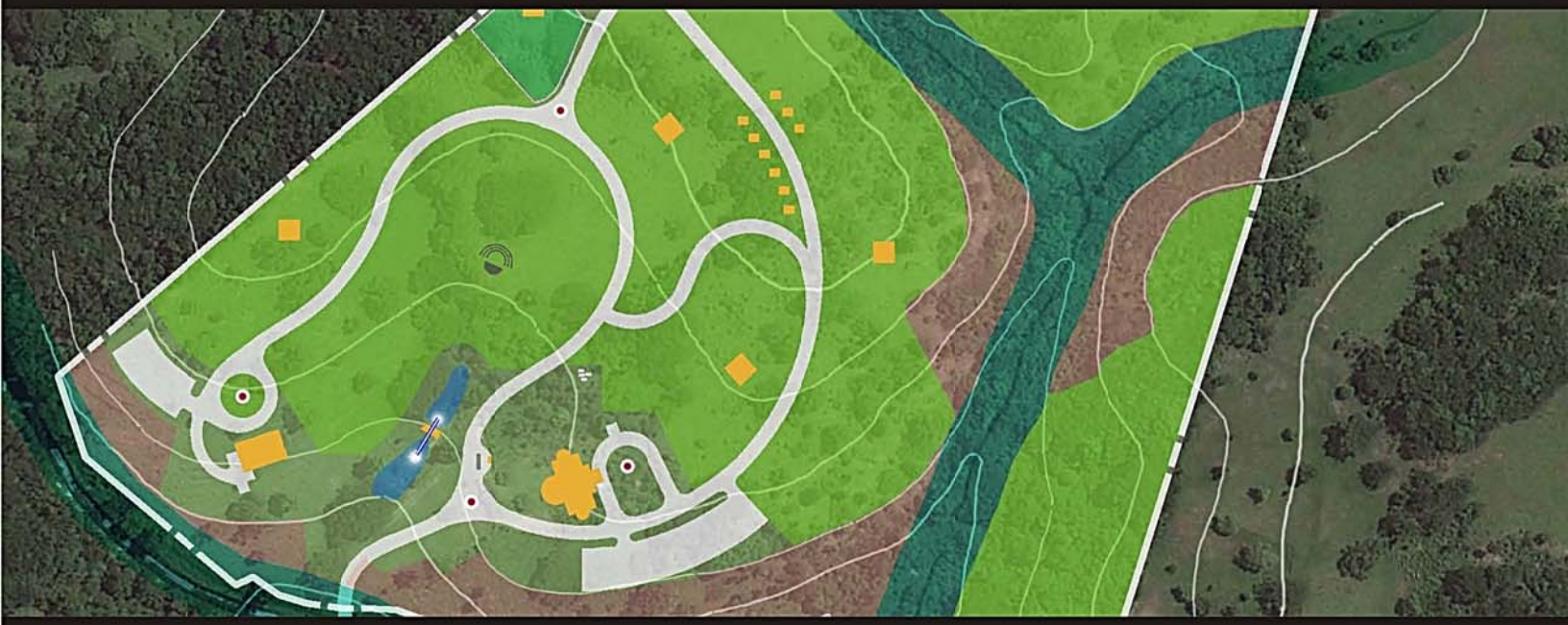
ENVIRONMENTAL IMPACT ASSESSMENT

for the Proposed Cemetery and Crematorium at Moor Park, St James, Jamaica



June, 2011

Prepared for Delapenha Funeral Home Ltd

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NATIONAL ENVIRONMENT & PLANNING AGENCY

PERMIT APPLICATION: 2011-08017-EP00029

ENVIRONMENTAL IMPACT ASSESSMENT

FOR A CEMETERY DEVELOPMENT

AT MOOR PARK, ST JAMES, JAMAICA

PROPOSED BY DELAPENHA FUNERAL HOME LTD.

June 2011

ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED CEMETERY DEVELOPMENT, MOOR PARK, ST JAMES, JAMAICA

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SECTION 1 EXECUTIVE SUMMARY

1.1. Delapenha Funeral Home Ltd. (DFH) is seeking permission to establish a private cemetery and crematorium at a 43 acre site located at Moor Park, St James. This Environmental Impact Assessment (EIA) is submitted to National Environment and Planning Agency (NEPA) in support of the application for an Environmental Permit made by DFH, pursuant to the requirements of the Natural Resources Conservation Authority Act Permit and Licenses Regulations (1996) which specify that cemeteries and crematoria require an environmental permit. The EIA has been prepared in accordance with the approved Terms of Reference (Appendix 1). Appendix 2 is the letter from NEPA offering no objection for the EIA to proceed on the basis of this Terms of Reference (TORs).

1.2. The turn off to Moor Park property is located less than 4 km from Adelphi to the east and less than 12 km from Montego Bay to the west. Falmouth is located ~ 15 km away. The site is located 2.5 km SSE of the operating Dovecot Cemetery and Crematorium at Kirkpatrick Hall, 3.6 km WNW from the Adelphi Church Cemetery and 4 km SSW the Content public cemetery. All three of these cemeteries are located within the same watershed of the Montego River, and are underlain by the same bedrock.

1.3. The site does not fall within any protected area or zone in respect of the following national plans: Water Resources Master Plan, Forestry Master Plan, and National Parks and Protected Areas plans. The area, although not specifically zoned as agricultural, may be part of a general agricultural area (Adelphi), and may require a letter of no objection or change of use from the Rural Physical Planning Unit (RRPU). The site is not located in proximity to any protected heritage resources.

1.4. Criteria for selecting this site included the following:

- Proximity to Montego Bay via a reliable main road (less than 10 miles from the Montego River Bridge).
- Availability of a sufficiently large parcel (43-acres) of relatively flat to undulating land for the development of a cemetery with more than 50 years development potential. This includes the capacity to accommodate any recommended buffers.
- Absence of environmental sensitivities: not forested (disused pasture), no sinkholes, no rivers, springs or ponds within 500 m of boundary, not within a 100-year floodplain, not close to high density housing, no water production wells within 500 m, located well above the water-table.

1.5. **The Master Plan given in this document replaces the previous plan that was submitted with the application**. The design of the cemetery has taken into account statutory and other recommended buffer zone limits, and general environmental constraints at the site, including site drainage and slope. Based on this master plan, a total of 15.6 ha or 90 % of the property will be green space. Built space (the remaining 10%) includes three main facilities (Reception Centre, Cremation Centre and a Chapel) and associated infrastructure (including 1400 m of internal roadway). Most of the planned development of the property will occur on the south-western side south and west of the dry gully tributary. This area forms the core of the cemetery.

1.6. The facilities will be built in 5 phases. The scheduling of phases beyond the first will depend on the market conditions. However, an estimated build-out rate for the graves is

of the order of ~100 graves per year. It is therefore unlikely that burial lawns associated beyond Phase 3 will be constructed within the next 100 years.

1.7. The design concept of the burial plots is to use modular approach. Each module has a gross yield of 120 graves assuming a grave plot size (~ 1 m by 2.4 m). At an estimated 100 burials per year, each cell will have a life time of 1 year. Each acre of developable land will take approximately 13 years to be fully utilized. Therefore the estimated 18.2 acres (7.4 ha) of burial lands gives a design life of over 200 years.

1.8. The main environmental impacts that were assessed by this study for the construction phase of the project included impacts on noise levels, air quality, surface waters, groundwater, landfill space, and haul roads. With the exception of the impacts on haul roads, all of these were classified as negligible or minor.

1.9. During the operational phase, impacts on the following parameters were found to be minor or negligible: noise levels, traffic, pest populations (disease vectors), site hydrology, groundwater, carbon footprint, and landfills. Impounding of storm flows was initially thought to be potentially a negative impact, but was assessed to actually result in positive environmental effects.

1.10. The following operational impacts were assessed as moderately adverse: thermal emissions, conversion of part of the site to monoculture and habitat change. The likelihood of negative impact from thermal emissions is very low as there are cost-effective mitigation measures available. The other two impacts must be considered against mitigating factors and the extent of green planning that this development represents, as well as its general suitability for the environmental setting.

1.11. It is the finding of this report that this project is unlikely to generate any significant adverse environmental effects. Most of the impacts caused by the project in all its phases are likely to be minor impacts, which are not likely to result in major changes to the baseline conditions that presently exist and are within normal levels of fluctuations for the various baseline parameters.

1.12. Mitigation measures for the construction phase which need to be passed down to construction contractors and on-site project managers cover the following broad areas: noise abatement, air emissions control, site run-off control, sewage management, solid waste management and haulage management. Operational controls that include mitigation measures for

- Ensuring optimal performance of emissions controls in the crematory.
- Off-setting the carbon footprint of the project.
- Considerations for design modification or enhancement to improve environmental performance or site planning efficiency.
- Identification of opportunities for optimization of environmental performance, in respect of grave design, community relations, landscaping, water conservation, and upset conditions.

1.13. The TORs specify that an outline monitoring programme should be included in the EIA, and a detailed version submitted to NEPA for approval after the granting of the permit and prior to the commencement of the development. It is recommended that water quality in the central water feature be monitored on a quarterly basis to ensure compliance with the national irrigation standards, if this water is being used for irrigation purposes.

SECTION 2 INTRODUCTION

Purpose of this Document

1.14. Delapenha Funeral Home Ltd. (DFH) is seeking permission to establish a private cemetery and crematorium at a 43 acre site located at Moor Park, St James. This Environmental Impact Assessment (EIA) is submitted to National Environment and Planning Agency (NEPA) in support of the application for an Environmental Permit made by DFH, pursuant to the requirements of the Natural Resources Conservation Authority Act Permit and Licenses Regulations (1996) which specify that cemeteries and crematoria require an environmental permit. The EIA has been prepared in accordance with the approved Terms of Reference (Appendix 1). Appendix 2 is the letter from NEPA offering no objection for the EIA to proceed on the basis of this Terms of Reference (TORs).

Information on the Project Proponent

1.15. Delapenha Funeral Home Limited was incorporated under the Companies Act of Jamaica as a Limited Liability Company on March 11, 1983. The company has had offices at 45 Union Street, Montego Bay since 1993. The Company's Directors are Marcia L. Delapenha and Dale A. Delapenha. The Company serves the funeral needs of residents in the Western Region, particularly those in St. James, Hanover and Westmoreland, extending into Trelawney with a satellite office in Falmouth.

1.16. The project development team includes Mr. Dale Delapenha (overall design input); Mr. Jack Goodnoe (cemetery master plan[1] and vault module design) and Mr. Fitz Henry (sewage, building design, roads and parking areas). Mr. Goodnoe is a registered landscape architect in the State of Michigan in the USA. Mr. Henry is an Engineer registered in Jamaica.

[1] http://www.jackgoodnoe.com/Jack_Goodnoe/Welcome.html

Information on the EIA Preparers

1.17. This EIA was prepared by Environmental Management Consultants (Caribbean) Ltd. The principal author and EIA specialist was Dr. Ravidya Burrowes, who has 18 years experience in EIAs and environmental geology. Emc^2 has submitted several other EIAs to the Natural Resources Conservation Authority (NRCA) through the permits and licensing system of the National Environment and Planning Agency (NEPA) since 2006.

1.18. Mr. Marc Rammelaere assisted with the compilation of the Environmental Baseline section, and conducted the assessment of the hydrology and run-off changes at the site. CL Environmental conducted the socio-economic community survey. A geophysical survey was conducted by Dr Lyndon Brown of the Earthquake Unit (UWI) with Dr Arpita Mandal.

1.19. The site planner (Mr Goodnoe), the applicant (Mr Delapenha), Dr Burrowes and Mr Rammelaere reviewed the EIA for content and accuracy.

Project Rationale

1.20. Delapenha Funeral Home Ltd. (DFH) has been offering clients in western Jamaica quality funerary services for the past 28 years. With the parish council burial capacity approaching its limits and other commercial cemeteries not allowing burials from competing mortuaries, DFS has been increasingly limited to being able to offer burial services at private family plots and to a lesser extent, at the various parish and church cemeteries.

1.21. In 2006 DFS sought to expand its burial business potential by opening the Royale Rest facility at Burnt Ground in Hanover. Although an environmental permit was obtained and a rigorous EIA completed, the facility's attractiveness to buyers was greatly impacted by negative press. Once again, DFS is seeking to expand its business by opening a world class cemetery and crematorium at the newly acquired 43-acre site located in Moor Town, St. James.

Location of the Project

1.22. The Moor Park property is located off a small parochial road ~600 m from the main road which runs between the town of Adelphi and Montego Bay (Figure 1). The turn off to the site is less than 4 km from Adelphi to the east and less than 12

km from Montego Bay to the west. The town of Falmouth is located approximately 15 km away.

1.23. The site does not fall within any protected area or zone in respect of the following national plans: Water Resources Master Plan, Forestry Master Plan, and National Parks and Protected Areas plans. The area, although not specifically zoned as agricultural, may be part of a general agricultural area (Adelphi), and may require a letter of no objection or change of use from the Rural Physical Planning Unit (RRPU). The site is not located in proximity to any protected heritage resources.

1.24. In terms of the WRA hydrogeological classification, the property falls within the Montego River Water Management Unit (WMU 4) in the Great River Basin (VII). The site is underlain by the Montpelier Formation, which is classified as an aquiclude due to its relatively low primary transmissivity.

1.25. WRA has identified the nearest well as a non-pumping well at located Glasgow, 1.7 km to the SE at elevation of 134 m which is drilled into the Montpelier Limestone to a depth of 47.2 m. This puts the groundwater elevation at Glasgow to ~87 m above mean sea level (amsl). Geophysical investigations conducted at the site confirmed that there was no water table or saturated zone within the maximum depth of the instrumentation (31 m). This study estimated the water table at this site to be between 50 and 60 m below ground surface.

1.26. The Moor Park area has been listed by the Office of Disaster Preparedness and Emergency Management[2] as a flood prone area. High storm flows in the gully running along the access road to the site is evident from the bedload and erosion seen after the tropical Storm Nicole in April 2010, and the September 2010 flood rains. Normal flows in the Montego River itself are notably very small to small[3]. According to this source, the Montego River has a mean annual flow of ~2 m^3/s at its distal end.

1.27. The site is located 2.5 km SSE of the operating Dovecot Cemetery and Crematorium at Kirkpatrick Hall, 3.6 km WNW from the Adelphi Church Cemetery and 4 km SSW the Content public cemetery (Figure 1). All three of these

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[2] http://www.odpem.org.jm/DisastersDoHappen/TypesofHazardsDisasters/Floods/MainFloodProneAreasinJamaica/MainFloodProneAreasinCornwallCounty/tabid/291/Default.aspx

[3] Water Resources Assessment of Jamaica. USACE 2001 p43

cemeteries are located within the same watershed of the Montego River, and are underlain by the same bedrock.

1.28. The criteria for selecting this site included the following:

- Proximity to Montego Bay via a reliable main road (less than 10 miles from the Montego River Bridge).
- Availability of a sufficiently large parcel (43-acres) of relatively flat to undulating land for the development of a cemetery with more than 50 years development potential. This includes the capacity to accommodate any recommended buffers.
- Absence of environmental sensitivities: not forested (disused pasture), no sinkholes, no rivers, springs or ponds within 500 m of boundary, not within a 100-year floodplain, not close to high density housing, no water production wells within 500 m, located well above the water-table.

Site Boundaries

1.29. The western side boundary is a straight line 544 m long running between elevations of 122 m amsl and 206 m amsl. The lands to the west are owned by Felix Headley. On the adjacent parcel there is a dwelling house located 115 m from the western boundary. The northern boundary is 163 m, and extends over elevations of 206 m amsl. The lands to the north are owned by Joseph Franklin.

1.30. The eastern boundary consists of three main segments: (1) an upper 521 m straight line segment running between elevations of 198 m and 137 m amsl; (2) a middle straight line segment which is ~96 m connecting segment 1 to the gully bed at elevations between 137 m amsl and 117 m amsl; and (3) the lower segment which follows the gully for a distance of 191 m to the gully that runs parallel to the public road at elevations around 117 m amsl. The lands to the east are owned by Joseph McIntosh. In the lower segment, there is a dwelling house located ~12 m from the gully/boundary.

1.31. The southern boundary runs parallel to the gully that follows the parochial roadway. It is approximately 268 m long. The St James Parish Council (SJPC) and National Works Agency (NWA) control the public roadway to the south.

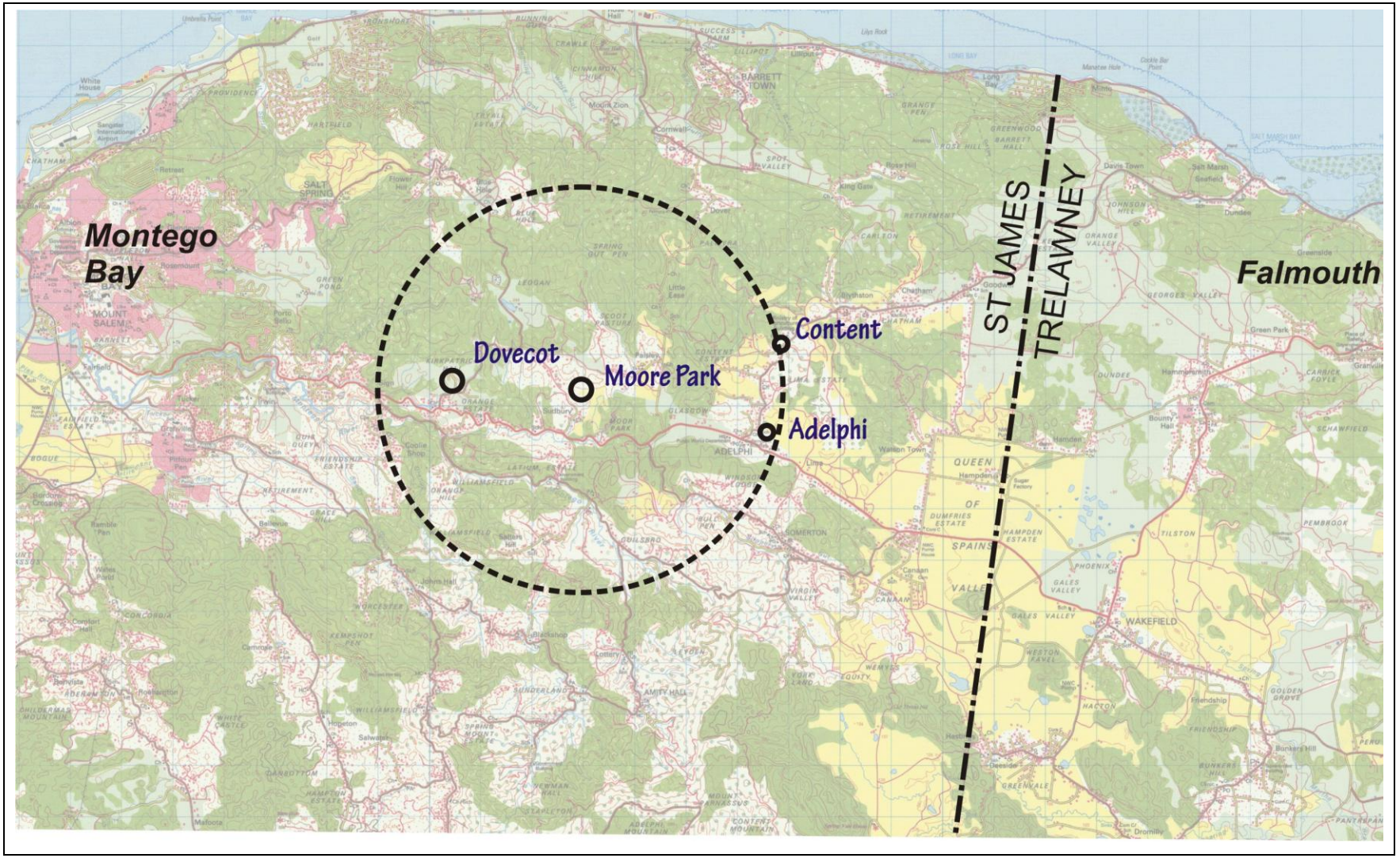

Figure 1 Location of Moor Park Cemetery showing the locations of other cemeteries within a 4 km radius of the site.

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SECTION 3: PROJECT DESCRIPTION

3.1. The purpose of this section of the EIA report is to disclose information about the project and to document all aspects in its life cycle that could potentially create an adverse impact on the environment.

3.2. The development proposal is for a new commercially-operated cemetery and crematorium to be constructed in the parish of St James. The developer's target market is primarily the Greater Montego Bay Metropolitan area, where urban dwellers may not have easy access to family burial plots or cannot get space in the public cemetery.

Master Plan Overview

3.3. Figure 2 shows the revised cemetery Master Plan. This plan replaces the previous plan that was submitted with the application. This plan makes provisions for cemetery buildings inclusive of associated parking, roadways, burial lawns, landscaped lawns, protected slopes and stream buffers and run-off management zones. The design of the cemetery has taken into account statutory and other recommended buffer zone limits, and general environmental constraints at the site, including site drainage and slope.

Green/Open Space

3.4. Based on this master plan, a total of 15.6 ha or 90 % of the property will be green space.

3.5. Approximately 6.27 ha (15.5 acres) will be left in an undisturbed state. This includes all of the lands on the northern side of the property above the 525 foot contour, and lands that are associated with steeper slopes southern (front) boundary of the site, steeper slopes associated with the eastern gully and a 15 m buffer zone provided for that gully. All trees within these areas will remain.

3.6. Approximate 2 ha (5 acres) will be landscaped with lawns and trees. This area is located primarily to the front of the property, between the location of the Cremation Centre on the south-western side and the Reception Centre located in proximity to the existing building on the site. This includes an area immediately west of the main entrance road which will contain a landscaped water feature.

The existing dry gully will be re-graded to create two re-circulating ponds. All drainage from the roadways and buildings will be routed by curb-side concrete drains into this feature. This is further described under drainage infrastructure (paragraph 3.48).

3.7. The burial lawns will comprise the remainder of the green space, and has been estimated to be 7.3 ha (18.2 acres or 42% of the total property) of the total available space on the property. Development constraints for the location of burials included buffer zones and slopes. Slopes in excess of 24% were regarded as prohibitive.

3.8. To the extent possible mature trees within the burial and landscaped lawn areas will be retained. Additional trees will be planted as part of the general landscaping.

3.9. Buried septic systems and tile-fields are included as green space.

Built Space

3.10. Based on this master plan, a total of 1.8 ha (4.4 acres) or 10% of the property will be built space. This includes three main facilities: (a) the Reception Centre (b) the Cremation Centre and (c) a Chapel located on the western boundary. Each will be served by parking lots and access roadways. Building sites were selected based on the opportunities for views.

3.11. Other buildings include mausoleums, barn and paddock for horse, gazebos and an open amphitheatre. Approximately 1400 m of internal road will be constructed with a design width of 7.3 m, plus a 1 m drainage provision, giving a road reserve area sub-set of 1.2 ha (or ~3 acres). According to the Master Plan, another 1.2 acres are also reserved for roadway, including provisions for 3 roundabouts and parking lots.

3.12. Most of the planned development of the property will occur on the south-western side south and west of the dry gully tributary. This area forms the core of the cemetery.

Figure 2 Revised Master Cemetery Plan

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Site Development Phasing

3.13. The facilities will be built in 5 phases. Table 1 below outlines the project elements that will be developed in each phase.

Phase	Construction Elements	New Roads (m)	Burial Capacity (number of graves)	Years of Burial**	Cumulative years
Phase 1	Reception Centre, entrance and landscape amenity development and roadway (Figure 3 below).	907	204	2	2
Phase 2	Cremation Centre and Phase 2 Burial area.		4,500	45	47
Phase 3	Chapel and roadways. *122 m of road on the main ridge will be removed*	271-122	5,900	59	106
Phase 4	Burial area on the north side of the dry gully and associated roadway.	344	6,500	65	171
Phase 5a	Burial areas around the amphitheatre at the core of the property (central lawn)	344	2,500	25	196
Phase 5b	Slopes across the east gully.		4,100	41	237

Table 1 Master Plan Phasing

** based on an estimated rate of 100 burials per year.

3.14. The scheduling of phases beyond the first will depend on the market conditions. However, an estimated build-out rate for the graves is of the order of ~100 graves per year. It is therefore unlikely that burial lawns associated beyond Phase 3 will be constructed within the next 100 years.

3.15. While the expansion into new burial space may proceed on a somewhat slower basis and will be market driven, the applicant may choose to proceed with the construction elements (cremation centre etc) that are planned for later phases (up to Phase 3) as a means of developing new product offerings.

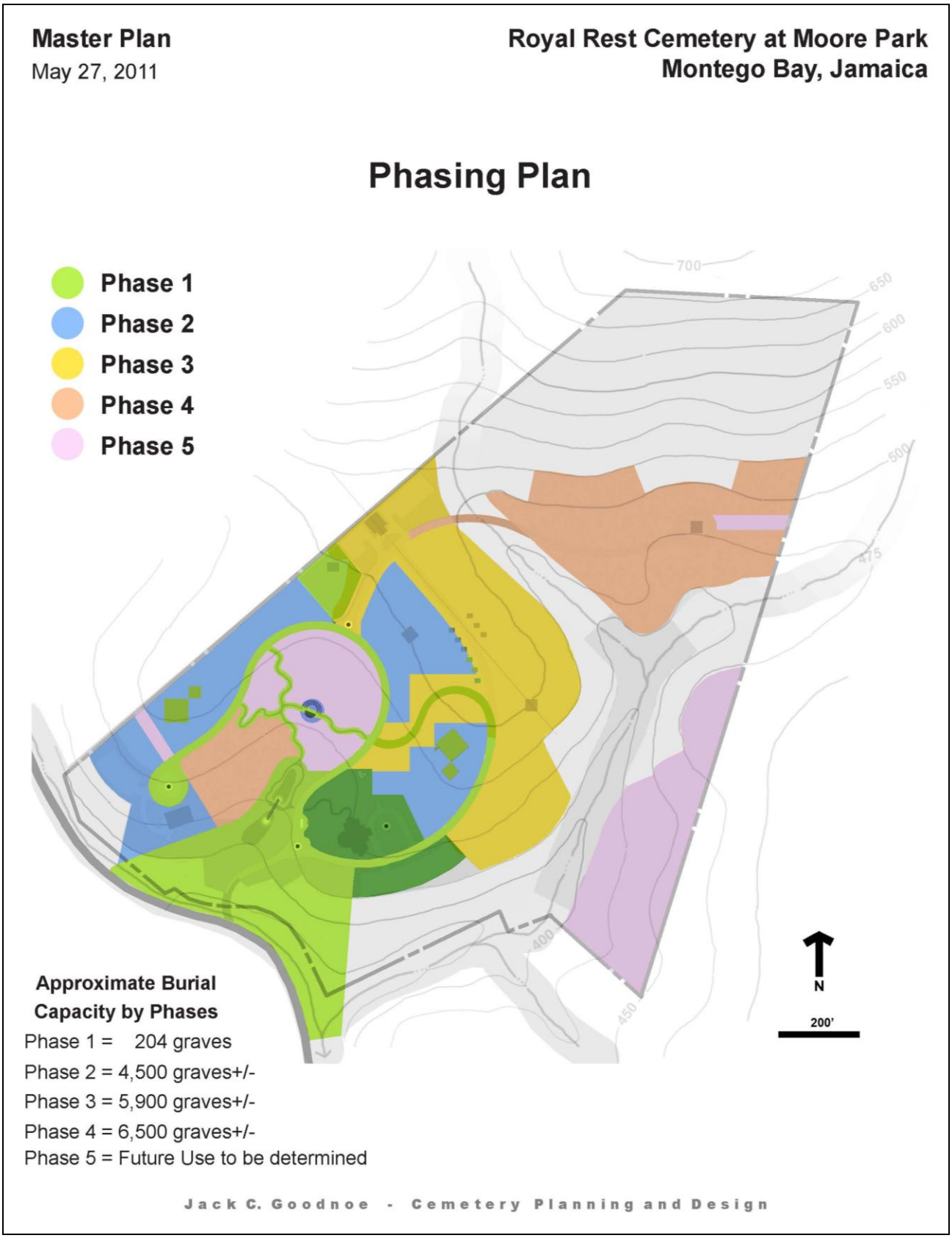

Figure 3 Phasing Diagram

Design Parameters and Specifications

Burial Areas

3.16. The design concept of the burial plots is to use modular approach (Figure 4). Each module has a gross yield of 120 graves assuming a grave plot size (~ 1 m by 2.4 m). Allowing for trees and variable site conditions, road geometry, existing trees, gazebos or site features, an average net yield of 102 graves per module is expected. This gives a density of 13 modules per acre or 1,322 graves per acre net developable land[4]. Higher densities allow for the most efficient use of the space, and are consistent with the historic patterns observed in the public and church cemeteries.

3.17. At an estimated 100 burials per year, each cell will therefore have a life time of 1 year. Put another way, each acre of developable land will take approximately 13 years to be fully utilized. Therefore the estimated 18.2 acres (7.4 ha) of burial lands gives a design life of over 200 years.

3.18. Each module area will be excavated, with vaults and infrastructure constructed, and landscaped before sales commence. Due to the thinness of the soil layer in this area (less than 0.5 m), the burial cells will be excavated to a maximum depth of 1 m into the underlying bedrock. The base of the vault will not be sealed with concrete to maximize infiltration in a naturally low permeability area. In preparation for a burial, pre-constructed vaults will be re-excavated as needed. It is planned that there shall be two modules in operation at any given time. These shall be located in different parts of the property so that excavations or ceremonies can be simultaneous. After the coffin is lowered into the vault, a slab of concrete will be placed on top of the casket. The grave will then be backfilled with earth material removed previously. The top of the grave will be compacted after burial and grassed over. The graves will be marked with stone or concrete headstones. Graves will be maintained to avoid sunken spots or bushing over.

3.19. The main product offering will be the vaults located in the modules. In addition to these, some premium estate lots may be developed as mausoleums or with lower density in high-priced areas (e.g. with a view, near trees or some feature, and gives greater privacy).

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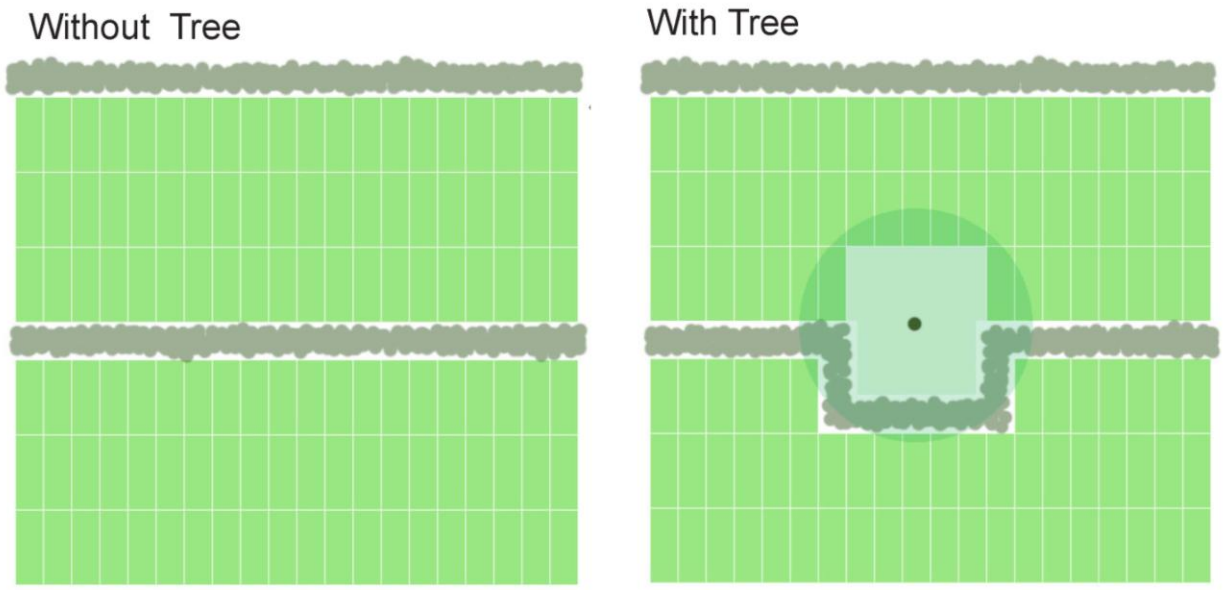
[4] NB this is vault density is different from the 200 graves per acre that was previously mentioned in the Project Brief and Terms of Reference. The developer has changed his original estimate based on the cemetery planner's guidance for the most efficient the use of the available space.

Master Plan
May 27, 2011

Royal Rest Cemetery at Moore Park
Montego Bay, Jamaica

Burial Development Planning Module



1 Module = 120 Graves Gross

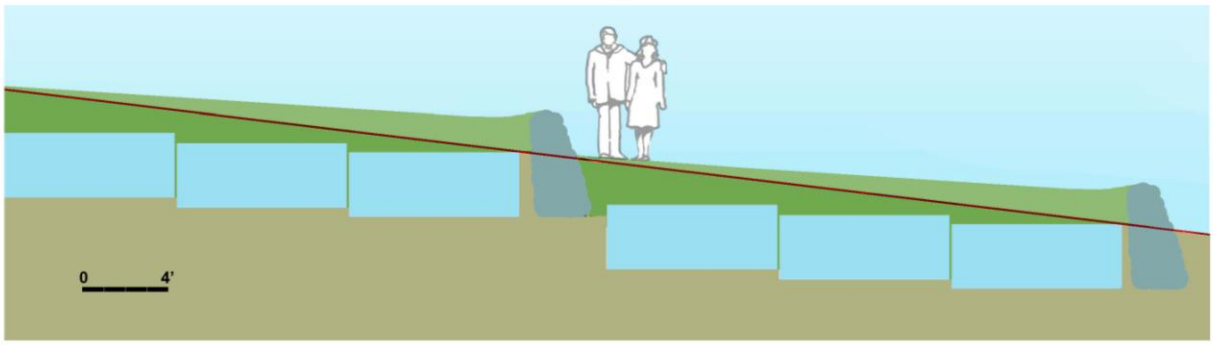
10'

Less 6 graves every 2 Modules for new tree planting

Less 10% (12 graves) due to variable site conditions of rock, topography, road geometry, existing trees to be preserved, or site features and gazebos.

Average Net Yield = **102 Graves per Module**

Approximately 13 Modules per Acre or **1,322 Graves per acre** of net developable land.



Typical terracing for burial development using on-site rock for walls

Jack C. Goodnoe - Cemetery Planning and Design

Figure 4 Burial Module Design

Buildings

3.20. Three main buildings are shown on the master plan. These include the Reception Building, the Cremation Centre, and the Chapel. Each of these is planned for construction in different phases of the development. Smaller structures include family mausoleums and gazebos. All buildings will be accessible to the impaired and will have wheel chair ramps adjacent to staircases.

Cremation Centre

3.21. The crematory will be located within a cremation centre, which is to be located at a ground elevation of 130 m (425 feet) above mean sea level on the western side of the property. The structure will be located 75 m from the main entrance and ~100 m from the Reception Centre and ~250 m from the Chapel site. This building will be approximately 40 m away from the front boundary and 75 m from the western boundary (see Figure 5).

3.22. The crematory will be designed such that mourners will not be able to obtain an accidental view into this room. The room will be sized to accommodate two cremation units, although there are no plans to purchase more than one. The total area of the room containing the cremator will be of 140 square m (1500 square feet). The room containing the unit will be approximately 4 m high and fitted with an overhead ventilation system.

3.23. Appendix 3 is the brochure for the system that will be installed at the facility. The Power Pak II has a maximum burn rate of 68 kg/hour, and is expected to be able to complete a typical human cremation in 2 to 3 hours. The body is loaded into the primary chamber and the secondary chamber is heated to 982^{o}C using the afterburner (30 minutes). After this, the primary burner begins the cremation cycle. The time to completion depends on the size, and can be up to 6 hours long. A cool-down period of 30 minutes or more is required before the ashes can be removed.

3.24. The ashes are swept from the cooled chamber into a hopper located below the front door. Cremated ashes are normally placed in a pulverizing machine that is manufactured for the purpose of reducing cremated remains to powder. Pulverized remains are then placed in a sealed urn and given to the family. In some cases, the family may wish the remains to be reposited at the facility, in which case, the urn will be placed in a columbarium wall located within the Cremation Centre.

3.25. The specifications for the equipment are given as Appendix 4, and plans are given as Appendix 5. The cremator will occupy a space of 5 m long by 3 m wide with a clearance of 3 m from the rear wall, and has a weight of ~11 metric tons. Combustion chambers are constructed of high quality fire-bricks and insulating materials. It requires gross gas input of 118.2 l of LPG[5] per hour if operating at optimal temperatures, plus a 230 volt electrical supply and 70.8 m^3/min air supply.

3.26. This unit is equipped with patented technologies to abate noise (Whisper Shield) and completely eliminate smoke and odours ("Smoke Buster System"). The unit has a number of built in emission control features, including a secondary chamber with afterburner, opacity monitor with alarms, auxiliary air control system and temperature control system. In addition, the unit has a built-in exhaust cooling system which reduces the temperature of the exhaust air from 871 C (1600 F) to 426 C (800 F). Actual data (see paragraph 3.67) showed emission temperatures around 598 C (1110 F).

3.27. Appendix 6 shows the design and requirements for the stack. It is required to have a minimum height of 1 m above the roof peak.

3.28. The cremator will be provided with an aboveground 2 m^3 (2,500 l or 550 UK gallon capacity) LPG storage tank, which would fuel ~21 hours of incineration. The tank will be housed within the covered building so as to avoid accumulation of storm water.

3.29. The Cremation Centre will house the crematory as described above. Adjoining the crematory there will be a small staff room, workroom and washroom. There will also be a fan room, room for the pulverizing machinery, and a columbarium for the storage of sealed urns. The Cremation Centre will also have a room for religious rites to be performed as necessary (with remote trigger for the ignition of the crematory). There will be 9 lavatories (in the ratio of 2 female to 1 male).

Reception Centre & Chapel

3.30. A Reception Centre is to be located near the entrance on the eastern side of the property. The purpose of this building is to cater for receptions after the funeral is completed. It will contain a pantry, cold room and kitchen, as well as main dining

[5] The specifications indicate that it requires 3.2 million kJ per hour or 3 million BTU.

hall, and provisions for garden/outdoor functions. This building will be able to cater for a maximum of 400 persons. There will be 9 lavatories (in the ratio of 2 female to 1 male).

3.31. A Chapel is planned for a later phase of the development. This will be a multi-denominational chapel.

3.32. Covered gazebos are strategically placed throughout the burial lawns.

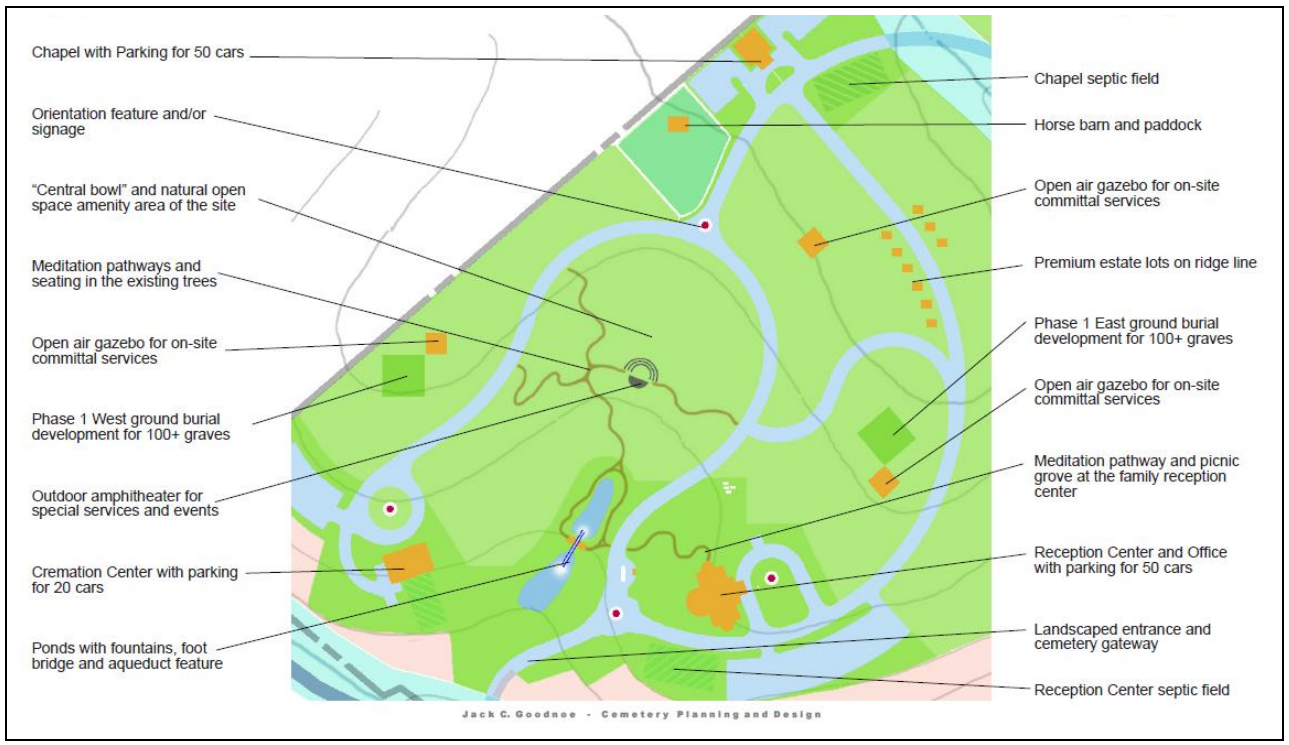


Figure 5 Core Area of Master Plan

Infrastructure

Water

3.33. The area along this road does not presently have a pipeline running to the site and surrounding properties from the main road. Residents in the area living beyond the Shiloh basic school/church currently catch rainwater and use black tanks that are periodically filled by water trucks. The developer will be responsible for extending the water pipeline by about 100 m along the public parochial road from the main road to the site entrance. The pipe will be installed prior to construction and so will also meet construction water demand.

3.34. All buildings will be guttered to harvest rainwater. The CEHI Rainwater Harvesting Manual[6] concepts are integrated into the architectural design of the buildings. Water storage tanks will be installed in the general area of the buildings and attached to the guttering. Overflow from these will be routed to the central pond feature. The drainage plan is designed so that run-offs from each site and roadway can be routed to (via roadside drains) and impounded in the central pond.

Power and Telecommunications

3.35. The site presently has electricity and telephone service. It is expected that the operational power demand at the facility (from security lighting, interior lighting, and air conditioning) will be ~1500 kWh per month, and will be provided by JPS.

Sewage

3.36. Sewage will be disposed of on-site using a suitably sized septic tank and tile field, which will be located as shown in Figures 2 and 5. The Chapel and Reception Centres will each have a septic field area of 15 m by 30 m, including provisions for a 4,000 gallon (18 m^3) septic tank and tile field. The Cremation Centre will have a septic field area of 12 m by 23 m, and will include provisions for a 1,800 gallon (8 m^3) septic tank. These facilities will provide for sewage generated by both visitors and staff. The staff contingent on property at any given time is not expected to be greater than 15 persons, and it is unlikely that there will be this many permanently based at this facility.

3.37. The final designs for the sewage system for each building will be submitted to the MOH and the SJPC for approval. The septic tank and tilefield will be constructed in accordance with any further specifications and requirements by these agencies.

Solid Waste Disposal Facilities

3.38. Solid waste will be collected and stored in a metal skip located near the service area of the Reception Centre for routine collection by an approved waste

[6] http://www.cehi.org.lc/Rain/Rainwater%20Harvesting%20Toolbox/Media/Print/RWH_handbook.pdf

contractor. The service area will be approximately 10 m by 10 m. Wash down from this area and the kitchen gray water will be routed to the septic tanks/tile-fields via grease traps.

Site Fencing & Lighting

3.39. Most of the site is presently fenced off with a barbed wire fencing that is typical of farmlands in this area. While most of the existing fencing on the property boundary will remain as is, to the front of the property this fence will be replaced by a wall and entry façade that is fitting of an upscale cemetery facility. The area to the front of the wall will be landscaped with ornamental trees.

3.40. It is not expected that the facility will be open to the public after dusk. Consequently, there shall be no need for lighting of much of the property. The main building areas and front wall shall have security lighting installed. This will also serve the function of providing some minor street lighting along the parochial road.

Public Roadway and Drainage Upgrade

3.41. The applicant has sought the approval of SJPC to improve approximately 700 m of public roadway between the main road and the site (see Appendix 7 for letter from the SJPC). Three major issues presently affect this roadway: (a) poor surface quality; (b) risk of overtopping and side undercutting from turbulent storm flows in the adjacent gully that runs along its length and (c) the narrowness of the road only allows one vehicle to pass with little no space for a shoulder.

3.42. The dry gully running along the roadway will also be trained. The proposed drainage improvement extends upstream of the entry way and all the way down to the confluence with the Barnett/Montego Bay River. The gully will be cleared of debris and maintained in such a way that the spontaneous peak flows from the catchment can be accommodated without overtopping the roadway. In addition, check dams will located along the course to intercept debris. Gabion baskets will be used along the new roadway to protect it from storm flows in the gully. Stones for the gabion will be sourced from the gully bedload deposits.

3.43. Cars entering the property will have to cross the gully to enter the property. Two options for the crossing are currently being discussed: either a bridge or a fording

(existing situation). This gully currently only has water after a heavy rain, so for most of the time, maintaining the fording will be most cost-effective.

Internal Roadways

3.44. As stated above, approximately there will be ~1400 m of new internal roads constructed in the course of the project. These roads will all be 7.3 m wide, so that they will allow for two lanes of traffic and parallel parking on the side of roads (for burials).

3.45. Roads will have a suitably-sized concrete drain on the down slope side of the roadway. These will be routed to the central pond using culverts.

3.46. The main entrance will be located in the same place as its present location as shown in Figure 2.

Drainage on property

3.47. The site falls within the basin of a tributary of the Montego River, the confluence with which is located near the intersection of the site access road with the main road. Two basins occur on the site. The sub-basin located on the western side of the property is entirely contained on site (Figure 6). The remainder of the site falls into a second larger sub-basin that extends off-site on the eastern side.

3.48. All of the core master plan area falls entirely within the western basin. The drainage lines shown on Figure 6 indicate ephemeral flow paths that occur only during storms. After development, it is expected that much of the sheet flows would be eliminated. Precipitation falling directly on vaults would infiltrate into the fill. Run-offs will not be allowed to travel across the burial lawns, and will be intercepted by dry perimeter swales. These drains will be planted with vetiver to assimilate excess nutrients. All other storm flows from roads, buildings and other areas will be routed to concrete storm drains that run parallel to the roadways.

3.49. Via these storm drains, all storm run-offs from the western basin will be routed to a central dual pond feature (Figure 6) using culverts, and impounded there. The remains of a concrete structure provide historical evidence that a small water catchment had been placed here to serve as a water supply for cattle. The proposed water feature will serve the functions of impounding storm water flows for the purposes of (a) preventing flash flooding downstream of the property (b) storing unchlorinated water for irrigation use in the landscaped lawns and (c) facilitating the aesthetic design of a circulating system between the upper and

lower pond, possibly using a replica of a stone aqueduct to transmit water between the two ponds and a waterwheel.

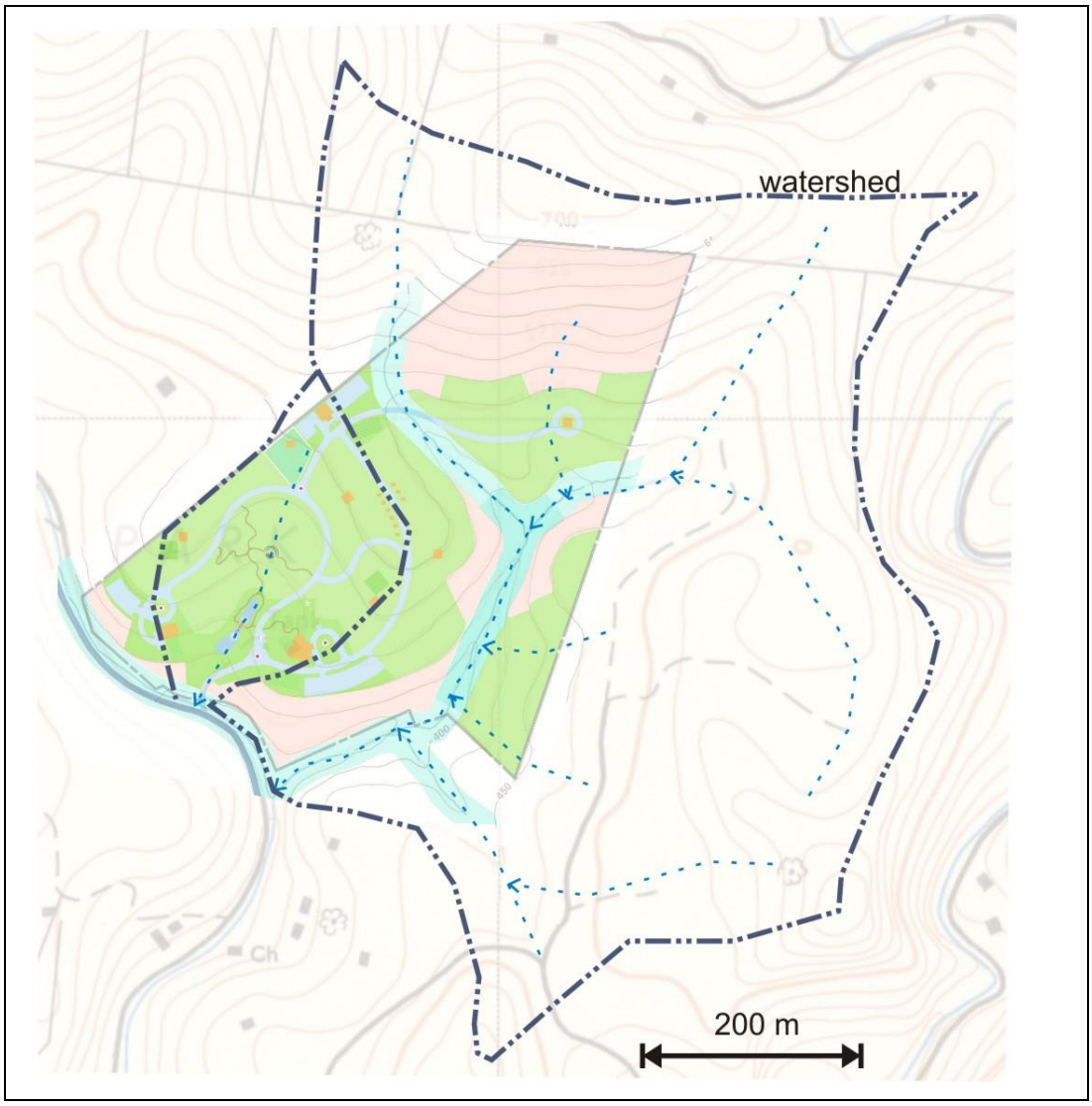


Figure 6 Drainage Basins at the Site

3.50. Based on peak discharge calculations for the eastern basin, the central ponds feature will be designed to accommodate at the least increase in storm flows for the 100 year peak discharge from the catchment arising from the development. The estimated capacity to accommodate this is 756 m^3. The ponds will be designed with a 40% overdesign factor, giving a total capacity of ~1060 m^3. Using this estimate, each of the two ponds will have a maximum depth of 2 m. The surface area will be roughly 260 m^2 (roughly 10 m by 26 m as shown on the Master Plan).

3.51. The pond system will be so landscaped that during drier periods, when the water level is very low, the lower basin can be allowed to dry out completely, and the pump circulating water between the upper and lower ponds will be turned off.

3.52. The eastern basin is the larger of the two basins. The gully associated with this basin only transmits storm flows, and is generally dry (ephemeral). The sides of the gully are near vertical in places, and comprised of well-cemented limestone bedrock.

3.53. The drainage plan for this system involves maintaining it in its natural condition with a 15 m buffer zone on either side. Consideration is being given to the creation of a detention basin along the lower course of this gully. The final position of this detention feature has not been determined. Based on the Master Plan, and the fact the post-development peak flows are not expected to be different from the baseline, a detention basin in this catchment is not entirely necessary. If a basin is desired (as a means of checking storm flows to the roadway gully, and to impound water for irrigation purposes), it has been estimated that a capacity of ~200 m^3 is required to keep the peak discharge at the pre-development level. However, given the dynamics of this catchment, small check dams would be effective in reducing the risk of flash flooding from this gully; and could serve to accommodate the post-development flows. It should be noted that almost all of the development proposed for this eastern catchment will occur after Phase 2.

3.54. As noted previously, all lands above the 525 foot contour on the property will be left in their natural vegetated state. Run-off from this area principally occurs as sheet flows. Burial lawns located in the eastern basin will have dry intercepts (swales) along their entire perimeter to prevent storm sheet flows from moving across them.

Landscaping

3.55. The entire facility shall be landscaped to enhance the feeling of serenity for family members attending funerals or visiting graves. The burial area and other areas will that are now under a mix of wild grasses will be planted with lawn grass (most likely *Zoysia* sp.) with edgings in different ornamental plants. This species is widely used as lawn grass in Jamaica, and is presently the dominant grass on the existing house plot. It is generally low maintenance (in terms of mowing) and drought tolerant.

3.56. To the extent reasonably practicable mature trees within areas slated for burials will not be removed as these will be relied upon to provide shade and improve the aesthetics of the site.

3.57. In fact, additional trees will be planted within the burial modules. It is unlikely that lawns beyond Phase 3 of the project will be developed as such within the next 100 years. Consequently, areas now slated as phases 4 and 5 burial areas (Figure 3) will be left in natural state until needed. With the removal of grazing animals from the property, it is expected that these areas will transition to a more natural vegetation assemblage, and will eventually become heavily wooded areas.

3.58. The Phase 4 burial areas include a small area immediate to the west of the proposed ponds, and a larger area on the north-eastern side of the gully. The Phase 5 burial areas include a small area around the amphitheatre and those sections of the property that lie across the eastern gully on the eastern boundary of the property. With this distribution, effectively, the lands north and east of the eastern gully are expected to become wooded areas in the next hundred years.

3.59. Lands at the core of the cemetery above the ponds (with the amphitheatre at the centre) will also become more heavily wooded. Figure 7 below shows how the existing tree line has been incorporated into this design, with walking trails meandering through the wooded area.

3.60. In areas zoned for burials where the land exceeds 6% slope, the slopes will be terraced as shown in Figure 4.

3.61. The wooded area above the 525 contour will not be developed. Buffer zones (including the riparian banks) shall be left in their natural condition and are expected to transition to a more natural assemblage when the grazing animals are removed from the property.

Figure 7 Core of the Master Plan over the Google Image

Impact Causing Aspects

3.62. Prior to commencing, it will be necessary to relocate the person who now lives in the existing house on the property. She will be relocated elsewhere on the property at the developer's expense. In addition, all informal grazing of cattle on the property will cease. This will allow for immediate control of the grass lice infestation problem. Vegetation clearance will only be done at sites where immediate construction will occur. As the entire site is fenced no construction screens or fences will be necessary.

3.63. The construction activities associated with the project are expected to commence immediately with the granting of the environmental permit and any other statutory approvals that are needed. Activities, resources and waste streams projected for the next 5 years are summarized in the Table 2.

Activity	Resources	Waste Streams & Nuisances
On-site construction of: • Reception Centre including parking lot and sewage system (to be completed in first 18 months after approvals). • Cremation Centre (within the first 3 years). • Chapel (depending on demand). • Ridge top mausoleums (depending on demand) • Amphitheatre (within the first 5 years). • Front wall (stone wall) with wrought iron gates **Material stockpiling** **Construction camp** **Transport of materials and labour**	• Construction materials: steel rebar, sand, cement, construction water, roofing tiles, paint, pvc pipes, electrical wires, wood beams, floor tiles, nails; • Furnishings: prefabricated doors and windows; air conditioners; furnishings. • Construction consumables (hammers, wheel barrows, galvanized zinc, etc). • Pervious paving stones or grass-crete for the parking lot. • Equipment Usage and fuel: excavators, graders; compactors, mixers, haulage vehicles • Construction labourers plus skilled workers (plumbers, electrician, windows and door specialists, roofers, tilers etc.). • Potable water for workers; • Construction camp site (for cooking, showers, portable lavatory); • Electricity for equipment like drills, sanders etc.	**Air & Noise Emissions** • Fugitive dust from bared soils, excavated materials, stockpiled materials and earth-moving equipment and haulage vehicles. • Diesel combustion emissions. • Noise from equipment and vehicles. **Effluents** • Sewage: from portable lavatories. • Construction site run-offs – construction water or storm water with possibly suspended solids that would run toward the existing gullies. **Solid Waste** • Construction camp wastes (packaging, Styrofoam containers etc). • Material used for equipment maintenance (detergents, oily rags etc.) • Excavated material – stone and marl. • Vegetative debris • Material from demolition of the existing house. **Nuisances** • Increased vehicular traffic along the parochial road to the site (slow moving haulage vehicles on a single lane).
• Internal roads and roundabouts • Curb drains • Parking lots • External roadway	• Marl and aggregate (from property); • Asphaltic concrete & cement • Construction water • Stone for gabion baskets • Steel mesh for gabions • Equipment: excavators, graders; compactors, mixers • Labour	
• Landscape amenities: trails, gardens, landscaped lawns, Central water feature. • Check dams on external gully • Detention basin on east gully • Check dams on the east gully	• Top-soil; • Ornamental plants; turf; • Boulders for stone walls, dams, or gabions. • Concrete blocks, sand and cement and steel for walls and stone features. • Water for landscaping • Equipment: excavators, • Labour	

Table 2 Construction Impact Causing Aspects

3.64. During the operation phase, the main activities that will occur on site include:

- On-going construction of burial vault modules.
- Grounds maintenance.
- Weekend interments (burials).
- Cremations two days a week.
- Reception services (including catering)
- Religious services/rites associated with burials and cremations.
- Visitor traffic (visiting graves or attending funerals).

3.65. Operational phase resource requirement include:

- Vault construction will require prefabricated concrete blocks, steel rebar, cement, sand, and construction water. In addition, fill material will be required to back fill vaults.
- Grounds maintenance will require periodic inputs of fertilizer, pesticides and irrigation water. To minimize the usage of these chemicals, drought tolerant locally adapted species will be used.
- Fuel may be required for lawn mowers and staff vehicles.
- Crematory resource requirements include LPG for the fuel, as well as compressed air. LPG will probably also be used for cooking at the Reception Hall.
- Potable water will be used in all buildings. Water demand in the Reception Hall is expected to be greatest as catered functions will be held there for parties up to 400 persons. Cooking will also be done at this site.
- Food supplies for receptions will be kept at the Reception Centre, along with other supplies for food service.
- Electricity will be required for all buildings, mainly for daytime lighting and cooling. Buildings will be so designed to minimize these demands. Electricity will also be required for the monitoring console of the crematory unit, and to run the compressor.
- Jobs that will be created include maintenance staff, and specialized staff to operatory the crematory. In addition, hospitality staff will be needed for receptions. Supervisory staff may be required for vault construction teams.

3.66. Operational waste streams include the following:

<u>Air Emissions:</u>

3.67. During the operational phase air emissions are expected to principally be associated with the crematorium. The following data are taken from US application reviews for two identical systems in the US for continuous operation. In the case of the Moor Park crematorium, an estimated annual maximum of 100 cremation days per year are expected, giving an estimated ~800 hours of operation per year. The estimated Potential to Emit (PTE) for the Moor Town crematory, using the same equipment, is calculated to be ~9% of the Missouri

emissions, and ~26% of the W. Virginia emissions (lower rate of operation). Together, these provide a range that can be used to estimate the PTE.

Pollutant	Missouri 2009[7] 8760 hours/year	W. Virginia 2010[8] 3,120 hours/year	Moor Park (est.) 800 hours/year	Air Quality Regulation (1st Schedule)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$)	0.29	0.35	0.03 to 0.09	25 (plus 15 PM_{10})
Sulfur Dioxide (SO_2)	0.67	0.44	0.06 to 0.11	40
Oxides of Nitrogen (NO_x)	0.02	2.85	0.002 to 0.73	40
Volatile Organic Compounds (VOCs)	0.02	0.02	0.002 to 0.005	40
Carbon Monoxide (CO)	0.07	0.06	0.006 to 0.015	100
Mercury	0.014		<0.002	
Hydrogen Chloride (HCL)	0.03	0.23	0.003 to 0.059	40

Table 3 PTE Estimates (in tonnes per year) for the Crematory

3.68. The table also gives the NRCA Air Quality Regulation (1st Schedule) maximum allowable PTEs. Based on an estimated annual PTEs even at peak operational capacity (8760 hours), this facility is not classified as a "Significant Facility" or "Major Facility" as defined under the NRCA Air Quality Regulations 2006 and hence does not require an Air Pollutant Discharge License.

3.69. Test results for stack emissions for the same unit that were provided by the manufacturer[9] for use in this EIA are given in Table 4.

3.70. The W Virginia (2010) report indicated that the unit emitted only traces of non-criteria pollutants, including: acetaldehyde, arsenic, antimony, beryllium, cadmium, chromium, copper, formaldehyde, hydrogen chloride, lead, and mercury. In most states in the US, the crematory would be subject to 20% opacity (visible emission) limitation. Based on the available emissions data, the unit is expected meet this requirement, as the secondary chamber further combusts any particulate matter that is present in the exhaust stream.

[7] Review of the Application for a Permit to Construct. State of Missouri, Department of Natural Resources Missouri Air Conservation Commission. Permit Number 032009-01 issued to McCombs Funeral Home and Cremation Center. The application was made for the installation of a Power-Pak II Mathews Cremator. March 20, 2009

[8] West Virginia Department of Environmental Protection Division of Air Quality. Engineering Evaluation/Fact Sheet. Application No. R13-2860. Applicant Smith Funeral Home Inc. Application to construct and operate one crematory dedicated for human remains.

[9] Horizon Engineering 2003 Source Evaluation Report for the Longview Memorial Park Crematory, Longview Washington. Project No. 1917.

Crematory Unit Test Results				
Test Date: January 15, 2003	**Units**	**Run 1**	**Run 2**	**Average**
Start Time		12:26	16:11	
End Time		14:31	18:18	
Sampling Time	minutes	120	125	123
Sampling Results				
Particulate Conc.(Actual)	gr/scfd	0.006	0.007	0.007
Conc. @ 7% O_2	gr/scfd	0.010	0.011	0.011
Permit Limit 7% O_2	gr/scfd			0.025
Particulate Rate	lb/hr	0.03	0.04	0.04
Opacity	%	0	0	0
Sample Volume	dscf	34.5	34.5	34.5
Sample Weight, Total	mg	13.9	16.0	14.9
Percent Isokinetic	%	111	103	107
O_2	%	12.0	12.2	12.1
CO_2	%	5.3	5.3	5.3
CO Concentration	ppmv	4	3	4
Rate	lb/hr	0.01	0.01	0.01
NO_x Concentration	ppmv	--[1]	70	70
Rate	lb/hr	--	0.3	0.3
SO_2 Concentration	ppmv	9	9	9
Rate	lb/hr	0.06	0.05	0.06
Source Parameters				
Flow Rate (Actual)	acf/min	1,970	2,050	2,010
Flow Rate (Standard)	dscf/min	614	634	624
Temperature	°F	1,108	1,110	1,109
Moisture	%	9.2	9.9	9.6

[1] Due to a problem with the analyzer during Run 1, the NO_x data was not recorded. Vanessa McClelland of SWCAA was notified of the situation and assured the testers that Run 2 NO_x data would suffice.

Table 4 Stack Emissions Data for the same crematory unit

3.71. According to Mari and Domingo (2010)[10] the air toxins of greatest concern with crematories are polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDD/Fs), and mercury. The generation of PCDD/Fs occurs as a result of combustion of chlorinated products such as plastics. These plastics may form part of the container for the body or may occur in prosthetics or clothing. Dioxin may also be produced from small amounts of chlorine in the body[11]. Dioxins are created on soot particles which will be effectively removed by incinerated in the second chamber. The table above shows the estimated maximum emission rate

[10] Available online at: http://no2crematory.files.wordpress.com/2011/01/toxic_emission_from-_crematoriesenv-intl.pdf

[11] http://www.ees.ufl.edu/homepp/cywu/ENV4121/Project2001/Crematory/Pollutants.htm#Diox

from this equipment for mercury is less than 0.014 per year. However, this number will be a function of the amount of mercury present in dental amalgams in the bodies as well as the number of bodies being cremated.

3.72. Although air pollutant levels are expected to be negligible, the heated emissions from the stack could be ~600 C with flow rate of 1 m^3/sec (57 m^3 per minute or 2000 cubic feet per minute) for the duration of a cremation cycle (2 to 3 hours).

Noise

3.73. Operational noise sources include the crematorium, excavators, lawn mowers and vehicular traffic. Crematory noise includes furnace, air compressor, fans, emergency generators, and pulverizing machine. Typical noise levels within the crematory during operation are not expected to exceed 85 dBA (ENSR, 2009). As described above (3.27) this unit is equipped with a noise abatement shield to reduce the noise emanating from the furnace chambers. In addition, the entire unit will be fully enclosed within a concrete room, there will be a further 20 dBA reduction in the noise level from the crematory.

3.74. Additional sources of noise at the facility include air conditioning noise from the buildings and break-out noise from the chapel or noise generated during particular funeral rites.

Sewage

3.75. Sewage generated at the Reception Centre during peak use times (400 persons at the site for a maximum of 3 hours), assuming each person flushes once, and 10 liters per toilet is not expected to exceed 4,000 liters per day (1,057 gallons). Sewage generated at the Chapel and Cremation Centre is expected to be less than this amount, and will be treated via septic system and tilefield within proximity to each facility.

Leachate

3.76. The main waste stream from the cemetery is the decomposing material (fluids and solids from the bodies and materials from the coffin/casket). Each grave will contain one body, which typically will breakdown to 75% water. A range of

naturally occurring salts will be dissolved in this water, along with any embalming chemicals that have been used.

3.77. Formaldehyde is used as part of the embalming fluid. Approximately 0.6 to 0.85 l of this fluid is used per body. The solution contains approximately 36% formaldehyde. Therefore, the typical amount of formaldehyde that will be used per body is ~310 g, which gives a maximum concentration of ~6.2 g/l at the source. Dissolved formaldehyde quickly breaks down to formic acid and carbon monoxide[12,] and is not environmentally persistent. All material from the body can be effectively contained within the grave (with a total volume of 1.8 m^3) and the fluids are expected to slowly leach out from the bottom of the pit to the surrounding bedrock.

Solid Wastes

3.78. Solid waste produced by the facilities is expected to be negligible and variable with the size of funeral parties. It can be estimated that at peak solid waste generated by a funeral party may be of the order of 1 kg per person inclusive of food and beverage wastes. Assuming that there are 100 functions per year (2 per weekend for 50 weeks), each with 200 people on average, it can be estimated that the Reception Centre will produce ~2000 kg of solid waste per year.

3.79. Aside from funeral services some minor wastes will be generated by flowers placed at graves and landscaping. Of these only plastic ribbons, plastic containers and florists wires may not be biodegradable. Non-biodegradable components of arrangements left at graves will be collected and disposed of along with solid waste generated in the buildings. Non-biodegradable solid waste will be transported off site on a routine basis by a licensed waste haulage operator to an approved land fill. It is difficult to estimate this volume of waste or the rate of generation for this. It is unlikely to be more than half a kg of non-biodegradable per year per grave, and it is unlikely that more than 500 graves per year will be left with flowers (assuming 100 new burials per year). This is therefore conservatively estimated to be 300 kg per year.

3.80. Rock and marl will be generated from the excavation of the vaults, as well as the clearance of the storm gullies, and creation of the ponds. The marl will be used as fill to backfill the constructed vaults. All of the stone that is generated will be

[12] http://www.atsdr.cdc.gov/ToxProfiles/tp111-c1.pdf

utilized on property in various projects, including the construction of dry stone walls in the terraced burial modules, gabions to protect the riparian banks, check dams and other stone features. None of the earth materials generated onsite will be disposed of offsite.

3.81. Vegetative waste from landscaping will also be generated. All vegetative waste will be composted and recycled on property.

3.82. Ash waste are normally sealed in an urn and given to the family or reposited on site in the columbarium wall.

SECTION 4: LEGAL AND INSTITIONAL FRAMEWORK

4.1. This section of the EIA seeks to provide a general outline of the legal and administrative controls that may govern the proposed development during construction and operational phases.

Development Control

Planning Controls

4.2. The Rural Physical Planning Division of the Ministry of Agriculture is responsible for the declaration of agricultural zones in the 1996 National Land Policy. The purpose of this was to protect arable lands against fragmentation and uneconomic uses. Although the site is not specifically zoned for agriculture, it is located in proximity to agricultural lands, and has been historically used as pasture. The proponent has advised the RPPD in writing of the proposed change in land use from disused pasture to cemetery.

Cemeteries (Burial Areas)

4.3. This document is submitted in compliance with NEPA's Permitting and Licensing System. Cemeteries and crematoria are listed amongst the project requiring environmental permits in Jamaica in the Natural Resources (Prescribed Areas) (Prohibition of Categories of Enterprise, Construction and Development) Order, (1996). Sections 9 and 10 of the Natural Resources Conservation Authority (NRCA) Act make provisions for Environmental Impact Assessments (EIAs) to be conducted for projects falling within the schedule of prescribed activities. Cemeteries are generally analogous to landfills and golf-courses, in terms of the nature and scale of the potential environmental impact on the environment.

4.4. NEPA is guided in its decision-making process by input from relevant agencies and stakeholder concerns. The Water Resources Authority (WRA) plays a major role in advising NEPA in respect of environmentally sound siting of cemeteries. WRA Guidelines stipulate that places of interment should NOT be located:

i. On lands that **flood-prone** (within a 100-year floodplain) or have the potential to pond water (slopes <2% or enclosed depressions). WRA also

specifies that the drainage design for the cemetery should allow for interception of any sheet or channels flows before they cross the burial area, and for run-offs generated on site to be efficiently conveyed off-site into receiving drains of adequate capacity so that there would be no downstream flooding.

ii. Where there is a potential to **negatively impact water resources**. WRA specifies that cemeteries should not be situated within Critical Recharge Areas or where there are potentially conduits to the water table (e.g. brecciated fault zones) or where the base of the graves can be within 1 m of the highest water table. The WRA also set general recommendations for the cover and base of the vault; however, these are guidelines that can be modified by the WRA, in its discretion, upon consideration of the various hydrogeological factors and risk.

4.5. The WRA also prescribes the following **buffer zone widths** (from the perimeter of the burial areas):

- <250 m from any spring or watercourse;
- <500 m away from any production well;
- 500 m up-gradient of any wetland, estuary or shoreline.

These buffer widths are generally consistent with those issued by the World Health Organization (Ucisik and Rushbrook, 1998). However, the WHO stipulates that the prescribed buffer widths may be increased if there is a "*steep hydrogeological gradient or the velocity of groundwater flow within an aquifer is rapid".* WHO also recommends a minimum buffer zone of 10 m from drains, and 30 m from springs or watercourses where potable water is not drawn (compared to 250 m where potable is drawn).

4.6. The Public Cemetery Management and Regulation Act 1894 pertains to public cemeteries on lands vested in the Parish Council, and therefore does not relate to the development of private commercially operated cemeteries. It is instructive that Section 6 requires that cemeteries be enclosed, and that the cemetery drainage and sewage be maintained such that it remains dry. Section 19 requires that a detailed burial plan of the cemetery be prepared with each grave plot numbered, so that a registry of burials could be maintained in accordance with Section 20. This is also reiterated in the Rules (Section 12) Section 21 stipulates that it is unlawful to disinter a body without a license from the Chairman of the Local Board of Health (Western Regional Health Authority).

4.7. The Rules made under this act for each parish also pertain to primarily Public Cemeteries. The Rules (Section 9) are also instructive in that they stipulate the minimum dimensions of the grave plots for adults to be 6 feet deep by 7 feet long by 2.5 feet wide. The lots in which graves are placed are stipulated in Section 10 to be not less than 8 feet long by 4 feet wide. This suggests that individual graves would not share a wall. Section 21 of the Rules required that coffins should be covered by a 6-inch layer of concrete within 24 hours of burial in a vault. Alternatively, the coffin could be "*enclosed in a separate cell or receptacle which shall be constructed of slate or stone flagging, not less than two inches in thickness and properly jointed in cement or other brick work in cement, in such manner as to prevent as far as may be practicable the escape of any foul smell or noxious exhalation from the interior of the cell or receptacle into the cemetery."*

4.8. The Burial Within Towns' Limits Act (1875) establishes the requirement for a license from the local Board of Health (Western Regional Health Authority) to have a private burial within the limits of any town or village (Section 8). This law also establishes a 3.5 feet (~1 m) soil cover requirement over the coffin.

4.9. The Environmental Health Unit (EHU) of the Ministry of Health also has the responsibility for the review and approval of the design of the cemetery development plan.

Crematoria

4.10. Aside from the NRCA Act which establishes the environmental permit requirement, the main national legislation governing crematoria in Jamaica is the Cremation Act (1951). Under this Act, the construction and operation of a crematorium requires a license issued by the relevant Parish Council (St James Parish Council). Section 5 of this statute indicates that the Parish Council has to approve the site and plans for the crematorium, and further sets out the following buffer limits:

- 200 yards (183 m) from any dwelling house (unless the owner, lessee or occupier gives consent in writing for a closer location)
- 50 yards (46 m) from any public thoroughfare.

4.11. According to this law, cremation of any human remains also requires an order from the coroner or constabulary in the parish. Section 32 of the Registration (Births and Deaths) Act (1881) also requires authorization (Registrar's Certificate or Order) for burial of a body.

4.12. Other public agencies may play a role in regulating the crematorium. These include the Jamaica Fire Brigade, to which a proposal for the installation of the incinerator should be submitted for approval, along with the flue height and details on the planned disposal method for ashes.

4.13. The Environmental Health Unit (EHU) in the Ministry of Health reviews proposals for crematoria in terms of the design, maintenance plan and potential for air pollution to affect public health.

4.14. In the absence of national design requirements for crematoria to ensure environmental protection, the New York Code of Rules and Regulations pertaining to crematoria[13] are cited below, and may be instructive in management of the proposed facilities.

> *(a) Furnace design must provide for a residence time for combustion gas of at least one second at no less than 1,800°F. For a multichamber incinerator, these parameters must be met after the primary combustion chamber and the primary combustion chamber temperature must be maintained at no less than 1,400°F.*
>
> *(b) Auxiliary burners must be designed to provide combustion chamber temperatures as described in subdivision (a) of this section by means of automatic modulating controls.*
>
> *(c) Mechanically fed crematories must incorporate an air lock system to prevent opening the crematory to the room environment. The volume of the loading system must be designed so as to prevent overcharging to assure complete combustion of the charge.*

Construction & Infrastructure

General

4.15. The applicant is required to submit a full set of plans for the proposed buildings and site development to the St. James Parish Council (SJPC) for approval, in accordance with the Parish Councils' Building (PCB) Act (1952) and the Town and Country Planning (TCP) Act (1958 amended in 1993 and 1999), and the 1982 St James Development Order. Plans are submitted in duplicate indicating the type of building, location, method of construction, drainage and water supply.

[13] http://www.dec.ny.gov/regs/4239.html

Standards for drains, sanitary waste, cesspool construction, absorption pits are included as schedules to PCB Act. Plans for the buildings, crematorium, roadway, drains and sewage disposal solution will have to be submitted to the Parish Council for approval.

Roads and Drainage

4.16. The National Works Agency (NWA) is responsible for reviewing the development proposal and approving any proposed road or drainage works, particularly as they tie in with pre-existing municipal roads and drainage systems. The NWA ensures that the storm water runoff from the site conforms to an approved drainage plan and that the roadway design (entrance/exit point) from the cemetery to the parochial road is safe. The developer will require permission from the NWA to upgrade the public roadway between the cemetery entrance and the main road.

4.17. The Water Resources Authority (WRA) has the mandate to regulate and manage flood water control. The NWA, however, maintains responsibility for approving and regulating drainage designs in terms of surveys, civil works and clearance.

Sewage Disposal

4.18. The Environmental Health Unit (EHU) of the Ministry of Health is responsible for the review and approval of the design of any proposed sewage treatment and disposal solution. Given the very small scale of the proposed tilefield, it is not expected that an NRCA Environmental Permit will be required as NEPA's policy is not to require such for the construction of small sewage solutions that treat domestic waste to a secondary level, or a license to discharge treated effluent from such.

Water Supply

4.19. The connection to the municipal water supply mains and the supply of potable water from the mains is controlled by the National Water Commission (NWC), in accordance with the NWC Act.

Pollution Control

Air quality

4.20. The project is expected to impact on air during the construction phase through the generation of fugitive dust from bare construction areas, stockpiles and haulage routes, and during the operational phase through emissions associated with the periodic (maximum twice a week) use of the crematorium. The now outdated Clean Air Act (1964) regulates air pollution. Section 6 requires landowners to prevent the escape of noxious or offensive gas into the air, where such is defined as emanating from the following kinds of works: alumina, cement, lime, petroleum, gypsum, power generation station, or sugar factory.

4.21. The NRCA Air Quality Regulations (2002) establishes an air pollutant licensing system for all facilities having air pollutant sources falling within specific categories. Although the Fourth Schedule does not specifically include crematoria, biomedical incinerators are listed amongst the categories. However, the proposed crematorium does not qualify as a "major or significant facility" as defined in the Regulations, and therefore does not require an air pollutant discharge license.

4.22. The following is suggested as a guide for crematoria emissions[14] in the absence of national standards for crematoria.

- Particulate emissions should be <0.1 gr/dscf (grains per dry standard cubic foot[15]) flue gas, corrected to 12% carbon dioxide. The NYSDEC recommends 0.08 gr/dscf corrected to 7% oxygen.
- Visible emissions should have an opacity <10% averaged over 6 consecutive minutes. Complete (100% opacity) means that nothing can be seen through the exhaust.

4.23. The NYDEC also recommends the following:

- No waste other than that associated with human cremation should be incinerated in the unit. This includes solid waste, medical waste, radioactive and hazardous wastes.

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[14] *deq.mt.gov/AirQuality/ARM**per**mits/3882-00.pdf - Air Quality permit for a 2007 Mathews Division Human Crematory and associated equipment*

[15] 1 pound (453.6 g) is the equivalent of 7000 grains. Therefore, 1 g is the equivalent of 15.5 grains.

- The following materials should not be incinerated along with the body: fibreglass, plastics, narcotics or pharmaceuticals.

Ambient Noise

4.24. The proposed cemetery and crematorium may generate noise during the construction and construction phase, which would be limited to daylight hours. The main legislation for the control of noise in Jamaica is the Noise Abatement Act (1997). This Act prohibits the operation of operating noise amplification devices in such a way that could cause a nuisance to persons in the vicinity. The NRCA environmental permit for the Burnt Ground Cemetery (Hanover) stipulated that noise from the site boundaries was not to exceed 70 dB at any time.

Public Health

4.25. It is expected that this EIA will be reviewed by the EHU of the Ministry of Health, which administers the Public Health Act (1985) along with the Central Health Committee. It is not anticipated that the project will generate any waste streams or local conditions that would endanger public health. No food will be stored, prepared or sold on property. The developer may include a banqueting hall, to which catered food might be brought.

Effluent Discharges

4.26. Sewage effluent discharge into a tilefield the main effluent expected to be generated by the proposed operations. The NRCA Sewage Effluent Standards indicate the maximum levels of nitrates (10 mg/l), phosphates (4 mg/l), Biological Oxygen Demand (20 mg/l), Total Suspended Solids (20 mg/l), and faecal coliforms (1000 mg/l) at the discharge point.

Solid Waste and Landfill Management

4.27. The National Solid Waste Management Authority (NSWMA) is the public authority responsible for solid waste management in Jamaica, under the National Solid Waste Management Act, 2001. If municipal collections services are not available in this area, any private contractor that is hired to collect solid waste

from the property will be required to have a solid waste license issued under this statute.

Environmental Conservation

Water Resources

4.28. The Water Resources Authority (WRA) administers the Water Resources Act 1995, which regulates the allocation and preservation of water resources in Jamaica. WRA also implements the Water Sector Policy Strategy/Action Plan (Ministry of Water, 1999), which addresses water resource management, urban water and sewerage, rural water and sanitation, urban drainage and irrigation. There are no surface water resources or wells or springs within 500 m of this site.

Wildlife and Biodiversity

4.29. The main wildlife found at the site includes birds and reptiles. Under the Wild Life Protection Act all birds except those in the 2nd Schedule (see Appendix 8) are protected by law. Other terrestrial species that are protected in the Wildlife Protection Act include one species of mammal (Coney), two species of butterflies (Giant Swallowtail Butterfly, Jamaican Kite Swallowtail) and two reptiles: iguanas and the Yellow Snake (*Epicrates subflavus*). The IUCN lists the Yellow Snake as vulnerable (1996).

Heritage and Cultural Resources

4.30. No heritage or cultural resources are no from this site. In the event that some artefact is uncovered during site development, the Jamaica National Heritage Trust (JNHT) is the agency to which the find should be reported. The JNHT was established by the JNHT Act (1985) for the purpose of safeguarding national monuments and places of national heritage.

SECTION 5: DESCRIPTION OF THE ENVIRONMENT

5.1 The purpose of this section is to describe sensitive environmental receptors in terms of pre-project status and trends (if the project is not implemented). This therefore is expected to provide:

a) A baseline against which predicted environmental change can be measured. Any future monitoring data can be compared to these baseline parameters to determine whether and how a project is actually impacting specific receptors.

b) An evaluation of contributions to environmental degradation from other sources (or cumulative impacts), and the carrying capacity of the environment in respect of specific stresses. This will also allow for some level of discrimination between future effects of the project from other sources of environmental change to these same parameters.

Physical Environment

Climate

5.2 The site is located at 18.45 N latitude and is less than 8 km south of the coast. It is separated from the coastal plains by a line of limestone hills approximately 4 km north of the site. These hills reach a maximum elevation of ~415 m above mean sea level (amsl); this divide represents the northern boundary of the watershed for the Montego River catchment. The site itself is located at an elevation of ~150 m amsl. This latitude and situation gives the site a tropical maritime climate with dominant northeast trade winds. The meteorological data for the Sangster International Airport (SIA) located 10.5 km to the north west of the site is considered generally representative.

5.3 Mean annual rainfall for the site is estimated to be 1500 mm/a. Rainfall is strongly seasonal with two wet seasons, in May-June and September-October. Seventy per cent (70%) of the precipitation falls in the two wet season with a primary peak in October and the secondary in May. There is a marked dry season during the months of January and March.

5.4 Mean annual temperatures for the SIA (National Meteorological Service data, 1951-1980) range between a low of ~21 C in February to a high of ~31 C in July.

Diurnal temperature ranges are not greater than 8 degrees on average throughout the year.

5.5 Annual wind speeds and directional variations[16] are shown in Figure 8 below (2010 data). Prevailing wind direction is generally from the east, and north-east. Although wind velocities generally below 3 m/s, wind speeds tend to be higher in the cooler months between November and May, when wind speeds tend to more frequently exceed 5 m/s.

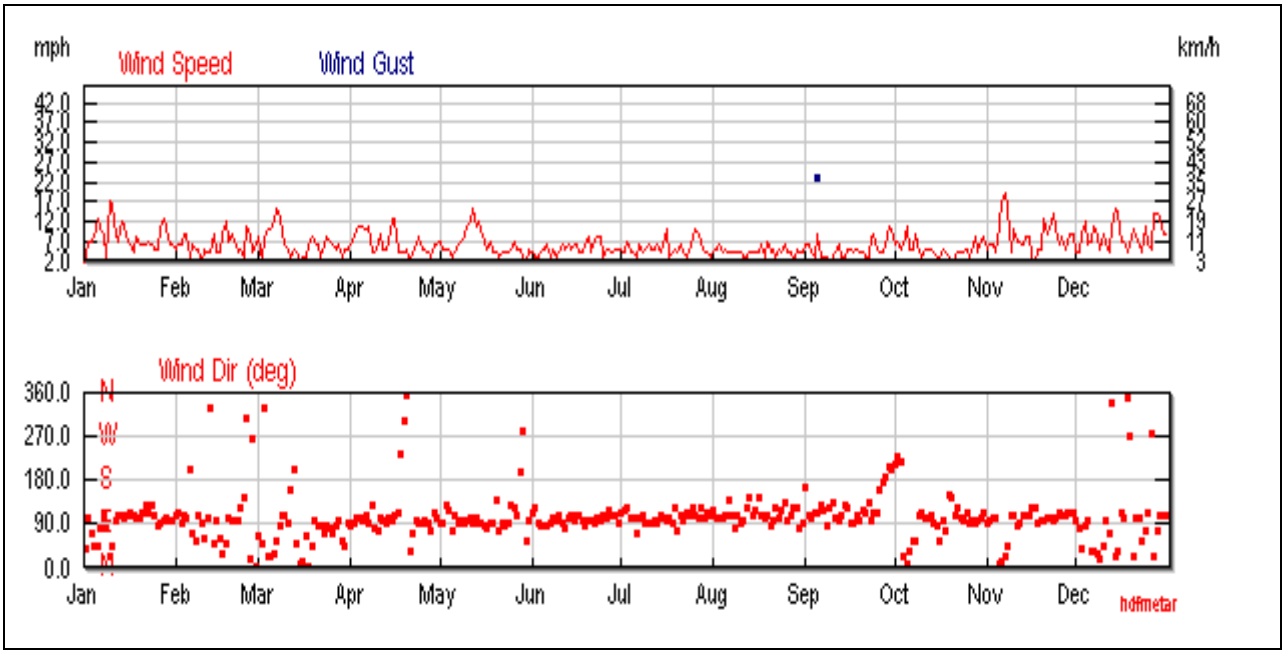

Figure 8 Meteorological Parameters for Montego Bay Airport (2010)

Source: wunderground.com

5.6 Ambient air quality and noise levels in this area are a function of land use. The area is generally rural with pasture lands, wooded areas and sparse rural settlements. The major existing source of emissions in proximity to the site is the main road between Adelphi and Montego Bay. Large cane haulage trucks use this route (from Queen of Spain Valley), and are the major source of exhaust emissions, fugitive dust and engine noise.

[16] Source:
http://www.wunderground.com/history/airport/MKJS/2010/1/1/CustomHistory.html?dayend=31&monthend=12&yearend=2010&req_city=NA&req_state=NA&req_statename=NA

Geomorphology

Site Features

5.7 The property consists morphologically of 3 distinct sections.

- Plateaus (wide ridges with flat tops denoted on Figure 9). Two of these ridges are found in the south western quadrant of the property, and a third is found on the eastern side above the gully. These ridges are the remnant of a regional erosion plain with a base level at approximately 150 m (500 feet). It is on that same plain that Glasgow Great House property and the Dovecot cemetery have been established. The narrow strip of land across the channel along the eastern section of the property is part of the same base level that continues on the adjoining property.

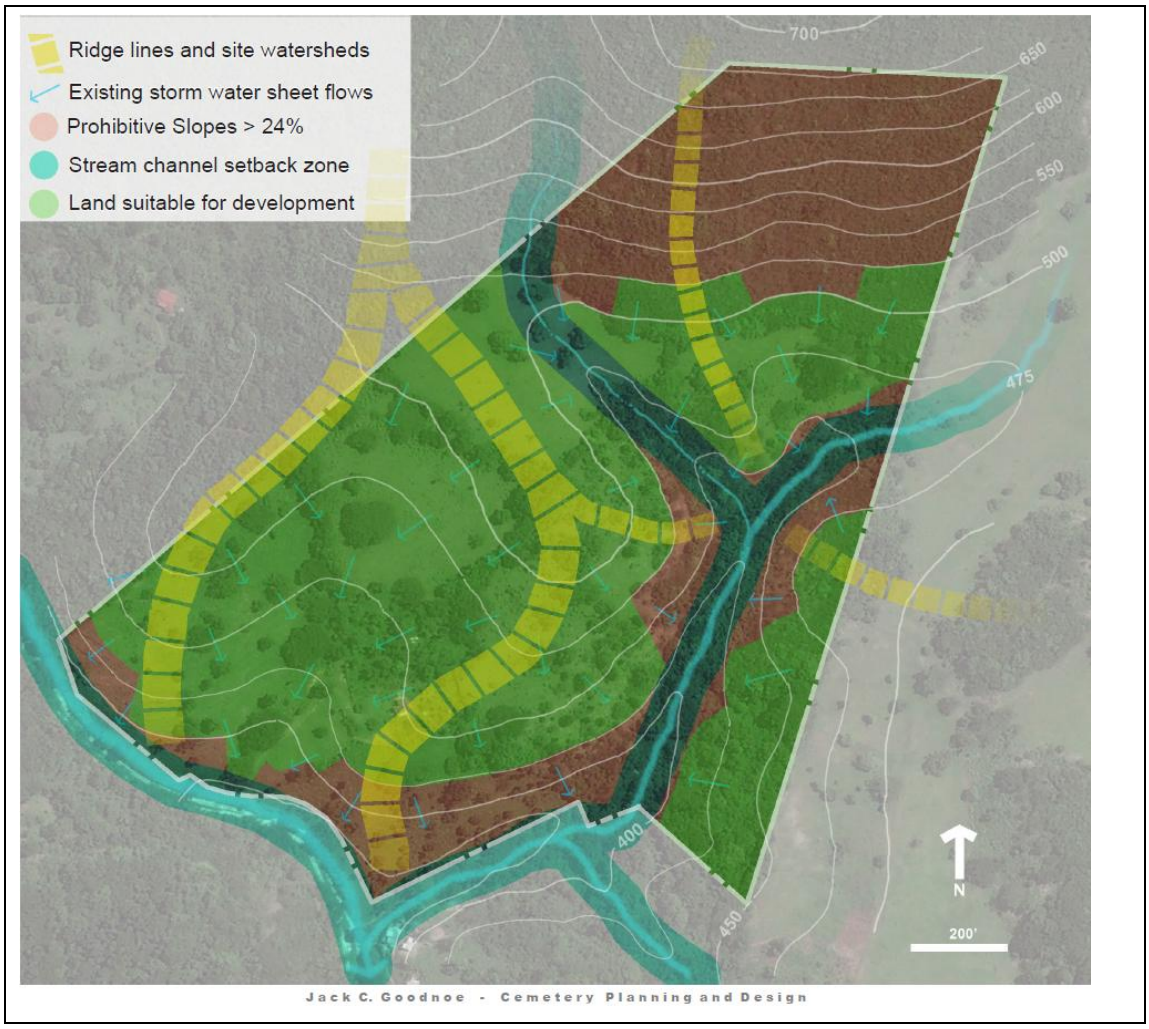

Figure 9 Geomorphology of the Site

- The steep slopes (>24%) of a limestone hill which forms the wooded upland in the northern section of the property at elevations generally above 160 m (525 feet) above mean sea level (amsl). Within the property boundary, this unit reaches a maximum elevation of 206 m (675 feet) amsl.
- The relatively incised channel in the eastern section of the property. This feature is typical of the landscape at or below the 150 m (500 ft) base level, which is characterized by fluvial erosion and ephemeral dry gullies.

Surface Drainage

5.8 The site is located in the watershed of the Montego River which flows in a generally East- West direction. The front of the property is defined by the N-S oriented Moor Park gully. The Moor Park Gully watershed has a total area of 188.2 hectares and makes up 1.8% of the Montego River watershed. The north-south flowing Moor Park gully is an ephemeral stream which carries only water during and shortly after heavy rainfall. The Moor Park Gully merges with Slippery Gut, a tributary of the Montego River, near the main road from Montego to Adelphi. In its lower reaches the Gully has a cross-sectional area of 6 m^2.

5.9 Two sub-basins of the Moor Park Gully watershed occur on the site. Catchment 1 (5 ha) is located on the western side, and Catchment 2 (41.6 ha) is located on the eastern side (Figure 10). Catchment 1 accounts for less than 3% of the Moor Park Gully watershed (which connects to a major tributary of the Montego River along the Main Road), while Catchment 2 accounts for 22% of it. The two catchment basins are characterized by a normal surface drainage regime. Although the area is underlain by limestone, solution drainage (karst) is not developed.

5.10 The West Catchment (Catchment 1) has a tree cover over ~ 7%. Except for the small stand of trees near the farmhouse, the trees forming the fence-line and some scattered food trees, the Catchment 1 consist almost entirely of pasture land which is used for the grazing of a small herd of cattle and goats (approximately 10 heads each). The main channel in this catchment is shallow, not very well defined and has an equal area slope 16.9%.

5.11 The East Catchment (Catchment 2) has a tree cover over approximately 55%. The tree cover shows clearly the impact of development pressure and human disturbance. The forest cover in the areas adjacent to the gullies consists of

secondary forest and in the upland of degraded primary dry limestone forest. The remaining of catchment consists of pasture land. The cross section of the lower half of the main drainage channel is steep and V-shaped but it becomes gradually shallow and poorly defined in the upper reaches. The channel has an equal area slope of 10.3%. Less than a third (29%) of Catchment 2 is within the control of the developer.

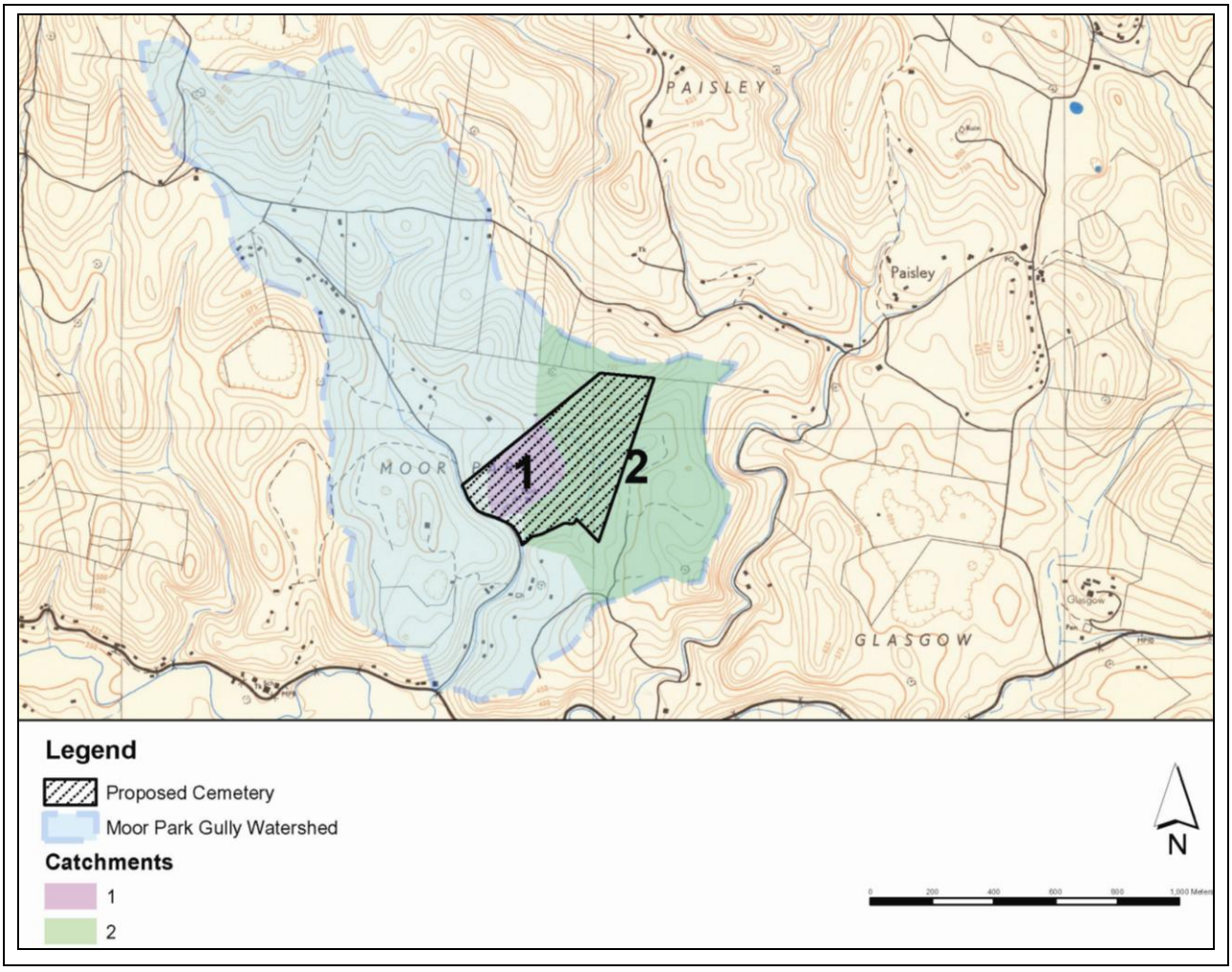

Figure 10 Moor Park Watershed

5.12 The runoff coefficients calculated for each phase of the development and for each return period were entered in the Rational Formula with the respective rainfall intensities (Appendix 9). The baseline peak discharges for both catchments are given in Table 5 below.

RETURN PERIOD	10Y	25Y	50Y	100Y
Catchment 1	2.24	3.01	3.73	4.35
Catchment 2	10.10	13.55	16.44	19.01

Table 5 Peak Discharges (m^3/sec) Before Development Scenarios

5.13 Although the main road to Adelphi near Moor Park has been listed as prone to flash flooding, the site itself is not flood prone. There is evidence of flooding (overtopping of the road) along the parochial road that leads to the site from the main road; this is likely to be as a result of low rates of infiltration in the catchment (producing flashy responses to storm events), and insufficient capacity in the storm drain that runs along the road.

Soils and Geology

5.14 The bedrock on the site consists of well-bedded and moderate jointed white chalky limestones of the Montpelier Formation. The deposits shows a fair amount of recrystallization along the bedding and joint planes. Similar recrystallization appears to have taken place at the soil rock interface and formed a duricrust which occur throughout the property. This recrystallization makes the rocks appear to be harder than they really are. The chalky material in the rock mass between the recrystallized joints, fractures and bedding plane is in fact just soft enough to be scratched with a fingernail. The same recrystallization is probably also responsible for the low hydraulic conductivity of the deposits.

5.15 The Montpelier Formation deposits dip in a general northerly direction and are part of the southern limb of a syncline with an East-west axis dipping to the west. A major east-west trending fault system which is part of the Duanvale Fault system defines the Montego River valley from Fairfield to Adelphi. The alignment of the road from Montego Bay to Adelphi coincides with the Northern branch of this fault system.

5.16 In this area this fault juxtaposes the Montpelier Formation with the underlying the Gibraltar Bonny Gate formation. The Gibraltar Bonny Gate formation consists in this area of cream-white hardened chalk interbedded with impure bioclastic calcarenites. The Gibraltar Bonny Gate formation is considered a transitional facies with the Yellow limestone but is in this area difficult to distinguish from the Montpellier.

5.17 In general the slopes comprised of the Montpelier limestone are very stable and not prone to landslides Terracing of steep slopes will further increase stability.

5.18 A Resistivity Survey was conducted at the site using a Schlumberger array (Lyndon Brown, 2011). Nine survey lines were done along the flattest surface of the site as shown in Figure 11 below. The maximum depth that could be determined using this method was 31 m.

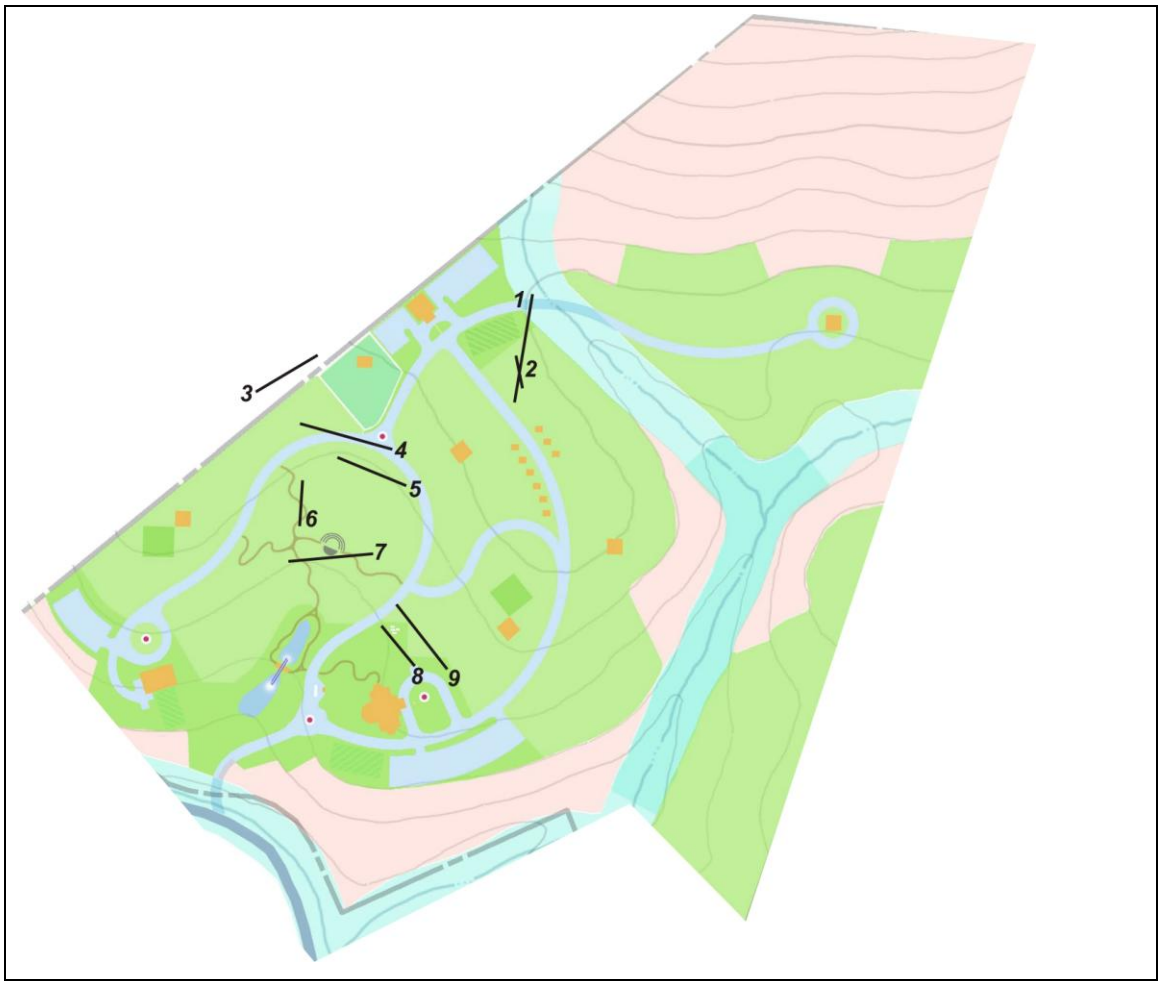

Figure 11 Resistivity Survey Lines

5.19 Three layers were found based on the apparent resistivity values: a soft limestone (highly weathered limestone mixed with soil), a fractured limestone, and a hard (unweathered limestone). The soft limestone was overlain by a cover material ranging between 1.3 m and 5 m, with an average depth of ~1.5 m for most of the lines. Relatively thicker covers were found along Line 1 (5 m) and Line 9 (2.5 m). Line 1 was located near the proposed Chapel site, and Line 9 was located on the proposed burial lawns just north of the Reception Centre site. This

is also an area that has been previously cultivated Field evidence suggests that this relatively softer stony limestone is overlain by a case-hardened limestone crust.

5.20 Layer 1 (fractured or soft limestone) had thickness varying between 5 m (Lines 2, and 7) and 15 m (Lines 1, 3 and 5). Based on this finding, it is unlikely that hard unweathered bedrock (Layer 3) will form the base of the constructed vaults. Field observations suggest that this layer is a chalky marl.

5.21 The survey further found that:

a) "*There is no evidence that the unsaturated zone was reached in the maximum contrasting boundary of hard limestone at 31 metres. The depth to this layer can therefore be interpreted as an unsaturated or vadose zone. It can also be inferred that the phreatic zone or saturated zone is below 31 metres*."

b) "*Fault trend could be inferred from two points along the property; however, there were no obvious variation or trend in the apparent resistivity values that could imply that these fault trends are conduit for groundwater at the maximum depth observed."*

5.22 Additional information on the soils on property comes from the trenches that were dug for percolation testing (Appendix 10). These pits had dark brown clay topsoil with abundant stones, with thicknesses ranging between 25 cm and 43 cm. This was underlain by chalky limestone, which probably forms part of the material identified overlying Layer 1 in the resistivity survey. These brown clay soils are not transported but developed in situ over limestone. In general, they are thin and stony with a high erosion hazard.

Seismicity

5.23 Jamaica is located in a tectonically active area, and this site in particular is located just north of the Duanvale Fault Zone, which is a major regional strike slip fault. Most earthquakes in recent times have affected the eastern part of the island more severely than the western side. The most damaging earthquake to affect western Jamaica occurred March 1, 1957.

5.24 Figure 12 shows a map generated from a search at the USGS NEIC database. All of these events are very shallow. The nearest epicentres were located ~18 km to the SSE and 21 km NE (near Falmouth).

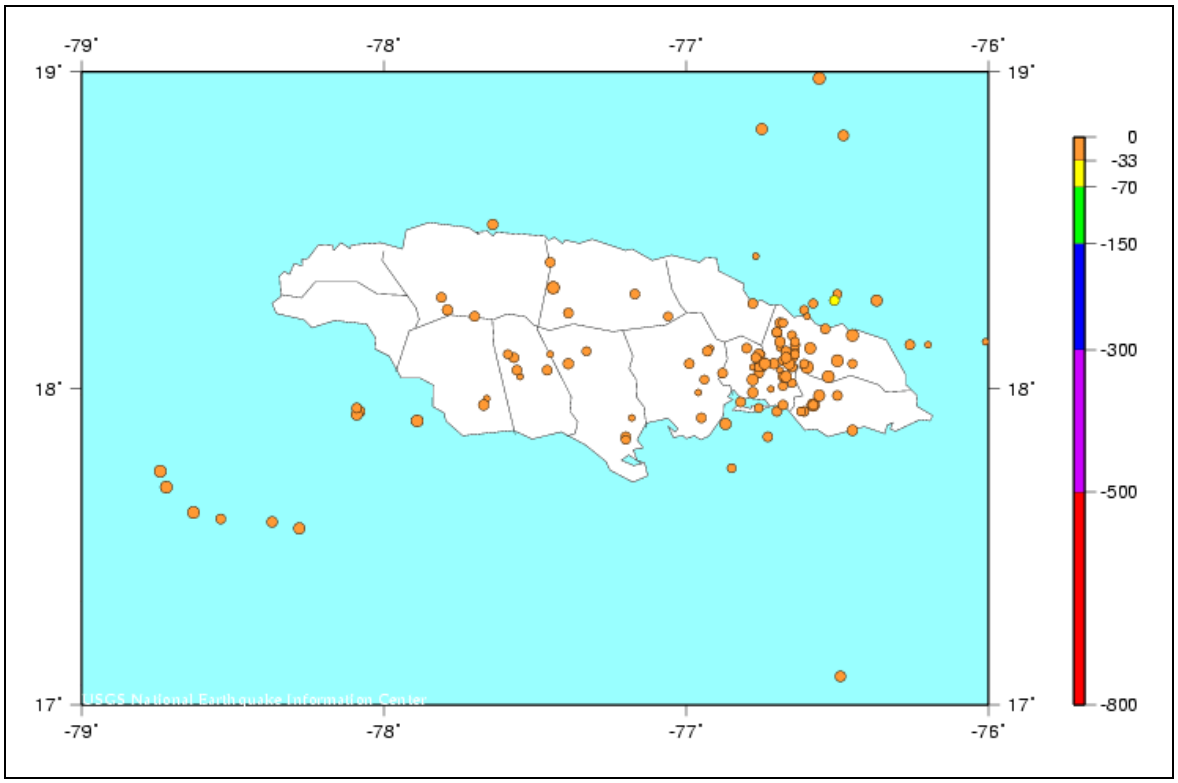

Figure 12 Earthquake Events Affecting Jamaica (1977 – 2011)

Source: NEIC (rectangular grid search): http://neic.usgs.gov/neis/epic/epic_rect.html

(see Appendix 11 for corresponding data)

Hydrogeology

Regional Setting

5.25 The WRA classifies the deposits of the Montpelier Formation north of the Duanvale fault as aquiclude and the Gibraltar Bony Gate Formation south of the northern branch as an aquifer (Figure 13). The change in hydraulic conductivity of these deposits has clearly more to do with a change in structure (the fault) than a variation of lithology.

5.26 The overall direction of the regional groundwater flow is from East to West. The fault zone which defines the position of the Montego River is clearly the route of least resistance and the preferred route for the groundwater to follow. The ground water in the lands adjacent to the fault zone drain straight towards the fault zone and flow in a N-S to NE-SW direction north of the fault and a S-N to SE-NE direction to the south of it.

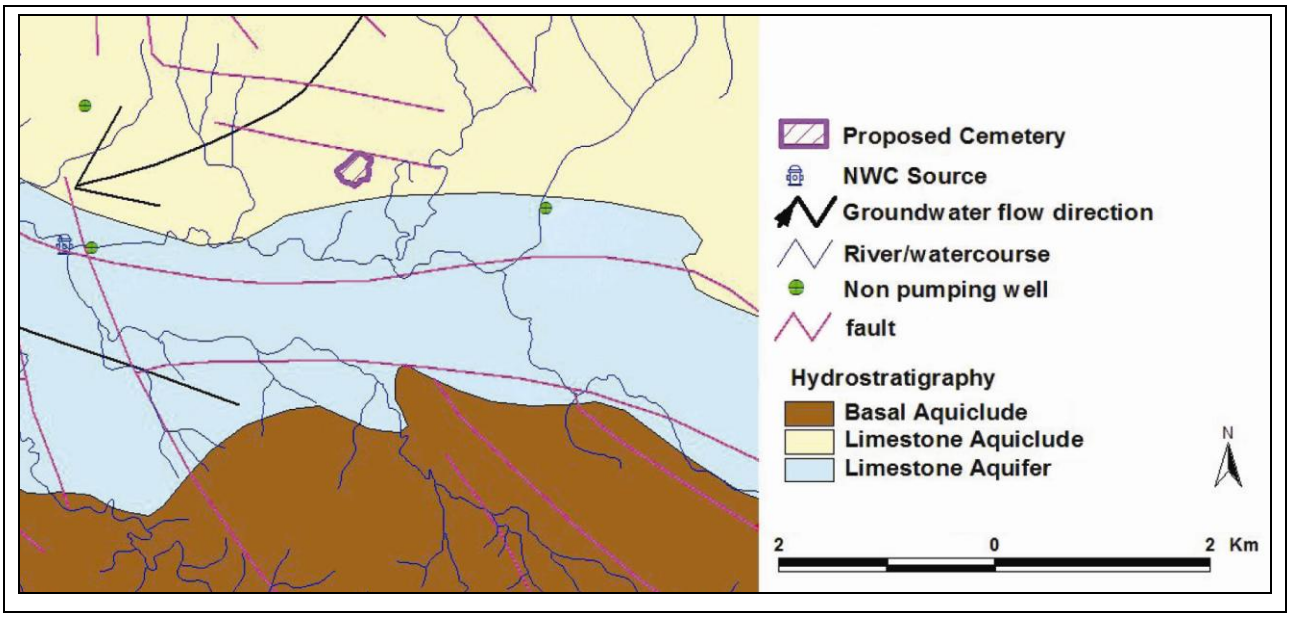

Figure 13 Hydro-stratigraphy of the Moor Park Area (Source: WRA)

5.27 The regional ground water table reaches an elevation of 91 m (or 300 ft) below the development site and dips 2 degrees to the South West. Because of dip in the groundwater table and the topography the depth to groundwater table varies quite a bit over the property. The groundwater table is closest to surface at the front of the property, along the dry channel of the Moor Park gully. Near entrance the water table level reaches an elevation of 84 m (275f t) and is 30 m below the surface. At the far end of the area slated for burial, near the foot of the forested uplands, the water table reaches an elevation of (325 ft) and is more than 50 m below the surface. In the principal burial areas (the zone between the 450 and 500 ft. contours) the water table is located 50 to 60 meters below the surface (Figure 14).

5.28 The site easily complies with WRA's guideline that the outer boundary of a cemetery should be at least 0.5 km away from production wells. The closest wells are the Glasgow well at a distance of 1.7 km SW of the study area, the Leogan well at 2.1 km North, the Latium Core Hole at 2.1 South, the Kirkpatrick Hall well at 2.8 km ENE, the Latium Dug well at 3.9 km SE. These wells, which were drilled in 1968 and 1969, do not have the yield to be used as a production well. (Letter of NWC in Anderson J. ,2009).

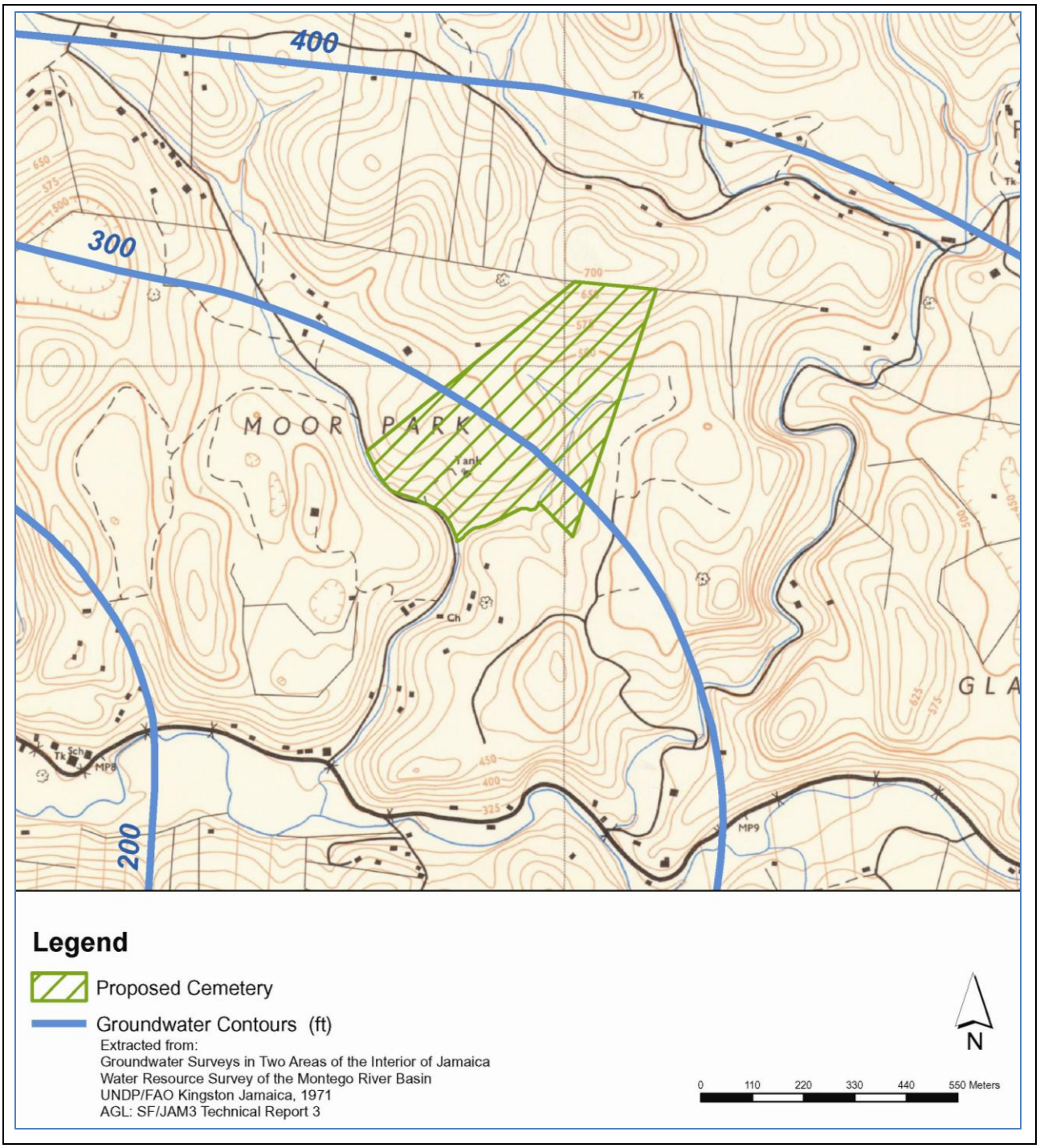

Figure 14 Hydrostratigraphy of the Moor Park Area

5.29 The 500 m guideline is intended to provide protection against worst-case scenarios in which a cemetery is sited upstream of a production well and on geological formation that functions as an aquifer. None of these conditions applies here. The site is located on an aquiclude and wells are hydraulically

upstream from the site and cannot be affected by any groundwater flow coming from the site. This applies also for the Appleton Spring.

5.30 The Appleton Spring (Figure 15), which is operated by the National Water Commission (NWC), is currently the source of water for the domestic supply to Latium, Orange, Sign, Moor Park, Sudbury and Rocky Road. This spring is located 3.4 km to the WSW of the cemetery site, and has produced up to 1,642 m^3/day, which is enough to meet the water demands of 1427 households. The spring is located on the other side of the Montego River from the site, and emanates from a different hydrogeological unit (see Figure 13).

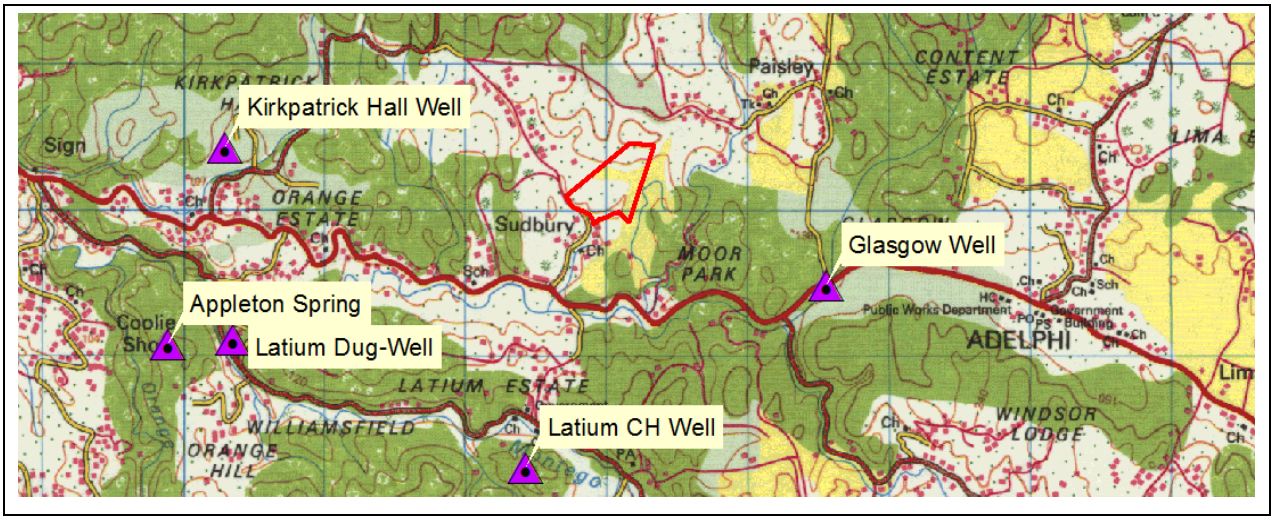

Figure 15 Locations of nearest wells and springs

(nb each grid is 1 km, oriented grid north)

Site Percolation

5.31 To assess the permeability of the deposits on the property, three test pits were dug with a backhoe to perform an infiltration test. While digging the pits, the walls were kept as vertical and square as possible. However, because of the hardness of the deposit it was difficult the shape the pits. The cross section of each pit was recorded in detail. That information was then used to accurately calculate the area available for infiltration for each time interval.

5.32 During the test the fall of the water level and the corresponding time were recorded. The water losses were converted to a value of loss with time and areas. These values were than plotted against elapsed time to determine a representative rate of percolation and the equivalent saturated hydraulic conductivity (Ks).

5.33 The results a summarized in Table 6; percolation pit logs are given as Appendix 10.

PIT #	DATE	cumL/m2/min	Infiltration rate (mm/hr)	Ks (m/sec)
1	12 April 2011	0.13	7.8	2.2×10^{-06}
1	13 April 2011	0.19	11.1	3.1×10^{-06}
2	12 April 2011	1.40	84.0	2.3×10^{-05}
2	13 April 2011	1.11	66.6	1.9×10^{-05}
3	12 April 2011	0.11	6.8	1.9×10^{-06}
3	13 April 2011	0.09	5.6	1.5×10^{-06}

Table 6 Percolation Results

5.34 In comparison with other tests which measure permeability in a laboratory, this test method has the advantage that the test is performed on undisturbed material and on a much larger sample size. This test reflects the heterogeneous nature of natural deposits and takes in account the impact of vegetation and facies variation.

5.35 Overall the percolation rates were rather consistent. The hydraulic conductivity values (Ks) range from 2.3×10^{-05} to 1.5×10^{-06}. This classifies the deposits on this property as semi-impervious and as a poor aquifer.

5.36 No water quality testing is feasible as there are no receiving surface water bodies within 500 m of the site. Testing water quality in the nearest point in the Barnett/Montego River is unlikely to yield information that would allow for better environmental management at the site as it is too far away, and impacted by too many other sources.

Biological Environment

Site Ground Cover

5.37 Reflecting the geomorphology and the geology, three distinct habitat types can be identified: (a) Dry Limestone Forest, (b) Riparian Forest, and (c) Pasture & Farm Land. All lands with slopes of less than 25% have been converted for agricultural/residential purpose. Their distribution is show and summarized in Figure 16 and Table 7.

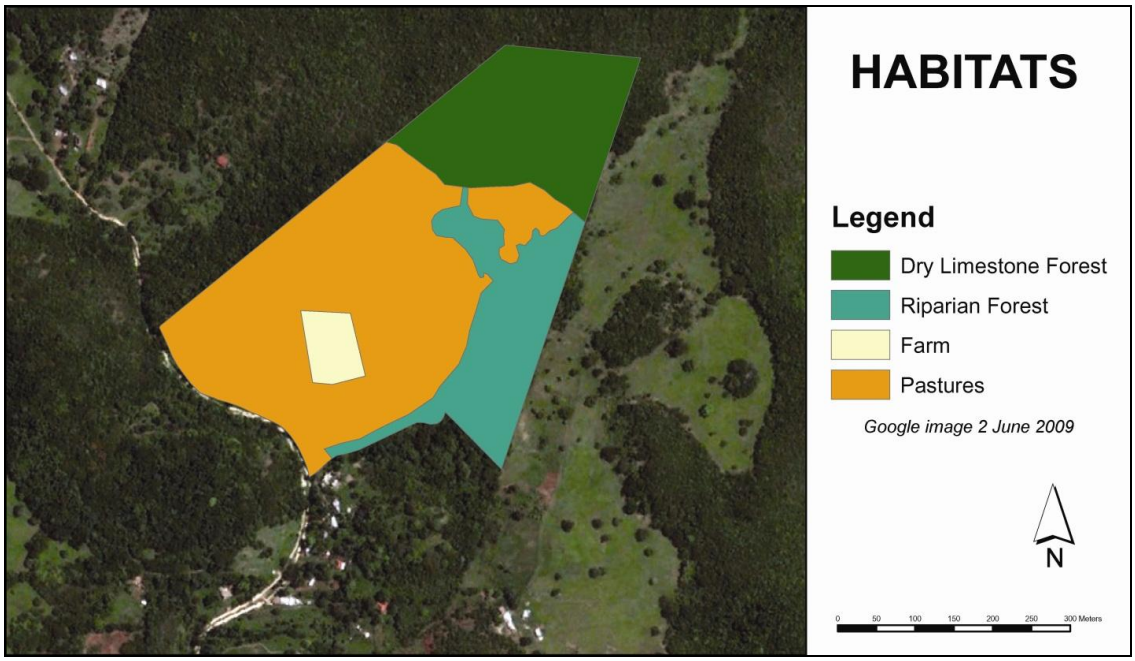

Figure 16 Distribution of Habitats across the site

Habitat	Area (m^2)	% of Property
Dry Limestone Forest	43,079	23%
Riparian Forest	34,390	19%
Pasture	100,486	55%
Farm	5,964	3%

Table 7 Distribution of Habitats across the site.

5.38 The Dry Limestone Forest takes up the steep slopes in the north of the property. The vegetation in the heavily wooded area above the 160 m (525 ft) contour consists of an assemblage typical for the dry limestone forest on the Montpelier limestone such as Red Birch (*Bursera simaruba)*, Acacia *(Acacia tortuosa)* and Bastard Cedar (*Guazuma ulmifolia*). This forest has been exposed to a significant amount of disturbance, but with the decline of the agriculture it has rebounded. The 2001 IKONOS satellite imagery shows a considerable amount of openings in the forest on the western side of the property but most of has been filled in over the last 10 years. No quantitative survey was done as this area will not be impacted by the project footprint.

5.39 The Riparian Forest is limited to the eastern gully. This is a denser wooded area associated with the gully banks are dominated by Acacia *(Acacia tortuosa)* and Red Birch *(Bursera simaruba)*. A couple specimens of the Banyan Ficus (*Ficus*

benghalensis) were seen in the gully on the Southeastern edge of the property. No detailed survey was done in this area as it will be maintained in its natural condition.

5.40 Pasture and farm homestead account 58% of the property. The pasture land (55%) is covered with a mixed of Seymour *(Andropogon pertusus)*, Guinea *(Panicum maximum)* and Crab grasses. The pasture is subdivided into six areas which are fenced and lined with trees. The Bastard Cedar (*Guazuma ulmifolia)* commonly found. Scattered shade trees are growing in the pastures, mainly Mango (*Mangifera indica*) and a few Guango (*Samanea saman)* trees. A list of species that are likely to occur in this area (based on literature review) is included as Appendix 12.

5.41 A small section of the property in the middle of the pasture land is used for the farmer residence. The lawn in front of the house consists mainly of *Zoysia* grass. The section behind the house is used for subsistence farming. Banana, Pimento, Ackee, Plums and June Plum *(Spondias cytherea)* are cultivated in that section.

5.42 Appendix 13 gives a few photos of the site taken during the course of this EIA (2011). It focuses on areas likely to be impacted by the proposed project.

Fauna

5.43 As can be expected from a pasture land the fauna is not particularly rich and varied. There was no obvious presence of large avian community. Bird sighting were limited to the ubiquitous Cattle Egret (*Bubulcus ibis*), Wood pecker (*Melanerpes radiolatus*) and John Crow (*Cathartes aura*).

5.44 No bats were observed during the survey. Resident said that they occasionally see bats but that they never enter their houses. A senior resident commented that bat sightings are now far fewer than when she was young. A list of Butterflies and bird common to this area has been attached as Appendix 14.

Socio-Cultural Environment

Land Use

5.45 Development pressure in the semi-rural areas outside the urban fence is increasing as a result of the continuing expansion of the tourist sector, the need for affordable housing and the fear for the criminal element in the inner city communities. Reflecting this trend, the emerging development order for Montego Bay is proposing to move the city boundary further east along the Adelphi main

road as far as the intersection with Moor Park. The proposed cemetery would therefore be located just outside the city boundary of Montego Bay.

5.46 The land use (Figure 17) along the main road is predominantly residential with higher concentrations in the Orange (near turn off to Kirkpatrick Hall) and Sudbury districts mixed with residential/commercial and institutional land use. The commercial land use includes activities typical for rural communities such as shops, carpenters, bars etc. The institutional land use comprises schools e.g. the Sudbury All Age School (population of 383) and churches. The residential development extends linearly along the roads, developing more densely in response to the easier availability of transportation, and utilities nearer the main roadways.

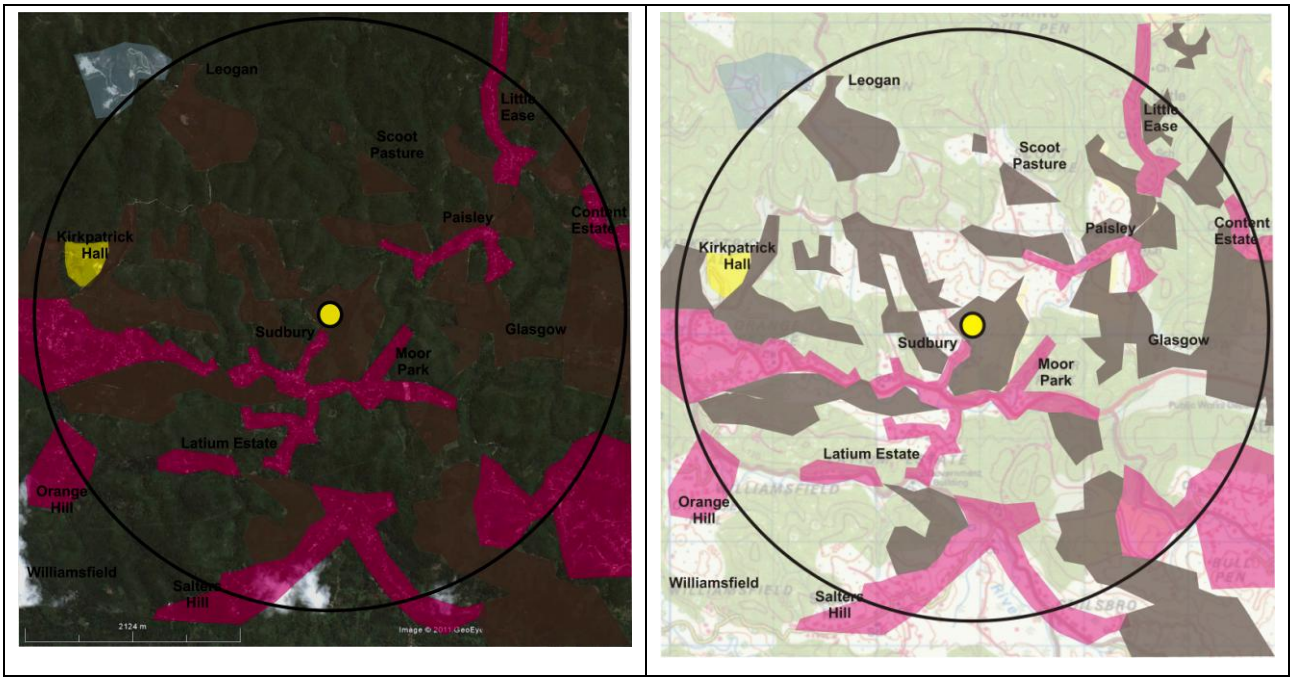

Figure 17 Land use around the site

Key: pink denotes rural settlements; brown denotes farming area; yellow denotes cemetery use; no colour denotes natural vegetative cove; and blue (top left) denotes quarry.

5.47 Much of the land fringing the roads have subdivided in to small lots from 1 to 0.5 acres or even less and are too small and too small to support commercial farming activities. Large commercial farming is not considered a viable activity in this area because the soils are thin and highly susceptible to erosion. The 2009 Google image (left side of Figure 17) when compared to the older 1970 OS Map (right side of the figure) planemetric data shows that the area immediately north of the site was previously mapped as farmland, not under forest as it is today. With the decline in agriculture, many of these farm lands are in various stages of

transition back to the natural dry limestone forest, which is estimated to take ~30 years to reinstate itself.

5.48 The Kirkpatrick Hall estate has already been converted in to a cemetery, the Dovecot of St. James Memorial Park, and the Rural Physical Planning Division has released Glasgow Estate near Adelphi, which produces orchard crops, cattle and sugar cane. Plans are afoot to convert the Glasgow Estate into a mixed use development, inclusive of residential, commercial and industrial elements.

5.49 In this context noteworthy that there seems to be wide support in the community to have the property converted in to a cemetery. Before the land was sold to Mr. Delaphena the original owner held a public community meeting in which the options were presented to sell the lands to the government for low-income housing or to Mr. Delaphena for a cemetery. In that meeting the local community rejected the plan of the low income housing development in favor for the cemetery development based of the perception that low-income could bring “undesirable criminal” elements to the area.

Access Road

5.50 The proposed development site is located 600 m north from the Adelphi main road along the narrow parochial road which continues all the way up Leogan. The natural valley floor is narrow and does not leave much space for the gully to share with road. To allow two-way traffic a number of lay-bys will have to be constructed. At the gate of the property the road crosses the gully channel from the right bank to left bank side by way of a fording. While the road is in a poor condition and its surface is gone, its base is stable and firm. During tropical storm Nicole the road flooded near the Moor Park Shiloh Apostolic Church and its embankment was undercut but it did not affect the structural integrity of the road.

Access Road

5.51 The proposed cemetery is about 10 km from West Gate Montego Bay and about 4 km from Adelphi. The Adelphi road is the main access road for the growing population in Orange Estate and Adelphi. This route is also used extensively by the Sugar cane haulers as it the only alternative route one can take to avoid driving through Montego Bay. These trailers cause traffic problem in the winding

sections of the road in the Orange district where the trailers need to full width of the road to negotiate the turn and cannot pass another vehicle.

5.52 The traffic volume assessment of the 3-way (T) intersection between the Adelphi main road and the road to Catherine Mount near West Gate suggest that the road is fairly consistently used throughout the day without the big variations one would expect during peak hour traffic. The morning peak and evening peak are respectively 59% and 27% above 12 hour average. The midday "peak" is 30% below the 12 hour average. There is a net balance of vehicle driving towards Montego Bay which seems to suggest that the 18% of vehicles a taken a different route in the evening than in the morning.

5.53 Tables 8 and 9 summarize the vehicle assessment on the Adelphi side of the intersection on Thursday 11 October 2001.

Period	East & West Bound		East Bound		West Bound	
	Vehicles /hr	% of 12 hr average	Vehicles /hr	% of 12 hr average	Vehicles /hr	% of 12 hr average
(7:30 to 8:30) AM	671	159%	187	97%	484	208%
(12:00 to 1:00) MID	308	73%	165	86%	143	61%
(5:30 to 6:30) PM	538	127%	322	168%	216	93%
12 hr average	423	100%	192	100%	233	100%

Table 8 Traffic Volume Assessment East of the Adelphi Main Road & Catherine Mount Intersection

Period	Δ time (s) E& W bound	Δ time (s) E bound	Δ time (s) W bound
(7:30 to 8:30) AM	5	19	7
(12:00 to 1:00) MID	12	22	25
(5:30 to 6:30) PM	7	11	17
12 hr average	8	19	15

Table 9 Average lag time in seconds between 2 vehicles East of the Adelphi Main Road & Catherine Mount intersection

5.54 No heritage or archaeological sites occur within proximity to this site. There is an old copper near the entrance of the dwelling plot, which has probably been transported to this site from an old sugar cane estate. Anecdotal evidence as well as soil capability suggests that this property would have been used historically principally for grazing animals.

Municipal Burial Capacity & Burial Practices

5.55 There are fifteen (15) public cemeteries in St. James, four (4) of which are operated by the Council (Pye River, Barrett Town, Adelphi, Content). The Pye River Cemetery which is the largest (8 hectares/19.77 acres) has almost reached its capacity.

5.56 A private cemetery and crematorium was established in 2003 at Kirkpatrick Hall near Sign to meet the anticipated demand in the event that the Pye River Cemetery is closed in the short-term. This cemetery is located less than 3 km to the east of the proposed Moor Park site.

5.57 It remains a widespread local practice in Jamaica to maintain family burial lots on private lands, which may be a form of establishing tenure. There are presently several such graves located near the existing house at the Moor Park site. Generally, rural dwellers with access to family lands may use this burial option, whilst urban dwellers, without family lands may opt to purchase burial plots in a private or public cemetery.

SECTION 6: STAKEHOLDER CONSULTATION

Purpose of this Section of the EIA

6.1. This section outlines the stakeholder consultation programme for this EIA process, summarizes the key stakeholder issues arising to date.

6.2. The degree of public concern with specific issues (and general acceptability of the impact given proposed mitigation) is a key criterion used in determining of the relative significance of environmental impacts.

Stakeholder Consultation Programme

6.3. Stakeholder consultation during the course of this EIA includes the following mechanisms.

6.4. Community meeting held at Sudbury All Age School by the developer in 2010 prior to the application. A third of the 138 persons surveyed in the community based Perception Survey indicated that they had been made aware of the project by persons who had attended this meeting. Respondents also indicated that that they had been advised personally by the applicant, and that they had seen a sign at Moor Park.

6.5. Perception Survey (Appendix 15) to the neighbouring host community. The locations of these communities are given in Figure 18 below. This survey addressed the following major issues:

a) General acceptability of the proposed project, with consideration of the community-based stakeholders' willingness to make trade-offs, given the potential benefits of the project to the local and national economies.
b) Fears and expectations about the specific project, including any anticipated social conflict and crime.
c) Perceptions and attitudes of the community.
d) General health, safety and environmental concerns related to the project

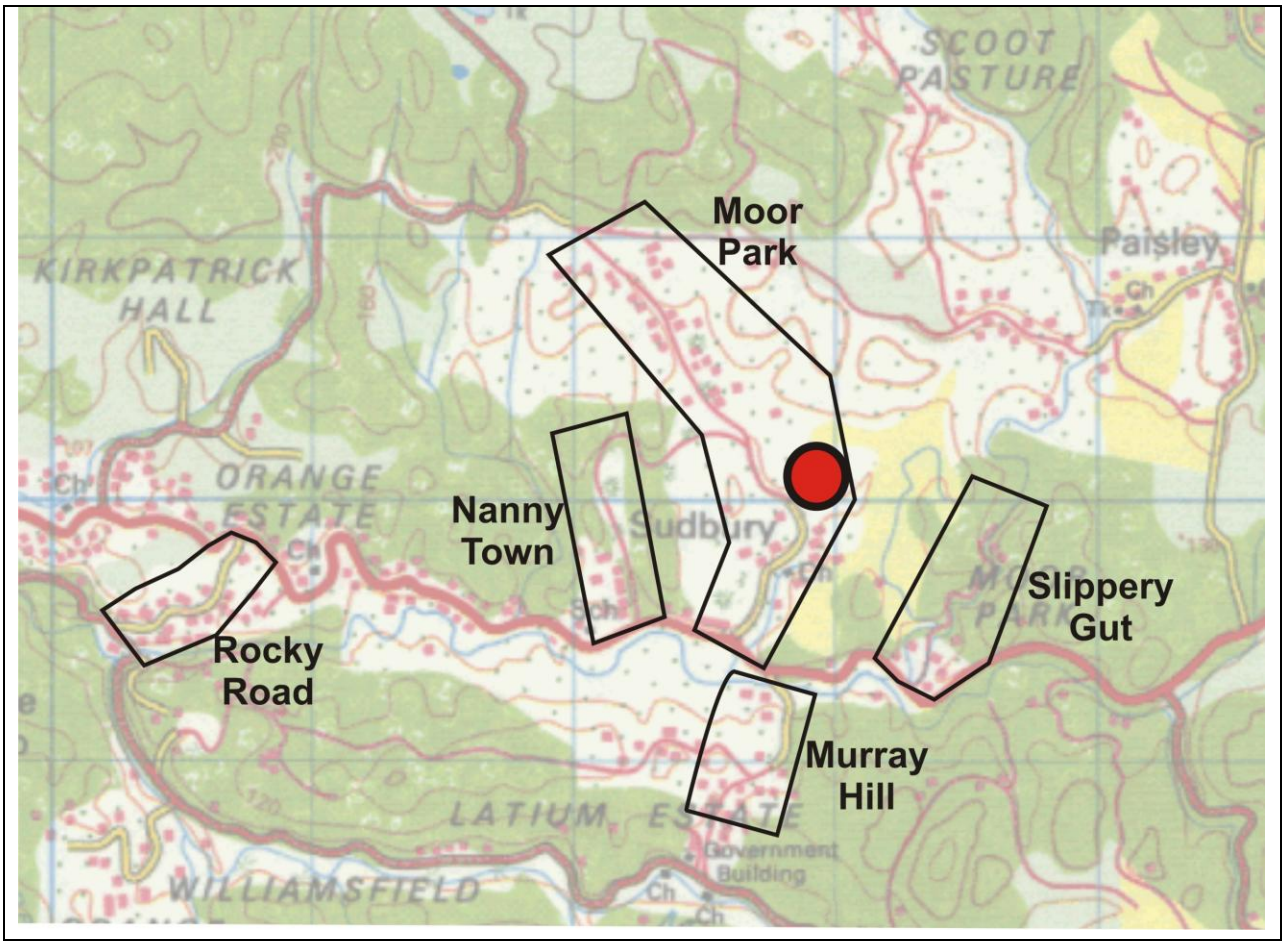

Figure 18 Survey Areas

6.6. Correspondences with via email submitting the Terms of Reference for review: Water Resources Authority (WRA), St James Parish Council, Rural Physical Planning Unit, National Works Agency (NWA), Office of Disaster Preparedness and Emergency Management (ODPEM), Environmental Health Unit (EHU), Ministry of Health and Jamaica National Heritage Trust (JNHT), Occupiers/Owners of adjacent lands.

6.7. A public presentation outlining the project, environmental impacts, and proposed mitigations main findings of the EIA at a community-based meeting. The public meeting shall be held not less than 3 weeks after the EIA is made available for public review. It shall be conducted in accordance with the NEPA Guidelines for Public Presentation at a time and location agreed by NEPA.

6.8. The continued availability of all EIA documentation for public review until a decision is made in respect of the development application. This includes: (1) the approved Terms of Reference (appended in the EIA) (2) the EIA inclusive of all

supporting technical appendices (3) the Public Meeting Report (containing presentations, summary, verbatim report of question and answer session and the register of attendance) and (4) Addendum Report (i.e. written response to EIA review comments).

Issues Raised

6.9. On February 11 and 12, 2011 138 questionnaires were administered within a 3 km radius of the site. The perception report that was prepared by the specialist is included as Appendix 16. Issues arising include:

a) Expectations of Road Repair: based on commitments made by the developer at the 2010 meeting, respondents held expectations for improved road repairs and street lighting.

b) Expectations of Improved Domestic Water: Piped water supply in this area is regarded as inadequate (low water pressure and insufficient infrastructure) by the communities. Many rely on rainwater harvesting or carrying water from stand pipes. Drinking water is stored in black plastic drums or above ground tanks. Respondents held an expectation that water supply along the access road to the site would be improved by the development.

c) Expectations of Job Creation: Some respondents indicated that the hoped that there would be employment opportunities arising from the development.

d) Emissions: Respondents from Nanny Town indicated a concern about smoke emissions from the cremation and possible effects on their health after long-term exposure.

e) Discomfort being in proximity to a cemetery.

f) A belief that there were enough burial plots in the area to meet their needs already, including family plots.

6.10. The WRA prepared a Technical Note (February 25, 2011). This is included as Appendix 17. In this note the WRA indicated that:

a) Groundwater: Secondary Level Sewage Treatment was recommended for this location. This issue was also raised in the Perception Survey. Although groundwater is not used as a source of water in this area, some respondents indicated a concern with how the cemetery might impact it. One respondent from Rocky Road indicated that he believed that river supplying their drinking water flows from Rose Hall through Paisley and passes underground at Moor Park and resurfaces beyond the property.

b) Flooding: Flooding from the nearby watercourse could potentially affect the property, and appropriate setbacks and mitigation measures should be implemented. This should be informed by an evaluation of normal and extreme flows in the watercourse. Respondents of the Perception Survey indicated that the main road to Adelphi and site access road are prone to flash flooding. Specifically, the area in front of the entrance is impassable during heavy rains, and they held an expectation that this would be rectified by the proposed development.

6.11. The Environmental Health Unit (EHU) of the Ministry of Health has indicated that they have no objection to the development, provided that WRA certifies that the underground water will not be impacted. This is included as Appendix 18.

Index of Technical Responses to Stakeholder Issues in the EIA

6.12. Table 10 indicates how public input was incorporated into the proposed project design, the EIA; and environmental management systems. It specifies reasons in the event that any stakeholder concerns are not discussed elsewhere

Stakeholder Issues	Response
1) Road Repair	The applicant has confirmed that he is working with the SJPC to upgrade the parochial roadway between the main road to Adelphi and the property entrance. This will involve resurfacing and protection of the road from overtopping and erosion from the adjacent storm drain. See Appendix 7.
2) Improved Domestic Water Supply	The developer will connect to the mains, and will extend the pipeline as far as the cemetery entrance.
3) Expectation of Job Creation	There will be construction jobs when the buildings are being constructed, as well as operational jobs to create the vault modules, and maintain the site. Staff will also be needed for the Cremation and Reception centres. No determination has been made as yet by the developer as to how many and what kinds of staff will finally be needed to maintain the proper. It is expected that this will be primarily driven by business forces.
4) Impact of Cremation Emissions on Public Health in the long term.	This is addressed in Section 7 (see paragraphs 7.40 to 7.50)
5) Proximity of the Cemetery (discomfort)	This matter lies outside the scope of EIA. The cemetery will not produce any undue nuisance noise or visual intrusion to nearby residences.
6) Over-supply of burial plots to the area	This matter lies outside the scope of EIA. No major social or economic effect is predicted to occur as a result of healthy competition between private cemetery service providers. The developer will continue to conduct burials at private family plots where these are available.
7) Impact on groundwater	This is discussed in paragraphs 7.110 to 7.116. No impact on groundwater is predicted.
8) Risk of flash flooding	See paragraphs 7.99 to 7.103. Essentially the development of the site as cemetery is not expected to contribute to flood risk in the area, and may even serve to reduce this risk (see paragraph 7.104 to 7.109).

Table 10 Inventory of Responses to Stakeholder Issues

Section 7: ENVIRONMENTAL IMPACTS

7.1 The purpose of this section of the EIA is to:

a) Identify the major environmental and public health issues of concern and,

b) Predict the characteristics of the impacts

c) Indicate their or significance of the residual impacts, taking into account the potential effectiveness and acceptability of any proposed mitigation measures in the protected area context, and the relative importance of the causative activities to the project.

Methodology

Impact Identification

7.2 The following methods were used to identify the range of negative environmental impacts that are likely to occur as a result of implementation of this project, as described in Section 3:

a) A comprehensive assessment of the project as described in Section 1, in terms of activities, consumption of resources and subsidiary inputs, and associated waste streams in all phases.

b) Technical inputs from environmental specialists on the EIA team.

c) Review of impact assessments done for similar projects and checklists of adverse impacts arising from this review

d) Regulatory criteria governing aspects of the environment likely to be impacted and guidance documents.

e) The sensitivity of valued environmental components (VECs) likely to be impacted.

f) Review of the risks arising from the project and the range of environmental consequences that could arise under upset conditions.

g) Consultation with a range of stakeholders (Section 6), including inputs from NEPA and the WRA on the Terms of Reference.

Cumulative Impacts

7.3 Cumulative adverse shall be identified. These are defined as negative impacts are caused by (a) activities unrelated to the proposal being evaluated but are likely to occur at the same time that the project activities are occurring and (b) several activities associated with the implementation of the project as proposed.

7.4 External activities form part of the baseline condition, and are taken into account in the examination of the baseline, as well as divergence from the baseline that might be expected to arise from project implementation. In this way the impact of the project on the surrounding area especially as it relates to the cumulative impacts of this project with any existing developments will be included.

7.5 In respect of internal aggregations of impacts on specific VECs that may individually be assessed as having a “minor” effect, but that may collectively have a significant combined effect, the resultant cumulative effects are evaluated collectively where multiple project activities contribute to the same effect (however, these should be treated separately when the activities are spatially separated).

Characterisation of Adverse Impacts

7.6 Each identified adverse impact is classified according to the assessed Effect Level (no impact, minor, moderate or major). Each identified impact is analyzed using a standard set of impact evaluation criteria. These criteria fall into three broad groups of environmental metrics, which together give a more comprehensive picture of the character of the impact.

7.7 Magnitude Indicators:

a) Secondary (Indirect) Effects: The number of likely adverse secondary (indirect/ triggered) effects occurring elsewhere or at a later time.
b) Scale Spatial extent of influence arising from frequency and magnitude of the causative action: isolated within the boundaries of the property, near dispersion pathways, or off-site effects (downstream etc).
c) Environmental Persistence: This refers to the duration/frequency of the causative activity, and the time after cessation for the environment, and the extent of residual adverse effects that occur despite mitigation.
d) Affected Numbers The proportion of a population or habitat that will be adversely impacted by the project.

e) Baseline change: the estimated change on an adversely impacted receptor that can be measured and attributed to the project. This allows for: (1) comparison of normal seasonal change with change arising from the project, and (2) inclusion of cumulative effects (from unrelated activities) through the concept of a dynamic or moving baseline.

7.8 Vulnerability:

a) Resilience: the ability of a receptor to cope with the effect at the particular time/season when it will occur. For socio-economic parameters, this is best indicated as a measure of nuisances/loss of amenity or revenue. For ecological parameters this is indicated as a potential health or mortality concern. For physical parameters, this is indicated as the possible demand on the assimilative carrying capacity and effect on system stability.
b) Reversibility: the extent to which the site (or affected area) can be returned to a pre-project state

7.9 Manageability and Validation:

a) Mitigation Potential: the feasibility, effectiveness and timeliness of management responses to reduce or avoid environmental costs.
b) Uncertainty: disclosure of the level of scientific and statistical confidence in the predicted outcomes, and the general reliability of the data and models used to predict impacts and an understanding of any scientific uncertainties that could diminish the effectiveness of management responses.
c) Acceptability to stakeholders: The acceptability of the impact can be measured by the likelihood of compliance with (1) environmental quality standards; (2) legal requirements; (3) physical plans and land use policy; (4) societal norms for trading off the impact against project benefits; (4) public opinion/interest/values; level of controversy and (5) opportunities for positive environmental effects and mitigating circumstances.

Impact Significance

7.10 Using the evaluations on the magnitude of the impacts, the vulnerability of the receptors and the general manageability of the impact, impacts shall be classified as either having no impact, or being minor, moderate or significant.

7.11 Impacts shall be classified as minor or negligible if the change to baseline is not measureable or is less than normal fluctuations within the system. In many cases, where the change to baseline is very small, the effects are likely to be cumulative, and should be identified as such where relevant.

7.12 If the change to baseline is measureable, the impact shall be classified as moderate or major depending on the following parameters, whereby a major adverse impact is one that:

a) Where the geographic extent and persistence:
   - Is widespread (offsite regional effects) and persistent after 2 years and impacts on a biological population continue to occur over a number of recruitment cycles after the cause has ceased.
   - Associated with numerous indirect negative affects, with more than one generation and several trophic levels involved.
   - Affects a large number of individuals or large proportion of the exposed community.

b) Where receptors are vulnerable and the impact:
   - Occurs within designated protected area or the habitat of protected species, and these receptors are unable to cope with the change resulting in mortality.
   - Permanently damages habitat quality or creates ecological barriers.
   - Contributes to the endangerment of threatened or protected species or reduces the stock of commercially important species.
   - Occurs at the peak time when receptor is vulnerable.
   - Results in a loss of revenue or amenity which is sustained after remedial action is taken or threatens cultural or heritage resources.
   - Alters community lifestyles or requires long-term adjustments of local people in respect of traditional values and resource use.
   - Represents a long-term nuisance or significant safety or health risk to other users.

c) Where management of the impact is characterized by:

- Not being easily or cost-effectively returned to previous state or be re-used for any other productive purpose.
- Not being cost effectively mitigated or requiring major design change to causative activities or no mitigation possible.
- Little or no opportunity for environmental enhancement or no perceptible environmental benefit of the project.
- Public outcry against the impact or cause. Prohibitive legislation, plans or policies or the impact or cause exceeds legal thresholds, limits or criteria or maximum allowable levels.

7.13 Wherever relevant, a lack of scientific certainty or confidence in the data or findings shall be disclosed, and taken into account in assessing the impact. In the absence of scientific certainty, the precautionary principle shall be adopted, such that worst case scenarios shall be assumed, and appropriate mitigation measures recommended.

Assessments

Construction Phase Impacts

7.14 Table 2 summarized the main construction activities, including construction of the various buildings and infrastructure, as well as activities related to transportation and storage on site of the construction materials. The environmental impacts of these activities are related to the consumption of resources, and more importantly to the waste streams.

7.15 In terms of the resource consumption, the main impacts are related to the overall carbon footprint of the project (in terms of use of fuel, electricity, products that use a relatively high amount of energy or release a high amount of carbon in the manufacturing process, and goods that have to be transported from far away). The consumption of resources (e.g. fuel) is often regarded as a positive effect as it results in job creation, long-term investment and development as well as stimulation of local economies through purchase of locally manufactured materials (such as concrete blocks, stone and sand) and local services. The main resource on the site is an abundance of stone and marl, which can be used in many of the construction projects that are planned.

7.16 Adverse impacts associated with construction almost invariably are related to waste streams along transportation corridors and at the site. These are all relative short term, ceasing with the duration of the impact.

Construction Noise

7.17 Nuisance noise along haulage routes (truck engines) and at construction site (heavy equipment such as an excavator or back hoe, hammering etc.). Haulage noise is mainly engine noise, and will be cumulative with other road traffic noise. Based on available ratings of construction equipment[17] it is unlikely that the noise emissions at source would exceed 96 dBA at any of the three major construction site locations on the property. Using the standard noise distance decay rate of 6dBA for every double of distance from the source, it can be estimated that this peak estimated noise of 96 dBA will reduce to 60 dBA within a distance of 64 m.

7.18 There are no noise sensitive receptors (dwelling houses, schools, churches, hospitals) within this distance of any of the construction sites. The nearest dwelling house is on the west boundary of the site, and is located ~127 m from the chapel site. Any birds or other wildlife that might be disturbed by the noise can be expected to temporarily retreat to the wooded areas to the north of the site. The main receptors of the noise will be construction workers, who will be equipped with suitable gear to protect them from any harmful noise levels. No persistent environmental effects are predicted to occur as a result.

7.19 All construction activities (including haulage) will be limited to normal working hours. Noise can also be reduced through the use of noise abatement technologies that might be available for specific equipment.

7.20 Due to the absence of sensitive receptors, normal acceptability of this impact given its manageability potential, the residual effect of this impact is considered to be negligible.

[17] E.g. http://www.cpwr.com/hazpdfs/kfnoise.PDF

Reduction in Air Quality Due to Construction Site Emissions

7.21 Air quality at construction sites and along haulage routes tend to be impacted adversely by the generation of fugitive dust (e.g. cement or soil stockpiling and cleared areas) and combustion emissions (from excavators, trucks etc). These effects are much restricted to the duration of the construction period, and the extent of the effects tends to vary with local meteorological conditions as well as the effectiveness of material management and maintenance.

7.22 The following standard mitigation measures can be implemented at the construction sites to reduce the air emissions:

- Limit site clearance to the areas needed most immediately for construction. For example, do not clear parking lot and tile field area until necessary.
- Wet cleared areas and earth material stockpiles as well as earthen roadways to construction sites.
- Cover stores of cement.
- Restrict and control cement mixing on site: use ready-mixed poured concrete as much as possible.
- Use construction stabilized construction exits (SCEs) at the exits to remove excess muds from the wheels of haulage vehicles.
- Screen the building site or place fine mesh screening close to the dust source.
- Ensure that haulage trucks are covered.
- To the extent reasonably practicable, use non-toxic paints, solvents and other hazardous materials wherever possible
- To the extent reasonably practicable, use low sulphur diesel oil in all vehicle and equipment engines, and particulate filters and catalytic converters.
- Prohibit burning of materials on site.

7.23 This impact on air quality is considered relatively minor as the construction sites are isolated within the property, and extent of change to baseline is expected to be marginal if the mitigation measures are properly implemented, and this is normally acceptable to stakeholders.

Contamination of Surface Water by Construction Site Effluents

7.24 Typically these include run-offs from the construction site which are mobilized by construction water imported into the site, or by rainfall. These run-offs can

contain suspended solids as well as oil. There is also potential for accidental spills of fluids such as paints, lubricants, fuels etc, which can contaminate soils and potential migrate to waterways.

7.25 These effluents can be managed using the following mitigation measures:

- Site stockpiles away from major storm run-off pathways.
- Stockpile areas should be properly sized to ensure capacity for the necessary materials, and bunded.
- Stockpiled earth materials (sand, stone etc) should be covered and bermed.
- If there is any washing of equipment or vehicles on site, it should be done at a designated wash-down area, where the run-off is routed to a settling pond or tank. Sludge should be disposed of at a landfill by an approved contractor.
- SCEs should be used.

7.26 This impact is classified as negligible because with proper management, the impact is unlikely to occur or be residual or show any measureable change to baseline water quality in the nearest surface flows (Montego River). Due to the absence of running or receiving water bodies, it is unlikely that normal site run-offs (construction water) will generally exit the boundaries of the site unless mobilized by major storm flows. This impact is generally acceptable to stakeholders once proper mitigation measures are implemented.

Contamination of Groundwater with Construction Site Sewage & Grey Water

7.27 Generally at small construction sites in Jamaica construction workers are provided with a temporary pit latrine (soakaway) and shower. One commode serves approximately 25 workers.

7.28 The latrines should be located away from major water courses, and should be properly screened with zinc or plywood. The pit should be covered with a toilet, inclusive of a seat and cover. The toilet should be sanitized daily. A hand washing basin should be provided immediately outside the facility.

7.29 When abandoned, the pit should be filled with marl and compacted over. Approximately 30 cm of marl should be mounded over the top of the pit after compaction.

7.30 Grey water from the shower and sink should be routed to a temporary settlement pond located near to the facility.

7.31 This impact is considered negligible as it is part of normal practice in Jamaica, and unlikely to contaminate groundwater supply. There are no water wells or springs in vicinity of the site, the underlying deposit has a low hydraulic conductivity, and the ground water level is likely to be more than 50 m below ground level at this site. Leachate from pit no more than 2 m deep is unlikely to impact groundwater in this area. It is unlikely that this will cause a change in the baseline water quality of the groundwater system in this area.

Demand for Landfill Space due to Construction Waste

7.32 This impact is difficult to quantitatively assess as there is considerable uncertainty in terms of how much material will be produced over the entire period during which these lots will be developed.

7.33 Demolition waste from existing one-storey house and associated outhouses together comprise less than 1100 square feet (~100 m^2). A conservative rate of 4 lbs per square foot[18] is used, giving a total estimated solid waste generated as 2 metric tons.

7.34 It is estimated that construction could potentially generate solid waste 28 kg per m^2 (6.14 lbs per square foot[19]). Assuming that the average size of each building is of the order of 5000 square feet, the total estimated solid waste that could be generated by the construction would be ~14 metric tons.

7.35 Solid waste will be generated during project implementation as a result of:

- Clearance of tracts of land (vegetative debris)
- Domestic waste associated with site workers. This can include food package (polystyrene containers, plastic wrapping, paper, boxes, bottles, tins, organic material from leftover food).
- Construction materials packaging. This will include cardboard, gypsum (drywall cuttings), plastic sheeting, fencing materials, wooden pallets,

[18] http://www.epa.gov/osw/conserve/rrr/imr/cdm/pubs/cd-meas.pdf

[19] http://peakstoprairies.org/p2bande/construction/c&dwaste/whatsC&D.cfm - this site estimates construction wastes to range between 2.41 and 11.3 lbs per square foot, with an average of 6.14 per square foot, although home size is just a rough guide as choice of construction materials, contractors and other factors may control solid waste generation.

roofing shingles, asphalt felt cuttings, containers etc. This also includes construction fencing and used scaffolding materials, as well as solid waste accumulating in any waste water treatment system on the construction site.

- Earth materials from grading of lots, roadways, creation of drains, etc.
- Demolition waste from the existing house is expected to consist mainly of wood, plastics (PVC pipes), glass (windows, bulbs, mirrors), metal (pipes, roofing sheets, rebar etc) and concrete and miscellaneous (e.g. fibre mats, etc) debris.

7.36 The secondary effects of solid waste generation during the construction period include potential impact on visual aesthetic if improperly collected and stored on site, potential for pest infestation (especially if there is waste food that are being disposed on site), demand for routine collection from the site and disposal of solid waste at the landfill. In general, generation of solid waste is an accepted and unavoidable effect of all development projects.

7.37 The following recommendations are made for environmentally sound management of solid waste generated at the construction sites.

- Use a wood chipper to breakdown plant material. This can be used as mulch at landscaped locations.
- Demolition debris will be transported to the landfill off-site. During demolition, care should be taken ensure that there is no asbestos in the old house, and if there is, construction workers should be properly protected, and the asbestos safely disposed of.
- Designate waste collection/storage area with skips or large bins.
- Employ a licensed waste haulage contractor to collect waste on a weekly basis from the sites.
- Re-use all concrete waste, stone and marl excavated on site for other purposes.
- Top soil from areas to be permanently paved (e.g. roadways, parking lots and building footprints) should be re-used at graded sites that are allocated for landscaping.

7.38 This waste generation will be barely measureable against the general consumption of landfill space in the parish. However, it is considered a cumulative effect, which can be minimized through efforts to reduce, re-use and re-purpose waste at source. Given that this is generally acceptable and small scale, it is classified as minor.

Adverse Effects along Haulage Routes

7.39 As in the case of solid waste impacts, these effects cannot be quantitatively assessed as there is considerable uncertainty about the specific routes of haulage vehicles and the periods when these will be operational. It is likely that most of the haulage vehicles will use the road from Montego Bay to the site. Once the vehicles turn onto the parochial road, there is a concern that vehicles coming from the other direction will have some difficulty as that road is a single lane in need of repair.

7.40 The main environmental effects associated with haulage vehicles include wear and tear on roads, congestion due to slow moving laden vehicles as well as noise, dust and combustion emissions along transportation corridors. Haulage contractors shall be required to undertake the following mitigation measures:

- Spread axel loads to ensure that the wear and tear on road surfaces is kept to a minimum.
- Secure and cover loads to avoid presenting a hazard to other road users.
- Maintain vehicles to avoid excessive noise and emissions.
- Wash vehicles to avoid excessive generation of fugitive dust from surfaces.

In addition to the fore-going mitigations, it is recommended that the proposed upgrade of the parochial road be done prior to the commencement of construction.

7.41 The effect level of this impact can vary between minor and moderate depending on the frequency of haulage and routes, neither of which can be determined at this time.

Operational Phase Impacts

Air Pollution

7.42 Air emissions from the crematory are discussed in Section 3 above, paragraphs 3.65 to 3.70. Based on those projections, it appears that the pollutant levels from the unit can be expected to be very low and within allowable limits, even if operated at a much higher level of use than is projected by the applicant. Despite the negligible air impacts, the following mitigation measures must be put in place to ensure that the system continues to operate at design standards:

- Maintenance of the technologies and system being used to reduce air pollution is critical. The efficiency of combustion is improved by maintaining the temperature in the two chambers and air flow at recommended levels.
- As indicated in paragraph 4.23, limit the materials entering the combustion chamber. The use of synthetic fabrics and treated woods should also be limited.

7.43 Although there is a cooling system thermal air pollution is probably of greater concern, as exhaust at exit temperatures of 426 C will be emitted from the stack at a rate of ~1 m^3/s for ~3 hours on average per body. With the appropriate stack elevation, with an emission level >168 m amsl (550 feet), it is expected that these thermal emissions will rise and be dissipated at higher atmospheric levels.

7.44 The main secondary effect of air emissions is the visual intrusion of a stack, given its proposed site location at 130 m (425 feet) amsl. The stack would have to be close to 38 m above ground level to clear the elevation of the topography to the west of the stack (as the prevailing winds blow from east to west).

7.45 Alternatively, the developer could consider implementing a secondary cooling system (with some kind of heat reclamation) and go with the minimum stack elevation which is 1 m above the roof peak. A second viable option would be to relocate the site of the crematorium to another location on property where the elevation is greater than 150 m amsl.

7.46 Due to the number of options available for avoiding the emission of low level thermal exhaust, it is unlikely that when implemented that there will be any impacts on vegetation or other heat sensitive receptors that would be located at lower levels. It should also be noted that the nearest planned building will be 120 m of this site and the road is located ~50 m from the site.

7.47 Thermal emissions are predicted to rise and cool naturally under slow to medium wind conditions. Under fast wind conditions, the plume may develop a horizontal vector component and there may be some degree of shearing to the west, expanding, rising and cooling as it moves westwards at elevations well above the maximum elevations of topography in this area (550 feet amsl or 167 m amsl). As it unknown which options will be ultimately selected by the developer (tall stack, secondary cooling system and short stack, or relocation of the site), it is not possible to determine with any certainty what the extent of dispersal of heated exhaust would be.

7.48 Thermal emissions are only expected when the crematorium is operation, which has been estimated to be no more than 800 hours per year, which would be 9% of the time.

7.49 Although, there is likely to be some measurable change in baseline (air temperature), the lack of sensitive receptors and flue exit temperature standards, this impact is classified as moderate.

Nuisance Noise

7.50 As indicated in paragraph 3.71, operational noise sources at the site would include excavators used in the construction of the vault modules, lawn mowers used to maintain the grounds, traffic noises from funerary processions, and crematory noises. In general, operational noise is not expected to exceed 65 dBA outside of the crematory. This level is well within acceptable levels for noise sensitive areas, which this area is not, as there are no noise sensitive receptors.

7.51 Within 64 m of the boundary the noise level will be ~58 dBA, which is within normal fluctuations of ambient noise, where there can be periodic noise from vehicle engines, or music systems from the community.

7.52 Loud noise within the property can disturb animals such as birds. However, the interior areas of the wooded steeper slopes to the north and the eastern gully are likely to serve as refugia.

7.53 Externally, the loudest noise that can be expected would be related to the lawn mowers. A rotary lawn mower has a noise level of ~94 dBA, which is very similar to the peak construction noise (described in paragraph 7.18). At a distance of 64 m from the source, the 94 dBA will reduce to 58 dBA.

7.54 Noise is not an environmentally persistent impact. Moreover, maintenance activity will vary from place to place on the property.

7.55 None of the dwelling houses in the area are likely to be impacted by noise generated at the border of the site, or within the site.

7.56 Birds are not expected to be particularly vulnerable to the lawn mower noise. Moreover, it is unlikely that the maintenance activities will be conducted before dawn or after dusk, at which times roosting or nocturnal animals tend to be more sensitive to noises.

7.57 No mitigation is necessary. The proposed grass (*Zoysia*) is a low slow growing creeping grass that requires less cutting than others.

7.58 The level of noise likely to occur at the perimeter is within allowable levels.

7.59 Due to the fact that the noise at the perimeter is expected to fall to within ambient levels within 64 m, and that it is only likely to occur during working hours, this impact is classified as Minor.

Traffic Impacts

7.60 Funeral services will be held on Saturday or Sunday afternoons between the hours of 3 and 6 pm, to accommodate attendance by persons who have to work during the week. Funeral processions are likely to take the main road from Montego Bay, and turn off at the Shiloh/Moor Park parochial road. The traffic associated with the funeral is not expected to be particularly slow moving.

7.61 It is expected that these processions/convoys of vehicles may increase peak hourly flows on this road by up to 300 vehicles depending on the size of the funeral, and whether people car pool. It is expected that this flow can easily be accommodated on the main road, and will be within the normal operating parameters of traffic flows along the main road.

7.62 These include vehicular engine noise, wear and tear on the roadway, and exhaust emissions, all of which are cumulative and not expected to be measureable against the baseline.

7.63 Any effects will be felt along the transportation corridor between Montego Bay and the site; it is difficult to determine what proportion of road users or the road itself would be adversely impacted. This is fairly regional, but expected to be within normal fluctuations of the baseline. The impacts associated with this will occur most weekends during the year, so it can be considered to be long-term.

7.64 Because funerals are likely to occur on weekends only in the afternoon, it is unlikely that it would result in any traffic congestion as commuter traffic at these times is at its lowest. The parochial road is presently in poor condition, and can only accommodate one lane of traffic, so a funeral procession can potential inconvenience persons living north of the site.

7.65 It is recommended that the operator of the facility maintain an open door policy with the community to deal with any issues arising from routine operations in an amicable manner. It is recommended that for larger funerals (i.e., more than 300

guests), the operator should consider making available a bus service from a central location in Montego Bay to the site. The developer should also consider the construction of lay-bys along the roadway where possible.

7.66 Funerals form a fundamental part of all cultures, and the associated funerary processions are a widely accepted norm.

7.67 This impact is classified as minor.

Conversion of Part of the Site to Monoculture (Turf)

7.68 The Master Plan proposes to convert approximately 42% of the site (7.3 ha of the 17.4 ha) to burial grounds from pasture lands now occupied by a mix of grasses. This change in land use is likely to result in the introduction of mono-specific zoysia turf, not unlike a golf course.

7.69 One kind of vegetative cover (mixed pasture with trees) will be replaced with another vegetative cover (with a dominant species of grass with more trees). Although this conversion is a biologically measureable change, it is expected to function very similarly as a habitat and in terms of its biomass.

7.70 The change in vegetative cover does not necessarily have to impact on either biomass or biodiversity. In terms of biodiversity, the burial lawn areas will have a dominant floral species as to a mix of a few pasture grasses. This change to monoculture is not unlike the vegetation cover of a golf course is different from the surrounding lands. However, a recent scientific study of biodiversity in nine older UK golf courses (Tanner and Gange, 2005) showed that golf courses supported a higher biodiversity in selected indicator species (trees, birds and insects) than surrounding lands (pasture) from which the golf courses had been created;. It is therefore predicted, that in the long-term, the change in land use will not necessarily reduce biodiversity. In terms of biomass, it is likely that there would actually be similar, possibly with more trees. The loss of grazers will be off-set by cutting of the lawns. It is expected therefore, that secondary effects will be positive or very minimal.

7.71 This change will be localized within the boundaries of the property and is not likely to affect surrounding areas adversely. However more than 40% of the site will be affected and the change is likely to last for the design life the cemetery which is greater than 200 years.

7.72 The mix of pasture grasses that will be lost comprise very common grasses that are found throughout Jamaica. No rare, protected or endangered species of either flora or fauna has been reported to occur in this area. In addition, many of the birds are likely to be tree dwelling rather than ground dwelling, and therefore are unlikely to be impacted adversely as trees will not be removed. Similarly, if there are bats in the area, they are likely to be tree dwelling and will not be adversely impacted. The few animals that now use the pasture will be relocated elsewhere.

7.73 Although this cannot be directly mitigated, it is off-set by the following considerations: (a) in total, 90% of the property, including the burial lawns, will be locked into perpetuity as green open space (b) another 40% of the site will be left to revert to natural wooded areas, including the protected slopes and riparian banks (c) there will be additional trees planted in most of the vault modules to improve the quality of the burial area (d) mature trees within the pasture lands now slated for burial lawn will be preserved, thus reducing the loss of localized biodiversity and (e) in the 2 ha slated for landscaping, there will be a mixture of ornamental species of plants including lawns; this will include wetland species in and around the water feature.

7.74 Given the mitigating factors listed above, it is expected that the change would be generally acceptable to most stakeholders. It is expected that the developer will have to confirm the change of this land use (from an agricultural pasture) to the proposed use.

7.75 Due to the uncertainty of the long-term effect on biodiversity arising from the shift from pasture to turf on 42% of the site, this impact is classified moderate.

Habitat Change

7.76 Aside from the shift in floral species assemblage, and in particular, the loss of pasture species, proposed development could potentially also fragment habitats through the installation of internal roadways, drains, fences, lighting corridors (e.g. along the front wall). Roads in particular can "*disrupt ecological process; increase mortality in animals, lead to a degradation, loss and isolation of wildlife habitat, and cause a fragmentation of the landscape in a literal sense" (*Seiler, 2001).

7.77 The expected change to baseline parameters include:

- Roads and associated drains will represent a change in ground cover, but should not form a barrier to most flying species. Insects and reptiles may avoid crossing the roadways as it would leave them open to predation. The larger mammals (cows) are not expected to be impacted as they will be removed from the site.
- Internal roadways will not be lit in the nights, and night time lighting will be limited to the areas around the buildings and the front entrance. These lit areas are not expected to impact adversely on the limited site fauna, most of which consists of birds and insects that can be expected to prefer the wooded areas that will not be lit.
- Site fencing will not change (see paragraph 3.39), with the exception of a front wall, which would run parallel to the road, dry gully and hillside, all of which already form an ecological barrier.

7.78 This evaluation will therefore focus on the presence of the roads. Secondary effects include:

- The physical presence of the roadways will represent an impervious pavement which will not support life generally, and will thus represent a loss of 1.2 ha of habitat.
- Roads also tend to be primary receivers of pollution (disturbance) associated with vehicular traffic (noise, air emission, oil and grease), and hence there may be chemical effects that extend beyond the 7.3 m of impermeable pavement.
- There can be mortality associated with roads, if fauna collides with moving vehicles; animals on roads are unable to hide, and therefore more prone to predation.
- Non-flying populations that are completely constrained by roads may become isolated if the road serves as a barrier. Fragmentation of habitat in general is believed to affect the carrying capacity of the area in terms of population densities (Seiler, 2001), but it is unclear to what extent this applies to smaller species of wildlife as would occur at this site (reptiles, insects, small mammals).

7.79 Figure 19 shows that there are three main areas that are bounded almost completely by roadways on all sides, comprising a total of ~3 ha. Each area is separated by a 24 foot paved roadway plus a concrete drain. These areas are isolated within the site, and will not result in a regional scale or off-site impact.

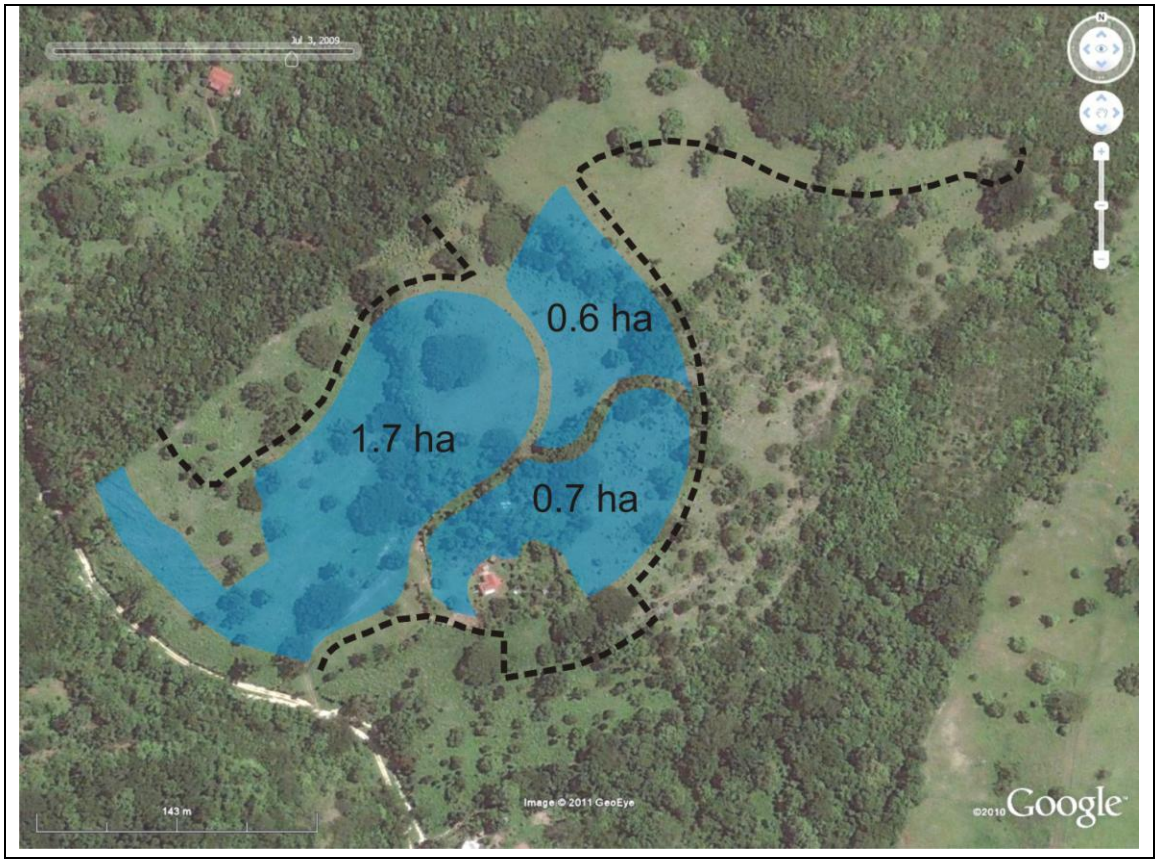

Figure 19 Areas Segmented by Roads

7.80 This change is expected to be long-term. The larger of the two other areas will be impacted partly in Phase 1, and the smaller segment will be impacted in Phase 2 (see Figure 3). The road to the north of the smaller segment (0.6 ha) will only be constructed in Phase 3, and by the time that is done, the roadway separating this parcel from the other parcel (0.7 ha) will be removed, creating a larger unfragmented zone of 1.3 ha. It is uncertain when the phasing for infrastructure will occur, but it is likely to be tied to the phasing for the burial grounds, and so may take many years before it is implemented. In the long term (after Phase 3 roadway is built), it can be expected that there would be only two enclosed areas.

7.81 Three (3 ha) out of 17.4 ha (~17%) will experience some level of habitat fragmentation as a result of road construction.

7.82 The entire area now slated for burial will represent an area of ecological disturbance, where no rare, endangered or protected species will occur. The

largest of the 3 road enclosed areas, is unlikely to ever come into use for burial (1.7 ha at the core of the property) and will be combination of undisturbed woodlands and landscaped lawns and gardens including the pond. This area is expected to be ecological diverse; even without the presence of the roadway, the presence of the burial lawn in itself around this core area could potentially represent an ecological barrier. The effect is completely reversible with the removal of structural elements.

7.83 No mitigation measure is available for this impact. The following mitigating factors may be taken into account (a) several new ecological niches will be created by the development, including additional trees and wooded areas, cavernous structures (such as mausoleums) and water will be introduced (the pond), (b) a significant portion of the property (more than a third) will be left in an undisturbed state including the steeper slopes and riparian banks, which would serve as refugia for species during initial site disturbance (c) the area will be protected from predatory domestic animals that would normally be introduced with increasing rural residential land use (i.e. cats, dogs, goats, cows); these animals typically have a more deleterious impact on biodiversity and wildlife such as birds and reptiles than roadways, that will see relatively small amounts of traffic.

7.84 This area is privately owned, and does not occur within a protected area, or does not represent a habitat of any known protected species.

7.85 Despite the persistence of the impact, and the relatively large areas impacted, the mitigating factors listed above, and the phasing element and the lack of ecological sensitivity in this area allow this impact to be classified as moderate instead of significant.

Risk of Pest Infestation Associated with Food Storage, Preparation and Disposal

7.86 At the Reception Centre there will be a kitchen with the capacity to cater to up to 400 persons on a weekly basis. Consequently, food and food waste will be stored on property. A major impact of food storage, preparation and refuse is the attraction of pests such as vermin, flies and roaches, which are disease vectors.

7.87 The site where the Reception Centre will be constructed has been the site of a dwelling house for many years. There is a vegetable garden and animal coops in the yard and there is a kitchen in the house. It is likely that there is already some level of pests associated with this site.

7.88 With proper management, there would not be any secondary affects. However, if management is not put in place, there could be public health issues.

7.89 This effect would be localized to the Reception Centre.

7.90 The impacts would persist as long as there is improper food and food waste storage.

7.91 There is some uncertainty, as affected numbers would depend on the size of the party affected by some disease borne by food pests.

7.92 Diseases spread by rats include leptospirosis, meningitis, rat-bite fever and salmonellosis. Cockroaches tend to carry organisms that cause gastroenteritis (food poisoning, dysentery, diarrhoea, etc.). Human resilience to these various illness would depend on age, health etc. Flies carry a range of diseases including typhoid and dysentery. A pest infestation can be easily eradicated with implementation of proper management.

7.93 Demolition of this structure and removal of all the waste materials, and clearance of the site will likely result in the removal of a considerable proportion if not all of the existing pests at the site. After construction, this impact is easily managed by the implementation of proper sanitation procedures to prevent the entrance and harbourage of pests. It is recommended that the facility should be designed in way that takes food sanitation, storage, preparation and disposal needs into consideration.

7.94 With the implementation of proper sanitation, the residual risk of pests is expected to better than it is at present at this site.

7.95 This is classified as minor as the only area of the property that will be impacted is the existing house site, where the pests are likely to already exist.

Modification of Site Hydrology

7.96 The creation of the vault modules as described in paragraph 3.16 (and shown in Figure 4) will necessitate the modification of the terrain, and in effect the near surface hydrology. Figure 4 indicates that module terraces will be divided by low stone walls. Vault modules will be constructed on lands that some degree of slope (up to 24%). Each vault module will require two levels of terraces to be cut into the slope to provide for level ground for construction of three rows of vaults in each terrace. After the module terraces are excavated, and concrete block vaults constructed, these will be back-filled with marl that was previous

excavated from this area. The dry stone wall will be constructed of limestone boulders from the excavated material. Based on pits that have been dug, it is expected that there will be a combination of boulders and marl in the excavated materials. Top soil from the site will be then used to cover over the top of the module (not including the dry stone wall) to an average grade of 6% and grassed. After a vault has been used (i.e. for a burial), backfilled earth will be compacted over time to prevent subsidence of the slope after the coffin has caved in.

7.97 Catchment 1 falls for all practical purposes completely within the boundaries of the property. The catchment is defined by the two ridges and is the focal point of the development. Most of the infrastructure and by extension most of the hard impervious surfaces will be located in this area. Eighteen percent (18%) of the catchment will be cover by roads and building infrastructure or impervious surfaces. This figure also includes the water feature. A total of 26% of this catchment will be converted to burial area. Considering the low permeability of underground, the activity associated with the creation of the burial areas (the excavation, terracing and landscaping) will improve the water retention capacity and the run off of the site.

7.98 Only a small portion of Catchment 2 (5,760m^2 or 1.5%) will be covered by roads and building infrastructure or other impervious surfaces. Six percent (6%) of the property will be converted to burial. None of the tree cover above the 160 m (525 ft) contour will be removed. Most of the catchment will not affected by the cemetery development.

7.99 Based on the estimated peak discharges (Table 11) the difference between the baseline and the post-construction phases indicates that the change to storm run-offs arising from the project is negligible. As expected, changes in Catchment 1 are marginally greater than the baseline, particularly after the initial phase, when most of the core infrastructure will be put in, with relatively little conversion of the areas slated for burial ground from case hardened bedrock to back-filled vault modules. However, as can be seen in the following paragraphs on detention storage, the actual volumes involved, even in the most extreme storms, are small and can easily be contained within the perimeter of the development.

7.100 Due to the negligible change from baseline conditions, this impact is classified as minor.

	CATCHMENT 1					CATCHMENT 2			
RETURN PERIOD	**10Y**	**25Y**	**50Y**	**100Y**		**10Y**	**25Y**	**50Y**	**100Y**
Pre-Project Baseline	2.24	3.01	3.73	4.35		10.10	13.55	16.44	19.01
After Phase 1	2.44	3.28	4.07	4.75		10.16	13.63	16.54	19.12
After Phase 2	2.38	3.20	3.97	4.63		10.16	13.63	16.54	19.12
After Phase 3	2.45	3.30	4.09	4.77		10.10	13.55	16.45	19.01
After Phase 4	2.41	3.25	4.02	4.69		10.07	13.52	16.41	18.96

Table 11 Peak Discharges (m^3/sec) for both catchments

Impounding of Storm Flows

7.101 Due to the historic reports of flash flooding on the Moor Park Gully parochial road, as well as the need for unchlorinated irrigation water and for aesthetic purposes, the developer wishes to retain on site all storm flows generated on property or in the feeding catchments above it. The proposed detention feature in Catchment 1 is described in paragraph 3.50.

7.102 The main change that can be expected in terms of the site hydrology will therefore be the collection and impounding of all surface run-offs. The conceptual drainage plan calls for dry intercepts to be placed on the upslope perimeter of the vault modules to prevent any sheet flows from entering the module. This water, along with rainwater harvested from all pavements and roofs will be routed to the central pond via concrete roadside drains.

7.103 The detention storage needed to maintain the peak run-off at pre-development levels was calculated using the Rational Hydrograph method. While rational formula was designed to estimate peak discharge and not runoff volume, the method can be used for small watershed to get an indication of the size detention storage required. For both watersheds a design storm of 60 min was used and their respective concentration time and pre-development 100 year peak discharge. The Phase 3 peak discharge was used for Catchment 1 and the Phase 1 peak discharge for Catchment 2. The detention storage needed for Catchment 1 is 756 m^3 and for Catchment 2 is 198 m^3.

7.104 There will be a small increase in storm runoff in the centre of the development, which will be contained in the proposed ponds. Overtime there will be a slight reduction of runoff from the larger catchment, which will off-set the increase in runoff from the smaller catchment in which the development is concentrated.

7.105 Creation of the pond will have the following effects (a) creation of a new ecological niche (b) reducing the risk of flash flooding off-site (c) containment of any pollutants that might be generated from the site (d) reducing the property's demand for municipal water for irrigation and (e) facilitating a design objective to create a central water feature for aesthetic purposes. None of these secondary effects is believed to be negative, consequently no mitigation measure is proposed.

7.106 Although there is a change from baseline conditions, in general, the effects of this are regarded as positive.

Groundwater Contamination

7.107 With a high density of graves at any site, there is always a concern about the potential for pollution of groundwater resources by cemetery leachate or plumes. Using the percolation rates that were determined for the site, an estimation of the highest rate a contaminated fluid could move through the underground and contaminate a possible water source was undertaken. The nearest receptors would in this case the regional groundwater table, located 50 to 60 meters below the surface or the gully channel on or off the property.

7.108 The worst case assessment makes the following unlikely assumption: (a) saturated conditions exist; (b) a constant flow of groundwater exist along a steep direct pathway to nearest water resource and (c) there are no natural absorptive materials or less permeable deposits or structure that could divert and delay the transmission of fluids. Using Darcy's Law, the highest hydraulic conductivity obtained by the field test (2.3×10^{-05}) and a hydraulic gradient of 3.4% (based on the water table map for the Montego River basin, Plate IV, UNDP/FAO 1971), the velocity was calculated to be 8.0×10^{-7} m/sec.

7.109 Studies (Dent 2002) have shown that after 100 days, all bacterial or viral infection become harmless in a soil-groundwater. In 100 days groundwater at this site travel not more than 7 m in a straight line. This means that a 7 m buffer for this site should be more than adequate because in the real word groundwater/ leachate does not move in a straight line (as is the assumption in this worst case estimate) and will take a much longer time to cover this distance. It is therefore unlikely that harmful contaminants from grave leachate will exit the site if a perimeter buffer of 7 m is used. Based on the depth to groundwater, it is also

highly unlikely that there is any chance of groundwater resources being impacted by cemetery leachate.

7.110 Similarly, sewage effluents from the tiled fields are not predicted to cause any groundwater contamination.

7.111 It is recommended that the burial grounds be located 7 m from the perimeter. The 15 m riparian buffer to the gully may be relaxed to 7 m, but the slopes in parts of this area are considered economically prohibitive for conversion to terraces (>24%).

7.112 No change in ground water quality parameters is predicted to occur. Based on this assessment, this impact is not predicted to occur, and is classified as negligible.

Cumulative Effects

Carbon Footprint

7.113 The carbon footprint is a sub-set of the overall environmental footprint of the project. According to the Carbon Trust, the carbon footprint is "*the total set of GHG[20] emissions caused directly or indirectly by an individual, organization, event or product*." The main indicator GHG used to determine the carbon footprint is carbon dioxide, emissions of which optimally should be quantified over the entire life cycle of the project. However, in this case, only a qualitative assessment is possible. The main sources of carbon emissions for this project include:

- Consumption of fossil fuels: This includes relatively minor amounts of fuel consumption during the construction phase, and incrementally increasing power demands (electricity) as the project approaches full build-out and occupancy. The crematory is expected to consume the greatest amount of fossil fuel with an estimated 100 m^3 LPG being used per year (800 hours per year at 26 gallons of LPG per hour).

- Consumption of cement products associated with building construction. The USEPA estimates for every metric ton of concrete there are net carbon

[20] Green House Gases

emissions of ~265 kg. No data are available on the quantities of concrete that are likely to be consumed over the life cycle of this project. It is expected that the CO_2 contribution will be relatively small amount compared to the estimated global production of the order of 2.5 billion metric tons.

- Use of products that are imported (which consumes transportation fuel) or require a lot of fuel for manufacture (such as steel).

- The removal of biomass and carbon sequestration capacity (through vegetation clearance). The latter will be significantly off-set by replacement of biomass through landscaping and habitat restoration activities that are planned for the project.

7.114 The main mitigation measures are those that off-set the carbon footprint, such as:

- Ensure maximum operation efficiency in all equipment being used at the site during construction. This would involve routine maintenance.
- Minimize wastage of concrete or cement products.
- Design to maximize the use of natural light (including the use of light tubes), and install energy efficient lights (florescent and LEDs as opposed to incandescent).
- Use renewable timber and natural stone products where possible.
- Restore vegetation cover as far as reasonably practicable.
- Install energy efficient appliances, especially air conditioners.
- Use locally or regionally sourced supplies. Transportation of goods increases the carbon footprint through consumption of fossil fuels. Therefore, for example, bottled water from Figi has a greater carbon footprint that water imported from another Caribbean island.
- There are a number of recommendations in respect of managing energy costs in restaurants, however, at this stage, these can only be generic. The restaurants management can be directed to standard guidance documents[21] to adopt and integrate the most feasible and cost-effective recommendations.

7.115 This impact cannot be measured against the baseline, but is cumulative and expected to be relatively **minor**.

[21] https://www.servu-online.com/energy-efficient-incentives/media/featured-resources/Managing-Energy-Costs-in-Restaurants.pdf

Consumption of Municipal Landfill Space

7.116 As indicated in paragraph 3.77, solid waste from the site is estimated to be of the order of ~2.3 metric tons per year. This waste is expected to be cumulative with other demands for municipal landfill space and relatively insignificant compared to the gross demand. The USEPA[22] estimates that the average person in the US produces 4.54 lbs (~2 kg) of waste per day, so that the annual production of waste per person is of the order of 0.75 metric tons per year, which is actually a little more than the amount predicted for the cemetery. As a means of comparing, the cemetery is expected to generate a lot less solid waste than a residential land use at this site, or even less than four individuals living in a dwelling house on the property.

7.117 This impact is classified as negligible.

Conclusion

7.118 The main environmental impacts that were assessed by this study for the construction phase of the project included:

a) Construction noise
b) Reduced air quality due to construction emissions
c) Contamination of surface water by construction site effluents
d) Contamination of groundwater with construction site sewage and grey water.
e) Demand for landfill space due to construction waste.
f) Adverse effects on haulage roads

Of these six, only one was classified as moderate (effects on haulage roads) and the remaining five were classified as negligible or minor.

7.119 Of the eleven operational phase impacts that were identified, the following seven were assessed as being negligible or minor :

a) Operational nuisance noise
b) Traffic Impacts
c) Risk of pest infestation associated with food storage, preparation and disposal
d) Modification of site hydrology

[22] http://www.epa.gov/region01/solidwaste/index.html

e) Groundwater contamination
f) Carbon footprint
g) Consumption of landfill space (operational phase)

7.120 Impounding of storm flows was initially thought to be potentially a negative impact, but was assessed to actually result in positive environmental effects.

7.121 The remaining three impacts included (a) thermal emissions, (b) conversion of part of the site to monoculture and (c) habitat change. These were all assessed as being moderately negative impacts.

7.122 It is the finding of this report that this project is unlikely to generate any significant adverse environmental effects as defined in paragraph 7.12. Moderately negative impacts on the haulage roads during construction and on air quality arising from thermal emissions both can be cost-effectively mitigation. The two operational phase impacts (on the biological environment) must be considered against mitigating factors and the extent of green planning that this development represents, as well as its general suitability for the environmental setting. Most of the impacts caused by the project are not likely to result in measureable changes to the baseline conditions or are within normal levels of fluctuations for the various baseline parameters.

SECTION 8: ANALYSIS OF ALTERNATIVES

9.1 The purpose of this section of the EIA is to examine feasible alternatives to the project. The following land use options will be rigorously evaluated (a) leaving the land as is (status quo), versus (b) the proposed option. Feasible land use options are compared below in terms of potential benefits and costs, using a range of factors or normative criteria. This section also highlights the benefits of and general rationale for the project that need to be considered against any potential environmental cost. It should outline in balanced way, the wider societal benefits of the development proposal that could arise if the environmental permit is granted.

9.2 Under the status quo, the lands will remain under scrub vegetation with trees located along the fence-lines, gullies and steeper slopes. There is a low level of use of these lands for cultivation due to the impermeability of the case-hardened limestone outcropping extensively on the site, as well as the general stoniness and shallowness of the soils developed over the limestone. Another major limitation to agricultural development in this area is the lack of water, which arises from the low internal drainage of the bedrock. This also serves to limit the further development of the property as pasture. Agriculture in this area is affected by erosion of the thin stony soil. This together with any hillside denudation (from grazing) would aggravate run-off problems.

9.3 The option of the project as proposed include the following major benefits to the wider community:

a) Flood management, without which there would continue to be a flash flood risk to the parochial road between the site and the main road to Adelphi.
b) Installation of a piped connection from the water mains along the main road at Adelphi, running at least as far as the cemetery site, thus reducing the cost for communities lying beyond to extend and connect to the NWC mains.
c) Upgrade of the parochial road so that it is always passable.
d) Creation of additional burial capacity to supplement parish capacity.
e) Cemetery operations are not labour intensive. However, there is likely to be a creation of earning opportunities associated with services and goods that have to be provided for funeral receptions, the demand for cinder blocks from local manufacturers, as well as potential works in landscaping and construction. It can be expected that small vendor establishment

might develop along the roadside to meet the perceived demand for light refreshments. However, this will be constrained by the relatively low volume of visitors into the area (assuming a maximum of 100 per week).

f) Aside from maintaining all slopes greater than 24% in their natural state (which agricultural use would not necessarily do), the cemetery use locks in a large acreage of land as “green space”.

g) Although the visual aesthetic of the cemetery would be apparent, it is difficult to assess the effect this will have an adjacent land values. According to Zhang (2004), cemeteries generate a high net return on land, and this would be expected to be higher than adjacent uses.

9.4 Another feasible land use option for this site would be low density (1/3 to ½ acre lots) residential land use. The same areas that would be prohibitive for burial land use would also be prohibitive for residential development, so a similar acreage of the site would be utilized. The benefit of this land use is that it would still requirement infrastructural development along the access roadway (road upgrade, improvement to the storm drain and crossing, piped water). It is likely that there would also be effective implementation of flood management measures. There would also be more construction employment. However, adverse effects would include larger generation capacity for sewage, solid waste, noise emissions and traffic; greater demands for municipal land fill capacity, roads maintenance, potable water and electricity, as well as social amenities and services such as schools, hospitals, police etc. It is also likely that the long-term run-off co-efficient at the site will be less than it is at present with the introduction of more houses and roadways.

Cost-Benefit Analysis

9.5 The three land use development options outlined above are compared in terms of most benefits and least costs using a range of factors or normative criteria given in Table 12 below. This approach tries to evaluate the economic, technical, social and environmental consequences of each option. These options are compared using a simple ranking system in relation to the normative criteria. A rank of number 1 indicates that the option is best suited to satisfying the normative criterion, and a rank of 3 indicates that the option is least suited to satisfying the normative criterion. The option scoring the lowest total score may be regarded as the most suited overall.

		Cemetery	Status Quo	Residential Sub-Division
1	Best suits landowners needs	1	3	2
2	Most earning opportunities for communities	2	3	1
3	Best effects on land values in the area	2	3	1
4	Most preservation of green space and habitats	2	1	3
5	Best serves wider societal and community needs	1	2	1
1	Least waste generation	1	1	3
2	Least impact on biomass and biodiversity	2	1	3
3	Least traffic impacts	2	1	3
4	Least implementation costs	2	1	3
5	Least demand on municipal resources	2	1	3
	Total	17	17	23

Table 12 Ranking of Most Benefits and Least Costs Criteria

9.6 Based on these criteria, the “no action” alternative scored the lowest (17 points). This was very close to the score achieved by the proposed option (cemetery), which would better suit the landowner. To be able to implement a no action alternative, the government would have to purchase the lands from the landowner. The residential land use sub-division option scored the highest, suggesting overall least satisfaction of the range of most benefits and least costs.

SECTION 9: ENVIRONMENTAL MANAGEMENT PLAN

9.1 The purpose of this section is to outline the Environmental Management Plan (EMP) for the proposed development in all its phases.

Environmental Performance Objectives

9.2 Based on the adverse environmental impacts that are likely to occur, the following environmental performance/quality objectives are recommended for this project:

(a) To conduct the construction activities in such a manner as to minimize or avoid any related nuisances (noise, traffic, dust) to the surrounding communities, and mitigate any reduction in the environmental quality (air, soils, water) near to the construction site arising from associated activities.

(b) To operate and to maintain all equipment in accordance with manufacturers' specifications so as to ensure that built in abatement technologies are functioning at peak efficiency at all times.

(c) To design all buildings, open areas and outdoor features in a manner that maximizes opportunities to (a) reduce the overall carbon footprint of the project, (b) improve habitat quality, biodiversity and ecological functions and (c) enhance the visual aesthetic of the cemetery will optimize functionality.

(d) To reduce quantity of solid waste that is likely to be produced by the operations through waste reduction, recycling/re-purposing, and re-use.

(e) To exploit the natural resources (eco-systems, water, soils and stone) on property in a conservative and precautionary manner.

(f) To avoid or minimize all risk to public health associated with the operations of the facilities, including pest control, waste management and occupational safety.

Mitigation Schedule

9.3 The following are the recommended construction phase mitigation measures which need to be passed down to construction contractors and on-site project managers:

Noise Abatement

- Limit construction activities to normal working hours.
- Use noise abatement technologies available for specific equipment.

Air Emissions Control

- Limit site clearance to the areas needed most immediately for construction. For example, do not clear parking lot and tile field area until necessary.
- Wet cleared areas and earth material stockpiles and dirt roadways.
- Cover stores of cement.
- Restrict and control cement mixing on site: use ready-mixed poured concrete as much as possible.
- Use construction stabilized construction exits (SCEs) at the exits to remove excess muds from the wheels of haulage vehicles.
- Screen the building site or place fine mesh screening close to the dust source.
- Ensure that haulage trucks are covered.
- To the extent reasonably practicable, use non-toxic paints, solvents and other hazardous materials wherever possible
- To the extent reasonably practicable, use low sulphur diesel oil in all vehicle and equipment engines, and particulate filters and catalytic converters.
- Prohibit burning of materials on site.

Site Run-Off Control

- Site stockpiles away from major storm run-off pathways.
- Stockpile areas should be properly sized to ensure capacity for the necessary materials, and bunded.
- Stockpiled earth materials (sand, stone etc) should be covered and bermed.
- If there is any washing of equipment or vehicles on site, it should be done at a designated wash-down area, where the run-off is routed to a settling pond or tank. Sludge should be disposed of at a landfill by an approved contractor.
- SCEs should be used.

Sewage Management

- Locate pit away from major water courses
- Screen properly with zinc or plywood.
- Cover pit with a toilet, inclusive of a seat and cover.
- The toilet should be sanitized daily.
- Provide a hand washing basin immediately outside the facility.
- When abandoned, fill the pit with marl and compact over. Approximately 30 cm of marl should be mounded over the top of the pit after compaction.

- Route grey water from the shower and sink to a temporary settlement pond located near to the facility.

Solid Waste Management

- Use a wood chipper to breakdown plant material and recycle on site.
- Demolition debris will be transported to the landfill off-site. During demolition, care should be taken ensure that there is no asbestos in the old house, and if there is, construction workers should be properly protected, and the asbestos safely disposed of.
- Designate waste collection/storage area with skips or large bins.
- Employ a licensed waste haulage contractor to collect waste on a weekly basis.
- Re-use all stone and marl excavated on site, as well as concrete demolition debris for other purposes.
- Top soil from areas to be permanently paved (e.g. roadways, parking lots and building footprints) should be scraped off prior to grading, and re-used at sites that are allocated for landscaping.

Haulage Management

- Haulage contractors shall be required to (a) spread axel loads and (b) secure and cover loads and (c) limit haulage to off-peak hours during normal working periods.
- Maintain vehicles to avoid excessive noise and emissions.
- Wash vehicles to avoid excessive generation of fugitive dust.
- Upgrade the parochial road prior to the commencement of construction.

Operational Air Pollution Abatement

9.4 Proper operation of the crematory unit is best achieved by:

- Secure specialized training for staff;
- Maintain the Crematory Unit in accordance with the manufacturer’s schedule.
- Ensure the unit is not overloaded beyond manufacturer’s rated capacity.
- Maintain the recommended burn temperature (at least 850 C) and a gas residence time of not less than 2 seconds for the second chamber to ensure complete combustion of particulates and other compounds.
- Ensure that the supply of secondary air is sufficient so that the combustion efficiency is optimized. Oxygen level of the flue gas shall be greater than 6%.

9.5 The following table (Table 13) indicates how maintaining the system in peak performance will ensure air pollution abatement.

Release source	Substance	Control techniques
Flue gas	Nitrogen oxides	No control
	Odour	Good combustion and a secondary com bustion zone
	Carbon monoxide	Good combustion and a secondary com bustion zone
	Volatile organic com pounds	Good combustion and a secondary com bustion zone
	PAH	Good combustion and a secondary com bustion zone
	Mercury and its com pounds	Abatement , or contribute via burden sharing scheme
	Particulate matter	Good combustion, slow gas velocities and a secondary combustion zone. Abatement further minimises emissions
	Hydrogen chloride	Minimise halogens combusted, avoid excessive temperature in primary chamber. Abatement further minimises emissions
	PCDD/F	Minimise chlorine combusted and particulate matter emitted, good combustion and a secondary combustion zone, Abatement further minimises emissions
	Carbon dioxide	Measure gas consumption, good cremator design
Cremated remains size reduction machine	Particulate matter	Filter on machine or external dispersion and filter if needed.
Spent gas-cleaning materials	Particulate matter, mercury	Keep containers tightly lidded

Table 13 Summary of Control Techniques (Taken from 2010 UK Statutory Guidance for Crematoria)

9.6 The type of material used to contain the human remains affects the emissions. It is recommended that chlorinated plastics in the container be avoided. Containers should optimally be made of cardboard or pine. The use of synthetic fabrics and treated woods should also be limited. The UK Guidelines specify further that coffin materials for the crematory unit should not include PVC and melamine, cardboard with chlorine, materials with lead or zinc.

Minimization of Carbon Footprint

9.7 The overall carbon footprint of the project can be minimized by the following measures:

- Ensure maximum operation efficiency in all equipment being used at the site during construction. This would involve routine maintenance.
- Minimize wastage of concrete or cement products.
- Design to maximize the use of natural light (including the use of light tubes), and install energy efficient lights (florescent and LEDs as opposed to incandescent).
- Use renewable timber and natural stone products where possible.
- Restore vegetation cover as far as reasonably practicable.
- Install energy efficient appliances, especially air conditioners.
- Use locally or regionally sourced supplies. Transportation of goods increases the carbon footprint through consumption of fossil fuels. Therefore, for example, bottled water from Figi has a greater carbon footprint that water imported from another Caribbean island.
- There are a number of recommendations in respect of managing energy costs in restaurants, however, at this stage, these can only be generic. The restaurants management can be directed to standard guidance documents[23] to adopt and integrate the most feasible and cost-effective recommendations.

Planning Considerations

9.8 The following recommendations are submitted to the developer and regulatory authority for consideration in improving the design and operations to ensure long term sustainability:

- Ensure that emissions of exhaust from the crematory occur at a sufficiently highly elevation so that in the event of high wind conditions, the hot air plume will be able to clear the surrounding land elevations, and safely disperse to ambient conditions. Alternatively, the exit emissions should be cooled.
- It is recommended that the unit is scheduled for operation at times when meteorological conditions are expected to be optimal for dispersal to the highest possible levels (i.e. calm conditions). In order to ascertain the best time

[23] https://www.servu-online.com/energy-efficient-incentives/media/featured-resources/Managing-Energy-Costs-in-Restaurants.pdf

of day for this, it is recommended that an electronic wireless anemometer[24] be installed on top of the building to record continuously the wind conditions over an extended period.

- Relax the buffer along water ways to 10 m where the riparian slope exceeds 24%.
- Ensure that there is a 7 m buffer zone between all burial lawns and the perimeter of the site.
- For larger funerals (i.e., more than 300 guests), the operator should consider making available a bus service from a central location in Montego Bay to the site.
- The design of the Reception Centre should allow for sanitary food handling, storage and disposal.
- To the extent reasonably practicable, re-use grey water from sinks and washrooms (routed through a grease trap) for irrigation.
- Buildings should be designed to optimize natural ventilation and reduce insolation by direct sunlight on west-facing walls in the afternoons.
- The developer should consider the construction of lay-by along the parochial roadway between the main road and the site entrance.

Opportunities for Optimizing Environmental Performance

Burials

9.9 Manage grave sites to avoid the development of depressions over vaults. This will require compaction and possibly topping up of fill.

9.10 The area should be re-shaped to allow for direct precipitation on vaults to run-off efficiently to perimeter drains.

9.11 The base of the vault should not be lined with concrete; if possible, the sub-base can be lined with gravel and charcoal.

Community Relations

9.12 The operator of the facility should maintain an open door policy with the community to deal with any issues arising from routine operations in an amicable manner.

[24] These are available for between 80 USD and 200 USD and require very little maintenance.

Landscaping & Water Conservation

9.13 To the extent reasonably practicable, use drought resistant ornamental plants such as bougainvillea, plumbago and periwinkle. Large savannah trees like samaan (guango), cassia sp. can be used as shade trees.

9.14 Maintain perimeter fencing to prevent feral domestic animals (dogs and cats) and ruminants (cows, goats, sheep) from coming on to the property.

9.15 During times of drought (regional) there should be no watering of lawns and landscaped areas, or filling of ponds.

9.16 Vetiver should be used along all earthen swales or drains, and around the perimeter of the ponds.

Upset Conditions

9.17 During either phase there is a risk of accidents occurring. During construction this may involve accidental spillage of materials or oil leak in equipment or workplace accidents. During the operational phase, it can also involve a similar range of accidental conditions.

9.18 The risk of accidents in all phases and operations can best be managed by:

- Proper training of staff in respect of equipment usage and safety and emergency response plans.
- Provision of proper safety gear to staff.
- Operation of equipment in accordance with design specifications and operational parameters.
- Provision of emergency response, fire-fighting and life saving equipment on property.

Post-Permit Requirements

9.19 Based on the current state of project planning, it is expected that after the Environmental Permit is secured, the following approvals will be required:

- Building approvals (inclusive of tilefield design specifications).
- Environmental permit for any significant drainage modification plans, in the event that the developer decides to construct a detention basin on the eastern gully.
- An Environmental License for storage of LPG if a tank larger than what is described in paragraph 3.28 is required.

Outline Monitoring Programme

9.20 The TORs specify that an outline monitoring programme should be included in the EIA, and a detailed version submitted to NEPA for approval after the granting of the permit and prior to the commencement of the development.

9.21 It is recommended that water quality in the central water feature be monitored on a quarterly basis to ensure compliance with the national irrigation standards, if this water is being used for irrigation purposes.

9.22 BOD, Total Nitrogen, Total Phosphorus, Salinity/Conductivity, and Total Suspended Solids (TSS), Total coliforms should be monitored at least one station within the upper basin of the pond system on a monthly basis.

9.23 The results of the monitoring should be reported to NEPA annually unless there is non-compliance with the standards, in which case the data should be immediately reported.

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Appendix 1

NATIONAL ENVIRONMENT & PLANNING AGENCY

PERMIT APPLICATION: 2011-08017-EP00029

DRAFT TERMS OF REFERENCE
ENVIRONMENTAL IMPACT ASSESSMENT

FOR A
PROPOSED CEMETERY DEVELOPMENT PROPOSED BY
DELAPENHA FUNERAL SERVICES LTD.
AT MOORE PARK, ST JAMES, JAMAICA

April 2011

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DRAFT TERMS OF REFERENCE

FOR THE ENVIRONMENTAL IMPACT ASSESSMENT
FOR A CEMETERY DEVELOPMENT
AT MOORE PARK, ST JAMES BY DELAPENHA FUNERAL SERVICES LTD

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1 INTRODUCTION

1.1 Regulatory Requirement

Delapenha Funeral Services Ltd. (DFS) is seeking permission to establish a private cemetery and crematorium at a 43 acre site located at Moore Park, St James. These Terms of Reference (TORs) are submitted as the scope of work for an Environmental Impact Assessment (EIA) which the National Environment and Planning Agency (NEPA) has requested the applicant to submit in support of his application for an Environmental Permit. The Natural Resources Conservation Authority Act Permit and Licenses Regulations (1996) specify that cemeteries and crematoria require an environmental permit.

1.2 Objectives of the TORs

The objectives of these TORs are to:

(1) Provide preliminary information about the project and project site which would be sufficient to allow stakeholders an opportunity to raise any concerns that have not been identified as yet.

(2) Include a preliminary scoping of impacts conducting, which is understood to be preliminary, and may be expanded based on more in depth site investigation, project appraisal, and stakeholder consultation. This preliminary scoping of impacts allows for a determination of the minimum levels of investigation needed for the environmental receptors that are likely to be affected.

(3) Set out a minimum scope of work for the EIA, to which the applicant and NEPA both agree. This will include a basic description of each task involved in the preparation of the standard EIA section, and the level of investigation or description that would be acceptable in this specific case. The EIA must be conducted in accordance with this document. Where the need arises to modify the TORs, the proponent shall inform the Agency of the need and obtain the approval for the modification of the TOR from the Agency before the final EIA report is submitted.

2 Project and Site Information

2.1 Project Rationale

DFS has been offering clients in western Jamaica quality funerary services for the past 28 years. Public (Parish Council operated) cemetery capacity in Montego Bay has been almost completely exhausted, and this has resulted in the need for privately operated cemeteries. In this highly competitive industry private operators tend to restrict their availability to burials coming from associated funeral homes. Consequently DPH has become increasingly restricted to burials mainly where family plots are available. In 2007 Delapenha received a permit to operate a private cemetery at Burnt Ground near Shettlewood in Hanover. However, controversy surrounding the site, despite the permit, impacted business severely at that location. This Moore Park site represents an alternative location to the controversial Burnt Ground site.

2.2 Location of the Project Site & Environmental Setting

Site Boundaries: The lands around the site are privately owned, with the exception of the west side, which is the roadway (controlled by the NWA?).

Location: the property is located ~600 m from the main road which runs between the town of Adelphi and Montego Bay, and is less than 4 km from Adelphi. The distance from the main road intersection and Montego Bay is ~10 km. The site does not fall within any protected area or zone in respect of the following national plans: Water Resources Master Plan, Forestry Master Plan, and National Parks and Protected Areas plans. The area, although not specifically zoned as agricultural, may be part of a general agricultural area (Adelphi), and may require a letter of no objection or change of use from the Rural Physical Planning Unit (RRPU). The site is not located in proximity to any protected heritage resources.

The site is located within the Montego River Water Management Unit (WMU 4) in the Great River Basin (VII) [1]. Flows in the Montego River itself are notable very small to small[2]. According to this source, the Montego River near to Montego Bay had a mean annual flow of ~2 m^3/s. During the wet season moderate flows can occur. The Moore Park area has been listed by the Office of Disaster Preparedness and Emergency Management[3] as a flood prone area. High storm flows in the gully running along the main access road to the site is evident from the

[1] NB: the Dovecot cemetery at Kirkpatrick, less than 1.5 away, is located on the same lithology as underlies this site and is in the same Montego River watershed.

[2] Water Resources Assessment of Jamaica. USACE 2001 p43

[3] http://www.odpem.org.jm/DisastersDoHappen/TypesofHazardsDisasters/Floods/MainFloodProneAreasinJamaica/MainFloodProneAreasinCornwallCounty/tabid/291/Default.aspx

bedload and erosion seen after the tropical Storm Nicole in April 2010, and the September 2010 flood rains.

According to the WRA (D Scott, emailed correspondence, 11/01/11) "*groundwater flow direction is to the west generally along faults*." This is consistent with the regional surface flow direction of the Montego/Barnett River towards the west. WRA also identified a non-pumping well at Glasgow located 1.7 km to the SE at elevation of 134 m and drilled in the Montpelier Limestone to a depth of 47.2 m, which puts the groundwater elevation at that location (Glasgow) at ~87 m above mean sea level. The minimum ground elevations at the site is 115 m above mean sea level, giving a vault base depths not lower than 113 m above mean sea level.

The WRA classifies the underlying limestone bedrock (Montpelier Limestone) as an aquiclude, with low transmissivity and infiltration capacity. All decomposition fluids from a body can be expected to be contained within the vault, and will seep out from the unlined base of the vault.

Present land use: The site is presently under open grassland with trees along the gully courses and in the elevations above 500 feet above mean sea level. These fields have been informally used for grazing cattle. One occupied house is located on the property; the long-term resident will be allowed to remain. The persons presently grazing cattle will be allowed to phase out their use of the property over the next two to three years.

2.3 Overview of the Development Concept

The preliminary site plan is given as Figure 2. Operational activities/main project elements are described below.

2.3.1 Burials

Single (1 m deep) and double vaults (2 m deep) will be 0.8 m wide by 2.3 m long. Child vaults will be 0.8 m wide by 1.3 m long. These dimensions allow for a vault density of ~500 vaults per ha (~200 per acre). The base of the 14 vault will not be sealed with concrete. A slab of concrete will be placed on top of the casket upon burial, and will be backfilled with earth material removed from the grave. During the initial construction phase (prior to commissioning of the facility) approximately 100 vaults will be dug and concrete slab put in place. A back hoe which will remain permanently located on property will be used to excavate the vaults. Material excavated from the pit will be used to backfill it. The top of the grave will be compacted after burial and grassed over. The graves will be marked with stone or concrete headstones only.

The main waste stream from the cemetery is the decomposing material (fluids and solids from the bodies and materials from the coffin/casket). Each grave will contain one body, which typically will breakdown to 75% water. A range of naturally occurring salts will be dissolved in this water, along with any embalming chemicals that have been used. It is the practice in Jamaica for partial embalming of the body to be undertaken using formaldehyde. All material

from the body can be effectively contained within the grave (which has a total volume of 1.8 m^3 or 475 gallons compared to the expected volume of a human body of 50 gallons), and the fluids are expected to slowly leach out from the bottom of the pit to the surrounding soil. The main pollutant of concern is formaldehyde[4], the typical use of which is ~310 g per body, which gives a maximum concentration of ~6.2 g/l before any leaching begins. Dissolved formaldehyde quickly breaks down to formic acid and carbon monoxide[5], and is not environmentally persistent. The WHO recommends that there should be 1 m of soil between the base of the grave and the underlying bedrock. DFS will ensure that all burials comply with this and all other WHO and WRA requirements.

Burials will be located on the areas zoned for such on the site plan. Initially, approximately 7 acres will be used as Phase 1. At an estimated rate of use of 100 burials per year and 200 vaults per acre, it is expected that Phase 1 will be in use for the next 14 years. It is expected that 80% of the site (35 acres) can ultimately be used for burials, giving a design capacity of the cemetery of 7000 graves, and an estimated design life of 70 years. This allocation can include later provisions for an urn columbarium or burial area.

2.3.2 Crematorium

The unit that is proposed to be installed is the Mathews Power-Pak II. This unit uses natural or LPG as fuel, and comes with a feature that "*effectively consumes and destroys smoke and odor from the cremation process"* (Appendix 1). The detailed specifications of the unit are given in Appendix 2. The plan view of the installed unit is given as Appendix 3 and further information on the design and requirements of the stack are given in Appendix 4. Appendices 5 and 6 are examples of US permits to construct/install this particular unit issued pursuant to the US Federal Clean Air Act and highlights the main environmental issues and measures to control these. As in the case of these examples, the applicant in this case proposes to emit from a single source.

Appendix 6 presents a table (Table 3 on page 4 of 9 in Appendix 6: Potential to Emit) using an annual operation schedule of 3120 hours per year, which is continuous operation through the year averaging 8.55 hours per day. In the case of Delapenha's crematorium, it is expected that cremations will be limited to 2 days per week, for 50 weeks for the year, given a total of 100 expected cremation days per year and ~427.4 hours per year of operation. Therefore, the potential to emit (PTE) at the Moore Town operation is 13.7% of those estimates (Appendix 6).

Based on the proposed operating time of 427.4 hr/year the crematorium will not classify as a "Significant Facility" or "Major Facility" as defined under the NRCA Air Quality Regulations 2006 and hence will not require an Air Pollutant Discharge License.

[4] See: http://www2.dupont.com/Plastics/en_US/assets/downloads/processing/FETEG_Facts.pdf

Pollutant (measured in tons/year)	POWER PAK II PTE	Air Quality Regulation (1st Schedule)
Particulate Matter (PM, PM_{10}/$PM_{2.5}$)	0.05	25 (plus 15 PM_{10})
Sulfur Dioxide (SO_2)	0.06	40
Oxides of Nitrogen (NO_x)	0.39	40
Carbon Monoxide (CO)	0.01	100
Volatile Organic Compounds (VOCs)	0.003	40
Hydrogen Chloride (HCL)	0.03	40
Total emissions	**0.54**	

Table 1 Comparison of Power Pak II PTE at Moore Town site with the AQ Regs (1st Schedule) TONS/YR

2.3.3 Buildings

A 1500 sf building is included on the site plan for the purpose of housing a cremation unit. The crematorium is to be located at a ground elevation of 580 feet above mean sea level on the northwestern side of the property. The site plan also shows provision for a 2550 sf building to accommodate the chapel and banqueting hall. Both of these buildings will share a parking lot designed to accommodate 40 cars. One acre has been allocated for the buildings, parking lot and tilefield.

2.3.4 Infrastructure

Water: The site will receive potable water for these facilities via a connection to the NWC water mains which runs along the main road. Water requirements (potable) are not expected to exceed 1000 gallons per day during a peak use period. Irrigation water will also be required. All buildings will be guttered to harvest rainwater. A plan to develop a rainwater catchment from the storm flows that now create a major flood hazard along the road is also being considered.

Power and Telecommunications: The site presently has electricity and telephone service. It is expected that power demand at the facility (from security lighting, interior lighting, air conditioning) will be ~1500 kwh per month.

Sewage: Sewage will be disposed of on-site using a suitably sized septic tank and tile field, which will be located as shown in Figure 3. Eight toilets will be provided for females, and 4 for males. Sewage generated at peak use times (400 persons at the site for a maximum of 3 hours) is not expected to exceed 800 gallons per peak use day.

Solid Waste: Solid wastes produced by the facilities are expected to be negligible and variable with the size of funeral parties. It can be estimated that at peak solid waste generated by a funeral party may be of the order of 800 lbs (363 kg) inclusive of food and beverage wastes. Aside from funeral services some minor wastes will be generated by flowers placed at graves and landscaping. Of these only plastic ribbons, plastic containers and florists wires may not be biodegradable. Non-biodegradable components of arrangements left at graves will be collected

[5] http://www.atsdr.cdc.gov/ToxProfiles/tp111-c1.pdf

and disposed of along with solid waste generated in the buildings. Waste will be collected and stored in a metal skip for routine collection by an approved waste contractor.

Roadway: Approximately 1000 m of internal roadway will be developed. This roadway is expected to 3 m wide which necessitates a space allocation of 3000 m^2 (or 0.75 acres) of roadway pavement. In addition, the applicant intends to seek the approval of the National Works Agency (NWA) to improve approximately half a mile of public roadway (700 m) between the main road to Adelphi and the site. Gabion baskets will be used along the new roadway to protect it from storm flows in the gully.

Drainage: All watercourses on the property are ephemeral and there are no standing bodies of water on or adjacent to the property. The site falls within the basin of a tributary of the Montego River, the confluence with which is located near the intersection of the site access road with the main road. Two tributary sub-catchments fall within the site. The sub-basin located on the western side of the property is entirely contained on site. The remainder of the site falls into a second larger sub-basin that extends off-site.

- It is proposed that the western channel will be realigned as a suitably sized concrete drain along the proposed roadway that leads from the main site entrance. The drain will exit the site to the dry gully off-site by way of a culvert.
- Lands have been allocated for the creation of a stormwater detention basin on the eastern side of the property at the confluence of three streams emptying the eastern sub-basin.
- Outside of the western sub-basin and the detention pond, all channels will be kept in their natural state with 15-m buffer zones.

2.3.5 Landscaping

The entire facility shall be landscaped to enhance the feeling of serenity for family members attending funerals or visiting graves. The burial area and other areas will that are now under a mix of wild grasses will be planted with lawn grass with edgings in different ornamental plants. No large trees will be removed as these will be relied upon to provide shade and improve the aesthetics of the site. To the extent reasonably practicable, ornamental plants native to this region will be used, minimizing the needs for fertilizer and pest control.

Water for irrigation will be mainly sourced from harvested rainwater, which will be collected off all constructed surfaces (through guttering). Water detained in the proposed stormwater detention basin will be used for irrigation.

In areas zoned for burials where the land exceeds 30% slope (e.g. the northern section of the property above the 500 ft contour), the slopes will be terraced before use. The treed area above the 525 contour will not be developed. In addition, all existing trees will be preserved as part of the general landscaping.

The perimeter of burial grids will be planted with a barrier zone of vetiver (*Vetiveria zizanioides*) as means of assimilating excess nutrient loads in the soil water.

Buffer zones shall be left in their natural condition populated by plants indigenous to the area and shall include the riparian zones where there would be more moisture and trees which would support any nocturnal species.

3 PRELIMINARY ENVIRONMENTAL SCOPING

3.1 Environmental Sensitivities (Negative Impacts)

The following major environmental concerns have been identified at this time for further evaluation.

1. Changes arising from the physical footprint of the proposed construction and operations:
    a. Change in drainage pattern, and impact on flood potential, making clear reference to the relative areas included in the ODPEM mapping as flood prone.
    b. Possible effect of excavation or site terrain modification and vegetation changes on slope/soil stability, and increased sediment bedload in streams.
    c. Possible fragmentation of habitats arising from installation of roadways, fences, lighting corridors, buffer zones, drains etc. that may serve as ecological barriers.

2. Changes arising from storage of project subsidiary inputs and disposal of waste streams
    a. Potential for oil spill arising from fuel storage for the crematorium
    b. Potential for pollution of ground and surface waters by cemetery leachate or plumes and sewage effluent.
    c. Air pollution from the incinerator.
    d. Potential for vermin or pests arising from food storage on site.
    e. Carbon footprint of the crematorium, and buildings.

3. Impacts on the socio-economic environment, specifically,
    a. Increased traffic on weekends from Montego Bay – cumulative with other cemetery.
    b. Change in land use from open pasture to cemetery.
    c. Potential for increased nuisance noise arising from use of excavation equipment or lawn mowers.
    d. Generation of solid waste at the site.
    e. Demand for irrigation water for landscaping.

4 Description of EIA Tasks

4.1 Content of the EIA Report

The following describes the typical scope and content of the EIA report, and is subdivided according to the standard sections of the EIA, as are usually stipulated in the NEPA TOR for such projects.

4.1.1 Non-Technical Executive Summary

This section shall allow for a clear understanding of the project proposal and summarize the main findings of the EIA study.

4.1.2 Project Description

The aim of this task is to provide a comprehensive description of the project, noting areas to be reserved for construction, areas to be preserved in their existing state as well as activities and features which will introduce risks or generate impact (negative and positive) on the environment. This should involve the use of maps, site plans, aerial photographs and other graphic aids and images, as appropriate.

This section will include at a minimum:

1. Description of the Project Proponent/Applicant. This shall include a profile of the company including its principals.
2. Rationale or justification for the proposed development. This should include a background to the development proposal, including criterion used in selecting this site.
3. Location and setting (relative to other developments, environmental sensitivities and communities).
4. Project overview (main design elements and objectives) and general description (and spatial allotments) of the site plan (lay-out, boundaries and scale) including built areas, burial areas, site infrastructure and landscaping. Design life, overall design capacities and availability. The design capacity shall be compared with the carrying capacity of the site to the extent reasonably practicable.
5. The proposed schedule for development of the various design components of the project. Phasing and timelines for each aspect of the proposed development should be disclosed. For projects to be done on a phased basis it is expected that all phases be clearly defined, the relevant time schedules provided and phased maps, diagrams and appropriate visual aids be included.

6. Design parameters and planning specifications: crematorium & subsidiary inputs (including fuel) storage, graves, sewage disposal system, columbine, buildings & parking lot, drainage, access roadways, fencing/lighting, landscaping/recreational land use.
7. Impact-causing aspects of activities conducted during both expected and upset conditions should be evaluated in terms of estimated resource consumption and waste streams, for all phases of the project (construction, operational/maintenance). This should involve the use of maps at appropriate scales, site plans, aerial photographs and other graphic aids and images, as appropriate.

4.1.3 Analysis of Alternatives

The purpose of this section of the EIA is to examine feasible alternatives to the project. The following land use options will be rigorously evaluated. This shall include an examination of the environmental, social and economic costs of (a) leaving the land as is (*status quo*), versus (b) the proposed option. Feasible land use options are compared below in terms of potential benefits and costs, using a range of factors or normative criteria.

This section should highlight the benefits of and general rationale for the project that need to be considered against any potential environmental cost. It should outline in balanced way, the wider societal benefits of the development proposal that could arise if the environmental permit is granted.

4.1.4 Legal and Institutional Framework

The objective of this task is to provide an outline the relevant environmental regulations, policies and standards governing. This shall include a regulatory controls and institutional frameworks with jurisdiction over the following main areas as they relate specifically to this site and project:

1. Development Control:
    - Permitting: environmental permits, petrol and sewage discharge licenses, planning permission and other operational permits.
    - Construction (including building codes and site management controls) and subsidiary inputs
    - Public safety and vulnerability to natural disasters
    - Physical planning controls (Water Resources Master Plan, National Physical Plan, plans for road and infrastructural development and other planned development projects for the area).
2. Environmental Conservation:
    - Forestry, wildlife and biodiversity.
    - Water resources (surface and ground water).
    - Heritage and cultural resources.

3. Waste Management:
    - Air quality
    - Noise levels
    - Public health and sewage
    - Solid waste and landfill management
    - Storm water.

The examination of the legislation should include at minimum, legislation such as the NRCA Act, the Public Health Act, Public Cemetery Management Act, Burial Within Town Limit Act, The Public Health (Nuisance) Regulations, Parish Councils Building Act and the appropriate international convention/protocol/treaty where applicable. In all cases the roles of agencies with responsibility for implementing legal mechanisms will be described. Where Jamaican standards or policies are insufficient, international standards and policies will be outlined.

This section should summarize (thematically) the key regulatory controls on the project (including environmental quality criteria, physical planning restrictions, building codes etc.). The degree of compliance with these controls (general acceptability) is a key criterion used in determining of the relative significance of environmental impacts.

4.1.5 Description of the Environment (Baseline)

The EIA must include an overall evaluation of the existing environmental conditions, values and functions of the proposed development area. The purpose of this section is to describe sensitive environmental receptors in terms of pre-project status and trends (if the project is not implemented). This therefore provides a baseline against which future monitoring data can be compared to determine whether and how a project is actually impacting specific receptors.

It also allows for evaluation of contributions to environmental degradation from other sources (or cumulative impacts), and the carrying capacity of the environment in respect of specific stresses. The most basic use of the data is terms objectively determining the effect level of impacts, using a classification system.

Based on the preliminary environmental scoping, the following parameters should be included in the description of the environmental baseline, as they are considered to be valued environmental receptors that could potentially be impacted by implementation of the project:

Physical Environment

- Parameters affecting the ambient air quality in the area. This should include wind speed and direction, as well as existing sources of air pollution (particulates, NOx, SOx).
- Noise Levels. Existing sources of noise pollution shall be described. No primary survey is suggested as the project will not increase ambient noise levels.

- Groundwater system. This should include an evaluation of the depth to bedrock (soil overburden), estimated depth to the regional water-table, bedrock percolation rates (based on field tests), expected ground water flow directions as affected by faults and bedding in the bedrock, and the general hydrogeological mapping (from WRA literature). There is no well close enough to the site that can be tested as the site is an aquiclude.
- Surface drainage. This should include a mapping of the watershed showing the location of major drainage channels and sub-basins relative to the site boundaries. These streams are known to be ephemeral, transmitting storm flows only during storm events. This characteristic should be explained in the EIA, and any historic information on flooding should be included. Annual rainfall data (and extreme rainfall data) should be described so that the wet season months (when the water table and flood potential are likely to be higher) can be identified. No water quality testing is feasible as there are no receiving surface water bodies within 100 m of the site. Testing water quality in the nearest point in the Barnett/Montego River is unlikely to yield information that would allow for better environmental management at the site as it is too far away, and impacted by too many other sources.
- Slope stability. Slopes on the property should be classified, and areas where there is a potential for land slippage or soil erosion with clearance of vegetation should be identified. Historic evidence for earthquakes in the area should also be described.

Biological Environment

- Site Ground Cover. This shall include a (satellite image based) mapping of the vegetation ground cover classes on the site, showing areas dominated by pasture/grassland, riparian vegetation, and forest cover types (disturbed, etc.). To the extent possible this should be discussed within the context of historic and traditional/informal land uses at the site.
- Fauna: A literature review of faunal species that can be expected to range in this area, including birds, reptiles, insects, mammals. The literature review shall be augmented by field observations and discussions with residents in the area as to whether there are known occurrences of bats infesting structures and roofs.

Socio-cultural Environment

- Land use within 3 km of the site. Economic activities in the area should also be described.
- Condition of public access roadway between the main road to Adelphi and the site.
- Traffic: funerals will only be conducted on weekend afternoons, when traffic volumes to and from Montego Bay are significantly less than on weekdays. Therefore, no primary

traffic survey is considered necessary. Any available literature on traffic volumes should be reviewed.

- Municipal burial capacity for St James and a description of general burial practices.
- No heritage or archaeological sites occur within proximity to this site. However, the Jamaica National Heritage Trust should be consulted.

4.1.6 Summary of the Stakeholder Consultation Process

This section should summarize the key environmental concerns arising during the stakeholder consultations done prior to submission of the EIA. At a minimum, this section should

- Document the public participation programme for the project.
- Describe the public participation methods, timing, type of information to be provided to the public, and stakeholder target groups. Append survey instruments used to collect information.
- Summarize the issues identified during the public participation process.
- Discuss public input that has been incorporated into the proposed project design, the EIA; and environmental management systems. Concerns that were raised by the public but not considered in the EIA must be justified.

The degree of public concern with specific issues (and general acceptability of the impact given proposed mitigation) is a key criterion used in determining of the relative significance of environmental impacts.

A public meeting shall be held in accordance with the Guidelines for Public Presentation at a time and location signed off by the National Environment and Planning Agency (NEPA). That meeting shall outline the development proposal, and the EIA findings.

4.1.7 Assessment of Impacts and Mitigation Measures

The impact of the development on the specific sensitivities of the protected area should be comprehensively evaluated. The purpose of this is (1) to identify the major environmental and public health issues of concern and (2) to indicate their relative importance to the design of the project and the intended activities, taking full consideration of the effectiveness and acceptability of any proposed mitigation measures in the protected area context.

Negative project impacts shall be identified using the following methods:

1. Stakeholder consultation.
2. Technical inputs from environmental specialists on the EIA team.
3. Review of the possible impact-causing aspects of the project.
4. Review of impact assessments done for similar projects.

5. Regulatory criteria governing aspects of the environment likely to be impacted.
6. The sensitivity of valued environmental components (VECs) likely to be impacted.
7. Review of the risks arising from the project and the range of environmental consequences that could arise under upset conditions.

Each identified negative impact is classified according to the assessed Effect Level (no impact, minor, moderate or major). Each identified impact should be assessed using the following criteria:

1. Scale: this refers to the magnitude of the adverse effect in terms of the geographic extent of influence arising from frequency and magnitude of the causative action. This allows higher assessment of impacts with a wider sphere of influence.

2. Affected Numbers: this considers the numbers of individuals (organisms, people etc.) from a valued population that stand to be impacted. This parameter can refer to indicator species or general receptor populations.

3. Secondary Effects: This parameter looks at the impact as a trigger mechanism for other effects, particularly those manifesting downstream of a pathway emanating from a project component, latent effects that could occur in the future, such as bioaccumulation of heavy metals in the food chain, or effects on future generations.

4. Resilience: This criterion examines ecological resilience/sensitivity (ability of a population to cope with effect). Existing stresses and variability of sensitivity (spatial or seasonal) should be considered. Resilience/sensitivity can be determined by eco-toxicological response, dose/response relationships and exposure of the population given effect pathways. Degree of loss (risk) can also be factored in terms of quantifiable amounts.

5. Persistence: This addresses the frequency and duration of effects in the environment. In general, chronic (persistent) or acute (short-term but severe) effects are regarded as more significant.

6. Reversibility. This criterion evaluates the extent to which an effected receptor can be returned to its pre-project state.

7. Baseline change: This relates to any model or prediction of the extent of change that can be expected. This should compare predicted levels of change with normal fluctuations as well as trends in the parameter without the effect of the project.

8. Extent to which the impact can be mitigated (manageability): This addresses the feasibility (ease of implementation and cost-effectiveness) of measures to prevent or reduce environmental costs. It should also consider the benefits or moderating circumstances given these environmental costs.

9. Uncertainty: This allows for disclosure of the level of scientific confidence in the predicted outcomes, and the general reliability of the data and models used to predict impacts.
10. Acceptability to stakeholders: This examines the willingness to make trade-offs and the degree of objection, given potential benefits of the project. This also includes planning constraints and scientific criteria (maximum allowable limits).

Using these criteria, **a significant negative environmental impact** is herein defined as one that:

- Is located in proximity to any sensitive or protected areas and has been determined to impact negatively on these.
- Is extensive over space or time (scales must be appropriately defined)
- Is intensive in concentration (i.e. exceeding recommended criteria) or in relation to assimilative capacity (as appropriated to the affected receptor).
- Is not consistent with national plans for the general use of the area.
- Contributes to the endangerment of threatened species.
- Reduces the stocks of commercially important species.
- Permanently damages habitat quality or creates ecological barriers.
- Threatens cultural or heritage resources.
- Alters community lifestyles or requires long-term adjustments of local people in respect of traditional values and resource use.
- Represents a long-term nuisance or significant safety risk to other users.

Cumulative impacts are caused by (a) activities unrelated to the proposal being evaluated but are likely to occur at the same time that the project activities are occurring and (b) several activities associated with the implementation of the project as proposed.

External activities form part of the baseline condition, and are taken into account in the examination of the baseline, as well as divergence from the baseline that might be expected to arise from project implementation. In this way the impact of the project on the surrounding area especially as it relates to the cumulative impacts of this project with any existing developments will be included.

In respect of internal aggregations of impacts on specific VECs that may individually be assessed as having a “minor” effect, but that may collectively have a significant combined effect, the resultant cumulative effects are evaluated collectively where multiple project activities contribute to the same effect (however, these should be treated separately when the activities are spatially separated).

This section must conclude with the preparer’s statement on whether, based on the various investigations and assessments of the project that were done as part of the EIA process, there is a Finding of No Negative Significant Impacts (FONSI). If the study finds that the project has the potential to result in significant negative environmental impacts that cannot be cost

effectively mitigated, and which require project modification (in terms of design, site, technology use or scale/footprint), this must be clearly disclosed.

4.1.8 Environmental Management Plan

Design a plan for the management of the natural, historical and archaeological environments of the project to monitor implementation of mitigatory or compensatory measures and project impacts during construction and occupation/operation of the units/facility. An Environmental Management Plan and Historic Preservation Plan (if necessary) for the long term operations of the site should also be prepared.

The Environmental Management Plan (EMP) outlines the following:

- Environmental performance/quality objectives for the project based on the specific impacts identified during site preparation, construction and operational stages of the proposed development.
- Summary of proposed mitigation measures, identifying the best timing for implementation, responsibilities and any required commitments of resources (including training and human resources).
- General guidelines for activities during construction and operational phases of the project to improve the project's overall environmental performance (e.g., in respect of waste management, water and energy conservation, soil conservation, community development, etc.) and to enhance any opportunities for environmental conservation. The proponent is encouraged to incorporate the principles and practices associated with green design and operation, including but not limited to reuse of water, rainwater harvesting, energy conservation etc.
- Requirements for post-permit plans and approvals.
- Outline monitoring programme should be included in the EIA, and a detailed version submitted to NEPA for approval after the granting of the permit and prior to the commencement of the development. At the minimum the monitoring programme and report should include:
  - Introduction outlining the need for a monitoring programme and the relevant specific provisions of the permit and/or license(s) granted.
  - The activity being monitored and the parameters chosen to effectively carry out the exercise.
  - The methodology to be employed and the frequency of monitoring.
  - The sites being monitored. These may in instances, be pre-determined by the local authority and should incorporate a control site where no impact from the development is expected.
  - Frequency of reporting to NEPA

4.1.9 Other Information

The EIA shall also include the following information:

- A comprehensive list of references.
- The report should include appendices with items such as the approved TOR; raw data; survey instruments, and other relevant information.
- A list of EIA preparers and their credentials must be included. It is expected that EIA team shall include qualified persons with expertise and experience in hydrogeology-geology, geomorphology, hydrology, environmental impact assessment and environmental engineering.
- Glossary of technical terms

5 Stakeholder Consultation Process

5.1 Stakeholders

Aside from the Environmental regulatory Agency (NEPA/NRCA), the following stakeholders shall be apprised of the proposed development, and should be included in the EIA consultative process:

1. Relevant government agencies:
    - Water Resources Authority (WRA)
    - St James Parish Council
    - Rural Physical Planning Unit
    - National Works Agency (NWA)
    - Office of Disaster Preparedness and Emergency Management (ODPEM)
    - Environmental Health Unit (EHU), Ministry of Health
    - Jamaica National Heritage Trust (JNHT)

2. Non-Governmental Organizations and community based organizations with an interest in the area.
3. Occupiers/Owners of adjacent lands:
4. Neighbouring communities.

5.2 Stakeholder Consultation

The EIA process will only be considered valid if there are meaningful and valid opportunities for public scrutiny of the environmental effects of the project as proposed, including:

1. During the course of preparation of the EIA Report, direct written communication from the EIA preparer to relevant public agencies, NGOs and adjacent land owners/occupiers

advising them of the project, and seeking their concerns about it as they relate to potential environmental impacts.

2. Survey of the communities within proximity to the site in respect of:
    a. General acceptability of the proposed project, with consideration of the community-based stakeholders' willingness to make trade-offs, given the potential benefits of the project to the local and national economies.
    b. Fears and expectations about the specific project, including any anticipated social conflict and crime.
    c. Perceptions and attitudes of the community.
    d. General health, safety and environmental concerns related to the project
3. Public Meeting held three weeks after the EIA is made available for review. This meeting should include presentations outlining the project, environmental impacts, and proposed mitigations.
4. Availability of all EIA documents for public review, inclusive of: (1) these Terms of Reference (2) the EIA inclusive of all supporting technical appendices (3) the Public Meeting Report (containing presentations, summary, verbatim report of question and answer session and the register of attendance) and (4) Addendum Report (i.e. written response to EIA review comments).

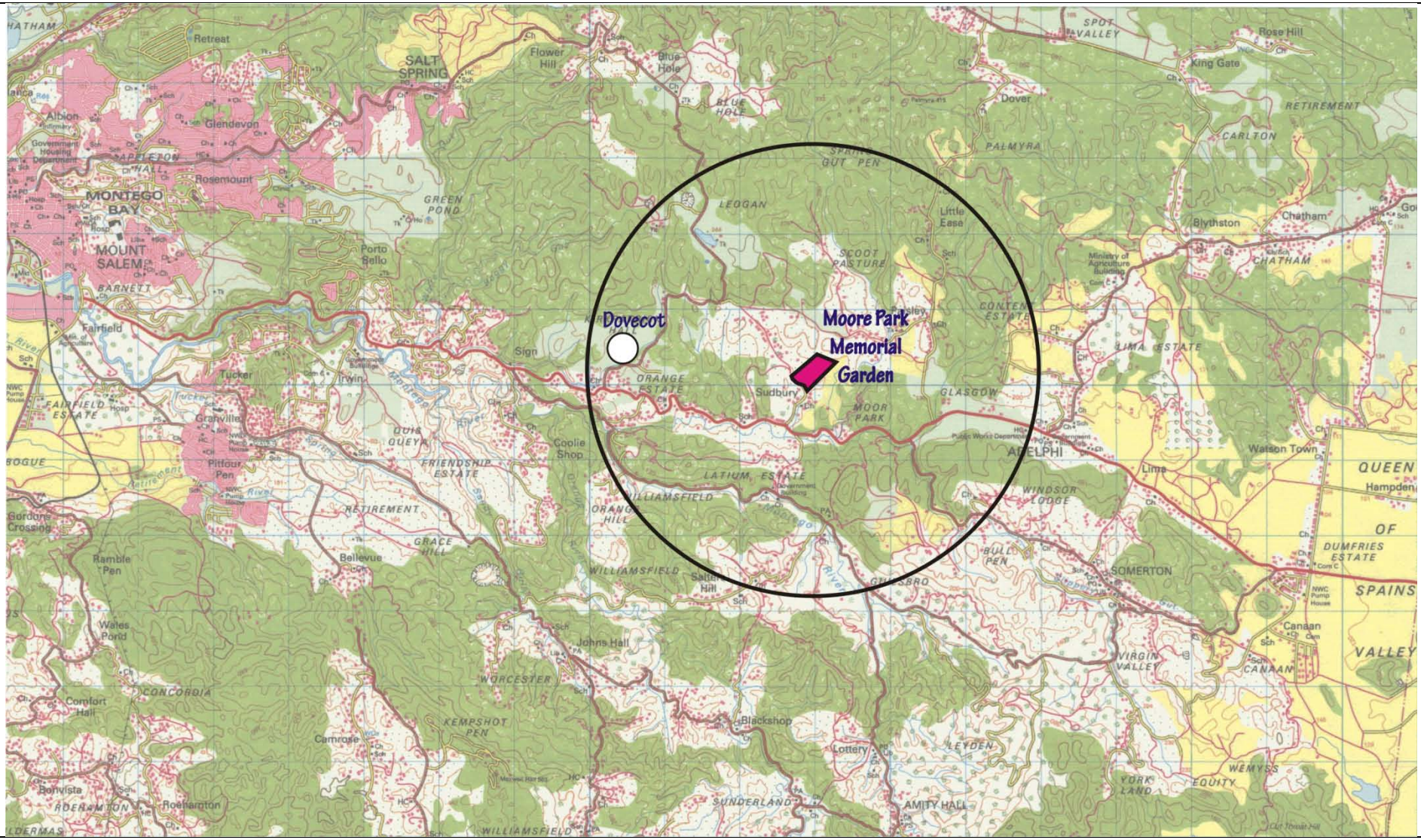


Figure 1 Location of the Site

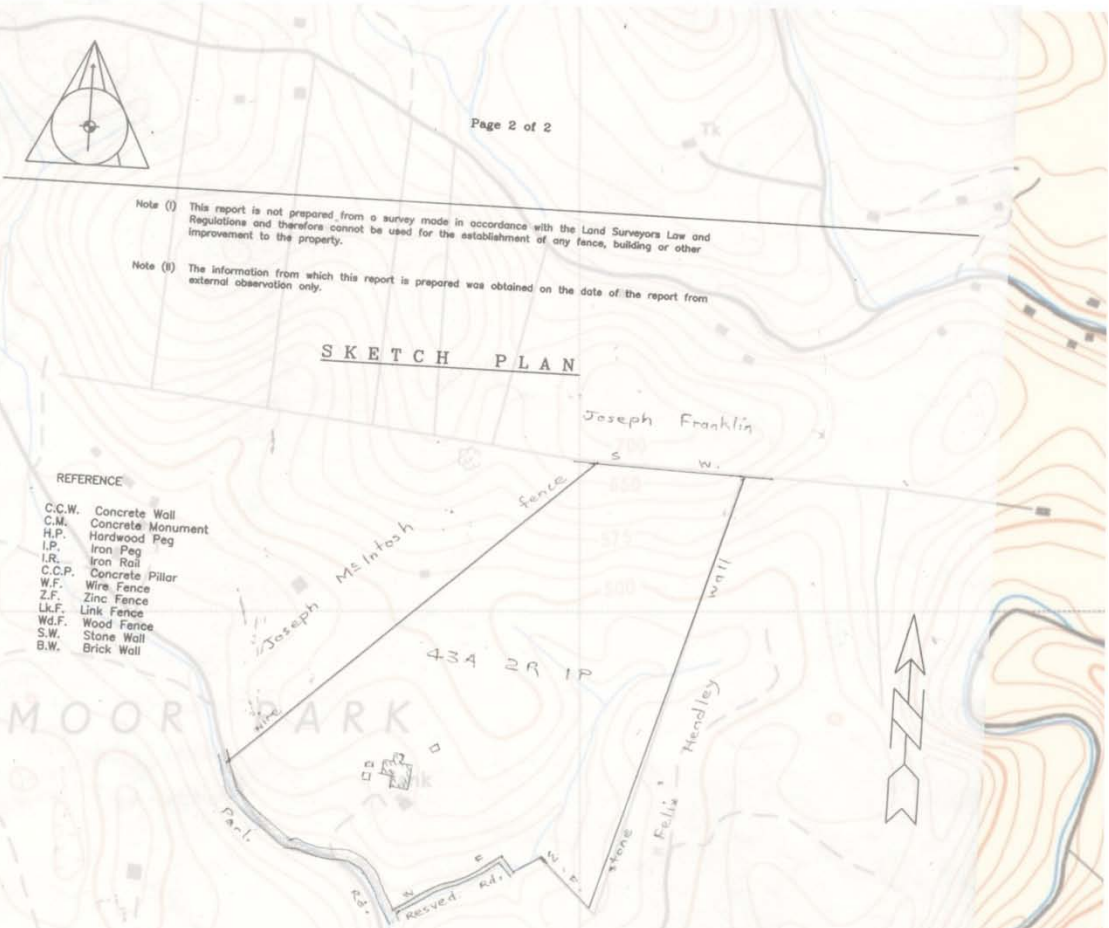
Map extract from 1:50,000 metric series (north is grid north, and each grid cell is 1 km by 1 km). Three (3) km radius around site is demarcated.

7

Note (I) This report is not prepared from a survey made in accordance with the Land Surveyors Law and Regulations and therefore cannot be used for the establishment of any fence, building or other improvement to the property.

Note (II) The information from which this report is prepared was obtained on the date of the report from external observation only.

SKETCH PLAN



REFERENCE

C.C.W.	Concrete Wall
C.M.	Concrete Monument
H.P.	Hardwood Peg
I.P.	Iron Peg
I.R.	Iron Rail
C.C.P.	Concrete Pillar
W.F.	Wire Fence
Z.F.	Zinc Fence
Lk.F.	Link Fence
Wd.F.	Wood Fence
S.W.	Stone Wall
B.W.	Brick Wall

Delapenha's Funeral Home Ltd.
45 Union Street
Montego Bay P.O.
Saint James

GRANTLEY F. KINDNESS
COMMISSIONED LAND SURVEYOR

2011-01-05

Your ref.

Our ref.

Field Bk. No.

Figure 2 Site Boundaries (overlain on the 1:12,500 OS map).

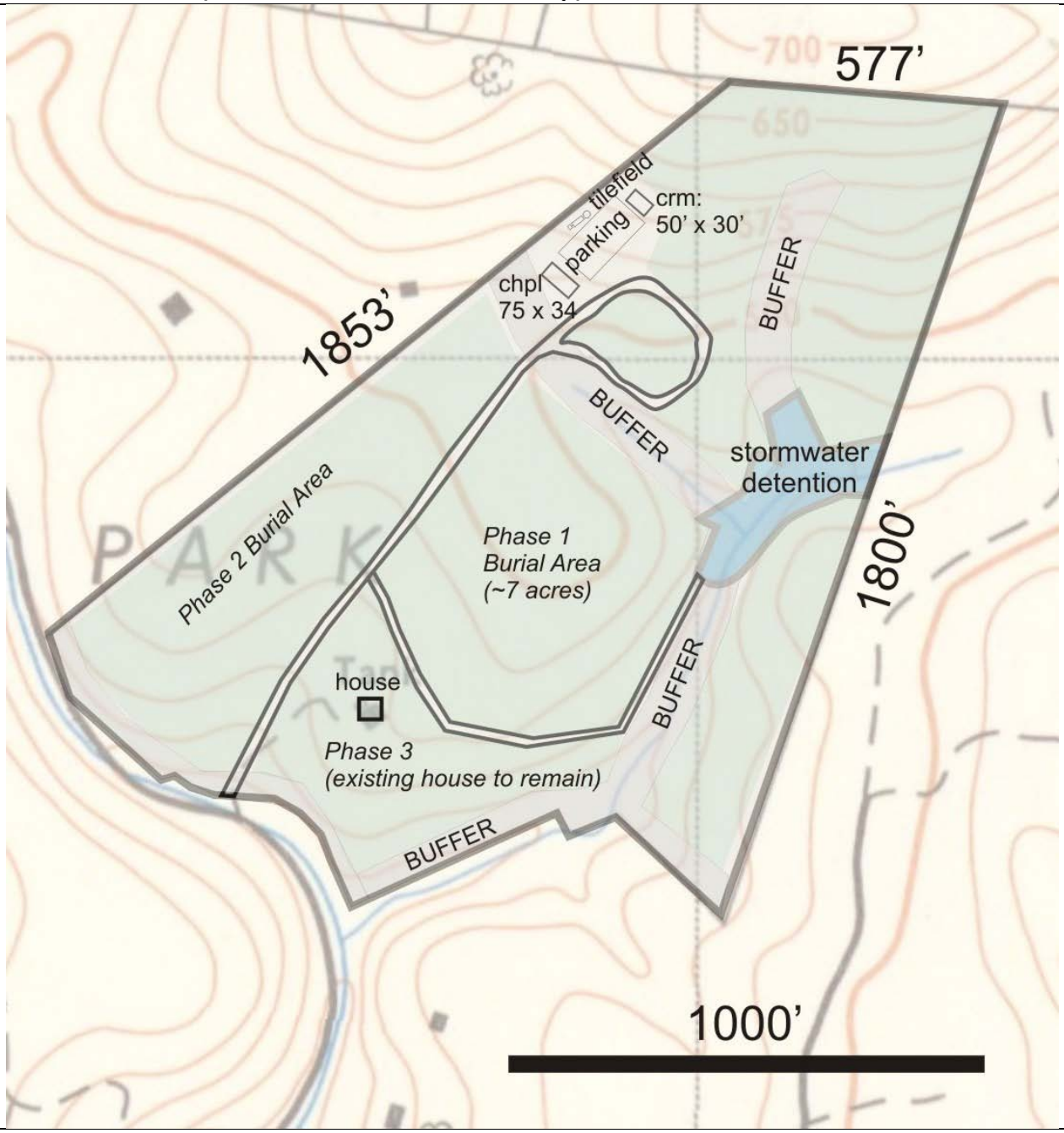


Figure 3 Preliminary Site Plan (Sketch)

NATIONAL ENVIRONMENT & PLANNING AGENCY

10 & 11 Caledonia Avenue, Kingston 5, Jamaica W.I. Tel: (876) 754-7540/3 Fax: (876) 754-7595-6 Tollfree: 1-888-991-5005
E-mail: ceo@nepa.gov.jm, Website: http://www.nepa.gov.jm

APPENDIX 2

Ref No. 2011-08017-EP00029

14 April 2011

Mr Dale Delapenha
Delapenha Funeral Home Limited
45 Union Street
Montego Bay
St. James

Dear Mr Delapenha,

TOR for Environmental Impact Assessment for Proposed Cemetery Development at Moore Park, St. James by Delapenha Funeral Services Ltd

Please be advised that the National Environment and Planning Agency offers no objection to the final Terms of Reference (TORs) submitted in connection with the captioned application. On this basis, you should proceed with the execution of the Environmental Impact Assessment (EIA). Please note that on completion, ten (10) copies and an electronic copy of the EIA report are to be presented to this office.

If there are any queries, please do not hesitate to contact the undersigned or Chalene Roye at 754-7540 ext 2184 or chalene.roye@nepa.gov.jm.

Sincerely,

Leonard Francis
for Chief Executive Office/Government Town Planner.

Cc: Dr. Ravidya Burrows - Environmental Management Consultants (Caribbean) Ltd.

M-Pyre™ Control System (Optional Features)

- M-Pyre™ Advanced PLC System – 10-inch Hi-Definition color touch screen monitor with simple graphic illustrations of everything happening during the cremation cycle. Operators can answer 4 standard questions: Weight range, Container Type, Gender, and Case # in Day and production settings are automated.
- M-Pyre™ Network – Allows you to monitor production activity from a remote work station while capturing important vital production data during the cremation cycle. Through an internet connection, offers Matthews technician the ability to view equipment production "on line" to assist local operator with troubleshooting issues.

- M-Pyre™ Oxygen Sensor – Monitors oxygen during the cremation cycle and automates air and fuel input to create the fastest cremation time, lower fuel cost, provide cleanest emissions and reduce wear & tear on refractory.

ECP-200 Electric Cremated Remains Processor

- Reduces cremated remains to fit standard sized urns
- Average processing time is 30 seconds or less
- Quiet and dust-proof.

VPS-1 Processing Station

- Recovers dust when transferring cremated remains for operator safety
- Ventless design eliminates wall or ceiling openings
- Built in florescent lighting adds convenience and safety
- Steel frame construction, finished with heavy gauge stainless steel.

Deluxe Processing Workstation

Similar features to the ECP and VPS-1 Processing station with additional benefits:

- Cooling station for cremated remains
- Built in temporary container filler
- No perforated screens or drums to clog and eliminates potential commingling.

Three-body Cooler

- Safe storage until final disposition
- Thermostatically controlled system maintains constant temperature
- Removable shelves accommodate a mortuary cart or caskets
- On/Off switch, door-mounted thermometer and self-sealing magnetic door

Auto-Loader

- Increases production & enhances operator safety
- Extends the cremation chamber floor life
- Offers a professional presentation during family viewing.

Matthews Cremation Division

offers several accessories to complement the professional crematory.

Matthews INTERNATIONAL
Cremation Division

2045 Sprint Boulevard
Apopka, FL 32703
Phone: 407-886-5533
Toll Free: 1-800-327-2831
FAX: 407-886-5990
www.matthewscremationdivision.com

Matthews INTERNATIONAL
Cremation Division

APPENDIX 3

Power-Pak II

The New Standard

SMOKE-BUSTER™ 140
2-Hours or Less Cremation Time
Up to 4 Cremations in 8 Hours

The Standard of Excellence in Cremation Solutions.

Matthews Cremation Division (MCD) represents over 100 years of experience in cremator technology and our equipment has set the standard of excellence for quality and performance. With over 3,000 installations in 50 countries, we are the oldest and largest manufacturer in the cremation industry.

From design through startup, our goal is to protect your interest and make certain that your investment in cremation equipment is supported with the foundation for long-term success. We'll determine your equipment needs, evaluate your facility, design floor plans, guarantee environmental acceptance, assist your contractors in the installation and provide on-site operator training.

Our Matthews commitment is to go the extra mile…

- Customized Return on Investment Analysis (ROI)
- Zoning Board Assistance
- Operator Certification
- 24/7 Customer Service
- Custom Engineering & Design
- Industry & Trade Support
- Widest array of cremation accessories
- Lease & Finance options.

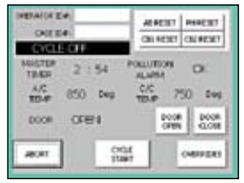
Highly advanced engineering. Highly efficient operation. Highly profitable results.

The Power-Pak II Cremation System represents the very latest in cremation industry technology. Designed to provide fully automated operation, the Power-Pak II is the fastest, most fuel efficient cremator in its class.

- **Automatic Operation –** The self-monitoring control system simplifies the cremation process, shutting itself off upon completion of the cycle
- **Operator Safety –** Underwriter's Laboratories (UL) listed represents the most widely recognized measure of safety and compliance, ensuring the safety of personnel and facilities
- **SMOKE-BUSTER™ 140 –** This feature effectively consumes and destroys smoke and odor from the cremation process
- **Hydraulic Loading Table –** Conveniently allows one person to safely and easily load the case into the chamber, coolers, coaches and vans
- **Pollution Monitoring and Control System –** Automatically checks and regulates stack emissions.

The Power-Pak II is pre-wired, pre-piped, and pre-tested before shipment, requiring only off-loading, one connection each for gas and electricity and placement of the stack we provide.

Quiet Operation– *Exclusive "Whisper Shield" allows operation without disturbing other services.*



Basic PLC System - *6-inch Black/White touch screen monitor which replaces the customary lights, buttons and switches with a cleaner, more streamlined operator control.*

Insulation Thickness– *12" of multi-component materials for longest lasting refractory and highest thermal efficiency.*

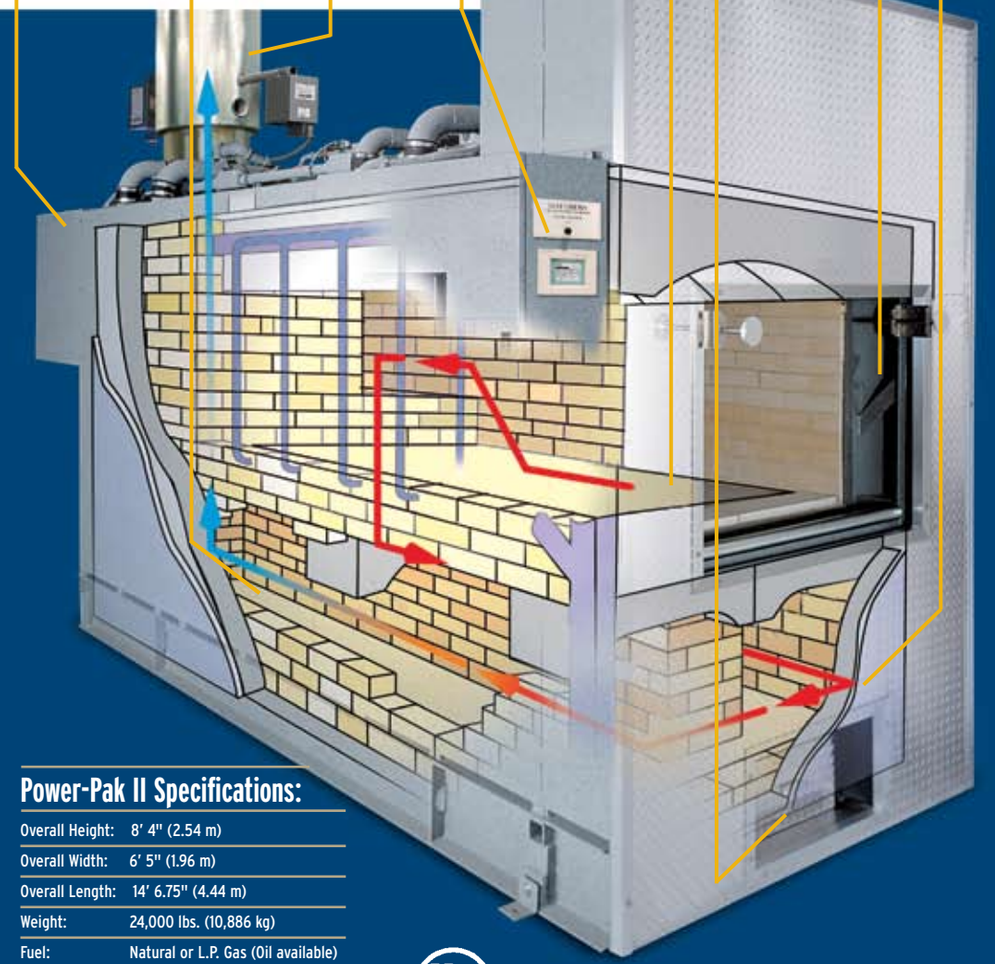
Retrieval System– *Retrieval of cremated remains is safe and quick with the convenient external collection hopper.*

Stainless Steel Stack– *Non-Corrosive, with 4½" refractory lining for strength, durability and safety.*

SMOKE BUSTER™ System– *Complete combustion of smoke and odor*

Cremation Chamber Floor– *Unique "Hot Hearth" design eliminates fluid runoff and minimizes fuel consumption.*

Loading Door– *Self-locking, self-sealing door opens and closes at the push of a button.*



Power-Pak II Specifications:

Overall Height:	8' 4" (2.54 m)
Overall Width:	6' 5" (1.96 m)
Overall Length:	14' 6.75" (4.44 m)
Weight:	24,000 lbs. (10,886 kg)
Fuel:	Natural or L.P. Gas (Oil available)
Electrical:	220 volts, 1-phase/3-phase

Control panel can be located right, left or remote

Dimensions include control panel and whisper shield.

Who is Matthews Cremation Division?

Matthews Cremation Division is the premier manufacturer of Industrial Equipment & Engineering (IEE) and ALL Crematory (ALL) cremation equipment. We are the global leader in cremation equipment sales, service and repair. Representing the highest standards for safety, we manufacture a wide range of human and animal cremation equipment. As a full-service provider, we offer accessory equipment, supplies and memorial products to meet your business requirements.

A significant number of our cremators are still operating, including some manufactured more than 40 years ago. Discover why Matthews Cremation Division is the most trusted name in cremation products and services.

SPECIFICATIONS- Model Power-Pak II

1.	Equipment Type	Model Power-Pak II
	A. Model No.	IE43-PPII
	B. Underwriters Laboratories Listing and File No.	87E8; MH14647
2.	Dimensions	
	A. Footprint	12’ – 6 ½ ” x 6’ – 8” (3.82 m x 2.03 m)
	B. Maximum Length	14’ – 8” (4.47 m)
	C. Maximum Width	6’ -5” (1.96 m)
	D. Maximum Height	8’ - 4” (2.54 m)
	E. Chamber Loading Opening	25 ¾ ” H x 39 ½ ” W (654 mm x 990 mm)
3.	Weight	24,000 lbs. (10,900 kg)
4.	Utility/Air Requirements	
	A. Gross Gas Input, Natural or LP Gas	2,000,000 BTU/hr. (2,110,112 kJ/h) 3,000,000 BTU/hr. (3,165,168 kJ/h) if operating temperature is greater than 1,600° F (871° C)
	Running Gas Pressure, Natural Gas	7 inches (177.8 mm) water column or greater
	Running Gas Pressure, LP Gas	11 inches (279.4 mm) water column or greater
	B. Electrical Supply	230 volt, 3Ø or 1Ø, 50/60 hz (other available)
	C. Air Supply	2,500 cfm (70.8 standard m^3/min)
5.	Incineration Capacity	150 lbs./hr. (68 kg/h)
6.	Typical Loading Capacity of Waste Types	750 lbs. (340.2 kg)
7.	Construction and Safety Standards	Incineration Institute of America, Underwriters Laboratories, Canadian Standards Association
8.	Steel Structure Construction	
	A. Frame	2” (51 mm) square tubing
	B. Front/Rear Plates	3/8” (9.5 mm) plate
	C. Floor Plates	3/16” (5 mm) plate
	D. Outer Side Casing	12 gauge (3 mm) plate
	E. Inner Side Casing	12 gauge (3 mm) plate
9.	Stack Construction	
	A. Inner Wall	4 1/2” (110 mm) insulating firebrick or castable
	B. Outer Wall	12 gauge (3 mm) sheet, 304 s.s., welded seams (unlined stack available)
10.	Draft Nozzle Construction	Schedule 40 type 316 s.s. pipe, welded connections
11.	Main Chamber Door Construction	
	A. Steel Shell	3/16” (5 mm) steel, welded with reinforcement
	B. Outer Refractory	1” (25 mm) insulating block
	C. Inner Refractory	4½” (110 mm) insulating firebrick
12.	Primary Chamber Wall Construction	
	A. Outer Casing Wall	12 gauge (3 mm) sheet
	B. Inner Frame/Air Compartment	2” (51 mm) air compartment
	C. Inner Casing Wall	12 gauge (3 mm) sheet

SPECIFICATIONS- Model Power-Pak II

D. Outer Refractory Wall ..... 5” (127 mm) insulating block
E. Inner Refractory Wall ..... 4½” (114 mm) firebrick

13. Secondary Chamber Wall Construction
    A. Outer Casing Wall..... 12 gauge (3 mm) sheet
    B. Inner Frame/Air Compartment ..... 2” (51 mm) air compartment
    C. Inner Casing Wall..... 12 gauge (3 mm) sheet
    D. Outer Refractory Wall ..... 6” (152 mm) insulating block
    E. Inner Refractory Wall ..... 4½” (114 mm) firebrick

14. Refractory Temperature Ratings
    A. Standard Firebrick..... 3,100° F. (1704° C)
    B. Insulating Firebrick..... 2,600° F. (1427° C)
    C. Castable Refractory (Hearth)..... 2,550° F. (1399° C)
    D. Castable Refractory ..... 2,550° F. (1399° C)
    E. Insulating Block..... 1,900° F. (1038° C)
    F. Bonding Mortar ..... 3,200° F. (1760° C)

15. Chamber Volumes (not including external flues, stacks or chimneys)
    A. Primary Chamber..... 64 cubic feet (1.8 m^3)
    B. Secondary Chamber..... 74 cubic feet (2.1 m^3)

16. Emission Control Features
    A. Secondary Chamber with Afterburner..... Included
    B. Opacity Monitor and Controller with Visual and Audible Alarms..... Included
    C. Auxiliary Air Control System ..... Included
    D. Microprocessor Temperature Control System ..... Included

17. Operating Temperatures
    A. Primary Chamber..... 1,200° F. - 1,800° F. (649° C - 982° C)
    B. Secondary Chamber..... 1,400° F. - 1,800° F. (760° C - 982° C) as required

18. Secondary Chamber Retention Time..... > 1 second

19. Ash Removal ..... Door functions as a heat shield. Sweep out beneath front door into hopper that fills collection pan.

20. Safety Interlocks
    A. High Gas Pressure..... Optional
    B. Low Gas Pressure ..... Optional
    C. Blower Air Pressure ..... Included
    D. Door Position ..... Included
    E. Opacity..... Included
    F. Motor Starter Function ..... Included
    G. Chamber Temperature..... Included
    H. Motor Overload ..... Included
    I. Flame Quality..... Included
    J. Burner Safe Start ..... Included

22. Burner Description..... The nozzle mix burners used on this cremation equipment are industrial quality and designed for

SPECIFICATIONS- Model Power-Pak II

incinerator use.

23. Ultraviolet Flame Detection ..... Ultraviolet flame detection has proven to be the most reliable means of flame safety. The system is completely sealed in a quartz capsule to eliminate problems, caused by moisture and dust created in the cremation process, which effect flame rod detectors.

24. Operating Panel Indicating Lights
    - A. Safe Run ..... Included
    - B. Door Closed ..... Included
    - C. Pollution Alarm ..... Included
    - D. Afterburner On (Secondary Burner) ..... Included
    - E. Cremation Burner On ..... Included
    - F. Low Fire Cremation Burner On ..... Included
    - G. Afterburner (Secondary Burner) Reset ..... Included
    - H. Cremation Burner Reset ..... Included
    - I. Hearth Air ..... Included
    - J. Throat Air Off ..... Included

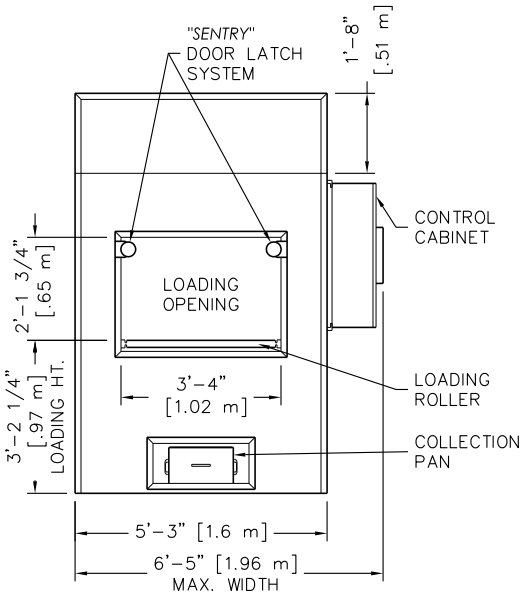
25. Automatic Timer Functions
    - A. Master Cycle ..... Included
    - B. Afterburner (Secondary Burner) ..... Included
    - C. Cremation Burner ..... Included
    - D. Low Fire Cremation Burner ..... Included
    - E. Hearth Air ..... Included
    - F. Throat Air ..... Included
    - G. Pollution Monitoring ..... Included
    - H. Afterburner (Secondary Burner) Prepurge ..... Included
    - I. Cremation Burner Prepurge ..... Included
    - J. Cool Down ..... Included

26. Exterior Finish
    - A. Primer ..... 2 coats rust inhibiting
    - B. Finish ..... 2 coats textured finish

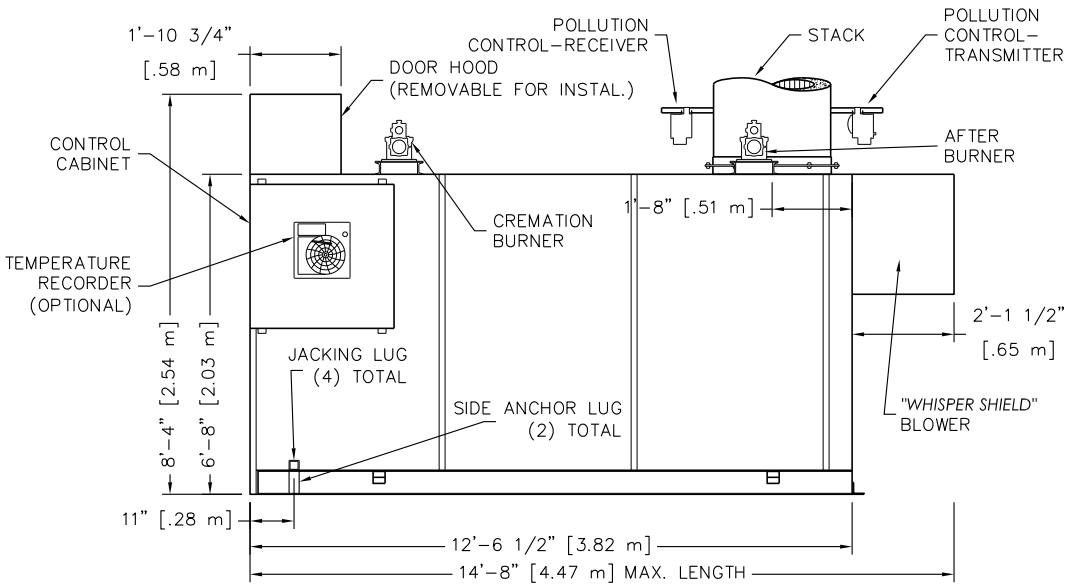
27. Start-Up and Training ..... Startup of cremation equipment and training of operators to properly operate and maintain the equipment is performed on-site under actual operating conditions. Included is a comprehensive owner's manual, with details on the equipment, its components and proper operation.

28. Environmental Submittals ..... Complete technical portion of state environmental permits. Engineering calculations, technical data, existing stack test results and equipment blueprints provided.

APPENDIX 5



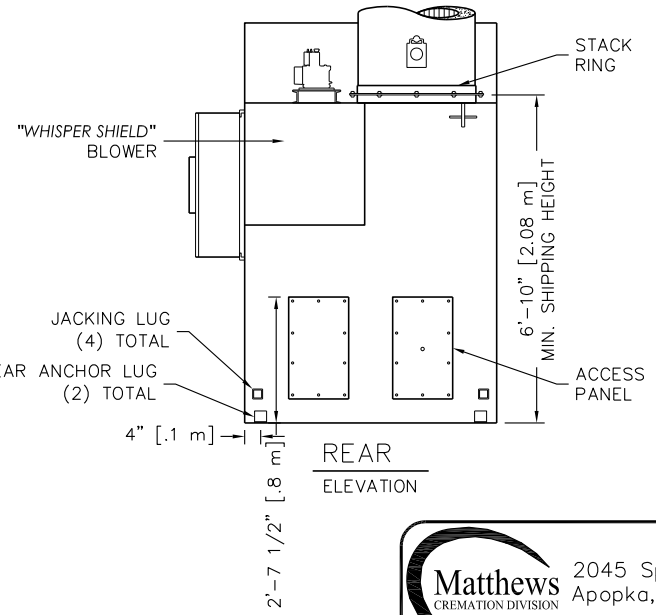
FRONT ELEVATION



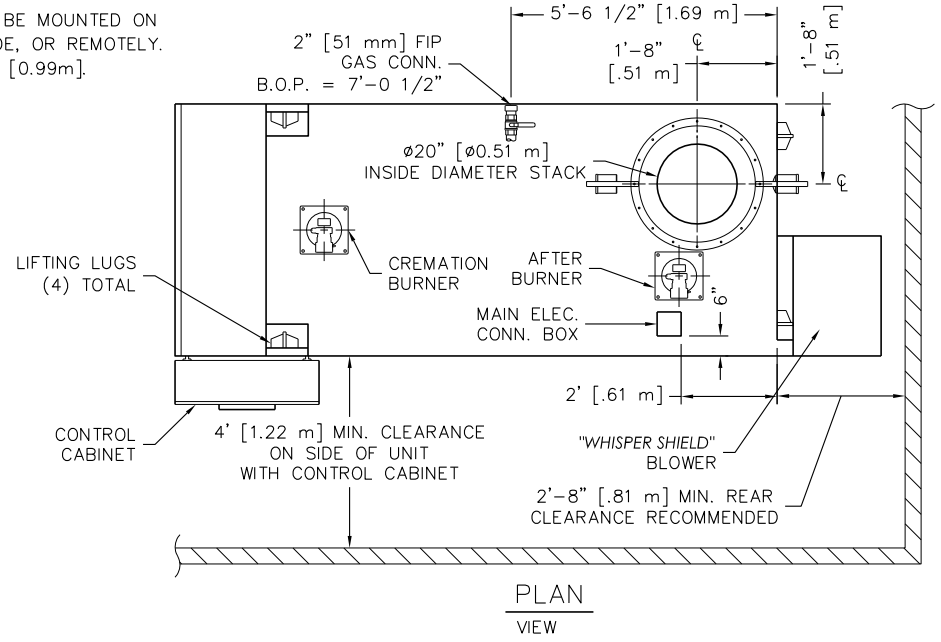
RIGHT SIDE ELEVATION

NOTES:

1) CONTROL CABINET CAN BE MOUNTED ON THE LEFT OR RIGHT SIDE, OR REMOTELY.
2) CHAMBER WIDTH IS 39" [0.99m].



REAR ELEVATION



PLAN VIEW

Matthews CREMATION DIVISION
2045 Sprint Boulevard
Apopka, Florida 32703
USA

POWER-PAK II

PLAN & ELEVATIONS INCL: CLEARANCES, REQUIREMENTS & RECOMMENDATIONS

DATE:	08-03-09	SCALE:	1/4"=1'
DRAWN:	JG	PLOT SCALE:	1:48
APRVD:		SHEET:	1 OF: 2
DWG FILE:		PPII-MarketingPlanElevS1R5	
DWG #:		0000140	

CREMATOR CLEARANCES

	RECOMMENDED		MINIMUM	
TOP: (2)	2 FEET	[610 mm]	6 INCHES	[152 mm]
CABINET SIDE:	4 FEET	[1.22 m]	4 FEET	[1.22 m]
OTHER SIDE:	2 FEET	[610 mm]	6 INCHES	[152 mm]
FRONT:	9 FEET	[2.74 m]	8 FEET	[2.44 m]
REAR:	3 FEET	[0.91 m]	32 INCHES	[812 mm]
STACK:	6 INCHES	[152 mm]	6 INCHES	[152 mm]

1. FOR CLEARANCES OTHER THAN THOSE SHOWN, OR FOR SPECIAL REQUIREMENTS, CONSULT YOUR MCD REP.

(2.) FROM HIGHEST POINT ON UNIT.

3. CONTROL CABINET MOUNTS ON UNIT'S LEFT OR RIGHT SIDES, OR REMOTELY. (SEE PLAN VIEW, SHEET 1).

4. REAR OF UNIT REFERS TO THE "BACK PLATE", RATHER THAN THE BACK OF THE *"WHISPER SHIELD"*. (SEE PLAN VIEW, SHEET 1).

CREMATOR REQUIREMENTS

FUEL: A PRESSURE REGULATOR ADJUSTABLE TO 7" [178 mm] W.C. FOR NATURAL GAS, OR 11" [279 mm] W.C. FOR LP GAS.

CAPACITY: RANGES FROM 2.0 TO 3.0 MILLION BTU/HR [2.1 TO 3.1 MILLION KILOJOULES/HR] DEPENDING UPON AMOUNT OF BURNERS.

ELECTRICAL: 230 VOLT, 3ø, (40A BREAKER) AND 115v (10A BREAKER), OR 230 VOLT, 1ø, (70A BREAKER) AND 115v (10A BREAKER) 50/60 HERTZ

AIR: LOUVER NEAR THE REAR OF THE UNIT CAPABLE OF PASSING 2,500 CU FT/MIN [70.8 CU M/MIN] OF FREE AIR (36" X 36") [914 mm X 914 mm].

STACK INSTALLATION INSTRUCTIONS

1. APPLY A 1/2" THICK MORTAR JOINT TO EXPOSED REFRACTORY SURFACE IN STACK RING. LOWER THE BASE STACK SECTION (B) ONTO STACK RING (A) AND FASTEN WITH HARDWARE PROVIDED (NO MORE THAN (2) STACK SECTIONS SHALL BE LIFTED TOGETHER). REPEAT PROCESS FOR REMAINING STACK SECTIONS. IF SECTIONS OF VARYING LENGTHS ARE SUPPLIED, ASSEMBLE AS TO AVOID FLANGES & LIFTING EYES INTERFERING WITH RAIN COLLAR LOCATION.

2. INSTALL STORM COLLAR ON STACK, 3" [76 mm] ABOVE NON-COMBUSTIBLE LINER (FLASHING), ALLOWING FOR PROPER VENTILATION (SEE DETAIL).

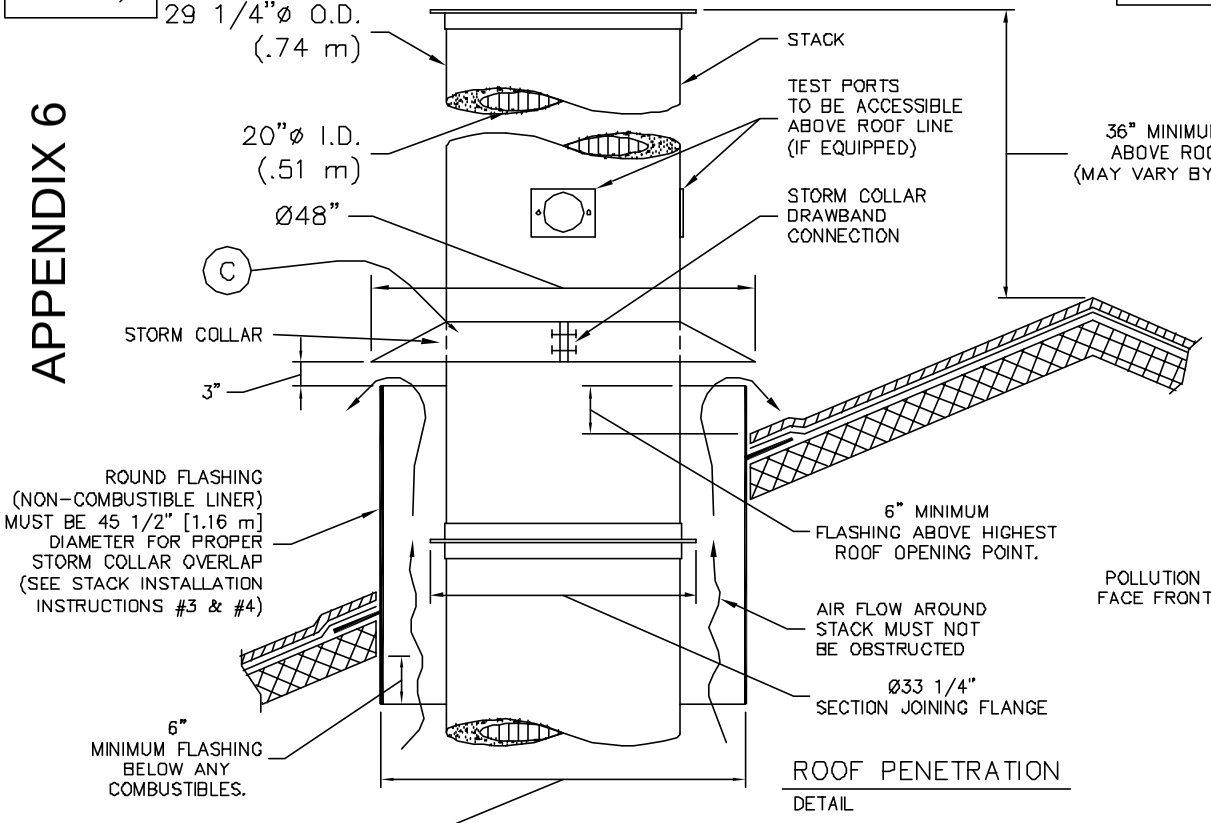
3. APPLY A 1/4" [6 mm] BEAD OF HIGH-TEMPERATURE SILICON SEALANT (PROVIDED BY MCD) TO THE JOINT BETWEEN THE STORM COLLAR (C) AND THE STACK (B).

4. STORM COLLAR IS FURNISHED BY MCD. THE NON-COMBUSTIBLE LINER (FLASHING) TO BE PROVIDED BY THE OTHERS.

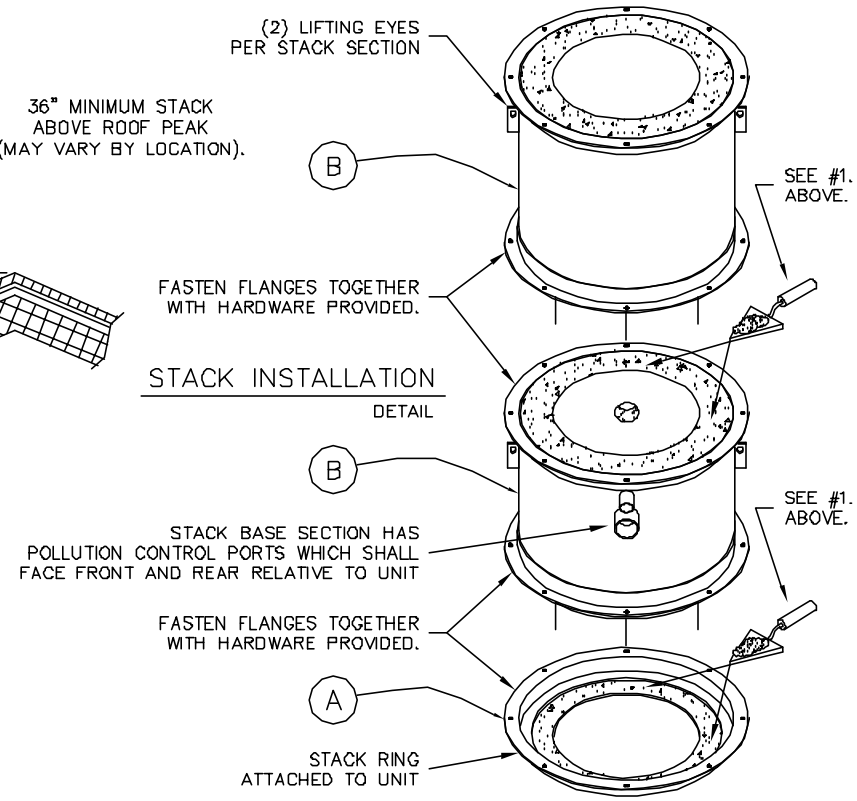
5. IF FIFTY PERCENT OF THE STACK LENGTH IS ABOVE THE ROOF, GUY WIRES MAY BE REQUIRED. CONSULT WITH YOUR MCD REP.

6. RAIN CAP NOT REQUIRED.

APPENDIX 6



ROOF PENETRATION
DETAIL



STACK INSTALLATION
DETAIL

Matthews CREMATION DIVISION
2045 Sprint Boulevard
Apopka, Florida 32703
USA

POWER-PAK II

STACK DETAILS, CLEARANCES & INSTALLATION INSTRUCTIONS.
REFRACTORY STACK DETAIL

DATE:	08-18-05	SCALE:	1/2"=1'
DRAWN:	JG	PLOT SCALE:	1:24
APRVD:		SHEET:	2 OF: 2
DWG FILE:	PPII-MarketingStackRefS2R2		
DWG #:	0000140		

St. James Parish Council
19a Union Street, Montego Bay
St. James, Jamaica, West Indies
Telephone: 1 (876) 952-5500/2
Facsimile: 1 (876) 952-4066

St. James Parish Council

www.stjamespc.org stjamespc@mlgycd.gov.jm

April 29, 2011

APPENDIX 7

Ms. Marcia Delapenha
Delapenha Funeral Home Limited
45 Union Street
Montego Bay

Dear Ms. Delapenha:

Re: Rehabilitation of Moore Park Road - Somerton

In response to your letter dated April 14, 2011regarding the captioned matter.

A site visit was conducted on April 21, 2011 which revealed that some sections of the road needs widening. The length of the section of the roadway in question is approximately 700 metres. Close to the entrance to your property there is need of a fording or a box culvert. There is need for approximately 100 metres of rubble retaining wall and a section of the gully needs to be dredged.

Kindly be advised that I offer no objection to Delapenha Funeral Home Limited or rehabilitating sections of Moore Park Road, and I offer technical assistance from the Roads and Works Department with a view to ensure that the works are done satisfactorily and to the specification of the St. James Parish Council.

Please note that notice should be given at least seven (7) days prior the start of the project to the department so as to mobilize the staff.

Thanks for your cooperation in this matter as we look forward to a good working relation.

Yours sincerely,

Bryce Grant
Acting Superintendent Roads and Works
ST. JAMES

Copied: Mr. Winson Palmer, Secretary/Manager
Councillor Charles Sinclair, Mayor

Appendix 8 Birds that are not protected (2nd part of the second schedule)

SECOND SCHEDULE (Section 2)

FIRST PART

L.Nn. 58/1998. 98C 2002.

Mourning Dove (Long-tailed Pea Dove)	—	(Zenaida macroura)
White-winged Dove	—	(Zenaida asiatica)
White-crowned Pigeon (Bald-pate)	—	(Columba leucocephala)
Blue-winged Teal	—	(Anas discors)
Green-winged Teal	—	(Anas Crecca)
Pea Dove	—	(Zenaida aurita)

SECOND PART

Cattle Egret	—	(Bubulcus ibis)
Rock Dove (Pigeon)	—	(Columba livia)
Ring-turtle Dove (Barble Dove)	—	(Streptopelia risoria)
European Starling	—	(Sturnus vulgaris)
Saffron Finch (Wild Canary)	—	(Sicalis flaveola)
House Sparrow	—	(Passer domesticus)
Yellow-crowned Bishop	—	(Euplectes afer)
Red Bishop	—	(Euplectes orix)
Nutmeg Mannikin	—	(Lonchura punctulata)
Chestnut Mannikin	—	(Lonchura malacca)
Shiny Cowbird	—	(Molothrus bonariensis)
Chickens	—	(Gallus gallus)
Geese	—	(Anser spp.)
Turkey	—	(Meleagris gallopavo)
Guinea fowl	—	(Numida meleargris)
Pea fowl	—	(Pavo cristatus)
Budgerigars	—	(Melopsittacus undulatus)
Cockatiel	—	(Nymphicus hollandicus)

Ducks excluding endemic and migratory species.

APPENDIX 9

Calculation of Storm Runoff

The peak runoff for the two watersheds was calculated using the Rational Method, one of the most popular methods to estimate the peak runoff of small watersheds in rural and urban environment.
To estimate the peak discharge the following assumption were made.

- The forest cover in the upper slopes to the north of the property and in the gully area east of the property including the land on the banks east of the gully will be maintained
- No changes will happen to the lands in catchment outside the boundaries of the development

The Rational Formula calculate the peak discharge as follow

Q is discharge in m^3/sec
C is dimension less runoff coefficient
I rainfall intensity in mm/hr lasting a critical duration t_c
A is catchment area in ha

The response time of the basin or the concentration time t_c was calculated using the Bransby Williams Equation:

t_c is time of concentration in minutes
L is mainstream length in miles
A is catchment area in square miles
S_e is the equal area slope of the mainstream in percent

The concentration time t_c for Catchment 1 and 2 are respectively 4.11 min and 10.85 min.

The rainfall intensity for the 10, 25, 50, 100 Year storms for the two catchments were obtained from the Rainfall Intensity-Duration (IDF) Curves created by WRA for the Sangster International Airport in Montego Bay.

The runoff coefficient used in this calculations is a composite coefficient that reflects the four aspects of the catchment: relief, permeability, vegetation cover and surface characteristic. The composite runoff coefficient was further adjusted for return periods in excess of 10 years.

To evaluate the impact of the development, the average run coefficient for the each catchment was calculated taking in account the proportional impact of the infrastructure development and the burial areas for each phase of the development.
The results of these calculation are summarized in tables 1 and 2

Runoff Coefficients for CATCHMENT 1

RETURN PERIOD	10Y	25Y	50Y	100Y
Before Development	0.59	0.65	0.71	0.74
After Phase 1	0.64	0.70	0.76	0.80
After Phase 2	0.56	0.62	0.67	0.70
After Phase 3	0.61	0.67	0.73	0.76
After Phase 4	0.58	0.64	0.70	0.72

Table 1

Runoff Coefficients for CATCHMENT 2				
RETURN PERIOD	10Y	25Y	50Y	100Y
Before Development	0.52	0.57	0.62	0.65
After Phase 1	0.52	0.58	0.63	0.65
After Phase 2	0.52	0.58	0.63	0.65
After Phase 3	0.52	0.57	0.62	0.65
After Phase 4	0.52	0.57	0.62	0.65

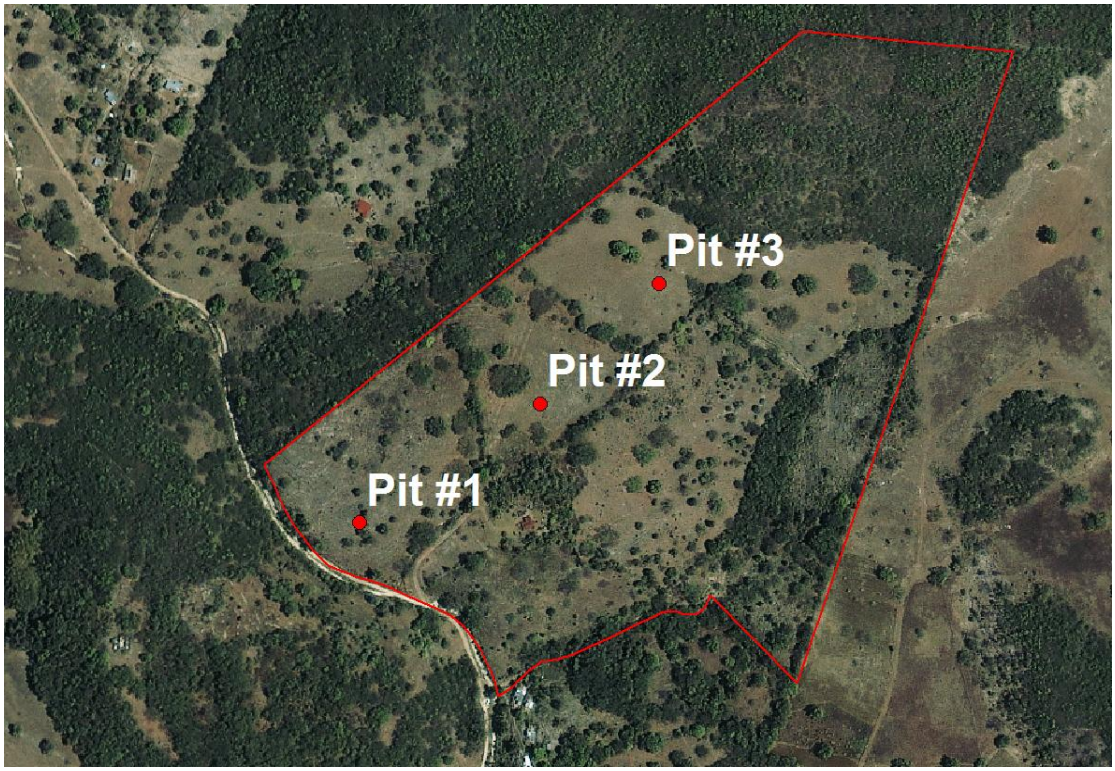
Table 2

The runoff coefficient calculated for each phase of the development and for each return period were entered in the Rational Formula with the respective rainfall intensities. The peak discharge for each phase of the development and for each return are shown in the tables above.

APPENDIX 10 Pit Logs

All three pits were excavated on April 12. The Percolation test started on April 12 and continued on 13 April 2011
On both days the weather was overcast for most of the day with very light and short showers in the afternoon .

Fig X.Y Location Map of the Pits



Pit 1

Pit 1 is 1.42 m deep, 0.54 wide and 3.23m long near the surface
This pit is located closest to front of the property, on the ridge NW of the driveway to the farm House.

0-43 cm: Dark brown fine gravelly sandy clay. Soil has a granular structure. Towards the contact soil bedrock contact the gravel fragment become larger and more abundant

43 – 142 cm: Brecciated light ochre coloured chalky limestone, secondary recrystallization. Light discolouring of bedding and joint plains. Bedding of 25 cm. Ochre coloured gravelly plastic clays infilling between fracture plane.

Pit 2

Pit 2 is 1.32 m deep, 0.6 m wide and 2.34 m long near the surface.
It is located in the pasture behind the Farmhouse southeast of the guango tree.

0-25 cm: Dark brown fine gravelly sandy clay. Soil has a granular structure. Clay is plastic in subangular cluster of 3 mm

25-132 cm: Jointed chalky limestone (5cm spacing), secondary recrystallization. Light discolouring of bedding and joint plains.

Pit 3

Pit 3 is 1.17 m deep and 0.59m wide by 1.93 m long. Pit 3 is located beyond the NW – SE ridge, close to the foot of the forested uplands.

0-25 cm: Dark brown fine gravelly sandy clay. Soil with an outspoken granular structure.

25-69cm: Rubble of white chalky limestone, very white chalk to micritic limestone.

69-86 cm: Brecciated limestone, block of 5 cm, with dark dentritic manganese staining

86-117 cm: massive chalky limestone of medium to low hardness (3 on the Mohs scale of mineral hardness. Very Light brown staining of bedding and joints.

Percolation Test Data

PIT 1

12 April 2011 initial water volume (l): 164

time	elapsed time (min)	height Water (m)	cum % ht lost	cum L equivalent	effective infiltration area	cumL/m2	cumL/m2/min
17:58	0	0.305	0	0	1.666	0	0
18:31	33	0.292	4.17	6.83	1.594	4.28	0.130
19:06	68	0.279	8.33	13.66	1.524	8.96	0.132

13 April 2011 initial water volume (l): 253

time	elapsed time (min)	height Water (m)	cum % ht lost	cum L equivalent	effective infiltration area	cumL/m2	cumL/m2/min
8:09	0	0.394	0	0	2.192	0	0
12:58	289	0.318	19.35	49.05	1.738	28.22	0.098
16:19	490	0.203	48.39	122.63	1.122	109.27	0.223
17:10	541	0.191	51.61	130.81	1.022	128.04	0.237

PIT 2

12 April 2011 initial water volume (l): 268

time	elapsed time (min)	height Water (m)	cum % ht lost	cum L equivalent	effective infiltration area	cumL/m2	cumL/m2/min
13:23	0	0.394	0.00	0.00	2.012	0	0.000
13:45	22	0.318	19.35	51.79	1.702	30.42	1.383
14:13	50	0.203	48.39	129.47	1.406	92.06	1.841
15:28	125	0.191	51.61	138.10	0.967	142.85	1.143
15:41	138	0.121	69.35	185.57	0.912	203.41	1.474
17:43	260	0.114	70.97	189.89	0.629	301.70	1.160

13 April 2011 initial water volume (l): 299

time	elapsed time (min)	height Water (m)	cum % ht lost	cum L equivalent	effective infiltration area	cumL/m2	cumL/m2/min
7:50	0	0.508	0	0	2.172	0	0
8:13	23	0.425	16.25	43.48	1.830	23.76	1.033
8:24	34	0.394	22.50	60.20	1.702	35.37	1.040
8:53	63	0.318	37.50	100.34	1.406	71.35	1.133
10:17	147	0.191	62.50	167.23	0.912	183.31	1.247
13:02	312	0.114	77.50	207.37	0.605	342.70	1.098

PIT 3

12 April 2011 initial water volume (l): 119

time	elapsed time (min)	height Water (m)	cum % ht lost	cum L equivalent	effective infiltration area	cumL/m2	cumL/m2/min
1:04	0	0.305	0	0	1.195	0	0
2:29	85	0.279	8.33	9.90	1.106	8.95	0.105
3:48	164	0.254	16.67	19.79	0.999	19.81	0.121
6:02	298	0.2286	25.00	29.69	0.896	33.15	0.111
7:14	370	0.1524	50.00	59.38	0.606	98.02	0.113

13 April 2011 initial water volume (l): 99

time	elapsed time (min)	height Water (m)	cum % ht lost	cum L equivalent	effective infiltration area	cumL/m2	cumL/m2/min
7:57	0	0.273	0	0	1.079	0	0
12:45	288	0.229	16.28	16.16	0.896	18.03	0.063
13:06	309	0.222	18.60	18.46	0.870	21.21	0.069
16:25	508	0.165	39.53	39.23	0.652	60.18	0.118
17:06	549	0.159	41.86	41.54	0.629	66.08	0.120

APPENDIX 11

NEIC: Earthquake Search Results

U. S. G E O L O G I C A L S U R V E Y

E A R T H Q U A K E D A T A B A S E

FILE CREATED: Sat Jun 4 20:45:58 2011
Geographic Grid Search Earthquakes= 113
Latitude: 19.000N - 17.000N
Longitude: 76.000W - 79.000W
Catalog Used: PDE
Data Selection: Historical & Preliminary Data

CAT	YEAR	MO	DA	ORIG TIME	LAT	LONG	DEP	MAGNITUDE	IEM NFO TF	DTSVNWG	DIST km
PDE	1977	05	24	022923.50	17.74	-78.74	28	4.7 mbGS	...	.....	
PDE	1977	05	24	111436	17.61	-78.63	33	4.8 mbGS	...	.....	
PDE	1978	02	26	050720.80	18.17	-76.45	15	4.8 mbGS	.F.	.....	
PDE	1980	11	16	094444.10	18.14	-76.20	10		...	.....	
PDE	1981	02	15	075221.80	18.42	-76.77	10		...	.....	
PDE	1981	02	15	102336	18.06	-76.69	17		...	.....	
PDE	1981	02	26	233737.50	18.13	-76.69	16		...	.....	
PDE	1981	03	24	041700.80	18.04	-77.55	10		...	.....	
PDE	1981	04	16	170733	18.11	-76.75	25		...	.....	
PDE	1981	05	18	110423.10	18.07	-76.78	33		...	.....	
PDE	1981	06	24	194742.86	17.97	-77.66	10		...	.....	
PDE	1981	07	17	045658.73	17.91	-77.18	18		...	.....	
PDE	1988	05	09	162359.74	18.09	-76.50	10	4.5 mbGS	6C.	.....	
PDE	1988	09	02	062617.64	17.56	-78.28	17	4.3 mbGS	.F.	.....	
PDE	1988	11	12	033448.65	18.07	-76.60	16	5.4 mbGS	6DM	.....	
PDE	1989	08	24	021722.84	17.99	-76.96	10		.F.	.....	
PDE	1990	12	12	210524.61	18.09	-76.68	10	2.6 MDTRN	...	.....	
PDE	1991	05	29	103905.53	17.58	-78.37	10	3.4 MDJSN	...	.....	
PDE	1991	06	05	181125.25	18.15	-76.01	5		...	.....	
PDE	1991	06	15	052009.87	18.05	-76.88	10	2.6 MDJSN	...	.....	
PDE	1991	07	20	233136.08	17.85	-76.73	10	2.4 MDJSN	...	.....	
PDE	1991	09	06	095742.05	18.30	-77.17	10	2.5 MDJSN	...	.....	
PDE	1991	10	10	235039.23	18.14	-76.26	10	2.8 MDJSN	...	.....	
PDE	1991	10	15	053450.31	17.85	-77.20	10	2.5 MDJSN	...	.....	
PDE	1991	10	20	040901.57	18.30	-76.50	10	1.8 MDJSN	...	.....	
PDE	1991	10	31	032158.14	17.75	-76.85	10	1.8 MDJSN	...	.....	
PDE	1991	11	02	031020.53	18.82	-76.75	10	3.7 MDJSN	3F.	.....	
PDE	1991	11	24	043318.09	17.09	-76.49	10	3.1 MDJSN	...	.....	
PDE	1991	12	25	152558.39	17.93	-78.08	10	3.1 MDJSN	...	.....	
PDE	1992	01	05	080551.90	18.11	-77.45	10		3F.	.....	
PDE	1992	01	08	214324.10	18.00	-76.72	10		...	.....	
PDE	1992	01	27	202656.97	18.12	-76.67	10	2.6 MDJSN	3F.	.....	
PDE	1992	02	01	091817.41	17.96	-76.82	10	2.4 MDJSN	...	.....	
PDE	1992	03	05	131503.25	18.27	-76.58	10	2.3 MDJSN	...	.....	
PDE	1992	03	11	123633.69	18.17	-76.65	10	2.3 MDJSN	...	.....	
PDE	1992	03	15	164639.61	18.10	-77.57	10	2.9 MDJSN	3F.	.....	
PDE	1992	03	16	035929.35	18.06	-77.46	10	2.9 MDJSN	...	.....	
PDE	1992	04	15	022715.27	18.12	-77.33	10	2.2 MDJSN	...	.....	
PDE	1992	04	21	145236.29	18.27	-76.78	10	2.7 MDJSN	...	.....	
PDE	1992	04	23	220130.57	18.80	-76.48	10	3.3 MDJSN	...	.....	
PDE	1992	05	16	093632.22	18.08	-76.45	10	2.1 MDJSN	...	.....	
PDE	1992	05	19	095410.45	18.11	-76.64	10	2.3 MDJSN	...	.....	
PDE	1992	05	25	132838.28	18.02	-76.65	33	2.2 MDJSN	...	.....	
PDE	1992	05	25	172408.84	18.24	-77.39	10	2.4 MDJSN	...	.....	
PDE	1992	09	06	041825.17	18.13	-76.92	10		4F.	.....	
PDE	1992	10	01	130250.16	17.94	-76.76	10	2.0 MDJSN	...	.....	
PDE	1992	10	11	115932.71	17.98	-76.50	10	2.7 MDJSN	...	.....	
PDE	1993	01	13	171107.57	17.95	-76.58	16	5.5 MwHRV	7CM	.....	
PDE	1993	01	13	185205.48	18.10	-76.65	19	3.1 MDJSN	4F.	.....	
PDE	1993	01	14	005238.41	18.12	-76.64	10	2.2 MDJSN	.F.	.....	
PDE	1993	01	14	014342.20	18.11	-76.64	10	2.3 MDJSN	3F.	.....	
PDE	1993	01	14	022716.66	18.01	-76.68	10	2.1 MDJSN	3F.	.....	
PDE	1993	01	14	053446.26	18.14	-76.64	10	2.4 MDJSN	3F.	.....	
PDE	1993	01	14	095819.41	18.07	-76.65	10	2.4 MDJSN	.F.	.....	
PDE	1993	01	15	221750.45	18.04	-76.68	10	2.7 MDJSN	3F.	.....	
PDE	1993	01	17	144430.46	18.25	-76.61	10	2.2 MDJSN	.F.	.....	
PDE	1993	01	18	081149.21	18.07	-76.75	10	2.4 MDJSN	3F.	.....	
PDE	1993	01	18	124656.61	18.18	-76.70	10	2.4 MDJSN	2F.	.....	
PDE	1993	01	21	212106.87	18.08	-76.66	17	3.7 MDJSN	.F.	.....	
PDE	1993	01	23	100244.51	18.11	-76.76	10	3.5 MDJSN	4F.	.....	
PDE	1993	01	23	155640.81	18.15	-76.64	10	2.3 MDJSN	.F.	.....	
PDE	1993	01	27	192206.85	18.23	-77.06	10	2.1 MDJSN	...	.....	
PDE	1993	02	14	071917.34	18.05	-76.76	10	2.5 MDJSN	...	.....	
PDE	1993	02	14	094646.53	18.09	-76.76	10	2.5 MDJSN	...	.....	

PDE	1993	02	19	141357.47	17.99	-76.78	10	3.2 MDJSN	.F. .....
PDE	1993	03	05	063510.07	18.12	-76.93	10	2.4 MDJSN	... .
PDE	1993	03	20	181927.74	18.19	-76.54	10	2.4 MDJSN	.F. .....
PDE	1993	04	14	014023.97	17.69	-78.72	25	4.6 MDJSN	3F. .....
PDE	1993	05	07	083313.47	18.18	-76.70	10	2.4 MDJSN	... .
PDE	1993	05	27	140914.06	18.21	-76.69	10	2.8 MDJSN	... .
PDE	1993	06	21	203011.92	17.91	-76.95	33	2.6 MDJSN	3F. .....
PDE	1993	07	06	032239.38	18.07	-76.76	10	2.0 MDJSN	... .
PDE	1993	07	08	235018.08	18.08	-77.39	10	3.3 MDJSN	3F. .....
PDE	1993	07	19	131948.07	18.15	-76.69	10	3.2 MDJSN	... .
PDE	1993	08	13	043157.89	18.10	-76.77	10	2.5 MDJSN	.F. .....
PDE	1993	08	13	143218.59	18.08	-76.71	10	3.4 MDJSN	.F. .....
PDE	1993	08	28	073022.74	18.21	-76.68	10	2.2 MDJSN	... .
PDE	1993	11	26	235022.36	18.03	-76.94	10	2.1 MDJSN	... .
PDE	1993	11	28	180435.98	18.13	-76.80	10	2.8 MDJSN	... .
PDE	1994	02	15	225856.86	17.89	-76.87	10	3.9 MDJSN	... .
PDE	1995	06	03	214241.44	18.08	-76.74	20	3.8 mbGS	... .
PDE	1995	10	21	174346.70	18.08	-76.99	10	2.4 MDJSN	... .
PDE	1995	11	03	180916.85	18.11	-77.59	10	2.3 MDJSN	... .
PDE	1995	11	05	025713.53	18.06	-77.56	10	2.6 MDJSN	... .
PDE	1995	12	02	211451.31	18.25	-77.79	10	3.1 MDJSN	... .
PDE	1995	12	06	124438.32	17.95	-77.67	20	3.2 MDJSN	.F. .....
PDE	1995	12	16	193232.52	18.23	-77.70	10	2.5 MDJSN	... .
PDE	1996	01	01	103802.07	18.29	-77.81	10	2.7 MDJSN	... .
PDE	1996	01	02	030242.17	17.93	-76.61	10	2.8 MDJSN	3F. .....
PDE	1996	01	02	232100.57	17.93	-76.62	10	2.2 MDJSN	... .
PDE	1996	01	04	014118.05	17.84	-77.20	10	2.3 MDJSN	... .
PDE	1996	01	26	074600.84	17.93	-76.70	10	2.4 MDJSN	2F. .....
PDE	1996	01	29	035735.60	17.95	-76.68	10	2.7 MDJSN	2F. .....
PDE	1998	04	18	022341.55	18.23	-76.60	10		... .
PDE	2000	02	05	114825.41	18.40	-77.45	10	2.5 MDJSN	... .
PDE	2000	02	07	001345.75	17.92	-78.09	5	3.8 MDJSN	4F. .....
PDE	2000	02	07	003951.16	17.94	-78.09	5	2.6 MDJSN	... .
PDE	2001	01	24	035232.96	18.98	-76.56	33	4.4 mbGS	... .
PDE	2002	05	15	023346.81	17.59	-78.54	10	2.8 MLSSNC	... .
PDE	2002	08	10	062210.38	18.04	-76.53	33	4.6 MDJSN	.F. .....
PDE	2002	08	10	063521.19	18.08	-76.61	20	2.0 MDJSN	.F. .....
PDE	2002	08	10	085820.92	17.98	-76.56	15	4.0 MDJSN	... .
PDE	2002	08	10	085953.58	18.04	-76.67	10	3.7 MDJSN	... .
PDE	2002	08	10	162527.81	17.95	-76.58	10	2.4 MDJSN	... .
PDE	2003	01	30	151352.01	18.10	-76.67	10	3.2 MDSSNC	.F. .....
PDE	2003	05	15	015814.88	18.52	-77.64	10	3.5 MDSSNC	... .
PDE	2004	05	27	194642.35	18.28	-76.37	10	3.9 mbGS	.F. .....
PDE	2005	06	13	035801.29	18.32	-77.44	2	5.2 MwHRV	7DM .....S
PDE	2008	06	26	080940.70	17.87	-76.45	16	3.4 MDJSN	... .
PDE	2008	07	14	010659.40	18.03	-76.78	16	3.9 MDJSN	.F. .....
PDE	2008	07	20	201818.10	18.28	-76.51	39	2.5 MDJSN	... .
PDE-Q	2011	05	06	092924.29	18.13	-76.59	20	4.2 mbGS	... .
PDE-Q	2011	05	16	150707.56	17.90	-77.89	31	4.7 mbGS	... .

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APPENDIX 12 Dry Limestone Forest (Typical Floral Assemblage)

Family	Scientific Name	Common Name	Habit of Growth
Acanthaceae	Asystasia gangetica	-	Shrub
Amaranthaceae	Achyranthes indica	Devil's horsewhip	Shrub
Amaranthaceae	Amaranthus Australis	Southern Amaranth	Sub-shrub Forb/herb
Anacardiaceae	Mangifera indica	Mango	Tree
Anacardiaceae	Metopium brownei	-	Tree
Anacardiaceae	Spondias cytherea	June plums	Tree
Arecaceae	Thrinax Multiflora	Bullhead Thatch	Tree
Asteraceae	Baccharis dioica	-	Shrub
Asteraceae	Bidens pilosa var. alba	Spanish Needle	Shrub
Asteraceae	Borrichia Arborescens	Tree Oxeye	Sub-shrub
Asteraceae	Eupatorium odoratum	Jack-in-the-bush	Shrub
Asteraceae	Eupatorium villosum	Bitter bush	Shrub
Asteraceae	Launea intybacea	Wild lettuce	Shrub
Bignoniacea	Tecorna scans	Yellow elder	Tree
Bignoniaceae	Crescentia cujete	Calabash	Tree
Boraginaceae	Cordia globosa var. humilis	Gout tea, Wild sage	Herb
Boraginaceae	Cordia Sebestena	Geiger Tree	Tree
Boraginaceae	Heliotropium angiospermum	Dogs tail	Herb
Boraginaceae	Tournefortia volubilis	Chigger nut	Vine
Bromeliaceae	Bromelia Pinguin	Pinguin, Piro	Forb/herb
Burseraceae	Bursera simaruba	Red Birch Tree	Tree
Caesalpiniaceae	Bauhinia divaricata	Steely, Bullhorn	Tree
Caesalpiniaceae	Caesalpinia Vesicaria	Indian Savin Tree	Tree
Caesalpiniaceae	Haematoxylum Campechia	Logwood	Tree
Capparaceae	Capparis Ferruginea	Mustard Shrub	Shrub
Combretaceae	Terminalia catappa	Almond	Tree
Convolvulaceae	Ipomoea asarifolia	Wild potato, wild slip	Vine
Convolvulaceae	Ipomoea tiliacea	-	Vine
Convolvulaceae	Jacquemontia pentantha	Wild sweet potato	Vine
Convolvulaceae	Merremia dissecta	Know you	Vine
Convolvulaceae	Merremia quinquefolia	Rock Rosemary	Vine
Cyperaceae	Scleria lithosperma	Cutting grass	Herb
Ebenaceae	Diaspyros tetrasperma	Clamberry	Tree
Euphorbiaceae	Ateramnus lucidus	Crabwood	Tree
Euphorbiaceae	Croton discolor	Wild rosemary	Shrub
Euphorbiaceae	Croton humilis var. humilis	Pepper-rod	Shrub
Euphorbiaceae	Croton linearis	Pineland croton	Shrub
Euphorbiaceae	Euphorbia cyathophora	-	Herb
Euphorbiaceae	Euphorbia hirta	Milkweed	Herb
Euphorbiaceae	Jatropha gossypifolia	Bell-ache bush	Shrub
Euphorbiaceae	Phyllanthus angustifolius	-	Shrub
Euphorbiaceae	Tragia volubilis	Twining cowitch	Vine
Lamiaceae	Leonotis nepetifolia	Christmas candlestick	Shrub
Lamiaceae	Ocimum basilicum	Wild Basil	Herb
Lamiaceae .	Ocimum micranthum	Wild Barsley	Herb
Leguminosae	Samanea saman	Guango	Tree
Malvaceae	Sida acutifolia	Broomweed	Shrub
Menispermaceae	Cissampelos pareira	Pod cowitch, Velvet leaf	Vine

Mimosaceae	Acacia tortuosa	-	Tree
Mimosaceae	Desmanthus virgatus	Ground tamarind	Shrub
Mimosaceae	Mimosa pudica	Shame-me-lady	Herb
Moraceae	Cecropia	Trumpet tree	Tree
Moraceae	Ficus benghalensis	Ficus (the banyan)	Tree
Myrtaceae	Pimenta dioica	Pimento	Tree
Myrtaceae	Psidium guajava	Guava	Tree
Nyctaginaceae	Pisonia aculeata	Cockspur, puss-claw	Shrub
Papilionaceae	Abnis precatorius	John Crow Bead	Tree
Papilionaceae	Centrosema virginianum	Wild peas	Vine
Papilionaceae	Desmodium canum var. canum	Sweetheard	Vine
Papilionaceae	Phaseolus lunatus	Broad bean	Herb
Papilionaceae	Piscidia piscipula	Dogwood	Tree
Piperaceae	Haematoxylum campechianum	Logwood	Tree
Piperaceae	Piper amalago var. amalago	Black Jointa	Tree
Poaceae	Andropogon pertusus	Seymour grass	Herb
Poaceae	Cenchrus echinatus	Grass	Herb
Poaceae	Cynodon dactylon	Bermuda grass	Herb
Poaceae	Lasciacis divaricata	Wild bamboo	Herb
Poaceae	Digitaria	Crab grass	Herb
Poaceae	Panicum maximum	Guinea grass	Herb
Poaceae	Paspalum fimbriatum	*Grass*	Herb
Poaceae	Rhynchelytrum repens	*Natal grass*	Herb
Poaceae	Themeda arguens	*Piano grass*	Herb
Poaceae	Zoysia	-	Herb
Polypodiaceae	Adiantum fragile	*Fern*	Herb
Polypodiaceae	Adiantum pyramidale	*Fern*	Herb
Rubiaceae	Coffea canephora	*Robusta Coffee*	Shrub
Rubiaceae	Morinda royoc	*Strong back*	Shrub
Sapindaceae	Blighia sapida	Ackee	Tree
Sapindaceae	Cupania glabra	Toadwood, Wild Ackee	Tree
Sapindaceae	Melicoccus bijugatus	Guinep	Tree
Sapotaceae	Manilkara zapota	naseberry	Tree
Simaroubaceae	Picramnia antidesma	Macary bitter	Shrub
Smilacaceae	Smilax balbisiana	Briar withe, chainy root	Vine
Solanaceae	Capsicum baccatum	Bird pepper	Shrub
Solanaceae	Solanum erianthum	Wild susumber	Shrub
Sterculiaceae	Guazuma ulmifolia	Bastard Cedar, Bascedar	Tree
Ulmaceae	Tama lamarkiana	-	Shrub
Verbenaceae	Lantana camara	-	Herb
Verbenaceae	Lantana involucrata	Wild mint	Herb
Verbenaceae	Lantana reticulata	-	Herb
Verbenaceae	Lippia alba	Cullen mint, Guinea mint	Herb
Verbenaceae	Priva lappulaceae	Clammy Bur	Shrub
Verbenaceae	Stachytarpheta jamaicensis	Bur vine	Vine

APPENDIX 13

Site Photo Inventory

Pasture at Moore Park

Pasture at Moore Park

Pasture at Moore Park

Pasture at Moore Park

Entrance at Moore Park

Existing House on Property

Family Burial Plot at Moore Park

Ruins of a Concrete Cattle Water Trough/Catchment at Moore Park

Pasture and Riparian Vegetation

Bastard Cedar in the Pasture

Acacia at the fringe of the dry limestone forest

Rock outcroppings near the Crematory Centre Site.

Appendix 14

Bird Species that may range in this area

Family	Scientific Name	Common Name	Status
Anatidae	Dendrocygna arborea	West Indian Whistling Duck	b
Anatidae	Anas discors	Blue Winged Teal	w
Ardeidae	Bulbicus ibis	Cattle Egret	b
Ardeidae	Ardea alba	Great Egret	b
Ardeidae	Nycticorax nycticorax	Black-crowned Night Heron	b
Ardeidae	Ardea herodias	Great Blue Heron	w
Ardeidae	Egretta thula	Snowy Egret	b
Caprimulgidae	Chordeiles gundlachii	Antillean Nighthawk	bs
Cathartidae	Cathartes aura	Turkey Vulture	b
Accipitridae	Buteo Jamaicensis	Red-tailed Hawk	bes
Charadriidae	Charadrius vociferus	Killdeer	b
Columbidae	Columba leucocephala	White-crowned Pigeon	b
Columbidae	Zenaida aurita	Zenaida Dove	b
Columbidae	Zenaida asiatica	White-winged Dove	b
Columbidae	Leptotila jamaicensis	Caribbean Dove	bes
Columbidae	Columbina passerina jamaicensis	Common Ground-Dove	bes
Cuculidae	Crotophaga ani	Smooth-billed Ani	b
Cuculidae	Cuckoo Saurothera vetulatus	Jamaican Lizard	be
Tytonidae	Tyto alba	Barn Owl	bes
Strigidae	Pseudoscops grammicus	Jamaican Owl	be
Psittacidae	Aratinga nana	Olive-throated Parakeet	bes
Psittacidae	Forpus paserinus	Green-rumped Parrotlet	i
Apodidae	Streptoprocne zonaris	White-collared Swift	w
Apodidae	Cypseloides niger	Black Swift	w
Apodidae	Tachornis phoenicobia	Antillean Palm Swift	bes
Trochilidae	Trocholus polytmus	Red-billed Streamertail	be
Trochilidae	Anthracothorax mango	Jamaican Mango	be
Trochilidae	Mellisuga minima	Vervain hummingbird	bes
Emberizidae	Euphonia musica	Jamaican Euphonia	be
Emberizidae	Bullfinch Loxigilla violacea	Greater Antillean	bes
Emberizidae	Tanager Spindalis nigricephalus	Jamaican Stripe-headed	be
Emberizidae	Coereba flaveola faveola	Bananaquit	bes
Emberizidae	Quiscalus niger	Greater Antillean Grackle	bes
Emberizidae	Icterus leucopteryx leucopteryx	Jamaican Oriole	bes
Emberizidae	Dendroica petechia	Yellow Warbler	bes
Emberizidae	Parula americana	Northern Parula	w

Status according to Downer and Sutton "Birds of Jamaica."

Key Status
b=breeding species
be=jamaican endemic species
bes=Jamaican endemic sub-species
bs=summers and breeds
i=breeding introduced
w= winters

Species List Butterflies

Family	Scientific Name	Common Name
Lycaenidae	Hemiargus hanno	Hanno Blue
Nymphalidae	Anartia jatrophae jamaicensis	Jamaican White Peacock
Nymphalidae	Heliconius charitonius simulator	Jamaican Zebra
Nymphalidae	Dryas iulia delila	Julia
Nymphalidae	Euptoieta hegesia hegesia	Tropical Fritillary
Nymphalidae	Dione vanillae insularis	Tropical Silverspot
Pieridae	Phoebis senae senae	Cloudless Sulphur
Pieridae	Ascia josephina paramaryllis	Giant Antillean White

APPENDIX 15

DELAPENHA'S FUNERAL HOME LIMITED PROPOSED DEVELOPMENT OF A CEMETERY AND CREMATORIUM AT MOORE PARK, ST JAMES

COMMUNITY QUESTIONNAIRE

DATE:_____ LOCATION:_____

Delepenha Funeral Home is proposing to establish a private cemetery and crematorium on a 43 acre site located at Moore Park, St James. As stated the site will perform burials and cremations upon request. For burials, Single (1 m deep) and double vaults (2 m deep) will be 0.8 m wide by 2.3 m long (18.4 m3). Child vaults will be 0.8 m wide by 1.3 m long. These dimensions allow for a vault density of ~500 vaults per ha (~200 per acre). The base of the 14 vault will not be sealed with concrete. A slab of concrete will be placed on top of the casket upon burial, and will be backfilled with earth material removed from the grave. Bodies will typically be partially embalmed before burial.
The cremation unit that is proposed to be installed is the Mathews Power-Pak II. This unit uses natural or LPG as fuel, and comes with a feature that "*effectively consumes and destroys smoke and odor from the cremation process"*. The Delapenha's crematorium, will limit cremations to 2 days per week, for 50 weeks for the year, given a total of 100 expected cremation days per year

COHORT DESCRIPTION

1. (i) Male (ii) Female

2. Age group i) 18- 25 yrs (ii) 26-33 yrs (iii) 34-41 yrs (iv) 42 – 50 yrs (v) 51 – 60 yrs (vi) older than 60 yrs

PERCEPTION

1. Have you ever heard of a company called Delapenha's Funeral Home Limited? (i) yes; (ii) no
   a. If yes what have you heard and how did you hear? _____
   _____
2. Did you know that the Delapenha's Funeral Home Limited is proposing to establish a private cemetery and crematorium in the Sudbury/Moore Park Area of Saint James? (i) yes; (ii) no
   a. If yes how were you made aware? _____
   _____
3. Do you think that the proposed site located off the main road between Montego Bay and Adelphi is an accessible location? (i) yes; (ii) no
4. Do you know of any other cemetery or crematorium in the nearby area? (i) yes; (ii) no
   a. If yes what is the name and how far away is it? _____
   b. If yes do you know if that facility impacts (positively or negatively) nearby communities? _____
   _____
5. Do you know if existing public or private cemetery capacity nearby will soon be exhausted? (i) yes; (ii) no
6. Have you had deaths in your family? (i) yes; (ii) no
   a. If yes where have your loved ones been buried (i) public cemetery _____ (ii) private cemetery _____ (iii) family plot
7. Do you have any concerns about the project as proposed? (i) yes; (ii) no
   a. If yes what are they? _____
   _____
8. Do you think this project will affect your life in any way (positive or negative)? (i) yes; (ii) no
   a. If yes how? _____

NATURAL HAZARDS & SOCIAL AMENITIES

1. Do you have any problems with domestic/household water supply (i) yes (ii) no

   a. If yes how do you cope with the problem (i) collect rain water (ii) buy water (iii) collect water from a spring/river (iv) water truck supplies water (v) other _____

   b. How do you store water (i) drums (ii) underground tank (iii) aboveground tank (iv) other _____

2. Are there problems with frequent flooding? (i) Yes (ii) No

3. How frequently does flooding occur?

4. Where are the affected areas?

5. How high does the water level rise?

6. Are there problems with frequent fires?

7. Is there anything in particular about your area that you would like to tell us?
   _____

Signature of Interviewer: .....

APPENDIX 16

Perception Survey Report

Delapenha's Funeral Home Limited Proposed Development of a Cemetery and Crematorium at Moor Park St. James

Prepared By:
C.L. Environmental Co. Ltd.
22 Fort George Heights
Kingston 9

Introduction

On February 11 and 12, 2011 One Hundred and Thirty Eight (138) questionnaires were administered in a three kilometre radius of the site proposed for a cemetery and crematorium to be established by Delapenha's Funeral Home Limited in the Moor Park area of Saint James (Figure 1). Approximately forty eight percent (47.8%) respondents were female and 52.2% were male.

Of the One Hundred and Thirty Eight (138) respondents age cohort distribution was as follows; 22.5% were age 18-25 years , 18.1% were age 26-33 years, 13 % were age 34-41 years, 18.8% were age 42 – 50 years, 10.9% were age 51-60 years and 16.7% were older than sixty years of age.

The six communities visited were Slippery Gut, Murray Hill, Moor Park, Nanny Town, Orange and Rocky Road. Approximately fifty one percent (51.5%) questionnaires were administered in Moor Park, 19.6% in Orange, 5.8% in Nanny Town, 5.1% in Slippery Gut, 3.6% in Murray Hill and 14.5% in Rocky Road.

Results and Findings

Approximately ninety eight percent (98.6%) of all respondents had heard of Delapenha's Funeral Home Limited. Respondents were aware of Delapenha's and their services offered. Some respondents indicated that they had done business with the institution and the service provided to facilitate burial of loved ones was good. Others indicated that they heard of the company through media advertisements and from other persons relaying experiences ("word of mouth"). Approximately thirty one percent (30.9%) of all respondents while knowing of Delapenha's were not aware of the proposal to establish the cemetery and crematorium in Moor Park. These respondents were mainly from the communities of Slippery Gut, Orange, Rocky Road and. These communities are located furthest from the site, approximately ≈ 400m east, 2km and 2.6 km west respectively.

The respondents that were aware of the proposed development were mainly from Moor Park and Nanny Town; the communities closest to the site. Respondents were aware of Dovecot as the nearest cemetery and indicated that it was used mainly due to its close proximity. Data collected revealed that 5.1% of residents who had deaths in their family used Dovecot. Some respondents used the Content Cemetery while others had loved ones interred outside the area. Data collected suggests that there are three main gullies which channel water. These gullies are located at Slippery Gut, Moor Park and Glasgow.

Moor Park Respondents

The proposed project site is located in the Moor Park Community. Approximately eleven percent (11.3%) of respondents was not aware of the proposed project. Approximately thirty six percent (36.6%) of respondents indicated that they were made aware of the project at a meeting held at the Sudbury All Age School, while the remaining 52.1% of respondents were made aware of the project by "word of mouth" from community and/or family members who had either attended the meeting or heard

otherwise. Respondents who attended that meeting indicated that Mr. Delapenha was present. Two respondents were visited personally and one respondent indicated that a sign was posted at Moor Park. Respondents were not able to tell when the meeting was held or who the convener was.

Of those Moor Park residents interviewed who were aware of the proposed project, 90.5% indicated that the proposed site is accessible. While respondents indicated that the proposed site is accessible, some qualified by indicating that the roads must be repaired and a bridge or an elevated roadway must be built at the entrance to the site as the area is impassable during heavy rain. Regarding flooding in the Moor Park area closest to the site; respondents reported that flooding occurs whenever there are heavy rains. Flooded areas include the road leading to the proposed site as well as the main road leading to Adelphi. Respondents indicated that flood water recedes quickly, however the flow of the water is described as fast and strong.

Some respondents in Moor Park indicated that they think the project will impact their lives positively as they expect that commitments made at the meeting held at Sudbury All Age should improve their quality of life as the water supply would be brought closer, road repairs would be done and employment opportunities would be created.

In general, when asked about the potential impact the project may have on their lives, respondents do not think the project will impact their lives. They have an expectation that with the introduction of Delapenha's to the area there should be positive improvements to the community as water supply and road conditions and street lighting must be improved.

Regarding domestic water supply, 78.8% of respondents indicated that there problems with domestic water supply in Moor Park. Problems were related to low water pressure or no water in the main. Respondents indicated that no pipes were installed along the road leading to their homes. Additionally water pressure was low thereby making water available only at the main road stand pipe. One respondent indicated that a part of the water problem is attributable to the size of the bore supplying the community. This coupled with the increase in population density and not upgrading to meet the communities' needs. It was explained that a four inch bore leads from the water source to the Sudbury Baptist Church and this bore is reduced to two inches from the church to the communities it supplies. Residents living off the main depend on rainwater or have to carry water from the standpipe to the homes. It could not be determined if pipe installation was the responsibility of the resident or the National Water Commission

Nanny Town Respondents

Approximately eight seven percent (87.5%) of respondents interviewed in the Nanny Town community were aware of a Delapenha's and their services offered. All respondents were aware of the proposed project. Fifty percent (50%) of respondents were made aware as they attended the meeting held at Sudbury All Age and the remaining 50% were made aware by "word of mouth" from persons who attended the meeting, neighbours and family members. All respondents indicated that the site is

accessible. Approximately sixty two percent (62.5%) of respondents had deaths in their family and performed burials in family plots. Approximately twelve percent (12.5%) of respondents expressed concern about the project and indicated that the process must be environmentally safe. Similar to respondents in Moor Park, respondents in Nanny Town indicated that they had problems with the supply of domestic water. Respondents indicated that water for the community is available only at a standpipe located at the main road.

Approximately seventeen percent (16.7%) of residents indicated that they had concerns about the proposed project. The respondents who indicated that they had concerns were concerned about potential smoke emissions from the cremation unit and how this smoke may impact their health after long term exposure as well as the potential impact to ground water. One respondent from the Rocky Road area indicated that the river that supplies their drinking water flows from Spring Gut and passes underground at Moor Park and resurfaces beyond Moor Park. One respondent asked that a proper environmental and geological study be done to ensure that water will not be impacted. Other concerns were related to respondents being uncomfortable with a cemetery being located close to their homes.

Murray Hill Respondents

Eighty percent (80%) of respondents interviewed in Murray Hill were aware of Delapenha's Funeral Home Limited and the proposed project in the Moor Park Area. All respondents aware of the proposed project found out by "word of mouth". Sixty percent (60%) of respondents thought the site was in an accessible location. All respondents had deaths in their families; 20% of burials were done at family plots in the community, 40% of family plot burials were outside the community. The remaining 40% of burials were done at either a public or private cemetery.

No respondent expressed concern about the project.

All respondents reported problems with domestic water supply. Respondents attribute problems to low water pressure and/or irregular water supply. Domestic water is collected from the standpipe and rain water is also harvested and stored in drums and aboveground tanks. Eighty percent (80%) of respondents indicated that there are no problems with frequent flooding; however flooding occurs when there are heavy rains. During times of flood, the area flooded is primarily the main road leading to Moor Park from Adelphi. Water levels reported ranged between 0.9 m and 1.5 m (3 and 5 feet).

Regarding the effect the project may have on the lives of respondents, 20 % of respondents thought there may be some positive effect as the site will be closer for burials.

Slippery Gut Respondents

Approximately eighty five percent (85.7%) of those interviewed in Slippery Gut were aware of Delapenha's. Some respondents had used their services or heard that they were a good funeral home.

42.9% of respondents were aware of the proposed project and were made aware by “word of mouth”. 57.14% of respondents indicated that the site is at an accessible location, however mention was made that access was contingent on rainfall as the road leading to the site floods heavily.

Approximately eighty five percent (85.7%) of respondents had deaths in their families. Of this percentage, 66.7% performed family plot burials. Content Cemetery, a public cemetery in the Adlephi area was also stated.

Approximately twenty nine percent (28.6%) of respondents expressed concern about the project. Concerns related to smoke emission from the cremation unit and the addition of more burial spaces in the area as it is believed that there are enough burial spots including family plots.

Problems with domestic water supply were reported. 42.9 % of respondents confirmed water supply problems. It was realized that residents living further from the main road experience problems while those close to the main did not have problems. Respondents collect rainwater and/or use the stand pipe located at the main road. 28.6% of those interviewed indicate problems with frequent flooding, with the most recent flood event being January 2011. In general flooding events occur during heavy rains, inclement weather, and the rainy season. Water levels reported range between 0.6 and 1.5m (2 and 5 feet). The areas affected are Slippery Gut and the main road leading to Moor Park

Rocky Road Respondents

All respondents were aware of Delapenha’s and the funeral services offered. Seventy five percent (75%) of respondents did not know of the proposed project while the remaining 25% were made aware by “word of mouth”. Ten percent (10%) of respondents were of the opinion that the site is not in an accessible location. Sixty percent (60%) of respondents indicated that loved ones were interred in family plots. Ten percent (10%) of those interviewed thought the project would positively impact their lives as it is a potential source of employment.

Regarding concerns, 10% of respondents expressed concerns. These concerns focused on the potential impact to groundwater. Strong objection to the project was raised on this basis. It was explained that the source of groundwater that supplies Rocky Road originates from Spring Gut and continues from Rose Hall through Paisley and Moor Park in the vicinity of the proposed site.

Respondents did not have any problems with water supply and flooding.

Orange Respondents

Approximately ninety six percent (96.3%) of respondents knew of Delapenha’s and the services offered. Approximately forty eight percent (48.1%) of respondents heard of the proposal to establish a cemetery and crematorium in Moor Park. These respondents indicated that information was received by “word of mouth”. Seventy four percent (74%) of respondents indicated that the site is accessible. Sixty three percent (63%) of those interviewed indicated that loved ones were interred in family plots.

Approximately eighteen percent (18.5%) of respondents expressed concern about the project. Concerns were related to the potential impact to groundwater and smoke emissions association with cremation. Concerns were also raised about whether an environmental study was done. Approximately eighteen percent 18.5% of respondents thought the project would affect their lives mainly in the area of job creation. No water supply or flooding problems were reported.

General Comments

In general respondents in the communities nearer to the proposed site were aware of the proposed project. Most respondents did not think the project would affect their lives. Those who thought there may be some effect, highlighted environmental issues specific to smoke emissions and groundwater contamination as well as community infrastructure improvement and job creation. There seems to be a problem with water supply. These problems relate to low water pressure and no pipeline infrastructure in some areas. Flooding of the main road leading to the site is of concern and must be addressed.

WATER RESOURCES AUTHORITY

HOPE GARDENS, P.O. BOX 91, KINGSTON 7, JAMAICA
TEL: 927-0077/ 927-0293/ 927-0189/ 927-0302 FAX: 977-0179/ 702-3937

APPENDIX 17

REF: DR 8- 26

February 25, 2011

Ravidya Burrowes
Environmental Management Consultants Caribbean Ltd.
61 Mansfield Meadows, Ocho Rios

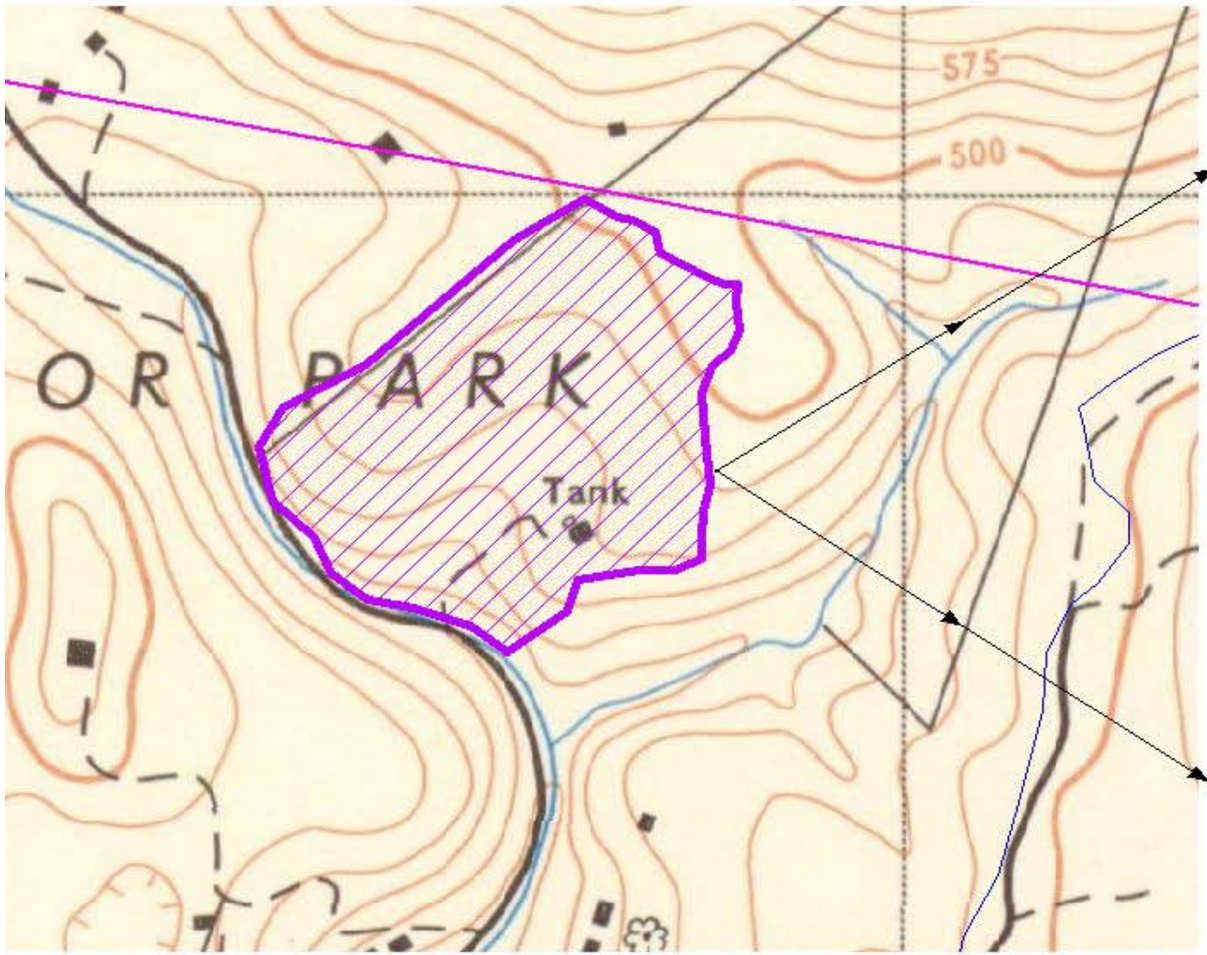
RE: PROPOSED FUNERAL HOME MOORE PARK ST. JAMES

Subdivision/ Development	Hydrogeology	Water Resources Potential	Flooding Vulnerability	Water Quality Issues
Name of Development: Moore Park Cemetery Type of Development: Cemetery on approximately 17 ha with vault density of 500 vaults per hectare Location:10.5 km SW of Montego Bay in the Great River Hydrologic Basin & Montego River WMU Developer: Delaphena's Funeral Home Review Requested by: Date Request Received: January 3, 2010	Geology/Hydrostratigraphy: The Montpelier Formation underlies this area. This unit belongs to the White Limestone Group but karstification has not been significant. In it's intrinsic property this rock has a very low primary permeability and is classified as an aquiclude. The Gibraltar-Bonnygate Formation underlies the area to the south. This unit belongs to the White Limestone Group and is considered an aquifer Faulting: The area is significantly faulted. An east to west trending fault is mapped in the area of the development site. Groundwater: The groundwater flow direction is to the west generally along faults. Faults are recognized as preferred flow paths. The nearest well is Glasgow non pumping well 1.7 km to the SE at elevation of 134 m and drilled in the Montpelier to a depth of 47.2 m. Latium Dug Well 2.4 km to SW drilled in Gibraltar Bonnygate Formation has a depth to GW of 6.1m Surface water: The 1:12500 maps indicate two surface water flow paths in the vicinity of the site. Regional surface water flow is to the west with drainage to Montego River. The Appleton Spring, a potable NWC source, is located 2.5 km to the SW. Soil: The predominant soil texture of the area is clay loam and features rapid internal drainage and high erosion potential.	Groundwater Resources: There is potential for groundwater development of the adjoining limestone aquifer to the south. Surface Water Resources: Currently the source of water for domestic supply to Latium is the Appleton Spring, which is operated by the National Water Commission (NWC). Other areas also served by this spring system include Appleton Spring, Orange, Sign, Moor Park, Sudbury and Rocky Road. Based on data received from NWC for the period of 1975 to 2006 the abstraction ranges from 185 to 1,642 m3/day. Rainfall Resources: Approximately 1500 mm */per annum (WRA Master Plan Draft 2005 isohyets).*	The applicant should be required to evaluate the impact of normal and extreme flows within the nearby watercourse ensure that flooding does not negatively affect the property. If necessary appropriate setbacks and mitigation measures should be effected. Site Elevation: Approximately 114 m to the SW of site and 152 m to the NE	The developer indicates Septic Tank Tile Field for the disposal of sewage. The presence of surface and ground water resource require an adequate level of sewage treatment. The WRA recommends at least Secondary Level Sewage Treatment for this Location. Other Remarks (if any) The criteria for the siting of cemeteries (see attached document for details), states that the developer should ensure that the site is well drained, is not situated atop a recharge area or a major fault. The outer boundary of the site should be at least 250m away from any spring or water course, and 500m away from production wells. The burial pit should maintain a minimum of 1.5m of soil layer below the bottom/base of the burial pit before encountering bedrock. Based on the available information (geology, river and well network, hydrology) all criteria are met. It is however recommended to provide information on the soil profiles across the proposed site to indicate the thickness of the soil layer.

Michelle Watts (Mrs.)
Senior Environmental Officer
For Managing Director

SEWAGE TREATMENT METHODS (List not exhaustive)			Glossary of Hydrological Terms
PRIMARY Treatment Methods	**SECONDARY** Treatment Methods	**TERTIARY** Treatment Methods	**Aquifer**- A geological formation that stores and/or transmits water to wells, springs and surface water bodies. **Aquiclude**- A geological formation that may contain water but is incapable of transmitting it in significant quantities. **Rainwater Harvesting**- The collection and storage of rainwater for use. Examples include hillside run-off and rooftop run-off systems. **Calculation of Water Demand-** . Demand assume a consumption of 0.182 m^3/day per person, plus 20% for leakage and system loss, plus an additional 30% for peak demand. **WMU-** Water Management Unit
- Septic tank-absorption pit - Dry pit latrine (double vaulted / composting toilet)	- Septic tank-tile field - Septic tank-mound system - Septic tank-sand filter-tile field - Septic tank-sand filter-abs. pit - Biodigester -tile field - Aerated septic tank-tile field - Stabilization ponds - Mechanical systems with aeration steps (e.g. oxidation ditch, aerated sludge process)	Any mechanical or non-mechanical treatment process which includes removal of nutrients by natural (eg. evapotranspiration bed/reed bed, biological denitrification) or chemical means (eg. phosphorus precipitation)	

Location Map Re: Proposed Delaphena's Funeral Home
Moore Park, St James



200 0 200 400 Meters

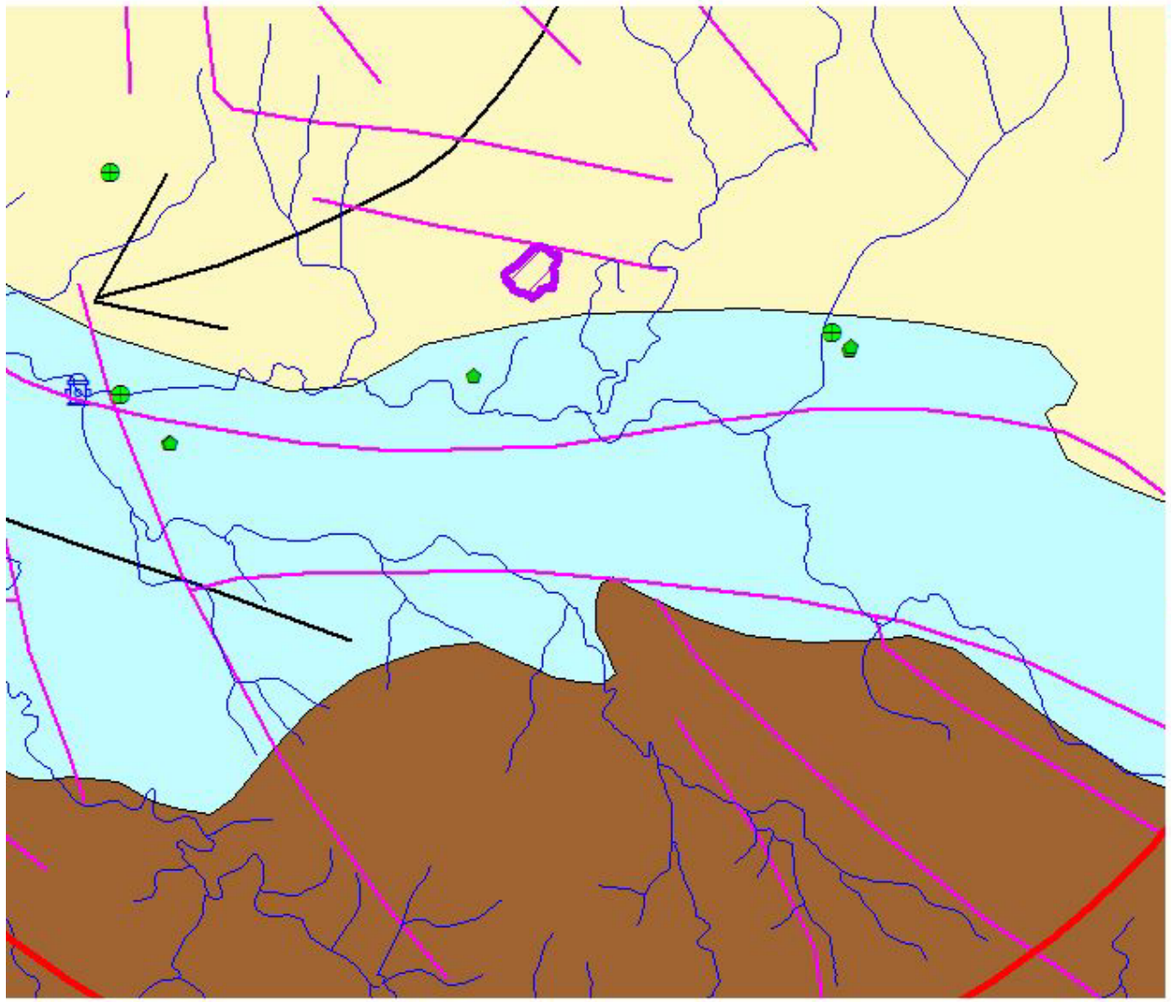
Fault
Subdivision assessed by WRA
Proposed Cemetery
Non pumping well
Nwc sources
River/watercourse
Flood prone area

1 0 1 2 Kilometers

80 0 80 160 240 Meters

Prepared by WRA Jan 2011

Hydrostratigraphy Re: Proposed Delaphena's Funeral Home
Moore Park, St James



2 0 2 Kilometers

N

5 km radius

Proposed Cemetery

Subdivision assessed by WRA

NWC Source

Groundwater flow direction

River/watercourse

Pumping well

Non pumping well

Jamaica fault

Hydrostratigraphy

- Alluvium Aquiclude
- Alluvium Aquifer
- Basal Aquiclude
- Coastal Aquiclude
- Coastal Aquifer
- Limestone Aquiclude
- Limestone Aquifer

Prepared by WRA Jan 2010

MINISTRY OF HEALTH
ENVIRONMENTAL HEALTH UNIT
OCEANA COMPLEX, 2-4 KING STREET, KINGSTON, JAMAICA
TEL: (876) 967-1100/3/5/7/ or (876)967-1275 or (876)967-4762 FAX: (876)967-1280
WEBSITE: www.moh.gov.jm Email: directorehu@yaho.com

ANY REPLY TO THIS COMMUNICATION SHOULD BE ADDRESSED TO THE PERMANENT SECRETARY AND THE FOLLOWING REFERENCE QUOTED:

EHU NO: 07/7/11-2
REF NO: 2011-08017-EP00029

APPENDIX 18

April 28, 2011

National Environment & Planning Agency
10-11 Caledonia Avenue
Kingston 5

RE: Crematorium at Moore Park Memorial, Moore Park, St. James. By Delapenha Funeral Home.

The Environmental Health Unit (EHU) reviewed documents/designs in a NEPA submission **dated February 9, 2011 and received February 15, 2011,** supporting the abovementioned crematorium.

The EHU has no objections to this development on the condition that the Water Resources Authority certifies that the underground water will not be negatively affected.

Please note that the engineering report plus drawings of the sewage treatment system are to be submitted for review.

If you have questions or require more information please contact the undersigned.

Mr. William Broughton
DIRECTOR Environmental Health Unit (Acting)

C.c. Medical Officer (Health)
St. James Health Department
Attention: Chief Public Health Inspector

C.c. Delapenha Funeral