

DESCRIPTION OF THE ENVIRONMENT

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Information for this section has been compiled from field observations and ground truthing to verify the accuracy of information sourced from reports including:

1. EIA for Step-in-Dyke RDA#1 (CD&A – 2005),
2. EIA for 2.8 Million Metric Tonne Per Year Efficiency Upgrade at JAMALCO – (CD&A -2004),
3. Biosurvey of Jamalco’s Special Mining Lease Area in Southern Manchester – (BEG’s LTD. – 2000),
4. Floral and Faunal Survey of Jamalco Special Mining Lease Areas and Environs of the Refinery and Port Facilities (BEG’s LTD. - 2005), and
5. Report on Webbers Gully Floodplain Mapping for Alcoa Train Line – Rio Minho River – (2005).

3.1 LAND USE AND GEOLOGY

3.1.1 LAND USE

Jamalco’s current RDAs are sited on lands formally occupied by sugarcane cultivation which were divested by Monymusk Sugar Factory.

The Bowens community which previously occupied lands located on the western side of RDA 1 and 2 was relocated to what is now called New Bowens. The relocation was to facilitate expansion of Jamalco’s residue disposal storage capacity.

RDA 5 will be constructed on approximately 100Ha of lands owned by Jamalco and lies adjacent to the other RDAs (East and South perimeters will be bounded by the existing RDA 2 and RDA 4 embankments).

Two residential communities are located within one half mile of the RDA’s, New Bowens to the Northeast and Cornpiece to the Southeast.

3.1.1.1 HISTORICAL

3.1.1.1.1 CLARENDON

3.1.1.1.1.1 Topography

The topography of Clarendon is characterised by the diverse nature of the coastal fringe and offshore islands and cays. The national and marine park and protected area of the Braziletto Mountains, Portland Ridge, Peake Bay, Portland Bight and the plains in the Southern areas with elevations from 0-150 meters, the Mocho Mountains at elevations of 150-300 meters, extending to the limestone uplands in the north around main ridges, and the Bull Head Mountain.

3.1.1.1.1.2 Area and Land Cover

Clarendon contains an area of 1142.8 km².

Land cover in Clarendon is characterised by a scattering of villages and major urban centres, vast areas of sugar cane, wetlands, dry forests, scrub, industrial estates, aquaculture, mixed cultivation including bananas, citrus, subsistence crops by small farmers which includes yams, peas, sweet potatoes, etc.; the decline of the sugar industry has left large areas abandoned and taken over by scrub vegetation. Uncultivated areas due to salinity include much of the coastal side of the plains. Tidal flats are largely inaccessible. There are also the dry forests of the Braziletto Mountains and the Portland Ridge, where Taino petroglyphs and some Taino burial caves are to be found.

3.1.1.1.1.3 Industrial Development Plan

Light industrial land use is confined to the rural/urban settlements and linear occupancy along district, sub-arterial and arterial roads. Heavy and special industrial plants include bauxite processing plant at Halse Hall (Jamalco), sugarcane processing at Moneymusk and New Yarmouth.

Transportation and access routes including all classes of roads and railway lines link all urban centres and also penetrate agricultural areas, national parks and conservation areas.

TABLE 3-1: URBAN SETTLEMENT DEVELOPMENT

CLARENDON – HEIRARCY OF GROWTH CENTRES		
District Centres	Sub-Regional Centres	Regional Centres
James Hill	Lionel Town	May Pen
Kellits		
Hayes		
Chapelton		
Kemps Hill		
Osbourne Store		
Mocho		
Rock River		
Chapelton		
Frankfield		
Alston		

3.1.1.1.4 Parish Council/Land Use Zoning

The parish of Clarendon is covered by Development Orders and subsequently falls under the aegis of the Town and Country Planning Act. Thus any form of development requires an application to the relevant Local Planning Authority (Parish Council) for permission to carry out building, engineering and mining operations or change in the use of land or buildings.

There are no specific demarcated zones for land use, but there are general statements of intended uses, supporting requirements and standards. This project does not present a change in land use for the site specified.

3.1.1.1.5 Aesthetics

There are several areas of outstanding natural beauty, visual and recreational amenity, and therapy. There are also areas which are felt to be aesthetically appealing and spiritually inspiring. The view from the Braziletto Mountains over the protected Peake Bay and West Harbour wetlands and the sea is outstanding. The Milk River Bath is world renown for its therapeutic quality, and the Canoe Valley-Portland Bight wetlands supports considerable marine life and is itself outstandingly beautiful.

A wide variety of micro climates exists in the parish, ranging from cool climatic conditions in northern Clarendon near the Manchester border, to high temperatures on the Clarendon plains (location of proposed RDA) and dry limestone forests in the Portland Bight and Braziletto Mountains.

It is not assumed that the proposed RDA will contribute negatively to aesthetics of the area since the location is behind the existing RDAs and away from the natural lines of sight of the majority of residential communities in the area.

3.2 GEOLOGY

The area under consideration is in the district of Halse Hall, in southern Clarendon. It can be located on the 1:50,000 topographic Sheet 17 (metric edition) at co-ordinates 245385 (Figure 3-1: Geology Map of Southern Clarendon). Geomorphologically, the area lies on the gently sloping alluvial fan of the Rio Minho. The apex of the fan, at May Pen, lies at an altitude of about 70 m above sea level (asl), although the present river bed is incised into the fan, being at about 50 m asl at May Pen. From May Pen the river flows over a straight line distance of about 20 km to the sea. In the vicinity of Hayes, at the confluence with Webbers Gully, the river bed lies at an altitude of 38 m asl, while the plant and RDAs at Hayes, east of the river, lie on an old, dissected terrace remnant at elevations of 45 to 50 m asl with flat to gently undulating topography. The terrace remnant forms a high spot between Webbers Gully, which borders the site on the north and northwest before entering the Rio Minho, and Cannons Gully which extends along the eastern side of the site, draining to the south at Bog and separating the site from the limestone plateau of Harris Savannah.

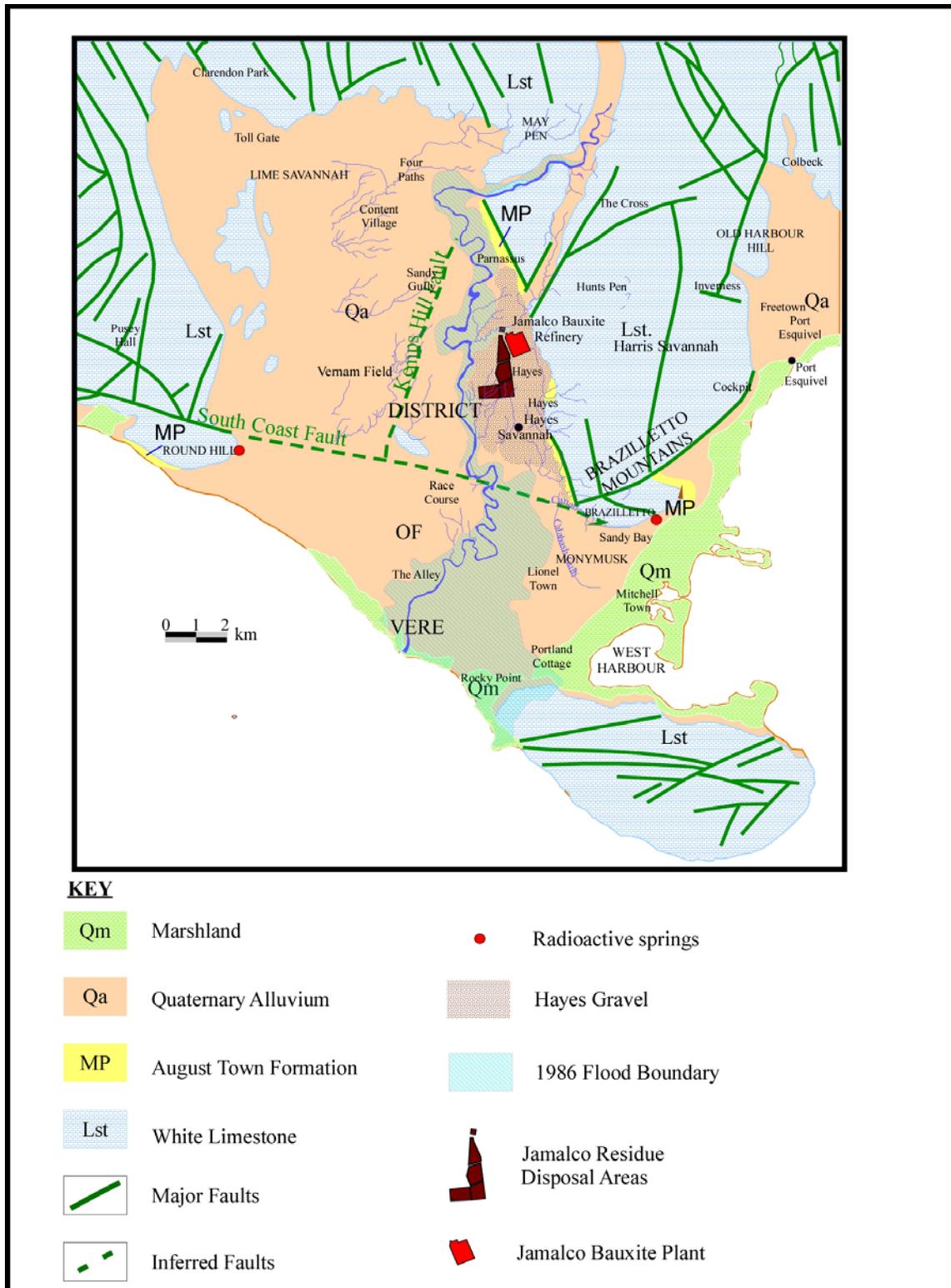


FIGURE 3-1: GEOLOGY MAP OF SOUTHERN CLARENDON

South of Hayes the alluvial fan flattens out to form what have been called the Vere Plains (Figure 3-1). Elevations over this area are low and the water table is relatively high, so that settlements such as Lionel Town and Alley are frequently flooded.

The rocks of the area consist of two main units. The various unconsolidated alluvial sediments, part of the Rio Minho fan complex, rest on limestone bedrock with a highly irregular surface.

3.2.1 THE ALLUVIAL FAN COMPLEX

The alluvial fan contains a wide range of more or less unconsolidated siliciclastic sediments. The top of the original fan, which has been extensively dissected, is preserved only in the neighbourhood of Halse Hall and Hayes (Figure 3-1). The sediments underlying the plant and RDAs make up this remnant and have been called the Hayes Gravels. The gravels range in particle size from pebbles and cobbles to silt and range in thickness from zero to 5-6 m in the north to 14-15 m in the south of the plant area (Plate 3-1). Clay is rare and the gravels are well-drained. Within the rest of the eastern part of the fan the sediments are very variable, although generally finer grained than the Hayes gravels, and with alluvial clay lenses.



PLATE 3-1: HAYES GRAVEL AT SITE OF PROPOSED RESIDUE DISPOSAL AREA

3.2.2 THE LIMESTONE BEDROCK

The sediments of the Hayes Gravels are separated from the limestone bedrock by an irregularly developed layer of clay (Figure 3-2), at least in part being a weathered palaeosol developed on the limestone surface.

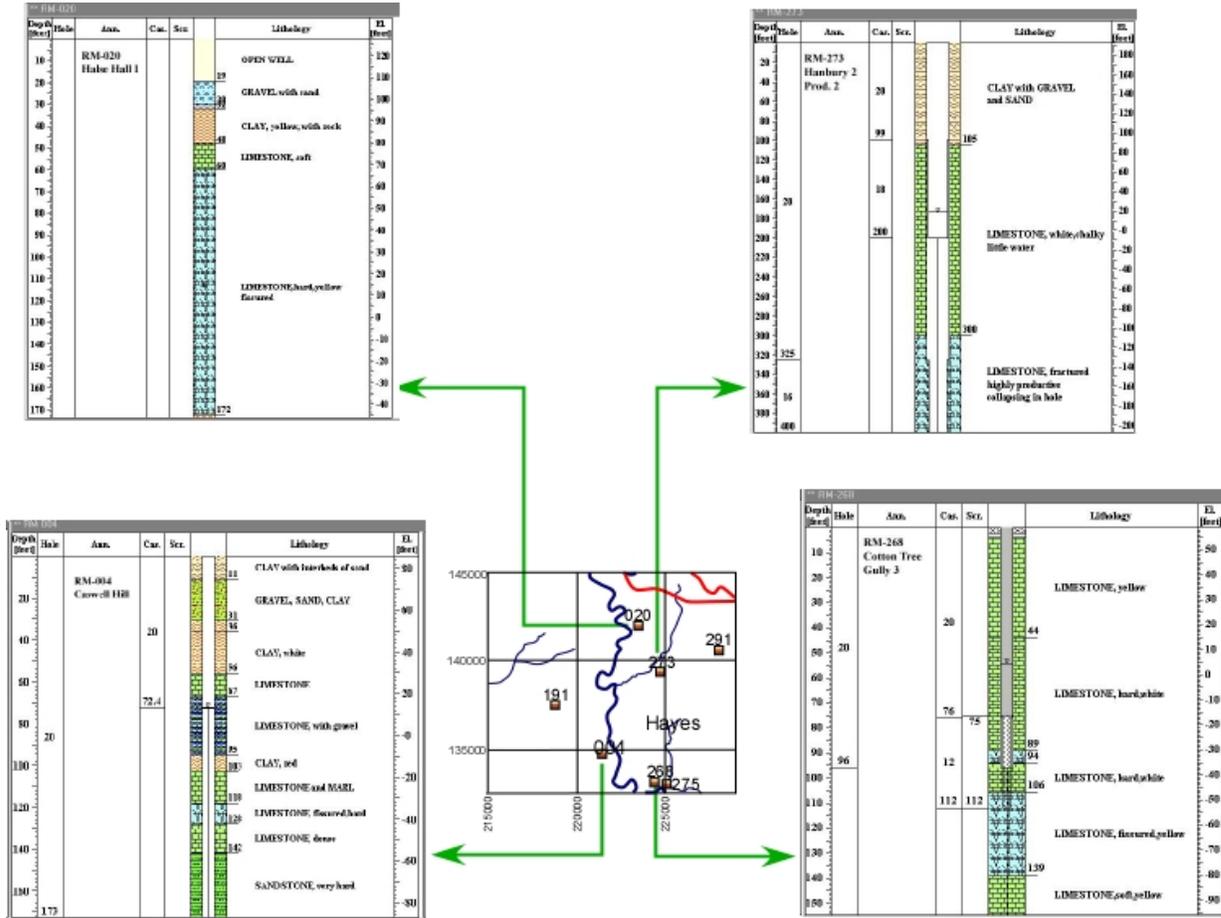


FIGURE 3-2: WELL LOGS THROUGH THE HAYES GRAVELS
 (SOURCE: [HTTP://WWW.GEOCITIES.COM/KKARANJAC/](http://www.geocities.com/kkaranjac/))

The limestone has been divided by the Mines and Geology Division into the lower, relatively pure Newport Limestone (Mn on Geological Sheet 16) and the upper, less pure August Town Formation (MP). The Newport limestone consists of moderately well-bedded, compact limestones, containing frequent rubbly layers, while the August Town Formation consists of impure limestones with irregularly interbedded marly and clayey layers. These rocks are exposed along the eastern side of the alluvial fan, less than a kilometre east of the plant site.

3.2.3 GEOTECHNICAL CHARACTERISTICS

3.2.3.1 THE ALLUVIAL FAN COMPLEX

Table 3-2: Properties of Various Soil Groups (adapted from Conrad Douglas & Associates EIA on the construction of Residue Disposal Area 4) below shows the characteristics of materials that should be expected in the Hayes Gravels.

TABLE 3-2: PROPERTIES OF VARIOUS SOIL GROUPS (ADAPTED FROM CONRAD DOUGLAS & ASSOCIATES EIA ON THE CONSTRUCTION OF RESIDUE DISPOSAL AREA 4)

Typical Names of Soil Groups	Group Symbols	Important Properties			
		Permeability when Compacted	Shearing Strength when Compacted and Saturated	Compressibility when Compacted and Saturated	Workability as a Construction Material
Well-graded gravels, gravel sand mixtures, little or no fines.	G.W.	Pervious	Excellent	Negligible	Excellent
Poorly graded gravels, sand mixtures, little or no fines.	G.P.	Very pervious	Good	Negligible	Good
Silty Gravels, poorly graded gravel-sand-silt mixtures.	G.M.	Semi-pervious to impervious	Good	Negligible	
Clayey gravels, poorly graded gravel-sand-clay mixtures.	G.L.	Impervious	Good to fair	Very low	Good
Well-graded sands, gravelly sands, little or no fines.	S.W.	Pervious	Excellent	Negligible	Excellent
Poorly graded sands, gravelly sands, little or no fines	S.P.	Pervious	Good	Very Low	Fair
Silty sands, poorly graded sand-clay mixtures	S.M.	Semi-pervious to pervious	Good	Low	Fair

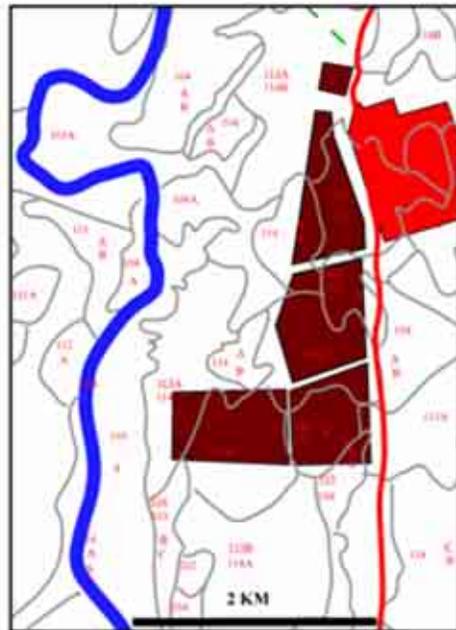
In summary the gravels tend to be pervious to very pervious with good to excellent shear strength, of negligible compressibility and good to excellent workability as a construction material. Alluvial materials sourced from other places in the Rio Minho fan should also be well suited for construction after washing and grading.

The limestone bedrock of the area may be thickly stratified and massive, but contains frequent zones of less competent, rubbly and marly limestone. There may be a case-hardened layer up to several metres thick, over the softer limestone, where it has been indurated from weathering. The rubbly zones are frequently the result of brecciation associated with faults. Solution features consist of joints widened by solution and there may be cave development. Most large features in the limestones of southern Clarendon and St. Catherine consist of vertical shafts with widening laterally into extensive cave complexes in some areas, such as Portland Ridge (Fincham, 1997).

In summary the bearing capacity of the limestone bedrock is good, although for large structures the presence or absence of caverns or fissures at shallow depth should be ascertained.

3.2.3.2 SOILS

The soils of the Hayes region are intimately associated with the alluvial deposits of the Rio Minho Fan Complex. Figure 3-3 indicates the distribution of the different soils of the area. In Figure 3-3: SOILS MAP OF HAYES, CLARENDON the classification follows that used by the Ministry of Agriculture, the symbol group representing the soil type and steepness of slopes.



SOIL TYPES

24	Agualta Sandy Loam
103	Agualta Loam
104	Agualta Clay
111	New Yarmouth Loam
112	New Yarmouth Clay Loam
113	Halse Hall Clay
114	Halse Hall Clay (Red Phase)
202	Rhynsbury Clay

SLOPE CATEGORIES

A	0 - 2 Degrees (0% - 5%)
B	2 - 5 Degrees (5% - 11%)
C	5 - 10 Degrees (11% - 22%)

FIGURE 3-3: SOILS MAP OF HAYES, CLARENDON

3.2.4 MINERAL RESOURCES

The only mineral resources of note are the limestone forming the Harris Savannah plateau, which has been used as a source of marl and crushed stone from the disused quarry near Halse Hall, and the sand and gravel extraction industry in the bed and flood plain of the Rio Minho. The Hayes Gravels contain small pebbles and occasional larger cobbles of the semiprecious stone jasper (Porter et al. 1982; Porter, 1990). Rarely fragments of silicified wood may be collected.

3.3 HYDROGEOLOGY AND HYDROLOGY

3.3.1 HYDROGEOLOGY

3.3.1.1 HYDROSTRATIGRAPHY

The Clarendon Alumina Works consisting of the bauxite/alumina plant and the Residue Disposal Areas (RDAs) owned by Jamalco is located within the parish of Clarendon on the south central coast of the island (Figure 3-4: Basin Location). The parishes of Clarendon and Manchester together form the Rio Minho Hydrologic Basin that consists of the Rio Minho, the Milk River and the Gut-Alligator Hole Watershed Management Units (Figure 3-5).