6 BASELINE ENVIRONMENT

Drawings relevant to this section:

- Topographic Plan
- Location Plan
- Vegetation Map

6.1 Site and Project Area

6.1.1 Site Description

The proposed site is located at Haute Rive in the district of Rivière du Rempart, about 1.5 km to the East of the urban centre of Rivière du Rempart and 1.7 kms to the north west of the village of Roches Noires; the village of Pointe des Lascars is located on northern embankment of the river, as shown on the Location Plan attached in the Drawing Section.

The proposed site is located between the following coordinates:

- Northern boundary of site: Latitude 20°05'33.81" S & Longitude 57°42'22.36" E
- Southern boundary of site: Latitude 20°05'51.03" S & Longitude 57°42'29.07" E
- Western boundary of site: Latitude 20°05'43.74" S & Longitude 57°42'19.92" E
- Eastern boundary of site: Latitude 20°05'41.02" S & Longitude 57°42'38.96" E

The land under proposed development is freehold land belonging to:

- Flacq United Estates Ltd, owner of private freehold land of a total extent of **19.6920 hectares** situated at Haute Rive, in the district of Rivière du Rempart, by virtue of title deeds registered and transcribed in Volume 1560 No.40, Volume 3523 No.28 and Volume 6306 No.49, and
- Indian Ocean Real Estater Company Ltd, owner of private freehold land of a total extent of **2.9457 hectares** situated at Haute Rive, in the district of Rivière du Rempart, by virtue of title deeds registered and transcribed in Volume 7258 No.53

The total extent of site is 22.6377hectares.

Necessary certificates from land owners to promoters and notary's certificates are attached at Appendix A.

The site is currently under sugar cane field with a belt of vegetation along the river, the coastal frontage and the Barachois (refer to section 6.2.4)
There are two small ground only buildings currently occupied by watchmen near the Barachois
There are two lime kiln worth conservation value (refer to section 6.7)

The existing services found on site are of two types:

- Private services being the irrigation system for the sugarcane field
- Public services , being CEB, CWA and MT lines to supply the two houses

The relocation of these services, if need be, will be dealt with as part of the detail design phase of the project and after discussions with the various services providers,

6.1.2 The Project Area

The Project area comprises land within 1,000 m of the site boundaries, which is the extent of the area commonly considered in Environmental Impact Assessment studies, as shown on the Location Plan under reference "Project area".

The Area of Environmental Influence for such type of development, i.e. small residential and hotel project with associated leisure facilities and associated infrastructure and services, is however much smaller than the project area and can be reduced to 500 m from site boundary, as shown on the Location Plan under reference "Area of Environmental Influence".

The Project area as indicated on the Location Plan includes the following main man-made features:

- To the north (opposite side of the river): Pointe des Lascars Village
- To the west (opposite side of the the river): proposed residential Morcellement (EREIT) and further west Riviere du Rempart village
- To the East: two houses, two lime kilns, the slipway (Pointe Bonhomme) and Barachois
- To the south east: residence of Mr C. Lagesse and further to the SE Roches Noires village

The Project area as indicated on the Location Plan includes the following main natural features:

- To the North of site: River du Rempart estuary (adjoining)
- To the West of site: sugar cane fields and further west River du Rempart at some 400m from site boundary
- To the south of site: sugar cane fields
- To the East of site: the lagoon (adjoining) and further ocean

The project area as indicated on the Location Plan includes the following main water feature:

- River du Rempart
- Lagoon

The hydrology of the project area is morefully described at section 6.2.3.

Photographs of site, surroundings and satellite picture of the project area are shown in Appendix D.

6.1.3 Site Topography

The site is almost flat to gently undulating with general slope seawards; this topography is a characteristic of the northern intermediate lava plains.
The topography of the site may have been reshaped with the intensive sugar cane cultivation, re-rocking scheme and mechanisation.

The slope towards the river is steeper and in many places man-made as boulders constitute the limit between the cultivated land and the riverine land.

Site elevation details are shown on Topographic Plan attached in the Drawing section. During the topographic survey a geo-referencing of all individual tall trees and clusters has been carried out and transcribed on the vegetation map (refer to section 6.2.4).

6.2 Terrestrial Environment

6.2.1 Site Geology

The geology of Mauritius is dominated mostly by deposits of basaltic lavas following volcanic activities which occurred during two distinct periods. The general series of basaltic rocks are as described in the Table 17 below.

LAVA SERIES		AGE (MILLION YEARS BC.)
Younger Volcanic Series	Late Lavas Intermediate Lavas Early Lavas	0.025 to 0.2 0.5 to 0.7 1.7 to 3.5
Older Volcanic Series		6.8 to 7.8

Table 17: Volcanic Series

From the "**Land Resource and Suitability Map, FAO/MSIRI**", extract of which is reproduced in Figure 6 below, the project area lies on the eastern edge of the northern intermediate lava plains (index 2.1) and bounded to the north by the riverine land (index 12.1) of River du Rempart.

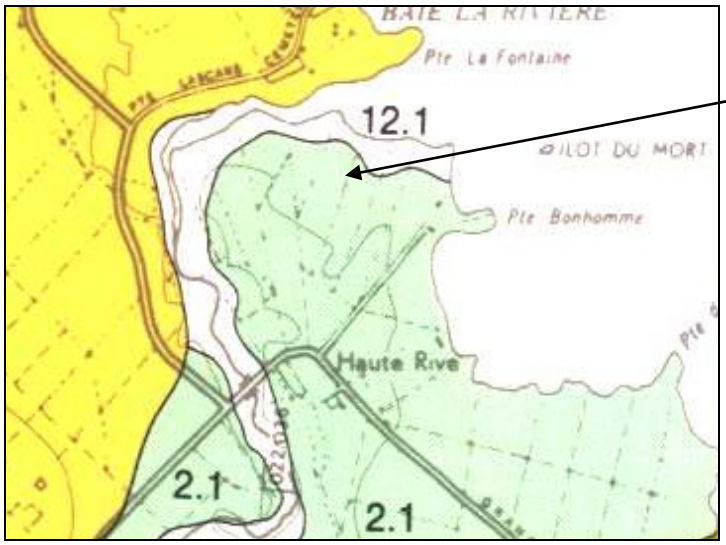

Figure 6: Geological Map - Land Resource and Suitability Map

The site description is presented in table 18 below.

LAND COMPLEX	LAND UNIT MAPPING SYMBOL	LANDFORM	SOILS
2.1	Northern and Western intermediate lava plains and slopes	Almost flat to gently undulating or undulating with general slope seawards	Low Humid Latosols. Moderatly deep to deep, dark reddish brown to brown silty clay on clay; no to few large boulders and stones
12.1	Riverine Lands	River valleys sides sloping, moderately steep to steep; valley bottoms float to almost flat	Complex of soils from Lithosols on steep valley sides to Latosols and Alluvial soil on the valley bottoms

Table 18: General Geological Description, FAO/MSIRI

6.2.2 Site Geotechnical Conditions

A geotechnical investigation was carried out by Water Research Co Ltd for the proposed site in March 2011; the report is attached at Appendix D (Annexure A). The executive summary of the report is reproduced below:

The soil profile comprised typically of successive layers of Topsoil, Residual Soil and Completely to Highly Weathered Basalts with numerous boulders of MWB and SWB. Groundwater measurements indicated that all coreholes were dry except for BH 11, which was in proximity to a broken water pipe. Based on the ground conditions and the expected column or wall loads, shallow foundations are considered the most cost effective foundation solution.

Typical settlement for isolated individual pads (i.e. ignoring any additional settlement due to interactions with other adjacent foundations) is also shown on Table 5.1 for a nominal stress of 150kPa. Tomlinson (Ref. 10) recommends maximum differential and total settlements of 40mm and 65mm for isolated foundations on clays and 65-100mm for rafts. Total settlement includes immediate and long term (consolidation) settlements; the former is around 25% of total settlement. Most of the consolidation settlement is likely to be completed between 3 to 6 months. Note that the presence of boulders can result in differential settlement.

The safe bearing capacity for the site is 150kPa based on bearing capacity and settlement calculations. For foundations near cliffs a total setback from the toe of 8m shall be applied according to the Uniform Building Code. Construction inside the setback area may be allowed if supported by detailed analysis.

During construction of the shallow pad/strip foundations an inspection at founding level is recommended ensuring suitable quality and consistency. Hard and soft pockets such as pockets of clay and boulders might need to be removed and backfilled in with suitable fill.

Particle size distributions (mostly silt size) typically classify similar Residual Soil and Weathered Basalts as Class 2A & 2B General Cohesive General Fill in accordance with Tables 6/1 and 6/2 of the UK Specification for Highway Works. Decomposed basalts are generally considered suitable as subgrade for earthworks provided precautions are followed. The materials are encountered mostly wet of the optimum moisture content.

The geotechnical properties of the identified shallow deposits (i.e. ≈ 3.0m) are considered generally suitable as a capping layer for the hardstanding areas without soil improvement. Excavation on the site can be carried out with conventional methods and conventional excavating plant. Small boulders may be disposed of by the excavating plant. The construction of the basements will be entirely in decomposed basalt clayey materials, with the groundwater level expected to be encountered deeper than 10m. Under an adequate short term construction programme and depending on the layout of the development the construction of shallow basements can be carried out on temporary open vertical excavations without temporary supports.

Based on the testing on similar material, a Design Sulphate Class of DS-1 and ACEC concrete class AC-1 applies for all buried concrete structures. This result is based on sulphate content and pH tests on soil samples and the UK Building Research Establishment (BRE) Special Digest SD1, Concrete in Aggressive Ground (2005).

6.2.3 Site Hydrogeology and Hydrology

6.2.3.1 Site Hydrogeology

The hydrogeology of a site pertains to the underground water features of this site.

Rivière du Rempart is the boundary between the aquifer of the Northern plains (Aquifer V) and the aquifer of Nouvelles Decouverte – Plaine des Roches/Midlands-Trou d'Eau Douce (Aquifer IV).
The site being located south of the river, it falls within Aquifer IV.
This aquifer comprises:

- The eastern part of the intracalderic reservoir centred on Valetta - Montagne la Terre
- The median reservoir of Camp Thorel – Pont Bondieu and Melrose – Belle Mare
- The coastal reservoirs of Plaine des Roches and Trou d'Eau Douce

In the aquifer of the Northern Plains, the zones of fractures between La Nicoliere and Riviere du Rempart constitute some natural drains that allow an important recharge of the central east part of the Northern Plains.

Adjacent to the lower, eastern boundary of River du Rempart is the Plaine des Roches minor catchment (AB), which is highly permeable with no surface runoff. Groundwater springs out at the sea near Roche Noires and Bras d'Eau.

From the general information gathered from the Hydrology Data Book, the main borehole used for domestic water supply is located at Rivière du Rempart / Haute Rive to the North of site beyond the 500m project area of influence at an elevation of 24.0 m AMSL. (BH391 located some 800m to the south west of site)
The variation of water level below collar have been recorded as follows:

- November 1980 to October 1999: 7.71 – 14.00

There are no boreholes in use in the project area.

6.2.3.2 Site Geology

The hydrology of a site pertains to the surface water features of this site.

6.2.3.2.1 River du Rempart Catchment Area

As per the Hydrology Data Book (2000 – 2005) the proposed site is located within the catchment of river du Rempart, catchment code A, as indicated in Figure 7 below.
The catchment area of Rivière du Rempart (North) extends from 4.28 km² at station (Station A03 located at La Nicolière) to 46.90 km² at sea (Pointe des Lascars).

There are two river gauging stations at Haute Rive (stations A06 - abandoned) & Haute Rive Irrigation Authority Dam (Station A06A), where regular measurements are being done; however no data have been obtained.

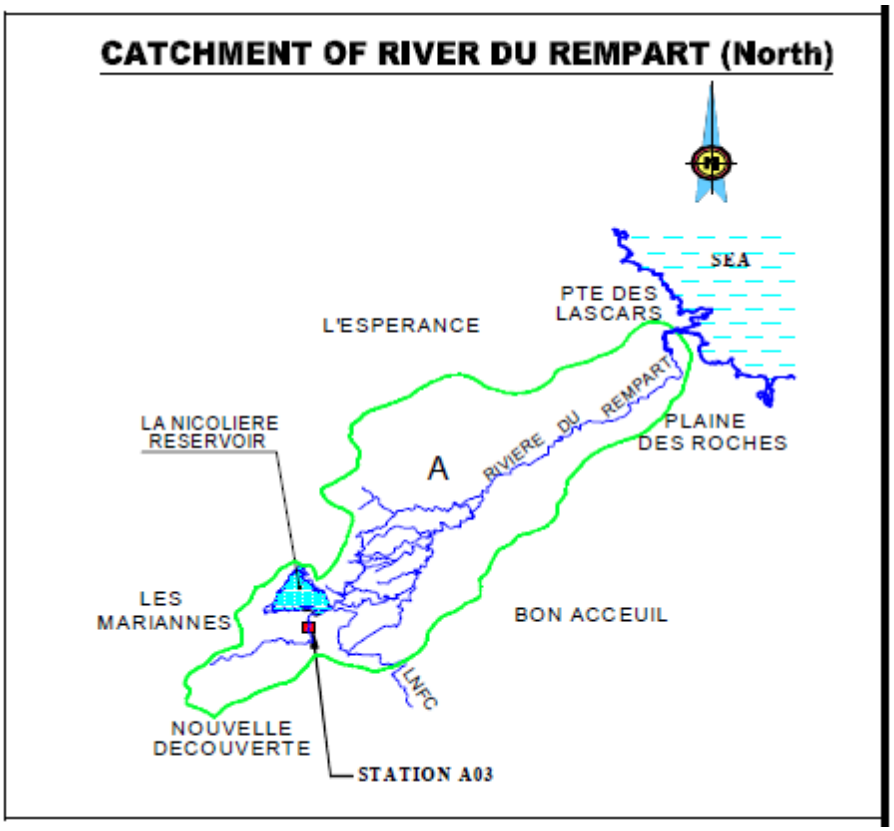

Figure 7: River du Rempart (North) Catchement Area

Mon Loisir/FUEL have water rights on the river and water is being pumped for irrigation purposes from the pump house located opposite the Irrigation Authority's pump house at the dam.

Use of water rights for domestic use is not normally permitted under the Rivers and Canals Act (1863) and it is hoped that this legislation will be amended in the near future to enable same as the quality of the river water is good as detailed in section below.
Conversion of Water originally for irrigation purposes into water for domestic purposes should be envisaged to reduce the stress on the CWA network in the area.

6.2.3.2.2 River du Rempart Water Quality Analysis

Water samples of River du Rempart were taken at the three following locations on 05 May 2011

- Upstream of the proposed site – under Haute Rive bridge
- Mid-stream i.e. at the weir – on the Mon Loisir pumping station side
- Downstream, i.e. some 350m from the weir towards the estuary

Samples were tested against the following standards (attached at Appendix H):

1. Standards of effluent for use in irrigation (Regulation 3(1)) (GN 46 of 2003) –
    a. Lists A, B, D (part) & E for up and down stream samples
    b. Lists A, B, C, D & E for mid-stream sample as river water pumping shall most probably be done at this location
2. Drinking Water Standards (GN 55 of 1996) where applicable

Results of upstream and midstream samples were also compared with previous river water quality analysis carried out at the two following locations on 9 February 2008:

- Upstream of the proposed site – under Haute Rive bridge
- Mid-stream i.e. at the weir – on the Irrigation Authority pumping station side

Results & Analysis

Results of the river water quality analysis at the three locations are presented in table 19 below and compared against standards and previous analysis.
Results certified by the laboratory, namely SGS (Mauritius) Ltd are available upon request.

Upstream Water Analysis

Parameters listed in sections A, B, D (part) & E were tested; heavy metals and pesticides were not tested.
The river water at this location meets standards for irrigation in terms of physic-chemical and bacterial parameters.
The river water at this location also meets drinking water standards in terms of physic-chemical parameters; it however exceeds the bacterial limits and thus would need to be potabilised.
Analysis carried out in February 2008 shows a BOD_5 value in the range 10 to 13 mg/l and a COD value of 154 mg/l measured within the drought context is therefore an indication of a moderately polluted river with a substantial amount of TDS.

- ➔ Analysis carried out in May 2011 shows a good river quality outside the drought period with however some minor bacterial content.

Midstream Water Analysis

Parameters listed in sections A, B, C, D & E were tested; a complete batch of pesticides were tested separately.
The river water at this location fully meets standards for irrigation in terms of physic-chemical, heavy metals, pesticides and bacterial parameters.
The river water at this location also meets drinking water standards in terms of physic-chemical parameters; bacterial analysis were not refined below 1 MPN/1ooml as in any case water extracted from the river for domestic used would be potabilised.
Analysis carried out in February 2008 shows a BOD_5 value in the range 10 to 13 mg/l and a COD value of 154 mg/l measured within the drought context is therefore an indication of a moderately polluted river with a substantial amount of TDS.

- ➔ Analysis carried out in May 2011 shows a good river quality outside the drought period.

Downstream Water Analysis

Parameters listed in sections A, B, D (part) & E were tested; heavy metals and pesticides were not tested.
The river water at this location is brackish with a salinity of 24,000ppm (seawater in average at 35,000ppm), thus the high concentration in total dissolved solids, chloride and sulphate.

- ➔ The river water at this location is not suitable for irrigation – or for drinking – given its salinity.

list	Testing parameters	Upstream (bridge)		Mid-stream (dam)		Downstream	Units	Standards of effluent for use in irrigation (Regulation 3(1)) (GN 46 of 2003)	Drinking Water Standards (GN 55 of 1996)
		Results May 2011	Result/s Feb 2008	Results May 2011	Result/s Feb 2008	Results May 2011			
A	Colour	7.50	15	10	15	5	Hazen	not objectionnnable	20 Pt-Co
	pH	7.10	7.14	6.90	6.80	7.90	-	5 - 9	6.5-8.5
	Taste & odour								not objectionnable
	Salinity*	N/A	0	N/A	0	24	ppt	N/A	
B	Biochemical Oxygen Demand*	1.00	10.0	2.0	13.00	2.00	mg/l	40	
	Chemical Oxygen Demand	<5	154	<5	154	<5	mg/l	120	
	Total Dissolved Solids	113.00	118.4	122.5	142.4	16,170	mg/l	2 000	1000
	Total Suspended Solids	2.10	<2.0	2.9	<2.0	6.6	mg/l	45	
	Chloride as Cl^-	27.60	23.5	80.6	20.7	13,966	mg/l	250	250
	Sulphate	12.89	14.74	12.53	16.30	1,536	mg/l	500	250
	Nitrate as NO_3 -N	2.56	1.11	3.16	1.06	<0.01	mg/l	20	50 (as NO3)
	Sodium Adsorption Ratio*	2.32	2.5	2.1	2.3	3.9	mg/l	<6	
C	Aluminium		<0.30	<0.30	<0.30		mg/l	5	0.2
	Arsenic*			<0.2			µg/l	100	10
	Beryllium			<0.01			mg/l	0.1	
	Boron*			0.16			mg/l	0.75	
	Cadmium			0.023			µg/l	10	3
	Hexavalent Chromium		<0.01	<0.01	<0.01		mg/l	0.1	0.05 (total Cr)
	Cobalt		<0.05	<0.05	<0.05		mg/l	0.05	
	Copper		<0.03	<0.03	<0.03		mg/l	0.2	1
	Fluoride		<0.05	0.31	0.1		mg/l	1	1.5
	Iron		<0.06	0.37	<0.06		mg/l	5	
	Lead		<0.10	<0.01	<0.10		mg/l	2	0.01
	Lithium						mg/l	2.5	
	Manganese		<0.02	0.03	<0.02		mg/l	0.2	
	Mercury*		<0.1	<0.01	<0.1		µg/l	20	1
	Molybdenum			<0.06			µg/l	10	
	Nickel		<0.10	<0.10	<0.10		mg/l	0.2	0.02
	Selenium*			<0.1			µg/l	20	
	Vanadium			<0.3			µg/l	100	
	Zinc		<0.01	<0.1	<0.01		mg/l	2	3
D	Total pesticides			see attached			µg/l	25	
	Aldrin & Dieldrin			ND*			µg/l		0.03
	DDT			ND*			µg/l		2
	HCB						µg/l		1
	Methoxychlor						µg/l		20
	Heptachlor and Heptachlor Oxide						µg/l		0.03
	Oil and Grease		3.4	1.2	4.0		mg/l	10	
	Anionic Surfactants as MBAS		0.09	0.05	0.07		mg/l	5	
E	E. Coli								must not be detected in any 100ml sample
	Faecal coliforms	30.00	130	<1	79	<1	MPN/100ml	1000 / 200	0 in 95% of sample
	Intestinal nematodes	<1	<1	<1	<1	<1	eggs/l	<1	

ND: Not detected

Table 19: Water Quality Analysis on River Rempart

6.2.4 Terrestrial Biodiversity

An ecological and botanical study of the site has been commissioned for EIA purposes. The complete ecological report is attached at Appendix F. Extracts of this report are presented hereafter.
The clusters of vegetation as well as individual trees that have been geo-referenced are shown on the Vegetation Map shown in the Drawing section of this report.

6.2.4.1 Ecological Description

Three main ecological zones and plant community types have been identified (Appendix 1) and are classified as follows:

- Sugar cane fields which form the largest part of the site,
- River corridor from the Rivière du Rempart bridge to the river mouth and estuary, and

The littoral zone from the river mouth to include the "barachois" on the southern portion of the site.

The sugar cane fields have no environmental importance and no conservation value.

The river corridor and the littoral zone do not have indigenous or endemic plants of great conservation importance due to their rareness. Being indigenous they are, however, well adapted to the particular environmental conditions of the site and can be utilised advantageously for landscaping purposes. The mangroves have considerable ecological and environmental importance and are protected by law.

These two zones, however, have been classed as Environmentally Sensitive Areas in the Report and Policy Document on Environmentally Sensitive Areas in Mauritius (2009). As they have been defined as having ecological importance, constraints for any development have been established. However, the presence of these two systems on the project site offers opportunities which must be utilised within the set guidelines. The line of conduct that must be adopted for the project is that of sustainable development which falls in line with the emerging strategy of the Ministry of Environment and Sustainable Development.

6.2.4.2 Flora

42 species of plants were recorded, of which 8 are native and 34 alien (Tables 1 and 2). All 8 native plants are indigenous; one is endemic to Mauritius and one to Mauritius and Rodrigues. None are threatened with extinction. Of the 34 alien plant species recorded 19 are classed as cultivated or weeds, 7 are invasive, and 8 are classed as very invasive.

6.2.4.3 Fauna

Fauna, mainly birds, was generally very rare throughout the study site. However, Grey white-eye *Zosterops mauritianus,* endemic Mauritius and the endemic to Mauritius and Reunion Mascarene swiftlet *Collocalia francica*, protected under the Fourth Schedule of the Wildlife and National Parks Act 1993, were observed in the dam area.

6.3 General Climatic Conditions

Mauritius has a moderate tropical climate characterized by a hot, humid summer between November and April (average mid-day temperature 25°C on the Central Plateau and 30°c on the coast), followed by cooler and drier winter period (19°c and 24°c respectively). Seasonal rainfall patterns are distinct, with about 50% of the annual rainfall (average 1,200 mm) occurring between January and March, and often little or no rainfall during November to December.

6.3.1 Wind Regime

Mauritius is situated in the equator-ward belt of the southern sub-tropical anticyclone system. Atmospheric pressures at the surface increase southward in this belt, creating a gradient, which maintains a general easterly flow.

The prevailing wind pattern in Mauritius is the South Eastern trade winds, as shown on Figure 8 below, except for short periods in the summer months when tropical storms approach the island. The trade winds are stronger and more persistent in winter when strong anticyclones pass to the South and close to the island.

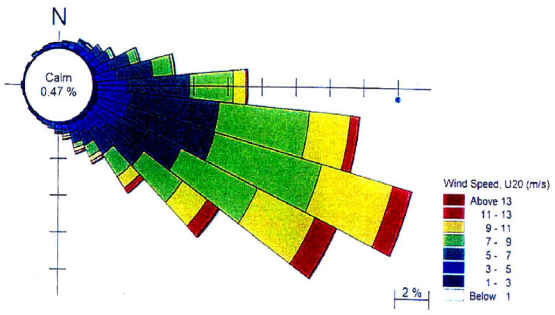

Figure 8: Wind Rose for Mauritius

Haute Rive is directly under the influence of the prevailing winds as located on the north eastern coastal plains.

Mean wind speed for the eastern region, i.e. FUEL meteorological station are reported in Table 20 below (Mauritius Meteorological Services, 1971-2000)

The wind speed increases in winter with strong south eastern trade winds and anti cyclones.

Wind variations should cause no effect to and from the proposed project due to the type of activity involved.

Month	Mean Wind Speed (km/h)	Highest Gust (km/h)
January	7	44
February	9	49
March	8	67
April	8	46
May	9	48
June	9	67
July	9	**68**
August	**12**	**68**
September	11	53
October	11	61
November	9	40
December	9	Mis

Table 20: Mean Wind Speed - FUEL

6.3.2 Temperatures

Mean maximum and mean Minimum monthly temperatures for the eastern region, i.e. FUEL meteorological station are reported in Table 21 below (Mauritius Meteorological Services, 1971-2000).

Mean minimum temperatures are recorded during the winter season in July, August and September. Mean maximum temperatures are recorded during the summer season from December to March.

Seasonal temperature variations should cause no effect to and from the proposed project due to the type of activity involved.

Month	Mean Max Temp (°c)	Mean Min Temp (°c)
January	**28.8**	22.0
February	**28.7**	22.3
March	**28.6**	22.0
April	27.6	21.2
May	26.2	19.3
June	24.6	17.8
July	23.7	**17.3**
August	23.8	**17.0**
September	24.3	**17.1**
October	25.4	17.9
November	27.1	19.4
December	**28.2**	21.0

Table 21: Temperatures Records - FUEL

6.3.3 Rainfall Regime

The comparative low annual rainfall for Haute Rive and its surroundings arises from the prevailing pattern of the south eastern trade winds.
These winds rise over the island and cause precipitation mainly on the higher Central Plateau and its eastern slopes. When the winds reach the lower regions, and the north western coast, they have already dropped most of their moisture.

Average monthly rainfall for the eastern region, i.e. FUEL meteorological station are reported in Table 22 below (Mauritius Meteorological Services, 1971-2000).

September to November are the driest months. December to April are above 200mm monthly rainfall. In the past year March has been a month of heavy rainfall with occasional flooding inland.

Seasonal rain variations should cause no effect to and from the proposed project due to the type of activity and to the small extent of site involved.

Month	Average Rainfall (mm)	No. day with rainfall	
		>1mm	>5mm
January	261	17	9
February	334	17	10
March	231	17	9
April	240	17	9
May	168	15	8
June	104	14	7
July	103	16	6
August	105	15	6
September	70	11	4
October	62	11	3
November	83	10	4
December	203	13	7
TOTAL	1,964		

Table 22: Mean Monthly Rainfall - FUEL

6.3.4 Cyclone and Natural Catastrophes

6.3.4.1 Cyclone

Mauritius is subjected to possible seasonal tropical cyclones in the months of December to March/April. Cyclones are characterised by low pressure conditions and high wind systems. From records available at the Mauritius Meteorological Services, over the period 1960-70, 39% of cyclones were classified as Weak", 42% as "Moderate" and 19% as "Strong" with gust speeds over 80km/h.

The strongest gusts recorded instrumentally in Mauritius have been of 280 kilometres per hour (Feb 1975) and records of gusts of over 250 km per hour have been made in earlier cyclones.
The values for 3 second gusts proposed by the Mauritius Meteorological Service in a paper dated May 1994 is as follows:

- Return Period of 50 years : 240 km/hr (67 m/s)
- Return Period of 100 years : 280 km/hr (76 m/s)

Authorities have recommended the use of a basic wind speed of 280-300 km/hr for recent projects.

Since cyclones Dina in 2001, Mauritius has not been subject to strong cyclones.
Elevations in sea levels caused by cyclones do not exceeded 2.00m, however high wind systems over the sea can contribute to formation of occasional waves exceeding this value.

Given that the building have been setback 30 metres from high water mark and the terrain is in general at the minimum +5.0 m amsl beyond the 30m line, there should be no flooding effect due to see level rise due to cyclonic conditions.

6.3.4.2 Natural Catastrophes

Mauritius is not subjected to earthquakes, nor has the island been affected by the Tsunami in December 2004. Elevations in sea levels which have been recorded from North to East of the island have not exceeded 2.00m.

6.4 Air Quality and Noise

6.4.1 Air Quality

Existing air quality within the area is expected to reflect its eastern coastal character free from any atmospheric pollutant.
There is little published data on ambient air quality in Mauritius and none in the eastern coastal area. The data available are extracted from the unpublished report "Environmental Investment Programme of Mauritius, Project No7A" prepared for the Government of Mauritius, Ministry of Health by the Norwegian Institute for Air Research and I. Kruger Consult AS-COWI Consult. The 1993 study included an air pollution survey that reported urban related levels of particulate matter (PM) from road traffic taken over a two-month period in August-October 1992.The report found that road traffic emissions (notably from old diesel truck and bus fleet) are the dominant source of PM pollution in Mauritius.

Mauritius having a moderate tropical climate with South East trade winds prevailing through most of the year and the site being located on the southern coast and with no nearby source of trans-boundary air pollution, the natural background dust level is extremely low. However, burning of sugar cane fields during the harvest season also raises particulate matter of less than 10µm concentrations above 70µg/m3 over a wider area during low wind speeds and poor dispersion.

No specific Ambient Air Monitoring was carried out on site since the proposed project is not likely to influence the ambient air quality in the area.

The Ambient Air Quality Survey and Ambient Air Standards for Mauritius are given in Appendix G.

6.4.2 Noise

Noise is probably the most common form of pollution experienced by the majority of the population, and is unfortunately an inevitable by-product of the whole process of industrialisation and urbanisation.

A specific Ambient Noise Monitoring was commissioned for EIA purposes and carried out by Enviro-Consult Ltd with objectives:

(i) To measure environmental noise levels during day at predetermined monitoring station in the project area , and more precisely to:
    a. Evaluate the background noise level
    b. Evaluate the contribution of the pumping station located on River du Rempart
    c. Extrapolate background noise level at the boundary of future residential development
(ii) To compare measured noise levels to prescribed environmental noise exposure limits in Mauritius (GN17/1997) for neighbourhood noise in residential areas

Neighbourhood Noise shall be 60 dB(A) Leq from 07.00 to 18.00 hrs, 55 dB(A) Leq from 18.00 to 21.00 hrs and 50 dB(A) Leq from 21.00 to 07.00 hrs

Extracts of the noise survey report are presented hereafter; the report itself is available upon request.

Monitoring Stations

- Station ST1: Evaluation of the background noise level at some 175m from the pumping station and 500m from the road; the noise at this location will represent the natural background noise landwards as located in the middle of the sugar cane fields
- Station ST2: Evaluation of the background noise level at some 100m from the pumping station, 60m from the river; the noise at this location will represent the natural

background noise with main natural contributors being the river and birds in the vegetation belt along the river

- Station ST3: Evaluate the contribution of the pumping station some 30m from the pumping station (which is a constructible area 30m away from river edge) and 40 m from the water pipe outflow at the dam; the noise at this location will represent a mix between the natural background noise with main natural contributors being the river and birds in the vegetation belt along the river and neighbourhood noise being the pumping station and the water pipe outflow
- Station ST4: Evaluate the contribution of the pumping station some 10m from the pumping station and 15 m from the water pipe outflow at the dam; the noise at this location is dominated by the neighbourhood noise being the pumping station and the water pipe outflow

Results

Whilst the noise levels are within prescribed noise limits during day or night time at stations ST1 & ST2 and the facilities at the dam are not audible at stations; the noise levels slightly exceed the prescribed noise limits of 50 dB(A) Leq at night at stations ST3 & ST4 and the facilities at the dam are clearly audible.

In the context of the proposed development, by extrapolating the current ambient noise level at the closest residence, located some 500m from the dam, the ambient noise level at residences would not be influenced by imported noise from the dam facilities and would be within standards at all time.

The Environmental Protection (Environmental Standards for Noise) Regulation 1997 (GN 17/1997) as amended by GN 115/2003 are given in Appendix G.

6.5 Built Environment

6.5.1 Socio-Cultural Conditions

The population of Mauritius, according to the Central Statistics Office of the Ministry of Finance and Economic Development (MFED), was estimated at 1,233,669 in July 2004 based on 2000 Census. Salient features of the Mauritius Demography are:

- according to the medium variant population projections, the population of Mauritius will grow from 1,186,873 in 2000 to around 1,486,000 in 2040, at an average annual rate of 0.56%;
- a sex composition of the population, that, from a slight excess of males over females in 1972, has reversed in 1983, to reach 610,294 males against 623,375 females in 2004, giving a sex ratio of 97.9 in 2040 due to lower mortality prevailing among female;
- the Republic of Mauritius, with a total land area of 2,040 square kilometres, had a population density of around 605 in mid-2004

6.5.1.1 Existing Settlements

The existing settlements and population - as per census 2000 - within the project area are provided in table 23 below:

	population (2000 Census)	Estimate July 2009
Rivière du Rempart	10,761	11,057
Roches Noires	5,219	5,791
Pointe des Lascars	(included in R. du Rempart fig.)	740

Table 23: Existing Settlements in the Project Area

The population of Rivière du Rempart district increased by nearly 20% from around 86,000 in 1990 to 98,000 in 2000, an increase of 12,000 people.
This growth rate was slightly above the national growth rate achieved during the same period but was similar to that achieved by all Rural Districts.
The same is essentially true for growth in households and housing units which increased by 31% and 37% respectively over the same period.

6.5.1.2 Social Infrastructures

6.5.1.2.1 Riviere du Rempart

Although Rivière du Rempart is a thriving commercial centre, the social infrastructure is comparatively basic and includes the community and cultural facilities of the urban development as follows:

- Along the most developed artery of the village (along A6 Road):
    - State secondary Schools (western side of the Village)
    - Textile industries
    - Village centre with residential and commercial developments (shops, stores, shopping centre)
    - Bank
    - Filing station
    - Religious infrastructures
    - Sports complex
    - Football ground
    - Market place
    - Bakery
    - Taxi services and public transport

- within the village (along the track of old railway and adjacent streets)
    - Community Centre & Health Centre
    - Village centre with commercial and residential developments
    - Post Office
    - Government School
    - Religious Infrastructures

6.5.1.2.2 Roches Noires

Roches Noires village can be characterised as a ribbon development along the main road. Social infrastructure is limited to the following:

- Community Centre including library & Health Centre
- Village council
- Post office/CEB/CWA counters
- Government Schools (pre-primary & primary) & specialised school (Etoile de Mer school)
- Sports complex (volley-ball & basket-ball)
- Football ground
- Religious Infrastructures
- Taxi services and public transport

6.5.1.2.3 Pointe des Lascars

Pointe des Lascars can be characterised as a small pocket development nested on the coast. Social infrastructure is very limited and consists of the following:

- Community Centre including library
- Sports complex (volley-ball & basket-ball)
- Spiritual park

- Religious Infrastructures (St Nathanael church and cemetery)
- 3 Nos retail shops (tabagies)
- Taxi services and public transport

The regional hospital for the northern region, SSR National Hospital, is located in Pamplemousses. The second closest hospital is situated in Flacq.

6.5.2 Socio-Economic Conditions

Rivière du Rempart district benefits from a range of economic activities which have evolved from its relatively advantageous location close to the greater Port Louis conurbation in the South and Grand Baie/Pereybère in the North.
By 2020 it is projected that there will be a requirement for 14,100 more dwellings to accommodate the population increase and changes in household structure.

The district sub-area of Rivière du Rempart itself is mostly still influenced by manufacturing industries, primarily textile and other activities such as agriculture.

With the continued rationalisation of facilities in the sugar industry, changes in markets and end products in manufacturing and particularly in textile industries and continued growth and specialisation in the tourism sector, employment is likely to continue to move out of primary and secondary economic activities to the tertiary services sector.

Rivière du Rempart village has been defined as a Growth Zone and designated as a Rural Regeneration Zone within the National Development Strategy Plan (NDS), Ministry of Housing and Lands.
Growth zones have been identified within the NDS as development opportunity areas on the basis of good or potential strategic road network links, threshold of population and jobs and proximity to social networks, retail and community service and facilities.
Other criteria for selecting growth zones can include the need to attract inward investment (private or public) to trigger regeneration due in part to loss of employment in the sugar industry (Mon Loisir, located west of Rivière du Rempart village, will be closing as part of the rationalisation of milling in the sugar industry).

Roches Noires village is characterised by small scale economies such as wholesale and retail trade, repair of motor vehicles, personal household goods an one larger textile manufacturing industry.

Pointe des Lascars village has no economic activity other than the 3 retail shops. The unemployment rate in this village is much higher than in the whole village council area

Azuri coastal village will generate substantial employment to the local population on a yearly basis in comparison with the more seasonal pattern of activities like to the sugar industry and is therefore considered as a need.

6.6 Traffic and Infrastructure

6.6.1 Traffic

A Traffic Impact Assessment (TIA) has been commissioned for the project; report of the TIA is attached at Appendix D annexure C.

In order to assess the existing traffic movement, 15-minutes' traffic counts have been carried out on five consecutive days.
Data were collected from 3rd to 7th July 2011 from 7:00 hours to 17:00 hours respectively.

Two stations along the B15 Road were taken, namely stations 1 & 2.

The raw data collected have been processed for input into the Traffix Traffic Modeler 5.0.
The 15 minutes' counts have been converted into hourly passenger car units by using appropriate default the following factors from the software.

After processing the data, the software gives the following hourly existing capacities along the B15 Road as shown in table 24 below:

Period ending		08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00
Station 1	pcu	356	353.7	357.7	394.7	382.2	355.9	385.2	319.4	400.8	496.5
	C.I.	0.43	0.42	0.35	0.39	0.37	0.38	0.35	0.40	0.44	0.55
	LOS	C	C	B	C	C	C	B	C	C	D
Station 2	pcu	98.7	53.4	55.5	42.4	45.8	49.2	19.3	32.6	54.9	65.8
	C.I.	0.42	0.37	0.35	0.23	0.25	0.31	0.25	0.28	0.31	0.22
	LOS	C	B	B	A	A	B	A	A	B	A

Table 24: Results of Traffic Count

Note: pcu: passenger car unit
C.I. : capacity index
LOS: Level of Service

The analytic results have been output in terms of Levels of Service (LOS) by the software. In summary to the results obtained the traffic conditions at Station 1 are at serviceable capacities during a whole day. The Levels of Service fluctuate between LOS B and LOS C. However, at Station 2, the Levels of Service show very acceptable levels ranging between A and B.

The existing traffic along the B15 Road, next to the proposed site for the development vehicular access does not show any signs of traffic problems.

6.6.2 Infrastructure

The following data has been gathered from the Outline planning Scheme for Pamplemousses – Rivière du Rempart DCA, September 2006 together with meetings with the relevant authorities and site assessment.

6.6.2.1 Water Supply

The water supply network to the District of Pamplemousses is reasonably robust with a network of large diameter water pipes serving the main communities.
A large portion of the potable water supplied to the District (currently over 60%) is supplied from groundwater abstracted from the aquifer that extends across the District.
Additional potable water is obtained from La Nicoliere dam, located in the southeast of the district and treated at La Nicoliere treatment works.
The potable water supply of the east is supplied partly by Haute Rive borehole BH 391.
For the purpose of the project, the CWA has indicated that the water would be supplied by Plaine des Roches Borehole· BH 949.

6.6.2.2 Water for Irrigation

The Irrigation Authority pumps water from Rivière du Rempart upstream of the dam (shown on the aerial photograph attached at Appendix D).

Rivière du Rempart Small Scale Irrigation Project cover an area of 424 Arpents (178 Ha) with 380 planters.

Mon Loisir sugar Estate also has a pumping station at this location for irrigation purposes as already mentioned in section 6.2.1.2.

For the purpose of the project, no abstraction from the river is envisaged at this stage given that grey water shall be recycled for irrigation.

6.6.2.3 Electricity Supply

The District is well served by electricity with the main 66/132kV transmission cables located in or close to the west of the district. The District is close to some of the main CEB power stations around Port Louis and one private power generating station at Belle Vue Harel.

For the purpose of the project, the CEB has indicated that the development shall be supplied from Amaury substation.

6.6.2.4 Sewerage System

Currently the only settlement in the District that is served by mains sewers is the Waterfront and Centre of Grand Baie, although the system is still not in operation.

However there are plans to provide sewerage networks and sewage treatment facilities in Rivière du Rempart area.

For the purpose of the project, a sewage treatment plant for treatment of black and grey water will be provided.

6.6.2.5 Solid Waste

All solid waste is disposed of at Mare Chicose managed landfill site via the waste transfer station located at Poudre d'Or.

For the purpose of the project, a waste management plan shall be set up consisting of waste segregation and recycling strategy.

6.7 Cultural and Historical Heritage

As per schedule two of the Outline Planning Scheme for Pamplemousses- Rivière du Rempart DCA – National Heritage Fund Act – Schedule of Items of National Heritage, there are five monuments in the Rivière du Rempart district, namely:

1) Transit of the Planet Venus Pillar (St. Antoine)
2) Monument commemorating the wreck of St. Géran (Poudre d'Or)
3) Windmill Tower of Forbach
4) Windmill Tower of Belle Rive, Cap Malheureux, Petit Paquet
5) Old Windmill (Petit Paquet)

None of these are located in the project area.
However, Haute Rive Bridge can be considered as a historic and patrimonial infrastructure that need be preserved by the authorities.

There are two lime kilns on site which will be preserved by the promoters (refer to photographs of site shown at Appendix F).

6.8 Landscape and Visual Environment

The northern plain being relatively flat or gently undulating seawards, the predominant view from the site is the coastal frontage and series of islets that are found within the lagoon.

The principal visual features in the area of the site are as follows:

- The River du Rempart that flows along the eastern site boundary to end its course in the estuary at Pointe des Lascars
- The River reserves that would need substantial cleaning and land management to restore the native vegetation
- The coast and lagoon that can be seen from the site

This new development proposed by EREIT aims at conserving and enhancing the character and attractiveness of the area so as to foster desirable and accessible living and working areas that provide an improving quality of living.
The proposed development has been designed in accordance with the Planning Policy Guidance (PPG) on Design Quality of residential and commercial development.