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Garden River Remediation Project – Landfill Operations, Maintenance & Closure Plan

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GARDEN RIVER REMEDIATION PROJECT
OPERATIONS, MAINTENANCE & CLOSURE PLAN

PARKS CANADA

PCA Contract No.: 5P420-13-5137

SLR Project No.: 200.02005.00000

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TABLE OF CONTENTS

DRAWINGS

Drg No. -00 Location Plan

Drg No. -01 Proposed General Layout

Drg No. -02 Proposed Cell A layout

Drg No. -03 Proposed cell B Layout

Drg No. -04 Long Section

Drg No. -05 Sections & Liner/Cap Details

Drg No. -06 Sump Details

Drg No. -07 Fill Schematic

Drg No. -08 Groundwater Monitoring Well Design

GLOSSARY OF TERMS

Airspace – The useful volume of a landfill site available to receive waste, normally measured between the top of the lining and leachate drainage system and the base of the capping system. Airspace includes capacity consumed by the use of **cover material**.

Cover material – Inert material, typically sub-soil or sand, whi.ch is spread over imported wastes at a landfill site at the end of the working day, in order to suppress odours, reduce attractiveness to **vectors** and vermin and prevent the spread of windborne litter.

Encapsulation – The engineered containment of waste materials using a combination of natural and man-made materials to form an enclosed space from which inbound moisture can be excluded and within which leachate can be contained, prior to removal and treatment.

HHW – Household hazardous waste, i.e. materials which can routinely be found in municipal wastes but which represent some potential risk to the environment due to their physical, chemical or biological characteristics. Examples include solvents, bleach, paints, batteries, etc.

Landfill compactor – Heavy duty steel-wheeled machine, dedicated to the specific purpose of crushing, tearing and compacting waste materials in order to maximise effective use of landfill **airspace**. Usually fitted with a hydraulic blade at the front of the machine, for pushing wastes and spreading cover material.

Landfill gas (LFG) – The gaseous breakdown products resulting from the microbial degradation of waste materials in an anaerobic environment. LFG can be explosive at concentrations of methane in excess of 5% in air, volume for volume (v/v).

Leachate – Precipitation, groundwater and snow-melt which has become contaminated by direct contact with wastes or their breakdown products.

Loading shovel – Heavy duty, normally rubber-tyred, machine used for scooping and carrying bulk materials, such as soils for cover material, over short distances. Can also be used for moving segregated recyclables or HHW from the **tipping face** to the Segregation Area.

Mobile plant – All heavy equipment used on a landfill, which is capable of movement under its own power or which can be towed. Examples include a **landfill compactor**, a **tracked dozer** or a **loading shovel.**

Natural attenuation – Processes, normally taking place in the sub-soil and unsaturated zones beneath a landfill, by which contaminants become attached to natural particles, so that no long term pollution plume develops. These processes can include cation exchange and other bonding at the molecular level. Landfills operating by natural attenuation may not have been through a formal regulatory process to confirm the suitability of the attenuating mechanisms.

Rolonof container – A type of waste container, normally made from steel, which is normally open at the top and with hinged rear doors, which can be loaded and unloaded from a **rolonof truck** with a hydraulic hooklift facility. Available in a variety of capacities and used for the bulk haulage of both unsorted wastes and sorted recyclable or residual materials.

Rolonof truck – Purpose-built truck with special chassis designed to lift and place **rolonof containers** using an on-board hydraulic hooklift facility.

Slave truck – A truck dedicated, for example, to the deployment of full and empty **rolonof containers** at appropriate locations within the landfill site, in order to enable efficient delivery and collection of containers by road going **rolonof trucks**. A slave truck would not normally need to be fully road-going, provided it was capable of safe operation.

Tipping face – The area of the landfill site where active waste disposal is taking place, i.e. imported wastes are being tipped out by visiting trucks and wastes are being spread, crushed and covered by the **tracked dozer**.

tpa – tonnes per annum.

Tracked dozer – Heavy duty machine, with articulated steel tracks used primarily for pushing bulk materials, such as wastes or soils. Can also perform the function of a **landfill compactor** on low-input landfill sites by crushing wastes containing any voids.

Vectors – Any creatures that can lead to the dispersion of waste materials away from a landfill site leading to impacts on amenity and potential impacts on health. The term usually refers to birds such as gulls and corvids, but can also apply to rodents and other mammals.

Working face – See **Tipping face.**

1.0 INTRODUCTION

1.1 Relevant Background

The existing Garden River Landfill Site is located in NE - Sec 12 – Twp 112 – Rge 23 W4M, approximately 1.5km west of the centre of the settlement of Garden River, on the west side of Wood Buffalo National Park. The landfill receives residential and institutional solid waste from Garden River and services a population of approximately 500. Site operations are undertaken by Little Red River Forestry on behalf of the community.

The existing Garden River landfill is a natural attenuation facility which is underlain by sandy soils. The site comprises a series of excavated trenches across the site into which wastes have been sequentially placed. The site entrance is currently off Highway 58. A plan showing the location of the site is presented in Drg No. -00.

A number of engineering and planning studies have been undertaken for the site and the locality, including:

- *Contaminated Site Assessment Initial and Detailed Testing Programs Wood Buffalo National Park Various Locations in the Community Garden River, Alberta. EBA, 2009.*
- *Detailed Site Assessment Garden River Old Dump in Wood Buffalo National Park. Columbia Environmental Consulting Ltd and Franz Environmental Inc, 2011.*
- *Garden River, AB Community Airstrip and Old Landfill Reports Review and Remediation Options Analysis. EBA, 2013*

The landfill construction work that is being proposed for the site includes the following three components:

- Excavation of the old dump site located immediately adjacent to the settlement of Garden River and encapsulation of the waste in a landfill cell at the site of the existing dump
- Placement of an engineered cap over the existing dump, and
- Construction of a new landfill cell in accordance with Alberta Standards for Landfills, to the extent possible in local geological conditions

1.2 Regulatory Status

The existing Garden River Landfill is understood to have been operational since approximately 1998 and is not currently subject to any formal regulatory oversight.

The main regulatory guidelines that govern the design, operation, and closure of landfills in Alberta are the '*Alberta Standards for Landfill'*, dated February 2010, prepared by Alberta Environment (now AESRD). However the Provincial regulator has recognized that the above guidelines are very stringent in the context of operating small remote facilities and has therefore put in place a Code of Practice for use on sites which accept less than 10,000 tonnes per annum (tpa) of non-hazardous wastes. This Code is given effect through the provisions of the Environment protection and Enhancement Act of 2000.

As the future operations at the site will be on Federal land they are not directly regulated by Provincial requirements, however it is the intention of Parks Canada and AANDC that the site will be managed in accordance with the principles of the Provincial regulations.

1.3 Scope of Document

The purpose of this document is to provide Parks Canada and AANDC with sufficient information to enable them to facilitate the future operation, maintenance and closure of the three proposed elements of landfill construction work at the site. Details of the design of the facilities are set out in SLR's Detailed Landfill Design Report of January 2015.

This report was prepared by SLR on the basis of the information contained in the reports cited in Section 1.1, discussions with LRRCN, Parks Canada, AANDC, as well as information gathered during site investigation and environmental monitoring carried out between March and November 2014.

In preparing this report we have given consideration to the Alberta Code of Practice for Landfills, described in 1.2 above as well as the Landfill Wastes Fact Sheet prepared by the Assembly of First Nations in 2009.

2.0 WASTE STREAM

2.1 Current Waste Stream

Few details of the composition of the current waste stream are available. On the basis of visual inspection of the facility, inputs would appear to include the normal range of municipal wastes together with redundant equipment which includes motor vehicles, white goods and other electrical appliances. A waste volume of around 12m^3 per week is collected by a waste truck and delivered to the existing landfill. A further unknown volume of waste is brought directly to the landfill by local residents, on an ad hoc basis.

As discussed in the Detailed Landfill Design Report, there is uncertainty regarding the rate at which wastes are generated by the Garden River community. On the basis of discussions with representatives of the community and on-site observations, an annual demand for around 2,000m^3 of landfill airspace has been assumed.

2.2 Future Waste Stream Projection

For the purpose of this Plan, it has been assumed that waste inputs will remain at current levels and that no new waste streams are likely to be introduced. However if either of these parameters change in the future then it will be necessary to review the details set out in this document.

Factors which would influence future waste generation could include one or more of the following:-

- Significant population change,
- Improved employment opportunities,
- Improved waste segregation & recycling activities.

3.0 SITE INFRASTRUCTURE

3.1 Site Access

The current access road enters the site directly from Highway 58. Both the Highway and the access road are unpaved and are constructed from locally-derived gravel. This access will continue to serve the proposed new operations.

3.2 Site Layout and Waste Reception Facilities

With the exception of the site access off Highway 58, there is no other formal built infrastructure serving the existing site. The development of the new waste management operations will be supported by the following new infrastructure, which is shown in Drg No. -01. Where relevant, details are set out in the Specifications report.

Extended access roads – Internal access roads will need to be extended in order to provide access for the following functions:-

- Waste deliveries to the Segregation Area, and removal of segregated hazardous or recyclable materials,
- Collection of leachate from the sumps in Cells A and B,
- Clean-out of the surface water retention swale.

Wildlife-proof security fencing – Heavy duty post and wire fence constructed to a height of 8ft, surrounding the facility.

Lockable entrance gates – Steel gates constructed to the same height as the security fencing, across the full width of the access road.

Waste drop-off & segregation area – Hard surfaced area sufficient to accommodate turning circles for all vehicle types visiting the facility and including a series of bays within which clean recyclable materials can be stored as and when viable arrangements for off-site haulage and sale can be put in place.

Household hazardous waste (HHW) storage area – Comprising a series of lockable steel shipping containers which can be used to safely store specific wastes prior to bulk shipment to a re-processor. Operational details are set out in Section 5.16 below.

Burn-pit - It is proposed that a dedicated burn-pit will be established adjacent to the Segregation Area, but as far as possible from Cell B, and will be demarcated by 2m high earth berms on three sides. Vegetation will also be cleared back at least 25m from the limits of the burn-pit. Operational details are set out in Section 5.16 below.

Given the low input rates at this site, a dedicated weigh-scale is not considered essential.

3.3 Cell B Development Options

There are two options regarding the way in which the airspace capacity in Cell B can be made available. This could either be developed in a single construction phase or in two phases. In the two phase approach, the cell shape is excavated in full but the lining and leachate management systems are only installed in one half of the excavation, so that rainfall and snow melt in the

unlined portion can drain freely into the underlying sands. If the full capacity is provided in a single phase then it is essential that operational and non-operational areas of the cell base are hydrologically separated, in order to minimise leachate generation. This can be achieved by constructing a temporary inter-cell earth berm of around 2m height, across the base of the cell and covering the berm with a sacrificial layer of geomembrane liner. Rainfall and snow melt accumulating in the non-operational portion can be subject to occasional quality analysis, prior to pumping out into the swale if the quality is acceptable. The temporary liner and the berm can be removed prior to waste placement moving into the second half of the cell.

While there can be additional costs associated with remobilisation of a contractor to deliver phased cell construction, there are also significant risks that non-operational parts of a fully-constructed cell will deteriorate due to exposure to weather and the activities of burrowing animals. This can be partly overcome by placing a substantial protective layer of available soils or geotextile over the parts of the liner that will not receive waste in the early years of operation. However, this either creates risks of liner damage during soil removal or the risk of higher costs due to the need to replace sacrificial geotextile prior to waste placement. A cost benefit assessment should ideally be carried out immediately prior to the formulation of the construction contract for Cell B.

4.0 ENVIRONMENTAL PERFORMANCE

Details of the proposed post-construction monitoring program are set out in the accompanying report entitled Garden River Landfill – Post Construction Monitoring Plan, dated Mar 2015. This plan covers the frequencies and parameters for the measurement, sampling and analysis of the following environmental media:

- Groundwater
- Surface Water
- Leachate
- Landfill Gas

5.0 SITE OPERATIONS

This section of the Plan has been structured to accord with the guidance set out in the Standards for Landfill in Alberta document, together with additional recommendations, where relevant.

5.1 Staffing Requirements

It is envisaged that the full complement of site staff will comprise;

- 1 X Site Manager, with overall responsibility for ensuring that operations are carried out safely and in accordance with all relevant documentation. The Site Manager will also be specifically responsible for:
  - Hiring other site staff,
  - Ensuring the effective segregation and storage of HHW,
  - Ensuring routine environmental monitoring is carried out, and
  - Completion of all records relating to site operations
- 1 X Deputy Site Manager, who will perform the function of the Site Manager during periods when the Site Manager is absent due to sickness, training, annual leave or

attendance at off-site meetings relating to the operation of the site. At all other times the Deputy Site manager will perform the same function as the Site Operator.

- 1 X Site Operator, who will take direction from the Site Manager or Deputy Site Manager in respect of any activities which he/she is competent to perform. Such activities will include operation of mobile plant and machinery as well as oversight of the Waste Segregation area and the Burn Pit.

5.2 Operator Certification

Following substantial investment in the new landfill facility it will be important for adequate training to be provided to the staff who will manage the operations. It is however recognized that limited budget resources mean that it would be unrealistic to require a fully qualified Manager to be in place prior to the start of operations. The Site Manager would ideally be a member of the Community who is willing to commit to a long-term role and for whom an adequate training allowance can be set aside in the site operating budget.

The nominated Site Manager would need to commence a program of training to run in parallel with the construction of Cell B and the Segregation Area, so that basic operating principles had been completed ahead of the receipt of the first waste loads. Training would continue as required during subsequent months, until the Site Manager was in a position to seek approval under a recognized certification scheme, as set out below.

Training would need to be delivered by an individual who had as a minimum at least 2 years' experience in the last 10 years of working in a supervisory capacity on a landfill accepting municipal-type wastes, as well as valid certification under one of the following qualification schemes:-

- Alberta Environment Certificate of Qualification, issued under the Municipal Waste Facility Operator Certification Guideline, or
- Alberta Basic Landfill Operator Certificate, issued by Solid Waste Assoc. of N. America (SWANA) – Northern Lights Chapter, or
- An equivalent Certificate recognized in other Canadian provinces.

5.3 Operating Hours

There is a need to improve the management and segregation of wastes in Garden River by controlling unrestricted access to the site. It is for this reason that the new landfill envisages enclosure within substantial fencing and lockable steel gates. Once operational budgets and resources have been defined, it will be possible to specify the hours within which the site will be open for receipt of waste.

In recognition of Health and Safety considerations, it is recommended that the site should only be open when there is a minimum of two operational staff available to manage the operations. The site should ideally be open for as many days of the year as possible and, if required by budgetary constraints, it will be preferable to restrict the number of hours it is open each day to achieve this, rather than the number of days in the year.

5.4 Waste Acceptance

The location of the Garden River landfill means that it is unlikely that unsuitable wastes will be delivered to the site. It will however be important that the Site Manager is aware of the need to exclude non-Community wastes in order to:

- Ensure the investment in the new landfill serves only the direct waste management needs of the Community, and
- Avoid possible detrimental impacts on the performance of the landfill which might arise from the acceptance of non-municipal type wastes.

For example, industrial wastes may create different and more complex leachates which will cost more to treat, or layers of low-permeability contaminated soils may prevent downward leachate migration which could be forced out laterally, encouraging seepage of perched leachate. Further, additional road traffic, associated with the importation of industrial wastes, could lead to damage to the internal landfill roads, which are not designed for the heaviest waste vehicles.

All loads should be inspected by the Site Manager while the delivering vehicle is at the tipping face, to ensure they do not contain any of the specified HHW or other materials set out in Section 5.15 below. The driver should be made aware of the non-acceptance of the HHW and other specified materials in order to inform future pre-delivery segregation. Any specified materials should be collected using the loading shovel and delivered to the Segregation Area for sorting by site staff into the correct container.

Gates should be closed in accordance with the specified operating hours and any remaining waste spreading, compaction and covering activities completed before site staff leave site and lock the gates behind them.

It is possible that wastes will be deposited at the gates outside operational hours, especially during the initial few months of the new regime. Resources will need to be made available for ad hoc clearance of such materials before normal daily operations commence. Particular attention will need to be applied to checking whether materials are suitable for acceptance at the landfill or whether they comprise hazardous materials for segregation.

5.5 Heavy Equipment Operation Requirements

The main heavy equipment operations at the site will comprise the spreading and compacting of waste, the excavation and spreading of cover material, and the moving of rolonof and shipping containers into and out of the Segregation Area. Secondary ongoing activities will include the operation of the burn-pit, the maintenance of drainage ditches and the retention swale.

A small low-input site like this does not require a dedicated steel-wheeled landfill compactor and the use of a conventional tracked dozer will be acceptable. Operation of the dozer should be supported by a loading shovel which can excavate cover material from the stockpile area and a dump truck which can deliver this material to the tipping face. The latter two items of plant can also, if necessary be used to excavate and transport material from the borrow area to the stockpile as and when reserves of suitable cover material are approaching exhaustion.

Ferrous and non-ferrous metals which have a residual value (and potentially other materials, subject to transport economics) can be stored in rolonof containers within the Segregation Area. It will not be necessary to have a slave truck located at the site, dedicated to the repositioning of

rolonof containers. However, arrangements will need to be made with visiting rolonof trucks to ensure that they are willing and able to move containers within the segregation area during visits, to swap out full containers for empty ones.

5.6 Filling Procedure

Waste should only be placed within the operational tipping area under the supervision of the Site Manager. The Site Manager is responsible for ensuring that waste is placed, spread and compacted by the tracked dozer, in accordance with either of the recommended methodologies shown in the accompanying Drg No. -07. These procedures, which are equally valid, ensure that the maximum compactive effort is applied to the waste, thereby minimizing the extent of post-placement waste settlement.

Filling should be restricted to an area (the working face) of no more than around 10m by 10m at any one time, and the operator of the compaction machine should allow sufficient time to spread the incoming waste and apply at least five to six passes of the machine, before additional waste arrives at the tipping area. The operator should also have the opportunity to apply additional compaction to recently tipped waste before daily cover is applied at the end of each day.

5.7 Nuisance Management

Dust – Generation of dust is not uncommon on landfill sites due to the handling of dry materials and the movement of vehicles along unpaved roads. While unlikely to be a significant issue at this low input site, measures should be employed to minimize dust blow. These can include:

- Specifying a maximum speed limit for vehicles on site, typically 15km per hour,
- Maintaining a towable water tank trailer at the site, which can be used to damp down haul roads in dry periods,
- Minimizing drop heights of soils or dusty waste materials,
- Creating rounded profiles of soil stockpiles, and
- Seeding any soil stockpiles that are not expected to be required for a year or more.

Litter - Preventative litter control measures should be taken to minimize the blowing of litter from the active area of the landfill. The following measures should be used at the site to control and minimize windblown litter:

- All open vehicular traffic transporting waste to and around the site should wherever possible be covered with a tarp to prevent litter from blowing out of the vehicle;
- Daily cover, sourced from stockpile, will be used to cover exposed waste and to confine light weight material;
- The tipping face location should be selected based on the direction and intensity of the wind to provide maximum shelter for the active area. The areal extent of the working face should be kept to a minimum on windy days; and
- The Site Manager should ensure that routine litter collection is carried out at the Site and up to 100 metres from the Site along the highway, at least once per month. Particular attention should be paid to the accumulation of litter against the peripheral security fence, as strong winds can cause localized damage to the fence structure if such material is not regularly removed.

Vectors & Vermin - The terms vector and vermin refer to objectionable insects, rodents, and birds that may seek to establish a habitat or feeding area at the landfill. Common vectors and vermin include flies, rats, and gulls. The impact of these species is of concern from both a

health and aesthetic perspective, especially in respect of waste materials carried off site. Landfill operations are required to control the presence and impacts of vector and vermin on the Site. No information is available regarding the current level of issues relating to these problems at the Garden River landfill site.

In the event that during future operations, vector and/or vermin become problematic, then the following control measures should be taken:

- Should an outbreak of flies occur at the Site, an insect exterminator will be contracted to control the population on an as-required basis;
- Should rodents come to inhabit the Site, then extermination will be conducted by a licensed exterminator on an as-required basis; and
- Should the presence of gulls or other birds become problematic at the Site, measures should be undertaken to control and discourage them. Increased thickness and/or frequency of application of cover soil over the waste material will assist in mitigating the presence of gulls.
- In severe cases of bird problems, it is possible to employ the use of an automatic distress call device.
-

***Scavenging* -** Scavenging of deposited and stockpiled waste should be prohibited at the Site. Segregation of recyclable and recoverable materials from the incoming waste stream should only be conducted by landfill personnel. These materials will be removed off-Site for subsequent recycling and value-recovery on an as required basis.

Some communities are recognizing that there can be benefits from encouraging re-use of certain materials to help contribute to landfill diversion. Such a system could be introduced at Garden River and would require the provision of a dedicated enclosed shelter where materials can be stored for inspection by the public.

5.8 Wildlife Management

Larger wildlife should be discouraged from being attracted to the site by the careful application of daily cover, with particular attention being paid to the covering of waste loads containing foods. Such animals will be excluded from the site outside operating hours by the security fence and locked gates.

Where the management of wildlife becomes problematic, the Site Manager should develop a Wildlife Management Plan based on the principles set out in the guidance document Waste Management Facilities and Wildlife, produced by AESRD, and in collaboration with local Fish & Wildlife officials.

5.9 Waste Covering

Good landfill practice requires that wastes placed during the working day should be covered with a minimum thickness of soil material to minimise odours and to discourage scavenging by birds. The depth and frequency of soil placement will depend on site specific circumstances and should be determined by the Site Manager on the basis of operational experience. The aim should always be to use the minimum soil depth necessary to achieve an acceptable reduction in nuisance.

Any excavation activities in Garden River which generate clean uncontaminated soils should be directed to a dedicated stockpile in the Stockpile Area at the landfill. This will ensure that materials are not lost or wasted that could be used for waste covering or final site restoration.

Soils excavated to create Cells A and B will be more than sufficient to provide the necessary restoration soils for Cell A, the existing landfill and for ongoing cover in Cell B. If these supplies are used up during the operation of Cell B, it will be necessary to source additional cover material from the Borrow Area which is located around 350m to the west of the existing landfill.

Fig 1. – Borrow Area

5.10 Liner Protection Procedures

During placement of the first lift of waste across the base or sides of the cell, there is an increased risk of damage from certain types of materials, such as scaffolding, poles and other hard, linear objects, which have the potential to be pushed through the leachate drainage gravel and into the underlying lining system.

Given the low rates of input at this site, it will not be realistic for independent third party supervision to be carried out on the placement of this first lift. It will therefore be essential that the Site Manager is adequately trained in the inspection of incoming loads at the time they are deposited and before spreading and compaction. Any items which could potentially put the liner at risk should be removed to a temporary stockpile in the Waste Segregation Area, until such time as a complete lift of waste, at least 1m in depth, has been placed over the lining system in the active area of the cell, and is providing a cushion for further waste placement.

5.11 Emergency Response Plan

The Site Manager should develop an Emergency Response Plan which sets out the actions to be taken by site personnel in the event of an event which could threaten the safety of operators, visitors or equipment. As a minimum the plan should include arrangements for dealing with the following incidents:

- Fire in the landfill waste mass,
- Fire in a container of recyclable material,
- Forest fire adjacent to the site,

- Personal injury to an operator or visitor,
- Major leak of fuel or other hazardous liquid.

The Plan should include emergency contact information including details of the nearest available medical facilities and the transport arrangements for getting there. They should also include details of the names and locations of specialist service providers who can deal with the consequences of damage to the site infrastructure or release of pollutants to the site and surrounding environment.

A copy of the Plan should be kept on site at all times and at a location known to all site staff.

5.12 Landfill Gas (LFG) Management

The volumes of waste to be contained in the various phases at Garden River are insufficient to permit the collection and utilization of gas for energy generation. Due to the age of the waste in Cell A, the potential for methane generation will be too low to allow effective flaring of any LFG. It is also anticipated that the rate of waste input to Cell B will be too low to allow generation of sufficient gas for effective flaring. The design therefore envisages the installation of a gas permeable blanket beneath the cap with wells installed into the permeable blanket after completion of capping. The wells will be installed with rotating cowls, which will encourage passive venting of the modest volumes of LFG anticipated. The cowls should ideally be constructed from stainless steel in order to minimize corrosion damage over time.

This approach will require the construction of boot structures for each well, which will effectively seal the capping geomembrane to the well pipework as it passes through the cap.

The vents require no maintenance other than routine checking that the cowls can rotate freely and that there are no blockages in the pipework.

Further details are set out in the Closure Section below.

5.13 Leachate Management

Details of the leachate drainage infrastructure are set out in the Detailed Design Report, the Specifications and Drg Nos. -02 and -03. Post landfill cell construction, leachate generation is likely to be different in Cells A and B due to the planned rapid waste emplacement and capping of Cell A. For provisions in respect of Cell A please refer to Section 6.4 below.

During its operational life, Cell B will be receiving all incident rainfall and snow melt and will therefore certainly require the routine removal of leachate from the sump. The frequency of removal is difficult to predict and will need to be monitored carefully in the early years of operation in order to establish requirements.

Following completion of the cell construction it will be necessary to install a means by which leachate elevation can be reliably measured. The simplest device is a weighted wheeled cradle in which the submersible level measurement probe is mounted so that it can be rolled up and down the inclined leachate side-slope riser. This will need to be calibrated at the commencement of operations, to compensate for the non-verticality of the pipe. If required, options exist to establish a solar powered pressure transducer device which can provide accurate fixed monitoring of leachate levels.

The depth of leachate in the sump should be monitored on a weekly basis by the Site Manager until there is evidence upon which to base a reduced frequency of monitoring. The depth of leachate in the sump should not exceed 2m above the sump base, which is equivalent to less than 1m average depth over the base of the cell.

When leachate depth is approaching 2m in the sump, the Site Manager should contact the Contractor with whom the Site has a contract, in order to request a collection. The contract should ideally specify a maximum number days (typically 3 -4) within which the Contractor will respond to the request.

The leachate collection tanker will need to be equipped with pumping equipment of sufficient power to collect leachate from the base of the Cell B sump, which is at an elevation of approximately 5m below ground level. In the event that there is any difficulty in obtaining a reliable service from Contractors with this type of tanker truck, it will be necessary to purchase a suitable submersible pump which can be installed within the riser pipe.

On each occasion that leachate is removed from the site, the Site Manager should record the date, the volume removed and the Cell from which it was collected.

5.14 Surface Water Drainage Management

The prevention of drainage run-in to a landfill cell and the effective shedding of rainfall and snowmelt from a landfill cap are critical to the minimization of leachate generation. The design therefore includes peripheral drainage ditches around all of the three landfill cells and a retention swale which will allow slow infiltration of run-off into the ground. Details of the drainage infrastructure are set out in the Detailed Design Report and the Specifications.

Maintenance of the drainage system will be limited to routine checking that drains are free of blockages and flowing effectively to the swale. The effectiveness of the swale will eventually become reduced by the build-up of suspended solids which are deposited in the lower flow rate environment. The swale can be accessed from the internal access road to allow the operation of heavy equipment to perform the required clean-out. Silty material that is removed can be stockpiled for drying during the summer period and then used to supplement stocks of daily cover material.

The swale is designed to allow through flow of heavy storm run-off and it is recommended that routine site inspections include the off-site area where the storm flow will be directed, to ensure that no significant erosion or vegetation damage is occurring in this area.

5.15 Waste Segregation

Currently there are separate open stockpiles of white goods, scrap metal, electronics, and batteries located around the existing landfill. There do not appear to be any formal arrangements in place for the routine collection and removal of these materials.

The design of the new Cell B landfill includes provision for an adjacent Segregation Area, which comprises hardstanding, open bays for storage of clean, loose recyclable materials and steel shipping containers for safe storage of potentially hazardous materials.

<u>Household Hazardous Wastes</u>

A Community Education Program on HHW should be developed in order to build local resident support for the diversion of potential HHW from the landfill site. These wastes should be labelled, stored and collected separately from general wastes and the Site Manager will require sufficient basic training to enable different materials to be segregated and bulked at the landfill. Residents delivering wastes directly to the landfill should also be advised via suitable signage, re-iterated by site staff, to put batteries and other solid HHW outside the shipping container dedicated to this purpose. This will allow site staff to assess the nature of the HHW and to ensure that is placed in the correct container. Any specified liquid HHW should also be placed into a designated container, from where they can be assessed and segregated by site staff.

Specified HHW should ideally comprise:-

- All batteries – wet batteries should be stored in dedicated totes within the shipping container,
- All full or part full containers of solvents,
- All full or part full containers of motor oils & greases,
- All full or part full containers of brake and hydraulic fluids,
- All full or part full containers of anti-freeze,
- All full or part full containers of paints,
- All full or part full containers of household chemicals,
- Used & unbroken fluorescent tubes and CFL bulbs
- End of life refrigerators and freezers.

The shipping containers should be equipped with pallet-mounted and clearly labelled intermediate bulk containers (IBC's) for bulk storage of known liquid wastes. Separate totes for the accumulation of unknown liquid HHW in their as-delivered receptacles, should also be provided in each shipping container.

Prior to the implementation of segregation and storage of potential HHW, it will be necessary to investigate and set up contractual arrangements for the periodic removal of full shipping containers to suitable re-processors or treatment facilities, possibly at significant distance from Garden River. It will be important for this exercise to be completed well in advance of the setting up of the Segregation Area, so that a clear understanding can be gained of the budgetary provision that will be needed to ensure the future operation of the facility.

End of Life Vehicles

A portable car crusher was brought to the site in 2013, to process all the vehicles that had been delivered in the preceding few years. Two to three full loads of crushed vehicles were removed following this exercise. Further wrecked autos are currently located around the existing landfill and it is recommended that the crushing and removal exercise is repeated once there are sufficient vehicles for the exercise to be viable. On delivery to site, batteries should be removed from vehicles and all fluids drained and stored in suitable containers. These materials should then be stored within the relevant dedicated steel shipping container located within the Segregation Area. De-polluted vehicle bodies should be stored at the periphery of the surfaced area, as far as possible from the nominated burn area.

Scrap Metal

A dedicated Rolonof bin should be provided for the storage of scrap metal. During inspection of delivered loads at the tipping face, any scrap metals should be set aside and delivered to the

scrap bin by the shovel, at the end of each working day. Any value that can be obtained from accumulated scrap can be used to offset the costs of hauling the segregated HHW from the site.

Yard and Food wastes

There are currently no plans to segregate and treat yard and food wastes, by composting or other methods, due to the small volumes generated, the harsh winter conditions and the potential wildlife attraction problems. If future resources permit, this is an option that should be explored further, as a means of potentially excluding materials which are a significant contributor to leachate and landfill gas generation in landfills.

5.16 Controlled Burning

Some waste, including wood waste, is currently burned at the landfill during fall/winter months. There is however a fire ban during summer months.

Given the remote location of the Garden River community and the need to make best use of the new landfill capacity which is to be created, it is recognized that selective ongoing use of controlled burning can be a valid part of a waste management system. A dedicated burn-pit area will be developed adjacent to the Segregation Area, as shown in Drg -01, as far as practically possible from Cell B and will be demarcated by earth berms on three sides. Vegetation will also be cleared back at least 25m from the limits of the burn-pit.

The only materials which will be permitted to be burned at the site will comprise: forestry waste, timber waste, disused furniture made from untreated wood, wooden packaging waste and dry waste cardboard and paper. Paper and cardboard will be temporarily stored in a lidded container near the pit and all other wastes suitable for burning will be accumulated within the pit Plastic wastes will be specifically excluded.

Wind direction will be monitored in advance of any planned, controlled burn and only commenced if dispersion will not be directly towards the community. A tracked or wheeled shovel shall be made available during controlled burns in order to place soils from the enclosing berms onto the wastes, in the event that fire needs to be suppressed. On completion of each controlled burn, ash will be carefully checked to ensure there is no residual heat before it is collected by the shovel and placed into the landfill.

5.17 Signage

Clear and well positioned signage can be a significant contributor to effective site management, especially where members of the community will be delivering wastes to the facility. Signage should have consistent style and colour and should be placed where it is in direct line of sight to visitors to the various parts of the site. Signage should be repaired or replaced promptly if it is damaged and should be kept clean as part of routine site maintenance.

Signage should be used for the following purposes:-

- To remind visitors about the need to segregate HHW,
- To designate individual containers in the Segregation Area for specific waste types,
- To direct traffic safely to the correct part of the site for landfill disposal,
- To remind site users regarding the types of waste which can be burned.

A sign should be erected at the site entrance and be visible regardless of whether gates are open or closed, advising the name of the facility and its operator, the types of waste that are accepted and the details of who to contact in the event of an emergency.

6.0 LANDFILL CLOSURE

6.1 Status of Closure Planning

Current proposals envisage the closure of Cell A during 2015, the completion of the closure of the current landfill site in either 2015 or 2016 and the closure of Cell B in approximately 2026, subject to rates of waste input. Drg Nos. -02 and -03 show the proposed restoration contours for cells A and B, respectively. The provisions set out below apply to any phase of the site which reaches designed capacity and has been subject to installation of capping and restoration soils, albeit the leachate management comments are not relevant to the current landfill post-restoration.

This Closure Plan documents how the landfill site will be maintained following termination of waste receipt, to ensure that environmental control systems that are required will continue to function and the landfill's environmental performance relative to appropriate criteria will continue to be met.

6.2 Final Cover Design and Maintenance

Details of the engineering elements of the proposed final cover are set out in the Detailed Landfill Design Report and the Specifications document.

Following placement of the soil layer it should be seeded in accordance with the Specifications. Immediately after completion of construction the final cover should be inspected on a weekly basis until the vegetative growth is adequately established to limit the potential for soil erosion.

Annual inspections should be completed to assess the condition of the final cover. Visual inspections will include the assessment of the integrity of the final cover with respect to the following:

1. Waste exposure due to soil erosion or action by rodents;
2. Vegetative stress which may be indicative of the presence of LFG; and
3. Presence of leachate seeps.

The appropriate responses to identification of the above problems are as follows:

1. Any areas of the restored landfill surface which are showing evidence of exposure of the capping geomembrane, or risk that this will occur shortly, should be clearly identified and then subject to a programme of soil replacement and reseeding, in accordance with the Specifications. If necessary during dry periods, a small towed water tanker should be made available for watering
2. Patches of dead or dying grass or shrubs, on or around the capped area should be monitored using a portable LFG probe. Where elevated levels of methane (i.e. greater than 2.5% v/v) are identified within the soil, the vents should first be checked for effective operation and if operating correctly then soil will need to be stripped back in the affected area(s) in order to locate and remediate any damage to the cap.

3. Excessive use of daily soil cover or the presence of impermeable waste materials, may give rise to localized leachate ponding which can travel laterally and emerge as seepage zones on the flanks of the restored landfill. In such situations the affected area will need to be stripped of soil, the cap stripped back for a suitable distance below the elevation of the seep, a channel of waste removed and clean gravel placed to encourage leachate to gravity flow past the blockage. The cap will then need to be repaired and the soils replaced and re-seeded.

Where necessary, the design and implementation of such remedial works should be overseen by an APEGA registered professional.

6.3 Landfill Gas Management

The passive gas venting wells cannot be installed until a cap has been placed over the waste materials. The locations of the vents are shown in Drg Nos. -01, -02 and -03 for the existing waste, Cell A and Cell B, respectively. Following installation of the vents, an annual inspection (which can be carried out at the same time as one of the biannual monitoring events) should be carried out to assess the condition of the vents and confirm the vents are undamaged and flow is unimpeded.

Any differential settlement in the vicinity of the vents should be corrected by the addition of further soils, to remove any potential for localised ponding of rainfall or snow melt. Care should be taken to avoid any risk of damage to the gas vents by the use of heavy equipment.

6.4 Leachate Management

The wastes may continue to generate modest volumes of leachate in the post-closure period and these will need to be monitored on a monthly basis in the first year after closure to establish the pattern of leachate generation. The method of monitoring leachate depth in the sumps will continue to be as set out in Section 5.13, above and a maximum depth of 2m of leachate in the sump should be maintained in the post-closure period. Subject to confirmation that no significant leachate volumes are being generated, monitoring can revert to a 6 monthly basis after the first year post-closure.

During the operation of Cell B, it will be possible for the Site Manager to oversee the process of arranging removal of excess leachate from Cells A or B. However, if landfill operations do not continue in the locality after completion of Cell B, then it will be necessary to make arrangements for whoever is carrying out the routine monitoring of leachate depths in the sumps, to be able to instigate removal of any excess leachate after that time.

There are not anticipated to be any significant changes in the nature of the leachate over the post closure period, other than a slow decline in some of the chemical parameters. There is therefore no reason to anticipate any need to change the type of treatment facility to which any excess leachate will need to be tankered.

After the first years' post-closure operation, the monitoring of leachate elevation in the sump should give a good indication of the likely total volume that can be extracted. Over the passage of time bio-fouling can lead to restrictions in the effectiveness of the leachate drainage system. If the volume of leachate removed for a given leachate head starts to reduce, this is an indication that there may be blockage in the system. As and when this effect becomes

significant, the Site Manager should employ the services of a specialist contractor who can provide a vacuum tanker truck with flexible flushing pipework to clean out any bio-fouling from the main diagonal leachate drainage pipe using the access points that have been provided in the design. While this process does not remove biofouling in the drainage blanket or the peripheral pipework it will return the primary conduit to effective functionality.

6.5 Surface Water Management

During the placement of final cover, surface water run-off will be controlled to minimize sediment deposition in the surface watercourses and swale. Final cover construction will be during the summer months to provide adequate time for a vegetative cover to be established prior to the winter season. Closure contracts should include provisions for irrigation and fertilization to promote root growth and reduce the potential for erosion.

Once vegetation is established on the restoration soils, maintenance of the surface water system will be limited to annual checking that drainage ditches are clear and free-flowing and that infiltration is still occurring from the swale. Any accumulation of eroded soils or debris should be carefully removed, to avoid damaging the ditch lining. Where woody vegetation is starting to develop in the ditches or the swale this should also be carefully removed.

6.6 Post-closure Environmental Monitoring

Notwithstanding the potential for development of future landfill cells at the site, monitoring will continue for a period of 25 years following the closure of the site, in accordance with the Post-construction Monitoring Plan. Subject to the stability of results and demonstration that no parameters are showing an upward trend in concentrations, it may be appropriate to reduce the range of parameters which are analysed in the post-closure period.

6.7 Cost Estimates

The costs of closure of Cell A and excavating the old dump have been estimated in support of the planned implementation of this work in 2015/16. Class A estimates for these two activities (at Oct 2014) have been provided under separate cover. These figures included Contractor mobilization and de-mobilization, health & safety, bonding, construction management, third party oversight and a 15% estimating contingency. The cost estimates for construction of Cell B and the capping of the existing landfill site have also been provided under separate cover. Planned implementation dates are still to be determined based on when funding becomes available.

The closure of Cell B is not intended to take place until at least 10 years after the commencement of operations in that cell. The design specification for the closure of Cell B will need to be reviewed in good time ahead of the actual anticipated completion date and a budget cost estimate developed for the closure works, based upon any design revisions and cost rates relevant at that time.

6.8 End Use

The future use of the Site will be restricted to a low-impact agricultural use such as grazing, or a passive use, such as wildlife habitat area or community green space.

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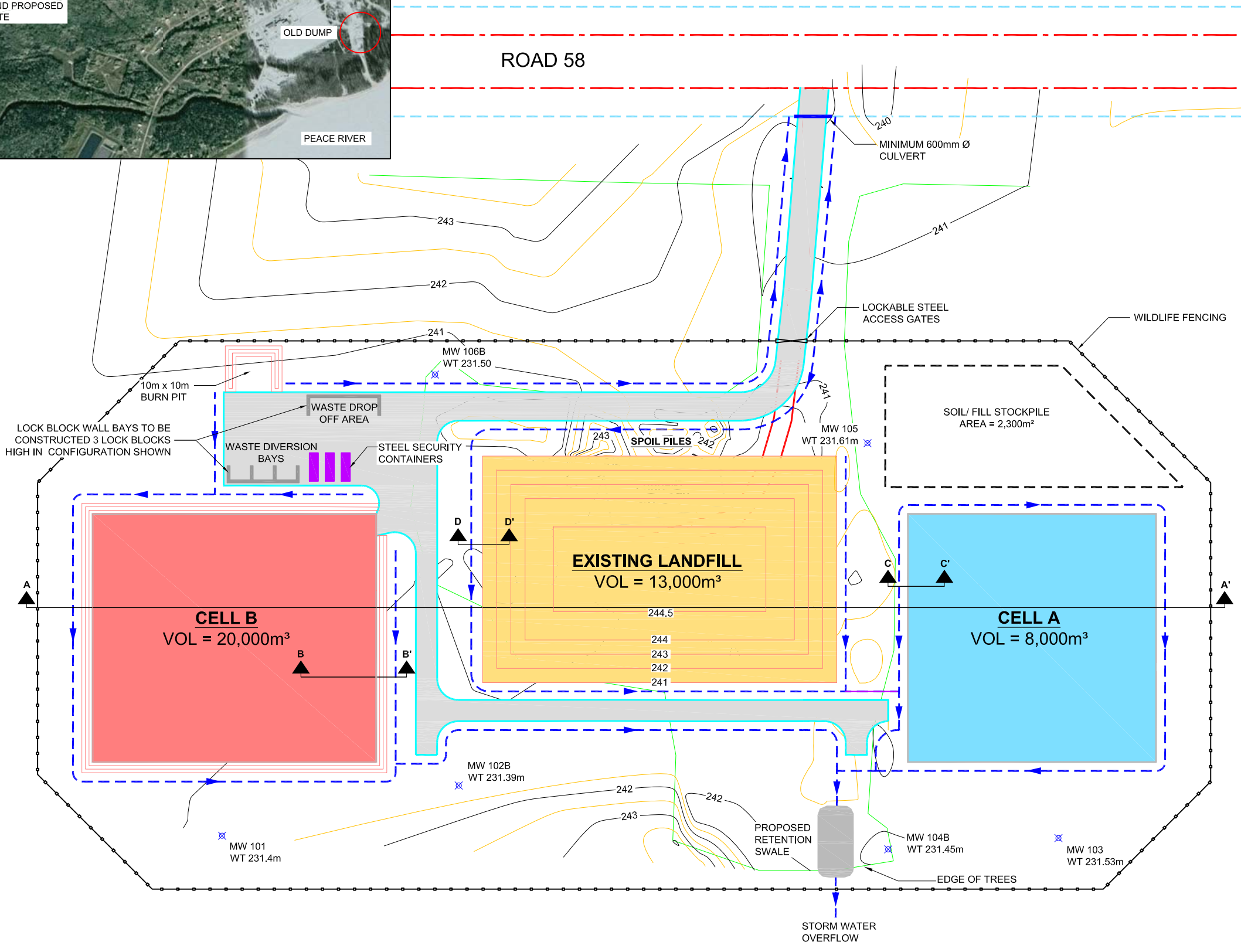

NOTES

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2. ALL ELEVATIONS, DIMENSIONS AND SETTING OUT CO-ORDINATES TO BE VERIFIED IN THE FIELD PRIOR TO CONSTRUCTION.

SCALE 1:1,250
WHEN PLOTTED ON A 11" x 17" SHEET
0 25 50 75m

LEGEND

- EXISTING 1m CONTOUR JUNE 2014
- EXISTING 0.5m CONTOUR JUNE 2014
- EXISTING SITE ROAD
- PROPOSED SITE ROAD
- MW 105 WT 231.61 — EXISTING MONITORING WELLS INSTALLED BY SLR WATER TABLE LEVELS OBSERVED ON MAY 21 2014
- EXISTING TREE/BUSHLINE
- EXISTING DITCHING
- PROPOSED DITCHING
- PROPOSED CULVERT
- PROPOSED WILDLIFE FENCING

Revision	By	Chk'd By	Date	Comments
E	AJC	BA	28/04/15	BURN PIT & STEEL SECURITY CONTAINERS ADDED
D	AJC	BA	17/02/15	FINAL
C	AJC	BA	26/01/15	CLIENT REVIEW
B	AJC	BA	29/09/14	CLIENT REVIEW
A	AJC	MS	26/09/14	INTERNAL REVIEW

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Site: GARDEN RIVER

Project: CONTAMINATED SITE REMEDIATION PROJECT

Drawing Title: PROPOSED SITE LAYOUT

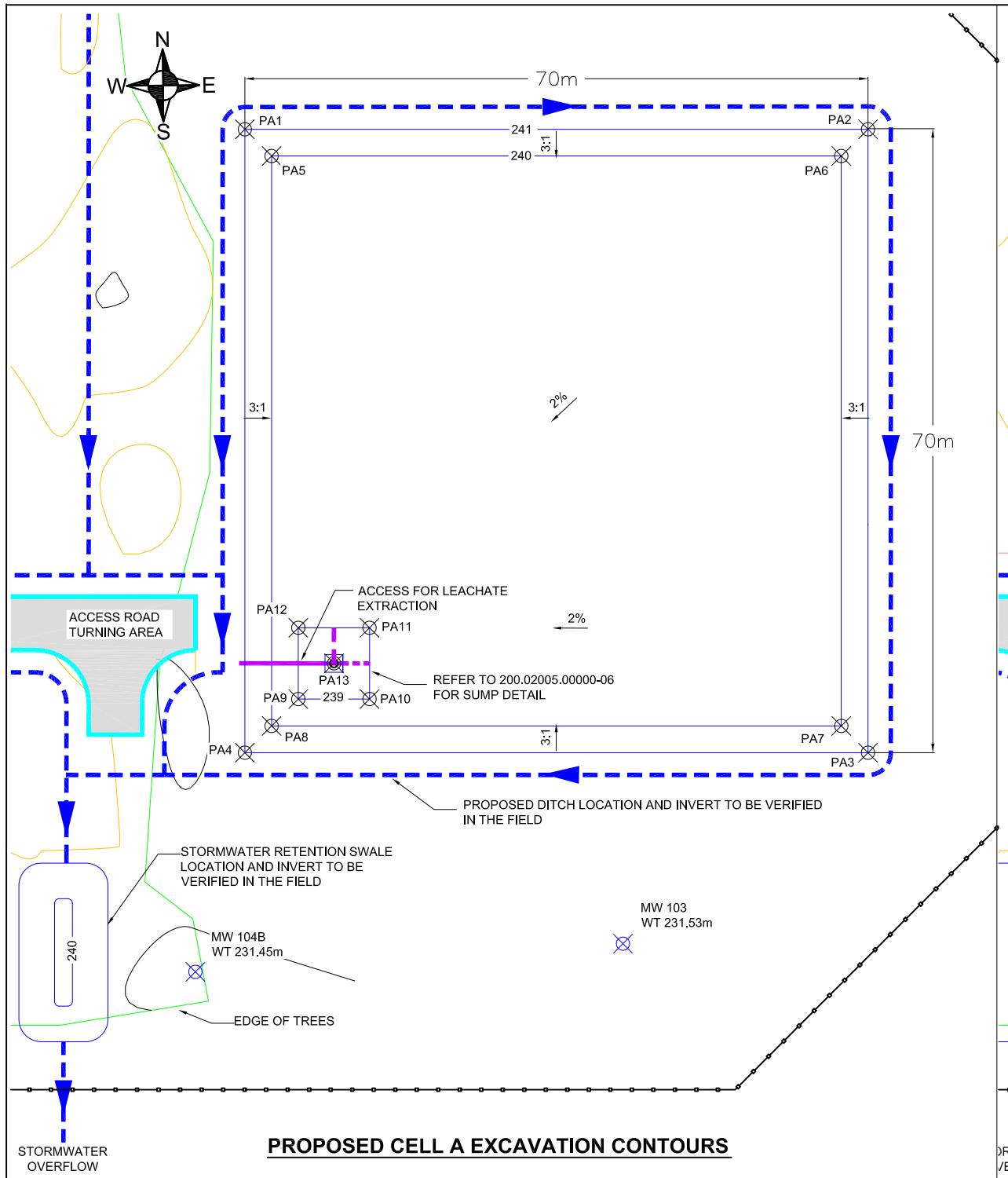
Scale: AS SHOWN

Date: JULY 30th, 2014

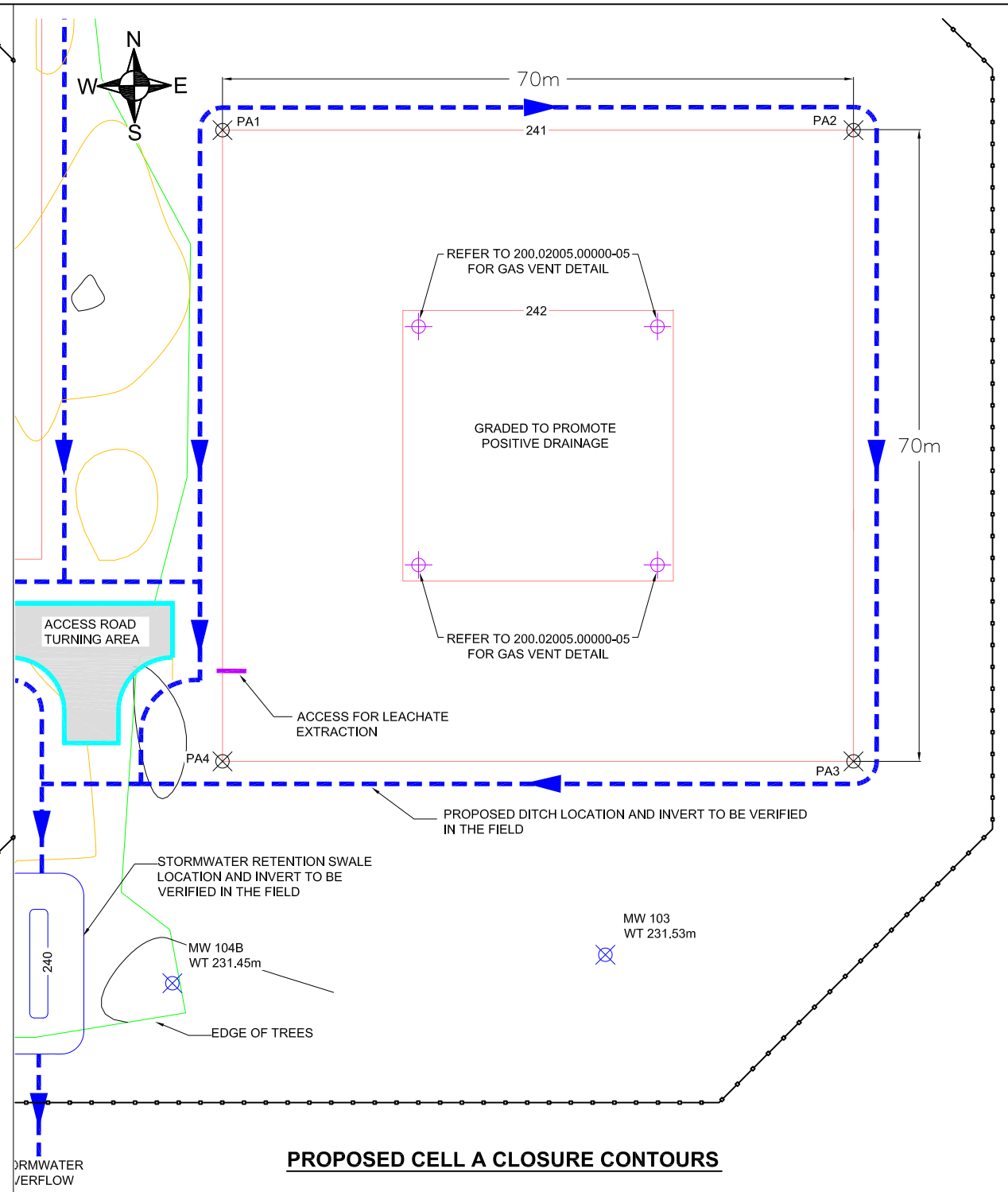
Drawing Number: 200.02005.00000-01

Rev: E

FINAL



PROPOSED CELL A EXCAVATION CONTOURS



PROPOSED CELL A CLOSURE CONTOURS

Cell A Setting Out Points			
Point	Easting (X)	Northing (Y)	Elevation (Z)
PA1	331,915	6,511,657	241.0
PA2	331,985	6,511,657	241.2
PA3	331,985	6,511,587	241.0
PA4	331,915	6,511,587	240.7
PA5	331,918	6,511,654	240.0
PA6	331,982	6,511,654	240.0
PA7	331,982	6,511,590	240.0
PA8	331,918	6,511,590	240.0
PA9	331,921	6,511,593	239.0
PA10	331,929	6,511,593	239.0
PA11	331,929	6,511,601	239.0
PA12	331,921	6,511,601	239.0
PA13	331,925	6,511,597	238.0

NOTES

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3. FINAL CONTOURS TO BE VERIFIED IN THE FIELD. CONTOURS SHALL BE GRADED TO PROMOTE POSITIVE DRAINAGE AND SHALL BE A MINIMUM OF 5% TO A MAXIMUM OF 30%.

SCALE 1:1,000

WHEN PLOTTED ON A 11" x 17" SHEET

0 20 40 60m

LEGEND

- EXISTING 1m CONTOUR JUNE 2014
- EXISTING 0.5m CONTOUR JUNE 2014
- EXISTING SITE ROAD
- PROPOSED SITE ROAD
- MW 105 / WT 231.61 — EXISTING MONITORING WELLS INSTALLED BY SLR WATER TABLE LEVELS OBSERVED ON MAY 21 2014
- EXISTING TREE/BUSHLINE
- EXISTING WASTE PIT
- PROPOSED 1m CONTOURS BELOW GRADE
- PROPOSED 1m CONTOURS ABOVE GRADE
- EXISTING DITCHING
- PROPOSED DITCHING
- PROPOSED CULVERT
- PROPOSED SOLID LEACHATE PIPE
- PROPOSED PERFORATED LEACHATE PIPE
- PROPOSED WILDLIFE FENCING
- GAS VENT

Revision	By	Chk'd By	Date	Comments
A	AJC	BA	16/02/15	FINAL ISSUE

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Site: GARDEN RIVER

Project: CONTAMINATED SITE REMEDIATION PROJECT

Drawing Title: PROPOSED CELL A

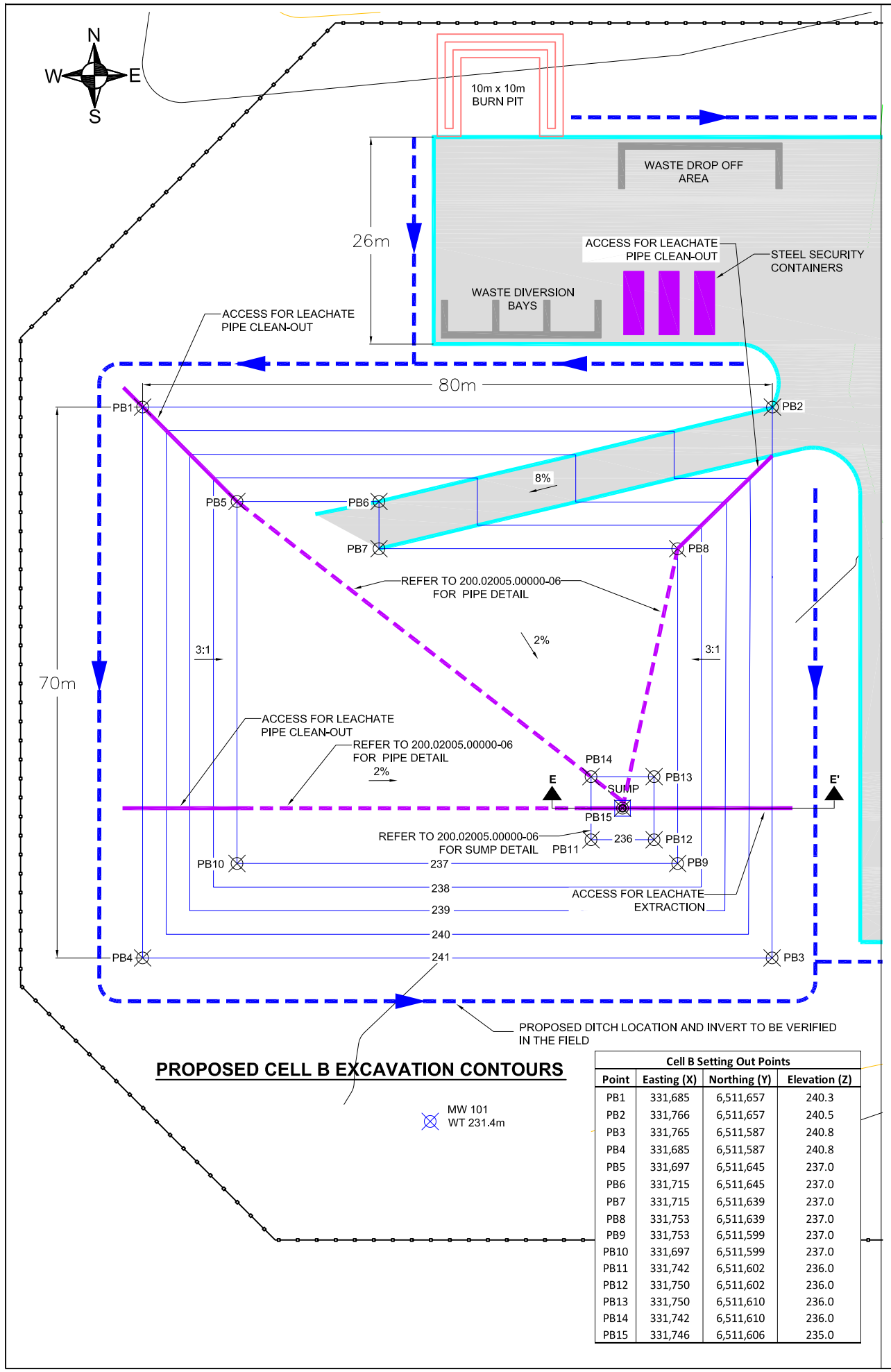
Scale: AS SHOWN

Date: FEBRUARY 11th, 2015

Drawing Number: 200.02005.00000-02

Rev: A

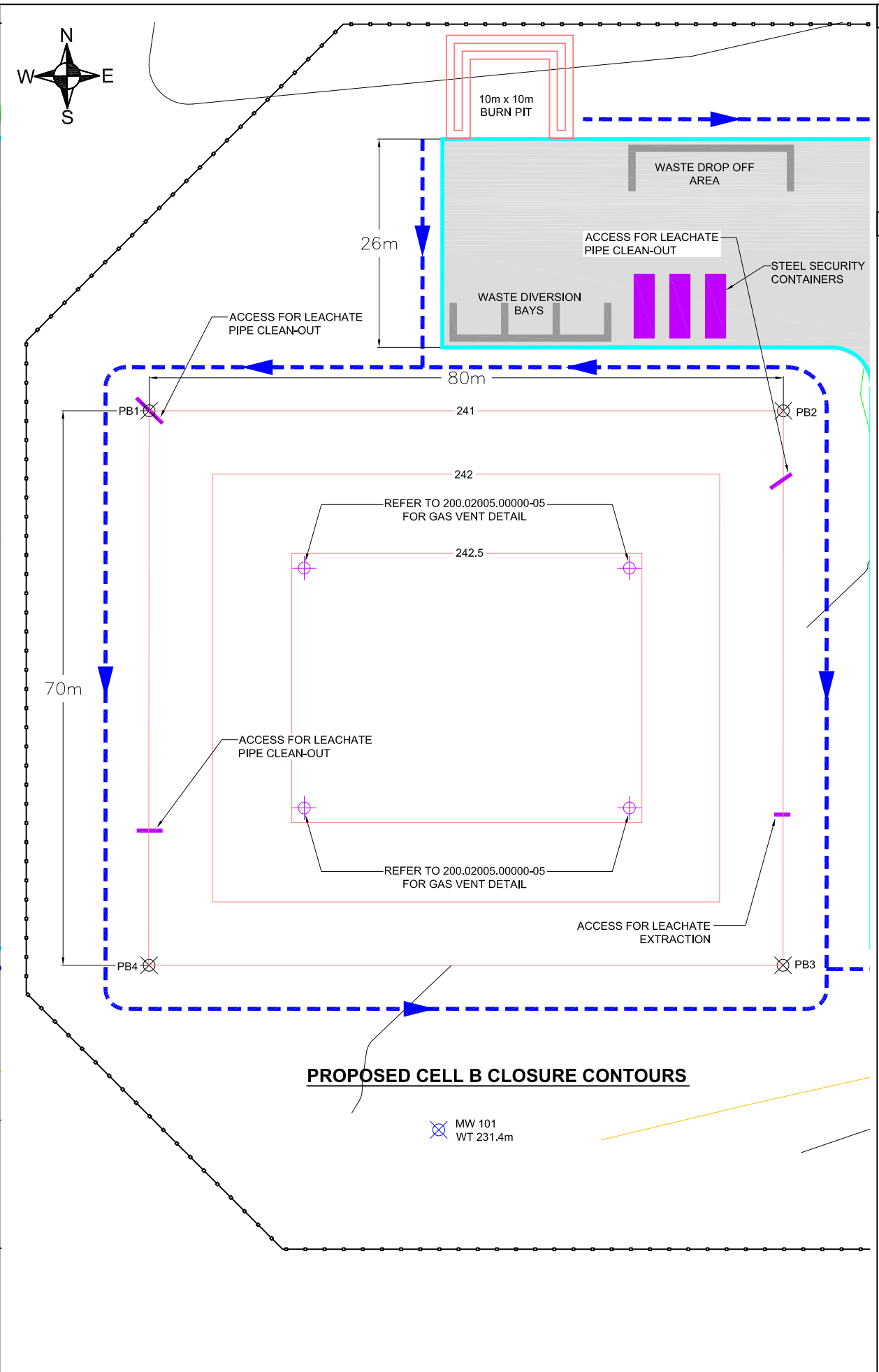
FINAL



PROPOSED CELL B EXCAVATION CONTOURS

Cell B Setting Out Points

Point	Easting (X)	Northing (Y)	Elevation (Z)
PB1	331,685	6,511,657	240.3
PB2	331,766	6,511,657	240.5
PB3	331,765	6,511,587	240.8
PB4	331,685	6,511,587	240.8
PB5	331,697	6,511,645	237.0
PB6	331,715	6,511,645	237.0
PB7	331,715	6,511,639	237.0
PB8	331,753	6,511,639	237.0
PB9	331,753	6,511,599	237.0
PB10	331,697	6,511,599	237.0
PB11	331,742	6,511,602	236.0
PB12	331,750	6,511,602	236.0
PB13	331,750	6,511,610	236.0
PB14	331,742	6,511,610	236.0
PB15	331,746	6,511,606	235.0



PROPOSED CELL B CLOSURE CONTOURS

NOTES

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3. FINAL CONTOURS TO BE VERIFIED IN THE FIELD. CONTOURS SHALL BE GRADED TO PROMOTE POSITIVE DRAINAGE AND SHALL BE A MINIMUM OF 5% TO A MAXIMUM OF 30%.

SCALE 1:1,000

WHEN PLOTTED ON A 11" x 17" SHEET

0 20 40 60m

LEGEND

- EXISTING 1m CONTOUR JUNE 2014
- EXISTING 0.5m CONTOUR JUNE 2014
- EXISTING SITE ROAD
- PROPOSED SITE ROAD
- MW 105 WT 231.61 — EXISTING MONITORING WELLS INSTALLED BY SLR WATER TABLE LEVELS OBSERVED ON MAY 21 2014
- EXISTING TREE/BUSHLINE
- EXISTING WASTE PIT
- PROPOSED 1m CONTOURS BELOW GRADE
- PROPOSED 1m CONTOURS ABOVE GRADE
- EXISTING DITCHING
- PROPOSED DITCHING
- PROPOSED CULVERT
- PROPOSED SOLID LEACHATE PIPE
- PROPOSED PERFORATED LEACHATE PIPE
- PROPOSED WILDLIFE FENCING
- GAS VENT

Revision	By	Chk'd By	Date	Comments
B	AJC	BA	28/04/15	BURN PIT & STEEL SECURITY CONTAINERS ADDED
A	AJC	BA	16/02/15	FINAL ISSUE

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Site: GARDEN RIVER

Project: CONTAMINATED SITE REMEDIATION PROJECT

Drawing Title: PROPOSED CELL B

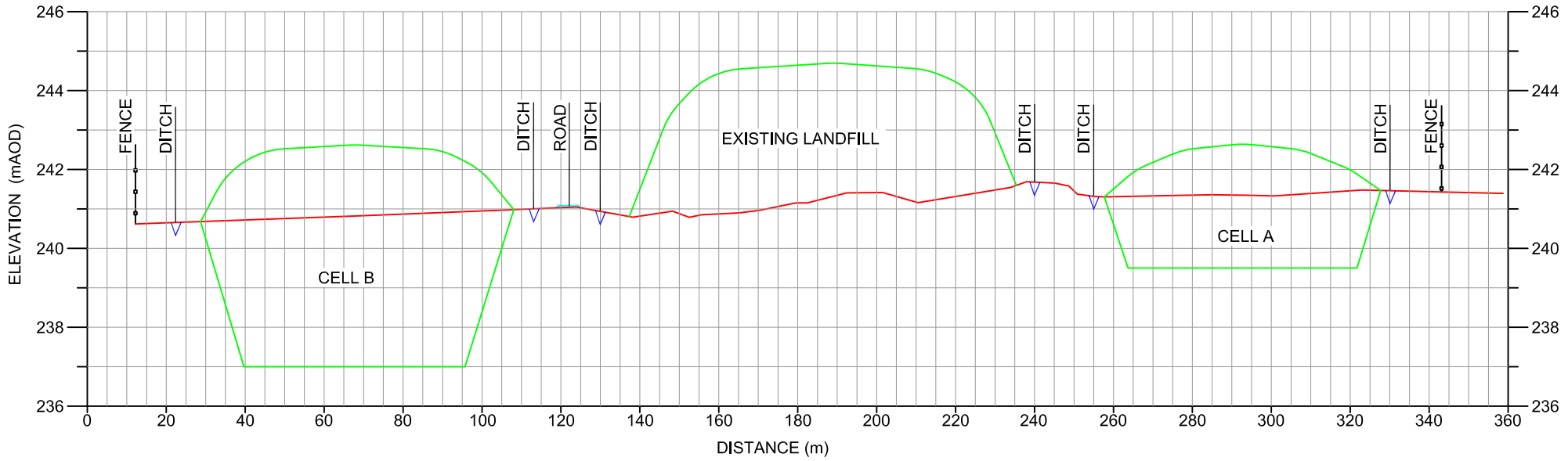
Scale: AS SHOWN

Date: FEBRUARY 11th, 2015

Drawing Number: 200.02005.00000-03

Rev: B

FINAL



Section A - A'
Scale: Hor 1:1,500 Ver 1:150
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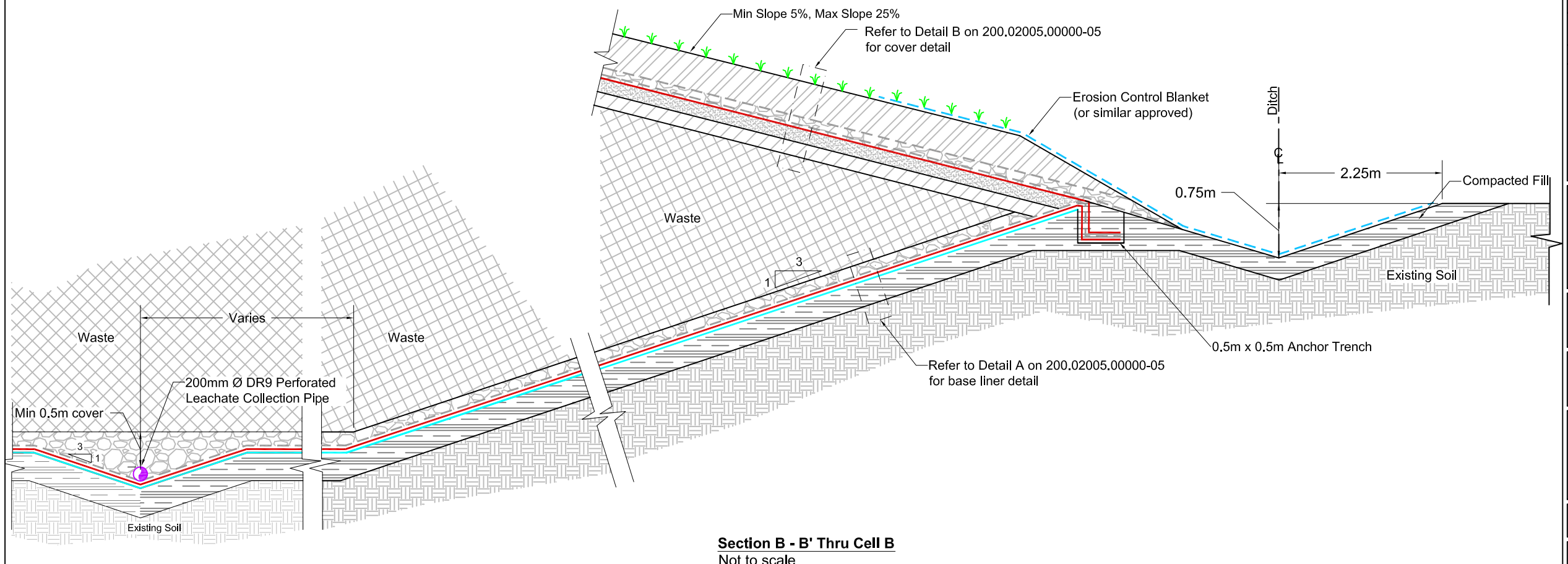

Section B - B' Thru Cell B
Not to scale

NOTES

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4. CONSTRUCT ALL SURFACE WATER SWALES TO DIMENSIONS SHOWN ON THIS DRAWING.

LEGEND

- EXISTING GROUND LEVEL
- PROPOSED CELL
- PROPOSED DITCH
- PROPOSED ROAD
- PROPOSED WILDLIFE FENCE

Revision	By	Chk'd By	Date	Comments
C	AJC	BA	17/02/15	FINAL
B	AJC	BA	29/09/14	CLIENT REVIEW
A	AJC	MS	06/08/14	INTERNAL REVIEW

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Site:
GARDEN RIVER

Project:
CONTAMINATED SITE REMEDIATION PROJECT

Drawing Title:
SECTION A - A' THRU SITE,
SECTION B - B' THRU CELL B

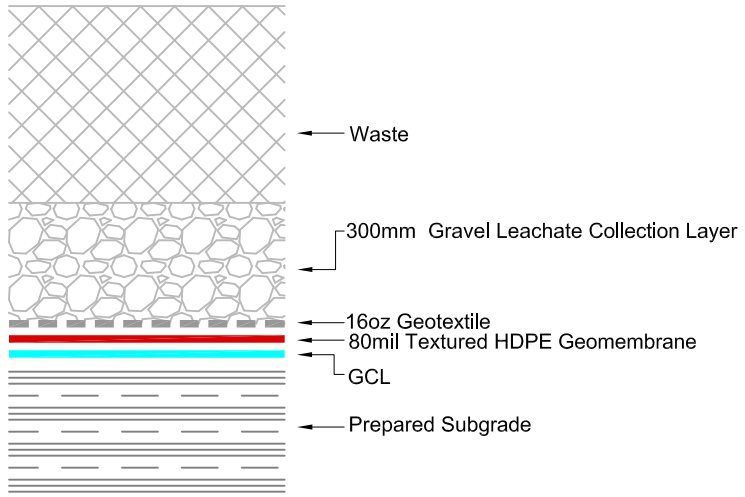
Scale: AS SHOWN

Date: SEPTEMBER 25th, 2014

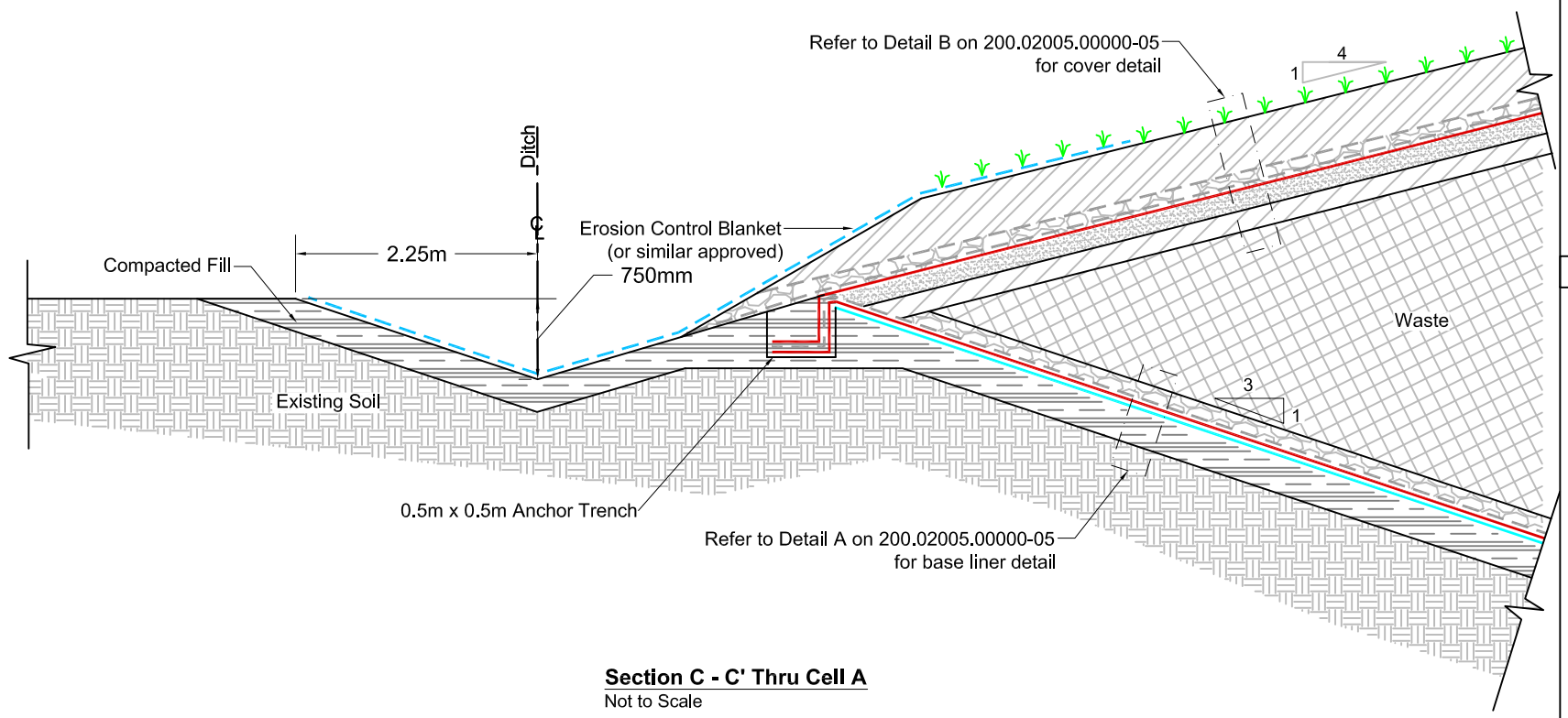
Drawing Number: 200.02005.00000-04

Rev: C

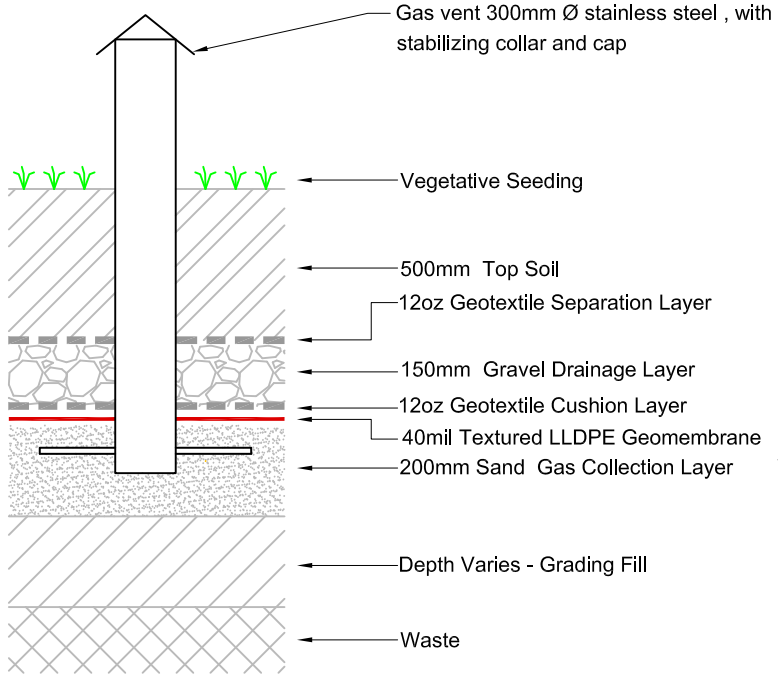
FINAL



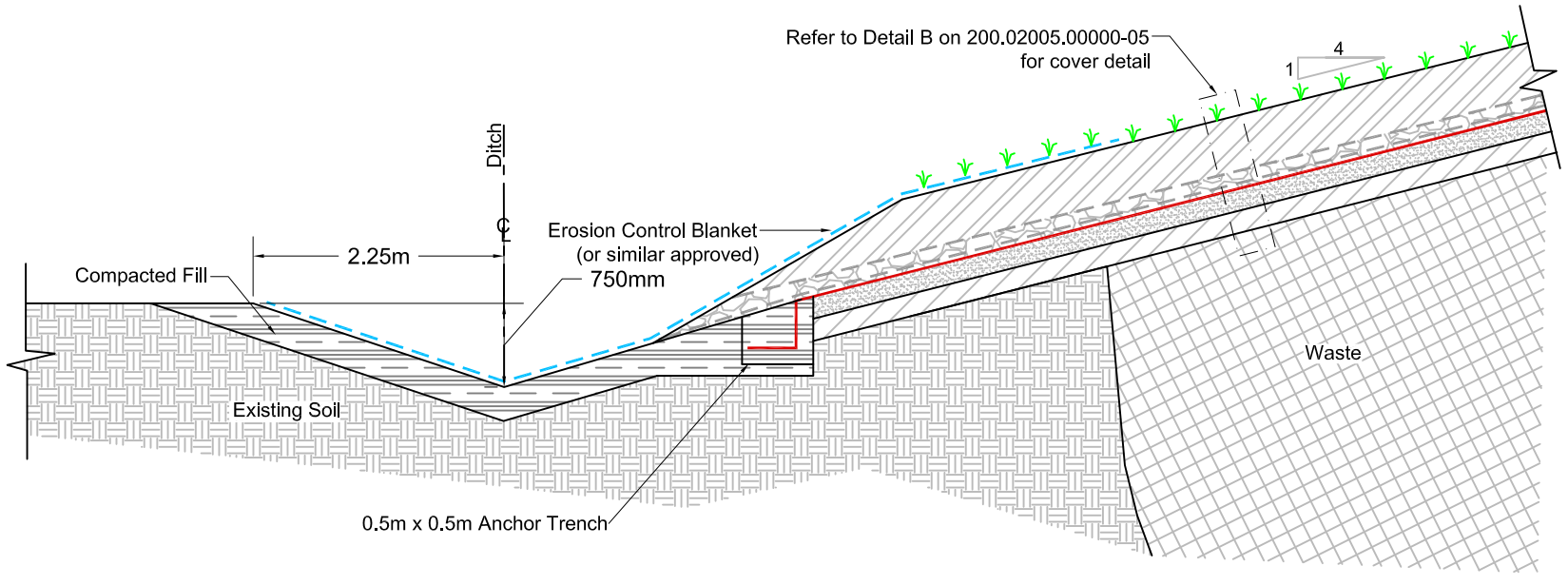
Detail A - Typical Base Liner Section
Not to Scale



Section C - C' Thru Cell A
Not to Scale



Detail B - Typical Final Cover Section
Not to Scale



Section D - D' Thru Proposed Cap over Existing Landfill
Not to Scale

NOTES

1. READ ALL DRAWINGS TOGETHER WITH ACCOMPANYING SPECIFICATIONS.
2. ALL ELEVATIONS, DIMENSIONS AND SETTING OUT CO-ORDINATES TO BE VERIFIED IN THE FIELD PRIOR TO CONSTRUCTION.
3. FINAL CONTOURS TO BE VERIFIED IN THE FIELD. CONTOURS SHALL BE GRADED TO PROMOTE POSITIVE DRAINAGE AND SHALL BE A MINIMUM OF 5% TO A MAXIMUM OF 30%.
4. CONSTRUCT ALL SURFACE WATER SWALES TO DIMENSIONS SHOWN ON THIS DRAWING.

LEGEND

Revision	By	Chk'd By	Date	Comments
C	AJC	BA	17/02/15	FINAL
B	AJC	BA	29/09/14	CLIENT REVIEW
A	AJC	MS	26/09/14	INTERNAL REVIEW

Parks Canada Parcs Canada

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Site: GARDEN RIVER

Project: CONTAMINATED SITE REMEDIATION PROJECT

Drawing Title: SECTIONS & TYPICAL DETAILS

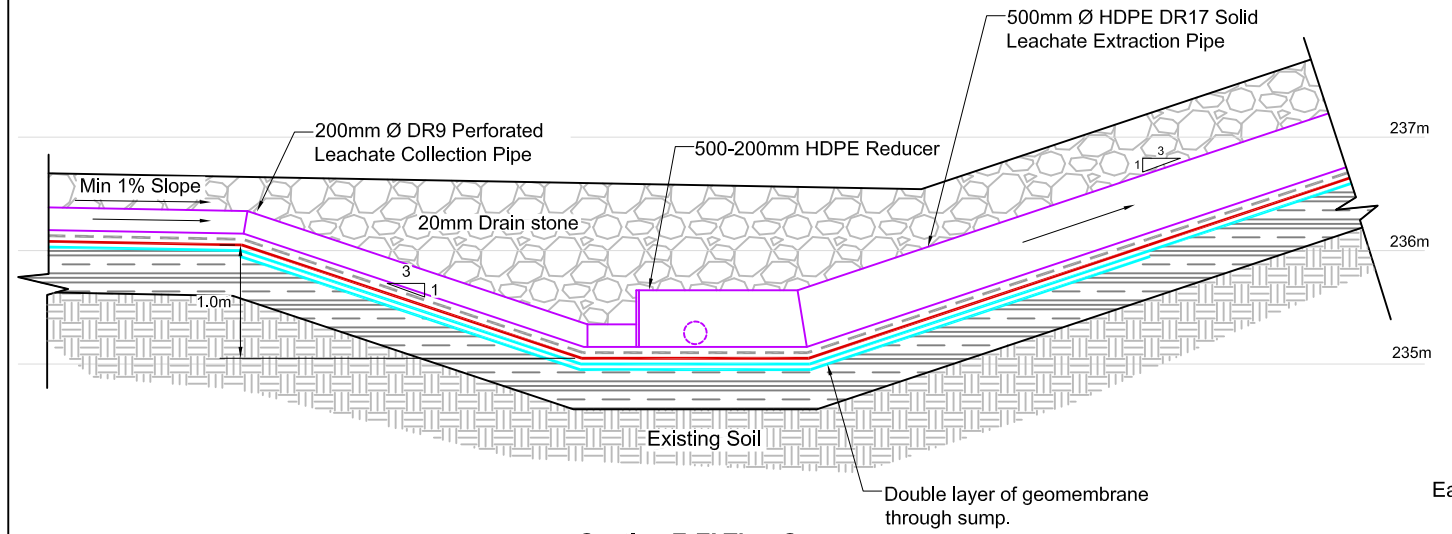
Scale: NOT TO SCALE

Date: SEPTEMBER 25th, 2014

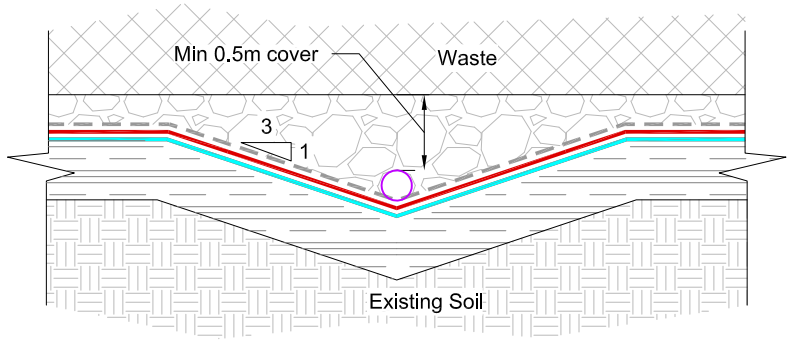
Drawing Number: 200.02005.00000-05

Rev: C

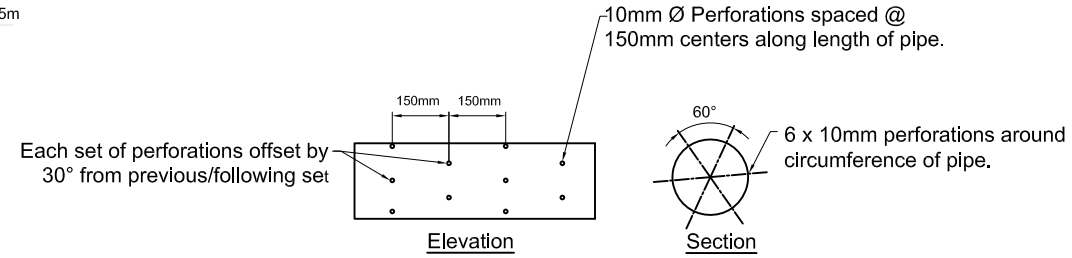
FINAL



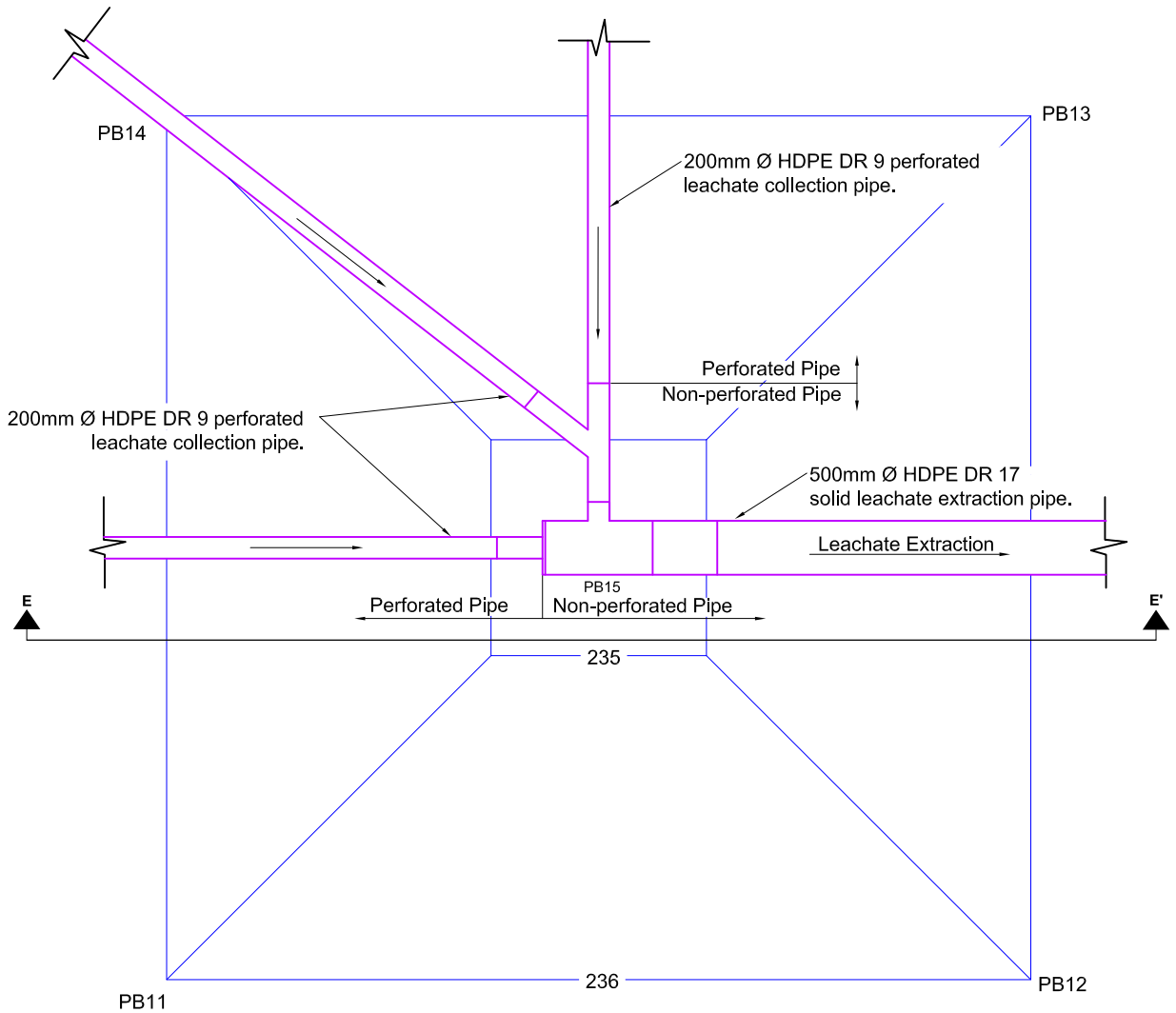
Section E-E' Thru Sump Cell B
Not to scale



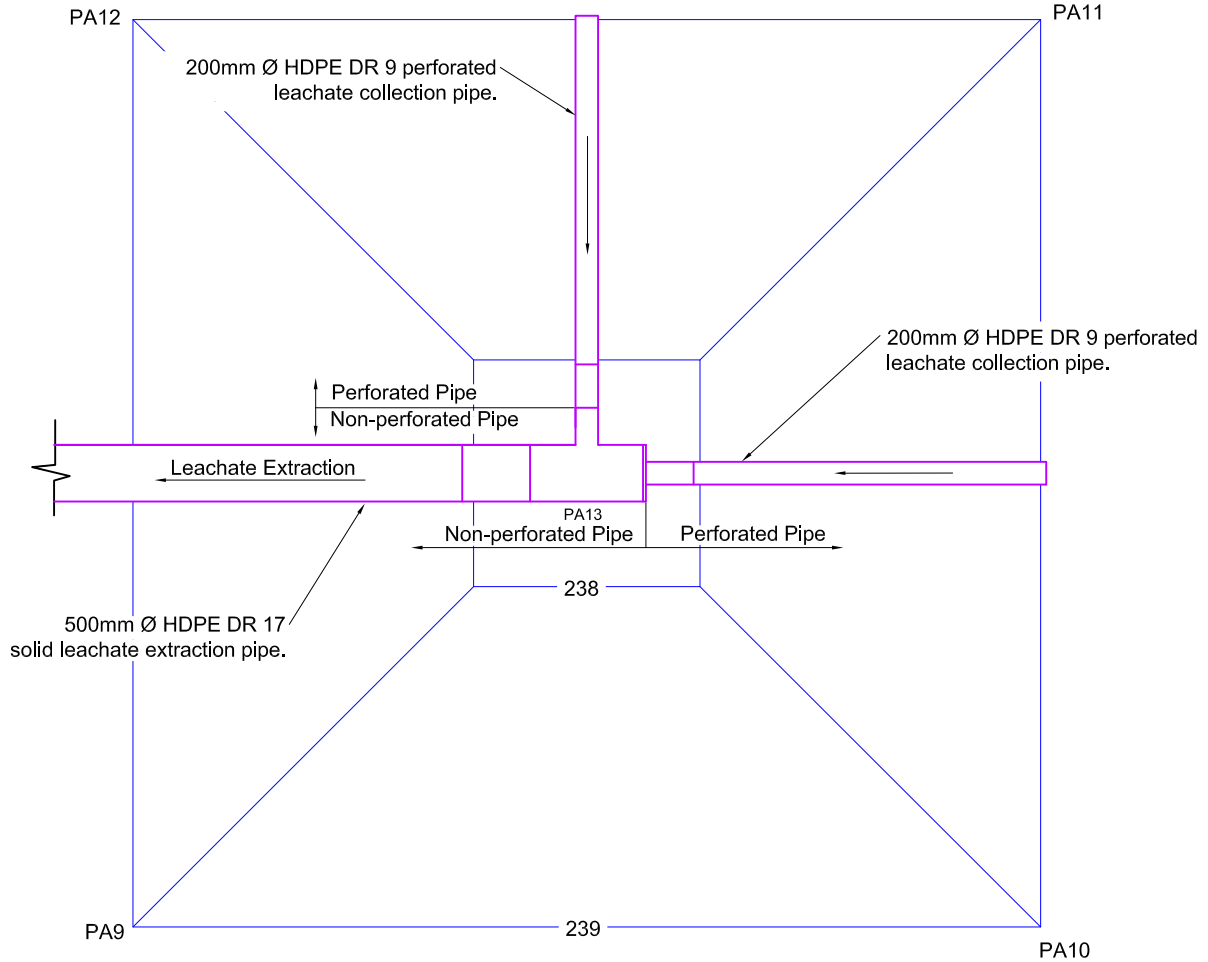
Typical Section Thru Leachate Collection Trench Cell B
Not to scale



Detail C Perforated Pipe Detail
Not to scale



Plan of Sump Cell B
Not to scale



Plan of Sump Cell A
Not to scale

NOTES

LEGEND

Revision	By	Chk'd By	Date	Comments
A	AJC	BA	17/02/15	FINAL

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Site: GARDEN RIVER

Project: CONTAMINATED SITE REMEDIATION PROJECT

Drawing Title: DETAILS

Scale: NOT TO SCALE

Date: FEBRUARY 3rd, 2015

Drawing Number: 200.02005.00000-06

Rev: A

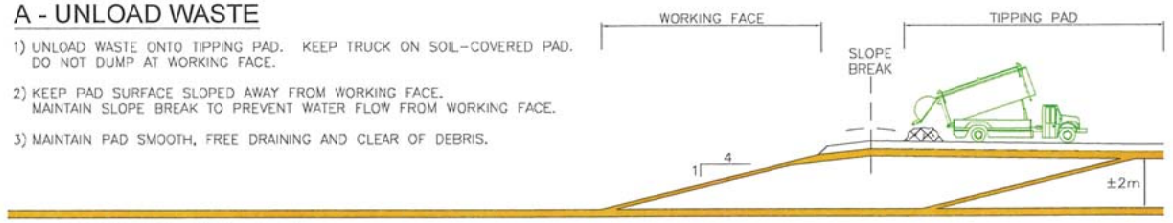
FINAL

A - UNLOAD WASTE

1) UNLOAD WASTE ONTO TIPPING PAD. KEEP TRUCK ON SOIL-COVERED PAD. DO NOT DUMP AT WORKING FACE.

2) KEEP PAD SURFACE SLOPED AWAY FROM WORKING FACE. MAINTAIN SLOPE BREAK TO PREVENT WATER FLOW FROM WORKING FACE.

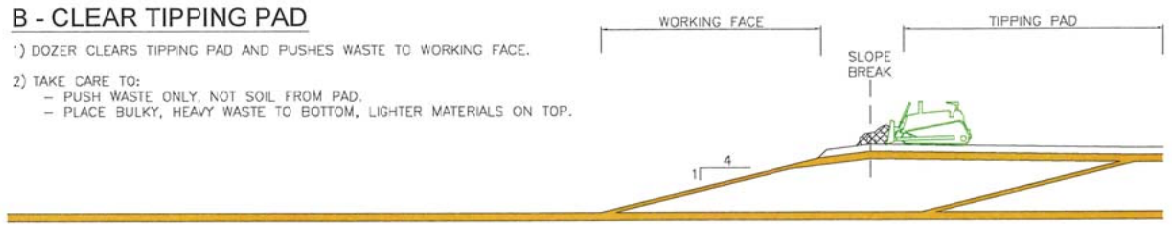
3) MAINTAIN PAD SMOOTH, FREE DRAINING AND CLEAR OF DEBRIS.



B - CLEAR TIPPING PAD

1) DOZER CLEARS TIPPING PAD AND PUSHES WASTE TO WORKING FACE.

2) TAKE CARE TO:
- PUSH WASTE ONLY, NOT SOIL FROM PAD.
- PLACE BULKY, HEAVY WASTE TO BOTTOM, LIGHTER MATERIALS ON TOP.

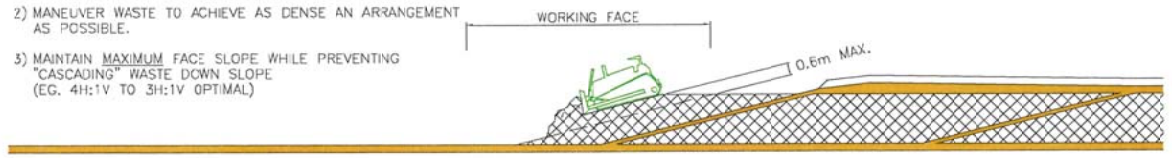


C - SPREAD WASTE ON WORKING FACE

1) SPREAD WASTE IN LIFTS 0.3 – 0.6m THICK MAXIMUM.

2) MANEUVER WASTE TO ACHIEVE AS DENSE AN ARRANGEMENT AS POSSIBLE.

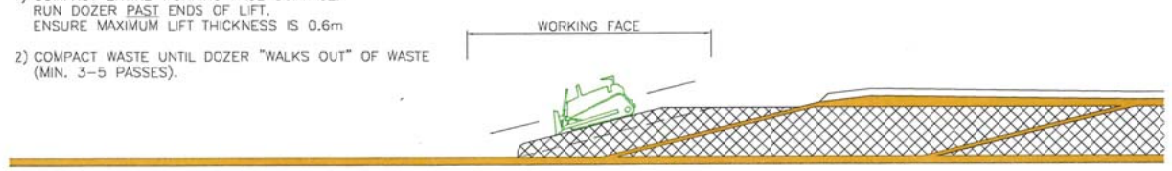
3) MAINTAIN MAXIMUM FACE SLOPE WHILE PREVENTING "CASCADING" WASTE DOWN SLOPE (EG. 4H:1V TO 3H:1V OPTIMAL)



D - COMPACT WASTE

1) COMPACT ENTIRE WORKING FACE SURFACE. RUN DOZER PAST ENDS OF LIFT. ENSURE MAXIMUM LIFT THICKNESS IS 0.6m

2) COMPACT WASTE UNTIL DOZER "WALKS OUT" OF WASTE (MIN. 3-5 PASSES).

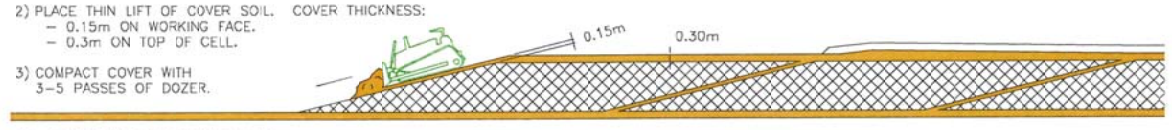


E - PLACE DAILY COVER

1) AT END OF DAY'S OPERATIONS:
- TRIM & RE-COMPACT WORKING FACE SURFACE.
- MAINTAIN SMALL STOCKPILE OF WASTE TO INFILL SURFACE VOIDS.

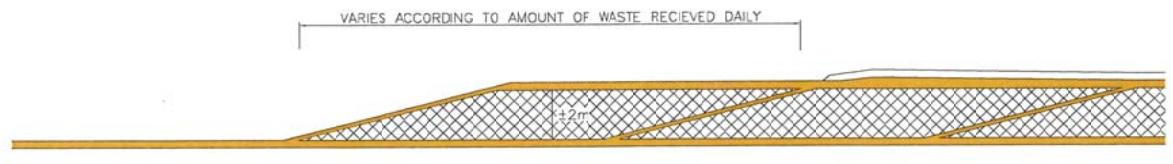
2) PLACE THIN LIFT OF COVER SOIL. COVER THICKNESS:
- 0.15m ON WORKING FACE.
- 0.3m ON TOP OF CELL.

3) COMPACT COVER WITH 3-5 PASSES OF DOZER.



F - COMPLETED CELL

1) COMPLETED & COVERED CELL, RESULT OF ONE DAY OF OPERATION.

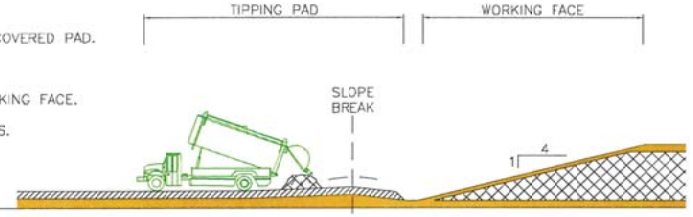


A - UNLOAD WASTE

1) UNLOAD WASTE ONTO TIPPING PAD. KEEP TRUCK ON SOIL-COVERED PAD. DO NOT DUMP AT WORKING FACE.

2) KEEP PAD SURFACE SLOPED AWAY FROM WORKING FACE. MAINTAIN SLOPE BREAK TO PREVENT WATER FLOW FROM WORKING FACE.

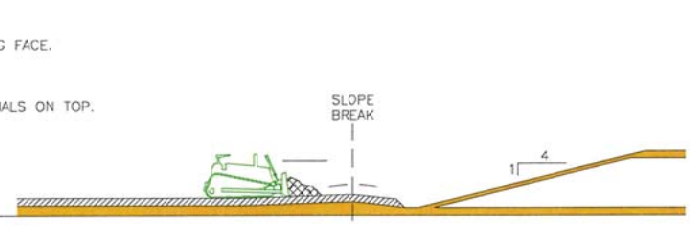
3) MAINTAIN PAD SMOOTH, FREE DRAINING AND CLEAR OF DEERIS.



B - CLEAR TIPPING PAD

1) DOZER CLEARS TIPPING PAD AND PUSHES WASTE TO WORKING FACE.

2) TAKE CARE TO:
- PUSH WASTE ONLY, NOT SOIL FROM PAD.
- PLACE BULKY, HEAVY WASTE TO BOTTOM, LIGHTER MATERIALS ON TOP.

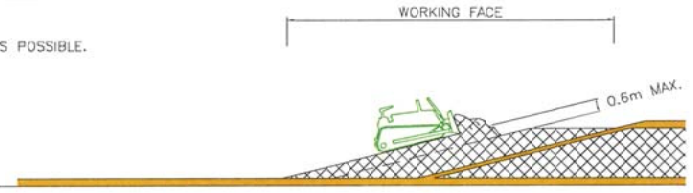


C - SPREAD WASTE ON WORKING FACE

1) SPREAD WASTE IN LIFTS 0.3 – 0.6m THICK MAXIMUM.

2) MANEUVER WASTE TO ACHIEVE AS DENSE AN ARRANGEMENT AS POSSIBLE.

3) MAINTAIN WORKING FACE SLOPE BETWEEN 4H:1V TO 3H:1V.



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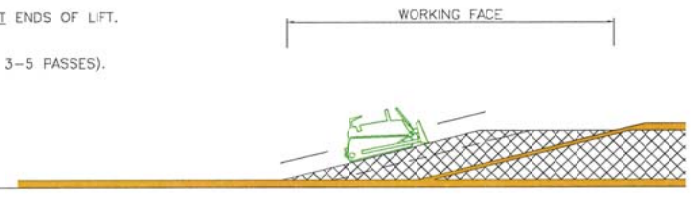
2) COMPACT WASTE UNTIL DOZER "WALKS OUT" OF WASTE (MIN. 3-5 PASSES).

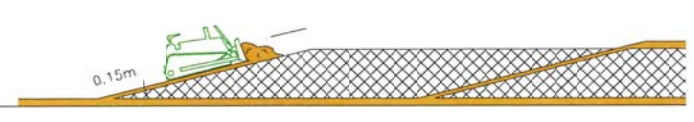


E - PLACE DAILY COVER

1) AT END OF DAY'S OPERATIONS
- TRIM & RECOMPACT WORKING FACE SURFACE.
- MAINTAIN SMALL STOCKPILE OF WASTE TO INFILL SURFACE VOIDS.

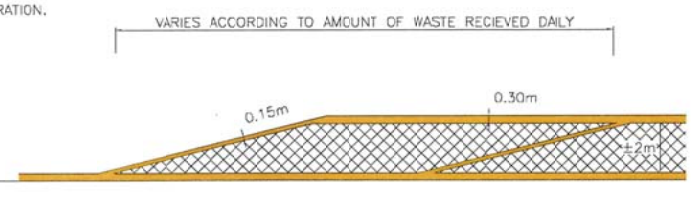
2) PLACE THIN LIFT OF COVER SOIL. COVER THICKNESS:
- 0.15m ON WORKING FACE.
- 0.3m ON TOP OF CELL.

3) COMPACT COVER WITH 3-5 PASSEES OF DOZER.



F - COMPLETED CELL

1) COMPLETED & COVERED CELL, RESULT OF ONE DAY OF OPERATION.



NOTES

1. EITHER OF THE METHODS OF WASTE PLACEMENT INDICATED IN THIS DRAWING ARE CONSIDERED SUITABLE FOR ACHIEVING EFFECTIVE WASTE COMPACTION.

LEGEND

A	AJC	BA	17/02/15	FINAL
Revision	By	Chk'd By	Date	Comments

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Site: GARDEN RIVER

Project: CONTAMINATED SITE REMEDIATION PROJECT

Drawing Title: PUSH UP AND PUSH DOWN SCHEMATIC

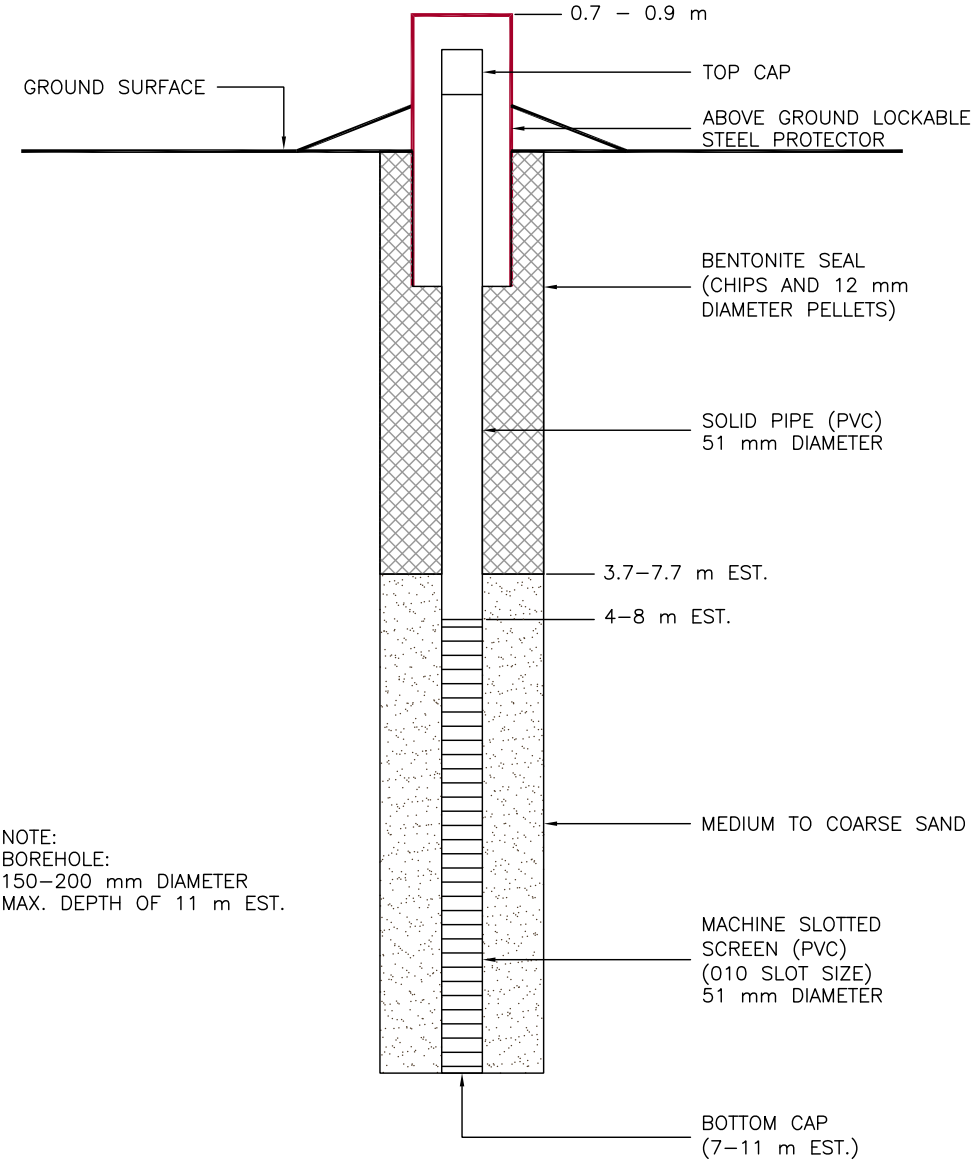
Scale: NOT TO SCALE

Date: FEBRUARY 12th, 2015

Drawing Number: 200.02005.00000-07

Rev: A

FINAL



NOTE:
BOREHOLE:
150–200 mm DIAMETER
MAX. DEPTH OF 11 m EST.

NOTES

FOR CONCEPTUAL PURPOSES ONLY COMPLETION DETAILS TO BE CONFIRMED DURING BOREHOLE DRILLING PROGRAM.

THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.

SLR

Site:

GARDEN RIVER

Project:

CONTAMINATED SITE REMEDIATION PROJECT

Drawing

MONITOR WELL CONSTRUCTION DETAIL

Date	February 13, 2015	Scale	NTS
File Name		Drawing No.	200.02005.00000-08