



LLANDOVERY DEVELOPMENT ENVIRONMENTAL IMPACT ASSESSMENT ADDENDUM





Sagicor Ja. Ltd (LOJ) Llandovery Development

Environmental Impact Assessment Addendum

**SAGICOR JAMAICA LIMITED (FORMERLY LIFE OF JAMAICA)
JAMAICA**

LLANDOVERY DEVELOPMENT

ENVIRONMENTAL IMPACT ASSESSMENT - ~~A~~DDENDUM

JULY 2008

**TECHNOLOGICAL AND ENVIRONMENTAL MANAGEMENT NETWORK LIMITED
20 WEST KINGS HOUSE ROAD
KINGSTON 10
JAMAICA**

**TEL: (876) 920-6012
TEMN@CWJAMAICA.COM
WWW.TEMNETWORK.COM**



1.0 Addendum

Addendum I – Stakeholder and Public Consultation

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ADDENDUM I

Stakeholder and Public Consultation

Addendum I – Stakeholder and Public Consultation

St. Ann Chamber of Commerce

A perception survey was completed by the St. Ann Chamber of Commerce (COC). The COC indicated that they were aware of the proposed development prior to TEMN’s contact and are of the opinion that the development would have a positive effect on the surrounding communities. The following table summarises the responses of the COC.

	Positive Impacts	Negative Impacts
Employment	<ol style="list-style-type: none"> 1. <i>Short Term:</i> use of local tradesmen and labourers 2. <i>Long Term:</i> introduction of new technologies and techniques 	<ol style="list-style-type: none"> 1. Importation of unqualified and non classified personnel
Housing	<ol style="list-style-type: none"> 1. Alleviate woefully short stock 	<ol style="list-style-type: none"> 1. Priced outside the reach of parishioners
The Environment	<ol style="list-style-type: none"> 1. Utilize lands in an organised manner which could otherwise be subject to squatting 	<ol style="list-style-type: none"> 1. Loss of use of beach to locals 2. Pressure on utilities e.g. water, solid waste, electricity, road and schools
ST. Ann Chamber of Commerce	<ol style="list-style-type: none"> 1. Greater need for services and increased and diversified clientele 	

The COC also commented that “Developers must exercise social corporate responsibilities, must ensure the development is eco-friendly and must adopt the local Primary School to help improve the facilities. The COC further stated that “stakeholders must make themselves available to answer burning questions at local consultation”.

St. Ann Parish Council

A perception survey was also completed by the St. Ann Parish Council (The Council). The Council reported that they were aware of the proposed development prior to TEMN's contact via communication sent to the Council, and is of the opinion that the proposed development would have both positive and negative impacts on the surrounding communities. The following table summarizes the Council's response to impacts on employment, housing, the environment and the Council.

	Positive Impacts	Negative Impacts
Employment	<ol style="list-style-type: none"> 1. Creation of employment in the short term during the construction phase 2. Possible post construction employment 3. Reduction in unemployment rates for the area 	<ol style="list-style-type: none"> 1. Hiring of construction workers from outside of the area
Housing	<ol style="list-style-type: none"> 1. Increase housing stock in the country 	<ol style="list-style-type: none"> 1. Increase demand for basic social services 2. Units may not be affordable to general public - low-middle income working class earners and young professional groups 3. May foster informal settlements if housing solutions are not identified for both short-term and long-term workers.
The Environment	<ol style="list-style-type: none"> 2. If development is environmentally-friendly, some of the natural characteristics of the site may be maintained. 	<ol style="list-style-type: none"> 1. Possible draining of on-site wetlands 2. Increase surface drainage into the marine environment if not properly maintained and disposed. 3. Loss of natural habitat for birds, marine life etc.
St. Ann Chamber of Commerce	<ol style="list-style-type: none"> 2. Increasing demand for the services of the Council thus increasing potential for revenue earning 	n/a

The Council also commented that the proposed development appears to be “more of a resort/residential” development and as such may not contribute to easing the housing problem that is experienced within the area. The Council further commented that the units may not be affordable to “typical working class people”.



QUESTIONNAIRE

July 10, 2008

Mr. Michael Morris
Secretary Manager
St. Ann Parish Council
St. Ann's Bay, St. Ann

Attention: Mrs. Claudine Thomas

Dear Mrs. Thomas,

RE: Information for the Socioeconomic Assessment of a Proposed Residential Development at Flat Point Llandoverly

Technological and Environmental Management Network Limited (TEMN) is currently preparing an Environmental Impact Assessment (EIA) of a Proposed Residential Development at Flat Point, Llandoverly, St. Ann by Life of Jamaica (LOJ).

The proposed development consists of the construction of 12 super studios, 8 1-bedroom apartments, 80 2-bedroom apartments, 4 3-bedroom town houses and 4 4-bedroom town houses as well as an administration building and a club house, on a 10.1-acre parcel. The parcel is bordered to the south by the North Coast Highway, to the north by the Caribbean Sea and vacant land to the east and west.

TEMN understands the value of stakeholders participation in the development and planning process and would like your feedback on the proposed development e.g., your opinion on how it will impact the community, the environment and the country. We would appreciate an opportunity to talk with you in a face-to-face or telephone interview, whichever is more convenient. A written response would also be appreciated.

Information provided by your company will be utilised in the Environmental Impact Assessment of the project which will be open to public inspection, as per the NEPA requirement.

Attached are copies of the Architect's Brief for the proposed development and a copy of a perception survey. Please contact me (see contact information below) and let me know when would be an appropriate time to discuss the project.

Thank you for your timely response.

Sincerely,

Allison A. Richards
Email: treasureal@yahoo.com or treasureallison_@hotmail.com
Phone: 461-5353

Socioeconomic Perception Survey

1. Are you aware of the planned residential development of at Flat Point, Llandoverly by the LOJ?
Yes No

2. If yes, how did you hear about the development?
Radio
Television
Newspaper
Public Meeting
Other, Specify St. Ann Parish Council _____

3. What kind of impact do you think this development will have on the community?
Positive Negative Other, specify _____

4. How do you think the planned development will affect the following within the surrounding communities?

Employment:

Positive Impacts

It will certainly create employment in the short-medium term during construction phase and possible post construction phase and this will in turn aid in the reduction of the unemployment rate in the area.

Negative Impacts

If proper screening/selection of workers is not done there is a strong possibility of the creation of new negative effects for that area which will spill over to several other damages. It must be noted that most construction workers during and post construction periods will not necessarily be residents of the surrounding communities, thus the creation of new informal settlements in and around the vicinity of the site.

Housing:

Positive Impacts

With a new development of this nature it will certainly put a not so significant dent in the Country's housing crisis/demand. The area will be developed with residential units.

Negative Impacts

It will certainly increase the demand on the Country for the provision of the basic social services, as well as these units may not be affordable to the general public (low-middle income working class earners and young professional groups). Again the negative impact that is some what foreseen is the issue of squatting if proper temporary housing solution directly for workers both during and post construction is not addressed thoroughly.

The Environment:

Positive Impacts

Generally any new development within a virgin site like this will be challenging, however with an environmentally friendly development it will certainly maintain some of its natural characteristics of the site.

Negative Impacts



Certainly there will be a negative impact on the existing wetland areas located on and in near proximity of the site and on the marine environment with excessive surface drainage if not properly maintained and disposed of. Additionally the natural habitat of the area i.e. birds, marine life etc.

Your Organization:

Positive Impacts

Well the only positive that be easily sited is the additional revenue for the Council.

Negative Impacts

N/A

Are there any other comments that you would like to make regarding the proposed development?

It is the view of the general populace that conducted this survey that this development is more of a resort/residential as a result this will not readily ease the housing problem that is experienced within the area. In addition typical working class people will not be able to purchase these units.



ADDENDUM II

National Water Commission Letter – Potable Water Supply



ADDENDUM III

Revised Drainage Plan

Addendum III – Revised Drainage Plan



FOREMAN
CHUNG
& SYKES

CIVIL & STRUCTURAL ENGINEERING CONSULTANTS
7A Barbados Avenue, Kingston 5
Tel 876 – 754-2154/5 Fax 754-2156 Email mail@fcsconsultants.com

LIFE OF JAMAICA LLANDOVERY HOTEL DEVELOPMENT

0740/241/S

DRAINAGE REPORT

Revision #1

PREPARED FOR
LIFE OF JAMAICA
28-48 BARBADOS AVENUE
KINGSTON 5

JULY 2008

Proposed Llandovery Hotel Drainage Report

Description of local watershed

The proposed LOJ Llandovery development is to be sited on a parcel of land in Flat Point Saint Ann. See figure 1 for general location.

The proposed development lies within the Flat Point river watershed. That watershed is long and narrow starting at Llandovery Mountain where the upper reach of the river is called Halls Gully.

Residents nearby the proposed development lands say that the Flat Point River only conveys flow during rain events and for short periods thereafter.

A large culvert approximately 21' wide by 4'-6" high and a 36" pipe convey flows across the highway and onto the proposed development lands. Those flows then meanders across the property until it enters the sea.

The Flat Point River watershed area is approximately 282 hectares that extends 4.6 kilometres south of the site as shown in figure 1.

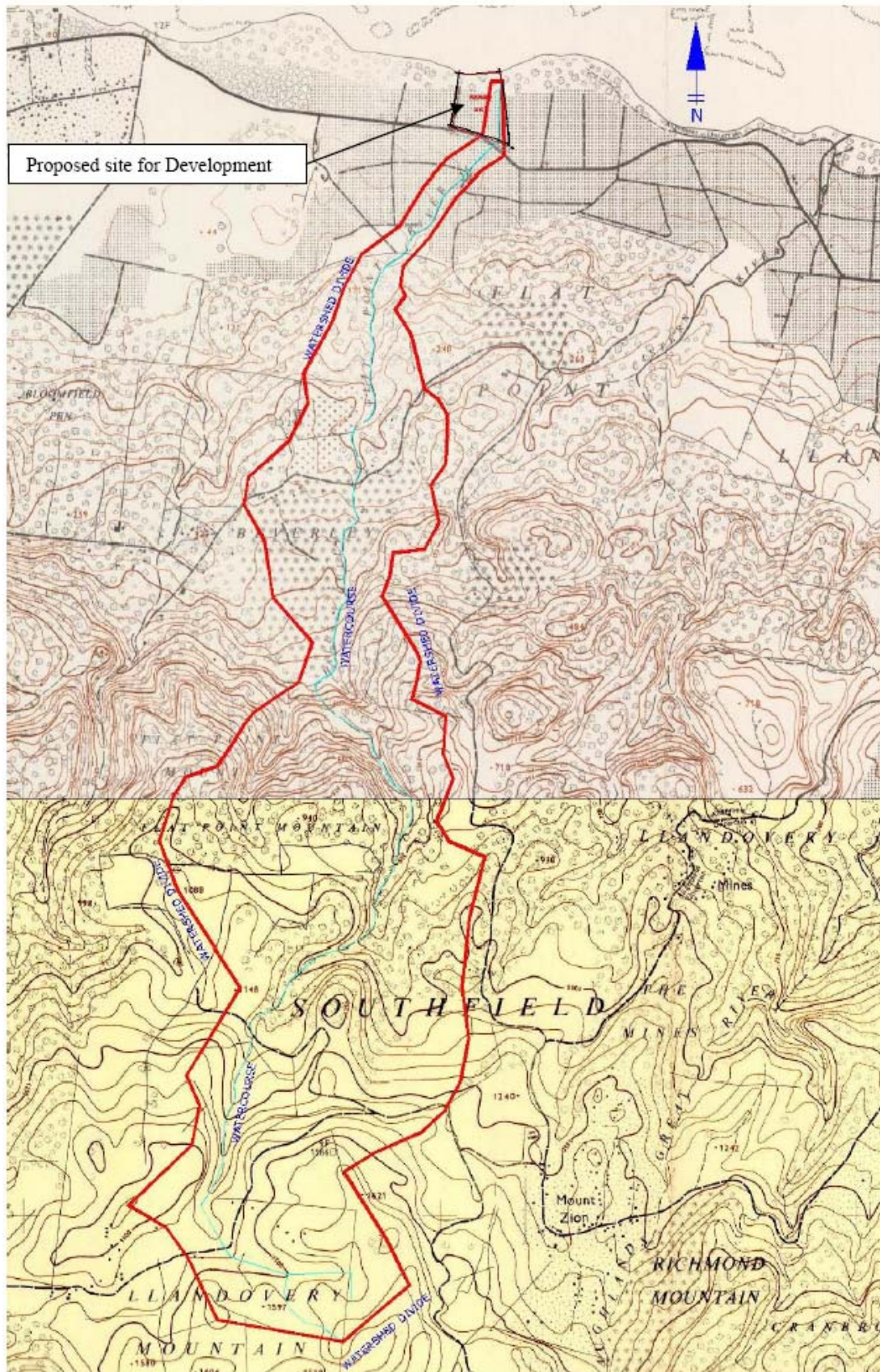


Figure 1 Watershed delineation for Flat Point River

Site Observations

The Flat Point River seems to convey flows at high velocity that transport large amounts of stones that are deposited on the site.



Photo 1 Culvert to the south east boundary of the site **Photo 2** Culvert to the south west boundary of the site

Large white stones were observed upstream and downstream of the large culvert to the east of the property and the stones spread some distance downstream of the culvert.



Photo 3 Debris in the watercourse deposited on site **Photo 4** General view of the proposed site

The eastern culvert was observed to be partially blocked with the white stones as shown in photo1. Based on the tyre marks in the soil it seems that the box culvert was recently cleaned of the stones.



Photo 5 Eastern outfall of watercourse into the sea



Photo 6 Western outfall of watercourse into the sea

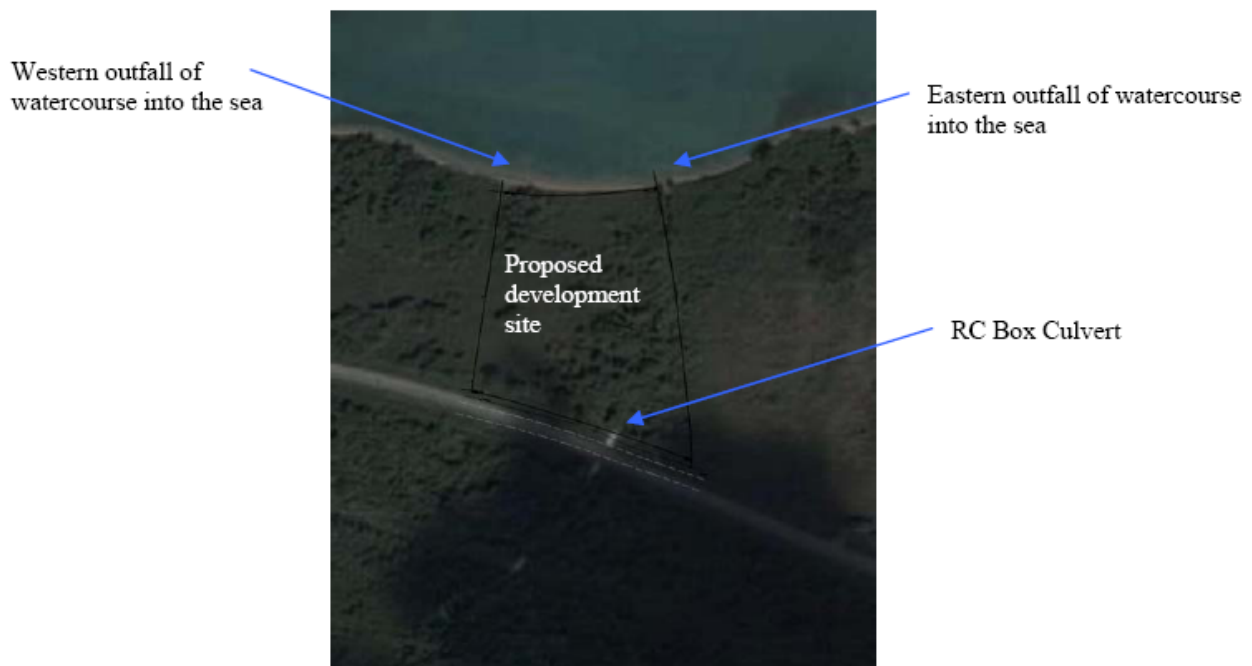


Photo 7 Satellite image with property boundary overlaid

Photo 7 Satellite image with property boundary overlaid

There are two distinctive channel outfalls that were observed along the shoreline in the general area of the property as shown in the photos above.

Hydrologic Assessment

The Flat Point River will have to be confined to a defined channel toward the eastern boundary of the property for the lands to be developed.

The Jamaica Institution of Engineers recommended “Guidelines for the design and Construction of Housing Infrastructure” Vol 1: 1984 Storm Water Drainage recommends that the design storm frequency of storm sewers be 2 years and for culverts, bridges and flood control projects a minimum of 10 years.

The Standard Handbook for Civil Engineers by Merritt, Loftin and Ricketts article 14.9 states “Flooding problems and surface drainage as concerns of community and regional planning studies, differ primarily in degree of severity. The principal concern with flooding is the desire to avoid injury and loss of life and reduce property damages caused by major floods (those having a recurrence interval of 25 to 100 years). Surface-drainage systems on the other hand are primarily concerned with convenience and providing access to property in relatively minor storms (those having a recurrence interval of 2 to 10 years)”.

The main channel was designed to convey the estimated 1 in 25 year return storm flows as it will be the outfall of a significant watershed.

The USDA NRCS TR-55 method of estimating surface runoff was used to estimate the flow from the Flat Point River. This method was used because of the size of the watershed and the data available for the area.

The TR-55 method required inputs for the following:

1. 24hour rainfall.
2. Rainfall distribution.
3. Curve Number derived from the soil type complex and land use.
4. Time of concentration based on the catchment geometry and drainage paths.

Rainfall

The rainfall data from the nearby Saint Ann’s Bay shown in table 1 below was used in this preliminary drainage assessment.

Table 1 Rain Data

Saint Anns Bay rainfall Data	
24 hr Return	mm/day
1 in 2 yr	119
1 in 5 yr	168
1 in 10 yr	199
1 in 25 yr	239
1 in 50 yr	269

The return period used was 1:25years based on the type of investment to take place.

The SCS type2 distribution was used to estimate rain intensity for the catchment delineated.

Soil data

The soil types for the Flat Point River catchment are taken from the soil map of Jamaica from a Ministry of Agriculture publication. The soil types for the area are described in ‘The Soil Technical Guide Sheets’ edited by Brown, Campbell, Evans, Gray and Woon; published 2004 by Rural Physical Planning Division, Ministry of Agriculture.

The soil types identified in that catchment are as follows with the internal drainage described.

Table 2 Soil Types and drainage description

Soils		Internal Drainage description
ID	Name	
29	Crane	Rapid
25	Fontabelle	Moderate
27	Fontabelle	Moderate/Rapid
77	Bonnygate	Very Rapid

Below is an extract from ‘The Soil Technical Guide Sheets’ that interprets the description into a rate of permeability.

(f) Internal Drainage

Internal drainage depends on the permeability of the soil and the material beneath it. The terms used for describing internal drainage should be interpreted according to the table below:

Terms	Permeability inches/cm per hour	Remarks
Slow	0.5 cm /Less than 0.20 inch	Soil saturated for long periods. Roots adversely affected. Mottled
Moderate	0.5 – 12.5 cm / 0.20 to 5.00 inches	Optimum for rooting and growth. Free of mottling.
Rapid	12.5 cm / over 5 inches	Droughty. Not optimum for plant growth.

All soils in the watershed are all taken as SCS Hydraulic soil group A soils. The definition of that soil type is as follows “**Group A** soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 in/hr)”.

95% of the catchment is described as the Bonnygate soil.

Land Use and Curve Number

Fairly thick forests generally make up the land use in the watershed. Approximately 0.5% of the land area has some houses along a parochial road but that area is too little to affect the estimate of abstractions in the watershed. The resulting curve number used for the catchment is 43 that for HSG type A and woods grass combination with fair undergrowth.

Time of Concentration

The time of concentration for the 5.7km long flow path in the catchment is estimated to be 0.55hrs. The fairly short time of concentration is due to the steep terrain in the watershed.

Table 5 Peak flow estimates

Region: SAINT ANN Locale: FLAT POINT			
Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period		
	10-Yr (cms)	25-Yr (cms)	50-Yr (cms)
SUBAREAS			
SA1	18.13	31.91	43.68
REACHES			
OUTLET	18.13	31.91	43.68

The eastern main drain has a fairly flat slope so that the larger stones can fall out of suspension in most storm events. Access to the channel to remove the deposited material is important and has been provided from the main road. Diversion structures approximately 300mm high will be constructed in the eastern and western drains to convey flow to debris traps at the discharge point to the sea to further improve water quality is incorporated in the design. As part of the hotel maintenance programme the drain is to be cleaned each year.

Hydraulic Evaluation

Direct discharge onto the proposed development site is regulated by the existing highway culvert and profile. The highway culvert has two bays each bay approximately 3 wide by 1.22m high. The difference in height between soffit of culvert deck and the road grade is approximately 0.8m. It is estimated that a surcharge of 0.8m on the culvert is possible before the road is inundated. The Culvert is estimated to convey 19.3m³/s with a headwater elevation at the edge of the carriageway. That flow is a little more than the estimate of the 10yr return surface flow.

Downstream of the culvert a rectangular reinforced concrete paved drain 5.5m bottom width and 1.5m high is proposed that transitions to a natural drain 6m bottom width 1.9m high. The anticipated heights of water in the drains are shown in the table below.

Table 6 Hydraulic evaluation of the proposed main drain through the property

Runoff		Paved Drain						Earth Drain					
Return period in yrs.	Estimated Flow m ³ /s	Bottom Width m	Height m	Depth m	Slope m/m	n	Bottom Width m	Height m	Side Slope m/m	Depth m	Slope m/m	n	
10	18.13	5.5	1.5	0.72	0.01	0.015	6	1.9	0.67	1.13	0.005	0.03	
25	31.9	5.5	1.5	1.05	0.01	0.015	6	1.9	0.67	1.6	0.005	0.03	
50	43.7	5.5	1.5	1.3	0.01	0.015	6	1.9	0.67	1.86	0.005	0.03	

The vertical alignment of the highway to the south of the site slopes to the east and if the runoff exceeds the capacity of the culvert it is expected that the excess will mostly flow to the east with the slope of the road. The drainage infrastructure within the site has been sized to convey flows greater than the capacity of the culvert if changes were to be made by the relevant Government Agency. The Dynamic storm surge elevations prepared by others are estimated to be 1.61m, 2.04m and 2.49m for the 25yr, 50yr and 100yr return wave elevations.

Internal Drainage

Low impact drainage methods have been used in the design of the onsite drainage. The flow from the land surrounding the units is directed to the driveways with the driveways falling toward earth swales. Those swales will discharge into detention ponds with gravel filters to improve storm water quality before discharge into the sea.

The onsite drainage is designed for a 1:5year return period. The building floor levels will be set above the 1:50 year flood level.



Figure 2 Plan of development showing sub catchments

Based on recommendations from the coastal engineer all floor levels will be a minimum of 2.5m above the mean sea level.

Table 7 Sub-catchments peak flows

LOJ Llandovery drainage

Subcatchments	Return period	mm/day	in/day	Tc	Area msq	Acres	c	I inches/hr	Q cfs	cms
Area-1	1 in 5 yr	166	6.54	5	8,331.48	2.06	0.8	4.855	7.997	0.226
Area-2	1 in 5 yr	166	6.54	5	1,624.57	0.40	0.75	4.855	1.462	0.041
Area-3	1 in 5 yr	166	6.54	5	1,635.51	0.40	0.75	4.855	1.472	0.042
Area-4	1 in 5 yr	166	6.54	5	3,676.48	0.91	0.75	4.855	3.308	0.094
Area-5	1 in 5 yr	166	6.54	5	2,512.71	0.62	0.9	4.855	2.713	0.077
Area-6	1 in 5 yr	166	6.54	5	2,895.17	0.72	0.8	4.855	2.779	0.079
Area-7	1 in 5 yr	166	6.54	5	3,441.07	0.85	0.8	4.855	3.303	0.094
Area-8	1 in 5 yr	166	6.54	5	3,331.05	0.82	0.8	4.855	3.197	0.091
Area-9	1 in 5 yr	166	6.54	5	2,362.27	0.58	1	4.855	2.834	0.080
Area-10	1 in 5 yr	166	6.54	5	1,944.03	0.48	1	4.855	2.332	0.066

The sub-catchments as delineated are shown in figure 2, and the peak flows from the sub-catchments are shown in table 7.

The gravel filter and detention ponds are sized for water quality improvement based on the “Center for Watershed Protection’s Storm Water Managers Resource Center guidelines”.

A sand berm of suitable height will be used to reduce wave run up during storm events.

Drawings of the drainage plan have been prepared and are submitted with this report.

Conclusions and Recommendations

The focus of the drainage design is to safely convey flows from the larger watershed through the property and the internal drainage to the sea with water quality improvement features to limit the effect of the development on the environment.

Floor levels will be a minimum of 2.5m above mean sea level and must also be constructed at least 45cm above the design water level in the drain.

To improve the quality of water entering the sea, debris traps are incorporated in the drainage design.

A 12m wide strip of land aligned to the eastern boundary has been reserved for a storm drainage channel to convey infrequent storm flow into the sea.

The site is graded toward detention features that are incorporated in the onsite drainage design. Those detention features will have outlets that flow to the sea.

Prepared by
Foreman Chung and Sykes Consultants Limited



APPENDIX

NWA Culvert evaluation.txt
Llandovery Existing culvert estimate of flow capacity

Culvert Calculator

Entered Data:

```

Shape ..... Rectangular
Number of Barrels ..... 2
Solving for ..... Headwater
Chart Number ..... 10
Scale Number ..... 1
Chart Description ..... BOX CULVERT; 90-DEGREE HEADWALL;
CHAMFERED OR BEVELED INLET EDGES
Scale Description ..... INLET EDGES CHAMFERED 3/4-INCH
Overtopping ..... Off
Flowrate ..... 19.3000 cms
Manning's n ..... 0.0130
Roadway Elevation ..... 7.2200 m
Inlet Elevation ..... 5.4200 m
Outlet Elevation ..... 5.2200 m
Height ..... 1.2200 m
Width ..... 3.0000 m
Length ..... 4.5002 m
Entrance Loss ..... 0.4000
Tailwater ..... 0.7200 m
  
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Computed Results:

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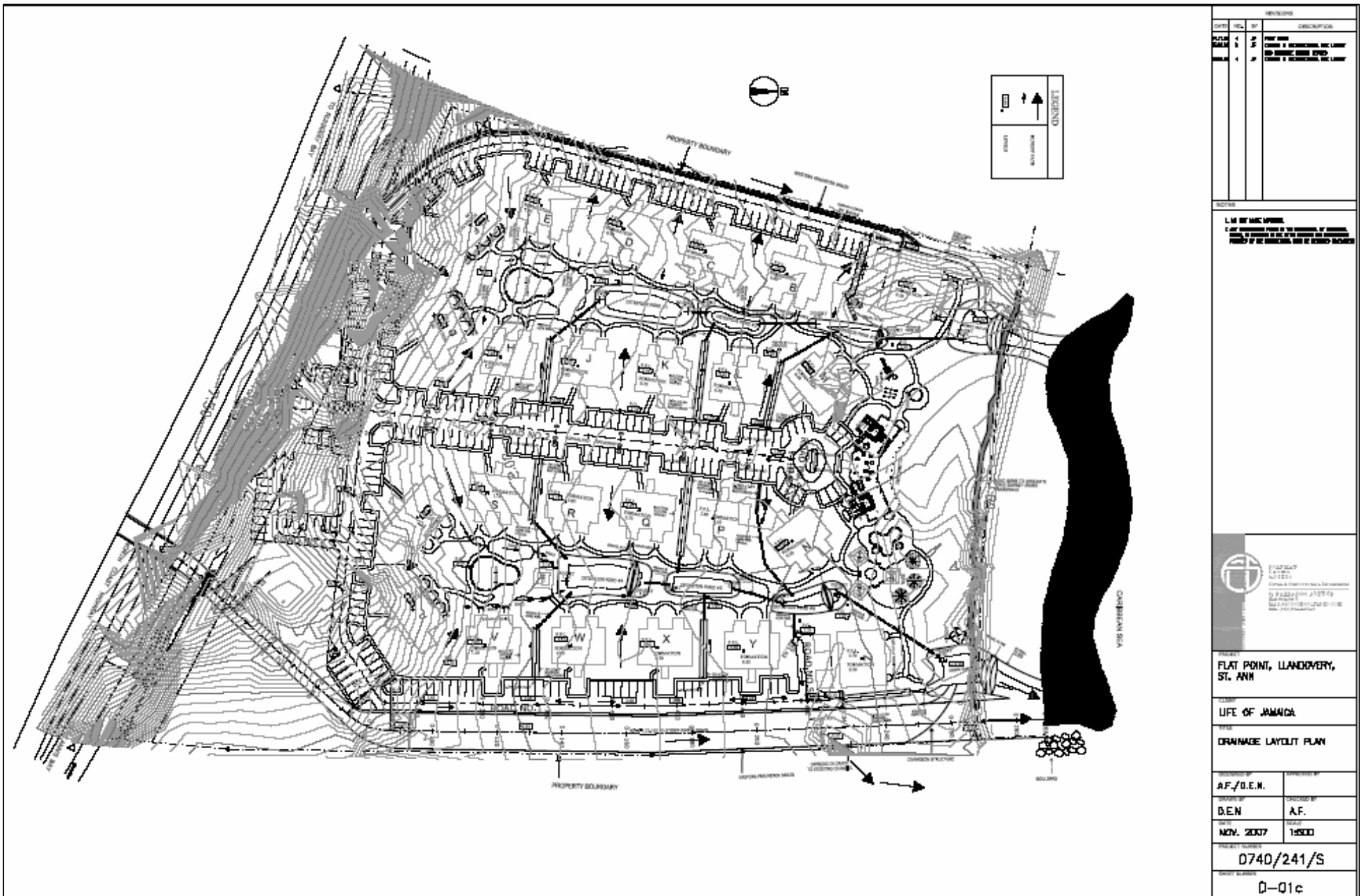
Headwater ..... 7.2120 m Inlet Control
Slope ..... 0.0444 m/m
Velocity ..... 7.6967 mps
  
```

Messages:

```

Inlet head > Outlet head.
Computing Inlet Control headwater.
Solving Inlet Equation 27.
Solving Inlet Equation 28.
Headwater: 7.2120 m
  
```

DIS-CHARGE TAILWATER	HEAD-WATER ELEV.	INLET CONTROL DEPTH	OUTLET CONTROL DEPTH	FLOW TYPE	NORMAL DEPTH	CRITICAL DEPTH	OUTLET VEL.	OUTLET DEPTH
Flow	m	m	m		m	m	mps	m
VEL. DEPTH								
cms mps	m							
1.80	5.96	0.54	0.45	NA	0.14	0.33	4.18	0.14
0.00	0.72							
3.60	6.28	0.86	0.64	NA	0.22	0.53	5.42	0.22
0.00	0.72							
5.40	6.55	1.13	0.89	NA	0.29	0.69	6.28	0.29
0.00	0.72							
7.20	6.79	1.37	1.19	NA	0.35	0.84	6.95	0.35
0.00	0.72							
9.00	7.10	1.68	1.47	NA	0.40	0.97	7.51	0.40
0.00	0.72							
10.80	7.10	0.00	1.68	NA	0.45	0.97	3.28	0.45
0.00	0.72							



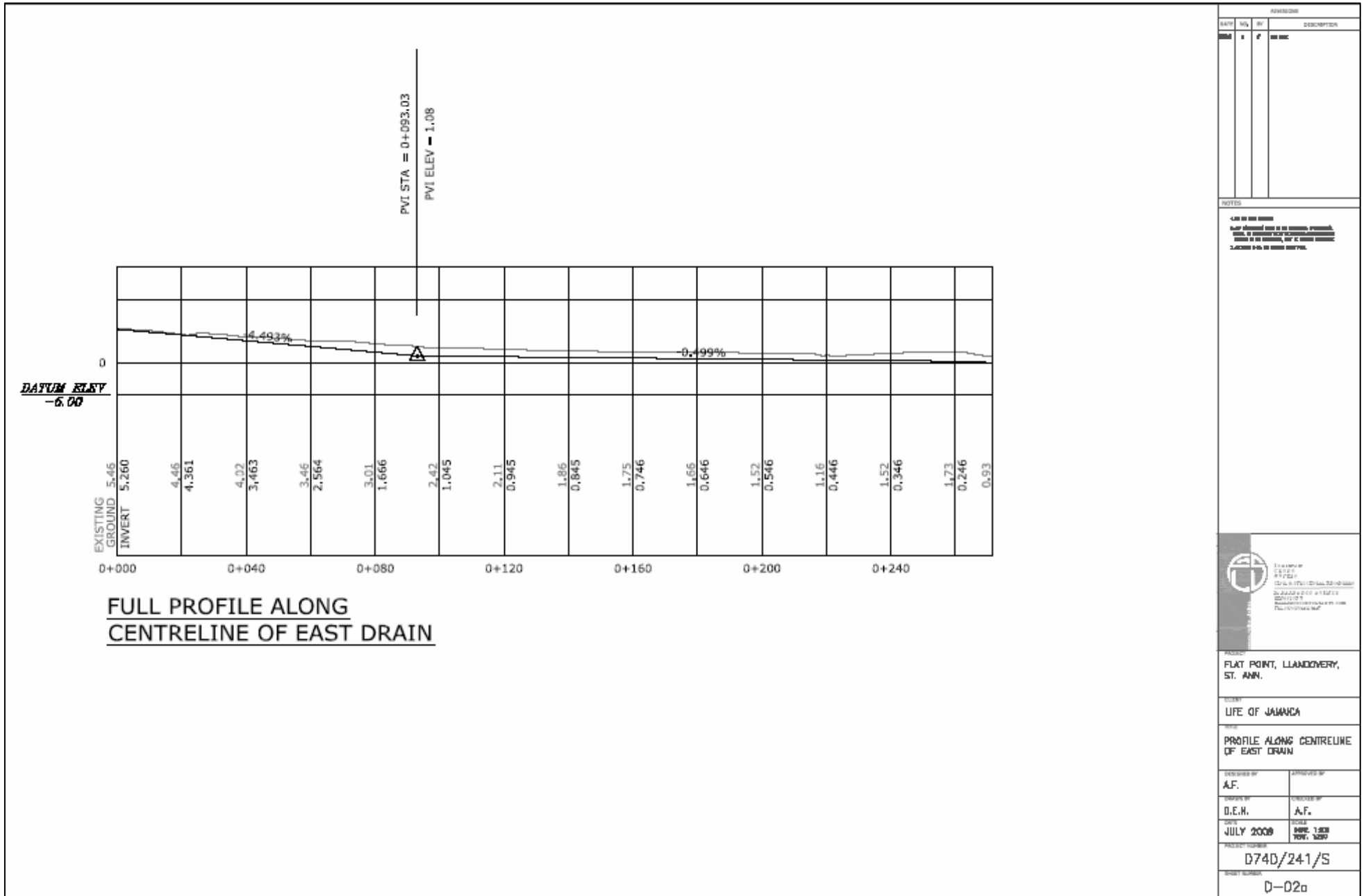
REVISIONS			
DATE	NO.	BY	DESCRIPTION
2007	1	AF	PREP WORK
2007	2	AF	CHANGE OF PROVISIONAL, THE LAYOUT AND DRAINAGE MAINS LAYOUT
2007	3	AF	CHANGE OF PROVISIONAL, THE LAYOUT

NOTES

L.M. BY M.C. SPURRIE.
 C.A.P. APPROVED FOR THE PURPOSES OF CONSTRUCTION PERMITS AND FOR THE PURPOSES OF THE ENVIRONMENTAL IMPACT ASSESSMENT.



PROJECT	
FLAT POINT, LLANDOVERLY, ST. ANN	
CLIENT	
LIFE OF JAMAICA	
TITLE	
DRAINAGE LAYOUT PLAN	
DESIGNED BY	APPROVED BY
AF/D.E.N.	AF.
DRAWN BY	CHECKED BY
D.E.N.	AF.
DATE	SCALE
NOV. 2007	1:500
PROJECT NUMBER	
0740/241/S	
SHEET NUMBER	
0-01c	



REVISION			
DATE	NO.	BY	DESCRIPTION

NOTES

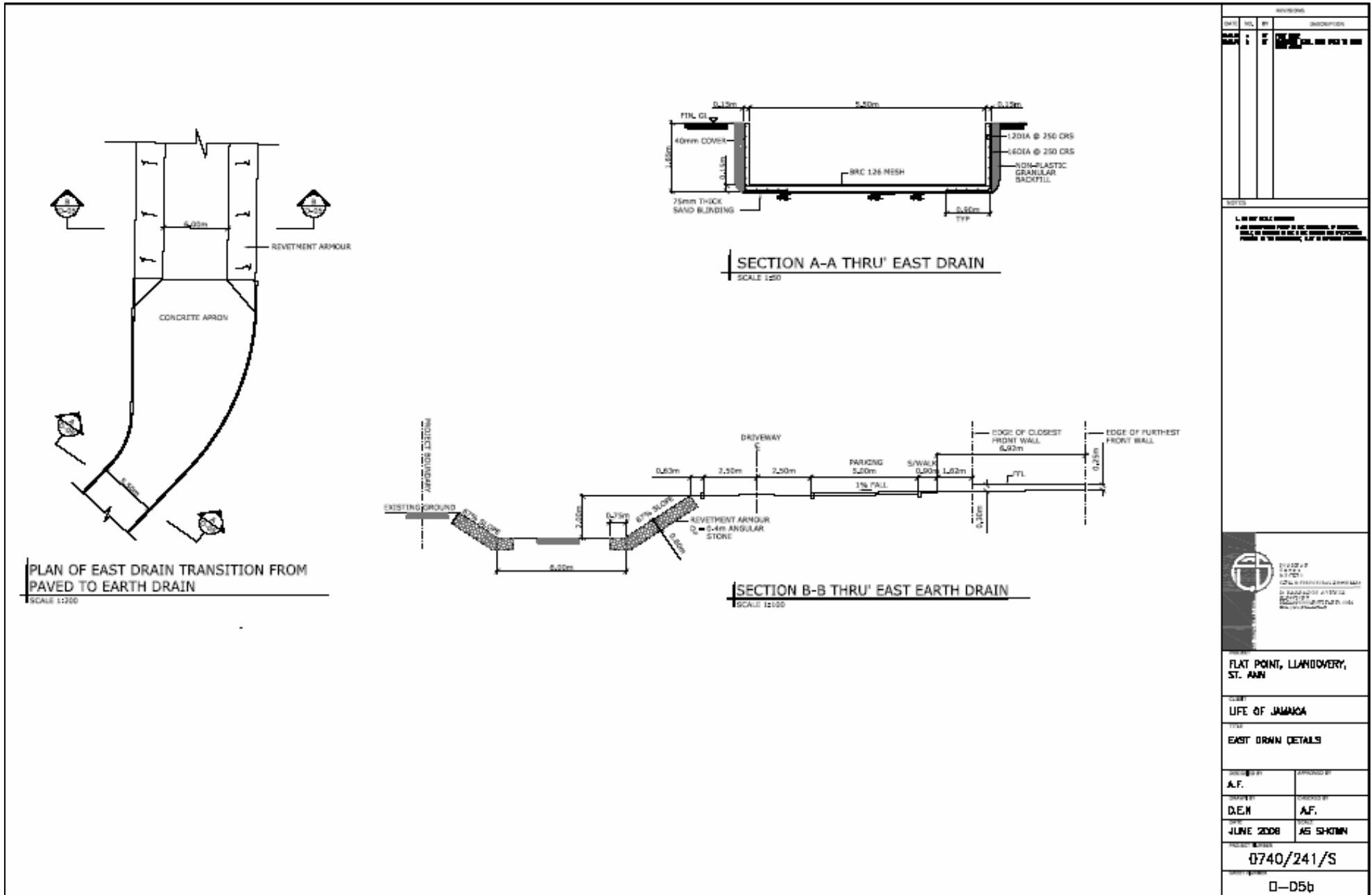
1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

2. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED.

3. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE SPECIFIED.



PROJECT	
FLAT POINT, LLANDOVERLY, ST. ANN.	
SITE	
LIFE OF JAMAICA	
PROFILE	
PROFILE ALONG CENTRELINE OF EAST DRAIN	
DESIGNED BY	APPROVED BY
A.F.	
DRAWN BY	CHECKED BY
D.E.H.	A.F.
DATE	SCALE
JULY 2008	1:500
PROJECT NUMBER	
D74D/241/S	
SHEET NUMBER	
D-02a	



REVISIONS			
NO	DATE	BY	DESCRIPTION
1			

NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE SANS STANDARDS REFERRED TO IN THE SPECIFICATIONS.

2. ALL DIMENSIONS SHALL BE IN METERS UNLESS OTHERWISE SPECIFIED.

3. ALL DIMENSIONS SHALL BE TO FACE UNLESS OTHERWISE SPECIFIED.



PROJECT	
FLAT POINT, LLANDOVERLY, ST. ANN	
CLIENT	
LIFE OF JAMAICA	
TITLE	
EAST DRAIN DETAILS	
DESIGNED BY	APPROVED BY
A.F.	
DRAWN BY	CHECKED BY
D.E.H.	A.F.
DATE	PROJECT
JUNE 2008	AS SHOWN
PROJECT NUMBER	
0740/241/S	
DRAWING NUMBER	
□-D5b	



ADDENDUM IV

Hydrogeology: Comments on Revised Drainage Plan

Addendum IV – Hydrogeology: Comments on Revised Drainage Plan

Following the release of the updated engineer’s report dated July 2008 (Document No. 0741/241/S Revision#1) the following serves to update the information in the main hydrologic assessment.

1. The latest peak flow estimates from the engineer’s report using TR-55 have updated flows requiring a revisit of peak flow comparison in the main work. This is presented in table below.

Table showing comparison of peak flows using TR-55

<i>Design Event</i>	<i>HEC-HMS Predicted Peak Flows</i>	<i>WinTR-55 Predicted Peak Flows</i>	<i>Engineering Report Peak Flows (REVISED)</i>
10yr	-	-	18.13 m ³ /s
25 yr	23.6 m ³ /s	36.4 m ³ /s	35.91 m ³ /s
50 yr	29.4 m ³ /s	45.3 m ³ /s	43.68 m ³ /s
100 yr	35.6 m ³ /s	54.7 m ³ /s	-

2. Additionally, the engineer’s report has done an evaluation of the capacity of the proposed drain to accommodate the predicted peak flows and each scenario indicates that the drains capacity will be able to accommodate the proposed flows with some freeboard. The requirement to have the drain cleaned annually will reduce the accumulation of debris and hence keep the proposed drain at its intended design capacity. Given the predictions that all the predicted flow will be contained within the proposed drains with freeboard the requirement for a flood assessment was not deem necessary by the engineers.
3. The engineers report contained water depths due to storm surge events and indicate levels due to wave return action at 25yr, 50yr and 100yr to be 1.61m, 2.04m and 2.49m respectively. The report further indicated that the building floor levels would be set above the 1:50yr storm surge levels at around 2.5m and be at least 45cm above the design water levels in the Flat Point drainage corridor.
4. The report further states that internal drainage will be handled by two drainage systems that consist of conventional drainage techniques along with earth swales and other detention areas

prior to discharge to sea. The internal drainage will be distinct and separate from the proposed Flat Point River drainage corridor through the property.

5. A 12m wide strip of land has also been reserved to the eastern boundary of the property to convey any infrequent storm events into the sea.