Part E

Conceptual Conservation and Reclamation Plan

PENGROWTH

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E. CONCEPTUAL CONSERVATION AND RECLAMATION PLAN

E.1 INTRODUCTION

This section presents the conceptual Conservation and Reclamation (C&R) Plan for the Project. This C&R Plan includes conceptual details for the proposed Project's footprint components.

The conceptual C&R Plan for the Project serves numerous purposes:

- it provides the regulatory agencies with the information needed to assess whether the land can be reclaimed and returned to equivalent land capability for the desired end land uses;
- it provides information about the reclamation activities that Pengrowth will carry out during the life of the Project to ensure that environmental effects are kept to a minimum and end land use objectives and goals are attained;
- it provides conceptual information about the ultimate closure and abandonment plans for the facilities once the Project has ceased operations; and
- after considering landforms, soils, vegetation and the hydrological regime, the C&R Plan identifies the reclamation practices and mechanisms that will be carried out to ensure that a sustainable reclaimed landscape meets the equivalent land capability of the pre disturbance landscape.

Conservation and reclamation methods described in this conceptual C&R Plan are based on the current field-proven reclamation practices used for successful reclamation of conventional oil and gas well sites and SAGD Projects, pipelines, and access roads. The concepts discussed are based on utilization of these reclamation techniques as well as regulatory requirements from other recent SAGD projects and implementation of current reclamation trends in the Oil Sands. Pengrowth will adapt the plan to comply with the regulatory requirements in place at the time of construction and reclamation. The Lindbergh Phase 1 Project is currently under construction and Pengrowth has incorporated the actual on-site practices into this C&R Plan.

In order to develop a C&R Plan suitable for resources within and adjacent to the proposed disturbance area, information on existing biophysical conditions is required. Information sources utilized to design the C&R Plan include:

- Project design and development processes to be utilized by Pengrowth;
- the Final Terms of Reference (FTOR) for the Project (Alberta Environment and Sustainable Resource Development (ESRD) 2013b);
- a review of C&R requirements in recent ESRD approvals for in situ projects; and
- applicable regulatory guidance documents relating to development and reclamation.

The Project footprint includes lands subject to direct disturbance from the development of the Project. The Project life will be approximately 25 years (including construction, operations and reclamation) with production beginning in 2017.

The Project disturbance footprint is a total of 812.7 ha. Components of the Project footprint are listed in Table E.1.0-1 and provided on Figure E.1.0-1.

Table E.1.0-1 Components of the Project Footprint

Project Component (number of components)	Area (ha)	% of Project Footprint
Well Pads (51)	232.5	28.6
Borrow Pits (14)	109.4	13.5
Topsoil and Subsoil Storage Areas (59)	142.8	17.6
Access/Utility Corridors	328.0	40.3
TOTAL	**812.7**	**100.0**

To supplement this C&R Plan, once the Project is operational, Pengrowth will prepare an Annual C&R Report for submission to ESRD. The annual report will summarize the C&R activities of the preceding year along with those planned to be undertaken in the following year.

In addition to preparing a C&R report for SAGD projects, ESRD also requires that a detailed pre disturbance report be prepared prior to construction occurring. This is an important component, as project proponents can prepare conceptual C&R plans such as this one, and then refine the plans later in the preparation of a Pre disturbance Assessment and detailed C&R Plan as per ESRD's *Guidelines for Submission of a Pre Disturbance Assessment and Conservation & Reclamation Plan (PDA/C&R Plan) Under an Environmental Protection and Enhancement Act Approval for an Enhanced Recovery In-Situ Oil Sands and Heavy Oil Processing Plant and Oil Production Site* (AENV 2009) (PDA document). For all applicable Project components, Pengrowth will ensure that the required pre disturbance information is collected as per the PDA document and provided to ESRD prior to construction as required in the EPEA approval.

Another regulatory process that project proponents must follow relates to borrow pit developments that require a public lands surface disposition (SMC or SML). The surface disposition applications have detailed operational design and reclamation requirements that must also be included in these applications. This information includes detailed development design, water management plans (if required), pre and post development cross sections, geotechnical information, and a detailed reclamation plan, as per the *Guidelines for Acquiring Surface Material Dispositions on Public Land* (AENV 2007b). Pengrowth will also provide the information required for development and subsequent reclamation of all borrow developments during this process.

In compliance with typical *Alberta Environmental Protection and Enhancement Act* (EPEA) approvals, an abandonment and reclamation plan will be submitted to ESRD six months prior to decommissioning the surface facilities.

The information provided within this conceptual C&R Plan provides high level information related to processes and operations needed for the development and reclamation for the Project.

Detailed development and reclamation for Project components will be addressed as per the aforementioned regulatory processes.

E.2 RECLAMATION GOALS AND OBJECTIVES

The reclamation goal for the Project is to reclaim developed lands to equivalent land capability or land capability suitable for the desired end land use. Equivalent land capability is the ability of the land to support various land uses after reclamation is similar to the ability that existed prior to any activity being conducted on the land, although the ability to support individual land uses will not necessarily be equal after reclamation (Powter 2002).

The reclaimed landscape will have a land capability equivalent to that of the pre disturbance landscape or land capability suitable for the establishment of desired end land uses.

Objectives of the Conceptual C&R Plan include:

- development of the Project to mitigate environmental effects to soil, landscapes, vegetation, wetlands and streams within and immediately adjacent to the development footprint;
- soil conservation throughout the life of the Project to provide sufficient soil material of suitable quality at reclamation;
- mitigate potential effects to watercourses throughout the life of the Project through prevention of sedimentation or soil erosion;
- creation of reclaimed landscapes that tie into adjacent undisturbed lands and accommodate appropriate surface drainage patterns across reclaimed lands;
- providing a prescriptive soil replacement plan; and
- creating a revegetation plan.

E.2.1 EQUIVALENT CAPABILITY

In consultation with regulators, grazing lease occupants, local stakeholders and private landowners, Pengrowth will reclaim disturbed lands to achieve land capability equivalent to that of the pre disturbance landscape or suitable for the desired end land use. The post reclamation land capabilities will be similar to the ratings determined for the pre disturbance soil map units with the exception of organic landscapes or transitional / depressional landscapes. Pengrowth intends to reclaim organic and transitional landscapes located on publicly held land into post disturbance landscapes suitable for self-sustaining improved pasture.

The pre disturbance forest soil capabilities within the Project footprint are provided in Table E.2.1-1 and are shown on Figure E.2.1-1 (A and B).

Table E.2.1-1 Pre Disturbance Land Capability for the Project Footprint		
Pre Disturbance Land Capability Rating	**Area (ha)**	**Proportion (%)**
Class 2	35.9	4.4
Class 3	584.1	71.9
Class 4	47.3	5.8
Class 5	74.4	9.2
Not Rated (ZDL, ZWA)	70.9	8.7
TOTAL[1]	**812.7**	**100**

The Project footprint is dominated with Class 3 (584.1 ha) and Class 5 (74.4 ha) forest soils. Limitations to Class 3 landscapes were variable and included soil reaction (moderately acidic pH in the upper profiles), firm consistence in the upper subsoil layers as well as moisture limitations due to rapid drainage and nutrient limitations. Class 5 lands are limited by poor drainage and are associated mostly with organic landscapes.

Class 4 soils account for 47.3 ha of the Project footprint and represent transitional areas between the uplands and organics. Limitations of Class 4 soils are mainly associated with poor drainage and firm consistence in the subsoil layers.

Details on baseline soil and terrain are provided in Consultant Report #9 (CR #9) Baseline Soil Survey & Impact Assessment.

E.2.2 SURFACE WATER DRAINAGE SYSTEMS

The Project lies within the drainage basins of the North Saskatchewan River and the Beaver River, which are drained by tributaries of Mooswa Creek and Borden Lake, and Garnier Lakes Creek, Reita Lake, and Muriel Lake, respectively. The two largest watersheds within the lease study area (LSA) drain northwest into Muriel Lake mainly through Garnier Creek and southwest through Mooswa Creek into Mitchell Lake. Two other much smaller watersheds drain northeast into Reita Lake and south into Borden Lake through Middle Creek. Most of the LSA is drained by small ephemeral streams and undefined drainages which flow into a few larger permanent creeks (Section D.6 and CR #6).

The Project footprint will cross mapped channels and drainages at 19 locations. All but one of the crossing locations are for access corridors. There are six locations where the footprint crosses ephemeral channels and one location where it crosses a small permanent channel. The drainage pathways at all of these locations can be maintained with adequately sized culverts. These crossings are not navigable.

The Project has been designed to mitigate effects to drainage and surface waters. Surface disturbances will be designed to discharge runoff into the natural landscape and so that runoff patterns are maintained. Surface water runoff will also be directed around various Project components through the use of ditches and culverts where necessary. Infiltration, depression

storage and evapotranspiration will likely buffer the effects of increased runoff from compacted soils. Prior to discharge, the water will be tested and released in accordance with the terms and conditions of the operating approval. Pengrowth will monitor pump off receiving areas for potential erosion and appropriate mitigation implemented if signs of erosion are recorded.

Maintaining site drainage patterns during operations will facilitate return of proper drainage patterns upon closure. Management of the local drainage systems is an integral component of a reclaimed landscape, which is a focus of the operational and closure plans for the Project.

E.2.3 FISHERIES & AQUATICS

Baseline aquatic resources inventories were conducted over a period of three years (2011 to 2013). Baseline information was collected for different parts of the LSA including Mooswa Creek and Garnier Creek and the lower reaches of their tributaries. Defined channels were noted at most of the locations and water was present during the entire open water season. Several named lakes were also sampled, including Garnier Lakes, Michel Lake and Muriel Lake. Baseline studies conducted in 2013 focused on the upper reaches of tributaries to Garnier Creek and defined shorelines (CR# 2).

Baseline fish inventories were conducted and a total of 1,564 fish were captured across all seasons and represented eleven different species including: brook stickleback, finescale dace, yellow perch, fathead minnow, lake chub, northern pike, longnose dace, longnose sucker, pearl dace, log perch and Iowa darter. Within the tributaries, brook stickleback was the most commonly-caught species (78%), followed by fathead minnow (12%) and finescale dace (7%). Within the lakes, fish were only caught at Garnier Lake, with yellow perch being the most commonly caught species (74%), followed by northern pike (16%). No fish were captured in the 2013 surveys (Section D.2 and CR # 2).

Throughout the construction, operation and reclamation of the Project, Pengrowth will ensure that all activities undertaken are carried out utilizing appropriate mitigation and monitoring activities to minimize impacts to fisheries and aquatic resources. A 100 m setback will be maintained for all waterbodies with fish habitat potential and a 50 m buffer will be maintained between Project activities and any watercourses with defined channels. Surface disturbance in proximity to watercourses will be carried out in periods of low surface runoff (late fall, winter and early spring). Sediment control plans will be implemented prior to undertaking earthworks activities, and erosion control undertaken in areas where vegetation has been removed and site grading or contouring has been completed. Prompt revegetation and proper surface drainage in and around the footprint will ensure minimal impact on the surface water quality and fisheries resources. Pengrowth will follow the necessary mitigation and monitoring requirements as detailed in CR# 2

E.2.4 WETLANDS

Wetlands within the footprint have been mapped into eight classes, the details of which can be found in Section D.10 and CR #10. Wetlands were classified using the *Alberta Wetland Inventory Standards* (Halsey *et al.*, 2004). Construction and operation of the Project will affect 85.9 ha of wetlands within the Project footprint. The distribution of the wetlands is as follows:

- 0.1 ha of wooded bog without internal lawns (BTNN);
- 6.3 ha of open graminoid fen without patterning (FONG);
- 32.5 ha of open shrub-dominated fen without patterning (FONS);
- 39.5 ha of wooded fen with no internal lawns or patterning (FTNN);
- 1.0 ha open graminoid dominated marsh (MONG);
- 4.2 ha of shrubby deciduous swamp (SONS);
- 0.8 ha of wooded coniferous swamp (STNN); and
- 1.5 ha of shallow open water (WONN).

During the life of the Project, drainage control measures will maintain the integrity of the wetlands outside the Project footprint. Removal of drainage control structures, fill materials (where applicable), and recontouring during reclamation will be implemented to ensure drainage patterns are achieved. Pengrowth will follow the necessary mitigation and monitoring requirements as detailed in Section D.10.4 and CR#2.

E.2.5 VEGETATION

An assessment of vegetation for the Project has been conducted (Section D.10 and CR #10). Ecosites were delineated and mapped through aerial photo interpretation of dominant vegetation along with topographical features. Ground truthing was then completed on representative areas.

The Project footprint is dominated by ecosite d (low-bush cranberry) in upland areas and poorly drained landscapes are dominated by ecosite k (rich fen). Eleven ecosites were mapped in the Project footprint, including:

- blueberry (b);
- labrador tea (c);
- low-bush cranberry (d);
- dogwood (e);
- horsetail (f);
- labrador tea subhygric (g);
- labrador tea – horsetail (h);
- bog (i);
- poor fen (j);
- rich fen (k); and
- marsh (l).

The pre disturbance ecosites within the Project footprint are provided in Table E.2.1-2 and shown on Figure E.2.1-2 (A to D).

Table E.2.1-2 Pre disturbance Ecosites within the Project Footprint

Ecosite / AVI Feature	Access/Utility Corridor	Borrow Pit	Soil Storage	Well Pad	Total Area (ha)2	% of Project Footprint
b	0.8	2.4	1.0	0.1	**4.3**	**0.5**
c	1.2	-	-	<0.1	**1.2**	**0.1**
d	137.3	71.0	75.1	94.4	**377.8**	**46.5**
e	48.4	18.9	20.8	32.5	**120.6**	**14.8**
f	3.8	0.7	-	<0.1	**4.5**	**0.6**
g	0.3	0.5	-	0.4	**1.2**	**0.1**
h	1.4		<0.1	0.5	**1.9**	**0.2**
i	<0.1	-	-	-	**<0.1**	**<0.01**
j	5.6	1.7	3.3	5.5	**16.1**	**1.9**
k	30.6	4.2	10.8	21.4	**67.0**	**8.2**
l	0.4	<0.1	0.6	<0.1	**1**	**0.1**
AIF	-	0.5	<0.1	<0.1	**0.5**	**<0.1**
AIG	1.0	-	<0.1	6.4	**7.4**	**0.9**
AIH	23.7	<0.1	0.8	3.0	**27.5**	**3.4**
AII	1.8	<0.1	2.2	0.5	**4.5**	**0.6**
CC	7.8	0.6	0.2	1.7	**10.3**	**1.3**
CIP	8.0	3.0	2.5	4.5	**18.0**	**2.2**
CIW	5.1	1.5	3.5	7.9	**18.0**	**2.2**
CL	10.7	3.4	3.5	4.6	**22.2**	**2.7**
CP	36.4	0.4	17.6	37.2	**91.6**	**11.2**
CPR	-	-	-	7.2	**7.2**	**0.9**
HG	0.5	0.3	0.4	0.5	**1.7**	**0.2**
NWF	<0.1	-	-	-	<0.1	**<0.1**
NWL	0.2	-	-	1.0	**1.2**	**0.1**
NWR	0.2	-	-	-	**0.2**	**<0.1**
SC	2.5	0.1	0.3	2.8	**5.7**	**0.7**
SO	0.3	-	0.1	0.2	**0.6**	**<0.1**
Total[1]	**328.0**	**109.2**	**142.7**	**232.3**	**812.7**	**100**

[1] Due to rounding of values, component totals may not equal the sum of the individual values presented in the table

Upland landscapes include ecosites b, c, d, and e which account for a total of 503.9 ha of the Project footprint. Transitional communities, ecosites classified as f, g and h, account for 7.6 ha. Lowland landscapes (*i.e.*, wetlands) include ecosites i, j, k and l which account for 84.1 ha of the Project footprint.

E.2.6 WILDLIFE

Pengrowth conducted an assessment of the wildlife resources for the Project (Section D.11 and CR #11). The majority of the Project footprint is located in mature forest (541 ha within LSA). Deciduous habitat is the most abundant natural habitat type accounting for 52.5% of the local study area (LSA), mixwood habitat is the second most abundant natural habitat type accounting for 7.6% of the LSA, lowland shrub habitat is the third most abundant natural habitat type accounting for 6.0% of the LSA and the remaining 12.6% of the LSA falls into ten other habitat types. Wildlife habitat in the LSA was classified on the basis of ecosite phases (Beckingham and Archibald 1996) and field observations. Within the LSA, 65 wildlife species of concern were identified as having the potential to occur, including three herptiles, 53 birds, and nine mammals.

Reclamation will be progressively executed during the life of the Project. This reclamation approach allows increased variation of wildlife habitat due to uneven habitat age development. Reclamation is also performed to establish biologically self-sustaining landscapes with equal or greater productivity than pre disturbance conditions. The Project footprint will be reclaimed to improved pasture, wetland, marsh and stream habitats based on topography and in relation to adjacent undisturbed areas. Wildlife typically use reclaimed areas as soon as herbaceous vegetation is established, and the diversity of wildlife use tends to increase with increasing vegetation cover and shrub and tree establishment. Wildlife use of natural and reclaimed areas will be monitored to provide information of the success of re-establishing wildlife habitat.

E.2.7 TRADITIONAL LAND USE

Pengrowth approached First Nations whose traditional territories lie within the proposed Pengrowth Lindbergh SAGD Expansion Project area (as determined by the Government of Alberta). Three of the Frist Nations (Kehewin Cree Nation, Onion Lake Cree Nation, and Saddle Lake Cree Nation) were involved in a collaborative traditional land use (TLU) assessment of the proposed Project. The participating Frist Nations have a long history of using the area for travelling, camping, hunting, trapping, gathering as well as using the lands for ceremonies and burials. The land is still used for hunting, trapping and ceremonies. Further information on Traditional Environmental Knowledge (TEK) and TLU within the region is being gathered as discussed in Part F. This information will be used to enhance the capability of the C&R process to return these values to the land.

E.3 SITE CONSTRUCTION

Pengrowth will use the following construction strategies as the basis for the C&R program design:

- all merchantable timber will be salvaged;

- coarse woody debris and brush will be disposed of to meet disposal requirements;
- all upland topsoil and organic material less than 40 cm will be salvaged for replacement at reclamation;
- upper subsoil up to 30 cm will be salvaged from well pads for replacement at reclamation;
- facility development, well pads, roadways, pipelines, and other landscape alterations will be constructed to be geotechnically stable;
- construction and operational activities and subsequent interim reclamation will support final reclamation and end land use objectives;
- reclamation is designed to create a landscape that is self-sustaining and capable of supporting soils and vegetation processes suitable for the desired end land uses with no subsequent management input required;
- following soil placement or decompaction, vegetation communities will establish and will be capable of ecological succession processes similar to those found within the region for similar land uses;
- on localized sites that are sensitive to erosion (*i.e.*, steeper erodible slopes, coarse textured soils), soil stabilization/conservation will take priority over vegetation objectives;
- on disturbances immediately adjacent to watercourses, watershed protection will take priority over other vegetation objectives;
- water discharges during the development and following reclamation, will be managed to provide an acceptable level of input that flows into receiving drainages; and
- mitigation and monitoring post reclamation will address issues related to soil, landscape and vegetation.

The areas disturbed by construction will be progressively reclaimed using interim reclamation techniques to minimize post-construction impacts such as soil erosion. Final reclamation will be undertaken when components of the Project are complete.

E.3.1 TIMBER AND VEGETATION MANAGEMENT

Pengrowth will salvage all merchantable timber in compliance with regulatory requirements. Harvesting of merchantable timber will occur annually as required. Prior to timber salvage, Pengrowth will address the following:

- rare plants;
- buffer zones associated with riparian habitat and water courses; and
- migratory birds (*Migratory Birds Convention Act;* (Government of Canada 1994).

Clearing of woody debris will commence once all merchantable timber has been salvaged. Care will be taken to remove as much woody debris as possible to preserve the integrity and quality of the soil before soil salvage commences.

Woody debris will be handled in consultation with ESRD and will either be mulched or burned depending on site conditions, and in accordance with regulatory requirements. If some of the woody debris is mulched, it will be spread to a maximum thickness of 5 cm over the ground surface as per ASRD Directive 2009-1 (ASRD 2009).

E.3.2 INTERIM RECLAMATION

Interim reclamation will be undertaken to minimize the amount of active surface disturbance. For example, road ditches and borrow pits will have the topsoil replaced and will be seeded, allowing revegetation to occur upon completion of road construction. Interim reclamation will occur until a particular component of the Project is no longer required for construction or operations, then the final site decommissioning, abandonment, grading and recontouring activities will take place.

Interim reclamation will also focus on revegetation and erosion control of soil stockpiles, access corridor ditches and edges of well pads. Erosion control of these areas will remain a priority until the desired vegetation cover has established.

Interim reclamation activities throughout the life of the Project will adhere to the processes and activities listed in this C&R Plan as well as ESRD requirements outlined in the Project approval.

E.3.3 EROSION AND SEDIMENT CONTROL

The risk of erosion to surface materials is greatest when the soil has been removed (salvaged) from the site. Soil materials replaced during reclamation are at risk of erosion by wind and/or water until a suitable vegetative cover has been established. The majority of the terrain within the Project footprint is considered to have level to moderate slopes. Approximately 40% of the proposed Project footprint occurs on areas that have slopes less than 5%, 42% have slopes between 5 and 15%, and 1% of the footprint is on lands with slopes greater than 15%. A total of 9% is made up of organic landforms, which are dominated by level to nearly level (0 to 2%) organic plains and basins. The remaining 9% is made up of previously disturbed areas. Reclaimed landscapes will be recontoured to achieve similar landscapes and slopes as the pre disturbance conditions. Details on erosion ratings for various soil and terrain map units are provided in CR #9, Section 4.4.

During soil handling, stockpiling, and reclamation activities Pengrowth will minimize erosion risk as required by implementing the following:

- when stockpiling soil material, soil piles will be placed in strategic locations, to minimize exposure to wind or water;
- stockpiles will have slopes less than or equal to 3H:1V;
- topsoil and subsoil will be stockpiled separately;
- topsoil and subsoil stockpiles utilized as long-term storage will be seeded with a non-invasive weed free seed mix that establishes quickly;

- reclaimed landscapes that have a high probability of erosion (*i.e.*, coarse texture) will be reseeded with a quick establishing, non-invasive cover crop to minimize the length of time bare soil is exposed to potential wind and water erosion. In addition, soil stabilizers or other measures will be utilized (where necessary) to minimize the effect of water erosion (*i.e.*, check bales, silt fences, sediment traps, *etc.*) on susceptible slopes; and
- monitoring of stockpiled soils and reclaimed areas will be conducted to ensure mitigative measures are effective.

If erosion concerns arise, Pengrowth will implement erosion control plans on a site specific basis. Determination of erosion control methods will depend on many variables related to soil texture, landscape (slope length and gradient), vegetation cover and type, level of disturbance, and distance to sensitive receptors (*e.g.*, adjacent drainages). Pertinent factors that will be considered when determining specific erosion control methods include:

- cause of erosion – wind, water, or both;
- dominant soil texture in area of concern – coarse, medium or fine textured surface soils;
- vegetative cover – sparse cover, moderate cover or good establishment;
- slope length and steepness – a combination of estimated slope length and slope gradient (%);
- distance to any water bodies, drainages, or other sensitive receptors (if applicable);
- expected level of runoff – is the area of concern considered to be a large catchment area with respect to surface runoff;
- location of erosion issues – is the area of concern easily accessible by equipment or, is access difficult; and
- likelihood of reoccurrence – based on site specific characteristics and cause of potential erosion; is the likelihood of future erosion expected.

Determination of erosion control methods will involve an evaluation of all aforementioned factors. This assessment will be completed on a site specific basis for all landscapes that occur within the Project footprint. Potential erosion control methods that Pengrowth may utilize throughout the life of the Project include, but are not limited to:

- silt fencing;
- brush or rock berm;
- continuous (earth-filled geotextile) berm;
- earth dyke barrier/ditch blocks;
- geotextile or synthetic coverings (*e.g.*, coconut matting)
- hydroseeding or hydromulching;
- live staking or brush-layering;
- addition of tackifiers; and/or
- slope texturing.

E.3.4 SOIL RESOURCES

An assessment of soil resources for the Project has been conducted and is included in the Baseline Soil Survey and Impact Assessment report (Section D.9 and CR #9). Figure E.3.4-1 (A and B) displays the Project components and includes baseline soil map units with the average soil thickness values for each soil map unit, and labelled soil inspection sites located within the Project footprint. These resources will be used for all salvage and replacement activities.

E.3.5 SOIL SALVAGE

Pengrowth will salvage upland topsoil and shallow organic material (less than 40 cm in thickness) for all Project components. Subsoil up to 30 cm thick will be salvaged on the well pads. Pengrowth plans to pad over deep organics with peat thicknesses greater than 40 cm.

There are four footprint components that will have different soil salvage requirements which are described further in this section and include:

- well pads;
- borrow pits;
- topsoil and subsoil storage areas; and
- access and utility corridors.

A description of upland and organic soil salvage activities are provided in Section E.3.5.6. A summary of available soil materials (upland and organic) for each component is provided in Table E.3.5-1. The data supplied in Table E.3.5-1 is based on the soil interpretation data from the baseline soil survey (CR#9).

E.3.5.1 Topsoil

Topsoil is defined by ESRD in various operating approvals as the uppermost layer of soil comprised of the following (if present):

- all organic horizons (L, F, H, and O) as defined in *The Canadian System of Soil Classification, 3rd Edition* (CSSC)(Soil Classification Working Group (SCWG) 1998);
- A horizons defined in the CSSC and rated as good, fair or poor, as described in *Soil Quality Criteria Relative to Disturbance and Reclamation* (Soil Quality Working Group (SQWG) 1987) (AENV 2010c Tier 1 Guidelines); and
- the replaced topsoil layer in a reclaimed soil.

Pengrowth will salvage all upland topsoil and shallow organic materials (less than 40 cm of surface organics). These soil materials will be used during reclamation with the intent to support revegetation activities, allow ecological succession and achieve equivalent land capability for the desired end land uses. The upland and organic soils that are found within the Project footprint are shown on Figure E.3.5-1 (A and B).

E.3.5.2 Subsoil

Subsoil is defined by ESRD as the layer of soil directly below the topsoil layer consisting of all B horizons defined in the CSSC and rated as good, fair, or poor, as described in *Soil Quality Criteria Relative to Disturbance and Reclamation* (SQWG 1987) (AENV 2010c).

ESRD requires that subsoil (to a maximum thickness of 30 cm) be salvaged from upland soil units in the well pads as part of soil conservation for SAGD developments. This salvaged subsoil material will be stockpiled separately from topsoil.

E.3.5.3 Deep Organics

Deep organics are defined by ESRD as soil with surface organic horizons that are greater than 40 cm in depth (AENV 2010c). Pengrowth may pad over all deep organic soils with peat thicknesses greater than 40 cm. Borrow pits will have all topsoil and organic materials salvaged for replacement at reclamation.

Pengrowth will provide more detailed information with respect to the handling of organic materials for the construction of the Project components through submission of a PDA document. Based on the findings of the PDA document, modifications to the organic soil handling plan provided in this document may be made.

E.3.5.4 Areas of Special Concern

Areas of special concern include soil map units that may require additional mitigation or monitoring measures to minimize potential impacts during soil salvage, storage and replacement (*i.e.*, coarse textured soils and steep slopes) due to soil and/or landscape characteristics. All soils within the Project footprint are not at risk of erosion via wind or water under current baseline conditions; however, upon removal of vegetation and subsequent soil handling and stockpiling, various soil types may be at risk of impacts via erosion. Within the Project footprint, seven map units are of special concern that may require additional management inputs: ABC2/I3h, ABC2/HR2h, ABC6/I3h, ABC6/I3m, ABC9/I3m, LCY1/I3h, and LCY9/I3m, which are susceptible to water erosion due to a combination of very steep slopes and long slope length; and ABC6/I3h, ABC6/I3m, ABC9/I3m, and LCY9/I3m map units, which contain significant proportions of coarse textured soils.

Most dominant within the footprint are the ABC6/I3m, and ABC9/I3m map units, which account for 24.6 and 22.1 ha of the planned disturbance, respectively. The ABC6/I3h, and LCY1/I3h map units occupy 5.7 ha and 2.2 ha within the Project footprint, respectively. The remaining map units (ABC2/HR2h, ABC2/I3h, and LCY9/I3m), occupy less than 1 ha each. Pengrowth will ensure that Project components that contain these particular soil types are addressed through prompt revegetation upon stockpiling, soil replacement, and slope recontouring to minimize potential soil losses. These areas will be monitored regularly until suitable vegetation has established. If erosion concerns are noted, Pengrowth will implement an erosion control program as outlined in Section E.3.3.

E.3.5.5 General Soil Conservation Practices

To mitigate the risk of topsoil, salvaged organic material, or subsoil loss during soil salvage, handling, and stockpiling throughout the life of the Project, the following will be implemented by Pengrowth during soil salvage activities:

- a qualified site supervisor will be present for soil salvage, handling, and stockpiling activities during Project development;
- a qualified site supervisor is an individual who holds the following credentials or is working directly under someone with the following credentials: extensive experience greater than 10 years) in construction and development of oil and gas related infrastructure and has a good understanding of soil material handling within the Project area and/or a relevant Professional designation. In addition, the site supervisor will have practical experience providing soil salvage and handling guidance for large scale operations;
- soil salvage activities related to expected soil layer thickness values and locations of potential sensitive areas will be guided by the information presented in this report, the advice of an accredited soils expert and information contained in future PDA's;
- materials will not be salvaged during extremely windy or wet conditions;
- soil salvage operations may occur during frozen conditions, and areas to be salvaged will be ripped to the expected soil salvage depth prior to salvage activities to minimize admixing of materials; and
- all salvaged and stored soils will be labelled with appropriate signage and documented accordingly.

E.3.5.6 Soil Salvage Details

Approximately 671.9 ha of the total 812.7 ha of the Project footprint is considered upland and will have topsoil material salvaged and stockpiled separately for replacement at reclamation. The following sections detail the topsoil, subsoil, and organic material salvage and handling with associated volumes of soil materials. The values provided in Table E.3.5-1 are based on the soil survey information and map unit interpretations provided in CR#9. Detailed soil salvage, handling, storage and reclamation activities will be provided to ESRD prior to construction in a PDA/C&R report for the Project footprint.

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Well Pad D04							
ABC9/HR2m	1.6	Mineral	25	3,950	40	6,320	-
ABC9/U1h	3.1	Mineral	20	6,198	40	12,397	-
Sub-total[3]	4.7	-	-	10,148	-	18,716	-
Well Pad D06							
CTW2/O1	1.8	Organic	130	-	-	-	23,322
CTW2/O2	2.5	Organic	200	-	-	-	50,105
ZDL	<0.1	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	-	-	-	73,428
Well Pad D07							
CTW2/O1	2.3	Organic	130	-	-	-	29,512
LCY9/U1h	1.5	Mineral	20	3,074	40	6,148	-
NWB20/U1l	0.5	Mineral	20	992	35	1,737	-
Sub-total[3]	4.3	-	-	4,066	-	7,885	29,512
Well Pad D08							
ABC6/I3m	3.0	Mineral	20	6,064	40	12,129	-
ABMH2/HR2m	5.1	Mineral	25	12,631	35	17,684	-
Sub-total[3]	8.1	-	-	18,695	-	29,812	-
Well Pad D09							
LCY9/U1h	3.1	Mineral	20	6,227	40	12,454	-
ZDL	0.7	-	-	-	-	-	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Sub-total[3]	3.8	-	-	6,227	-	12,454	-
Well Pad D10							
ABC9/U1h	2.6	Mineral	20	5,210	40	10,420	-
ZDL	1.7	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	5,210	-	10,420	-
Well Pad D11							
ZDL	3.8	-	-	-	-	-	-
Sub-total[3]	3.8	-	-	-	-	-	-
Well Pad D12							
LCY9/U1h	2.3	Mineral	20	4,650	40	9,299	-
NWB20/U1l	1.8	Mineral	20	3,623	35	6,340	-
ZDL	0.2	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	8,273	-	15,640	-
Well Pad D13							
LCY9/HR2m	0.7	Mineral	20	1,408	45	3,169	-
LCY9/U1h	<0.1	Mineral	20	32	40	64	-
NWB20/U1l	2.2	Mineral	20	4,488	35	7,853	-
ZDL	1.4	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	5,928	-	11,086	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Well Pad D14							
CTW2/O1	0.2	Organic	130	-	-	-	2,793
CTW2m/O1	0.1	Organic	170	-	-	-	2,166
LCY9/U1h	2.9	Mineral	20	5,847	40	11,693	-
ZDL	1.1	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	5,847	-	11,693	4,959
Well Pad D15							
LCY9/HR2m	<0.1	Mineral	20	4	45	10	-
LCY9/U1h	2.4	Mineral	20	4,776	40	9,553	-
NWB20/U1l	0.1	Mineral	20	158	35	277	-
ZDL	1.8	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	4,939	-	9,840	-
Well Pad D16							
SDLC2/U1l	4.3	Mineral	30	12,876	35	15,022	-
ZDL	<0.1	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	12,876	-	15,022	-
Well Pad D17							
CTW2m/O3	0.5	Organic	165	-	-	-	7,692
LCY9/U1h	1.9	Mineral	20	3,802	40	7,604	-
SDLC2/U1l	1.9	Mineral	30	5,791	35	6,756	-
ZDL	<0.1	-	-	-	-	-	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Sub-total[3]	4.3	-	-	9,593	-	14,360	7,692
Well Pad D18							
LCY9/U1h	4.3	Mineral	20	8,607	40	17,214	-
Sub-total[3]	4.3	-	-	8,607	-	17,214	-
Well Pad D19							
CTW1m/O2	0.9	Organic	65	-	-	-	5,838
LCY9/U1h	2.7	Mineral	20	5,343	40	10,686	-
NWB20/U1l	0.7	Mineral	20	1,467	35	2,568	-
Sub-total[3]	4.3	-	-	6,811	-	13,254	5,838
Well Pad D20							
LCY9/U1l	4.3	Mineral	30	12,910	40	17,214	-
Sub-total[3]	4.3	-	-	12,910	-	17,214	-
Well Pad D21							
SDLC2/U1l	4.3	Mineral	30	12,847	35	14,988	-
ZDL	<0.1	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	12,847	-	14,988	-
Well Pad D22							
LCY9/U1h	4.0	Mineral	20	8,062	40	16,123	-
SDLC2/U1l	0.3	Mineral	30	818	35	954	-
Sub-total[3]	4.3	-	-	8,879	-	17,077	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Well Pad D23							
LCY9/U1h	4.3	Mineral	20	8,607	40	17,214	-
Sub-total[3]	4.3	-	-	8,607	-	17,214	-
Well Pad D24							
SDLC2/U1l	4.3	Mineral	30	12,910	35	15,062	-
Sub-total[3]	4.3	-	-	12,910	-	15,062	-
Well Pad D25							
ABC9/U1h	0.2	Mineral	20	323	40	646	-
SDLC2/U1l	4.1	Mineral	30	12,425	35	14,496	-
Sub-total[3]	4.3	-	-	12,749	-	15,143	-
Well Pad D26							
LCY9/U1h	0.1	Mineral	20	236	40	472	-
SDLC2/U1l	4.2	Mineral	30	12,556	35	14,649	-
Sub-total[3]	4.3	-	-	12,792	-	15,121	-
Well Pad D27							
ABC2/U1h	2.2	Mineral	25	5,608	35	7,851	-
CTW1m-G/O2	<0.1	Organic	45	-	-	-	190
SDLC2/U1l	1.0	Mineral	30	2,981	35	3,477	-
Sub-total[3]	3.3	-	-	8,588	-	11,328	190

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Well Pad D28							
ABC2/U1h	4.3	Mineral	25	10,759	35	15,062	-
Sub-total[3]	4.3	-	-	10,759	-	15,062	-
Well Pad D29							
ABC2/U1h	1.8	Mineral	25	4,427	35	6,197	-
CTW1m-G/O1	1.6	Organic	45	-	-	-	7,260
CTW2/O1	0.5	Organic	130	-	-	-	6,373
ZDL	0.4	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	4,427	-	6,197	13,633
Well Pad D30							
CTW2/O1	4.3	Organic	130	-	-	-	55,944
Sub-total[3]	4.3	-	-	-	-	-	55,944
Well Pad D31							
ABC2/H1l	4.3	Mineral	25	10,759	30	12,910	-
Sub-total[3]	4.3	-	-	10,759	-	12,910	-
Well Pad D32							
ABC9/HR2m	0.4	Mineral	25	1,076	40	1,721	-
ABC9/U1h	<0.1	Mineral	20	32	40	65	-
ZDL	5.0	-	-	-	-	-	-
Sub-total[3]	5.5	-	-	1,108	-	1,786	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Well Pad D33							
ABC9/HR2m	4.3	Mineral	25	10,679	40	17,086	-
ABC9/U1h	<0.1	Mineral	20	64	40	129	-
ZDL	<0.1	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	10,743	-	17,214	-
Well Pad D34							
ABC6/I3h	0.3	Mineral	20	530	30	795	-
ABC9/HR2m	0.1	Mineral	25	160	40	256	-
ABC9/I3m	0.9	Mineral	30	2,552	30	2,552	-
ABC9/U1h	3.1	Mineral	20	6,273	40	12,546	-
Sub-total[3]	4.3	-	-	9,515	-	16,149	-
Well Pad D35							
ABC6/I3m	1.6	Mineral	20	3,243	40	6,485	-
ABC9/HR2m	2.6	Mineral	25	6,572	40	10,514	-
ZDL	<0.1	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	9,814	-	17,000	-
Well Pad D36							
ABC9/U1h	2.9	Mineral	20	5,831	40	11,663	-
ZDL	0.5	-	-	-	-	-	-
Sub-total[3]	3.4	-	-	5,831	-	11,663	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Well Pad D37							
ABC9/H1l	3.4	Mineral	25	8,598	30	10,318	-
CTW1m/O2	0.9	Organic	65	-	-	-	5,700
Sub-total[3]	4.3	-	-	8,598	-	10,318	5,700
Well Pad D38							
ABC2/H1m	4.7	Mineral	25	11,743	30	14,092	-
ABC9/U1h	3.9	Mineral	20	7,768	40	15,536	-
Sub-total[3]	8.6	-	-	19,512	-	29,628	-
Well Pad D39							
ABC9/HR2m	4.3	Mineral	25	10,638	40	17,020	-
Sub-total[3]	4.3	-	-	10,638	-	17,020	-
Well Pad D40							
ABC9/U1h	1.7	Mineral	20	3,435	40	6,870	-
NWB20/U1l	2.5	Mineral	20	5,066	35	8,866	-
ZDL	<0.1	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	8,501	-	15,736	-
Well Pad D41							
ABC2/H1l	4.3	Mineral	25	10,735	30	12,882	-
Sub-total[3]	4.3	-	-	10,735	-	12,882	-
Well Pad D42							
ABC9/H1l	3.6	Mineral	25	8,981	30	10,777	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
ZDL	0.7	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	8,981	-	10,777	-
Well Pad D43							
ABC2/H1m	4.3	Mineral	25	10,743	30	12,891	-
CTW1m/O2	<0.1	Organic	65	-	-	-	41
Sub-total[3]	4.3	-	-	10,743	-	12,891	41
Well Pad D44							
ABC2/H1l	1.8	Mineral	25	4,520	30	5,424	-
CTW2m/O3	2.5	Organic	165	-	-	-	41,174
Sub-total[3]	4.3	-	-	4,520	-	5,424	41,174
Well Pad D45							
ABC2/U1h	2.5	Mineral	25	6,304	35	8,825	
CTW1m/O3	1.4	Organic	65	-	-	-	8,994
ZDL	0.4	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	6,304	-	8,825	8,994
Well Pad D46							
ABC2/U1h	3.9	Mineral	25	9,705	35	13,588	-
ZDL	0.4	-	-	-	-	-	-
Sub-total[3]	4.3	-	-	9,705	-	13,588	-
Well Pad D47							
ABC2/H1l	2.7	Mineral	25	6,871	30	8,245	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
ABC2/H1m	1.4	Mineral	25	3,609	30	4,331	-
CTW2m/O1	0.1	Organic	170	-	-	-	1,893
Sub-total[3]	4.3	-	-	10,480	-	12,576	1,893
Well Pad D48							
ABC2/H1l	0.8	Mineral	25	1,933	30	2,320	-
ABC2/H1m	2.3	Mineral	25	5,719	30	6,862	-
CTW2m/O1	1.2	Organic	170	-	-	-	20,931
Sub-total[3]	4.3	-	-	7,652	-	9,182	20,931
Well Pad D49							
ABC2/H1l	1.7	Mineral	25	4,137	30	4,964	-
NWB20/U1h	2.6	Mineral	30	7,946	45	11,919	-
Sub-total[3]	4.3	-	-	12,083	-	16,883	-
Well Pad D50							
ABSL1/H1m	4.2	Mineral	45	18,836	30	12,557	-
ARV21/U1l	0.1	Mineral	25	292	-	-	-
Sub-total[3]	4.3	-	-	19,128	-	12,557	-
Well Pad D51							
ABC2/H1m	3.6	Mineral	25	8,890	30	10,668	-
ABSL1/H1m	<0.1	Mineral	45	51	30	34	-
CTW2m/O2	0.2	Organic	150	-	-	-	3,222
ZDL	0.5	-	-	-	-	-	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Sub-total[3]	4.3	-	-	8,941	-	10,702	3,222
Well Pad D52							
ABC2/H1m	0.9	Mineral	25	2,287	30	2,744	-
ABC9/I3m	3.4	Mineral	30	10,141	30	10,141	-
Sub-total[3]	4.3	-	-	12,428	-	12,885	-
Well Pad D53							
ABC2/H1m	4.3	Mineral	25	10,759	30	12,910	-
Sub-total[3]	4.3	-	-	10,759	-	12,910	-
Well Pad D54							
ABC2/U1h	3.0	Mineral	25	7,546	35	10,565	-
ABC9/H1l	4.4	Mineral	25	11,036	30	13,243	-
Sub-total[3]	7.4	-	-	18,582	-	23,808	-
Well Pad D55							
ABC2/U1h	7.5	Mineral	25	18,642	35	26,099	-
ABC9/I3m	0.2	Mineral	30	515	30	515	-
Sub-total[3]	7.6	-	-	19,157	-	26,614	-
Soil Storage 10							
ZDL	0.9	-	-	-	-	-	-
Sub-total[4]	0.9	-	-	-	-	-	-
Soil Storage 11							
ZDL	1.0	-	-	-	-	-	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Sub-total[4]	1.0	-	-	-	-	-	-
Soil Storage 12							
CTW2/O1	1.0	Organic	130	-	-	-	12,928
NWB20/U1l	0.8	Mineral	20	1,623	35	2,840	-
Sub-total[4]	1.8	-	-	1,623	-	2,840	12,928
Soil Storage 13							
ABC6/I3m	2.3	Mineral	20	4,557	40	9,113	-
ABC9/U1h	1.0	Mineral	20	2,006	40	4,013	-
ABMH2/HR2m	0.4	Mineral	25	906	35	1,269	-
Sub-total[4]	3.6	-	-	7,470	-	14,395	-
Soil Storage 14							
ABC9/HR2m	2.3	Mineral	25	5,860	40	9,376	-
ABMH2/U1h	0.7	Mineral	20	1,380	46	3,175	-
Sub-total[4]	3.0	-	-	7,240	-	12,551	-
Soil Storage 15							
LCY9/U1h	0.9	Mineral	20	1,838	40	3,676	-
ZDL	<0.1	-	-	-	-	-	-
Sub-total[4]	1.0	-	-	1,838	-	3,676	-
Soil Storage 16							
ABC9/U1h	0.7	Mineral	20	1,346	40	2,692	-
ZDL	1.5	-	-	-	-	-	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Sub-total[4]	2.2	-	-	1,346	-	2,692	-
Soil Storage 17							
LCY9/U1h	1.2	Mineral	20	2,414	40	4,828	-
NWB20/U1l	1.9	Mineral	20	3,742	35	6,548	-
ZDL	0.2	-	-	-	-	-	-
Sub-total[4]	3.3	-	-	6,156	-	11,376	-
Soil Storage 18							
CTW2/O1	1.2	Organic	130	-	-	-	14,959
NWB20/U1l	3.2	Mineral	20	6,388	35	11,180	-
ZDL	0.4	-	-	-	-	-	-
Sub-total[4]	4.8	-	-	6,388	-	11,180	14,959
Soil Storage 19							
LCY9/U1h	1.1	Mineral	20	2,172	40	4,344	-
ZDL	0.7	-	-	-	-	-	-
Sub-total[4]	1.8	-	-	2,172	-	4,344	-
Soil Storage 20							
LCY9/U1h	0.4	Mineral	20	742	40	1,484	-
NWB20/U1l	0.6	Mineral	20	1,209	35	2,117	-
ZDL	0.8	-	-	-	-	-	-
Sub-total[4]	1.8	-	-	1,951	-	3,600	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Soil Storage 21							
LCY9/U1l	<0.1	Mineral	30	27	40	37	-
SDLC2/U1l	1.8	Mineral	30	5,294	35	6,176	-
ZDL	<0.1	-	-	-	-	-	-
Sub-total[4]	1.8	-	-	5,321	-	6,212	-
Soil Storage 22							
LCY9/U1h	0.1	Mineral	20	195	40	391	-
SDLC2/U1l	0.7	Mineral	30	2,132	35	2,487	-
ZDL	1.0	-	-	-	-	-	-
Sub-total[4]	1.8	-	-	2,327	-	2,877	-
Soil Storage 23							
LCY9/U1h	1.6	Mineral	20	3,174	40	6,348	-
Sub-total[4]	1.6	-	-	3,174	-	6,348	-
Soil Storage 24							
CTW1m/O2	0.3	Organic	65	-	-	-	2,093
LCY9/U1h	1.1	Mineral	20	2,207	40	4,414	-
NWB20/U1l	0.4	Mineral	20	761	35	1,331	-
Sub-total[4]	1.8	-	-	2,968	-	5,745	2,093
Soil Storage 25							
LCY9/U1l	1.8	Mineral	30	5,418	40	7,224	-
Sub-total[4]	1.8	-	-	5,418	-	7,224	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Soil Storage 26							
SDLC2/U1l	1.8	Mineral	30	5,410	35	6,312	-
ZDL	<0.1	-	-	-	-	-	-
Sub-total[4]	1.8	-	-	5,410	-	6,312	-
Soil Storage 27							
LCY9/U1h	1.8	Mineral	20	3,612	40	7,223	-
SDLC2/U1l	<0.1	Mineral	30	-	-	-	-
Sub-total[4]	1.8	-	-	3,612	-	7,223	-
Soil Storage 28							
LCY9/U1h	1.7	Mineral	20	3,486	40	6,972	-
ZDL	0.1	-	-	-	-	-	-
Sub-total[4]	1.8	-	-	3,486	-	6,972	-
Soil Storage 29							
SDLC2/U1l	1.8	Mineral	30	5,418	35	6,321	-
Sub-total[4]	1.8	-	-	5,418	-	6,321	-
Soil Storage 30							
SDLC2/U1l	1.8	Mineral	30	5,418	35	6,321	-
Sub-total[4]	1.8	-	-	5,418	-	6,321	-
Soil Storage 31							
SDLC2/U1l	1.8	Mineral	30	5,418	35	6,321	-
Sub-total[4]	1.8	-	-	5,418	-	6,321	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Soil Storage 32							
ABC2/U1h	<0.1	Mineral	25	-	35	-	-
CTW1m-G/O2	<0.1	Organic	45	-	-	-	77
SDLC2/U1l	1.4	Mineral	30	4,064	35	4,741	-
Sub-total[4]	1.4	-	-	4,064	-	4,741	77
Soil Storage 33							
ABC2/U1h	1.8	Mineral	25	4,515	35	6,321	-
Sub-total[4]	1.8	-	-	4,515	-	6,321	-
Soil Storage 34							
ABC2/U1h	1.6	Mineral	25	4,031	35	5,644	-
ZDL	0.2	-	-	-	-	-	-
Sub-total[4]	1.8	-	-	4,031	-	5,644	-
Soil Storage 35							
CTW2/O1	1.6	Organic	130	-	-	-	20,511
Sub-total[4]	1.6	-	-	-	-	-	20,511
Soil Storage36							
ABC2/H1l	1.8	Mineral	25	4,515	30	5,418	-
Sub-total[4]	1.8	-	-	4,515	-	5,418	-
Soil Storage 37							
ABC9/HR2m	0.9	Mineral	25	2,147	40	3,435	-
ABC9/U1h	2.9	Mineral	20	5,893	40	11,787	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Sub-total[4]	3.8	-	-	8,040	-	15,221	-
Soil Storage 38							
ABC6/I3h	0.1	Mineral	20	123	30	184	-
ABC9/HR2m	0.1	Mineral	25	219	40	350	-
ABC9/U1h	4.4	Mineral	20	8,738	40	17,475	-
Sub-total[4]	4.5	-	-	9,079	-	18,010	-
Soil Storage 39							
ABC6/I3m	1.3	Mineral	20	2,524	40	5,048	-
ABC9/HR2m	0.5	Mineral	25	1,360	40	2,176	-
Sub-total[4]	1.8	-	-	3,884	-	7,224	-
Soil Storage 40							
ABC9/U1h	1.5	Mineral	20	2,970	40	5,940	-
ZDL	<0.1	-	-	-	-	-	-
Sub-total[4]	1.5	-	-	2,970	-	5,940	-
Soil Storage 41							
ABC9/H1l	1.7	Mineral	25	4,314	30	5,177	-
ABC9/U1h	0.1	Mineral	20	120	40	240	-
CTW1m/O2	<0.1	Organic	65	-	-	-	132
Sub-total[4]	1.8	-	-	4,434	-	5,417	132
Soil Storage 42							
ABC2/H1m	0.4	Mineral	25	1,009	30	1,211	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
ABC9/H1l	0.1	Mineral	25	287	30	345	-
ABC9/U1h	3.3	Mineral	20	6,605	40	13,211	-
Sub-total[4]	3.8	-	-	7,902	-	14,767	-
Soil Storage 43							
ABC9/HR2m	0.4	Mineral	25	1,111	40	1,777	-
CTW1m-G/O5	3.2	Organic	55	-	-	-	17,512
Sub-total[4]	3.6	-	-	1,111	-	1,777	17,512
Soil Storage 44							
ABC9/U1h	1.3	Mineral	20	2,644	40	5,289	-
NWB20/U1l	0.1	Mineral	20	167	35	293	-
ZDL	0.2	-	-	-	-	-	-
Sub-total[4]	1.6	-	-	2,812	-	5,581	-
Soil Storage 45							
ABC2/H1l	1.8	Mineral	25	4,491	30	5,389	-
Sub-total[4]	1.8	-	-	4,491	-	5,389	-
Soil Storage 46							
ABC9/H1l	1.5	Mineral	25	3,775	30	4,530	-
ZDL	0.3	-	-	-	-	-	-
Sub-total[4]	1.8	-	-	3,775	-	4,530	-
Soil Storage 47							
ABC2/H1m	1.6	Mineral	25	3,978	30	4,773	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
CTW1m/O2	0.2	Organic	65	-	-	-	1,396
Sub-total[4]	1.8	-	-	3,978	-	4,773	1,396
Soil Storage 48							
ABC2/H1l	1.5	Mineral	25	3,630	30	4,357	-
ABC2/H1m	0.4	Mineral	25	884	30	1,061	-
Sub-total[4]	1.8	-	-	4,515	-	5,418	-
Soil Storage 49							
ABC2/U1h	1.8	Mineral	25	4,401	35	6,161	-
Sub-total[4]	1.8	-	-	4,401	-	6,161	-
Soil Storage 50							
ABC2/U1h	1.7	Mineral	25	4,328	35	6,060	-
CTW1m/O3	0.1	Organic	65	-	-	-	485
Sub-total[4]	1.8	-	-	4,328	-	6,060	485
Soil Storage 51							
ABC2/H1l	0.7	Mineral	25	1,722	30	2,067	-
ABC2/H1m	1.1	Mineral	25	2,782	30	3,339	-
CTW2m/O1	<0.1	Organic	170	-	-	-	68
Sub-total[4]	1.8	-	-	4,505	-	5,406	68
Soil Storage 52							
ABC2/H1m	1.6	Mineral	25	3,932	30	4,719	-
ZDL	0.2	-	-	-	30	699	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Sub-total[4]	1.8	-	-	3,932	-	5,418	-
Soil Storage 53							
ABC2/H1l	1.8	Mineral	25	4,515	30	5,418	-
Sub-total[4]	1.8	-	-	4,515	-	5,418	-
Soil Storage 54							
ABSL1/H1m	1.8	Mineral	45	8,109	30	5,406	-
Sub-total[4]	1.8	-	-	8,109	-	5,406	-
Soil Storage 55							
ABC2/H1m	1.3	Mineral	25	3,134	30	3,761	-
ABSL1/H1m	0.3	Mineral	45	1,384	30	923	-
CTW2m/O2	0.2	Organic	150	-	-	-	3,503
Sub-total[4]	1.8	-	-	4,518	-	4,684	3,503
Soil Storage 56							
ABC2/H1m	0.7	Mineral	25	1,843	30	2,211	-
ABC9/I3m	1.1	Mineral	30	3,181	30	3,181	-
Sub-total[4]	1.8	-	-	5,024	-	5,392	-
Soil Storage 57							
ABC2/H1m	1.8	Mineral	25	4,515	30	5,418	-
Sub-total[3]	1.8	-	-	4,515	-	5,418	-
Soil Storage 58							
ABC2/U1h	4.1	Mineral	25	10,361	35	14,506	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
ABC9/H1l	<0.1	Mineral	25	2	30	3	-
Sub-total[3]	4.1	-	-	10,363	-	14,508	-
Soil Storage 59							
ABC2/H1l	0.7	Mineral	25	1,778	30	2,134	-
ABC9/U1h	0.1	Mineral	20	203	40	407	-
ABMH2/U1h	3.6	Mineral	20	7,239	46	16,650	-
ZDL	0.1	-	-	-	-	-	-
Sub-total[3]	4.5	-	-	9,221	-	19,190	-
Soil Storage 60							
SDLC2/U1l	2.0	Mineral	30	5,988	35	6,986	-
Sub-total[3]	2.0	-	-	5,988	-	6,986	-
Soil Storage 61							
LCY9/U1l	1.8	Mineral	30	5,370	40	7,159	-
SDLC2/U1l	0.6	Mineral	30	1,942	35	2,266	-
ZDL	0.2	-	-	-	-	-	-
Sub-total[3]	2.7	-	-	7,312	-	9,425	-
Soil Storage 62							
ABC9/U1h	2.0	Mineral	20	3,990	40	7,980	-
Sub-total[3]	2.0	-	-	3,990	-	7,980	-
Soil Storage 63							
ABC9/HR2m	5.6	Mineral	25	13,994	40	22,391	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
ZDL	0.5	-	-	-	-	-	-
Sub-total[3]	6.1	-	-	13,994	-	22,391	-
Soil Storage 64							
ABC9/I3l	1.9	Mineral	20	3,756	35	6,572	-
Sub-total[3]	1.9	-	-	3,756	-	6,572	-
Soil Storage 65							
ABC2/H1l	3.1	Mineral	25	7,838	30	9,406	-
ABC9/H1l	2.0	Mineral	25	4,872	30	5,846	-
Sub-total[3]	5.1	-	-	12,710	-	15,252	-
Soil Storage 66							
ABC2/H1l	3.2	Mineral	25	7,938	30	9,525	-
ARV21/U1l	1.7	Mineral	25	4,335	-	-	-
CTW1m/O2	0.2	Organic	65	-	-	-	1,136
Sub-total[3]	5.1	-	-	12,273	-	9,525	1,136
Soil Storage 67							
ABC2/H1l	5.1	Mineral	25	12,710	30	15,252	-
Sub-total[3]	5.1	-	-	12,710	-	15,252	-
Soil Storage 68							
ABC2/H1m	2.5	Mineral	25	6,213	30	7,455	-
ABC9/I3m	2.6	Mineral	30	7,796	30	7,796	-
Sub-total[3]	5.1	-	-	14,009	-	15,252	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Borrow Pit 5							
ABC9/HR2m	6.1	Mineral	25	15,239	40	24,383	-
ABMH2/U1h	3.2	Mineral	20	6,395	46	14,710	-
Sub-total[4]	9.3	-	-	21,635	-	39,092	-
Borrow Pit 6							
ABMH2/HR2m	1.3	Mineral	25	3,200	35	4,479	-
ABMH2/U1h	13.3	Mineral	20	26,515	46	60,984	-
ABOW9/U1h	2.0	Mineral	25	4,881	20	3,905	-
ZDL	2.1	-	-	-	-	-	-
Sub-total[4]	18.6	-	-	34,595	-	69,368	-
Borrow Pit 7							
CTW2/O1	3.5	Organic	130	-	-	-	45,868
LCY9/U1h	3.0	Mineral	20	6,097	40	12,195	-
NWB20/U1l	2.8	Mineral	20	5,628	35	9,848	-
ZDL	0.6	-	-	-	-	-	-
Sub-total[4]	9.9	-	-	11,725	-	22,043	45,868
Borrow Pit 8							
NWB20/U1l	2.6	Mineral	20	5,161	35	9,031	-
SDLC2/U1l	1.4	Mineral	30	4,229	35	4,934	-
Sub-total[4]	4.0	-	-	9,390	-	13,965	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Borrow Pit 9							
LCY9/U1l	2.2	Mineral	30	6,674	40	8,898	-
SDLC2/U1l	1.3	Mineral	30	3,882	35	4,530	-
ZDL	0.5	-	-	-	-	-	-
Sub-total[4]	4.0	-	-	10,556	-	13,428	-
Borrow Pit 10							
ABC9/U1h	3.6	Mineral	20	7,121	40	14,242	-
SDLC2/U1l	0.7	Mineral	30	2,112	35	2,464	-
ZDL	0.6	-	-	-		-	-
Sub-total[4]	4.8	-	-	9,234	-	16,707	-
Borrow Pit 11							
LCY9/U1h	4.6	Mineral	20	9,122	40	18,245	-
NWB20/U1l	0.4	Mineral	20	704	35	1,231	-
Sub-total[4]	4.9	-	-	9,826	-	19,476	-
Borrow Pit 12							
ABC9/HR2m	4.5	Mineral	25	11,358	40	18,174	-
ABC9/U1h	1.5	Mineral	20	2,921	40	5,843	-
ZDL	0.1	-	-	-	-	-	-
Sub-total[4]	6.1	-	-	14,280	-	24,016	-
Borrow Pit 13							
ABC9/H1l	<0.1	Mineral	25	77	30	93	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
ABC9/HR2m	4.9	Mineral	25	12,196	40	19,514	-
CTW1m-G/O5	0.1	Organic	55	-	-	-	767
Sub-total[4]	5.0	-	-	12,274	-	19,607	767
Borrow Pit 14							
ABC2/H1l	8.4	Mineral	25	21,005	30	25,206	-
ABC9/H1l	0.7	Mineral	25	1,709	30	2,050	-
Sub-total[4]	9.1	-	-	22,714	-	27,257	-
Borrow Pit 15							
ABC2/H1l	6.5	Mineral	25	16,158	30	19,389	-
ARV21/U1l	2.5	Mineral	25	6,269	-	-	-
CTW1m/O2	0.1	Organic	65	-	-	-	542
CTW2m/O3	<0.1	Organic	165	-	-	-	520
Sub-total[4]	9.1	-	-	22,427	-	19,389	1,062
Borrow Pit 16							
ABC2/H1l	9.1	Mineral	25	22,714	30	27,257	-
Sub-total[4]	9.1	-	-	22,714	-	27,257	-
Borrow Pit 17							
ABC2/H1m	1.7	Mineral	25	4,263	30	5,116	-
ABC9/I3m	7.4	Mineral	30	22,141	30	22,141	-
Sub-total[4]	9.1	-	-	26,404	-	27,257	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
Borrow Pit 18							
ABC2/U1h	6.2	Mineral	25	15,512	35	21,716	-
ABC9/H1l	0.2	Mineral	25	469	30	563	-
Sub-total[4]	6.4	-	-	15,981	-	22,279	-
Access/Utility Corridor							
ABC2/H1l	36.2	Mineral	25	90,533	30	108,640	-
ABC2/H1m	41.7	Mineral	25	104,211	30	125,053	-
ABC2/HR2h	0.6	Mineral	25	1,506	40	2,409	-
ABC2/I3h	0.6	Mineral	25	1,397	25	1,397	-
ABC2/U1h	13.1	Mineral	25	32,720	35	45,809	-
ABC6/I3h	5.4	Mineral	20	10,704	30	16,056	-
ABC6/I3m	16.4	Mineral	20	32,864	40	65,728	-
ABC9/H1l	11.6	Mineral	25	28,896	30	34,675	-
ABC9/H1m	6.6	Mineral	20	13,112	35	22,946	-
ABC9/HR2m	12.7	Mineral	25	31,799	40	50,878	-
ABC9/I3l	1.7	Mineral	20	3,387	35	5,928	-
ABC9/I3m	6.7	Mineral	30	20,072	30	20,072	-
ABC9/U1h	13.9	Mineral	20	27,780	40	55,561	-
ABMH2/HR2m	6.2	Mineral	25	15,600	35	21,841	-
ABMH2/U1h	3.5	Mineral	20	7,082	46	16,289	-
ABOW9/U1h	1.5	Mineral	25	3,762	20	3,009	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
ABSL1/H1m	4.7	Mineral	45	21,368	30	14,245	-
ARV21/U1l	0.2	Mineral	25	380	-	-	-
CTW1c-G/O3[4]	1.1	Organic	35	-	-	-	3,873
CTW1m/O1	0.5	Organic	70	-	-	-	3,263
CTW1m/O2	1.7	Organic	65	-	-	-	10,945
CTW1m/O3	3.5	Organic	65	-	-	-	22,536
CTW1m-G/O1	0.7	Organic	45	-	-	-	3,129
CTW1m-G/O2	0.1	Organic	45	-	-	-	381
CTW1m-G/O5	1.2	Organic	55	-	-	-	6,842
CTW2/O1	12.6	Organic	130	-	-	-	164,262
CTW2/O2	2.8	Organic	200	-	-	-	55,207
CTW2m/O1	2.3	Organic	170	-	-	-	39,442
CTW2m/O2	0.6	Organic	150	-	-	-	9,390
CTW2m/O3	10.0	Organic	165	-	-	-	165,290
LCY1/I3h	2.2	Mineral	25	5,418	35	7,585	-
LCY2/H1l	4.3	Mineral	25	10,852	35	15,193	-
LCY2/U1h	0.8	Mineral	25	1,971	35	2,759	-
LCY9/I3m	0.2	Mineral	20	346	45	779	-
LCY9/U1h	34.0	Mineral	20	68,096	40	136,192	-
LCY9/U1l	2.6	Mineral	30	7,736	40	10,315	-
NWB20/U1h	1.1	Mineral	30	3,277	45	4,916	-

Table E.3.5-1 Soil Material Available for Salvage within the Project Footprint

Soil Map Unit[1]	Area (ha)	Dominant Soil Type (Upland/Organic)	Combined Average Topsoil and Litter/ Shallow Peat or Deep Peat Depth[2] (cm)	Topsoil / Shallow Organic Material Available for Salvage (m^3)	Average Subsoil Thickness (cm)	Subsoil Material Available for Salvage (m^3)	Volume of Deep Organic Soils Available for Salvage (m^3)
NWB20/U1l	12.0	Mineral	20	23,927	35	41,872	-
SDLC2/U1l	10.5	Mineral	30	31,634	35	36,907	-
ZDL	39.9	Mineral	-	-		-	-
Sub-total[4]	328.0	-	-	600,430	-	867,052	484,561
TOTALS[3]	**812.7**	**-**	**-**	**1,630,526**	**-**	**2,354,320**	**880,209**

Dash (-): a particular component does not contain a value associated with a row and/or column.

[1] Topsoil values were not assigned to ZDL soil map units in the footprint; however, soil material is likely either stockpiled adjacent the disturbance or has not been salvaged. This soil material will need to be salvaged or relocated prior to construction.

[2] Topsoil and litter/shallow organic thickness values adapted from CR#9.

[3] Due to rounding of values, component totals may not equal the sum of the individual values presented in the table

[4] This soil unit consists of organic and peaty Gleysolic soils resulting in an average peat depth less than 40 cm. However, only soils with more than 40 cm of peat were classified as organic.

E.3.5.6.1 Well Pads

There are 51 well pads planned for the Project totalling 232.5 ha. Approximately 192.8 ha within the well pads are considered upland, with 21.0 ha located in organics soils, and the remaining 18.7 ha being previously disturbed under another approval (Figure E.3.5-1). All upland areas will have the topsoil material salvaged and stockpiled in designated soil storage areas for replacement. Soil thickness values provided in Table E.3.5-1 are used for the Conceptual C&R Plan to assist in determining estimated soil thickness values and volumes. Subsoil material, up to a maximum of 30 cm, will also be salvaged from upland areas within the well pads and stockpiled on-site separately from topsoil material. Shallow organics with peat thickness less than 40 cm in thickness will be salvaged for replacement. Deep organics with greater than 40 cm of organic material may be padded over with geotextile and fill materials.

The following is a summary of the soil materials available within the 51 well pads and the amount planned for salvage:

Well Pad 04 (4.7 ha)

- Available Soil Materials:
  - upland topsoil material (4.7 ha) = 10,148 m^3;
  - upland subsoil material (4.7ha) = 18,716 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.7 ha) = 10,148 m^3;
  - upland subsoil material (4.7 ha) = 14,037 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 06 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (0 ha) = no upland soils within component;
  - upland subsoil material (0 ha) = no upland soils within component; and
  - deep organic material (4.3 ha) = 73,428 m^3.
- Planned Salvage:
  - upland topsoil material (0 ha) = no upland soils within component;
  - upland subsoil material (0 ha) = no upland soils within component; and,
  - deep organic material (0 ha) = no salvage; organic soils to be padded over. .

Well Pad 07 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (2.0 ha) = 4,066 m^3;
  - upland subsoil material (2.0 ha) = 7,885 m^3; and

- deep organic material (2.3 ha) = 29,512 m^3.
- Planned Salvage:
  - upland topsoil material (2.0 ha) = 4,066m^3;
  - upland subsoil material (2.0 ha) = 6,100 m^3; and
  - deep organic material (0 ha) = no salvage; organic soils to be padded over..

Well Pad 08 (8.1 ha)

- Available Soil Materials:
  - upland topsoil material (8.1ha) = 18,695 m^3;
  - upland subsoil material (8.1 ha) = 29,812 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (8.1 ha) = 18,695 m^3;
  - upland subsoil material (8.1 ha) = 24,254 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 09 (3.8 ha)

- Available Soil Materials:
  - upland topsoil material (3.1 ha) = 6,227 m^3;
  - upland subsoil material (3.1 ha) = 12,454 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (3.1 ha) = 6,227 m^3;
  - upland subsoil material (3.1 ha) = 9,341 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 10 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (2.6 ha) = 5,210 m^3;
  - upland subsoil material (2.6 ha) = 10,420 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (2.6 ha) = 5,210 m^3;
  - upland subsoil material (2.6 ha) = 7,815 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 11 (3.8ha) – located on entirely disturbed land

- Available Soil Materials:

  - upland topsoil material (0 ha) = no undisturbed upland soils within component;
  - upland subsoil material (0 ha) = no undisturbed upland soils within component; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (0 ha) = no undisturbed upland soils within component;
  - upland subsoil material (0 ha) = no undisturbed upland soils within component; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 12 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.1 ha) = 8,273 m^3;
  - upland subsoil material (4.1ha) = 15,640 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.1 ha) = 8,273 m^3;
  - upland subsoil material (4.1 ha) = 12,409 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 13 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (3.0 ha) = 5,928 m^3;
  - upland subsoil material (3.0 ha) = 11,086 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (3.0 ha) = 5,928 m^3;
  - upland subsoil material (3.0 ha) =8,892 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 14 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (2.9 ha) = 5,847 m^3;
  - upland subsoil material (2.9 ha) = 11,693 m^3; and
  - deep organic material (0.3 ha) = 4,959 m^3.
- Planned Salvage:
  - upland topsoil material (2.9 ha) = 5,847 m^3;
  - upland subsoil material (2.9 ha) = 8,770 m^3; and
  - deep organic material (0 ha) =. no salvage; organic soils to be padded over.

Well Pad 15 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (2.5 ha) = 4,939 m^3;
  - upland subsoil material (2.5 ha) = 9,840 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (2.5 ha) =4,939 m^3;
  - upland subsoil material (2.5 ha) = 7,408 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 16 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 12,876 m^3;
  - upland subsoil material (4.3 ha) = 15,022 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 12,876 m^3;
  - upland subsoil material (4.3 ha) = 12,876 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 17 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (3.8 ha) = 9,593 m^3;
  - upland subsoil material (3.8 ha) = 14,360 m^3; and
  - deep organic material (0.5 ha) = 7,692 m^3.
- Planned Salvage:
  - upland topsoil material (3.8 ha) = 9,593 m^3;
  - upland subsoil material (3.8 ha) = 11,494 m^3; and
  - deep organic material (0 ha) = no salvage; organic soils to be padded over.

Well Pad 18 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 8,607 m^3;
  - upland subsoil material (4.3 ha) = 17,214 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 8,607 m^3;

- upland subsoil material (4.3 ha) = 12,911 m^3; and
- deep organic material (0 ha) = no organic soils within component.

Well Pad 19 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (3.4 ha) = 6,811 m^3;
  - upland subsoil material (3.4 ha) = 13,254 m^3; and
  - deep organic material (0.9 ha) = 5,838 m^3.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 6,811 m^3;
  - upland subsoil material (4.3 ha) = 10,216 m^3; and
  - deep organic material (0 ha) = no salvage; organic soils to be padded over.

Well Pad 20 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 12,910 m^3;
  - upland subsoil material (4.3 ha) = 17,214 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 12,910 m^3;
  - upland subsoil material (4.3 ha) = 12,910 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 21 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 12,847 m^3;
  - upland subsoil material (4.3 ha) = 14,988 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 12,847 m^3;
  - upland subsoil material (4.3 ha) =12,847 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 22 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 8,879 m^3;
  - upland subsoil material (4.3 ha) = 17,077 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

- Planned Salvage:
  - upland topsoil material (4.3 ha) = 8,879 m^3;
  - upland subsoil material (4.3 ha) = 12,910 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 23 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 8,607 m^3;
  - upland subsoil material (4.3 ha) = 17,214 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 8,607 m^3;
  - upland subsoil material (4.3 ha) = 12,910 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 24 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 12,910 m^3;
  - upland subsoil material (4.3 ha) = 15,062 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 12,910 m^3;
  - upland subsoil material (4.3 ha) = 12,910 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 25 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 12,749 m^3;
  - upland subsoil material (4.3 ha) = 15,143 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 12,749 m^3;
  - upland subsoil material (4.3 ha) = 12,910 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 26 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 12,792 m^3;

- upland subsoil material (4.3 ha) = 15,121 m^3; and
- deep organic material (0 ha) = no organic soils within component.

- Planned Salvage:
  - upland topsoil material (4.3 ha) = 12,792 m^3;
  - upland subsoil material (4.3 ha) = 12,910 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 27 (3.3 ha)

- Available Soil Materials:
  - upland topsoil material (3.2 ha) = 8,588 m^3;
  - upland subsoil material (3.2 ha) = 11,328 m^3; and
  - deep organic material (0.1 ha) = 190 m^3.
- Planned Salvage:
  - upland topsoil material (3.2 ha) = 8,588 m^3;
  - upland subsoil material (3.2 ha) = 9,710 m^3; and
  - deep organic material (0 ha) = no salvage; organic soils to be padded over.

Well Pad 28 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 10,759 m^3;
  - upland subsoil material (4.3 ha) = 15,062 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 10,759 m^3;
  - upland subsoil material (4.3 ha) = 12,910 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 29 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 4,427 m^3;
  - upland subsoil material (1.8 ha) = 6,197 m^3; and
  - deep organic material (2.1 ha) = 13,633 m^3.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 4,427 m^3;
  - upland subsoil material (1.8 ha) = 5,312 m^3; and
  - deep organic material (0 ha) = no salvage; organic soils to be padded over.

Well Pad 30 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (0 ha) = no upland soils within component;
  - upland subsoil material (0 ha) = no upland soils within component; and
  - deep organic material (4.3 ha) = 55,944
- Planned Salvage:
  - upland topsoil material (0 ha) = no upland soils within component;
  - upland subsoil material (0 ha) = no upland soils within component; and
  - deep organic material (0 ha) = no salvage; organic soils to be padded over.

Well Pad 31 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 10,759 m^3;
  - upland subsoil material (4.3 ha) = 15,062 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 10,759 m^3;
  - upland subsoil material (4.3 ha) = 12,910 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 32 (5.5 ha)

- Available Soil Materials:
  - upland topsoil material (0.5 ha) = 1,108 m^3;
  - upland subsoil material (0.5 ha) = 1,786 m^3;
  - deep organic material (0 ha) = no organic soils within component; and
  - disturbed area (5.0 ha) = no soils available for salvage.
- Planned Salvage:
  - upland topsoil material (0.5 ha) = 1,108 m^3;
  - upland subsoil material (0.5 ha) = 1,340 m^3;
  - deep organic material (0 ha) = no organic soils within component; and
  - disturbed area (0 ha) = no soils available for salvage.

Well Pad 33 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 10,743 m^3;
  - upland subsoil material (4.3 ha) = 17,214 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

- Planned Salvage:
  - upland topsoil material (4.3 ha) = 10,743 m^3;
  - upland subsoil material (4.3 ha) = 12,911 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 34 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 9,515 m^3;
  - upland subsoil material (4.3 ha) = 16,149 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 9,515 m^3;
  - upland subsoil material (4.3 ha) = 12,949 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 35 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.2 ha) = 9,814 m^3;
  - upland subsoil material (4.2 ha) = 17,000 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.2 ha) = 9,814 m^3;
  - upland subsoil material (4.2 ha) = 12,750 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 36 (3.4 ha)

- Available Soil Materials:
  - upland topsoil material (2.9 ha) = 5,831 m^3;
  - upland subsoil material (2.9 ha) = 11,663 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (2.9 ha) = 5,831 m^3;
  - upland subsoil material (2.9 ha) = 8,747 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 37 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (3.4 ha) = 8,598 m^3;

- upland subsoil material (3.4 ha) = 10,318 m^3; and
- deep organic material (0.9 ha) = 5,700 m^3.

- Planned Salvage:
  - upland topsoil material (3.4 ha) = 8,598 m^3;
  - upland subsoil material (3.4 ha) = 10,318 m^3; and
  - deep organic material (0 ha) = no salvage; organic soils to be padded over.

Well Pad 38 (8.6 ha)

- Available Soil Materials:
  - upland topsoil material (8.6 ha) = 19,512 m^3;
  - upland subsoil material (8.6 ha) = 29,628 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (8.6 ha) = 19,512 m^3;
  - upland subsoil material (8.6 ha) = 25,744 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 39 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 10,638 m^3;
  - upland subsoil material (4.3 ha) = 17,020 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 10,638 m^3;
  - upland subsoil material (4.3 ha) = 12,765 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 40 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 8,501 m^3;
  - upland subsoil material (4.3 ha) = 15,736 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 8,501 m^3;
  - upland subsoil material (4.3 ha) = 12,752 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 41 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 10,735 m^3;
  - upland subsoil material (4.3 ha) = 12,882 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 10,735 m^3;
  - upland subsoil material (4.3 ha) = 12,882 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 42 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (3.6 ha) = 8,981 m^3;
  - upland subsoil material (3.6 ha) = 10,777 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (3.6 ha) = 8,981 m^3;
  - upland subsoil material (3.6 ha) = 10,777 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 43 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 10,743 m^3;
  - upland subsoil material (4.3 ha) = 12,891 m^3; and
  - deep organic material (<0.1 ha) = 41 m^3.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 10,743 m^3;
  - upland subsoil material (4.3 ha) = 12,891 m^3; and
  - deep organic material (0 ha) = no salvage; organic soils to be padded over.

Well Pad 44 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 4,520 m^3;
  - upland subsoil material (1.8 ha) = 5,424 m^3; and
  - deep organic material (2.5 ha) = 41,174 m^3.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 4,520 m^3;

- upland subsoil material (1.8 ha) = 5,424 m^3; and
- deep organic material (0 ha) = no salvage; organic soils to be padded over.

Well Pad 45 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (2.5 ha) = 6,304 m^3;
  - upland subsoil material (2.5 ha) = 8,825 m^3; and
  - deep organic material (1.4 ha) = 8,994 m^3.
- Planned Salvage:
  - upland topsoil material (2.5 ha) = 6,304 m^3;
  - upland subsoil material (2.5 ha) = 7,564 m^3; and
  - deep organic material (1.4 ha) = no salvage; organic soils to be padded over.

Well Pad 46 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (3.9 ha) = 9,705 m^3;
  - upland subsoil material (3.9 ha) = 13,588 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (3.9 ha) = 9,705 m^3;
  - upland subsoil material (3.9 ha) = 11,647 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 47 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.2 ha) = 10,480 m^3;
  - upland subsoil material (4.2 ha) = 12,576 m^3; and
  - deep organic material (0.1 ha) = 1,893 m^3.
- Planned Salvage:
  - upland topsoil material (4.2 ha) = 10,480 m^3;
  - upland subsoil material (4.2 ha) = 12,576 m^3; and
  - deep organic material (0 ha) = no salvage; organic soils to be padded over.

Well Pad 48 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (3.1 ha) = 7,652 m^3;
  - upland subsoil material (3.1 ha) = 9,182 m^3; and
  - deep organic material (1.2 ha) = 20,931 m^3.

- Planned Salvage:
  - upland topsoil material (3.1 ha) = 7,652 m^3;
  - upland subsoil material (3.1 ha) = 9,182 m^3; and
  - deep organic material (0 ha) = no salvage; organic soils to be padded over.

Well Pad 49 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 12,083 m^3;
  - upland subsoil material (4.3 ha) = 16,883 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 12,083 m^3;
  - upland subsoil material (4.3 ha) =12,910 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 50 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 19,128 m^3;
  - upland subsoil material (4.3 ha) = 12,557 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 19,128 m^3;
  - upland subsoil material (4.3 ha) = 12,907 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 51 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (3.6 ha) = 8,941 m^3;
  - upland subsoil material (3.6 ha) = 10,702 m^3; and
  - deep organic material (0.2 ha) = 3,222 m^3.
- Planned Salvage:
  - upland topsoil material (3.6 ha) = 8,941 m^3;
  - upland subsoil material (3.6 ha) = 10,702 m^3; and
  - deep organic material (0 ha) = no salvage; organic soils to be padded over.

Well Pad 52 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 12,428 m^3;

  - upland subsoil material (4.3 ha) = 12,885 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 12,428 m^3;
  - upland subsoil material (4.3 ha) = 12,885 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 53 (4.3 ha)

- Available Soil Materials:
  - upland topsoil material (4.3 ha) = 10,759 m^3;
  - upland subsoil material (4.3 ha) = 12,910 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.3 ha) = 10,759 m^3;
  - upland subsoil material (4.3 ha) = 12,910 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 54 (7.4 ha)

- Available Soil Materials:
  - upland topsoil material (7.4 ha) = 18,582 m^3;
  - upland subsoil material (7.4 ha) = 23,808 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (7.4 ha) = 18,582 m^3;
  - upland subsoil material (7.4 ha) = 22,299 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Well Pad 55 (7.6 ha)

- Available Soil Materials:
  - upland topsoil material (7.6 ha) = 19,157 m^3;
  - upland subsoil material (7.6 ha) = 26,614 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (7.6 ha) = 19,157 m^3;
  - upland subsoil material (7.6 ha) = m^3; 22,886 and
  - deep organic material (0 ha) = no organic soils within component.

E.3.5.6.2 Soil Storage Areas

Soil storage areas designated for the well pads comprise 142.8 ha. Approximately 126.3 ha are considered upland, 8.0 ha are considered deep organic, and 8.6 ha have been previously disturbed (Figure E.3.6-1).

Pengrowth will be stockpiling soil materials on "like" material. In areas where topsoil material will be stockpiled, the topsoil material within these areas will not be salvaged prior to topsoil material placement. In locations where subsoil material is to be stored, the topsoil material will be salvaged and stockpiled separately from the subsoil material. The salvaged subsoil material will be stored on subsoil material within designated subsoil stockpile areas. The topsoil material salvaged from the subsoil stockpile areas will be placed within the topsoil storage areas and marked to ensure this material is replaced within the appropriate subsoil stockpile areas at reclamation. No subsoil material will be salvaged from the subsoil stockpile areas.

The following is a summary of the soil materials available within the soil storage areas and the amount planned for salvage:

Soil Storage 10 (0.9 ha)

- Available Soil Materials:
  - upland topsoil material (0 ha) = no undisturbed upland soils within component; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (0 ha) = no upland soils within component; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 11 (0.9 ha)

- Available Soil Materials:
  - upland topsoil material (0 ha) = no upland soils within component; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (0 ha) = no upland soils within component; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 12 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (0.8 ha) = 1,623 m^3; and
  - deep organic material (1.0 ha) = 12,928 m^3.

- Planned Salvage:
  - upland topsoil material (0.8 ha) = 1,623 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no salvage of deep organic material.

Soil Storage 13 (3.6 ha)

- Available Soil Materials:
  - upland topsoil material (3.6 ha) = 7,470 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (3.6 ha) = 7,470 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 14 (3.0 ha)

- Available Soil Materials:
  - upland topsoil material (3.0 ha) = 7,240 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (3.0 ha) = 7,240 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 15 (1.0 ha)

- Available Soil Materials:
  - upland topsoil material (0.9 ha) = 1,838 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (0.9 ha) = 1,838 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 16 (2.2 ha)

- Available Soil Materials:
  - upland topsoil material (0.7 ha) = 1,346 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

- Planned Salvage:
  - upland topsoil material (0.7 ha) = 1,346 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 17 (3.3 ha)

- Available Soil Materials:
  - upland topsoil material (3.1 ha) = 6,156 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (3.1 ha) = 6,156 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 18 (4.8 ha)

- Available Soil Materials:
  - upland topsoil material (3.2 ha) = 6,388 m^3; and
  - deep organic material (1.2 ha) = 14,959 m^3.
- Planned Salvage:
  - upland topsoil material (3.2 ha) = 6,388 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no salvage of deep organic material.

Soil Storage 19 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.1 ha) = 2,172 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.1 ha) = 2,172 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 20 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.0 ha) = 1,951 m^3; and

- deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.0 ha) = 1,951 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 21 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 5,321 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 5,321 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 22 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (0.8 ha) = 2,327 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (0.8 ha) = 2327 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 23 (1.6 ha)

- Available Soil Materials:
  - upland topsoil material (1.6 ha) = 3,174 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.6 ha) = 3,174 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 24 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.5 ha) = 2,968 m^3; and
  - deep organic material (0.3 ha) = 2,093 m^3.
- Planned Salvage:
  - upland topsoil material (1.5 ha) = 2,968 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no salvage of deep organic material.

Soil Storage 25 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 5,418 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 5,418 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 26 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 5,410 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 5,410 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no salvage of deep organic material.

Soil Storage 27 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 3,612 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 3,612 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and

- deep organic material (0 ha) = no organic soils within component.

Soil Storage 28 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.7 ha) = 3,486 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.7 ha) = 3,486 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 29 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 5,418 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 5,418 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 30 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 5,418 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 5,418 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 31 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 5,418 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

- Planned Salvage:
  - upland topsoil material (1.8 ha) = 5,418 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 32 (1.4 ha)

- Available Soil Materials:
  - upland topsoil material (1.4 ha) = 4,064 m^3; and
  - deep organic material (<0.1 ha) = 77 m^3.
- Planned Salvage:
  - upland topsoil material (1.4 ha) = 4,064 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no salvage of deep organic material.

Soil Storage 33 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 4,515 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 4,515 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 34 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.6 ha) = 4,031 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.6 ha) = 4,031 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 35 (1.6 ha)

- Available Soil Materials:
  - upland topsoil material (0 ha) = no upland soils within component; and

- deep organic material (1.6 ha) = 20,511 m^3.
- Planned Salvage:
  - upland topsoil material (0 ha) = no upland soils within component; and
  - deep organic material (0 ha) = no salvage of deep organic material.

Soil Storage 36 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 4,515 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 4,515 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 37 (3.8 ha)

- Available Soil Materials:
  - upland topsoil material (3.8 ha) = 8,040 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (3.8 ha) = 8,040 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 38 (4.5 ha)

- Available Soil Materials:
  - upland topsoil material (4.5ha) = 9,079 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.5ha) = 9,079 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 39 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 3,884 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

- Planned Salvage:
  - upland topsoil material (1.8 ha) = 3,884 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 40 (1.5 ha)

- Available Soil Materials:
  - upland topsoil material (1.5 ha) = 2,970 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.5 ha) = 2,970 m3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 41 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 4,434 m^3; and
  - deep organic material (<0.1 ha) = 132 m^3.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 4,434 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no salvage of deep organic material.

Soil Storage 42 (3.8 ha)

- Available Soil Materials:
  - upland topsoil material (3.8 ha) = 7,902 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (3.8 ha) = 7,902 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 43 (3.6 ha)

- Available Soil Materials:
  - upland topsoil material (0.4 ha) = 1,111 m^3; and

- deep organic material (3.2 ha) = 17,512 m^3.
- Planned Salvage:
  - upland topsoil material (0.4 ha) = 1,111 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no salvage of deep organic material.

Soil Storage 44 (1.6 ha)

- Available Soil Materials:
  - upland topsoil material (1.4 ha) = 2,812 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.4 ha) = 2,812 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 45 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 4,491 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 4,491 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 46 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.5 ha) = 3,775 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.5 ha) = 3,775 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 47 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.6 ha) = 3,978 m^3; and
  - deep organic material (0.2 ha) = 1,396 m^3.
- Planned Salvage:
  - upland topsoil material (1.6 ha) = 3,978 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no salvage of deep organic material.

Soil Storage 48 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 4,515 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 4,515 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 49 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 4,401 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 4,401 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 50 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.7 ha) = 4,328 m^3; and
  - deep organic material (0.1 ha) = 485 m^3.
- Planned Salvage:
  - upland topsoil material (1.7 ha) = 4,328 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and

- deep organic material (0 ha) = no salvage of deep organic material.

Soil Storage 51 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 4,505 m^3; and
  - deep organic material (<0.1 ha) = 68 m^3.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 4,505 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no salvage of deep organic material.

Soil Storage 52 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.6 ha) = 3,932 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.6 ha) = 3,932 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 53 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 4,515 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 4,515 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 54 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 8,109 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

- Planned Salvage:
  - upland topsoil material (1.8 ha) = 8,109 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 55 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.6 ha) = 4,518 m^3; and
  - deep organic material (0.2 ha) = 3,503 m^3.
- Planned Salvage:
  - upland topsoil material (1.6 ha) = 4,518 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no salvage of deep organic material.

Soil Storage 56 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 5,024 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 5,024 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 57 (1.8 ha)

- Available Soil Materials:
  - upland topsoil material (1.8 ha) = 4,515 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.8 ha) = 4,515 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 58 (4.1 ha)

- Available Soil Materials:
  - upland topsoil material (4.1 ha) = 10,363 m^3; and

- deep organic material (0 ha) = no organic soils within component.

- Planned Salvage:
  - upland topsoil material (4.1 ha) = 10,363 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 59 (4.5 ha)

- Available Soil Materials:
  - upland topsoil material (4.4 ha) = 9,221 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.4 ha) = 9,221 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 60 (2.0 ha)

- Available Soil Materials:
  - upland topsoil material (2.0 ha) = 5,988 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (2.0 ha) = 5,988 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 61 (2.7 ha)

- Available Soil Materials:
  - upland topsoil material (2.5 ha) = 7,312 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (2.5 ha) = 7,312 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 62 (2.0 ha)

- Available Soil Materials:
  - upland topsoil material (2.0 ha) = 3,990 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (2.0 ha) = 3,990 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 63 (6.1 ha)

- Available Soil Materials:
  - upland topsoil material (5.6 ha) = 13,994 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (5.6 ha) =13,994 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 64 (1.9 ha)

- Available Soil Materials:
  - upland topsoil material (1.9 ha) = 3,756 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (1.9 ha) = 3,756 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 65 (5.1 ha)

- Available Soil Materials:
  - upland topsoil material (5.1 ha) = 12,710 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (5.1 ha) = 12,710 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and

- deep organic material (0 ha) = no organic soils within component.

Soil Storage 66 (5.1 ha)

- Available Soil Materials:
  - upland topsoil material (4.9 ha) = 12,273 m^3; and
  - deep organic material (0.2 ha) = 1,136 m^3.
- Planned Salvage:
  - upland topsoil material (4.9 ha) = 12,273 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 67 (5.1 ha)

- Available Soil Materials:
  - upland topsoil material (5.1 ha) = 12,710 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (5.1 ha) = 12,710 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

Soil Storage 68 (5.1 ha)

- Available Soil Materials:
  - upland topsoil material (5.1 ha) = 14,009 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (5.1 ha) = 14,009 m^3, NOTE: not all topsoil material within the soil storage areas will be salvaged, only in areas where subsoil stockpiles will be located; and
  - deep organic material (0 ha) = no organic soils within component.

E.3.5.6.3 Borrow Pits

There are 14 borrow pits proposed for the Project footprint totalling 109.4 ha. Approximately 101.9 ha are considered upland, 3.7 ha are considered deep organic, and 3.8 ha are previously disturbed (Figure E.3.5-1). The topsoil material and deep organic material will be salvaged and stockpiled on designated areas for replacement at reclamation. The stockpiled topsoil and organic materials will be seeded to establish a vegetative cover and used at final reclamation of the borrow pits. The use of any surplus topsoil material for other footprint components will be discussed with regulators. In addition to the topsoil and organic material salvage, Pengrowth

will also stockpile materials excavated during borrow pit development that are not suitable for construction purposes. This poor construction material will be stockpiled separately from the salvaged topsoil and organic material and used to recontour the borrow disturbance at reclamation.

Pengrowth plans to submit a Surface Material Licence/Lease Application to ESRD with a detailed operating and reclamation plan for approval for the borrow areas. In addition, the borrow pits will be included in the PDA document, which also requires detailed development and reclamation plans. As such, conceptual information related to the development and reclamation of the borrow pits is supplied for the Application as Pengrowth will supply all detailed borrow pit development and reclamation information prior to construction in these two separate ESRD documents for review.

The following is a summary of the soil materials available within the Project footprint borrow pits and the volumes planned for salvage:

Borrow Pit 5 (9.3 ha)

- Available Soil Materials:
  - upland topsoil material (9.3 ha) = 21,635 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (9.3 ha) = 21,635 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Borrow Pit 6 (18.6 ha)

- Available Soil Materials:
  - upland topsoil material (16.5 ha) = 34,595 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (16.5 ha) = 34,595 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Borrow Pit 7 (9.9 ha)

- Available Soil Materials:
  - upland topsoil material (5.9 ha) = 11,725 m^3; and
  - deep organic material (3.5 ha) = 45,868 m^3.
- Planned Salvage:
  - upland topsoil material (5.9 ha) =11,725 m^3; and
  - deep organic material (3.5 ha) = 45,868 m^3.

Borrow Pit 8 (4.0 ha)

- Available Soil Materials:
  - upland topsoil material (4.0 ha) = 9,390 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.0 ha) = 9,390 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Borrow Pit 9 (4.0 ha)

- Available Soil Materials:
  - upland topsoil material (3.5 ha) = 10,556 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (3.5 ha) = 10,556 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Borrow Pit 10 (4.8 ha)

- Available Soil Materials:
  - upland topsoil material (4.2 ha) = 9,234 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.2 ha) = 9,234 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Borrow Pit 11 (4.9 ha)

- Available Soil Materials:
  - upland topsoil material (4.9 ha) = 9,826 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (4.9 ha) = 9,826 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Borrow Pit 12 (6.1 ha)

- Available Soil Materials:
  - upland topsoil material (6.0 ha) = 14,280 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

- Planned Salvage:
  - upland topsoil material (6.0 ha) = 14,280 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Borrow Pit 13 (5.0 ha)

- Available Soil Materials:
  - upland topsoil material (4.9 ha) = 12,274 m^3; and
  - deep organic material (0.1 ha) = 767 m^3.
- Planned Salvage:
  - upland topsoil material (4.9 ha) = 12,274 m^3; and
  - deep organic material (0.1 ha) = 767 m^3.

Borrow Pit 14 (9.1 ha)

- Available Soil Materials:
  - upland topsoil material (9.1 ha) = 22,714 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (9.1 ha) = 22,714 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Borrow Pit 15 (9.1 ha)

- Available Soil Materials:
  - upland topsoil material (9.0 ha) = 22,427 m^3; and
  - deep organic material (0.1 ha) = 1,062 m^3.
- Planned Salvage:
  - upland topsoil material (9.0 ha) = 22,427 m^3; and
  - deep organic material (0.1 ha) = 1,062 m^3.

Borrow Pit 16 (9.1 ha)

- Available Soil Materials:
  - upland topsoil material (9.1 ha) = 22,714 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (9.1 ha) = 22,714 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Borrow Pit 17 (9.1 ha)

- Available Soil Materials:
  - upland topsoil material (9.1 ha) = 26,404 m^3; and
  - deep organic material (0 a) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (9.1 ha) = 26,404 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

Borrow Pit 18 (6.4 ha)

- Available Soil Materials:
  - upland topsoil material (6.4 ha) = 15,981 m^3; and
  - deep organic material (0 ha) = no organic soils within component.
- Planned Salvage:
  - upland topsoil material (6.4 ha) = 15,981 m^3; and
  - deep organic material (0 ha) = no organic soils within component.

E.3.5.6.4 Access and Utility Corridors

The Access and Utility Corridors include access roads, interconnecting piping and power lines between the existing CPF, well pads and borrow pits. Pengrowth expects that the entire width of right-of-way within each corridor containing underground facilities and access roads will be disturbed.

Approximately 250.9 ha of the total 328.0 ha are considered upland, 37.1 ha are considered deep organic, and 39.9 ha have been previously disturbed along the utility corridors (Figure E.3.5-1). The topsoil will be salvaged by blading the soil material to the edge of the right-of-way, out of the way of construction activities. For access roads, this topsoil material will be spread evenly along the ditches after construction is complete to provide a growing medium for vegetation establishment. Excess soil will be placed in a stockpile until it is needed for reclamation. Deep organic soil areas may be padded over.

The following is a summary of the soil materials available along the utility corridors and the amount planned for salvage:

- Available Soil Materials:
  - upland topsoil material (250.9 ha) = 600,430 m^3; and
  - deep organic material (39.9 ha) = 484,561 m^3.
- Planned Salvage:
  - upland topsoil material (250.9 ha) = 600,430 m^3; and
  - deep organic material (0 ha) = no salvage of deep organic material.

E.3.6 SOIL STORAGE AND MATERIAL BALANCE

Soil storage areas for the borrow pits and the majority of the well pads have been designed for each Project component to ensure that the estimated volume of topsoil and subsoil material to be salvaged can be stockpiled to provide maximum stockpile heights ranging from 1 to 3 m.

All upland and organic materials that are salvaged will be placed in designated soil stockpiles as follows:

- soil material salvaged along the access and utility corridors will be stockpiled along the right-of-way and some of this topsoil material will be spread along the ditches after construction is complete and some will be stored along the right of way in stockpiles and used at final reclamation;
- topsoil and subsoil materials salvaged from the well pads will be stockpiled separately at the designated areas and utilized at reclamation. Topsoil will be stored on topsoil and salvaged subsoil materials will be stored in areas where the topsoil layer has been salvaged; and
- topsoil materials salvaged from the borrow pits will remain at the borrow soil storage area in stockpiles until required for reclamation.

The stockpiles will be constructed as follows:

- soil will be stockpiled on similar material (*i.e.*, topsoil stockpiled on topsoil);
- long-term stockpiles will have a set-back of 5 m from standing timber;
- topsoil will be stockpiled separately from salvaged subsoil and other materials;
- stockpile foundations will be stable;
- stockpiles will be stabilized to control water and wind erosion;
- stockpiles will be constructed out of the way of surface water flow;
- stockpiles will be accessible and retrievable;
- stockpiles will be revegetated and controlled for weeds;
- all stockpiles will include signage that indicates the type of reclamation material; and
- the average height of the stockpiles will vary and will depend on the volume and type of material to be stored. It is expected that the average height of soil stockpiles will vary from 1 to 3 m with side slopes not exceeding 3H:1V.

Figure E.3.6-1 displays the estimated stockpile locations within the Project footprint. Materials salvaged from access and utility corridors are not displayed on the figures.

The reclamation material balance for the Project is shown in Table E.3.6-1. The estimated volume of soil material that is expected to be salvaged from the Project footprint is based on the summary of soil salvage information. The replacement volume of soil material is assumed to be equal to the estimated in situ volume prior to disturbance.

The soil volumes provided in Table E.3.6-1 for the Project footprint are based on soil results adapted from the baseline soil map and thickness information.

Approximately 1,725,921 m^3 of topsoil and deep organic material and 578,391 m^3 of subsoil is planned to be salvaged for the Project footprint (Table E.3.6-1). The total volumes of soil materials estimated for salvage in the Project are provided below:

- Pengrowth Lindbergh Phase 2 Footprint (812.7 ha)
  - topsoil material = 1,678,223 m^3;
  - subsoil material = 578,391 m^3; and
  - deep organic material = 47,698 m^3.

Table E.3.6-1 Reclamation Material Balance for the Project Footprint

Project Component	Total Area (ha)	Area of Upland Soil Salvage (ha)	Area of Deep Organic Material (ha)	Area of Past Disturbance (ha)	Topsoil Materials to be Salvaged (m^3)[1]			Total Volume of Topsoil Materials (m^3)[2]	Target Replacement Depth of Topsoil (cm)[3]	Total Volume of Topsoil to be Replaced (m^3)[4]	Topsoil Reclamation Material Balance (m^3)[5]	Total Volume of Subsoil to be Salvaged (m^3)[6]	Average Replacement Depth of Salvaged Subsoil (cm)	Total Volume of Subsoil to be Replaced (m^3)	Subsoil Reclamation Material Balance (m^3)
					Shallow Organic/ Litter	Mineral	Deep Organic								
Well Pad D04	4.7	4.7	-	-	2,340	7,809	-	10,148	22	10,148	0	14,037	30	14,037	0
Well Pad D06	4.3	-	4.3	<0.1	NS	NS	NS	NS	-	-	-	NS	-	-	-
Well Pad D07	4.3	2.0	2.3	-	1,265	2,802	NS	4,066	20	8,607	-4,540	6,100	30	6,100	0
Well Pad D08	8.1	8.1	-	-	4,042	14,653	-	18,695	23	18,695	0	24,254	30	24,254	0
Well Pad D09	3.8	3.1	-	0.7	1,557	4,670	-	6,227	20	6,227	0	9,341	30	9,341	0
Well Pad D10	4.3	2.6	-	1.7	1,302	3,907	-	5,210	20	5,210	0	7,815	30	7,815	0
Well Pad D11	3.8	-	-	3.8	-	-	-	-	-	-	-	-	-	-	-
Well Pad D12	4.3	4.1	-	0.2	2,974	5,299	-	8,273	20	8,273	0	12,409	30	12,409	0
Well Pad D13	4.3	3.0	-	1.4	2,956	2,972	-	5,928	20	5,928	0	8,892	30	8,892	0
Well Pad D14	4.3	2.9	0.3	1.1	1,462	4,385	NS	5,847	18	5,847	0	8,770	30	8,770	0
Well Pad D15	4.3	2.5	-	1.8	1,275	3,664	-	4,939	20	4,939	0	7,408	30	7,408	0
Well Pad D16	4.3	4.3	-	<0.1	2,146	10,730	-	12,876	30	12,876	0	12,876	30	12,876	0
Well Pad D17	4.3	3.8	0.5	<0.1	1,916	7,677	NS	9,593	22	9,593	0	11,494	30	11,494	0
Well Pad D18	4.3	4.3	-	-	2,152	6,455	-	8,607	20	8,607	0	12,911	30	12,911	0
Well Pad D19	4.3	3.4	0.9	-	2,070	4,741	NS	6,811	20	8,607	-1,796	10,216	30	10,216	0
Well Pad D20	4.3	4.3	-	-	4,303	8,607	-	12,910	30	12,910	0	12,910	30	12,910	0
Well Pad D21	4.3	4.3	-	<0.1	2,141	10,705	-	12,847	30	12,847	0	12,847	30	12,847	0
Well Pad D22	4.3	4.3	-	-	2,152	6,728	-	8,879	21	8,879	0	12,910	30	12,910	0
Well Pad D23	4.3	4.3	-	-	2,152	6,455	-	8,607	20	8,607	0	12,910	30	12,910	0
Well Pad D24	4.3	4.3	-	-	2,152	10,759	-	12,910	30	12,910	0	12,910	30	12,910	0
Well Pad D25	4.3	4.3	-	-	2,152	10,597	-	12,749	30	12,749	0	12,910	30	12,910	0
Well Pad D26	4.3	4.3	-	-	2,152	10,641	-	12,792	30	12,792	0	12,910	30	12,910	0
Well Pad D27	3.3	3.2	0.1	-	1,618	6,970	NS	8,588	26	8,588	0	9,710	30	9,710	0
Well Pad D28	4.3	4.3	-	-	2,152	8,607	-	10,759	25	10,759	0	12,910	30	12,910	0

Table E.3.6-1 Reclamation Material Balance for the Project Footprint

Project Component	Total Area (ha)	Area of Upland Soil Salvage (ha)	Area of Deep Organic Material (ha)	Area of Past Disturbance (ha)	Topsoil Materials to be Salvaged (m^3)[1]			Total Volume of Topsoil Materials (m^3)[2]	Target Replacement Depth of Topsoil (cm)[3]	Total Volume of Topsoil to be Replaced (m^3)[4]	Topsoil Reclamation Material Balance (m^3)[5]	Total Volume of Subsoil to be Salvaged (m^3)[6]	Average Replacement Depth of Salvaged Subsoil (cm)	Total Volume of Subsoil to be Replaced (m^3)	Subsoil Reclamation Material Balance (m^3)
					Shallow Organic/ Litter	Mineral	Deep Organic								
Well Pad D29	4.3	1.8	2.1	0.4	885	3,541	NS	4,427	25	9,686	-5,259	5,312	30	5,312	0
Well Pad D30	4.3	-	4.3	-	NS	NS	NS	NS	-	-	-	NS	-	-	-
Well Pad D31	4.3	4.3	-	-	2,152	8,607	-	10,759	25	10,759	0	12,910	30	12,910	0
Well Pad D32	5.5	0.4	-	5.0	223	885	-	1,108	25	1,108	0	1,340	30	1,340	0
Well Pad D33	4.3	4.3	-	<0.1	2,152	8,591	-	10,743	25	10,743	0	12,911	30	12,911	0
Well Pad D34	4.3	4.3	-	-	2,583	6,932	-	9,515	22	9,515	0	12,949	30	12,949	0
Well Pad D35	4.3	4.2	-	<0.1	2,125	7,689	-	9,814	23	9,814	0	12,750	30	12,750	0
Well Pad D36	3.4	2.9	-	0.5	1,458	4,374	-	5,831	20	5,831	0	8,747	30	8,747	0
Well Pad D37	4.3	3.4	0.9	-	1,720	6,879	NS	8,598	20	8,598	0	10,318	30	10,318	0
Well Pad D38	8.6	8.6	-	-	4,291	15,221	-	19,512	23	19,512	0	25,744	30	25,744	0
Well Pad D39	4.3	4.3	-	-	2,128	8,510	-	10,638	25	10,638	0	12,765	30	12,765	0
Well Pad D40	4.3	4.3	-	<0.1	3,392	5,109	-	8,501	20	8,501	0	12,752	30	12,752	0
Well Pad D41	4.3	4.3	-	-	2,147	8,588	-	10,735	25	10,735	0	12,882	30	12,882	0
Well Pad D42	4.3	3.6	-	0.7	1,796	7,185	-	8,981	25	8,981	0	10,777	30	10,777	0
Well Pad D43	4.3	4.3	<0.1	-	2,149	8,594	NS	10,743	25	10,743	0	12,891	30	12,891	0
Well Pad D44	4.3	1.8	2.5	-	904	3,616	NS	4,520	25	10,759	-6,238	5,424	30	5,424	0
Well Pad D45	4.3	2.5	1.4	0.4	1,261	5,043	NS	6,304	25	9,763	-3,459	7,564	30	7,564	0
Well Pad D46	4.3	3.9	-	0.4	1,941	7,764	-	9,705	25	9,705	0	11,647	30	11,647	0
Well Pad D47	4.3	4.2	0.1	-	2,096	8,384	NS	10,480	24	10,480	0	12,576	30	12,576	0
Well Pad D48	4.3	3.1	1.2	-	1,530	6,122	NS	7,652	25	10,730	-3,078	9,182	30	9,182	0
Well Pad D49	4.3	4.3	-	-	6,125	5,958	-	12,083	28	12,083	0	12,910	30	12,910	0
Well Pad D50	4.3	4.3	-	-	10,756	8,372	-	19,128	44	19,128	0	12,907	30	12,907	0
Well Pad D51	4.3	3.6	0.2	0.5	1,806	7,134	NS	8,941	35	13,237	-4,296	10,702	30	10,702	0
Well Pad D52	4.3	4.3	-	-	3,838	8,590	-	12,428	29	12,428	0	12,885	30	12,885	0

Table E.3.6-1 Reclamation Material Balance for the Project Footprint

Project Component	Total Area (ha)	Area of Upland Soil Salvage (ha)	Area of Deep Organic Material (ha)	Area of Past Disturbance (ha)	Topsoil Materials to be Salvaged (m^3)[1]			Total Volume of Topsoil Materials (m^3)[2]	Target Replacement Depth of Topsoil (cm)[3]	Total Volume of Topsoil to be Replaced (m^3)[4]	Topsoil Reclamation Material Balance (m^3)[5]	Total Volume of Subsoil to be Salvaged (m^3)[6]	Average Replacement Depth of Salvaged Subsoil (cm)	Total Volume of Subsoil to be Replaced (m^3)	Subsoil Reclamation Material Balance (m^3)
					Shallow Organic/ Litter	Mineral	Deep Organic								
Well Pad D53	4.3	4.3	-	-	2,152	8,607	-	10,759	25	10,759	0	12,910	30	12,910	0
Well Pad D54	7.4	7.4	-	-	3,716	14,866	-	18,582	25	18,582	0	22,299	30	22,299	0
Well Pad D55	7.6	7.6	-	-	3,900	15,257	-	19,157	25	19,157	0	22,886	30	22,886	0
Soil Storage 10	0.9	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-
Soil Storage 11	1.0	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-
Soil Storage 12	1.8	0.8	1.0	-	811	811	NS	1,623	20	3,612	-1,989	NS	-	-	-
Soil Storage 13	3.6	3.6	-	-	1,822	5,647	-	7,470	20	7,470	0	NS	-	-	-
Soil Storage 14	3.0	3.0	-	-	1,862	5,378	-	7,240	24	7,240	0	NS	-	-	-
Soil Storage 15	1.0	0.9	-	<0.1	460	1,379	-	1,838	20	1,838	0	NS	-	-	-
Soil Storage 16	2.2	0.7	-	1.5	337	1,010	-	1,346	20	1,346	0	NS	-	-	-
Soil Storage 17	3.3	3.1	-	0.2	2,474	3,681	-	6,156	20	6,156	0	NS	-	-	-
Soil Storage 18	4.8	3.2	1.2	0.4	3,194	3,194	NS	6,388	20	8,690	-2,301	NS	-	-	-
Soil Storage 19	1.8	1.1	-	0.7	543	1,629	-	2,172	20	2,172	0	NS	-	-	-
Soil Storage 20	1.8	1.0	-	0.8	790	1,161	-	1,951	20	1,951	0	NS	-	-	-
Soil Storage 21	1.8	1.8	-	<0.1	891	4,430	-	5,321	30	5,321	0	NS	-	-	-
Soil Storage 22	1.8	0.8	-	1.0	404	1,923	-	2,327	29	2,327	0	NS	-	-	-
Soil Storage 23	1.6	1.6	-	-	793	2,380	-	3,174	20	3,174	0	NS	-	-	-
Soil Storage 24	1.8	1.5	0.3	-	932	2,036	NS	2,968	16	2,968	0	NS	-	-	-
Soil Storage 25	1.8	1.8	-	-	1,806	3,612	-	5,418	30	5,418	0	NS	-	-	-
Soil Storage 26	1.8	1.8	-	<0.1	902	4,509	-	5,410	30	5,410	0	NS	-	-	-
Soil Storage 27	1.8	1.8	-	-	903	2,709	-	3,612	20	3,612	0	NS	-	-	-
Soil Storage 28	1.8	1.7	-	0.1	871	2,614	-	3,486	20	3,486	0	NS	-	-	-
Soil Storage 29	1.8	1.8	-	-	903	4,515	-	5,418	30	5,418	0	NS	-	-	-
Soil Storage 30	1.8	1.8	-	-	903	4,515	-	5,418	30	5,418	0	NS	-	-	-

Table E.3.6-1 Reclamation Material Balance for the Project Footprint

Project Component	Total Area (ha)	Area of Upland Soil Salvage (ha)	Area of Deep Organic Material (ha)	Area of Past Disturbance (ha)	Topsoil Materials to be Salvaged (m^3)[1]			Total Volume of Topsoil Materials (m^3)[2]	Target Replacement Depth of Topsoil (cm)[3]	Total Volume of Topsoil to be Replaced (m^3)[4]	Topsoil Reclamation Material Balance (m^3)[5]	Total Volume of Subsoil to be Salvaged (m^3)[6]	Average Replacement Depth of Salvaged Subsoil (cm)	Total Volume of Subsoil to be Replaced (m^3)	Subsoil Reclamation Material Balance (m^3)
					Shallow Organic/ Litter	Mineral	Deep Organic								
Soil Storage 31	1.8	1.8	-	-	903	4,515	-	5,418	30	5,418	0	NS	-	-	-
Soil Storage 32	1.4	1.4	<0.1	-	677	3,386	NS	4,064	30	4,064	0	NS	-	-	-
Soil Storage 33	1.8	1.8	-	-	903	3,612	-	4,515	25	4,515	0	NS	-	-	-
Soil Storage 34	1.8	1.6	-	0.2	806	3,225	-	4,031	25	4,031	0	NS	-	-	-
Soil Storage 35	1.6	-	1.6	-	NS	NS	NS	NS	-	-	-	NS	-	-	-
Soil Storage 36	1.8	1.8	-	-	903	3,612	-	4,515	25	4,515	0	NS	-	-	-
Soil Storage 37	3.8	3.8	-	-	1,903	6,137	-	8,040	21	8,040	0	NS	-	-	-
Soil Storage 38	4.5	4.5	-	-	2,259	6,820	-	9,079	20	9,079	0	NS	-	-	-
Soil Storage 39	1.8	1.8	-	-	903	2,981	-	3,884	22	3,884	0	NS	-	-	-
Soil Storage 40	1.5	1.5	-	<0.1	743	2,228	-	2,970	19	2,890	80	NS	-	-	-
Soil Storage 41	1.8	1.8	<0.1	-	893	3,541	NS	4,434	25	4,384	50	NS	-	-	-
Soil Storage 42	3.8	3.8	-	-	1,911	5,991	-	7,902	21	7,902	0	NS	-	-	-
Soil Storage 43	3.6	0.4	3.2	-	222	889	NS	1,111	25	9,071	-7,960	NS	-	-	-
Soil Storage 44	1.6	1.4	-	0.2	745	2,067	-	2,812	20	2,812	0	NS	-	-	-
Soil Storage 45	1.8	1.8	-	-	898	3,593	-	4,491	25	4,491	0	NS	-	-	-
Soil Storage 46	1.8	1.5	-	0.3	755	3,020	-	3,775	25	3,775	0	NS	-	-	-
Soil Storage 47	1.8	1.6	0.2	-	796	3,182	NS	3,978	22	3,978	0	NS	-	-	-
Soil Storage 48	1.8	1.8	-	-	903	3,612	-	4,515	25	4,515	0	NS	-	-	-
Soil Storage 49	1.8	1.8	-	-	880	3,521	-	4,401	25	4,401	0	NS	-	-	-
Soil Storage 50	1.8	1.7	0.1	-	866	3,463	NS	4,328	24	4,328	0	NS	-	-	-
Soil Storage 51	1.8	1.8	<0.1	-	901	3,604	NS	4,505	25	4,505	0	NS	-	-	-
Soil Storage 52	1.8	1.6	-	0.2	786	3,146	-	3,932	25	3,932	0	NS	-	-	-
Soil Storage 53	1.8	1.8	-	-	903	3,612	-	4,515	25	4,515	0	NS	-	-	-
Soil Storage 54	1.8	1.8	-	-	4,505	3,604	-	8,109	45	8,109	0	NS	-	-	-

Table E.3.6-1 Reclamation Material Balance for the Project Footprint

Project Component	Total Area (ha)	Area of Upland Soil Salvage (ha)	Area of Deep Organic Material (ha)	Area of Past Disturbance (ha)	Topsoil Materials to be Salvaged (m^3)[1]			Total Volume of Topsoil Materials (m^3)[2]	Target Replacement Depth of Topsoil (cm)[3]	Total Volume of Topsoil to be Replaced (m^3)[4]	Topsoil Reclamation Material Balance (m^3)[5]	Total Volume of Subsoil to be Salvaged (m^3)[6]	Average Replacement Depth of Salvaged Subsoil (cm)	Total Volume of Subsoil to be Replaced (m^3)	Subsoil Reclamation Material Balance (m^3)
					Shallow Organic/ Litter	Mineral	Deep Organic								
Soil Storage 55	1.8	1.6	0.2	-	1,396	3,123	NS	4,518	35	6,282	-1,763	NS	-	-	-
Soil Storage 56	1.8	1.8	-	-	1,429	3,595	-	5,024	28	5,024	0	NS	-	-	-
Soil Storage 57	1.8	1.8	-	-	903	3,612	-	4,515	25	4,515	0	NS	-	-	-
Soil Storage 58	4.1	4.1	-	-	2,073	8,291	-	10,363	25	10,363	0	NS	-	-	-
Soil Storage 59	4.5	4.4	-	<0.1	4,026	5,195	-	9,221	21	9,221	0	NS	-	-	-
Soil Storage 60	2.0	2.0	-	-	998	4,990	-	5,988	30	5,988	0	NS	-	-	-
Soil Storage 61	2.7	2.4	-	0.2	2,114	5,198	-	7,312	30	7,312	0	NS	-	-	-
Soil Storage 62	2.0	2.0	-	-	998	2,993	-	3,990	20	3,990	0	NS	-	-	-
Soil Storage 63	6.1	5.6	-	0.5	2,799	11,196	-	13,994	25	13,994	0	NS	-	-	-
Soil Storage 64	1.9	1.9	-	-	939	2,817	-	3,756	20	3,756	0	NS	-	-	-
Soil Storage 65	5.1	5.1	-	-	2,542	10,168	-	12,710	25	12,710	0	NS	-	-	-
Soil Storage 66	5.1	4.9	0.2	-	5,923	6,350	1,136	12,273	24	12,273	0	NS	-	-	-
Soil Storage 67	5.1	5.1	-	-	2,542	10,168	-	12,710	25	12,710	0	NS	-	-	-
Soil Storage 68	5.1	5.1	-	-	3,841	10,168	-	14,009	28	14,009	0	NS	-	-	-
Borrow Pit 5	9.3	9.3	-	-	6,246	15,389	-	21,635	23	10,455	11,180	NS	-	-	-
Borrow Pit 6	18.6	16.5	-	2.1	15,850	18,746	-	34,595	23	19,238	15,357	NS	-	-	-
Borrow Pit 7	9.9	5.9	3.5	0.6	4,338	7,387	45,868	57,593	20	5,863	51,731	NS	-	-	-
Borrow Pit 8	4.0	4.0	-	-	3,285	6,105	-	9,390	25	4,988	4,402	NS	-	-	-
Borrow Pit 9	4.0	3.5	-	0.5	2,872	7,685	-	10,556	30	5,278	5,278	NS	-	-	-
Borrow Pit 10	4.8	4.3	-	0.6	2,132	7,101	-	9,234	25	5,331	3,903	NS	-	-	-
Borrow Pit 11	4.9	4.9	-	-	2,632	7,194	-	9,826	20	4,913	4,913	NS	-	-	-
Borrow Pit 12	6.1	6.0	-	0.1	3,002	11,278	-	14,280	23	6,755	7,525	NS	-	-	-
Borrow Pit 13	5.0	4.9	0.1	-	2,455	9,819	767	13,041	25	6,137	6,904	NS	-	-	-
Borrow Pit 14	9.1	9.1	-	-	4,543	18,171	-	22,714	25	11,357	11,357	NS	-	-	-

Table E.3.6-1 Reclamation Material Balance for the Project Footprint

Project Component	Total Area (ha)	Area of Upland Soil Salvage (ha)	Area of Deep Organic Material (ha)	Area of Past Disturbance (ha)	Topsoil Materials to be Salvaged (m^3)[1]			Total Volume of Topsoil Materials (m^3)[2]	Target Replacement Depth of Topsoil (cm)[3]	Total Volume of Topsoil to be Replaced (m^3)[4]	Topsoil Reclamation Material Balance (m^3)[5]	Total Volume of Subsoil to be Salvaged (m^3)[6]	Average Replacement Depth of Salvaged Subsoil (cm)	Total Volume of Subsoil to be Replaced (m^3)	Subsoil Reclamation Material Balance (m^3)
					Shallow Organic/ Litter	Mineral	Deep Organic								
Borrow Pit 15	9.1	9.0	0.1	-	9,501	12,926	1,062	23,489	25	11,213	12,275	NS	-	-	-
Borrow Pit 16	9.1	9.1	-	-	4,543	18,171	-	22,714	25	11,357	11,357	NS	-	-	-
Borrow Pit 17	9.1	9.1	-	-	8,233	18,171	-	26,404	28	12,493	13,911	NS	-	-	-
Borrow Pit 18	6.4	6.4	-	-	3,196	12,785	-	15,981	25	7,990	7,990	NS	-	-	-
Access/Utility Corridor	328.0	250.9	37.1	39.9	150,427	450,003	NS	600,430	21	600,430	0	NS	-	-	-
Total	**812.7**	**671.9**	**69.9**	**70.9**	**420,994**	**1,209,532**	**47,698**	**1,678,223**	**-**	**1,552,691**	**125,532**	**578,391**	**-**	**578,391**	**0**

Dash (-): a particular component does not contain a value associated with a row and/or column.
NS: No salvage of soil materials planned for a particular Project component.
[1] Topsoil comprised of shallow organics (<40 cm), litter, and mineral soil.
[2] Volumes provided include salvage of all topsoil within a particular Project component. No topsoil will be salvaged where storage of topsoil is to occur. Where storage of subsoil is to occur, the actual amount of topsoil salvaged will depend on the final size and dimensions of the subsoil stockpiles.
[3] Target replacement depths are a minimum of 80% of pre disturbance upland topsoil depths.
[4] Borrow pits estimated to require topsoil replacement on 50% of original area and the remaining 50% consisting of open water.
[5] Excess topsoil to be used on padded deep organic areas within well pad components.
[6] Subsoil only salvaged from upland areas of well pads.
NOTE: Material volumes provided in this table are based on potential soil salvage and handling processes provided in this report. Actual soil replacement volumes may vary depending on the finalized soil salvage methods and areas agreed upon with ESRD.

E.4 SITE OPERATIONS

E.4.1 EROSION AND SEDIMENT CONTROL

Throughout the life of the Project, operational areas and stockpiled materials will be monitored for signs of erosion. If erosion concerns arise, a qualified site supervisor will devise an erosion control plan based on specific needs required, as detailed in Section E.3.3. Pengrowth will ensure that Project components containing the ABC2/I3h, ABC2/HR2h, ABC6/I3h, ABC6/I3m, ABC9/I3m, LCY1/I3h, and LCY9/I3m soil landscape units are monitored regularly upon completion of soil stockpiling and until suitable vegetation is established or slopes are minimized. Upon vegetation establishment and recontouring, stockpiles and slopes containing these soil types will continue to be monitored for signs of erosion.

All erosion control implemented will be site-specific and continuous monitoring and maintenance will be performed as required.

E.4.2 SOIL QUALITY OF STOCKPILES

Soil stockpiles will be placed in locations that are not expected to be impacted by operations and potential operational incidents that may occur throughout the life of the Project. If soil stockpiles are impacted as a result of operations, Pengrowth will remediate the impacted materials to meet regulatory standards.

Topsoil and subsoil stockpiles will have signage identifying the material that is stored. Relocation of stockpiled material (if required) will be done under the supervision of a qualified site supervisor. Details related to the relocation of the material will be provided in the Annual C&R Report to ESRD and include the appropriate details.

E.4.3 INTERIM REVEGETATION STRATEGIES

Pengrowth will undertake revegetation of any areas disturbed during operations to reduce impacts to disturbed soils, minimize erosion potential and minimize the spread of invasive or weedy species in the development area. Pengrowth will use approved seed mixes that will provide rapid emergence and erosion control. Only weed free certified seed will be used.

E.4.4 WEED CONTROL

Pengrowth will undertake a weed control and mitigation program throughout the life of the Project. Details on weed and invasive species control are provided in Section E.6.4.

E.5 RECLAMATION PROGRAM

E.5.1 FINAL RECLAMATION

The Project reclamation program will implement the following procedures to ensure the reclaimed Project components achieve an equivalent capability for the desired end land use:

- determination of pre disturbance land capabilities and expected reclaimed capabilities based on desired end land uses prior to construction;
- meeting with regulators, grazing lease holders and landowners prior to commencing reclamation activities, to confirm final end land use and reclamation procedures that are planned;
- removal of facilities;
- remediation of contaminated areas (ongoing throughout operations as well as at decommissioning);
- ripping well pads, roadways, and facility pad areas to alleviate surface compaction;
- recontouring and establishment of drainage patterns;
- placing subsoil over areas in which subsoil material was salvaged prior to topsoil placement;
- placing salvaged topsoil (litter and mineral A horizons) over the disturbed area with replacement depths similar to what existed prior to development;
- stabilizing slopes and surface soils, as needed, using erosion control and stability control methods;
- completion of appropriate reclamation of peat lands as per the end land use objectives, including:
  - recontouring of pads in areas where deep organic material was not salvaged (greater than 40 cm thickness) to create transitional or upland landscapes followed by replacement of surplus salvaged topsoil materials from the borrow pits to depths similar to pre disturbance reference sites; and/or
  - removal of pads to expose and condition organics, as required;
- completion of revegetation activities on all reclaimed lands;
- undertaking regular monitoring and maintenance activities following reclamation and revegetation in order to assess reclamation success, identify areas of concern, and apply adaptive management strategies where applicable to improve reclamation and revegetation; and
- undertaking a post-reclamation site assessment to verify that equivalent capability has been achieved for the site prior to applying for a reclamation certificate.

E.5.2 FINAL SITE GRADING AND RECONTOURING

Pengrowth will recontour disturbed land to approximate the natural topography. Pengrowth will establish surface drainage on reclaimed areas to integrate it with the adjacent land. Specific objectives in relation to reconstruction of topography and surface drainage include:

- construct geotechnical stable landforms that will resist slumping, sliding or any other alterations;
- provide functional drainage pathways and effective hydrologic regimes through a site specific recontouring plan;
- establish surface drainage on all reclaimed areas so that it is integrated with the adjacent land;
- provide strategically designed contours to enhance the initiation of habitat in upland, transitional, and wetland areas; and
- remove any facility that is not desired in the end land use (*i.e.*, culverts, roads, *etc.*).

Deep organic material greater than 40 cm thick that was padded over for Project development will have fill left in place and will be recontoured to create upland and transitional reclaimed landscapes. These will be suitable for establishment of perennial vegetation communities consistent with the desired grazing/agricultural end land use. Drainage patterns will tie into adjacent landscapes through the establishment of drainage channels and swales. Surplus topsoil material from the borrow pits will be utilized to reclaim organic landscapes padded over at the time of construction.

Fill material will be removed from access road and utility corridors where deep organic material, greater than 40 cm thick, was padded over for Project development. The underlying organic material will likely require some conditioning as the deep organic layer will be compressed in comparison to pre disturbance conditions. Conditioning of organic materials will include decompaction of the organic material. This may include deep ripping and cross ripping the deep organic profile using a dozer or an excavator. The process of ripping or scarifying the deep organic layer will allow for increased water and air movement through the surface of the organic layer to be slightly above, slightly below, or at the surface of the water level. Creating an environment that maintains water level at or near surface is beneficial for future organic material development. (Quinty and Rochefort 2003, Alberta Environment 2008).

The recontouring process and prescriptions for the Project footprint may be modified and updated based on the findings when a PDA document is prepared. The PDA will be submitted to ESRD prior to development of the Project.

E.5.2.1 Compaction Issues

Gravel surfaces such as the working surface of access roads and well pads will be subjected to significant load applications and traffic over their life. Pengrowth will ensure that compacted sub-grades are deep ripped or “subsoiled” prior to replacement of topsoil material. These activities will help ensure that densities of the formerly compacted soils are not substantially different from that of nearby undisturbed lands.

In locations where fill materials are to be left in place, decompaction and conditioning will be conducted prior to the placement of surplus organic and upland soils from the borrow pits, allowing for vegetation establishment and water flow.

E.5.2.2 Well Pads

Reclamation of the well pads will begin once they are decommissioned. At this point, all contamination on the pads will be remediated, facilities will be removed, and contouring/grading can start.

In upland areas, final recontouring of well pads will involve ripping/decompaction, and recontouring of the reclaimed landscape to blend with surrounding adjacent lands. The reclaimed landscape will provide similar surface drainage patterns to pre disturbance conditions and allow connectivity of surface drainage patterns across the recontoured lands and undisturbed lands. Upon completion of final recontouring, the base material will be decompacted prior to placement of salvaged subsoil and topsoil material.

The deep organic landscapes padded over at construction will see the fill material placed over the organic soils left in place. Prior to soil replacement, recontouring of the well pads will include ripping/decompaction, where applicable, and recontouring of the pad material to blend in with the surrounding areas. Upon completion of final recontouring and decompaction, excess upland soil material from the adjacent borrow pits will be placed over top of the pad material. This has been discussed with the local regulators with the intent to create improved rangeland habitat for livestock.

E.5.2.3 Access and Utility Corridors

Pengrowth will reclaim all access and utility corridors by removing culverts and other structures (*e.g.*, surface pipelines). All watercourse crossings will be removed as part of the final reclamation.

In upland areas (250.9 ha), upon removal of gravel, all topsoil material that was replaced within the ditches will be salvaged by blading the material to the edge of the right-of-way and placing it into stockpiles until recontouring and decompaction activities are completed. Road bases will be decompacted and recontoured to restore natural surface drainage patterns perpendicular and parallel to the former bed. The recontoured base materials will then be decompacted and prepared for topsoil replacement.

In deep organic landscapes padded over for road development (greater than 40 cm thickness of organic material) (37.1 ha), pad materials will be removed to expose the underlying organic material. Some conditioning of this organic material may be required to relieve compaction and promote vegetation establishment.

E.5.2.4 Borrow Pits

Pengrowth expects that 50 to 60% of the borrow disturbances will be reclaimed as a water body and/or wetland depending on the location of the borrow pit in the landscape and volume of material extracted for construction. Conceptual reclaimed cross sections of the recontoured

borrow pits are provided in Figures E.5.2-1 (A to N). The depth of the reclaimed borrow pit is dependent on the volume of material extracted. The completed borrow pit will be contoured with slopes no steeper than 4H:1V into the center where water will collect forming the waterbody. Poor construction material stockpiled during borrow pit development will be spread out during recontouring.

Pengrowth will provide connectivity to surrounding natural drainage patterns and provide water inflow – outflow from the reclaimed borrow landscapes. The ability to create surface water connectivity will depend on the landform in which the borrow area is developed as well as the adjacent landforms.

A portion of the borrow pits will be reclaimed to upland areas to create upland pasture sites and a portion will fill with water creating wetlands.

E.5.3 SOIL REPLACEMENT

Replacement of soil materials for the Project footprint are based on the soil salvage procedures and the material balance as provided in Table E.3.6-1.

Soil replacement activities will be determined for each Project component by the type of soil salvage that occurred during site construction. Pengrowth will replace salvaged topsoil and subsoil materials on recontoured areas such that the average depth of the replaced soil material in the reclaimed profile for each reclamation area shall be equivalent to or greater than 80% of the original topsoil depth (this is not a target, it is the minimum). Pengrowth will replace all salvaged soil materials at reclamation.

Salvaged topsoil and subsoil will be replaced once final recontouring and decompaction of the surficial materials is complete. The goal of soil replacement is to establish a soil profile that permits the establishment of an initial vegetation cover, subsequent establishment of perennial vegetation communities suitable for grazing and/or vegetation communities consistent with the desired end land use, and initiation of natural soil processes such that land capability equivalent to that which existed prior to disturbance is achieved. The reclaimed soil profile will provide:

- adequate moisture supply;
- adequate nutrient supply; and
- capability to support a self-sustaining vegetative cover as per the desired end land use.

A description of recontouring and expected soil replacement activities for each component is summarized in the following sections.

E.5.3.1 Well Pads

Within upland terrain, after recontouring and decompaction of the base material, approximately 578,391 m^3 of subsoil will be spread evenly across the upland well pad disturbances to an average target thickness of 30 cm. Once replaced, subsoil will be alleviated of compaction prior to placement of topsoil material.

Estimated volume of topsoil to be replaced on the 51 well pads is 506,572 m^3. Average replacement depth of topsoil will vary from 15 to 45 cm.

A summary of the estimated volumes and replacement depths of salvaged soil materials for every well pad are provided in Table E.3.6-1.

E.5.3.2 Access and Utility Corridors

Soil replacement will occur on all upland landscapes and where shallow organic material was salvaged along the access and utility corridors. Upon completion of recontouring, all upland topsoil will be replaced evenly over the recontoured material. Approximately 600,430 m^3 of topsoil will be distributed across the recontoured upland areas within the former access and utility corridors to an average target replacement depth of 21 cm. The replacement values are expected to be variable as salvaged materials will be replaced on the landscape to allow for the development of a variety of moisture and nutrient regimes in the reclaimed landscape.

A summary of the estimated volume and replacement depth of salvaged soil materials for the access and utility corridors are provided in Table E.3.6-1.

E.5.3.3 Borrow Pits

All topsoil and organic material will be salvaged for the development of the borrow pits. A majority of the borrow areas are located in upland landscapes (101.9 of the 109.4 ha occur in upland landscapes). It is expected that the deep organic material salvaged from the borrow pits, which comprises 3% of the total topsoil amount, will be salvaged and stockpiled with the upland topsoil.

Once a borrow pit has been completed and recontoured, soil replacement will commence. The estimated soil volumes for replacement are based on a reduction of replacement area by 50 to 60% (due to formation of a water body and/or wetland). This area is based on a conceptual design of the borrow pits. The estimated volume of topsoil and deep organic material to be replaced on the 14 borrow pits development is 123,367 m^3. Average replacement depth of salvaged materials ranges from 20 to 30 cm. The target replacement depths for the borrow pits are based on achieving similar topsoil replacement depths as the estimated pre disturbance topsoil thickness values. Surplus topsoil will be used to enhance reclamation of other footprint components, specifically padded wellsites with pad material remaining in place.

Replacement depths provided are average values based on the estimated disturbance area requiring topsoil replacement. The actual replacement values will be variable as topsoil material will be replaced on the landscape to allow for the development of a variety of moisture and nutrient regimes in the reclaimed landscape.

Subsoil material will not be discretely salvaged from the borrow pit developments; however, it is likely that some subsoil material will be salvaged and stored on-site as the material may not be suitable for construction purposes. Any subsoil material salvaged and not used in construction will be used for recontouring of the depleted borrow pits.

Detailed development, operations and reclamation information of all of the borrow pits will be provided to ESRD in the PDA document as well as the Surface Material Licence/Lease Application.

A summary of the estimated volumes and replacement depths of salvaged soil materials for each borrow pit development is provided in Table E.3.6-1.

E.5.4 POST RECLAMATION LAND CAPABILITY

Pengrowth will reclaim the land to have characteristics (soils, topography and drainage) that result in a return of land to equivalent capability for the desired end land use. All public land end land use will be determined through conversations with regulators and grazing lease holders. All desired private end land uses will be determined though conversations with regulators and landowners.

The post reclamation land capabilities will be similar to the ratings determined for the pre disturbance conditions. Pengrowth intends to reclaim organic and transitional landscapes into post disturbance landscapes similar to adjacent upland improved pasture areas which will result in an increase in the LCCS soil capabilities. The predicted reclaimed soil land capability ratings are presented in Table E.5.4-1 and shown on Figure E.5.4-1 (A and B). Details on the methods and assumptions used to calculate baseline and reclaimed land capability using the *Land Capability Classification System for Forest Ecosystems in the Oil Sands* (CEMA 2006) is provided in CR#9.

Table E.5.4-1 Predicted Reclaimed Land Capability for the Project Footprint

Component (number of components)	Class 2	Class 3	Class 4	Class 5	Disturbed	Water 1	Total Area (ha)2
Access/Utility Corridors	132.6	113.4	4.7	37.3	39.9	0	328.0
Borrow Pits (14)	19.8	33.1	0	3.6	2.0	50.9	109.4
Topsoil and Subsoil Storage Areas (59)	55.6	66.9	2.1	9.7	8.6	0	142.8
Well Pads (51)	96.9	91.6	4.2	21.2	18.7	0	232.5
Total Area[2]	**304.9**	**305.0**	**11.1**	**71.7**	**69.1**	**50.9**	**812.7**
% of Project Footprint[2]	**37.5%**	**37.5%**	**1.4%**	**8.8%**	**8.5%**	**6.3%**	**100.0%**

[1] Wetland/pond created as a result of the creation of the borrow pits.
[2] Due to rounding of values, totals may not equal the sum of the individual values presented in the table.

Although the shape of the soil polygons will be altered as a result of the development, the reclaimed capability will be similar to pre-existing patterns, with the exception of the borrow areas where water bodies and/or wetlands are expected to develop and the reclamation of various well pads located in deep organic landscapes to upland pasture landscapes. The LCCS values were calculated using the physical and chemical characteristics of baseline soils using assumptions of reclaimed soil characteristics that are based on the anticipated soil salvage, storage and eventual replacement conditions within the recontoured landscape. The LCCS

ratings assigned to the baseline soil map units and reclaimed LCCS ratings are not meant to imply that the identical soil profiles and distribution of soil units exist upon completion of reclamation. They do estimate the expected reclaimed land capability based on the known soil and physical attributes of the soil materials coupled with the reclamation processes to be used.

The reclaimed LCCS ratings incorporate assumptions of salvaged soil characteristics and the likely composition of expected reclaimed soil profiles.

The reclaimed suitability ratings anticipated for the proposed Project footprint are similar to the baseline ratings calculated. Overall, the decrease in uplands as a result of borrow pit development will be offset by the reclamation of various well pads to upland/transitional landscapes. Table E.5.4-2 presents a comparison of the reclaimed and baseline LCCS ratings for soil map units within the proposed footprint.

Table E.5.4-2 Comparison of Baseline and Reclaimed Land Capabilities within the Project Footprint

Capability Class	Baseline Capabilities		Reclaimed Capabilities		Difference (%)1
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	
Class 2	35.9	4.4	304.9	37.5	33.1
Class 3	584.1	71.9	305.0	37.5	-34.3
Class 4	47.3	5.8	11.1	1.4	-4.5
Class 5	74.4	9.2	71.7	8.8	-0.3
NWL	-	-	50.9	6.3	6.3
ZDL[2]	70.9	8.7	69.1	8.5	-0.2
Total[1]	**812.7**	**100**	**812.7**	**100**	**0**

[1] Due to rounding of values, totals may not equal the sum of the individual values presented in the table.

Differences in reclaimed and baseline land capability ratings for the Project are mainly due to wetland/water body creation in the borrow pits and the transition of padded well pads to upland/ transitional reclaimed landscapes. The development of the Project will result in a decrease of approximately 279.1 ha of Class 3 and 36.3 ha of Class 4 lands due to borrow pit development and an increase of approximately 269.0 ha of Class 2 lands, both of which satisfy end land use objectives.

E.6 REVEGETATION

The primary objectives of the revegetation plan is to provide site conditions suitable for the desired end land uses, including self-sustaining improved pasture and watershed protection, with possibilities for recreation and other end uses.

As a result of discussions with ESRD, Pengrowth plans to reclaim components of the Project located on public land to an improved pasture end land use. The reclaimed areas will be revegetated with a weed-free seed mixture suitable for perennial forage, which will include agronomic species. Desired end land use for components located on privately held land will be done in consultation with the landowners and the ESRD reclamation inspector.

Revegetation is intended to follow an ecosystem-based approach for the Project. The target vegetation communities for upland sites will be similar to adjacent pasture communities. Vegetation programs for each disturbance area will consider reclaimed landforms and surface drainage, reclaimed soil profiles and vegetation communities similar to adjacent pasture lands. Final consultation with regulators and other stakeholders (grazing lease occupants and private landowners) will be completed prior to implementation of the revegetation program.

E.6.1 REVEGETATION PRACTICES

Revegetation practices are designed to enhance the recovery of vegetation communities. All seed used during reclamation will meet Canada No. 1 certified seed standards. Seedling rates will vary depending on location and degree of disturbance and seeding rates may be increased where required. Where possible, conventional reclamation equipment (tractor and a seed drill) will be utilized to complete seeding activities. In situations where this seeding method is impractical due to slope conditions and/or wet or unstable soil, broadcast seeding with a quad and harrows or by hand, may be utilized.

Fertilizer applications will be completed when and where required. If evidence of any nutrient deficiencies are discovered, soil testing will be completed and a fertilization plan will be implemented to ensure reclaimed areas have nutrient regimes equivalent to undisturbed areas.

Salvage and direct placement of soil onto reclamation sites normally enhances recovery of vegetation communities because of the viable seed, roots and other plant material fragments (propagules) transferred with the soil. Soil fertility and microorganisms within the soils are also maintained. Directly replaced soil requires less revegetation effort to achieve revegetation objectives. The soil to be replaced (*i.e.*, type and texture) is also an important factor in determining a revegetation strategy.

Soil to be used in the revegetation program for the Project will be either organic or upland soil, and most will have been in stockpiles or covered by fill material for extensive periods prior to reclamation. This material will have little viable seed or root material (propagules) remaining, and will need more revegetation effort to achieve objectives. Opportunities for direct replacement, as with most SAGD projects, will be limited to ditches along access roads and

surface pipeline corridors. Revegetation of disturbances will be coordinated with construction/reclamation activities to limit the area of exposed soil at any one time.

Revegetation of disturbances will be coordinated with construction / reclamation activities to limit the area of exposed soil at any one time. Revegetation practices to be employed as part of the reclamation program are discussed in terms of the degree of disturbance experienced with respect to the vegetation communities:

- **Low degree of disturbance** – above ground pipeline and power line rights-of-way. On these sites, rollback will be completed in areas disturbed (unless it is determined that access is to be maintained to meet other land use objectives). Sites will be seeded immediately after rollback to a previously agreed upon seed mix.
- **Moderate degree of disturbance** – borrow pits and underground pipeline facilities. On these sites, soil materials are expected to be in stockpiles for a relatively short period of time, therefore propagules and seed banks will likely be viable at soil replacement. Upon replacement of soil materials, a previously agreed upon seed mix will be seeded.
- **Highest degree of disturbance** - well pad and road grades. After the soil profiles on these sites has been reclaimed they will be seeded to a previously agreed upon seed mix.

Some areas located in the vicinity of water bodies or drainages may be sensitive to soil erosion. In such areas, the value of watershed protection supersedes other vegetation objectives, and special measures are required to stabilize soils including the use of agronomic species that are effective due to their quick establishment. In consultation with regulators, grazing lease holders and landowners, Pengrowth will utilize an appropriate seed mix for erosion control. Seed mixes used throughout the life of the Project will be detailed in the Annual C&R Report to ESRD.

E.6.2 REVEGETATION SPECIES

Revegetation of the reclaimed disturbances using appropriate species, and representative proportions of species will allow for the establishment of reclaimed vegetation communities that provide similar plant communities to adjacent improved pasture. Vegetation species will be selected in consultation with the land manager or landowner prior to seeding. Selected seed mixtures will be based on expected/reclaimed moisture regimes and the desired end land use objective to achieve equivalent land capability.

E.6.2.1 Borrow Pits

Revegetation of reclaimed borrow pits will require a wide range of species as a result of the potential to have a wide range of moisture gradients in the reclaimed borrow pit landscapes. It is expected that upland and various transitional areas within the borrow areas will be revegetated as per discussions with regulators, grazing lease holders and landowners to seed mixtures that will meet desired end land use objectives to achieve equivalent land capability. Revegetation of portions of the transitional zones, depressional areas, and margins around water bodies will require a range of different species depending on the resulting moisture regime.

The wetlands/ponds within borrow developments will initially be open water and are expected to transition to marsh once revegetated and established.

E.6.2.2 Seeding

Pengrowth will design a seed mix in consultation with regulators, grazing lease holders and landowners at time of reclamation. Only weed free certified seed accompanied with a seed analysis certificate will be used. Seeding will occur in areas where:

- stockpiles have been created;
- the soil material has been replaced within the road/pipeline corridor upon completion of road construction;
- various disturbed areas within the Project footprint where seeding is required to reduce the potential of invasive species;
- all areas within the Project footprint that are being returned to upland improved pasture suitable for grazing, including well pads; and
- site monitoring indicates additional revegetation efforts are required.

Specific seed mixes will vary throughout the project footprint depending on desired end land use, intended target use (*i.e.*, soil stabilization on stockpiles or cover crops), moisture regimes or grazing lease holder or landowner requests. An example of a seed mix recently used in the revegetation of a historical wellsite within the project footprint included the following species: Fleet Meadow Brome 30%, Ac Grazeland Alfalfa 25%, Tall Fescue 15%, Orchard Grass 15%, Perennial Rye 10% and Richmond Timothy 5%.

E.6.3 POST-RECLAMATION ECOSITES

A comparison between the predicted post disturbance/reclaimed ecosites and the baseline ecosites in the Project footprint are provided in Table E.6.3-1. The reclaimed ecosites are shown on Figure E.6.3-1 (A to D).

Table E.6.3-1 Baseline and Estimated Reclaimed Ecosites of the Project Footprint

Ecosite / AVI Feature	Baseline		Reclaimed		Difference (%)
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	
b - blueberry	4.3	0.5	-	-	-0.5
c – Labrador tea-mesic	1.2	0.1	-	-	-0.1
d – low-bush cranberry	377.7	46.5	-	-	-46.5
e – dogwood	120.6	14.8	-	-	-14.8
f – horsetail	4.4	0.5	-	-	-0.5
g – Labrador tea-subhygric	1.3	0.2	-	-	-0.2
h – Labrador tea/horsetail	1.9	0.2	-	-	-0.2

Table E.6.3-1 Baseline and Estimated Reclaimed Ecosites of the Project Footprint

Ecosite / AVI Feature	Baseline		Reclaimed		Difference (%)
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)	
i – bog	0.1	0.01	-	-	-0.01
j – poor fen	16.2	2.0	3.5	0.4	-1.6
k – rich fen	67.0	8.2	8.8	1.1	-7.2
l – marsh	1.0	0.1	7.5	0.9	0.8
AIF - farmsteads	0.5	0.1	-	-	-0.1
AIG – gravel pit	7.5	0.9	-	-	-0.9
AIH – permanent right-of-way	27.6	3.4	-	-	-3.4
AII – industrial sites	4.5	0.6	-	-	-0.6
CC – clear/partial cut	10.3	1.3	-	-	-1.3
CIP – pipeline/transmission line	18.0	2.2	-	-	-2.2
CIW – geophysical well sites	18.0	2.2	-	-	-2.2
CL – unspecified clearing	22.1	2.7	-	-	-2.7
CP – perennial forage crops	91.5	11.3	741.9	91.3	80.0
CPR – rough pasture	7.2	0.9	-	-	-0.9
HG – grassland	1.8	0.2	-	-	-0.2
NWF – flooded	0.1	0.01	-	-	-0.01
NWL – lakes and ponds	1.2	0.1	50.9	6.3	6.1
NWR – river	0.2	0.03	-	-	-0.03
SC – closed shrubland	5.8	0.7	-	-	-0.7
SO – open shrubland	0.6	0.1	-	-	-0.1
TOTAL[1]	**812.7**	**100**	**812.7**	**100**	**0**

Dash (-): a particular component does not contain a value associated with a row and/or column.

[1] Due to rounding, total values may not equal the sum of the individual values.

The addition of water bodies and/or ponds in some of the reclaimed borrows, as well as the conversion of wetland sites to upland or transitional landscapes, results in the largest change to post-disturbance ecosites.

A total of 50.9 ha of lakes and ponds and 7.5 ha of marshes are expected to develop from the projected post-reclamation landscape. The increase in estimated distribution of l (marsh) ecosites is based on the assumption that proposed vegetation communities will form around the periphery of the reclaimed pit areas. The recontoured landscapes will be designed in such a way as to provide appropriate drainage (inflow and outflow) through the reclaimed borrow developments. It is assumed that the reclamation of previously disturbed lands to equivalent capability will also result in a substantial change to post-disturbance ecosites.

Increases in upland ecosites (*e.g.*, CP – perennial forage crops) are estimated post reclamation as a result of the reclamation procedures for padded components in which the pad materials have been left in place. It is expected to result in a drier moisture regime (hygric to subhygric).

As reclamation proceeds, monitoring of reclamation and revegetation performance over time allows land use objectives to be reviewed and adjustments made to site conditions according to revegetation processes. The intent of adaptive management is to respond to the soil and revegetation processes to meet specific objectives and to allow improvements to be made to the reclamation and revegetation process.

E.6.4 WEED CONTROL

Pengrowth will conduct weed and invasive species control programs throughout all stages of the Project as per *The Alberta Weed Control Act* (Province of Alberta 2010). Pengrowth will also comply with ASRD's *Weed Management in Forestry Operations – Directive 2001-06* (ASRD 2001).

Control of invasive weed species will be completed through the establishment of perennial forage crops on soil stockpiles as well as during interim reclamation to mitigate weed populations in disturbance areas. Ongoing inspections for the presence of weed species will be performed throughout the construction, operations, reclamation and post reclamation stages of the Project to identify the occurrence of weeds and invasive species. Mechanical control (mowing, cultivation, and /or hand picking) of weeds will be the preferred method of weed control except where chemical weed control is the only feasible method. When chemical control is necessary, Pengrowth will utilize non-residual herbicides using application methods that will ensure herbicide specificity.

The following identifies best management and regulatory practices that will be utilized by Pengrowth in development and implementation of a weed management program:

- disturbance areas will be monitored for weeds during the life of the Project. Pre disturbance information on weeds in the Project footprint will be used to monitor for known weeds. Weed control will be undertaken in a timely manner and records of weed control activities will be kept and detailed in the Annual C&R Report;
- equipment mobilized to the Project will be cleaned to be free of soil and debris, to mitigate the potential for transport of weed seeds or other invasive species;
- physical removal of weeds (mowing, cultivation, and/or hand picking) is the preferred method, particularly near water and riparian areas. Herbicides will be used only where necessary;
- a seed certificate will be obtained for each pasture seed component used in seed mixtures. This documentation will be provided in the Annual C&R report;
- erosion control products that do not contain agronomic straw will be preferred (*i.e.*, erosion control matting);

- where necessary, an annual cereal crop may be used to control erosion if it is more appropriate than other methods because soil stabilization, sediment loading, or slope stability are considered a priority. Pengrowth will consult with regulators, grazing lease holders and landowners prior to seeding of any agronomic species. Use of any agronomic species will be reported in the Annual C&R Report including; location (and area seeded), seed mix, seeding rate, and planned mitigation and monitoring (to control the agronomic species);
- species defined as "prohibited noxious" in the *Weed Control Act* (GOA 2010) must be destroyed, and those classified as 'noxious' must be controlled. The document *Weed Management in Forestry Operations – Directive 2001-06* (ASRD 2001) will be followed as appropriate;
- herbicides will be selected and applied by a licensed industrial pesticide applicator to comply with the *Pesticide (Ministerial) Regulation* (Alberta Regulation 43/1997) and federal regulations; and
- soil sterilants will not be used for control of weeds.

E.7 RECLAMATION MONITORING PROGRAM

Development of the Project will progress in a phased manner, allowing for sequential reclamation of well pads, access roads and facilities over the operating period of the Project. This development schedule minimizes the active footprint within the Project area at any one time, and will allow for C&R program improvements to be implemented through adaptive management as reclamation, revegetation and monitoring progress through the various stages of Project development. Post reclamation monitoring will be phased for each area as it becomes reclaimed. In each case, site-specific reclamation targets will be defined (*e.g.*, borrow pit versus right of ways, and infrastructure). At sites with a target end land use of pasture, survival of seeded species will be assessed annually for 3 to 5 years until self-sustaining tame pastures are fully established. For sites that are reclaimed to wetlands, water quality and vegetation abundance and composition will be assessed until it can be determined that successional trajectories towards self-sustaining wetland vegetation communities are achieved. Reclamation monitoring will be incorporated into the Annual C&R Report to document the success of reclamation efforts and to refine measures according to site-specific conditions.

E.7.1 MONITORING OBJECTIVES

The objectives of the reclamation monitoring program are to evaluate the success of reclamation measures and to adjust or modify those measures where necessary to ensure:

- establishment of desired plant communities;
- erosion control and slope stability;
- self-sustaining vegetation cover on all disturbed areas;
- weed and invasive species control;
- establishment of the designated end land uses; and
- reclamation certification.

The objectives will be met through regular site inspections and implementation of additional reclamation measures (if necessary). Pengrowth will also evaluate the results of monitoring programs on reclaimed areas and update reclamation practices, as necessary, to allow for continual improvement of the reclamation program throughout the life of the Project.

E.7.2 MONITORING SCHEDULE

Reclamation monitoring will be consistent with the Project development schedule to ensure that reclaimed sites are fully documented according to the types of reclamation measures employed in the area. Information on each reclamation site will include:

- a description of the type of development (*e.g.*, borrow pit, well pads, roads);
- a description of the reclamation activities undertaken (*e.g.*, recontouring, soil depths, seeding);
- the date when the reclamation activities took place; and
- end land use objectives that were established for each site.

E.7.2.1 Revegetation Monitoring

Each reclaimed and revegetated area will be inspected after the first growing season following site landscaping, soil replacement and revegetation. The inspections will be used to gauge the success of initial revegetation activities and to evaluate conditions designed to encourage success of the revegetation efforts and vegetation establishment. The inspections will provide information regarding soil stabilization, erosion control and the status of vegetation composition and structure, and will include other pertinent information as required.

Subsequent annual inspections will be undertaken to monitor the continued establishment of the vegetative cover and progress towards establishment of desired end land use, as well as to identify requirements for follow-up activities. The annual program will include a routine maintenance component to address any potential erosion repair and control as well as any supplemental seeding and fertilizing needs. Assessments of older reclaimed areas will be conducted on a less frequent basis if deemed appropriate at the time.

E.7.2.2 Terrain and Soils Monitoring

The performance of reconstructed soils and reclaimed landscapes is a key element in erosion control, watershed protection and ecosystem sustainability. Soil and slope stability monitoring of all reclaimed sites will be undertaken in conjunction with the revegetation assessment, using a combination of site observations and systematic transects. Soils will be monitored for signs of erosion or compaction issues through examination of surface soil profiles. Pengrowth will monitor the reclaimed soil profiles by completing post reclamation profile checks and by comparing soil physical and chemical parameters on the reclaimed sites with the *Land Capability Classification System for Forest Ecosystems in the Oil Sands* (CEMA, 2006). Reclaimed landscapes will be inspected for slumping, ponding, and improper drainage patterns.

If subsequent monitoring events (after the initial assessment) indicate that the reclaimed soil and landscapes are appropriate for the desired end land use, then less frequent monitoring events will be implemented until a reclamation certificate is received.

E.7.2.3 Wildlife Monitoring

Pengrowth will include a wildlife monitoring program as a component of its reclamation activities. Monitoring wildlife use of both natural and reclaimed areas within the study areas will provide information on the success of re-establishing wildlife habitat and the effectiveness of mitigation measures.

Monitoring procedures minimize observer influence and ensure that monitoring activities do not create added disturbance to sensitive wildlife species. The monitoring program will involve the use of low-disturbance monitoring approaches to quantitatively measure changes in use of preferred habitats by wildlife species of management concern. Survey methods such as wildlife cameras and pellet-group counts will be utilised. Monitoring efforts will focus on parameters that are directly related to the effects of mitigation and that provide opportunities to improve mitigation performance over time. This wildlife monitoring approach will enable Pengrowth to evaluate the effectiveness of their wildlife protection, mitigation, and reclamation procedures and to ensure that the Project does not adversely affect wildlife in the region.

E.8 ABANDONMENT AND CLOSURE

Project facilities will be decommissioned at the end of Project life. In compliance with the EPEA Approval, an abandonment and reclamation plan will be submitted to ESRD six months prior to decommissioning of surface facilities. It is envisioned that abandonment and closure plans will address the following:

- the use of an adaptive management approach that incorporates knowledge learned during the operation of the Project;
- undertaking site assessments on required facilities to characterize and delineate any soil or groundwater impacts present. Remediation will also be undertaken;
- removal of surface structures and equipment. Wells will be cut off 1.2 m below the surface, cemented and blanked off. Steel piping will be cut off 1.2 m below surface;
- abandonment of all production, geotechnical and hydrogeological monitoring wells will be completed in accordance with ESRD and Alberta Energy Regulator (AER) standards;
- abandonment of access roads and removal of culverts;
- recontouring all sites to establish drainage patterns and topography;
- ripping, as required, to alleviate surface compaction on former disturbed areas;
- removal of fill materials and conditioning of underlying organic materials, where applicable;
- placement of soil over the disturbed areas followed by revegetation activities;
- reclamation of peat landscapes to desired end land;

- undertaking regular monitoring and maintenance activities, following reclamation and revegetation, to assess reclamation success and identify areas of concern; and
- undertaking a post-reclamation site assessment to determine the status of the site prior to applying for a reclamation certificate.

FIGURES

Project Component (number of components)	Area (ha)
Well Pads (51)	232.5
Borrow Pits (14)	109.4
Topsoil and Subsoil Storage Areas (59)	142.8
Access/Utility Corridors	328.0
TOTAL	**812.7**

R5 R4 R4 R3 W4M

T59 T58 T57

Muriel Lake
Holyoke
Reita Lake
Michel Lake
Cushing Lake
Garnier Lake
Bluet Lake
Dion Lake
Puskiakiwenin I.R. 122
657

Legend

Development Footprint

Initial Development
- Access/Utility Corridor
- Well Pad
- Soil Storage
- Borrow Pit

Future Development
- Access/Utility Corridor
- Well Pad
- Soil Storage
- Borrow Pit

- Existing and Approved Development
- First Nations
- Railway
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

0 0.75 1.5 3
Kilometres

PROJECT: PENGROWTH — Lindbergh SAGD Expansion Project

TITLE: **Components of Project Footprint**

DRAWN: SL
CHECKED: NC
DATE: Nov 12/13
PROJECT: 11-033

FIGURE: **E.1.0-1**

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; NHC hydrology Oct 2013.

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.1.0-1 Components of Project Footprint.mxd

R4 R3 W4M

Well Pad D53
Well Pad D54
Borrow Pit 18
SS58
Well Pad D55
Access/Utility Corridor
Well Pad D49
Well Pad D50
Well Pad D51
Well Pad D52
SS68
Borrow Pit 17
Well Pad D47
Well Pad D48
Reita Lake
Well Pad D43
Well Pad D44
SS50
Well Pad D46
Well Pad D45
Well Pad D42
Well Pad D41
Borrow Pit 16
SS67
SS66
Borrow Pit 15
Access/Utility Corridor
T59
T58

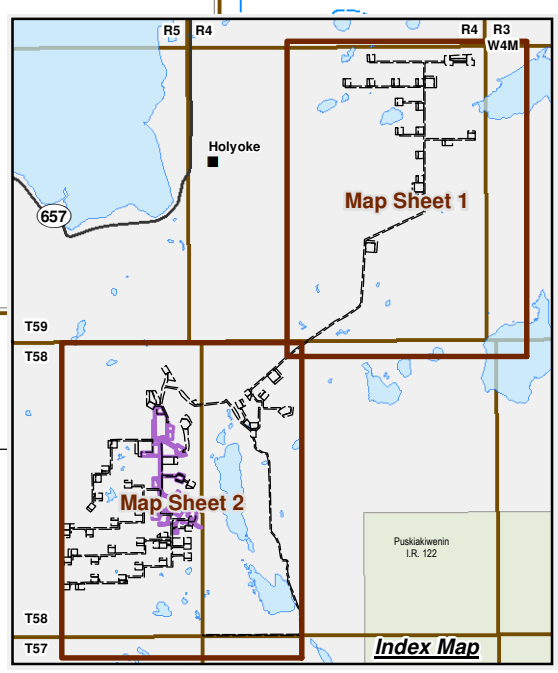
33 34 35 36 31
28 27 26 25
21 22 23 24 19
16 15 14 13 18
9 10 11 12 7
4 3 2

Legend

LCCS Rating
- 2
- 3
- 4W
- 5W
- NR (Not Rated)

- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

0 300 600 1,200
Metres



PROJECT: PENGROWTH — Lindbergh SAGD Expansion Project

TITLE: Baseline LCCS Ratings - Map Sheet 1

DRAWN: SL
CHECKED: JJ
DATE: Oct 31/13
PROJECT: 11-033

FIGURE: E.2.1-1A

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

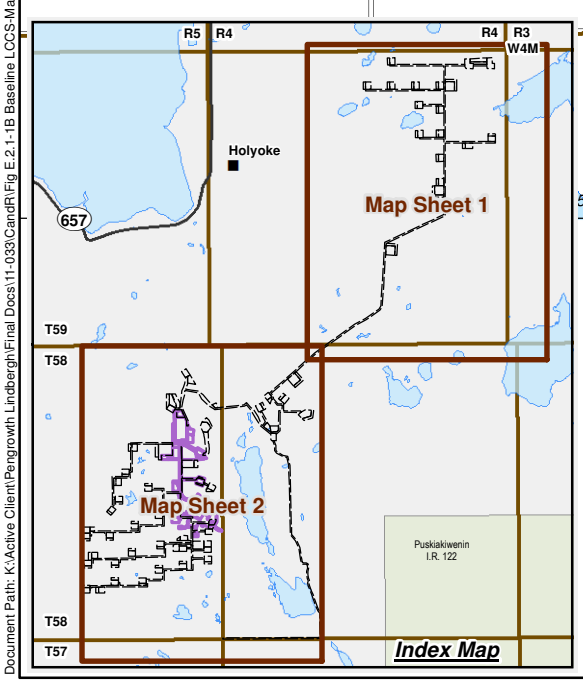
Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.2.1-1A Baseline LCCS-Mapsheet 1.mxd

R5 R4

Well Pad D34
SS38
Borrow Pit 12
SS37
SS63
Well Pad D33
Well Pad D32
SS64
Borrow Pit 14
SS65
Well Pad D36
SS41
Well Pad D35
SS39
SS40
Well Pad D37
Well Pad D38
SS42
SS43
Borrow Pit 13
Well Pad D39
SS13
Well Pad D08
Access/Utility Corridor
Access/Utility Corridor
SS36
Well Pad D31
SS59
Borrow Pit 6
Borrow Pit 5
SS14
Well Pad D30
SS35
Well Pad D29
SS34
Access/Utility Corridor
SS10
Well Pad D04
SS11
Well Pad D40
SS44
SS12
Well Pad D07
Access/Utility Corridor
Well Pad D28
SS33
Well Pad D27
SS32
Well Pad D06
Well Pad D11
SS16
Well Pad D10
Borrow Pit 10
SS62
SS31
Well Pad D26
Access/Utility Corridor
Well Pad D09
SS15
Well Pad D24
SS29
Well Pad D25
SS30
Borrow Pit 7
Well Pad D23
SS28
SS17
SS18
Well Pad D13
SS27
Borrow Pit 9
Well Pad D22
SS61
Borrow Pit 11
Well Pad D12
Well Pad D15
SS20
Access/Utility Corridor
Well Pad D20
SS25
Well Pad D21
SS26
SS19
Well Pad D14
SS24
Well Pad D19
Well Pad D18
SS22
Well Pad D17
SS23
SS21
Borrow Pit 8
SS60
Well Pad D16
Access/Utility Corridor
T58
T57

Garnier Lake
Bluet Lake
Dion Lake

34 35 36 31 32
27 26 25 30 29
22 23 24 20
15 14 13 17
3 2 1 6
5 36 31 32
10 11 12 7 8



Legend

LCCS Rating
- 2
- 3
- 4W
- 5W
- NR (Not Rated)

- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

0 300 600 1,200
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

PROJECT: PENGROWTH — Lindbergh SAGD Expansion Project

TITLE: **Baseline LCCS Ratings - Map Sheet 2**

DRAWN: SL
CHECKED: JJ
DATE: Oct 31/13
PROJECT: 11-033

FIGURE: **E.2.1-1B**

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\Cand\Fig E.2.1-1B Baseline LCCS-Mapsheet 2.mxd

R4 R3 W4M

Well Pad D53
SS57
Well Pad D54
Borrow Pit 18
SS58
Well Pad D55
Access/Utility Corridor

34
35
36

Well Pad D49
SS53
Well Pad D50
SS54
Well Pad D51
SS55
Well Pad D52
SS56
SS68
Borrow Pit 17

Well Pad D47
SS51
SS52
Well Pad D48

Reita Lake

27
26
25

Well Pad D43
SS47
Well Pad D44
SS48
SS50
Well Pad D46
SS49
Well Pad D45

Well Pad D42
SS46

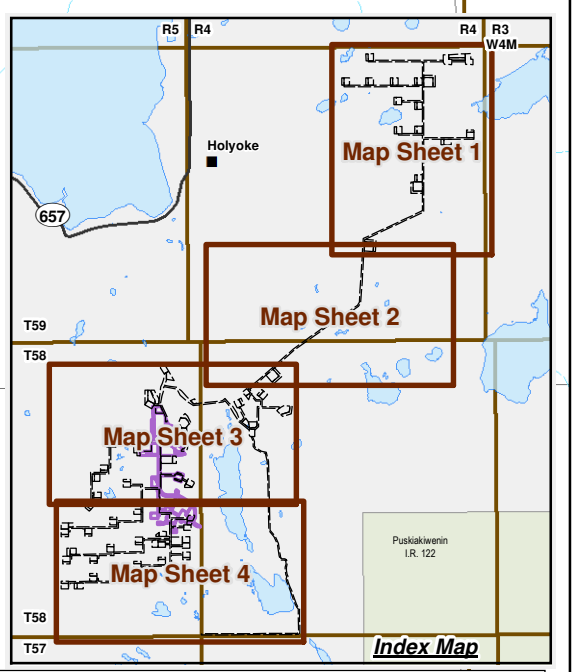
T59

22
23

Well Pad D41
SS45
Borrow Pit 16
SS67

15
14

SS66
Borrow Pit 15



Legend

- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

Dominant Ecosite

- B - Blueberry
- C - Labrador tea-mesic
- D - low-bush cranberry
- E - dogwood
- F - horsetail
- G - Labrador tea-subhygric
- H - Labrador tea/horsetail
- J - poor fen
- K - rich fen
- L - marsh
- HG - herbaceous, graminoid dominated
- SC - closed upland shrub
- NWF - flooded
- NWL - lake/pond
- NWR - river/stream

Disturbed

- AIF - farmstead
- AIG - gravel pit/borrow pit
- AIH - permanent right of way
- AII - industrial
- CC - clear-cut
- CIP - pipeline/transmission line
- CIW - well site
- CL - linear clearing
- CP - perennial forage crop
- CPR - rough pasture

0 200 400 800
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

PROJECT: PENGROWTH — Lindbergh SAGD Expansion Project

TITLE: **Baseline Ecosites Within the Development Footprint - Map Sheet 1**

DRAWN: SL
CHECKED: JK
DATE: Nov 4/13
PROJECT: 11-033

FIGURE: **E.2.1-2A**

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.2.1-2A Baseline Ecosites-Mapsheet 1.mxd

Legend

- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

Dominant Ecosite

- B - Blueberry
- C - Labrador tea-mesic
- D - low-bush cranberry
- E - dogwood
- F - horsetail
- G - Labrador tea-subhygric
- H - Labrador tea/horsetail
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- SC - closed upland shrub
- NWF - flooded
- NWL - lake/pond
- NWR - river/stream

Disturbed

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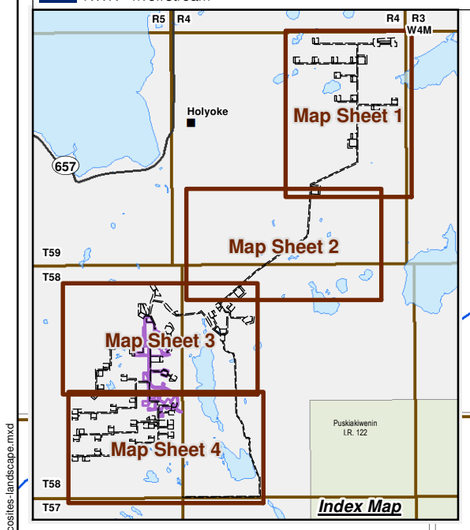
- AII - industrial
- CC - clear-cut
- CIP - pipeline/transmission line
- CIW - well site
- CL - linear clearing
- CP - perennial forage crop
- CPR - rough pasture



R4 W4M

Borrow Pit 15

Access/Utility Corridor

Borrow Pit 14

SS65

9 10 11 5 4 3 2 31 32 33 35

T59

T58

0 200 400 800
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\Cand\Fig E.2.1-2B-D Baseline Ecosites-landscape.mxd

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

TITLE: **Baseline Ecosites Within the Development Footprint - Map Sheet 2**

DRAWN: SL
CHECKED: JK
DATE: Nov 4/13
PROJECT: 11-033

FIGURE: **E.2.1-2B**

Legend

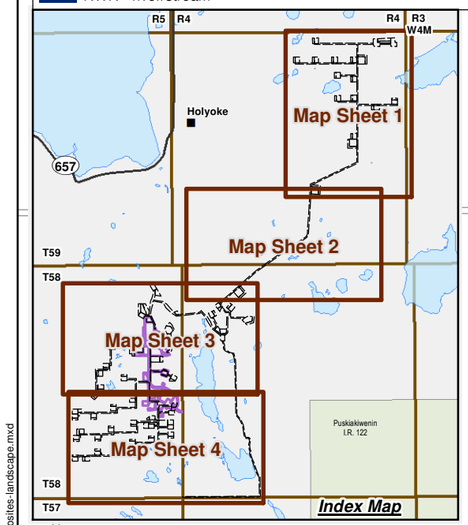
- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

Dominant Ecosite

- B - Blueberry
- C - Labrador tea-mesic
- D - low-bush cranberry
- E - dogwood
- F - horsetail
- G - Labrador tea-subhygric
- H - Labrador tea/horsetail
- J - poor fen
- K - rich fen
- L - marsh
- HG - herbaceous, graminoid dominated
- SC - closed upland shrub
- NWF - flooded
- NWL - lake/pond
- NWR - river/stream

Disturbed

- AIF - farmstead
- AIG - gravel pit/borrow pit
- AIH - permanent right of way
- AII - industrial
- CC - clear-cut
- CIP - pipeline/transmission line
- CIW - well site
- CL - linear clearing
- CP - perennial forage crop
- CPR - rough pasture



Well Pad D34
SS38
Borrow Pit 12
SS37
SS63
Well Pad D33
Well Pad D32
SS64
Borrow Pit 14
SS65
Well Pad D36
SS41
SS39
Well Pad D35
SS40
Well Pad D37
Well Pad D38
SS42
SS13
Well Pad D08
SS43
Borrow Pit 13
Well Pad D39
Access/Utility Corridor
Access/Utility Corridor
SS36
Well Pad D31
SS59
Borrow Pit 6
Borrow Pit 5
SS14
Well Pad D30
SS35
Well Pad D29
SS34
Access/Utility Corridor
SS10
Well Pad D04
SS11
Well Pad D40
SS44
SS12
Well Pad D07
Access/Utility Corridor
Well Pad D28
SS33
Well Pad D27
Garnier Lake
T58
R5 R4 W4M

35 36 31 32
26 25 30 29
23 24 20

0 200 400 800
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\Cand\Fig E.2.1-2B-D Baseline Ecosites-landscape.mxd

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

TITLE: **Baseline Ecosites Within the Development Footprint - Map Sheet 3**

DRAWN: SL
CHECKED: JK
DATE: Nov 4/13
PROJECT: 11-033

FIGURE: **E.2.1-2C**

Well Pad D27
SS32
15
14
Well Pad D06
Well Pad D26
SS31
Access/Utility Corridor
Borrow Pit 10
SS62
Well Pad D24
SS29
SS30
Well Pad D25
13
Well Pad D11
SS16
Well Pad D10
Well Pad D09
SS15
Borrow Pit 7
SS18
Well Pad D23
SS28
SS17
Well Pad D13
Borrow Pit 11
Well Pad D12
SS27
Well Pad D22
Borrow Pit 9
SS61
Access/Utility Corridor
Well Pad D15
SS20
Well Pad D20
SS25
Well Pad D21
SS26
10
11
12
SS19
Well Pad D14
SS24
Well Pad D19
Well Pad D18
SS23
SS22
Well Pad D17
Access/Utility Corridor
SS21
Borrow Pit 8
Well Pad D16
SS60
7
8
17
Bluet Lake
Dion Lake
1
6
Access/Utility Corridor
T58
T57
R5
R4 W4M

Legend

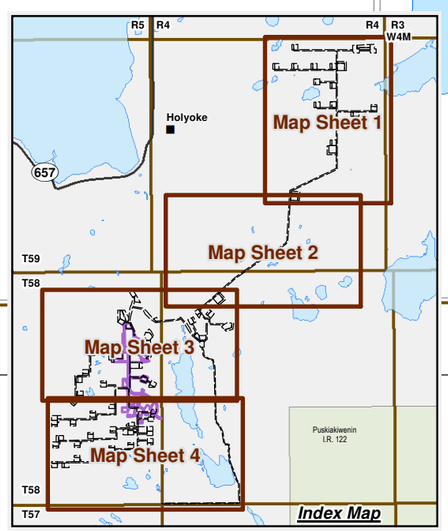
- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

Dominant Ecosite

- B - Blueberry
- C - Labrador tea-mesic
- D - low-bush cranberry
- E - dogwood
- F - horsetail
- G - Labrador tea-subhygric
- H - Labrador tea/horsetail
- J - poor fen
- K - rich fen
- L - marsh
- HG - herbaceous, graminoid dominated
- SC - closed upland shrub
- NWF - flooded
- NWL - lake/pond
- NWR - river/stream

Disturbed

- AIF - farmstead
- AIG - gravel pit/borrow pit
- AIH - permanent right of way
- AII - industrial
- CC - clear-cut
- CIP - pipeline/transmission line
- CIW - well site
- CL - linear clearing
- CP - perennial forage crop
- CPR - rough pasture



0 200 400 800
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\Card\Fig E.2.1-2B-D Baseline Ecosites-landscape.mxd

PROJECT: PENGROWTH — Lindbergh SAGD Expansion Project

TITLE: **Baseline Ecosites Within the Development Footprint - Map Sheet 4**

DRAWN: SL
CHECKED: JK
DATE: Nov 4/13
PROJECT: 11-033

FIGURE: **E.2.1-2D**

R4 R3 W4M

Well Pad D53 SS57 P3PM125
Well Pad D54 P3PM011 Borrow Pit 18 SS58 P3VL005
Well Pad D55
Access/Utility Corridor
Well Pad D49 SS53
Well Pad D50 SS54
Well Pad D51 SS55 P3PM027 P3PM029
Well Pad D52 SS56 P3RH018 P3RH016 SS68 Borrow Pit 17
Well Pad D47 SS51 P3RH035
Well Pad D48 SS52
Well Pad D43 SS47
Well Pad D44 SS48
Well Pad D46 SS50
Well Pad D45 SS49
Well Pad D42 SS46
Well Pad D41 SS45 P3RH076 P3RH077 Borrow Pit 16 SS67
P3RH422 P3RH423
Well Pad D40 SS66 P3JJ201 Borrow Pit 15
P3DL178 P3DL185 P2DS375
Reita Lake
T59 T58

Legend

Mineral
- ABC - Athabasca
- ABMH - Athabasca/Moose Hills
- ABOW - Athabasca/Owl River
- ABSL Athabasca/St. Lina
- ARV - Amber Valley
- LCY - La Corey
- NWB - Newbrook
- SDLC - Spedden/La Corey

Organic
- CTW - Chatwin

Other
- ZDL - Disturbed

- Soil Inspection Site (Sampled)
- Soil Inspection Site (Not Sampled)
- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

25 Topsoil Lift Thickness (cm)
Combination of surface litter/shallow organics + mineral topsoil materials.

0 300 600 1,200
Metres

Holyoke
Map Sheet 1
Map Sheet 2
Puskiakiwenin I.R. 122
Index Map

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

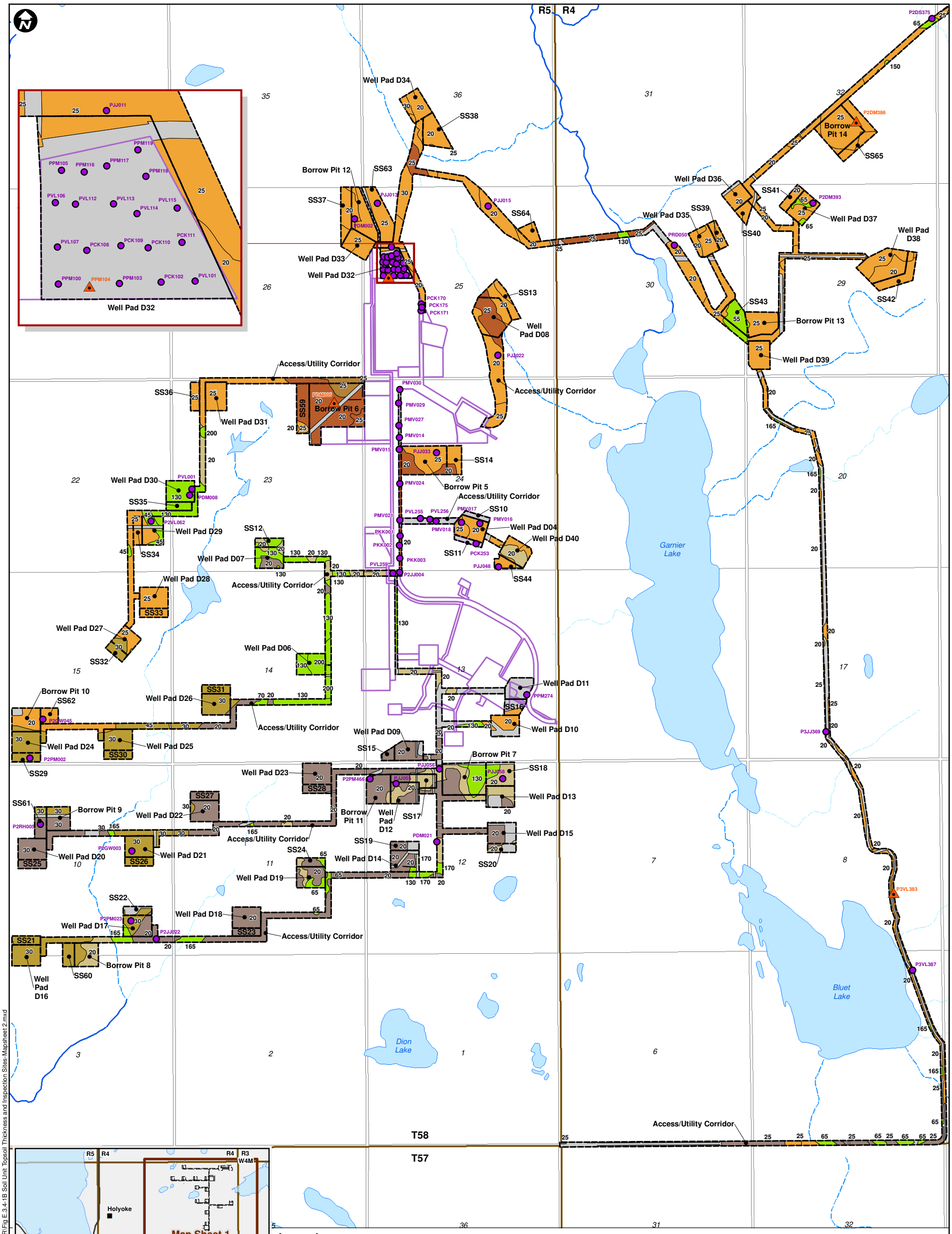
PROJECT: PENGROWTH
Lindbergh SAGD Expansion Project

TITLE:
Baseline Soils, Topsoil Thicknesses and Soil Inspection Sites - Map Sheet 1

DRAWN: SL
CHECKED: NC
DATE: Nov 7/13
PROJECT: 11-033

FIGURE: E.3.4-1A

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.3.4-1A Soil Unit Topsoil Thickness and Inspection Sites-Mapsheet 1.mxd



Legend

Mineral
- ABC - Athabasca
- ABMH - Athabasca/Moose Hills
- ABOW - Athabasca/Owl River
- ABSL Athabasca/St. Lina
- ARV - Amber Valley
- LCY - La Corey
- NWB - Newbrook
- SDLC - Spedden/La Corey

Organic
- CTW - Chatwin

Other
- ZDL - Disturbed

- Soil Inspection Site (Sampled)
- Soil Inspection Site (Not Sampled)
- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

25 Topsoil Lift Thickness (cm)
Combination of surface litter/shallow organics + mineral topsoil materials.

0 300 600 1,200
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

PROJECT: PENGROWTH — Lindbergh SAGD Expansion Project

TITLE: **Baseline Soils, Topsoil Thicknesses and Soil Inspection Sites - Map Sheet 2**

DRAWN: SL
CHECKED: NC
DATE: Nov 7/13
PROJECT: 11-033

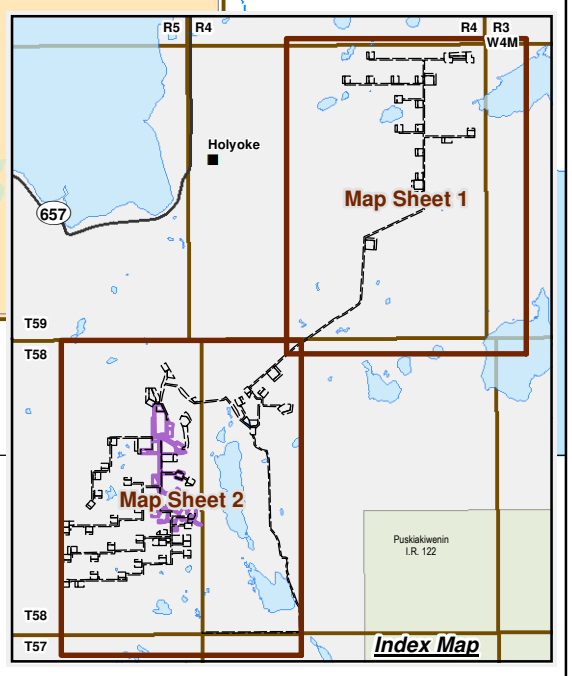
FIGURE: **E.3.4-1B**

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\Cand\R\Fig E.3.4-1B Soil Unit Topsoil Thickness and Inspection Sites-Mapsheet 2.mxd

R4 R3 W4M

Well Pad D53
Well Pad D54
Borrow Pit 18
Well Pad D55
SS58
Access/Utility Corridor
Well Pad D49
Well Pad D50
Well Pad D51
Well Pad D52
SS68
Borrow Pit 17
Well Pad D47
Well Pad D48
Reita Lake
Well Pad D43
Well Pad D44
SS50
Well Pad D46
Well Pad D45
Well Pad D42
Well Pad D41
Borrow Pit 16
SS67
SS66
Borrow Pit 15
Access/Utility Corridor
T59
T58

33 34 35 36 31
28 27 26 25
21 22 23 24 19
16 15 14 13 18
9 10 11 12 7
4 3 2



Legend

Upland and Organic Soil
- Upland
- Organic
- Disturbed Land
- Open Water

- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

0 300 600 1,200
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

PROJECT: PENGROWTH
Lindbergh SAGD Expansion Project

TITLE:
Organic and Upland Soils - Map Sheet 1

DRAWN: SL
CHECKED: JJ
DATE: Oct 31/13
PROJECT: 11-033

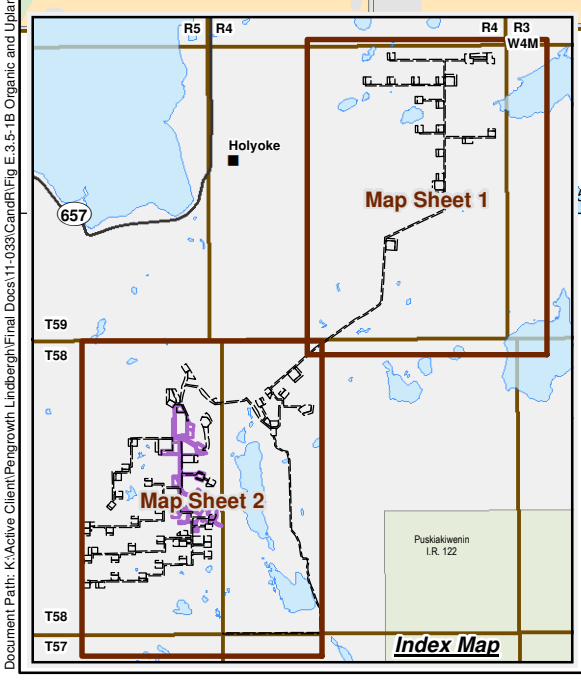
FIGURE:
E.3.5-1A

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.3.5-1A Organic and Upland Soils-Mapsheet 1.mxd

R5 R4

Well Pad D34
SS38
Borrow Pit 12
SS37
SS63
Well Pad D33
Well Pad D32
SS64
Borrow Pit 14
SS65
Well Pad D36
SS41
SS39
Well Pad D35
SS40
Well Pad D37
Well Pad D38
SS42
SS13
Well Pad D08
SS43
Borrow Pit 13
Well Pad D39
Access/Utility Corridor
Access/Utility Corridor
SS36
SS59
Borrow Pit 6
Well Pad D31
Borrow Pit 5
SS14
Well Pad D30
SS35
Access/Utility Corridor
SS10
Well Pad D04
SS11
Well Pad D40
SS44
Well Pad D29
SS34
SS12
Well Pad D07
Access/Utility Corridor
Garnier Lake
Well Pad D28
SS33
Well Pad D27
SS32
Well Pad D06
Well Pad D11
SS16
Borrow Pit 10
SS62
Well Pad D26
SS31
Access/Utility Corridor
Well Pad D10
Well Pad D09
SS15
Well Pad D24
SS29
Well Pad D25
SS30
Borrow Pit 7
SS18
Well Pad D23
SS28
SS17
Well Pad D13
SS27
Borrow Pit 9
Well Pad D22
SS61
Borrow Pit 11
Well Pad D12
Well Pad D15
SS20
Access/Utility Corridor
Well Pad D20
SS25
Well Pad D21
SS26
SS19
Well Pad D14
SS24
Well Pad D19
SS22
Well Pad D18
Well Pad D17
SS23
SS21
Access/Utility Corridor
Borrow Pit 8
SS60
Well Pad D16
Bluet Lake
Dion Lake
Access/Utility Corridor
T58
T57

34 35 36 31 32
27 26 25 30 29
22 23 24 20
15 14 13 17
10 11 12 7 8
3 2 1 6
5 36 31 32



Legend

Upland and Organic Soil
- Upland
- Organic
- Disturbed Land
- Open Water

- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream

- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

0 300 600 1,200
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

PROJECT: PENGROWTH — Lindbergh SAGD Expansion Project

TITLE: Organic and Upland Soils - Map Sheet 2

DRAWN: SL
CHECKED: JJ
DATE: Oct 31/13
PROJECT: 11-033

FIGURE: E.3.5-1B

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\Cand\R\Fig E.3.5-1B Organic and Upland Soils-Mapsheet 2.mxd

R4 R3 W4M

Well Pad D53
SS57
Well Pad D54
Borrow Pit 18
SS58
Well Pad D55
Access/Utility Corridor
Well Pad D49
SS53
Well Pad D50
SS54
Well Pad D51
SS55
Well Pad D52
SS56
SS68
Borrow Pit 17
Well Pad D47
SS51
SS52
Well Pad D48
Reita Lake
Well Pad D43
SS47
Well Pad D44
SS48
SS50
Well Pad D46
SS49
Well Pad D45
Well Pad D42
SS46
Well Pad D41
SS45
Borrow Pit 16
SS67
SS66
Borrow Pit 15
Access/Utility Corridor

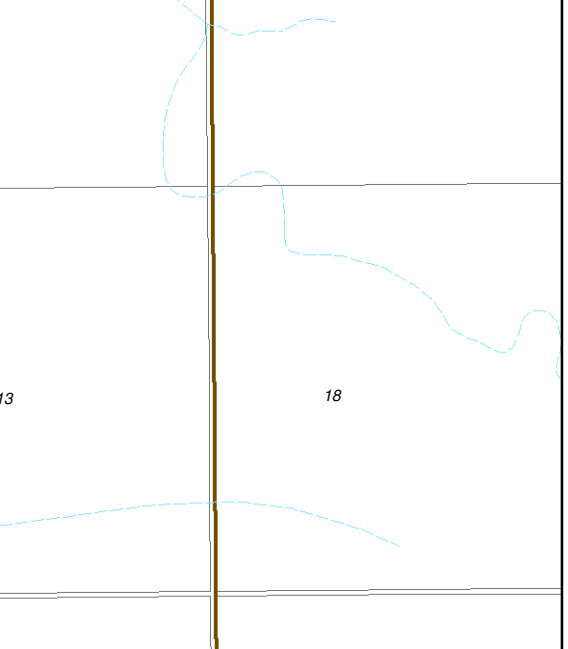
33 34 35 36 31
28 27 26 25
21 22 23 24 19
16 15 14 13 18
9 10 11 12 7
4 3 2

T59
T58

Legend

- Stockpile Location
- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

0 300 600 1,200
Metres



REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.3.6-1A Stockpile Locations-Mapsheet 1.mxd

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

TITLE: Stockpile Locations - Map Sheet 1

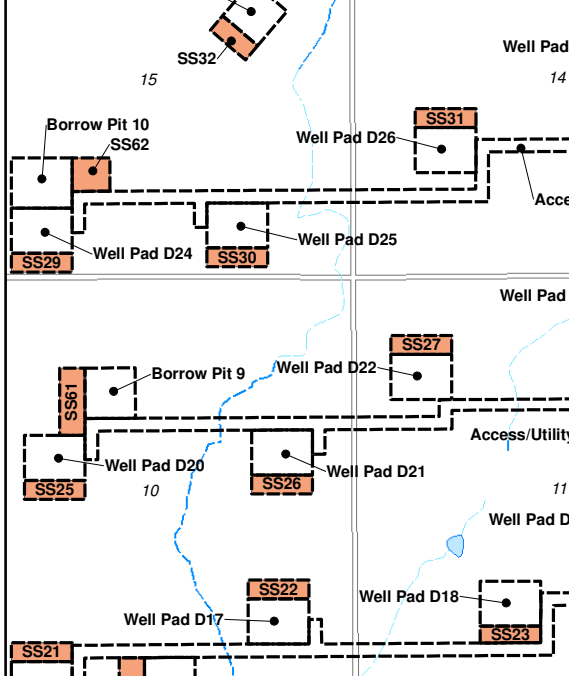
DRAWN: SL
CHECKED: JJ
DATE: Oct 31/13
PROJECT: 11-033

FIGURE: E.3.6-1A

R5 R4

Well Pad D34
SS38
Borrow Pit 12
SS37
SS63
Well Pad D33
Well Pad D32
SS64
Borrow Pit 14
SS65
Well Pad D36
SS41
Well Pad D35
SS39
SS40
Well Pad D37
Well Pad D38
SS42
SS13
Well Pad D08
SS43
Borrow Pit 13
Well Pad D39
Access/Utility Corridor
Access/Utility Corridor
SS36
SS59
Borrow Pit 6
Well Pad D31
Borrow Pit 5
SS14
Well Pad D30
SS35
Well Pad D29
SS34
Access/Utility Corridor
SS10
Well Pad D04
SS11
Well Pad D40
SS44
SS12
Well Pad D07
Access/Utility Corridor
Well Pad D28
SS33
Well Pad D27
SS32
Garnier Lake
Well Pad D06
Well Pad D11
SS16
Well Pad D10
Borrow Pit 10
SS62
Well Pad D26
SS31
Access/Utility Corridor
Well Pad D09
SS15
Well Pad D24
SS29
Well Pad D25
SS30
Borrow Pit 7
SS18
Well Pad D23
SS28
SS17
Well Pad D13
Borrow Pit 9
SS61
Well Pad D22
SS27
Borrow Pit 11
Well Pad D12
Well Pad D15
SS20
Access/Utility Corridor
Well Pad D20
SS25
Well Pad D21
SS26
Well Pad D14
SS19
Well Pad D19
SS24
SS22
Well Pad D18
Well Pad D17
SS23
SS21
Borrow Pit 8
SS60
Access/Utility Corridor
Well Pad D16
Bluet Lake
Dion Lake
Access/Utility Corridor
T58
T57

34 35 36 31 32
27 26 25 30 29
22 23 24 20
15 14 13 17
10 11 12 7 8
3 2 1 6
5 36 31 32



Legend

- Stockpile Location
- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

0 300 600 1,200
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

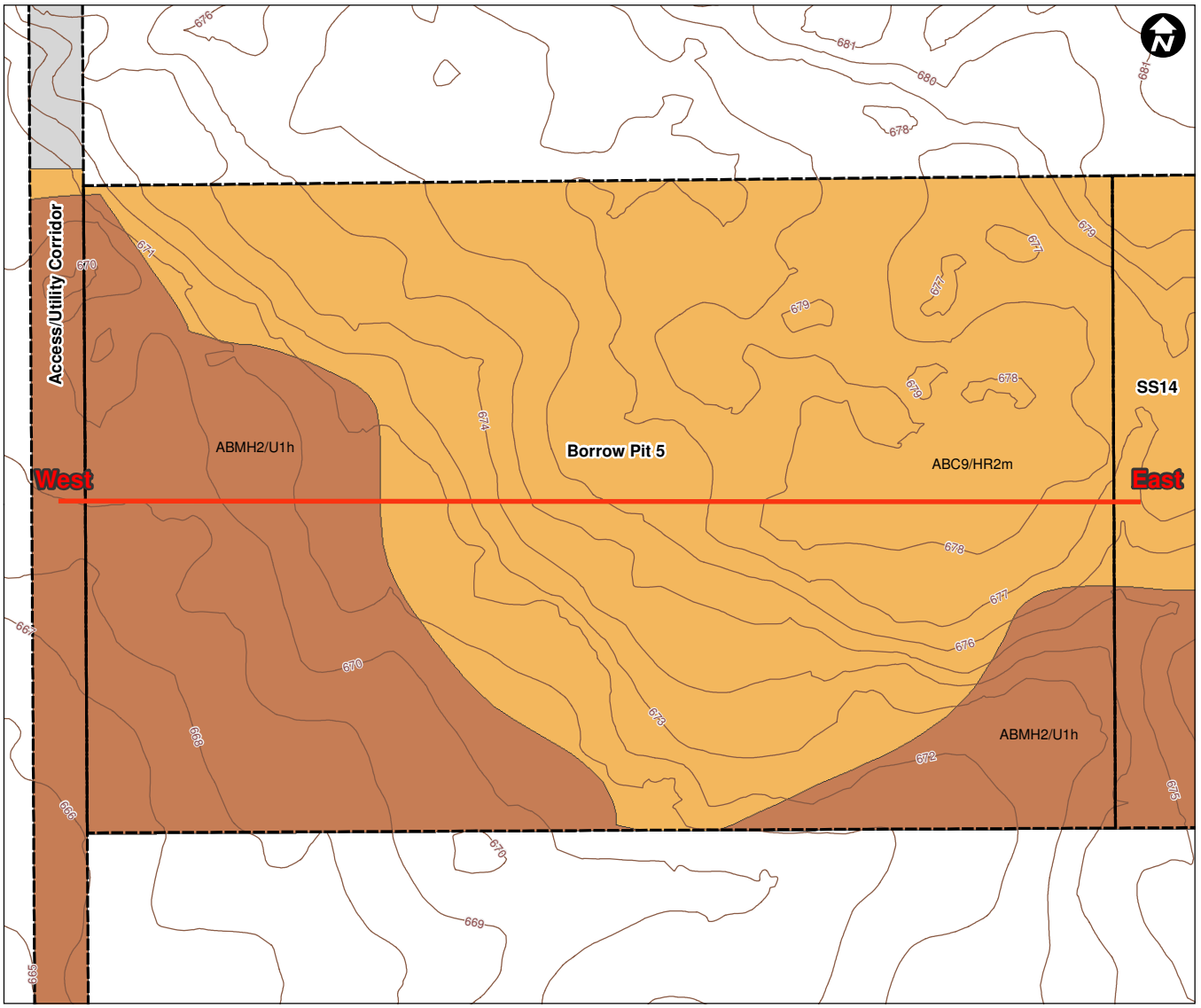
TITLE: Stockpile Locations - Map Sheet 2

DRAWN: SL
CHECKED: JJ
DATE: Oct 31/13
PROJECT: 11-033

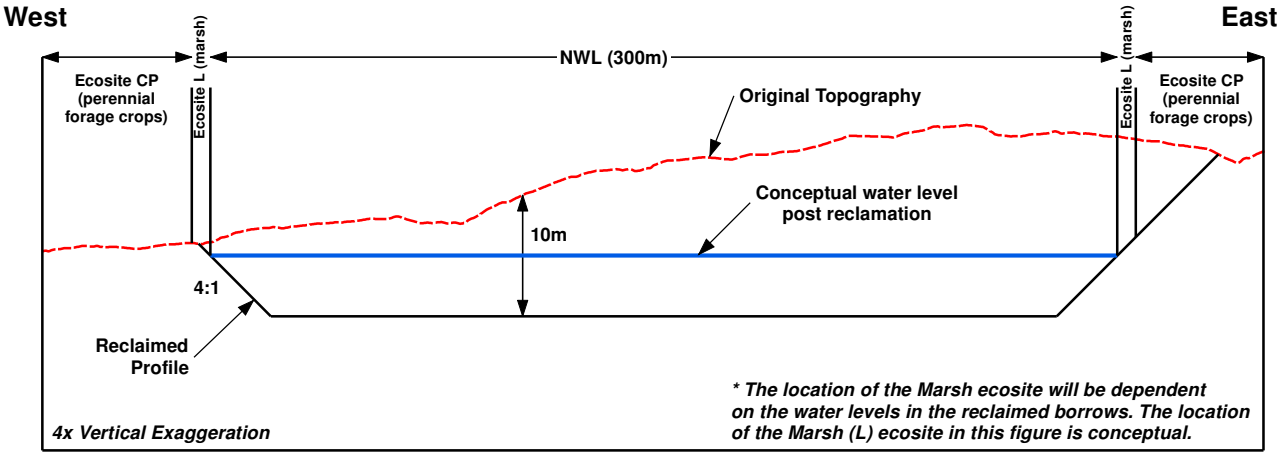
FIGURE: E.3.6-1B

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.3.6-1B Stockpile Locations-Mapsheet 2.mxd

PRE DISTURBANCE SOIL MAP UNITS



RECLAIMED TOPOGRAPHY



0 50 100 m

Scale 1:2,500

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 5

DRAWN: SL
CHECKED: NC
DATE: Nov 14/13
PROJECT: 11-033

FIGURE: E.5.2-1A

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1A Conceptual Reclaimed BP5.mxd

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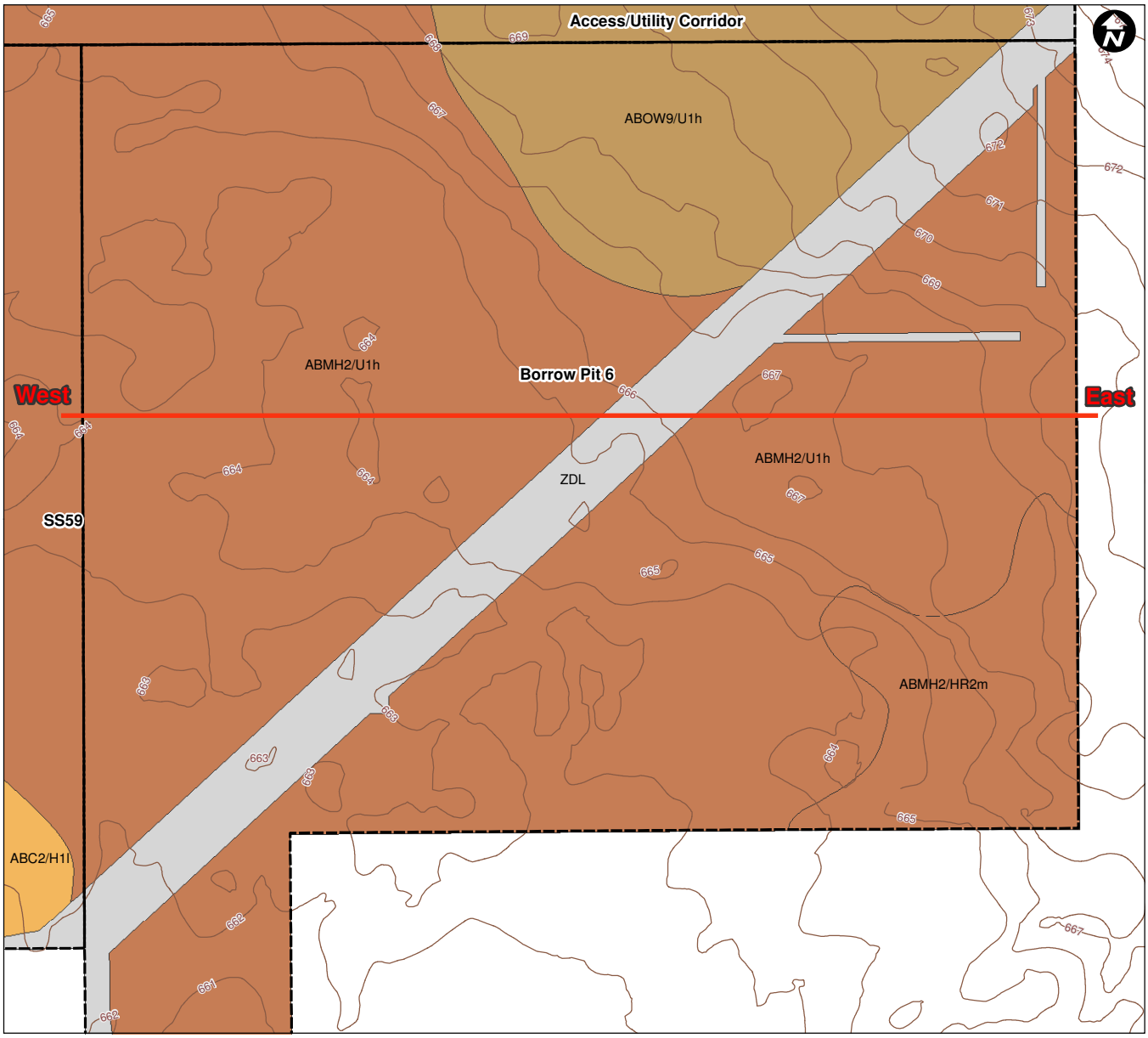
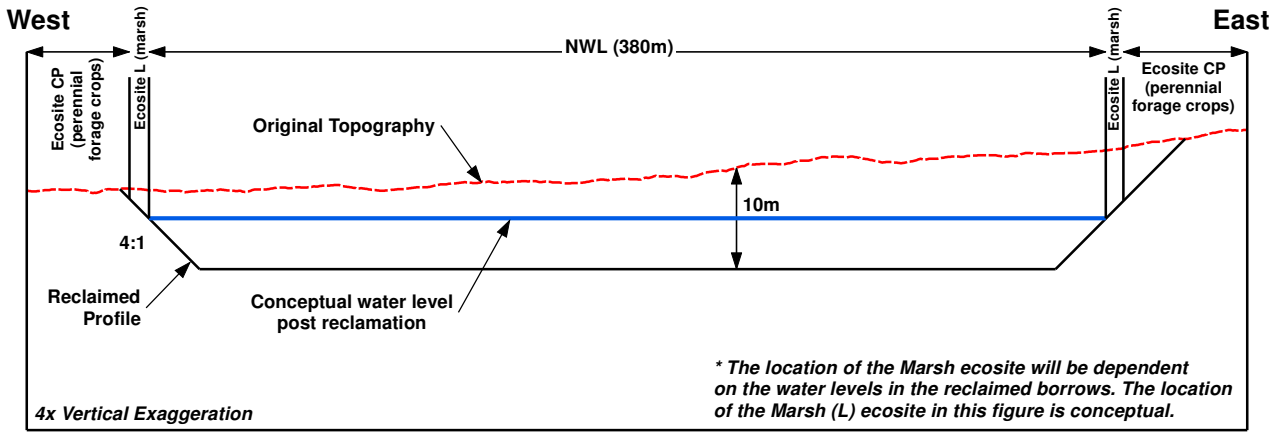


RECLAIMED TOPOGRAPHY



0 60 120 m

Scale 1:3,000

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

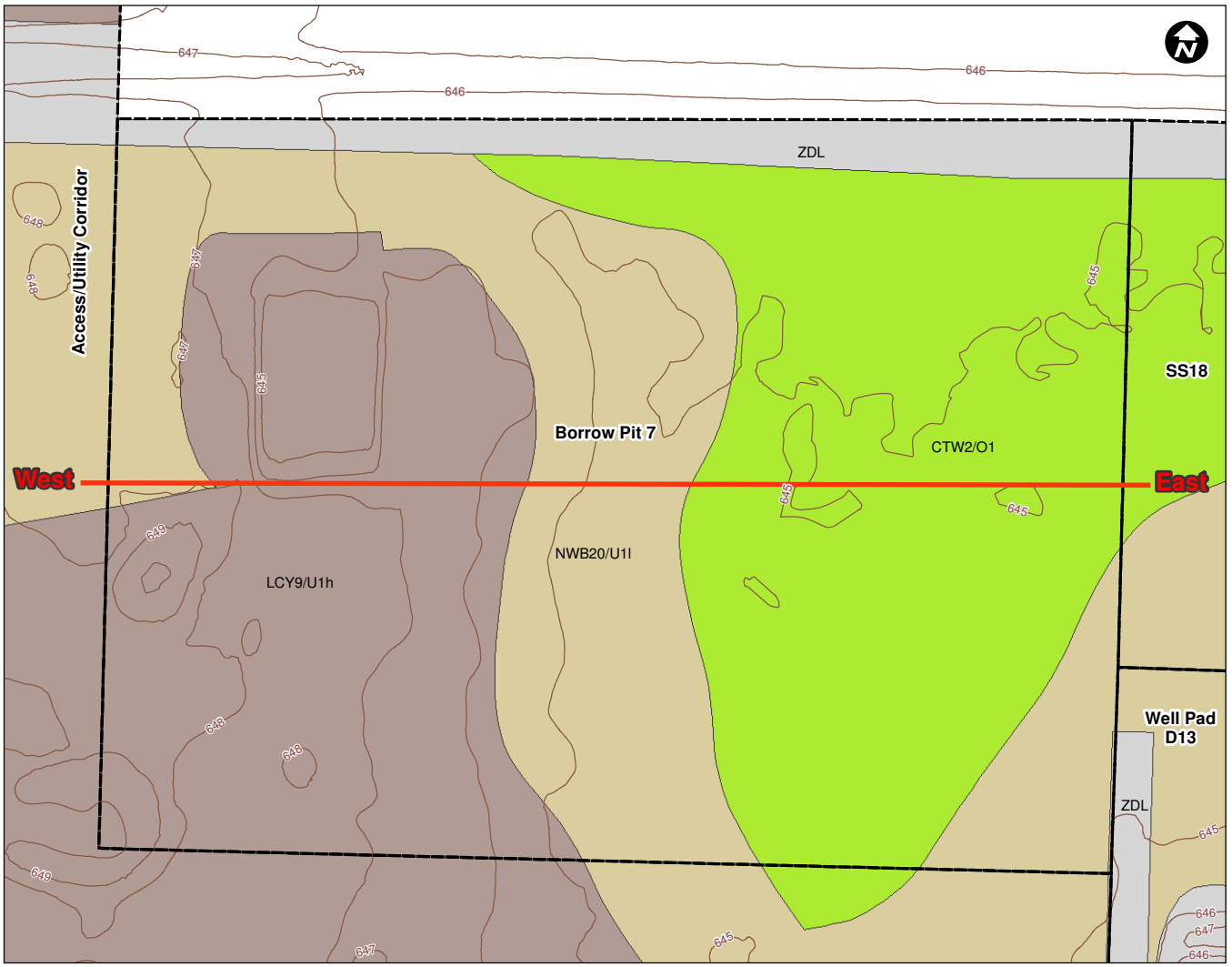
TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 6

DRAWN: SL
CHECKED: NC
DATE: Nov 14/13
PROJECT: 11-033

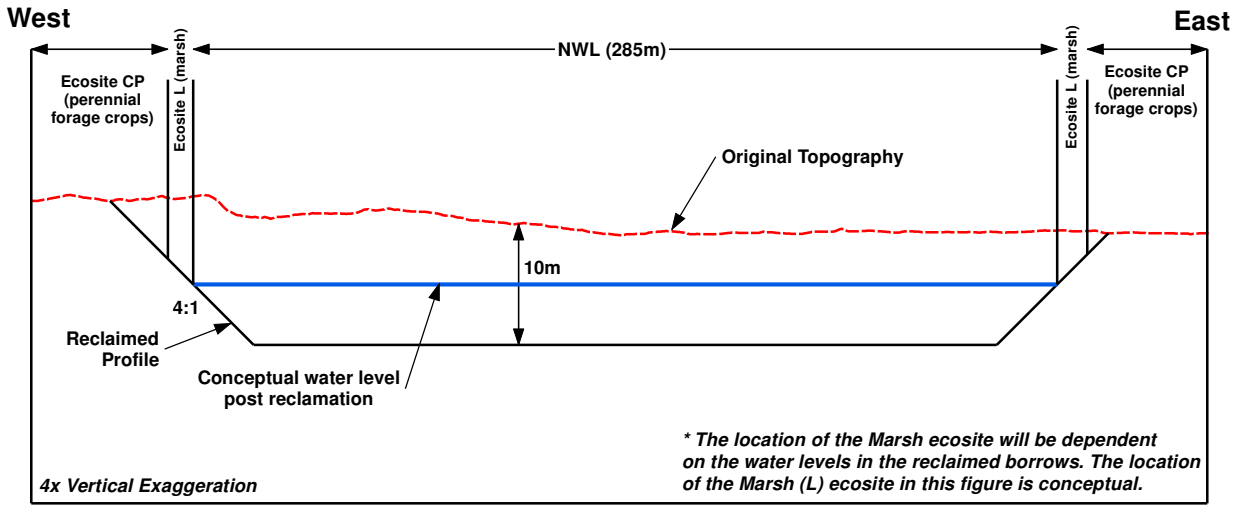
FIGURE: E.5.2-1B

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1B Conceptual Reclaimed BP6.mxd

PRE DISTURBANCE SOIL MAP UNITS



RECLAIMED TOPOGRAPHY



0 50 100 m

Scale 1:2,500

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

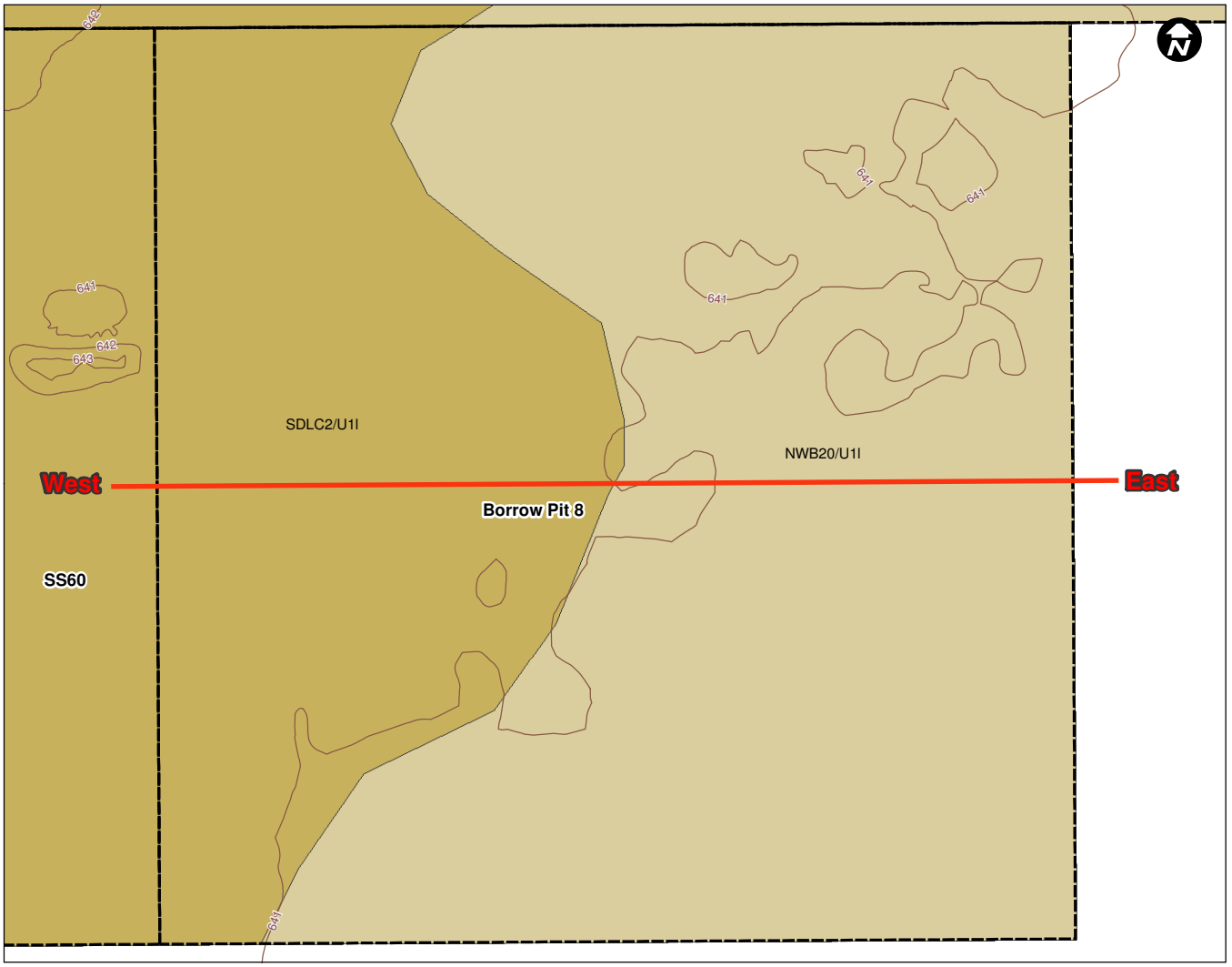
TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 7

DRAWN: SL
CHECKED: NC
DATE: Nov 14/13
PROJECT: 11-033

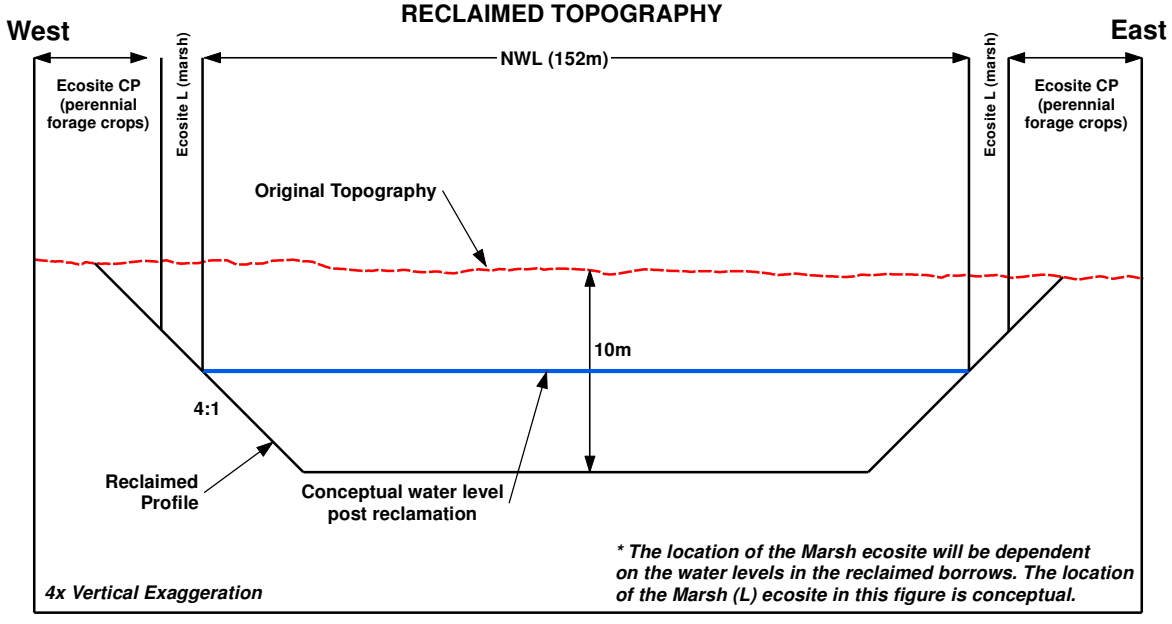
FIGURE: E.5.2-1C

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1C Conceptual Reclaimed BP7.mxd

PRE DISTURBANCE SOIL MAP UNITS



RECLAIMED TOPOGRAPHY



0 30 60 m

Scale 1:1,500

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

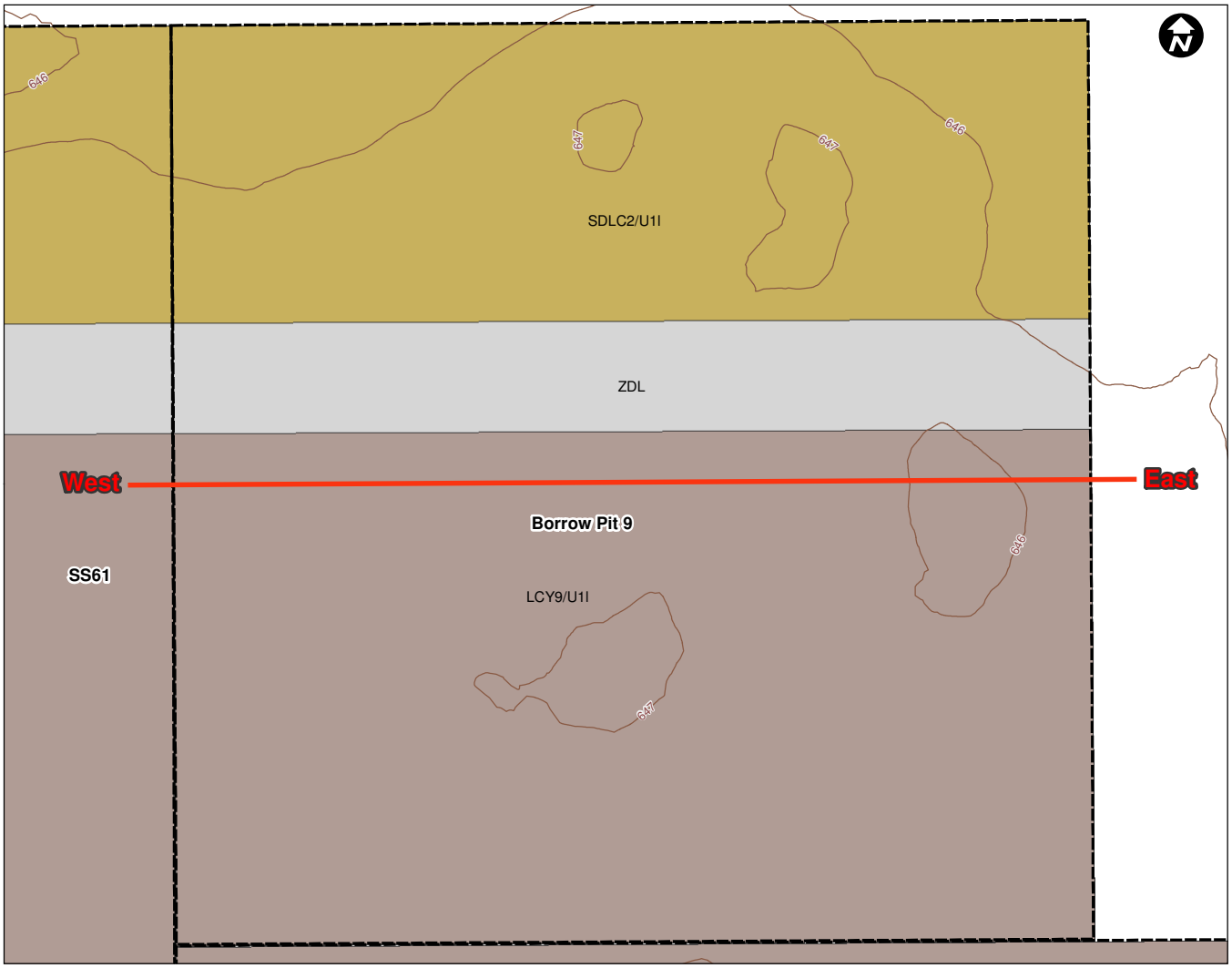
TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 8

DRAWN: SL
CHECKED: NC
DATE: Nov 14/13
PROJECT: 11-033

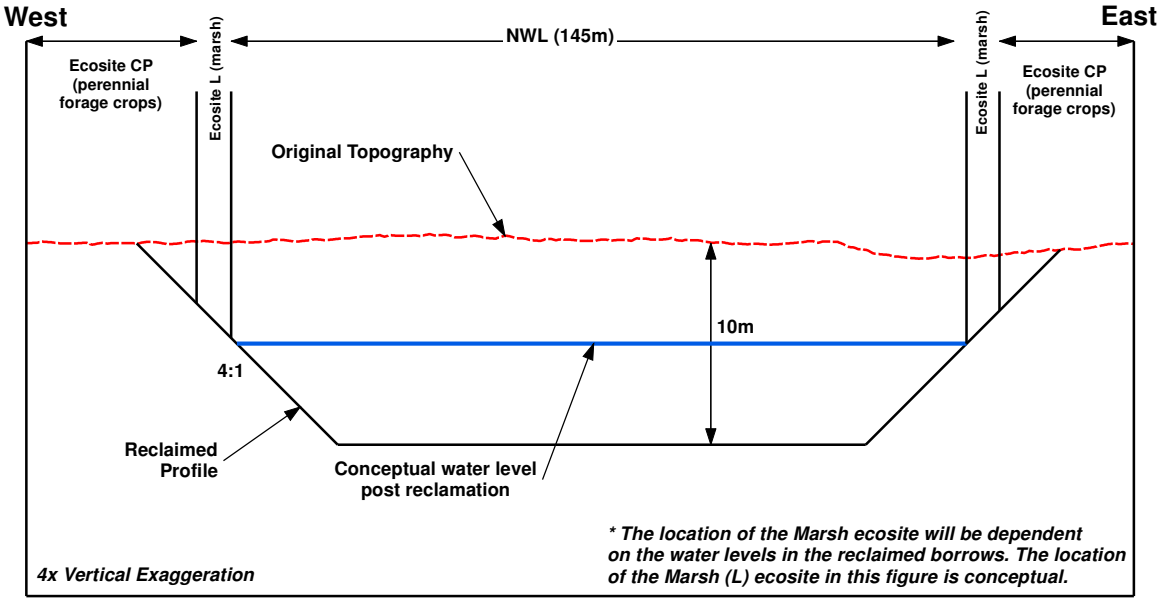
FIGURE: E.5.2-1D

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1D Conceptual Reclaimed BP8.mxd

PRE DISTURBANCE SOIL MAP UNITS



RECLAIMED TOPOGRAPHY



0 30 60 m

Scale 1:1,500

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

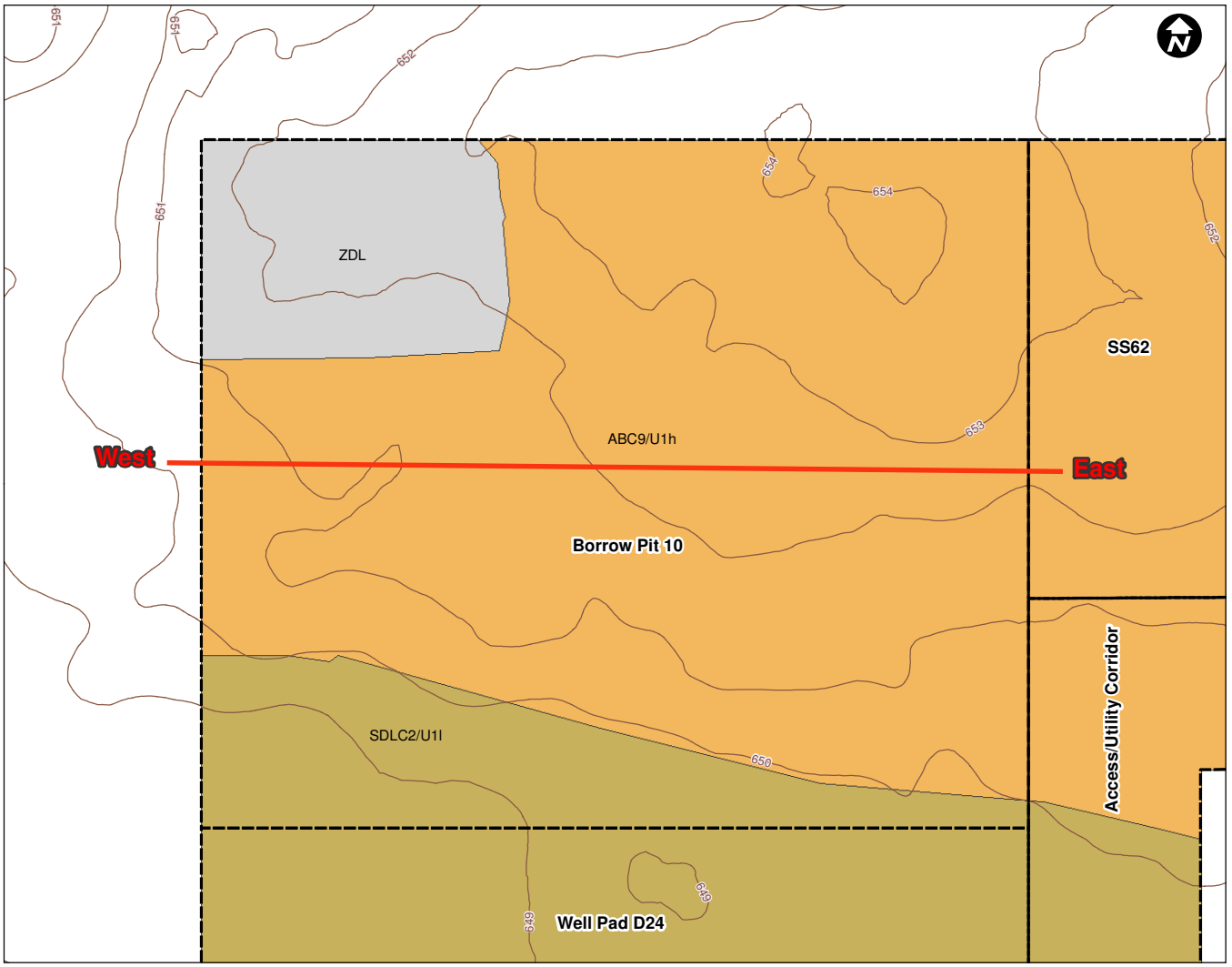
TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 9

DRAWN:	SL
CHECKED:	NC
DATE:	Nov 14/13
PROJECT:	11-033

FIGURE: E.5.2-1E

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1E Conceptual Reclaimed BP9.mxd

PRE DISTURBANCE SOIL MAP UNITS



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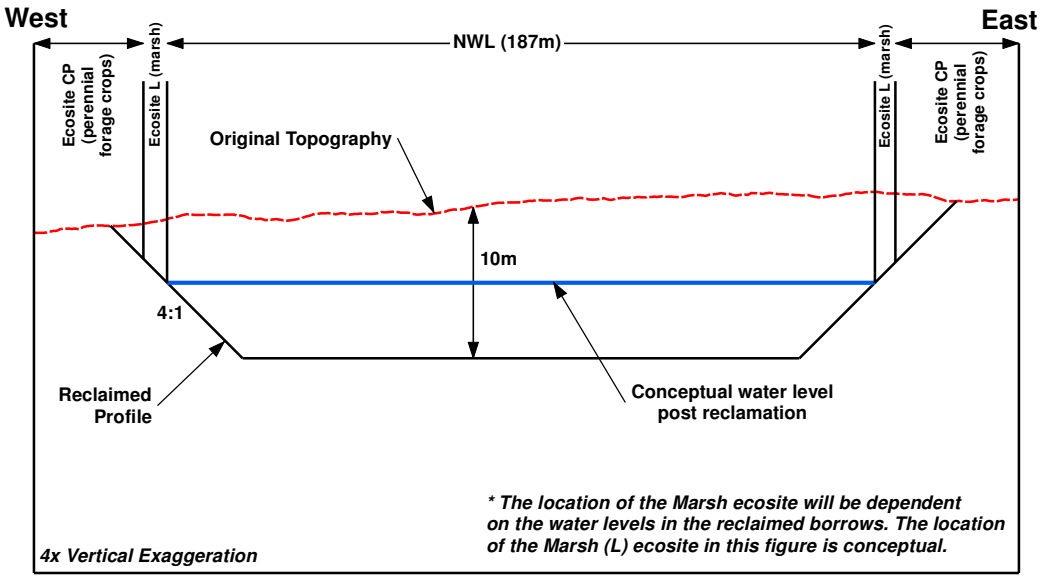


0 40 80 m

Scale 1:2,000

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

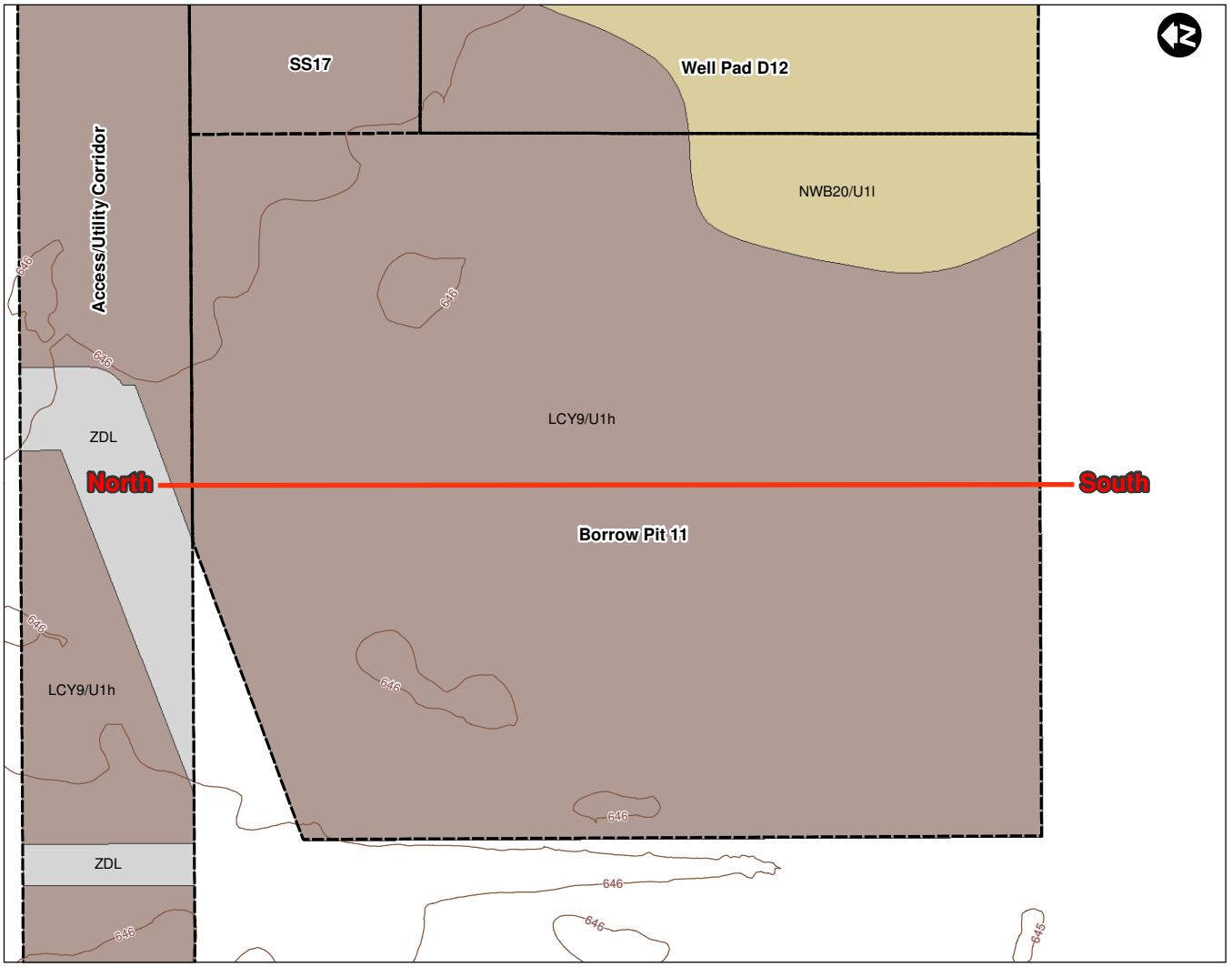
TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 10

DRAWN:	SL
CHECKED:	NC
DATE:	Nov 14/13
PROJECT:	11-033

FIGURE: E.5.2-1F

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1F Conceptual Reclaimed BP10.mxd

PRE DISTURBANCE SOIL MAP UNITS



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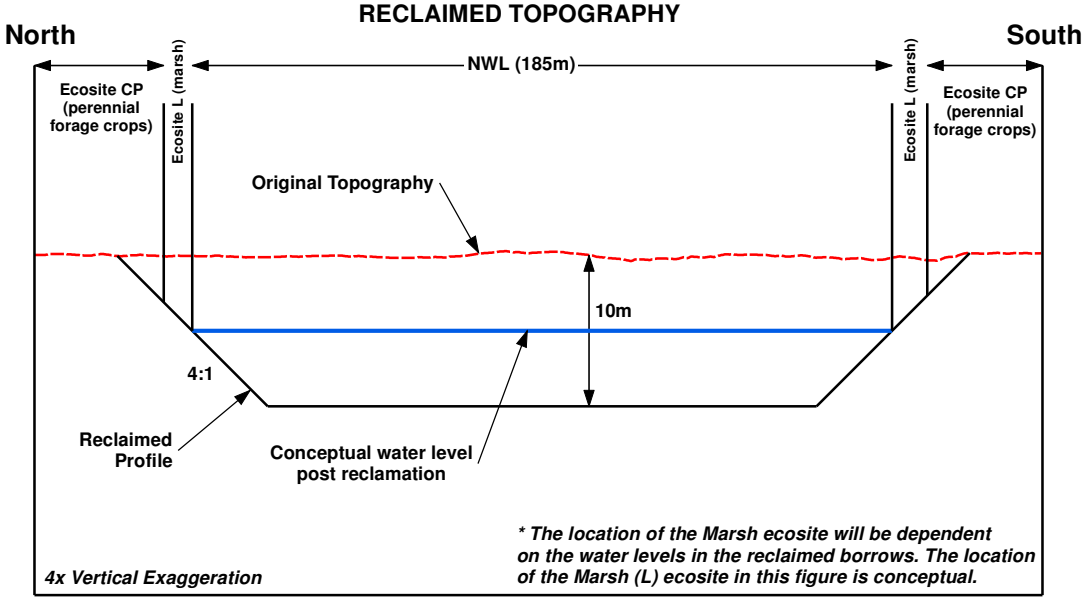


0 40 80 m

Scale 1:2,000

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

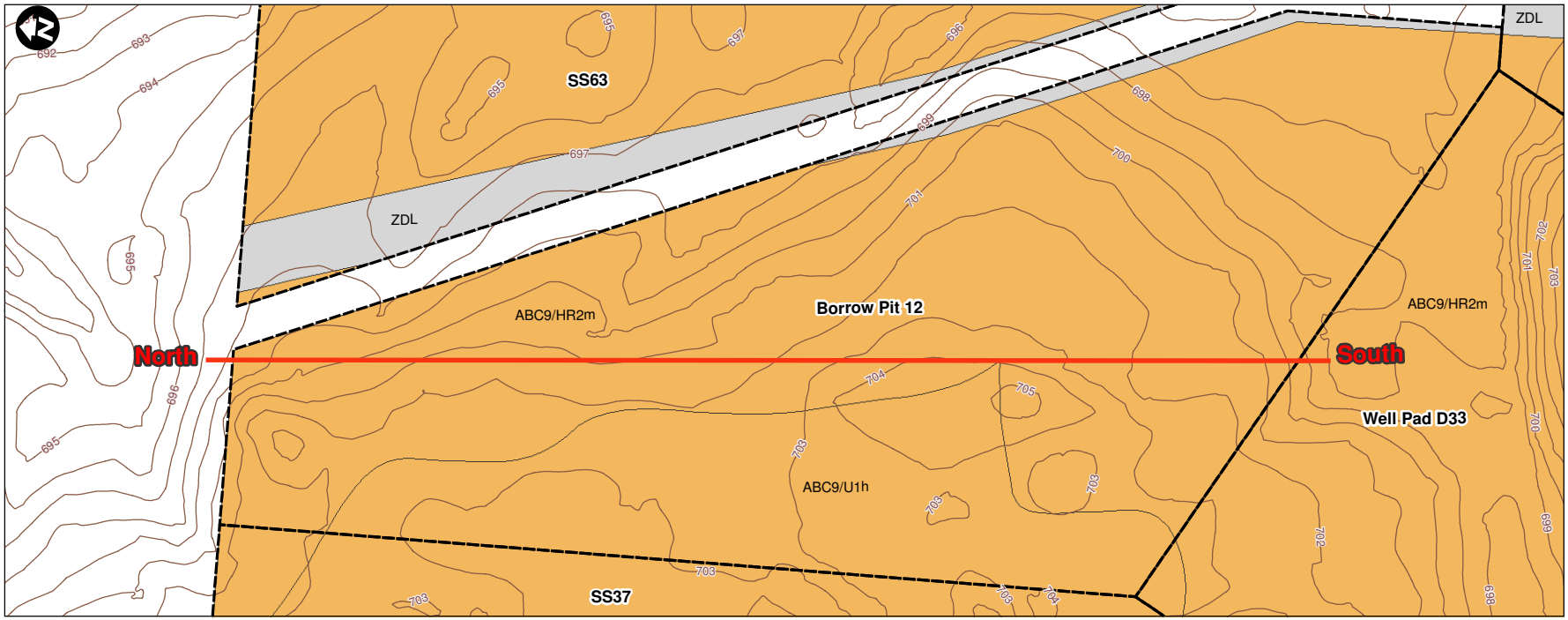
TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 11

DRAWN:	SL
CHECKED:	NC
DATE:	Nov 14/13
PROJECT:	11-033

FIGURE: E.5.2-1G

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1G Conceptual Reclaimed BP11.mxd

PRE DISTURBANCE SOIL MAP UNITS



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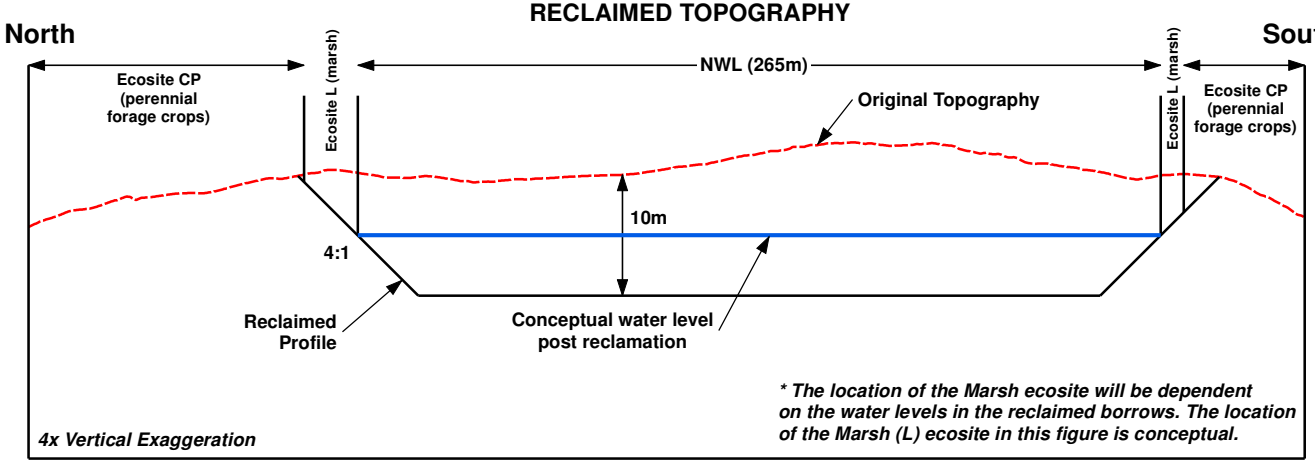


0 50 100 m

Scale 1:2,500

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

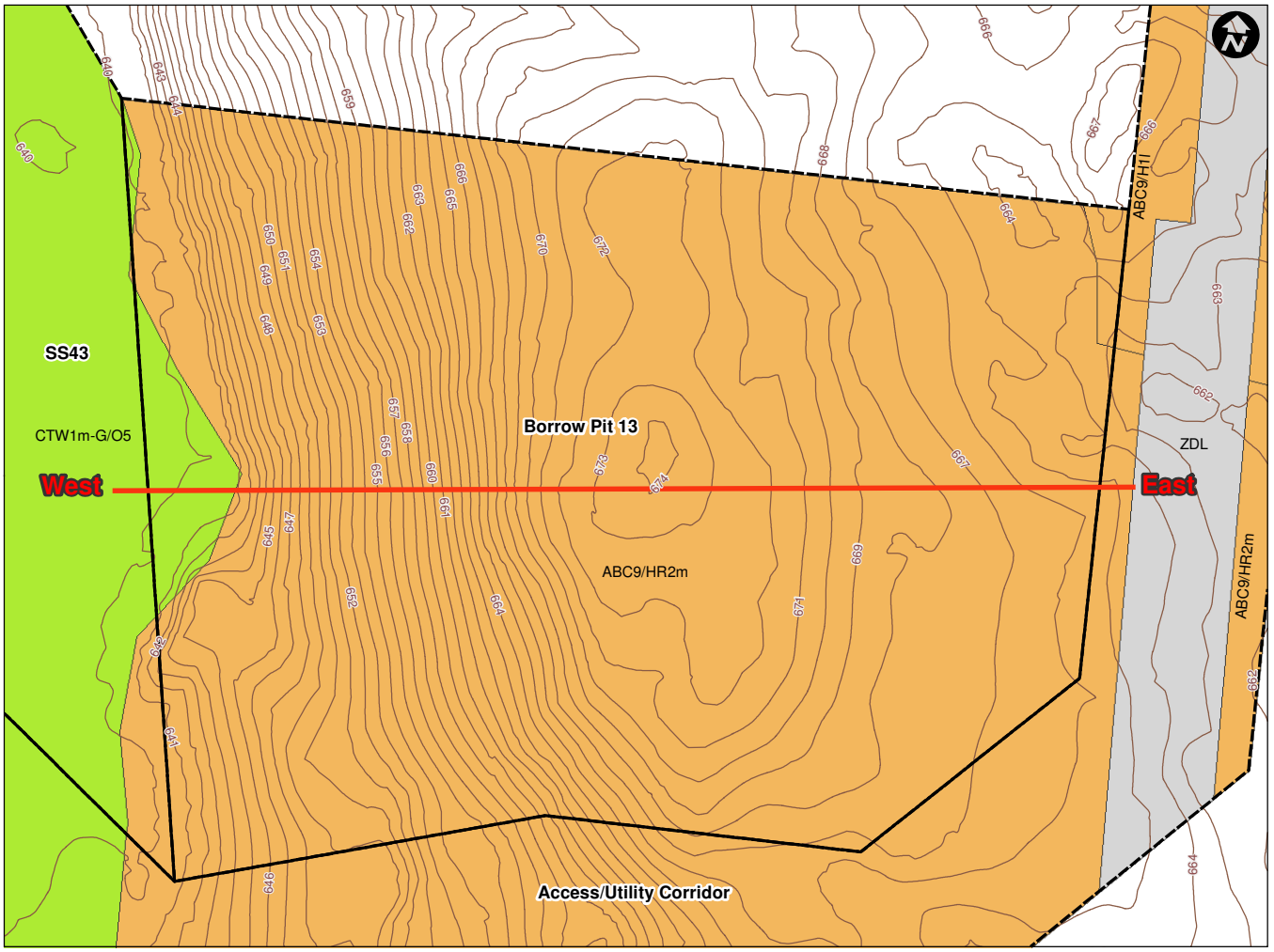
TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 12

DRAWN: SL
CHECKED: NC
DATE: Nov 14/13
PROJECT: 11-033

FIGURE: E.5.2-1H

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1H Conceptual Reclaimed BP12.mxd

PRE DISTURBANCE SOIL MAP UNITS



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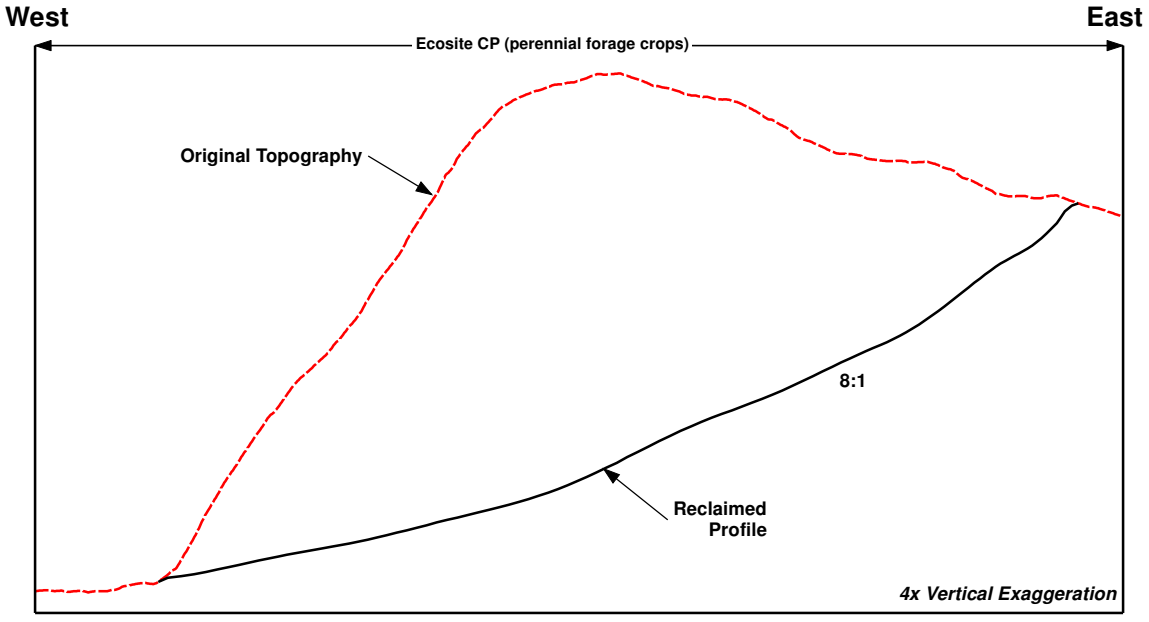


0 40 80 m

Scale 1:2,000

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

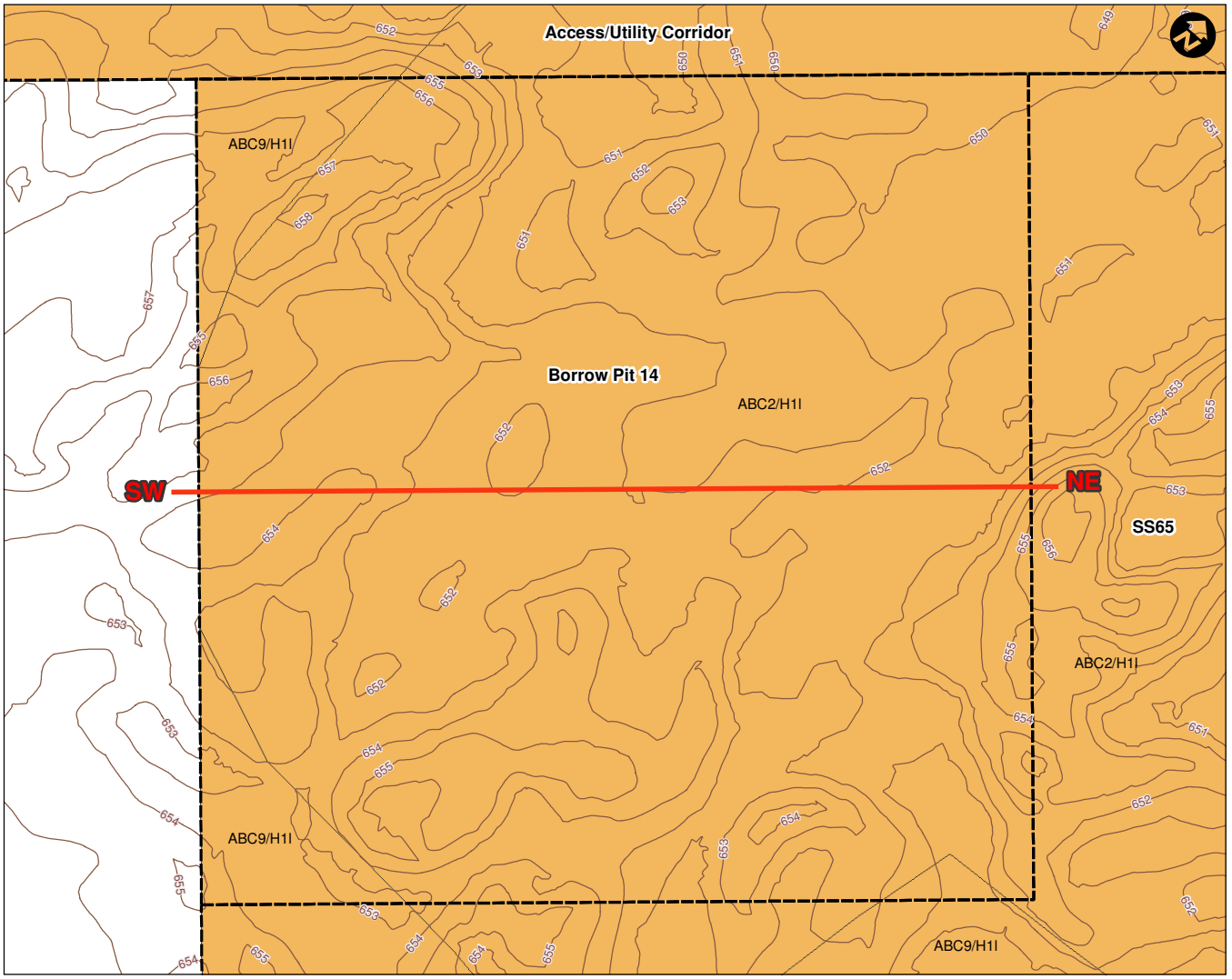
TITLE: **Conceptual Reclaimed Cross-Section of Borrow Pit 13**

DRAWN:	SL
CHECKED:	NC
DATE:	Nov 14/13
PROJECT:	11-033

FIGURE: **E.5.2-1I**

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1I Conceptual Reclaimed BP13.mxd

PRE DISTURBANCE SOIL MAP UNITS



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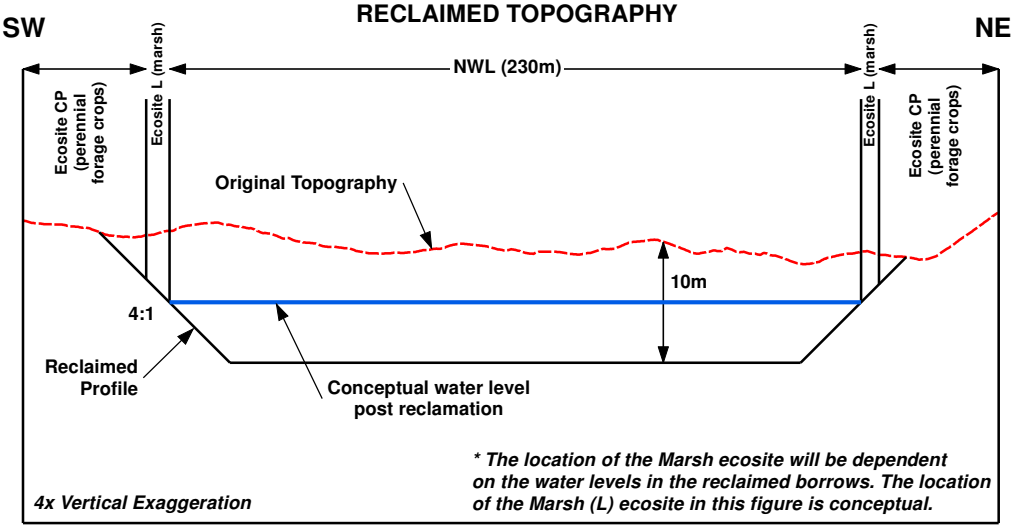

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Scale 1:2,500

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

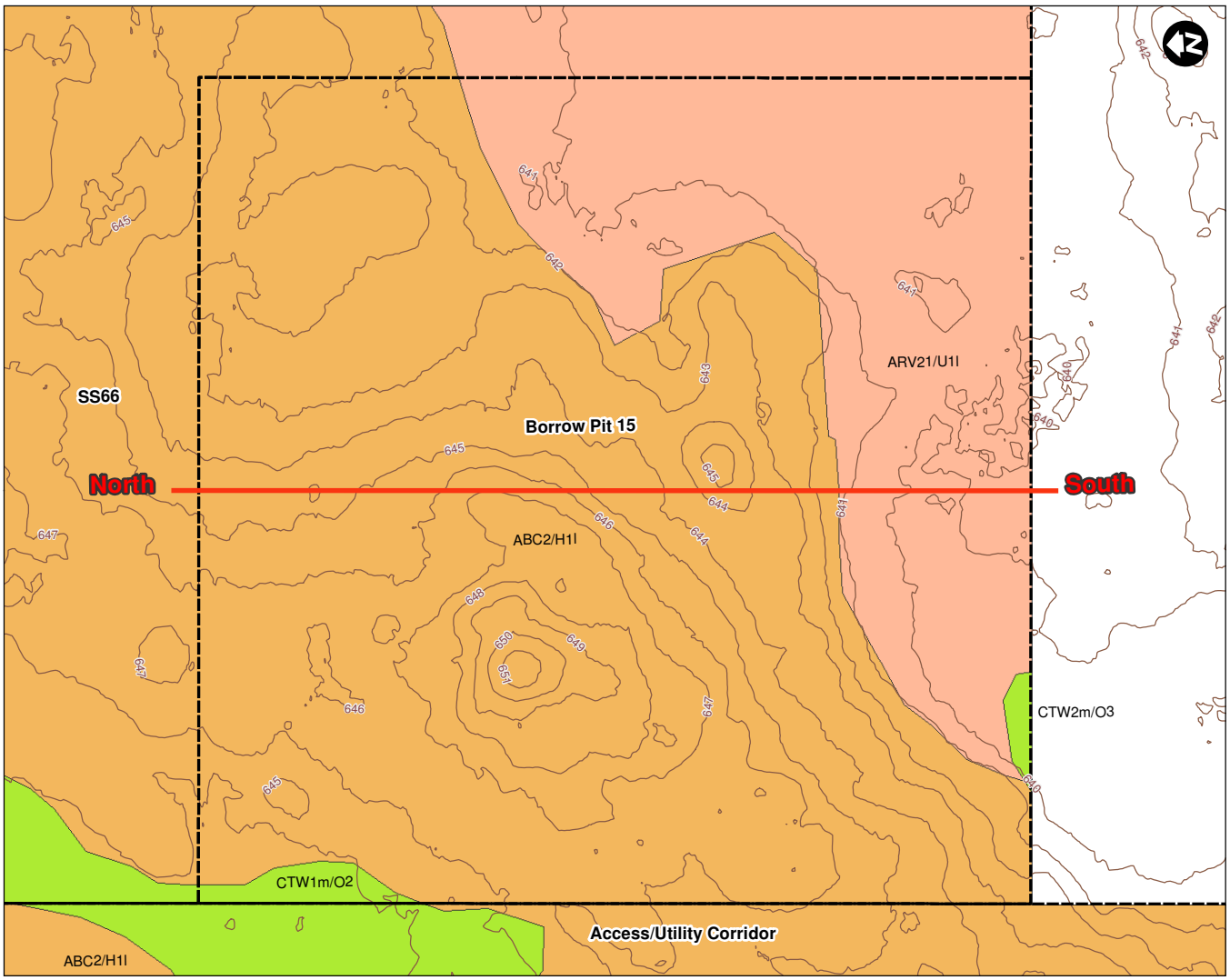
TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 14

DRAWN: SL
CHECKED: NC
DATE: Nov 14/13
PROJECT: 11-033

FIGURE: E.5.2-1J

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1J Conceptual Reclaimed BP14.mxd

PRE DISTURBANCE SOIL MAP UNITS



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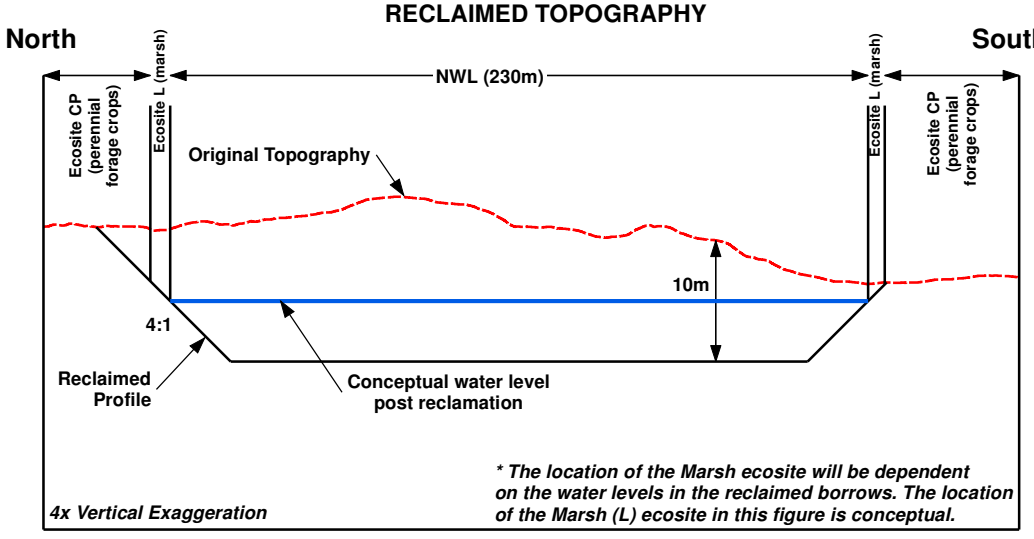


0 50 100 m

Scale 1:2,500

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

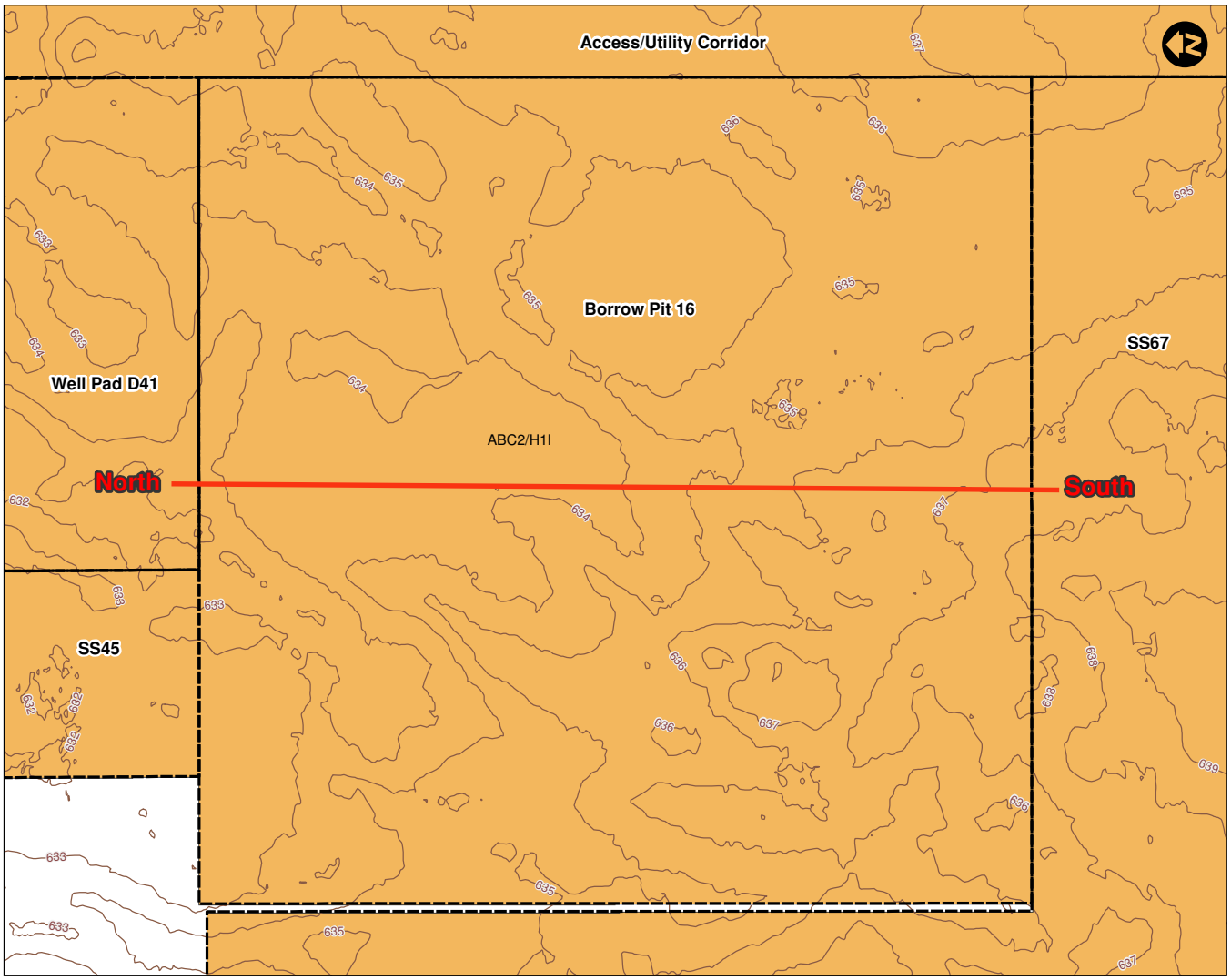
TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 15

DRAWN: SL
CHECKED: NC
DATE: Nov 13/13
PROJECT: 11-033

FIGURE: E.5.2-1K

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1K Conceptual Reclaimed BP15.mxd

PRE DISTURBANCE SOIL MAP UNITS



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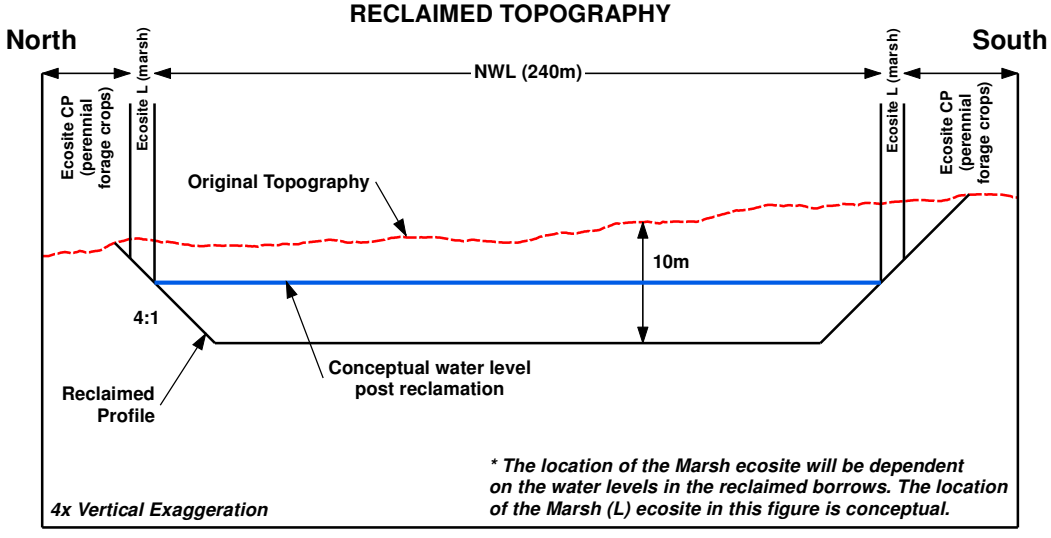


0 50 100 m

Scale 1:2,500

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

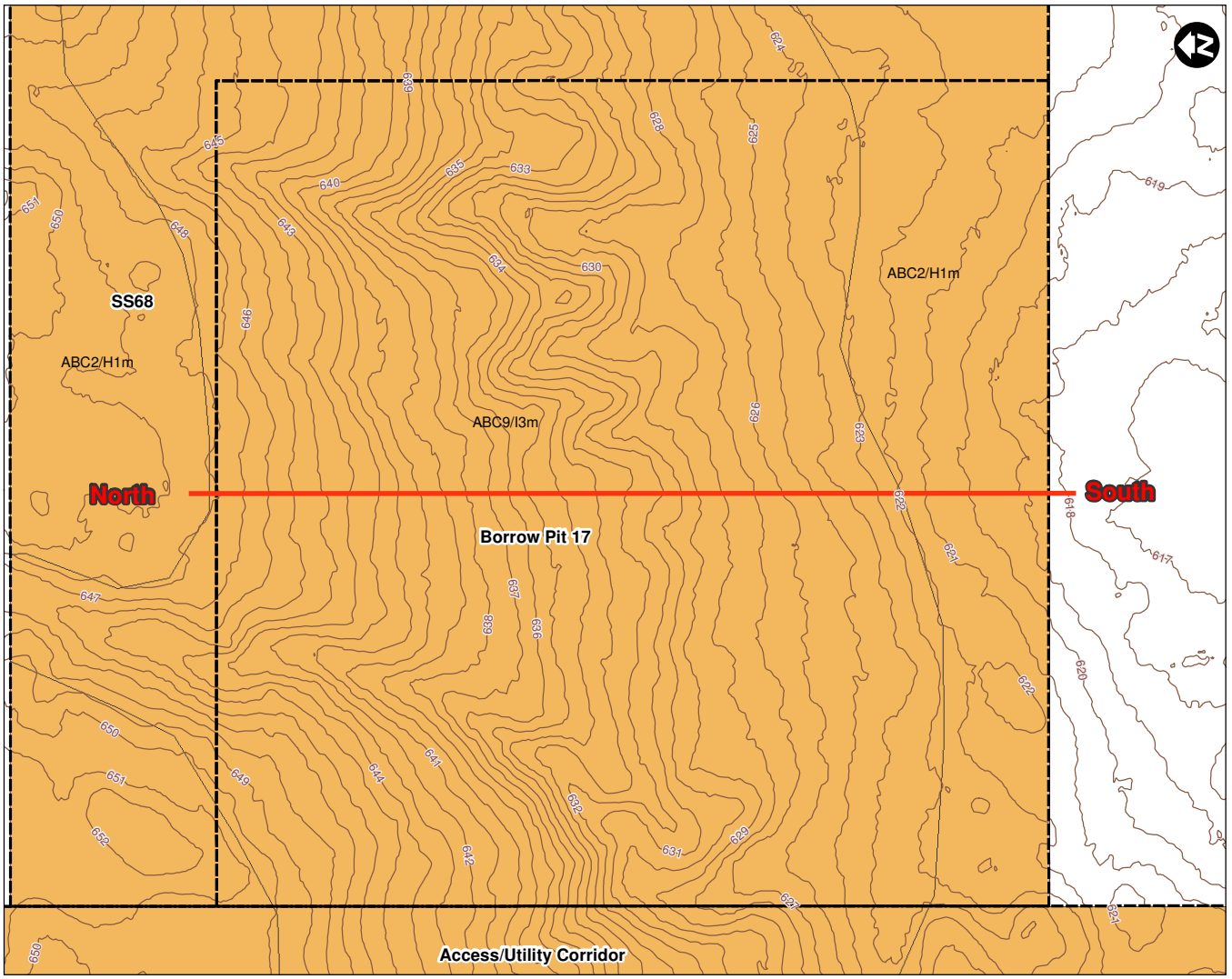
TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 16

DRAWN: SL
CHECKED: NC
DATE: Nov 13/13
PROJECT: 11-033

FIGURE: E.5.2-1L

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1L Conceptual Reclaimed BP16.mxd

PRE DISTURBANCE SOIL MAP UNITS



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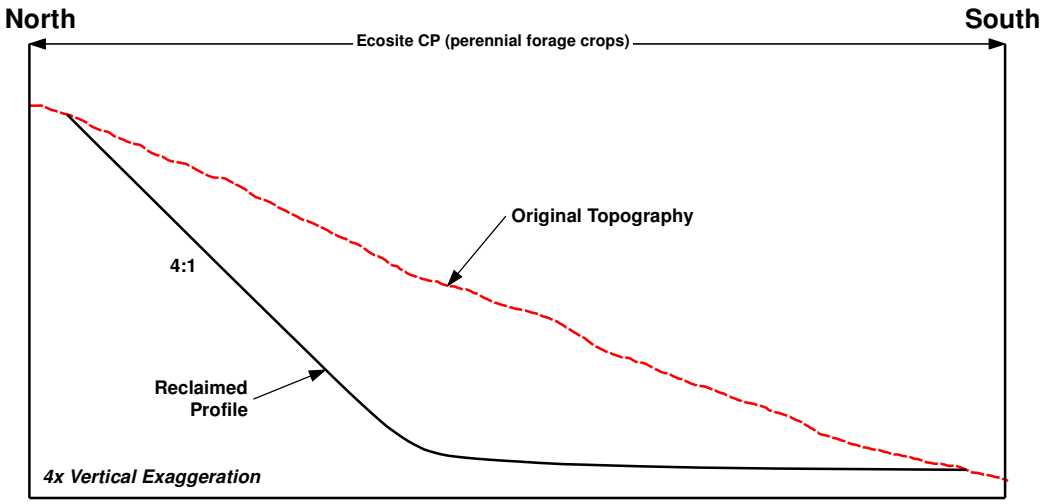


0 50 100 m

Scale 1:2,500

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

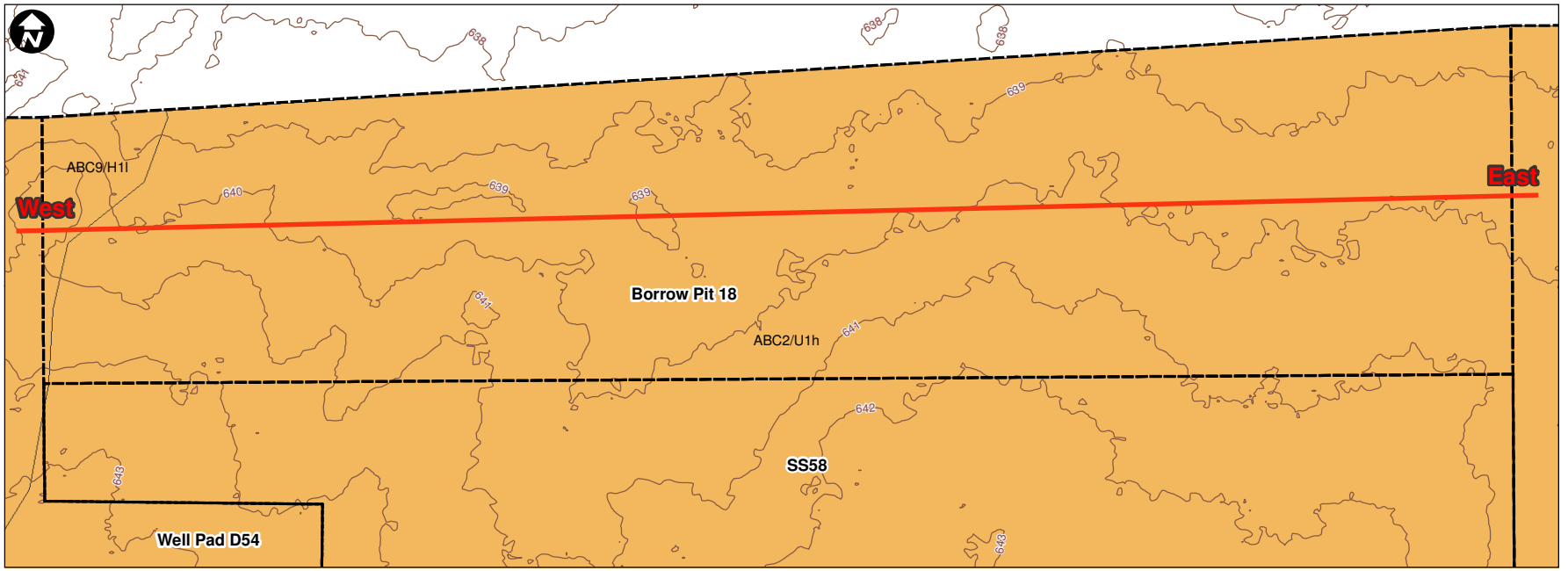
TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 17

DRAWN: SL
CHECKED: NC
DATE: Nov 13/13
PROJECT: 11-033

FIGURE: E.5.2-1M

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1M Conceptual Reclaimed BP17.mxd

PRE DISTURBANCE SOIL MAP UNITS



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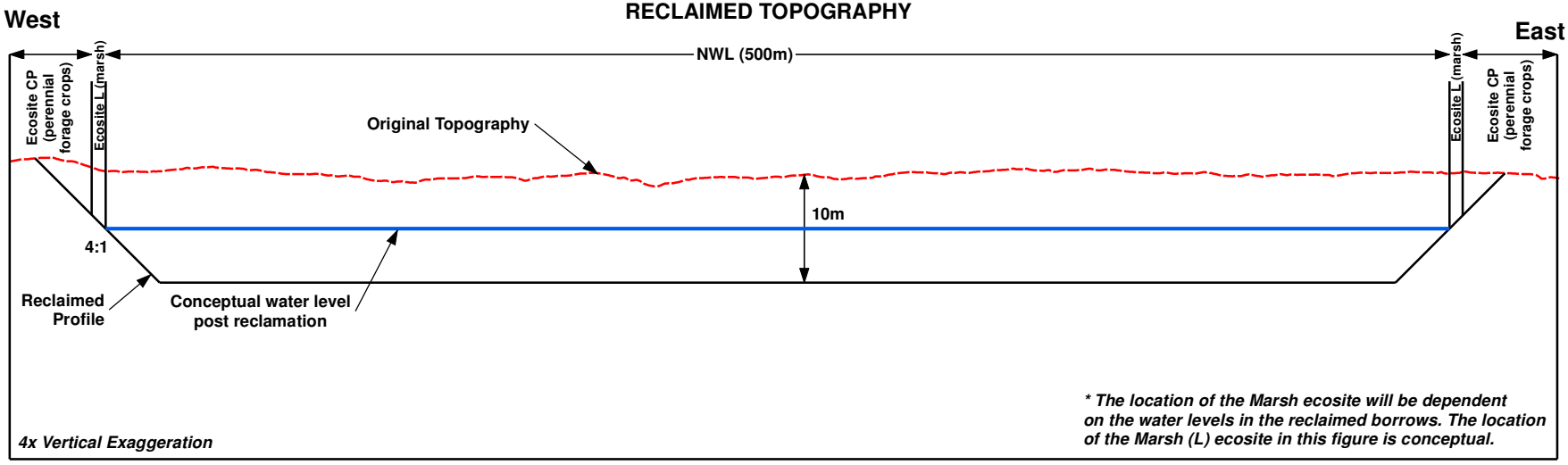


0 50 100 m

Scale 1:2,500

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013.

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

TITLE: Conceptual Reclaimed Cross-Section of Borrow Pit 18

DRAWN: SL
CHECKED: NC
DATE: Nov 13/13
PROJECT: 11-033

FIGURE: E.5.2-1N

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.2-1N Conceptual Reclaimed BP18.mxd

R4 R3 W4M

Well Pad D53
Well Pad D54
Borrow Pit 18
SS58
Well Pad D55
Access/Utility Corridor
Well Pad D49
Well Pad D50
Well Pad D51
Well Pad D52
SS68
Borrow Pit 17
Well Pad D47
Well Pad D48
Reita Lake
Well Pad D43
Well Pad D44
SS50
Well Pad D46
Well Pad D45
Well Pad D42
Well Pad D41
Borrow Pit 16
SS67
SS66
Borrow Pit 15
Access/Utility Corridor
T59
T58

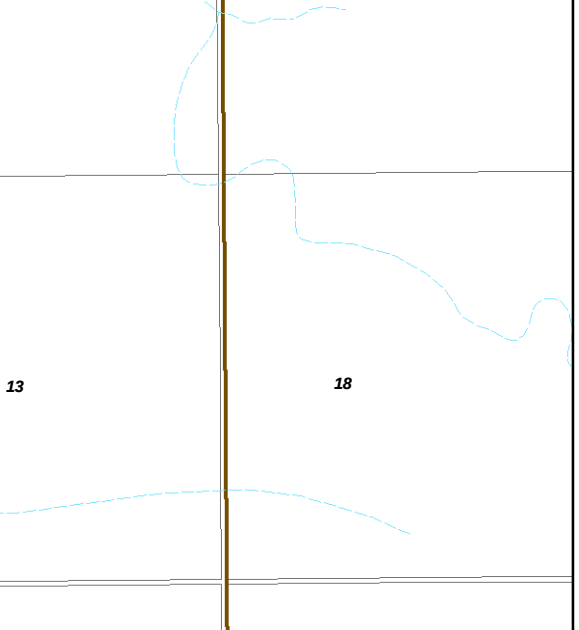
33 34 35 36 31
28 27 26 25
21 22 23 24 19
16 15 14 13 18
9 10 11 12 7
4 3 2

Legend

LCCS Rating
- 2
- 3
- 3W
- 4W
- 5W
- NR (Not Rated)
- Open Water

- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

300 600 1,200
Metres



PROJECT: PENGROWTH
Lindbergh SAGD Expansion Project

TITLE:
Reclaimed LCCS Ratings - Map Sheet 1

DRAWN: SL
CHECKED: JJ
DATE: Dec 5/13
PROJECT: 11-033

FIGURE:
E.5.4-1A

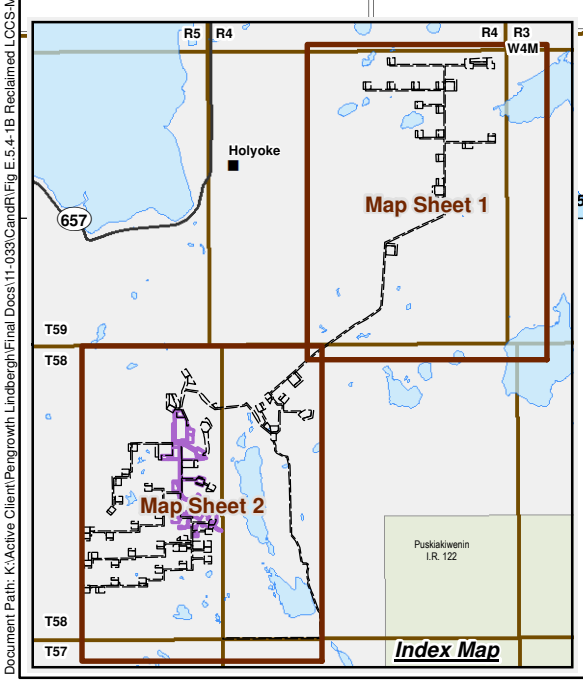
REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.4-1A Reclaimed LCCS-Mapsheet 1.mxd

R5 R4

Well Pad D34
SS38
Borrow Pit 12
SS37
SS63
Well Pad D33
Well Pad D32
SS64
Borrow Pit 14
SS65
Well Pad D36
SS41
Well Pad D35
SS39
SS40
Well Pad D37
Well Pad D38
SS42
SS43
Borrow Pit 13
Well Pad D39
SS13
Well Pad D08
Access/Utility Corridor
Access/Utility Corridor
SS36
Well Pad D31
SS59
Borrow Pit 6
Borrow Pit 5
SS14
Well Pad D30
SS35
Well Pad D29
SS34
Access/Utility Corridor
SS10
Well Pad D04
SS11
Well Pad D40
SS44
SS12
Well Pad D07
Access/Utility Corridor
Well Pad D28
SS33
Well Pad D27
SS32
Well Pad D06
Garnier Lake
Well Pad D11
SS16
Well Pad D10
Borrow Pit 10
SS62
Well Pad D26
SS31
Access/Utility Corridor
Well Pad D24
SS29
Well Pad D25
SS30
Well Pad D09
SS15
Borrow Pit 7
SS18
Well Pad D23
SS28
SS17
Well Pad D13
Borrow Pit 9
SS61
Well Pad D22
SS27
Borrow Pit 11
Well Pad D12
Access/Utility Corridor
Well Pad D15
SS20
Well Pad D20
SS25
Well Pad D21
SS26
SS19
Well Pad D14
SS24
Well Pad D19
Well Pad D18
SS22
Well Pad D17
SS23
SS21
Borrow Pit 8
SS60
Access/Utility Corridor
Well Pad D16
Bluet Lake
Dion Lake
Access/Utility Corridor
T58
T57

34 35 36 31 32
27 26 25 30 29
22 23 24 20
15 14 13 17
10 11 12 7 8
3 2 1 6
5 36 31 32



Legend

LCCS Rating
- 2
- 3
- 3W
- 4W
- 5W
- NR (Not Rated)
- Open Water

- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

0 300 600 1,200
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

PROJECT: PENGROWTH
Lindbergh SAGD Expansion Project

TITLE:
Reclaimed LCCS Ratings - Map Sheet 2

DRAWN:	SL
CHECKED:	JJ
DATE:	Oct 31/13
PROJECT:	11-033

FIGURE: E.5.4-1B

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.5.4-1B Reclaimed LCCS-Mapsheet 2.mxd

R4 R3 W4M

Well Pad D53
SS57
Well Pad D54
Borrow Pit 18
SS58
Well Pad D55
Access/Utility Corridor

34 35 36

Well Pad D49
SS53
Well Pad D50
SS54
Well Pad D51
SS55
Well Pad D52
SS56
SS68
Borrow Pit 17

Well Pad D47
SS51
SS52
Well Pad D48

Reita Lake

27 26 25

Well Pad D43
SS47
Well Pad D44
SS48
SS50
Well Pad D46
SS49
Well Pad D45

Well Pad D42
SS46

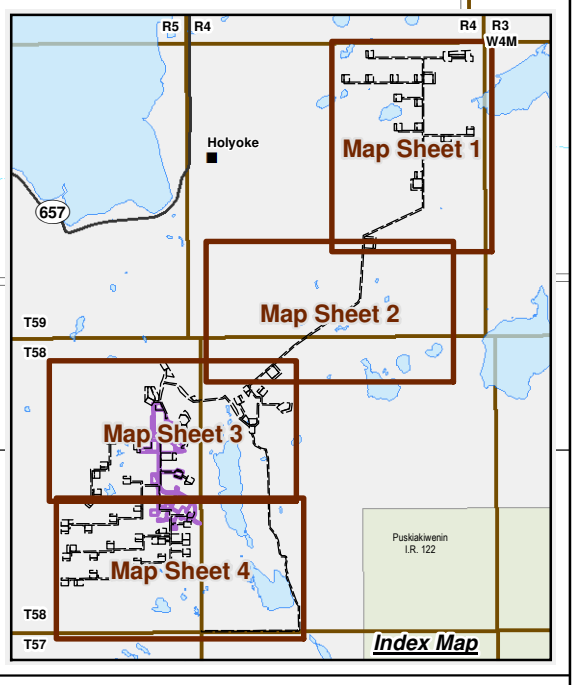
T59

22 23 24

Well Pad D41
SS45
Borrow Pit 16
SS67

15 14 13

SS66
Borrow Pit 15



Legend

- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

Dominant Ecosite
- J - poor fen
- K - rich fen
- L - marsh
- NWL - lake/pond

Disturbed
- CP - perennial forage crop

0 200 400 800
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

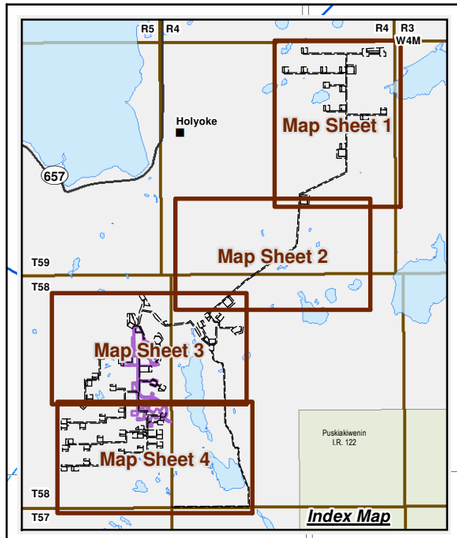
PROJECT: PENGROWTH
Lindbergh SAGD Expansion Project

TITLE:
Reclaimed Ecosites Within the Development Footprint - Map Sheet 1

DRAWN: SL
CHECKED: JK
DATE: Nov 14/13
PROJECT: 11-033

FIGURE:
E.6.3-1A

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\CandR\Fig E.6.3-1A Reclaimed Ecosites-Mapsheet 1.mxd



R4 W4M

Borrow Pit 15

8 9 10 11

5 4 3 2

Access/Utility Corridor

T59

T58

31 32 33 35

Borrow Pit 14

SS65

Legend

- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

Dominant Ecosite

- J - poor fen
- K - rich fen
- L - marsh
- NWL - lake/pond

Disturbed

- CP - perennial forage crop

0 200 400 800
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

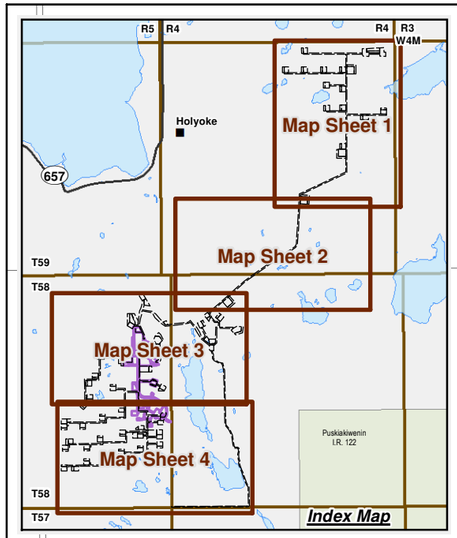
Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\Cand R\Fig E.6.3-1B-D Reclaimed Ecosites-landscape.mxd

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

TITLE: **Reclaimed Ecosites Within the Development Footprint - Map Sheet 2**

DRAWN: SL
CHECKED: JK
DATE: Nov 14/13
PROJECT: 11-033

FIGURE: **E.6.3-1B**



Legend

- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

Dominant Ecosite

- J - poor fen
- K - rich fen
- L - marsh
- NWL - lake/pond

Disturbed

- CP - perennial forage crop

Well Pad D34
SS38
Borrow Pit 14
SS65
Borrow Pit 12
SS37
SS63
Well Pad D36
SS41
SS64
SS39
Well Pad D35
SS40
Well Pad D37
Well Pad D33
Well Pad D32
SS13
Well Pad D08
Well Pad D38
SS42
SS43
Borrow Pit 13
Well Pad D39
T58
Access/Utility Corridor
Access/Utility Corridor
SS36
Well Pad D31
SS59
Borrow Pit 6
Borrow Pit 5
SS14
Well Pad D30
SS35
Well Pad D29
SS34
Access/Utility Corridor
SS10
Well Pad D04
SS11
Well Pad D40
SS44
SS12
Well Pad D07
Well Pad D28
SS33
Access/Utility Corridor
Well Pad D27
Garnier Lake
R5 R4 W4M

35 36 31 32
26 25 30 29
22 23 24 20

0 200 400 800
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\Card\Fig E.6.3-1B-D Reclaimed Ecosites landscape.mxd

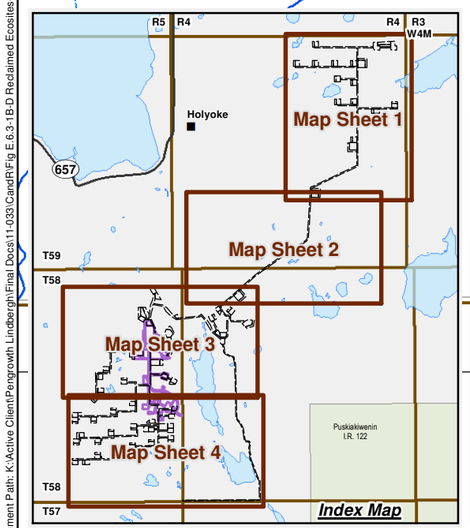
PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

TITLE: **Reclaimed Ecosites Within the Development Footprint - Map Sheet 3**

DRAWN: SL
CHECKED: JK
DATE: Nov 14/13
PROJECT: 11-033

FIGURE: **E.6.3-1C**

Well Pad D27
SS32
15
Well Pad D06
14
13
Well Pad D11
17
SS31
Well Pad D26
Borrow Pit 10
SS62
Access/Utility Corridor
SS16
Well Pad D09
SS15
Well Pad D10
Borrow Pit 7
SS18
Well Pad D23
SS28
SS17
Well Pad D13
Borrow Pit 11
Well Pad D12
SS27
Well Pad D22
Borrow Pit 9
SS61
Well Pad D15
SS20
Access/Utility Corridor
SS19
Well Pad D20
SS25
Well Pad D21
SS26
Well Pad D14
10
11
12
7
8
SS24
Well Pad D19
SS22
Well Pad D18
Well Pad D17
SS23
Access/Utility Corridor
SS21
Borrow Pit 8
Well Pad D16
SS60
Bluet Lake
Dion Lake
2
1
6
T58
T57
R5
R4 W4M
Access/Utility Corridor



Legend

- Development Footprint
- Existing and Approved Development
- First Nations
- Secondary Highway
- Permanent Stream
- Ephemeral Stream
- Drainages without Defined Channels
- Lakes and Ponds
- Beaver Ponds

Dominant Ecosite

- J - poor fen
- K - rich fen
- L - marsh
- NWL - lake/pond

Disturbed

- CP - perennial forage crop

0 200 400 800
Metres

REF: Drifter Projects Ltd., EIA Footprint REV 3.dwg; MEMS, 2013; NHC hydrology, Oct 2013.

Document Path: K:\Active Client\Pengrowth Lindbergh\Final Docs\11-033\Cand\RI\Fig E.6.3-1B-D Reclaimed Ecosites-landscape.mxd

PROJECT: PENGROWTH Lindbergh SAGD Expansion Project

TITLE: **Reclaimed Ecosites Within the Development Footprint - Map Sheet 4**

DRAWN: SL
CHECKED: JK
DATE: Nov 14/13
PROJECT: 11-033

FIGURE: **E.6.3-1D**