14.0 MONITORING AND CONTINGENCY

14.1 Effects Monitoring

An effective monitoring program provides results to: indicate whether the facility is working as expected and that the assumptions used in the assessment were correct; assess on an ongoing basis whether mitigation measures as designed and operated are effective; and identify unforeseen problems so they can be addressed in a timely manner. The proposed effects monitoring program for the CRRRC is summarized here and details are provided in the D&O Report, Volume IV. The monitoring program will be a separate appendix of the EPA application submission.

Effects monitoring programs are presented in relation to the environmental components used in the assessment. For the CRRRC, the conceptual effects monitoring programs are described below. The final details (i.e., frequency of monitoring, monitoring parameters, possible changes over time depending on the results of the specific monitoring program, etc.) of effects monitoring for the Atmosphere, Hydrogeology/Geotechnical, Surface Water and Biology components will be determined in consultation with the MOECC and incorporated in the ECA for the CRRRC.

14.1.1 Atmosphere

14.1.1.1 Noise

Taggart Miller proposes to initially monitor noise levels once per year during operations. The noise monitors will log acoustic data every hour for the duration of the monitoring period. If possible, monitoring will be carried out at or near POR02 and POR03, as defined in Section 8.4.1 and shown on Figure 8.4.1-1. The noise monitoring program may not be required on an on-going basis if the results are as predicted over the first few years of operation. Modifications to the noise monitoring program would be determined in consultation with the MOECC.

14.1.1.2 Air Quality & Odour

Taggart Miller proposes to complete annual property line dust monitoring after operational start up during the summer season for two summer seasons.

14.1.2 Geology, Hydrogeology & Geotechnical

14.1.2.1 Groundwater and Leachate

The proposed groundwater monitoring program for the Site has been split into the monitoring program for the processing and treatment facilities north of the Simpson Drain and a monitoring program for the landfill south of the Simpson Drain. The proposed groundwater monitoring program includes maintaining some of the existing groundwater monitoring wells that were used to assess the existing conditions and adding some additional monitoring well locations to fill in any gaps in the groundwater monitoring program, including sentinel groundwater monitoring wells located at the exterior perimeter berm toe of slope on the east side of the landfill. The existing and proposed groundwater monitoring locations are shown on Figure 14.1.2-1. In addition to on-Site groundwater monitoring wells, water wells within 500 metres of the Site will be sampled, with consent from the owner, one time prior to operations starting at the facility.

PLOT DATE: November 4, 2014
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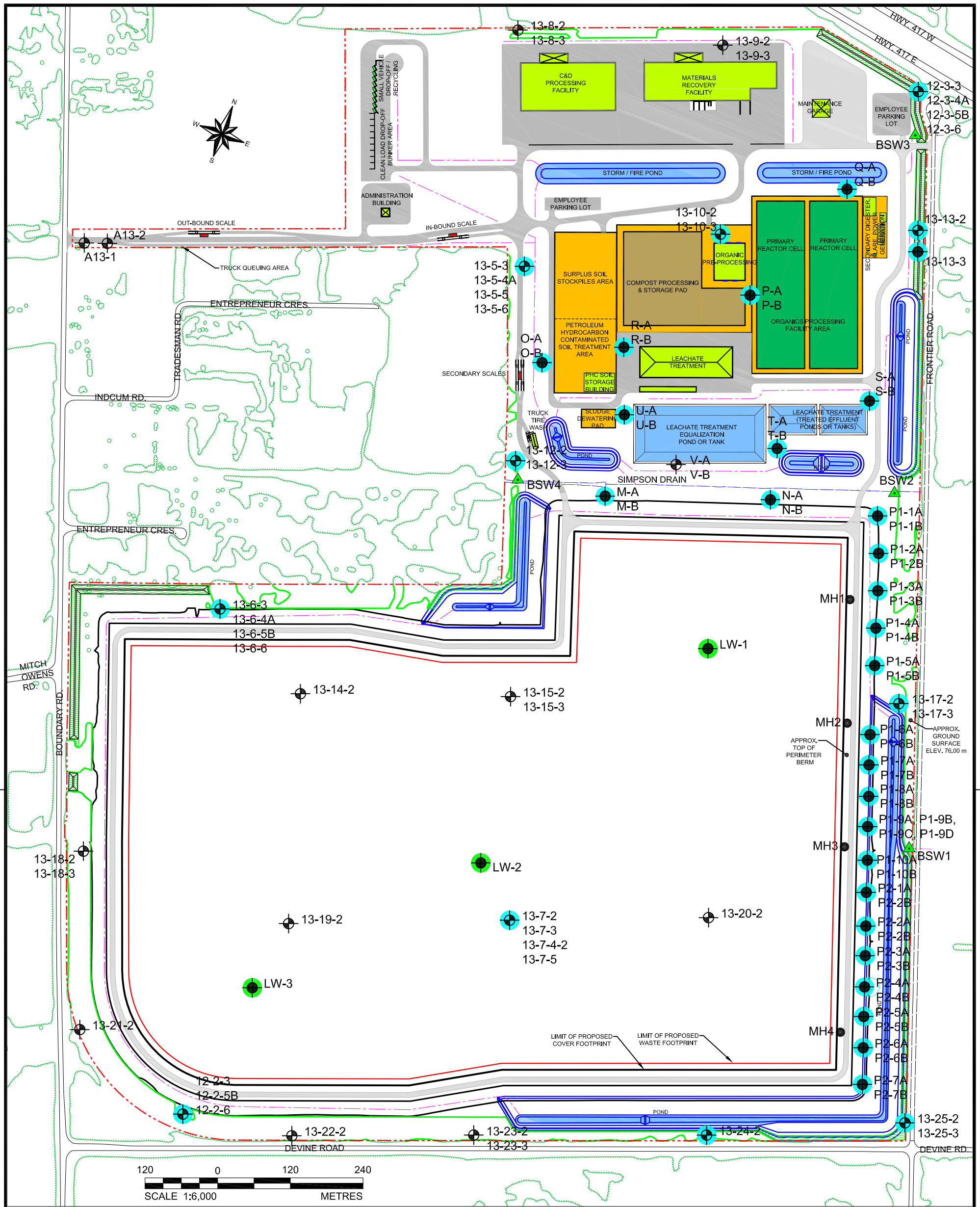

LEGEND

- PROPOSED FACILITY BUILDING
- OUTDOOR DIVERSION AREA
- PAVED ROAD (ASPHALT)
- GRAVEL ROAD
- PROPERTY BOUNDARY
- EXISTING VEGETATION SCREENING
- CONSTRUCTED SCREENING FEATURE
- PERIMETER BERM CONTOURS (interval 1 m)
- STORMWATER MANAGEMENT PONDS
- EXISTING GROUNDWATER MONITORING WELL (SAMPLING PROGRAM)
- EXISTING GROUNDWATER MONITORING WELL (WATER LEVELS ONLY)
- PROPOSED GROUNDWATER MONITORING WELL
- SURFACE WATER SAMPLING STATION
- PROPOSED LEACHATE MONITORING WELL
- LEACHATE DETECTION AND SECONDARY CONTAINMENT SYSTEM MANHOLE

NOTE:
THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

Golder Associates
Ottawa, Ontario, Canada

SCALE	AS SHOWN
DATE	7 Nov. 2013
DESIGN	M.L.F.
CAD	M.L.F.
CHECK	P.L.E.
REVIEW	P.A.S.
FILE No.	1211250045-V1-EAr-14.1.2-1.dwg
PROJECT No.	12-1125-0045
REV.	

TITLE

PROPOSED GROUNDWATER AND SURFACE WATER MONITORING LOCATIONS

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

FIGURE
14.1.2-1

Leachate sampling is proposed at the connection to the leachate pre-treatment facility and from three monitoring wells that will be completed within the leachate collection system drainage blanket. Leachate levels will be measured during each leachate sampling event in each leachate sump and leachate monitoring wells in the landfill (as they are constructed in conjunction with the landfill development phasing plan). The leachate monitoring well locations are shown on Figure 14.1.2-1.

The groundwater and leachate monitoring will occur three times per year (except as noted below), commencing the year prior to the start of operations, in the spring, summer and fall using the comprehensive list of parameters one time (plus hardness and a full VOC scan, including 1,4-dioxane) and the reduced list (plus manganese, TKN, potassium and hardness) the other two times as outlined in O. Reg. 232/98 (MOE, 1998a). Sentinel groundwater monitoring wells will be sampled in the spring and fall only. Water levels in the LDSCS manholes will be checked quarterly; this information will used to gain an understanding of the rate of groundwater inflow to the system.

14.1.2.2 Geotechnical

It is proposed that a geotechnical monitoring program be implemented for the purposes of:

- Confirming that the performance/behaviour of the underlying foundation soils is consistent with those expected based on the geotechnical investigation program and analyses, to thereby confirm the applicability of the design recommendations provided; and
- Providing the information needed to optimize the design and/or operation of the landfill, as construction and filling progress.

The following monitoring components are recommended:

- Subgrade settlement monitoring;
- Unit weight of the as-placed waste; and
- Lateral displacements of the silty clay beneath the perimeter berm of the landfill should be monitored by means of inclinometers and surface survey point/monuments.

It is also proposed that the rate of porewater pressure dissipation in the underlying clay be monitored by means of vibrating wire piezometers installed at the time of landfill cell construction at various depths in the upper portion of the silty clay deposit.

14.1.3 Surface Water

Run-off from completed Site areas flows to SWM ponds and from there is directed to on-Site ditches or the Simpson Drain. There are three discharge points from the Site at the eastern property boundary. The surface water sampling stations are located at each of these discharge points as well as from the Simpson Drain as it enters the Site at the western property boundary. The sampling locations are shown on Figure 14.1.2-1. Surface water monitoring will include an estimate of flow, where appropriate, and the collection and analysis of surface water samples. The frequency of sampling is proposed to coincide with the groundwater monitoring program in the spring, summer and fall, with an additional sampling session to occur after a heavy rainfall event. Collected samples will be analyzed for the comprehensive list of parameters one time and the reduced list on the

other two times as outlined in O. Reg. 232/98 (MOE, 1998a). Surface water monitoring will begin in 2014 to supplement baseline data. Monitoring locations BSW10 and BSW11 will be removed from the program once the landfill becomes operational.

14.1.4 Biology

Alteration of the surface water regime has the potential to affect streamflow in downstream sections of aquatic systems associated with watercourses and ditches within the Site. Changes in flow downstream could affect fish habitat by reducing the amount of habitat, increasing the deposition of fines in habitats and decreasing the amount of in-stream vegetation for cover.

Although it is expected that these changes in flow will be minimal and not ecologically important, a surface water monitoring program as outlined in Section 14.1.3 will be implemented post-development.

Benthic invertebrate community samples will be collected on a bi-annual basis during operations. To be able to compare the monitoring results to the baseline data, the samples will be collected and analysed in the same manner and the descriptors of the benthic invertebrate community will include taxa presence/absence, taxa richness and percent dominance at each sampling station. Because benthic invertebrates live their entire aquatic lives on, or in, the sediments, they tend to be relatively sensitive to changes in the sediments such as contaminant loadings. This sensitivity can result in changes in community composition, abundance and tropic structure over time. These community changes can represent long-term trends in water quality. The need for continued monitoring during the post-closure period would be evaluated during the development of the detailed closure plan. Sediment samples at the same survey stations will also be collected and analysed. Benthic and sediment monitoring is recommended at sampling stations B5, B6, B8, B9 and downstream of B5 and B7 as shown on Figure 8.7-1.

Monitoring for barn swallow, following the creation of the new habitat, will be conducted for a period of three years and a mitigation and restoration record will be maintained for an additional two years, following the requirements of O. Reg. 323/13 (MNR, 2013b).

As part of the closure plan, a rehabilitation plan will be developed and implemented to re-establish vegetation communities in the project footprint, subject to determination of the final end use plan for the Site. A mix of native species should be planted in order to establish a natural, native community post-closure. The vegetation cover will be surveyed to monitor its success. If there are deficiencies, such as weed encroachment, dead plants or evidence of erosion, the area will be supplemented with additional plantings of the most successful species.

14.1.5 Land Use & Socio-economic

A communication plan, including a Community Liaison Committee, as well as telephone number and email address to communicate directly with CRRRC personnel, will be developed to provide various means to allow and encourage residents and businesses in the Site-vicinity to communicate with CRRRC personnel and to report any concerns, and to ask questions related to air quality and odour, noise and traffic.

14.1.6 Cultural Heritage & Archaeology

No monitoring proposed.

14.1.7 Agriculture

As noted above, a communication plan, including a Community Liaison Committee, as well as telephone number and email address to communicate directly with CRRRC personnel, will be developed to provide various means to allow and encourage farmers in the Site-vicinity to communicate with CRRRC personnel and to report any concerns, and to ask questions related to air quality and odour, noise and traffic.

14.1.8 Traffic

No monitoring proposed.

14.1.9 Facilities Monitoring

For optimal operations of the various diversion and landfill related facilities, on-going monitoring of equipment performance will be required. This would include monitoring of the organics processing facility, compost processing, LFG system, leachate pre-treatment facility and PHC contaminated soil treatment facility. The details will be established in the ECA issued by the MOECC for these components of the CRRRC.

14.2 Contingency Plans

In the event that the monitoring programs detect unexpected problems or show that assumptions used in the assessment are incorrect, it may be necessary to implement contingency measures to further reduce the potential for any adverse environmental effects associated with the CRRRC. The proposed contingency measures are described below. Further details on these conceptual contingency measures are provided in Section 8.0 of the D&O Report, Volume IV,.

14.2.1 Groundwater

In the event that the leachate collection system beneath the landfill component has failed and monitoring results suggest leachate is getting into the groundwater system on-Site, the following contingency measures could be implemented. The intercepted leachate-impacted groundwater collected in the LDSCS could be pumped for treatment and act as the secondary containment system for the landfill. At this time, additional groundwater monitoring wells could also be installed between the sentinel monitoring wells (P1 series and P2 series) and the property boundary. Additionally, or alternatively, a series of purge wells through the cover of the landfill and into the granular blanket of the leachate collection system could be installed and leachate removed by pumping to leachate treatment. Typically, this type of a contingency is triggered by premature failure of the leachate collection system, such that a mound is formed within the landfill. The benefit of having purge wells installed into the leachate collection system is that leachate is contained within the landfill and collected prior to getting diluted with non-leachate-impacted groundwater. Details regarding purge well installation, such as the number and spacing, would be determined in consultation with the MOECC based on the area and level of leachate mound control required.

If, despite the presence of the LDSCS it is necessary to cut off flow through any or all of the perimeter berm, surficial silty sand layer or silty layer, would be to install a low permeability cut-off barrier inside the Site boundary. Options available for the barrier include a soil-bentonite wall constructed using the slurry trench method or an interlocking sheet pile wall (steel or PVC sheet piling). This would contain the leachate/groundwater on-Site, which would then continue to be removed from the leachate collection system.

MOECC approval to implement any of the above contingency measures would be obtained.

In the event that the liner systems associated with ponds in the leachate pre-treatment facility and primary reactor cells in the organics processing facility are compromised, materials would be removed and the liner repaired or replaced.

14.2.2 Surface Water

In the event that leachate-impacted water was to reach either SWM ponds or ditches, the source of the impact would be determined and then intercepted, as required. If necessary, the affected pond and/or ditches could then be emptied through a temporary pumping operation and the pumped water could be combined with the leachate and directed to the leachate pre-treatment facility.

14.2.3 Leachate Treatment Facility

Table 14.2.3-1 provides a summary of operational conditions that may be encountered at the on-Site leachate pre-treatment facility and contingency and/or maintenance options that could be undertaken.

Table 14.2.3-1: Leachate Pre-Treatment Facility Contingencies

Operational Condition	Contingency Options
Higher Flows than Design	Treatment process can be operated at up to 1,200 cubic metres per day with minimal effect on effluent quality.
Lower Flows than Design	Treatment process can be operated with fewer leachate digestion tanks operating to reduce flows. Alternatively, leachate digestion tanks and mixed liquor holding tanks can be operated at approximately 25% of their design flow without affecting system performance.
Higher metals loading or toxic constituents than assumed	Provision within the treatment building will be made to direct raw leachate from the initial equalization tank to a chemical mixing tank and clarifier before flowing through the biological treatment processes to remove excess metals.
Disruption to hauling treated liquid effluent	During normal operations, the effluent storage pond will be kept at a minimum volume so that in the event of a disruption to the hauled effluent program, the operator has approximately two weeks of storage at the design flows to fix the issue. If the operator chooses, the flow rate through the treatment system can be temporarily reduced and leachate stored in the leachate storage pond in order to gain greater than two weeks storage in the effluent storage pond. Pumping from the leachate collection system beneath the landfill can be temporarily reduced or suspended.

14.2.4 Landfill Gas (LFG) Collection System

14.2.4.1 LFG Odours or Insufficient Quantity of Collected LFG

If required to control odours or to augment the quantity of collected LFG recovered, vertical LFG extraction wells could be installed following the completion of individual landfill phases. Vertical LFG extraction wells could be located in individual phases already completed to final contours, specifically in areas of thicker waste and where horizontal collectors may have become blocked due to settlement. Vertical LFG extraction wells should be equipped with a wellhead to allow for the monitoring of LFG quality and pressure, measurement of LFG flow rates, and a valve to facilitate the regulation and balancing of LFG flow. Each vertical LFG extraction well would be connected to the LFG header pipe via lateral piping.

14.2.4.2 Unexpected LFG System Component Failure

In the event of the failure of a component that is connected to the programmable logic controller (e.g., LFG analyzer), the LFG system will automatically shut down and send an alarm via the autodialler.

A supply of typical spare parts will be maintained on-Site to allow for the timely replacement of failed components and to minimize down-time of the LFG collection system.