ENVIRONMENTAL IMPACT ASSESSMENT
For the

RHYNE PARK HOUSING DEVELOPMENT ST. JAMES

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February 2006

Executive Summary

Introduction

This document presents the findings of an Environmental Impact Assessment of the proposed Rhyne Park Village to be developed by Gore Developments Ltd., at Rose Hall in St. James. Environmental Solutions Ltd. was contracted by Gore Developments Ltd. to carry out the environmental requirements in respect of the proposed development.

Gore Developments Ltd. acquired 170 acres of land in Rose Hall, St. James from Rose Hall Developments Ltd. The property known as Rhyne Park is located on the south of the existing main north coast road, above Barrett Town, and is an existing subdivision originally planned and approved in 1974. These plans were put on hold until 1995 when the Victoria Mutual Building Society (VMBS) prepared 58 lots, but discontinued the development thereafter. In 1995 a Sewage Treatment Plant (STP) was also constructed, but was never commissioned as the design capacity was to meet the needs of the entire subdivision, and the existing 58 homes could not efficiently use the STP. A depression was subsequently excavated for a lined pond area sewage from the existing VMBS homes is currently collected in that pond. Effluent drains into a stream, which ultimately enters the Boyce Gully.

Proposed Development

The Rhyne Park Village is designed as a low to middle income housing subdivision with 900 lots. This will include one and two bedroom units, as well as service lots. A commercial area of 1.6 acres (0.65 ha), is proposed a new Sewage Treatment Plant of 1.0 acres (0.4 ha), total green area of 23.9 acres (9.67 ha), and a basic school of 0.5 acres. The existing 58 VMBS lots are located to the south east of the property, and the existing access will be maintained. The commercial area is proposed for the south eastern corner of the property and will have a separate access. Another access will be created at the north west of the property after rehabilitation of the existing broken bridge and road.

The proposed system for sewage treatment for the development is based on a design utilizing Lakeside Electro/Mechanical Equipment. Appropriate Technologies Ltd.

proposes the system to be used, and technical information is included in Appendix III. Biological nitrogen and phosphorous removal can be achieved with CLR Process through the addition of an anaerobic and anoxic stage ahead of the aeration basin. It will combine BOD removal with denitrify. The site office and construction yard are proposed for a location at the north western corner of the property in the vicinity of the proposed sewage treatment plant. This will necessitate construction of a northern access road and bridge at project inception and also immediate construction of the sewage treatment plant (STP). The plant will be designed to produce tertiary treated effluent that will meet NEPA Irrigation Standards.

The stormwater drainage plan has been prepared by Westech Ltd. and is based on the Draft Guidelines for Preparing Hydraulic Reports on Drainage Systems for Proposed Subdivisions that were provided by the National Works Agency. There are five main stormwater systems that originate on the property, and one that originates outside the property at Palmyra to the south with a watershed of about 160 acres. This Palmyra channel traverses the property and confluences with one of the systems on the property. Detention ponds will be sized so as to ensure that the total flow into the Boyce Gully and the eastern gully are equal to or less than the pre-development scenario.

The National Water Commission has agreed in principle with the supply of potable water to the development, with certain conditionalities, including the installation of two additional booster pumps. The source of water is from Success in Barrett Town, with a reservoir of 600,000 gallons capacity, representing two days supply. No supplemental supply will be provided. Water will be pumped to the proposed development via a hydro-pneumatic pump system which will be demand controlled.

The area known as Rhyne Park was slated for housing development and Rose Hall Developments Ltd. sold that portion of land to Gore Developments Ltd. in 2005. The proposed Rhyne Park Village, in location and design, is in keeping with the concept of the Rose Hall Master Plan.

Permitting and Legislative Requirements

Based on the NEPA EIA Guidelines, and NEPA Generic Terms of Reference for Human Habitation, the Terms of Reference for conducting the EIA were approved by NEPA, after their review and input.

The legislative framework relevant to the Rhyne Park Village has been presented. Pertinent pieces of legislation include the NRCA Act, the Water Resources Act, the Clean Air Act, Noise Standards, Water Quality Act, Trade Effluent Regulations, Town and Country Planning Act, Public Health Act, National Solid Waste Management Authority Act and the Jamaica National Heritage Trust Act.

Methodology

A multi-disciplinary team of experienced scientists and environmental professionals was assembled to carry out the required resource assessment, generation of baseline data, determination of potential impacts and recommendation of mitigation measures. An iterative approach among the environmental team members and other project professionals was adopted. Data was gathered through literature searches, aerial survey, field studies, laboratory analyses and structured interviews, and covered the physical, biological and socio-economic aspects of the environment.

The team utilized the Charette-style approach to data gathering, analysis, and presentation whereby team members conducted the reconnaissance investigations together to determine the critical elements for analysis and the issues to be highlighted for the design and planning process. Team meetings were held to discuss the progress of investigations and analyses and facilitate integration of data toward an understanding of the systems at work in both the natural and built environment. The EIA team worked very closely with the other project team members including the project manager, civil engineer, architect and land surveyor.

Physical Environment

The topographic elevation ranges between 141 m above mean sea level (amsl) in the western section and 215 m amsl at its southern border to the road. The main geomorphological units found at the site include steeply sloping limestone ridge, flat-topped limestone hills found on much of the central parts of the property and more gently sloping terrain with surface drainage found on the southern part of the site. Tertiary limestones belonging to the White Limestone Supergroup (WLS) underlie the site. These consist of very pure white limestones of varying lithologies.

The site is characterized by two distinct soil types based on the Rural Physical Planning Division categorization. The northern part of the site is underlain by Bonny Gate stony loam which has a very rapid internal drainage capacity, high permeability and a high erosion risk. The rest of the site is underlain by the Lucky Hill clay loam, which has a very slow internal drainage capacity/low permeability and slight erosion risk.

Generally surface runoff predominates in the 3 km wide coastal strip, which drains directly into the sea, as this coastal strip is composed mainly of low permeability aquicludes. The Boyce Gully flows along the western side of the proposed development. This gully has a catchment size of 2.9 km^2 and the proposed development occupies 19% or 138 acres of this catchment. The length of the catchment is approximately 3,360 m with an average slope of 1%. The Spot Valley River, which is located at the eastern side of the proposed development. This stream has a catchment size of approximately 4.9 km^2 and the proposed development occupies 4% or 51 acres of the catchment.

The proposed development can be divided into six main stormwater systems, of which five originate from within the site and one from outside the development site. Under the pre-development scenario it is expected that with a 50-year return period the basin outlet of the Boyce Gully at the coast road will receive a peak flow of 36 m^3/s of which the proposed development contributes a peak flow of 6.7 m^3/s and the basin outlet for the Spot Valley River at the North Coast Highway will receive a peak flow of 55 m^3/s with 2.7 m^2/s from the proposed development.

The general depth to groundwater is in the region of 25 m below ground. The low permeability of this limestone formation is supported by the deep draw down. The general groundwater flow direction is to the north. There are no wells to the north of the proposed development. In general, fault planes in brittle lithologies act as a preferential flow paths for groundwater as they create secondary porosities in the fault-brecciated zones. The groundwater flow direction could change along these planes.

Respirable particulate levels measured at all the sampling sites were well within the recommended national guideline of 150µg/m^3 per 24 hour period as well as the annual standard of 60 µg/m^3.

The surface water quality survey shows the significant impact of the sewage pond on surface water quality in the project area. The freshwater upwellings along Boyce Gully, as well as the inputs from the two springs (one located on the Rhyne Park site and one on an adjoining property) has resulted in the dilution of the nutrient, bacterial and suspended solids loading resulting from the discharge of sewage effluent.

Historical data (Environmental Solutions Ltd., 2004) shows that nutrient and suspended solids levels can be quite elevated at the mouth of Boyce Gully and in Success Beach. The proposed development will provide a designed sewage treatment system that will incorporate the existing load going to the pond. This will positively impact the surface waters in the project area as well as the coastal zone.

The main north coast road, now being upgraded under the Northern Coastal Highway Improvement Project (NCHiP), has been flooded on several occasions over the last few years, severely hampering vehicular traffic and causing widespread economic damage to tourism facilities and the road network. The section of highway between the Ritz Carlton and Wyndham-Rose Hall resorts has received significant damage. The last major event occurred in April 27, 2005 forcing the Ritz-Carlton to cease operations for an extended period. There is no single reason for flood events to occur. However it appears that

inadequate maintenance of drainage channels and the blocking of culverts with debris (rock material, vegetative matter) reduces the capacity of the drainage infrastructure to adequately convey storm water under the coastal road.

Jamaica is prone to hurricanes during the period June to November. The north coast of Jamaica is particularly vulnerable to cyclonic systems passing north of the island. Northern Jamaica is affected by the presence of a major transform boundary. Jamaica as a whole is falls within a zone receiving less than 1 earthquake of magnitude 5 per year. However, some lower magnitude earthquakes can be felt depending on the depth and ground type (acceleration).

Three major forms of erosion were observed at the site. These are rock falls associated with overhanging slopes of the bedded Montpelier lithology, minor slumping in the massive white lithology, and rill development and gully development along flat or depressed surfaces in the limestone.

Biological Environment

The project site is located in what was formerly dry lowland limestone forest. It has a long history of habitat modification and at present only a small fraction superficially resembles the natural state of the habitat. Four distinct habitat types were discernable on the site. These are abandoned pasture, recently cleared woodland, riparian woodland, and secondary dry limestone woodland. Forty seven species of birds were observed on the site in two days of observation. There were several other resident species that are expected to occur there but were not detected in the survey because of various factors such as variation in seasonal abundance, naturally low density, and low detectability during survey times. The site also has a combination of open areas, closed forest and riparian woods that appeals to migrants and to a wide variety of specialist species.

Twenty three species of butterfly were identified. Several species were full endemic or sub-species. All the species were common and most were typical of disturbed open habitats.

The Rhyne Park property does not fall within any Park or Protected Area. However it should be noted that the property is on what was part of the Rose Hall lands and as such is on lands that are of significant archaeological and cultural interest.

Socio-economic Environment

The site of the proposed Rhyne Park Village is located in the Rose Hall area approximately 10 km east of Montego Bay, with the nearest significant urban centre being Coral Gardens. The sprawling communities of Barrett Town and Lilliput are located along the northern periphery of the property.

The site of the proposed Rhyne Park Village is located in the Rose Hall area approximately 10 km east of Montego Bay, with the nearest significant urban centre being Coral Gardens. The sprawling communities of Barrett Town and Lilliput are located along the northern periphery of the property. Cornwall Community situated in a southwestern direction and the Spot Valley Community to the east. These communities are in close proximity to the site and could be considered part of the sphere of influence of the project.

The current population of Rhyne Park is estimated at 200 persons, consisting of a fairly young population, mainly of a 25 - 39 age cohort. The majority of these persons are part of the labour force of the GMBA occupying middle-income level jobs in the tourism, banking and government sector.

Barrett Town is a low to lower middle, income community. The population of Barrett Town is in the order of 1,441 (STATIN, 2001) having grown by 20% over the last 10 years. About 360 dwellings and 47 small business establishments are found in Barrett Town. Barrett Town is largely a residential community with limited small scale trading activities mainly in food retail ad household services. The main occupations of the residents are based on domestic and artisan skills supplied to the tourism sector outside of

the community. The community is served by a health clinic, a police station, a playing field, an all age school and a primary school.

Spot Valley is a low income unplanned community with informal residences of about 55 dwellings and 5 small shops that is part of the old Spot Valley estate lands. The population of Spot Valley is about 531 with a high proportion under age 35. Land use is mainly residential. Some small-scale back yard gardening is in evidence. Small business are mainly in food retail and household services. Main occupations involve domestic and artisan skills supplying services outside of the community. A similar housing development is underway in Spot Valley by West Indies Home Contractors (WHICON), providing 492 low to middle-income level housing solutions. Construction work began in 2005 and the proposed date for completion is in 2008.

Cornwall is a low to lower middle income, unplanned community with about 200 residents, about 35 dwellings and 8 business establishments, mainly small food retail and other household services. No schools clinics or churches are present but there is a playing field. The community is largely limited by small-scale trading activities, the most significant of which is a small hotel and guesthouse, catering to the tourist and local market. Water is supplied by the NWC. Run off toilets and pit latrines are the main sanitary conveniences used. Household garbage is mainly disposed of though burning and burying although the MPM collects garbage infrequently. The main mode of public transportation for community members is by route taxis.

Existing sewage treatment facilities on the site include the use of a raw sewage pond, which receives sewage from the existing VMBS subdivision. A sewage treatment plant was built in the 90's and is still present on the site, but was never commissioned, as the 58 lots connected were under the capacity required to run the plant.

A traffic study was conducted to determine the impact the development could have on current and future operations of relevant roads in the area. The p.m. peak hour (5:00- 6:00 p.m.) is typically considered to be the critical hour in intersection performance analysis

for this type of development and therefore be the period used for calculations. A 10-year growth rate of 3% per year was considered for analysis of the traffic demand on the roads. The current p.m. peak hour traffic flow on the development site road (Spot Valley Road) is 238 vehicles/hour in both directions; using a 3% growth rate in Year 2015 the traffic flow is expected to be 320 vehicles/hour.

Traffic surveys on the Rose Hall main road showed a current p.m. peak hour traffic flow of 520 vehicles/hour; using a 3% growth rate in Yr.2015 the traffic flow is expected to be 699 vehicles/hour. With development traffic in the design year; worst case loading projected to add 462 vehicles/hour inclusive of existing traffic, total loading on the Rose Hall road would be 1162 vehicles/hour.

Several educational institutions are located in nearby communities. These include Spot Valley Basic School, Barrett Town All Age School, Success Primary and Spot Valley High School. The Herbert Morrison Secondary School, the Montego Bay Community College, Cornwall College and Mt. Alvernia High School for girls, are also located in the Parish.

The property is on what was part to the Rose Hall lands and as such is on lands that are of significant archaeological and cultural importance. In the colonial days the land was under sugar cane cultivation. There have also been reports of Taino habitation. It should be noted that the property was previously cleared and subdivision infrastructure put in (roads, pipes, fire hydrants) in the early 1990's, and so the current development is not likely to result in unearthing of untouched artifacts.

Residents interviewed from the existing subdivision and neighbouring communities, were aware of the project and generally reported that Rhyne Park Village housing development is well needed in the community to provide housing solutions for the area.

Issues Identified, Potential Impacts and Mitigation Measures

Several issues have been identified for the proposed development that must be taken into consideration at the design, construction and operation phases. These issues have been explored in light of the potential impacts of the project on the existing environment, as well as the environmental attributes and how they may affect the project. The main issues that have been identified are:

Air Quality:	Construction phase dust
Water Quality:	Draining of sewage pond, Disposal of effluent, Disposal of sludge, Contamination of surface water
Geology:	Erodibility, Soil stability
Hydrology:	Sewage Pond Removal; Potential for offsite flooding; Capacity of detention ponds
Ecology:	Habitat loss and modification; Dry limestone forest
Solid Waste Management:	Removal of vegetative matter; Rocks and rubble; Existing infrastructure; Approved disposal site; Disposal of sludge
Liquid Waste Management:	Approval of STP; Connection of existing VMBS houses; Draining of existing sewage pond
Archaeological and Cultural Heritage:	Potential for Taino artifacts; Potential for Colonial artifacts

Potential Impacts

Grading, earthworks and removal of vegetation will expose the slopes to soil erosion from impacting raindrops. This can lead to the development of first order streams or rills that can transport topsoil and erode the limestone marls. During construction improperly stockpiled earth materials can also be transmitted to the surface water drainage system, thus impacting on turbidity, and drainage capacity. The use of heavy equipment on slopes and unpaved areas can also lead to a decline in soil stability. This will by extension impact on the marine environment. This is expected to be a major impact if not properly mitigated and should be short term during the construction phase.

Mitigation Measures

- Slope clearance should be phased with construction activities and bare soils should be re-vegetated as quickly as possible.
- Replanting the area with fast-growing trees that are already part of the ecology should be undertaken.
- The detention ponds should be used as silt traps in the construction phase.
- Stockpiled earth material need to be secured and covered against inadvertent removal by stormwater.
- Internal roads should be paved or consolidated and haulage trucks should carry loads not exceeding axel limits.

Potential Impacts and Mitigation Measures

Increased Turbidity & Reduced Drainage Capacity

Grading, earthworks and removal of vegetation will expose the slopes to soil erosion from impacting raindrops. This can lead to the development of first order streams or rills that can transport topsoil and erode the limestone marls. Mitigation measures should include the phasing of slope clearance, replanting, use of detention ponds, covering stockpiles of earth materials and paving of internal roads.

Dust and Noise

Noise and dust nuisance related to construction will affect communities within 160 m. In particular the existing housing scheme on the southeastern side of the proposed development may be negatively impacted once the construction begins. To mitigate these impacts Heavy equipment should enter through the designated main entrance at the western end of the development side and not through the existing VMBS housing subdivision; vehicles should be properly maintained and the exhaust systems should be muffled as required; and the movement of heavy equipment should be restricted to daytime hours or hours agreed to by the community.

Air Quality

During the construction phase air quality is expected to decline in as a result of an increase in levels of fugitive dust from cleared land, stockpiled earth materials, dusty roads and gaseous emissions from vehicular exhaust. Respirable particulates are a public health hazard and may otherwise create considerable nuisances to the public.

This is expected to be a short-term, reversible impact. Mitigation measures should include the regular maintenance of vehicles is essential to reduce gaseous emissions; wetting of stockpiles and haulage roads; fencing the construction site to a height that will reduce particulate levels near the existing homes; retention of as many trees for as long as possible near the existing homes will enhance the screening of fugitive dust; and covering of all stock piles of earth materials, especially fines and covering of all haulage vehicles carrying fines and cement, will be essential.

Water Quality

Management of the proposed sewage treatment system is important to ensure that there is no further deterioration in the surface water systems in the area. During construction, oil and grease and hazardous material should be managed in properly designated areas, and disposed of appropriately off-site. In the operation phase the water quality of receiving water bodies is expected to improve due to the use of a Sewage Treatment Plant and cessation of the collection of raw sewage in the pond and eventual discharge into the Boyce Gully. Mitigation measures should include the proper disposal of the existing effluent and sludge from the sewage pond; and proper maintenance of the sewage treatment plant installed. During the operation phase the detention ponds will assist in slowing the flow velocity and allowing for heavier particles to settle prior to a discharge into the environment thus reducing turbidity levels. Open areas with hard un-vegetated surfaces should be landscaped. Oil and grease should be stored in appropriately designated areas and servicing of construction vehicles should not be adjacent to or in any of the streams or gullies.

Flood Hazard (on site)

The post-development peak flows at the site will be significantly higher than the pre-development flows. The main mitigation measures to prevent on site flooding are included in the engineering design. Site grading and leveling with utilizing the road network as stormwater drains and dedicated drains within the scheme will safely convey stormwater to the designated storage areas or receiving water bodies. The detention ponds that have been designed will facilitate collection and containment of stormwater runoff, so that flooding does not occur on the site. These detention ponds will flow into the Boyce Gully. The engineering design follows the NWA design criteria for drainage structures. The design is based on a 50 year return period. For events the 50 year return period overflows will go into the Boyce Gully. Techniques to improve infiltration such as tiled parking lots or grass surface instead of concrete should be encouraged.

Flood Hazard (Off Site)

The analysis of the existing environment and engineering reports indicated that with return periods of less than 50 years the capacity of the existing two box culverts seem to be inadequate for conveying peak flows for even the pre-development scenario and this will remain for the post development scenario. The mitigation measures to prevent on-site flooding include the creation of detention ponds at strategic locations. The detention ponds have been sized to ensure that the total flow into the Boyce Gully and the eastern gully are equal to or less than the pre-development scenario.

The detention ponds do not address the possibility that the existing hydraulic structures on the Rose Hall main road may already be adequate. The capacity of the existing box culverts needs to be increased. The capacity can be increased by enabling the culverts to flow under higher heads. This can be achieved by the addition of wing walls and the raising of existing head walls. This however, is not the responsibility of the developer but is the responsibility of the relevant government agencies, as these culverts are already under-designed.

Recharge Areas

The change in land use associated with a higher degree of impermeability reduces the volume of rainwater percolating into the underground and contributing to recharge. The rock formation underlying the area is considered an aquiclude due to its low permeability and as such impact is not considered significant. Some leakage will occur through the base of the detention ponds, otherwise no further mitigation is required.

Slope Stability

The steep slopes particularly within zones 5, 6 and 8 are vulnerable to erosion. Soils overlaying Montpelier are generally thin and as such the potential for soil erosion is low. Road construction particularly near slopes has a high potential for slumping in soft marls. In order to mitigate these impacts it is proposed that these areas be retained as a nature reserve and green belt. Where houses are constructed on steeper slopes appropriate consolidation activities in pre-construction and during construction stages of the houses are followed. Recommendations from the Mines and Geology Division should be followed.

Biological Impacts

The clearing of vegetation will result in the modification or removal of existing habitats for birds. However, there are no rare, threatened or endangered bird species reported from the site. The species reported from the abandoned pasture areas and scrubland are mostly ubiquitous species that may easily adapt to a modified environment or re-locate to the verges of the remaining vegetated areas. The loss of the existing habitat will be an irreversible impact, for the areas affected. Mitigation measures should include landscaping in the development to replace vegetation lost, and this could encourage the re-establishment of dislocated bird species. This is especially important for migratory species that encounter the north coast first on their southward journey and require a suitable habitat. The limestone woodland and other areas to be kept as green spaces or buffers should be maintained in their current state during the construction period. These areas should not be used for storing of equipment, side-tipping of earth materials, handling of hazardous materials or disposal of solid or liquid waste.

Socio-economic Impacts

Traffic, Transportation and Access Roads-Potential Impacts

The development proposed by Gore Developments Ltd. along the Spot Valley Road is not expected to negatively impact on the current and future operation of the corridor. During the construction phase slow moving vehicles cause congestion on the North Coast Highway and the road network can be subjected to additional wear and tear. Congestion is expected to be a medium term, reversible impact that may be major during peak hours. Road wear and tear may be a long term impact. During the operation phase increased traffic will be observed as a result of the housing subdivision. This is expected to be a long term irreversible impact, but is not expected to be major according to the Traffic Impact Assessment. Mitigation measures should include the scheduling of construction work to minimize traffic flow disturbances. There should be some discussion with the NWA to determine the construction schedule. Adequately trained flag persons and road signs are required where heavy traffic crosses the highway. Where appropriate, road closures, detours and obstructions should be made public, in advance, through the print and electronic media. The construction schedule should be made available to agencies such as the National Works Agency and other stakeholders such as the Northern Coastal Highway Improvement Project, Community Groups and hotels. Additionally, given the magnitude of the development, for safety purposes it is recommended that the develop installing Intersection Ahead signs along the Spot Valley Road, indicating the presence of the entrance to the development. Flaggers should be used as appropriate to direct traffic, including haulage trucks, accessing the site. Haulage vehicles should be appropriately covered and adhere to axel limits

Employment

Employment opportunities will arise during both the site preparation and construction phase and will be limited to mostly unskilled labour. This is expected to be a positive, short-term, reversible impact. Vendors will be attracted to setup road-side shops and cook shops, which may be a negative, short-term impact, if not properly managed. The sourcing of aggregate will open linkages with local suppliers. Mitigation measures

should include the designation of an area for vending activities and properly equipped with solid waste receptacles, portable chemical toilets and running water. This will encourage proper sanitation and reduce negative public health impacts. Workers need to be instructed on traffic management, waste (liquid and solid) disposal practices, vehicle maintenance and oil spill control. Security is critical and arrangements with the local law enforcement arm or any other security provider should be made.

Solid and Liquid Waste Management

Potential Impacts

Construction debris, cleared vegetation and solid waste will be generated during the construction phase. Mitigation measures should include the provision of sanitary facilities (chemical portable toilets) by an approved contractor; waste separation; the provision of adequate storage receptacles; arrangement with local approved waste haulers and the NSWMA for disposal at an approved landfill site for St. James; and storage of hazardous waste clearly designated areas. Draining and removal of liquid and sludge from the sewage pond should be as detailed in above (Section 6.1.4).

Potable Water Demand

The development will require approximately 1,250 m^3/d (330,000 USgls) based on a per capita requirement of 227 l/d and losses of 10 %. A total flow of 3 m^3/min to satisfy the fire fighting demand was calculated. A storage capacity needs to be provided for at least 1.5 days resulting in a required storage capacity of 1,880 m^3. The capacity of the existing Mt. Zion spring is inadequate to satisfy the existing demand. The National Water Commission supply network will meet the required demand by taking water from the existing 32" main pipeline running along the North Coast Highway as per agreement.

Archaeological and Cultural Heritage

The JNHT should be advised of the project and construction schedule and allowed to perform a Watching Brief if required. Any location where artifacts are found is to be clearly demarcated and protected against public access and interference until the JNHT has given clearance.

Positive Impacts

Several positive impacts are expected from the development of Rhyne Park Village. These include the generation of employment for skilled and unskilled labour in the short to medium term, as well as an increase the demand for construction material. In the long term the provision of housing will be a major positive impact for this area. The existing sewage pond is a public health hazard and the Rhyne Park Village will necessitate removal of this pond and the construction of a sewage treatment plant that will meet NEPA standards. The connection of the existing VMBS houses to the sewage treatment plant will also be a positive impact. In the long term it is expected that the surface water quality will improve, in the streams and gully that are currently being impacted by the discharge of raw sewage effluent from the pond.

Consideration of Alternatives

No other sites were considered for this development. Several options were considered for the treatment of sewage for the Rhyne Park development. These include connection to the centralized Sewage Treatment Plant (STP) to be constructed by Rose Hall Developments Ltd.; the use of the existing STP that was constructed in the 1990's but never commissioned; connection to the STP to be constructed by West Indies Home Contractors Ltd. (WIHCON) at the new Spot Valley Housing Development; and the construction of an entirely new STP to support the Rhyne Park Village. The option to build a new STP for the development was the preferred option. The design for this facility is given in Appendix III. Effluent discharge parameters will meet NEPA guidelines. This plant is to be located in the northwest corner of the property. The STP will be constructed first, to facilitate immediate connection of the existing VMBS houses, so that the existing sewage pond can be drained and the site rehabilitated to allow the development to proceed. This fourth option is the preferred option of the developer.

The number of housing solutions and allocation of green space and recreational areas, was determined firstly by the Town Planning requirements and secondly by effective use

of space and the finalization of the location of the Sewage Treatment Plant. The final number of solutions and acreage of green spaces meets the national requirements.

The No Action Alternative would see the property at Rhyne Park remaining in the existing condition, which is a mixture of secondary growth and unimproved pastureland adjacent to the exiting VMBS houses. This would mean a continuation of the disposal of raw sewage into a pond that has clearly not been maintained, as evidenced by the high levels of effluent (above the previously designed berm), and possible breaches in the lining (as evidenced by the bubbling of the lining and high moisture content in the surrounding earth. Additionally, the No Action Alternative would result in the continued release of raw sewage effluent into the streams and eventually into the Boyce Gully and to the coastal waters. Although this option is certainly feasible, it would result in the continuation of a situation that has existed for some thirteen years.

The implementation of the No Action Alternative would not result in the following positive impacts:

1. Construction and commissioning of a STP to treat the effluent being currently discharged from the existing 58 VMBS houses.
2. Removal of the pond, which is a health risk as it is open and accessible. Draining, excavation and filling would facilitate removal of the pond.
3. Cessation of the release of untreated sewage effluent into the stream that leads to the Boyce Gully.
4. Provision of over 800 housing solutions to meet the needs of the ever growing staff that serve the tourist sector in this region
5. Partial fulfillment of the mandate of the Rose Hall Master Plan as regards middle income housing for the area
6. Provision of employment in the short term for skilled and unskilled workers.

Outline Monitoring Programme

If a permit is granted for the proposed development, and before site preparation and construction activities begin, a Monitoring Programme should be prepared for submission to NEPA, for their approval. The Monitoring Plan should include several components, including an inspection protocol; parameters to be monitored; frequency of monitoring and reporting procedures. The duration of the monitoring programme should be for the entire construction period, with monthly reporting. The Monitoring Programme cannot be prepared in detail before the permit is received from NEPA as Terms and Conditions of the permit must be taken into consideration, and included in the monitoring programme as appropriate.

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1.0 Introduction

This document presents the findings of an Environmental Impact Assessment of the proposed Rhyne Park Village to be developed by Gore Developments Ltd., at Rose Hall in St. James. Environmental Solutions Ltd. was contracted by Gore Developments Ltd. to carry out the environmental requirements in respect of the proposed development.

1.1 Purpose

Environmental Solutions Ltd. submitted an application for a development permit to the National Environment and Planning Agency (NEPA) on behalf of our client Gore Developments Ltd. The application was accompanied by a Project Information Form (PIF) and supporting documentation and was submitted on December 2, 2005. On January 6, 2005 NEPA responded to that application with a request that an Environmental Impact Assessment (EIA) be conducted on the proposed development. Based on environmental screening by NEPA the potential for adverse environmental impacts was identified for three aspects:

Land Resources
Air Quality (including noise)
Visual Resources.

Generic Terms of Reference (TOR's) for conducting an EIA for Human Habitation were provided by NEPA, with a request to modify these TOR's and submit to NEPA for approval. The TOR's were modified and submitted to NEPA on January 13, 2006. A response was received from NEPA dated February 8, 2006, with recommended amendments to the TOR's. NEPA's recommendations were included in the TOR's and resubmitted for approval on February 10. By letter dated February 13, 2006 NEPA offered no objection the revised TOR's, with instructions to proceed with the execution of the EIA. The approved TOR's are given in Section 2.0, and the document as submitted to NEPA is presented in Appendix I.

1.2 Background

Gore Developments Ltd. acquired 170 acres of land in Rose Hall, St. James from Rose Hall Developments Ltd. The property known as Rhyne Park is located on the south of the existing main north coast road, above Barrett Town, and is an existing subdivision originally planned and approved in 1974 (Figure 1.2). These plans were put on hold until 1995 when the Victoria Mutual Building Society (VMBS) prepared 58 lots, but discontinued the development thereafter. In 1995 a Sewage Treatment Plant (STP) was also constructed, but was never commissioned as the design capacity was to meet the needs of the entire subdivision, and the existing 58 homes could not efficiently use the STP. A depression was subsequently excavated for a lined pond and sewage from the existing VMBS homes is currently collected in that pond. Effluent drains into a stream, which ultimately enters the Boyce Gully.

Gore Developments Ltd. has redesigned the layout of the subdivision to more effectively suit the terrain, and has incorporated the existing VMBS homes.

The property was originally owned by Rose Hall Developments and had been slated for housing development under the Rose Hall Master Plan.

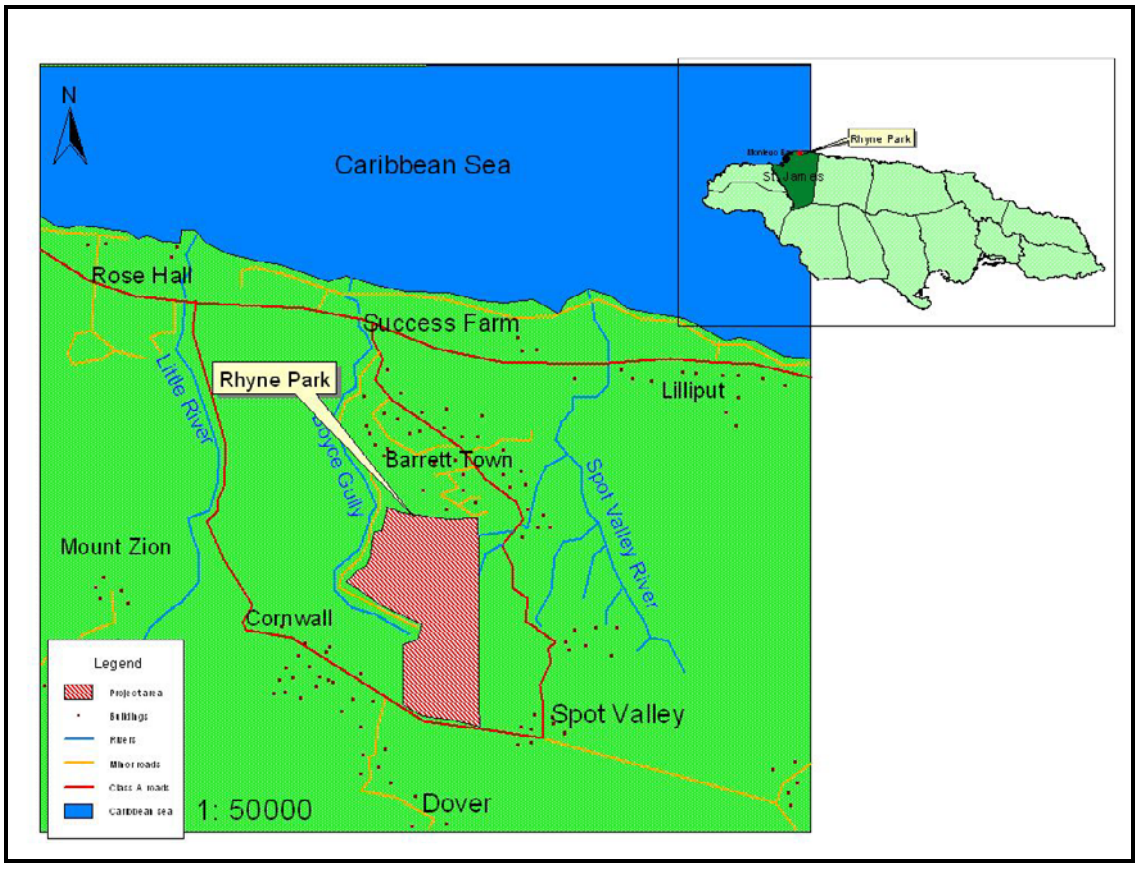


Figure 1.2: Site Location Map

1.3 Description of the Project

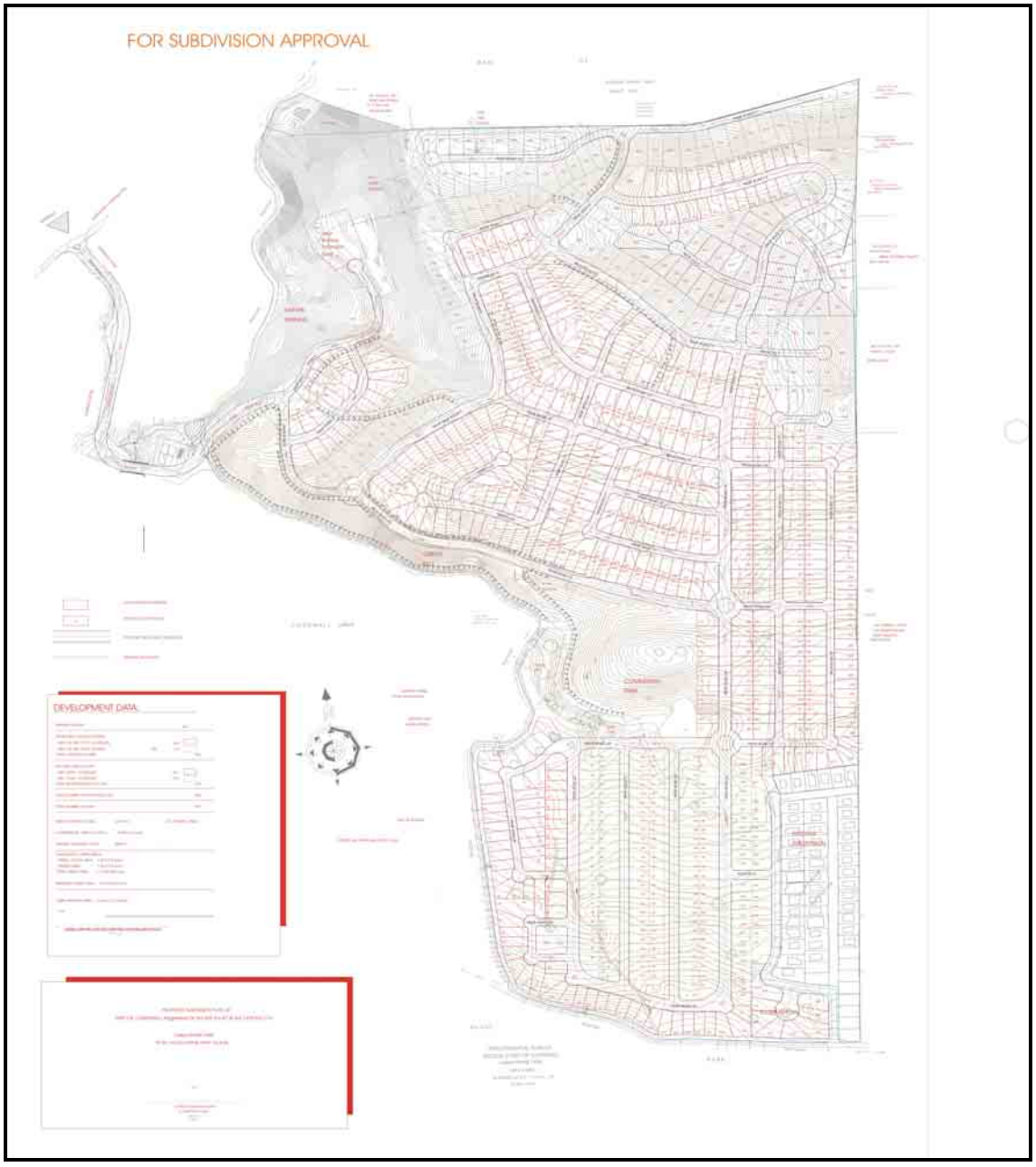
1.3.1 Project Components

The Rhyne Park Village is designed with a total of 908 lots. This will include 763 lots with houses and 145 service lots. The lots with houses will range between a minimum of 3,500 sq. ft. and a maximum of 4,000 sq. ft. The service lots will range from a minimum of 6,000 sq. ft. to larger lots with a minimum of 8,000 sq ft. Special features of the proposed Rhyne Park Village include a large central park (located the west), a natural green belt that will serve to preserve the existing watersheds and woodlands (located to the north west and adjacent to the Boyce Gully) and a picturesque terrain with views of the ocean and the hills. The total number of lots proposed by Gore Developments Ltd. is 908 and with the existing VMBS homes, the development will be a total of 966 lots. A commercial area of 1.6 acres (0.65 ha), is proposed a new Sewage Treatment Plant of 1.0 acres (0.4 ha), total green area of 23.9 acres (9.67 ha), and a basic school of 0.5 acres. The project components and the development data are shown in Figure 1.3.

The existing 58 VMBS lots are located to the south east of the property, and the existing access will be maintained. The commercial area is proposed for the south eastern corner of the property and will have a separate access. Another access will be created at the north west of the property after rehabilitation of the existing broken bridge and road. A Sewage Treatment Plant (STP) will be sited to the north west, with required regulatory setback being applied, and adjacent to limestone forest which will be preserved as a Nature Reserve. (Figure 1.3)

A Trigonometric Station located to the north of the property is part of the national grid and is under the jurisdiction of the Survey Department. This Trig Station will be maintained and access provided continuously, as appropriate, for the relevant authorities. An existing National Water commission (NWC) pump station to the south west of the property will also be kept and the area will be transferred to the NWC.

Figure 1.3 Layout of Rhyne Park Village



Special features of the proposed Rhyne Park Village have been designed to include the following open spaces:

- ✓ A large Central Park of approximately 10 acres (located to the west of the property) which will be available for community recreation. Future development by the community will be possible though the creation of a football field, baseball pitch and netball or tennis courts. There will be space for walking and jogging trails and a playground. The environment of a part of this area, which will remain in its natural state, also lends itself to use as a Nature Trail and River Park. The Basic School adjoins the Central Park and can therefore take advantage of these recreational facilities.
- ✓ The northwestern corner dominated by limestone woodland, will be retained as a Nature Reserve, keeping intact the natural habitat for wildlife, as well as the watershed and airshed purification functions provided. It will also provide a Green Belt as a buffer on this side of the subdivision.
- ✓ Another Green Belt will be kept to the south of main entrance road into the development. This will also retain existing habitats, as well as watershed and airshed purification functions, and aesthetic appeal.
- ✓ A small community park will be sited in each of the northern and southern sections of the development.

1.3.2 Sewage Treatment

The proposed system for sewage treatment for the development is based on a design utilizing Lakeside Electro/Mechanical Equipment. Appropriate Technologies Ltd. proposes the system to be used, and technical information is included in Appendix III. Biological nitrogen and phosphorous removal can be achieved with CLR Process through the addition of an anaerobic and anoxic stage ahead of the aeration basin. It will combine BOD removal with denitrification and phosphorous removal. The plant will be designed to produce tertiary treated effluent that will meet NEPA Irrigation Standards. The proposed system includes an anaerobic inlet chamber with two anoxic chambers followed by two aeration basins and two clarifiers. A sludge digester and a bank of drying beds

will also be included to allow for easier sludge management during plant operation. The capacity of the plant is designed for an average of 0.346 million liters of sewage per day.

1.3.3 Drainage Plan

The stormwater drainage plan has been prepared by Westech Ltd. and is based on the Draft Guidelines for Preparing Hydraulic Reports on Drainage Systems for Proposed Subdivisions that were provided by the National Works Agency, along with guidelines specific to the project, in a letter dated November 8, 2005 (Appendix IV).

The Stormwater Report is included in its entirety in Appendix V. There are five main stormwater systems that originate on the property, and one that originates outside the property at Palmyra to the south with a watershed of about 160 acres. This Palmyra channel traverses the property and confluences with one of the systems on the property.

All the systems, with the exception of two, which are on the eastern side of the property, drain into the Boyce Gully through SOS Village and eventually to the Caribbean Sea through a box culvert under the Rose Hall Main road near Seacastles. The Boyce Gully is a perennial system.

The following are proposed for the development based on Westech, (2005a):

1. The flows from Palmyra will be conveyed through a discreet conduit just below the start of the Boyce Gully.
2. The flows from another system will be routed through a detention pond within a large park.
3. The flows from the third system will partially be received by the detention pond at (2) while overland flow will take the difference to Boyce Gully.
4. Flows from a fourth and sixth system will be combined and routed through the detention pond, which will be located within the 0.43 acre park.
5. Flows from a fifth system will mainly be routed through a detention pond but overland flow from the undeveloped component 18.5 acres or 40% will take runoff to Boyce Gully.

Detention ponds will be sized so as to ensure that the total flow into the Boyce Gully and the eastern gully are equal to or less than the pre-development scenario. This may mean

that conservative, disproportion and detention is enforced in areas favourable to pond siting while other areas would see unconservative disproportionate detention because of limitations to pond siting imposed by the topography, or even no detention at all (Westech, 2005a).

The flows will be collected by storm sewers within the road reservations, which lead to the various outfalls. The 50-year storm has been used as the basis for design.

1.3.4 Water Supply

The incoming water supply system has been described by Westech Ltd (2005b) and is given in Appendix VI. The source of water is from Success in Barrett Town, with a reservoir of 600,000 gallons capacity, representing two days supply. No supplemental supply will be provided. Water will be pumped to the proposed development via a hydro-pneumatic pump system which will be demand controlled.

The National Water Commission has agreed in principle with the supply of potable water to the development, with certain conditionalities, including the installation of two additional booster pumps. Communication between the developer and the NWC is given in Appendix VII.

1.3.5 Site Office and Construction Yard

The site office and construction yard are proposed for a location at the north western corner of the property in the vicinity of the proposed sewage treatment plant. This will necessitate construction of a northern access road and bridge at project inception and also immediate construction of the sewage treatment plant (STP). The STP will be constructed at project onset to facilitate connection to the existing 58 VMBS houses, so that existing infrastructure, including pipes that now take sewage from these houses to the sewage pond, can be removed to facilitate the new development.

1.3.6 The Rose Hall Master Plan

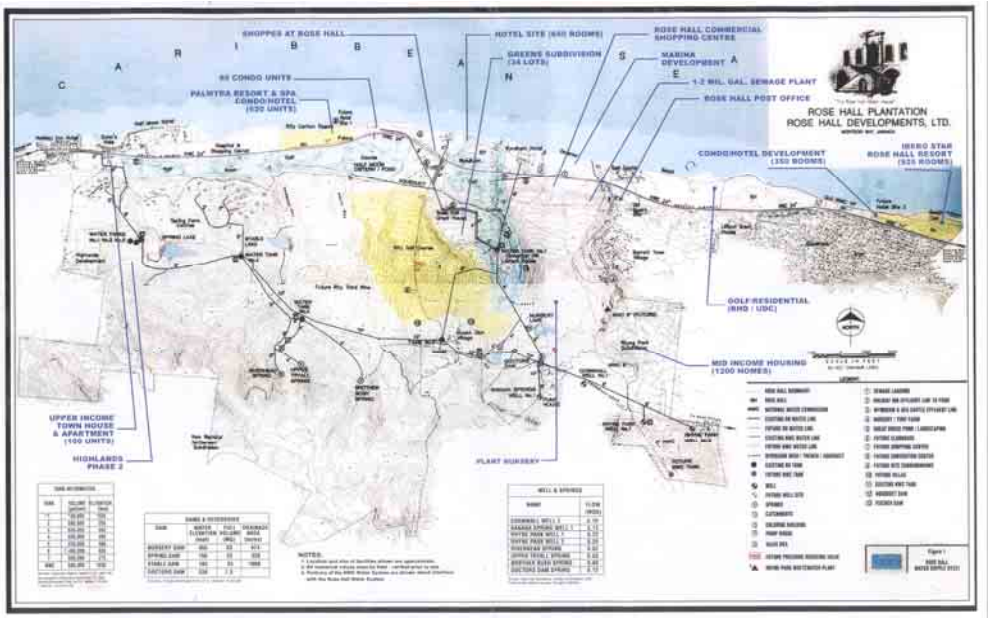
Rose Hall Developments Ltd. purchased land from the Government of Jamaica and has

been developing the Rose Hall Estate for several years. In an agreement with the Government of Jamaica, Rose Hall Developments Ltd. is to implement a phased development plan with specific benchmarks. The company produced a Master Plan for the site (Figure 1.3.6), which includes a combination of uses – residential, recreational, green areas and commercial functions.

The main north coast road divides the property, and the major components of the Master Plan lie on the landward side of the road, sloping toward the ridges. The seaward side of the Rose Hall Development lands contains properties earmarked for residential, resort and commercial use. On the landward side the proposed development covers approximately 329 hectares, with 16 hectares of residential development, considerable green areas, a commercial area, and recreational activity.

The area known as Rhyne Park was slated for housing development and Rose Hall Developments Ltd. sold that portion of land to Gore Developments Ltd. in 2005. The proposed Rhyne Park Village, in location and design, is in keeping with the concept of the Rose Hall Master Plan, and this has been verified through discussions with the management of Rose Hall Developments Ltd. (Stanley Nansen, Pers. Com, January 2006).

Figure 1.3.6: Rose Hall Master Plan



1.3.7 Project Schedule

The project is anticipated to begin immediately that all approvals, permits and licenses are secured, with a projected completion time of 3 ½ years after inception. At project inception an access road with a bridge will first be constructed to facilitate access to the project site. This road will be at the north western side of the property and will ensure that construction vehicles do not use the access by the existing VMBS residences, and will also enable timely completion of the site offices and the sewage treatment plant. Table 1.3.7 outlines the time frame for various aspects of the development.

Table 1.3.7: Proposed Project Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Rhyne Park**	**786 days**	**Thu 6/1/06**	**Thu 6/4/09**	
2	**Independent**	**162 days**	**Thu 6/1/06**	**Fri 1/12/07**	
3	Bridge (Independent)	160 days	Mon 6/5/06	Fri 1/12/07	
4	Sewage Plant (Independent)	140 days	Thu 6/1/06	Wed 12/13/06	
5	**Phase 1 lot 1-254 Unit**	**261 days**	**Mon 6/5/06**	**Mon 6/4/07**	
6	**Infrastructure**	**256 days**	**Mon 6/5/06**	**Mon 5/28/07**	
7	strip top layer	45 days	Mon 6/5/06	Fri 8/4/06	
8	Cut Roads	40 days	Fri 6/23/06	Thu 8/17/06	7SS+14 days
9	Storm water	90 days	Thu 7/13/06	Wed 11/15/06	8SS+14 days
10	Cut ,Fill & Compact block	160 days	Fri 7/7/06	Thu 2/15/07	8SS+10 days
11	Road Sub base Marl	160 days	Fri 7/7/06	Thu 2/15/07	8SS+10 days
12	Marl Pads	135 days	Fri 8/25/06	Thu 3/1/07	10FF+10 days
13	Sewer Main + Laterals	150 days	Fri 7/21/06	Thu 2/15/07	11SS+10 days
14	Water mains + Laterals	150 days	Fri 7/28/06	Thu 2/22/07	13SS+5 days
15	Curb walls	100 days	Fri 1/5/07	Thu 5/24/07	21FF
16	Marl Finish RD Level	112 days	Fri 12/22/06	Mon 5/28/07	21FF+2 days
17	**Structure**	**188 days**	**Thu 9/14/06**	**Mon 6/4/07**	
18	Foundation	130 days	Thu 9/14/06	Wed 3/14/07	12SS+14 days
19	Walls	130 days	Thu 9/21/06	Wed 3/21/07	18SS+5 days
20	Roof	85 days	Thu 11/30/06	Wed 3/28/07	19FF+5 days
21	Finishing Work	171 days	Thu 9/28/06	Thu 5/24/07	19SS+5 days
22	Handover	171 days	Mon 10/9/06	Mon 6/4/07	21SS+7 days
23	**Phase 2 lot 254Unit**	**261 days**	**Tue 6/5/07**	**Tue 6/3/08**	
24	**Infrastructure**	**256 days**	**Tue 6/5/07**	**Tue 5/27/08**	
25	strip top layer	45 days	Tue 6/5/07	Mon 8/6/07	22
26	Cut Roads	40 days	Mon 6/25/07	Fri 8/17/07	25SS+14 days
27	Storm water	90 days	Fri 7/13/07	Thu 11/15/07	26SS+14 days
28	Cut ,Fill & Compact block	160 days	Mon 7/9/07	Fri 2/15/08	26SS+10 days
29	Road Sub base Marl	160 days	Mon 7/9/07	Fri 2/15/08	26SS+10 days
30	Marl Pads	135 days	Mon 8/27/07	Fri 2/29/08	28FF+10 days
31	Sewer Main + Laterals	150 days	Mon 7/23/07	Fri 2/15/08	29SS+10 days
32	Water mains + Laterals	150 days	Mon 7/30/07	Fri 2/22/08	31SS+5 days
33	Curb walls	100 days	Mon 1/7/08	Fri 5/23/08	39FF
34	Marl Finish RD Level	112 days	Mon 12/24/07	Tue 5/27/08	39FF+2 days
35	**Structure**	**188 days**	**Fri 9/14/07**	**Tue 6/3/08**	
36	Foundation	130 days	Fri 9/14/07	Thu 3/13/08	30SS+14 days
37	Walls	130 days	Fri 9/21/07	Thu 3/20/08	36SS+5 days
38	Roof	85 days	Fri 11/30/07	Thu 3/27/08	37FF+5 days
39	Finishing Work	171 days	Fri 9/28/07	Fri 5/23/08	37SS+5 days
40	Handover	171 days	Tue 10/9/07	Tue 6/3/08	39SS+7 days
41	**Phase 3 lot 255 Unit**	**261 days**	**Mon 5/26/08**	**Mon 5/25/09**	
42	**Infrastructure**	**256 days**	**Mon 5/26/08**	**Mon 5/18/09**	
43	strip top layer	45 days	Mon 5/26/08	Fri 7/25/08	39
44	Cut Roads	40 days	Fri 6/13/08	Thu 8/7/08	43SS+14 days
45	Storm water	90 days	Thu 7/3/08	Wed 11/5/08	44SS+14 days
46	Cut ,Fill & Compact block	160 days	Fri 6/27/08	Thu 2/5/09	44SS+10 days
47	Road Sub base Marl	160 days	Fri 6/27/08	Thu 2/5/09	44SS+10 days
48	Marl Pads	135 days	Fri 8/15/08	Thu 2/19/09	46FF+10 days

'06 T W T F S

Project: Preliminaries Construction Pro
Date: Tue 2/28/06

Task | Split | Progress | Milestone | Summary
Project Summary | External Tasks | External Milestone | Deadline

Page 1

ID	Task Name	Duration	Start	Finish	Predecessors
49	Sewer Main + Laterals	150 days	Fri 7/11/08	Thu 2/5/09	47SS+10 days
50	Water mains + Laterals	150 days	Fri 7/18/08	Thu 2/12/09	49SS+5 days
51	Curb walls	100 days	Fri 12/26/08	Thu 5/14/09	57FF
52	Marl Finish RD Level	112 days	Fri 12/12/08	Mon 5/18/09	57FF+2 days
53	**Structure**	**188 days**	**Thu 9/4/08**	**Mon 5/25/09**	
54	Foundation	130 days	Thu 9/4/08	Wed 3/4/09	48SS+14 days
55	Walls	130 days	Thu 9/11/08	Wed 3/11/09	54SS+5 days
56	Roof	85 days	Thu 11/20/08	Wed 3/18/09	55FF+5 days
57	Finishing Work	171 days	Thu 9/18/08	Thu 5/14/09	55SS+5 days
58	Handover	171 days	Mon 9/29/08	Mon 5/25/09	57SS+7 days
59	**Phase 5 Lots 145**	**151 days**	**Thu 11/6/08**	**Thu 6/4/09**	
60	**Infrastructure**	**151 days**	**Thu 11/6/08**	**Thu 6/4/09**	
61	strip top layer	30 days	Thu 11/6/08	Wed 12/17/08	57SS+35 days
62	Cut Roads	30 days	Wed 11/26/08	Tue 1/6/09	61SS+14 days
63	Storm water	90 days	Tue 12/16/08	Mon 4/20/09	62SS+14 days
64	Cut ,Fill & Compact block	90 days	Mon 11/17/08	Fri 3/20/09	61SS+7 days
65	Road Sub base Marl	52 days	Wed 12/10/08	Thu 2/19/09	62SS+10 days
66	Sewer Main + Laterals	90 days	Wed 12/24/08	Tue 4/28/09	65SS+10 days
67	Water mains + Laterals	90 days	Wed 12/31/08	Tue 5/5/09	66SS+5 days
68	Curb walls	67 days	Fri 2/20/09	Mon 5/25/09	67FF+14 days
69	Marl Finish RD Level	68 days	Tue 2/24/09	Thu 5/28/09	68SS+2 days
70	Handover	105 days	Fri 1/9/09	Thu 6/4/09	67SS+7 days

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Project: Preliminaries Construction Pro
Date: Tue 2/28/06

Task | Split | Progress | Milestone | Summary
Project Summary | External Tasks | External Milestone | Deadline

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