diversity found within the local labour market population.

Contractors and subcontractors working with PDIP must also subscribe to and apply these principles in their own operations.