Wastewater Operations
Greater St. Catherine

1.0 Preamble

The parish of St. Catherine consists of somewhat densely populated residential communities with over 70% of the population living in the urban areas. The ***Population Census 2001 Report*** identified the five fastest growing urban centres in Jamaica (1991-2001), to be all located in St. Catherine (see Table 1).

The Greater St. Catherine (GST) area consists of the Portmore area in the south-eastern section of the parish and the parish capital, Spanish Town and its immediate environs. Except for the Hellshire Hills near the coast, the south of the parish is virtually flat. The topography of the area combined with the high water table, suggest that central sewerage would be best, environmentally and healthwise, for the disposal of wastewater.

The original development of the St. Catherine area was designed such that sewage collection and treatment is through a series of package sewage treatment plant, where generally, each plant was designed to treat wastewater generated from a discrete or a series of discrete housing developments.

Portmore, the second fastest growing urban centre over the period 1991-2001 is currently being impacted through urbanization. This is the case for many communities in St. Catherine, where population growth is also being influenced by the new Highway 2000 development. The growth in population in St. Catherine has resulted in undue pressures being exerted on existing infrastructure (including that of water and wastewater) which in some instances, had been installed over 35 years ago when communities such as Independence City and Edgewater were constructed. Also, developments in wastewater management to better mitigate against possible impact on the environment and person's health, have caused more stringent design parameters to be employed to effect improved effluent quality. Consequently, tertiary treatment is required at most wastewater treatment plant to meet new effluent discharge regulations. The older treatment plants were designed as secondary treatment facilities.

Urban Centre	Population			% Change		% Share of Total Parish population (1991 -2001)
	1991	2001	2008 (estimate)	1991-2001	2001-2008 (estimate)	
St. Catherine						
Old Harbour	12,718	23,610	33,222	85.6	40.7	4.9
Portmore/Hellshire	96,143	159,974	219,165	66.4	37.0	33.3
Ewarton	6,534	10,699	13,338	63.7	24.7	2.2
Bog Walk	6,572	10,735	13,257	63.3	23.5	2.2
Linstead	9,433	15,046	18,317	59.5	21.7	3.1
St. Ann						
Ocho Rios	10,254	15,714	16,929	53.2	7.7	9.5
Westmoreland						
Negril	4,184	5,823	6,140	39.2	5.4	4.2

Table 1: Fastest growing urban centers (1991-2001)

In a number of instances the increasing number of housing developments being constructed throughout the parish without the requisite expansion of the necessary sewerage infrastructure, has caused chronic overloading of the systems. This is compounded by the general practice of the homeowner expanding the housing units and usually the number of householders living in the unit thereby increasing the flows to the sewerage system.

The infiltration of storm water into the sewerage system is also contributing to the overloading at sewage facilities; negatively impacting on the treatment of wastewater. Given the topography of the area (generally flat in the southern section of the parish) and the inadequate storm water drainage in many area, it is often found that householders connect the storm water to the sanitary sewer system. This has been substantiated by the numerous reports of flooding at sewer manholes as well as the sewage plant after rain episodes.

Consequences from overloading of sewage facilities are:

- poor quality effluent being discharge into the environment, a potential health risk as well as an environmental concern;
- surcharge of sewers with resultant overflows, which is exacerbated by the flat area and in many instances the absence of an effective storm drainage system ; and

- increased maintenance/replacement costs to the NWC as there is a need for more frequent maintenance/replacement of the plants as the mechanical equipment (pumps, blowers) are utilized above their design capacity.

2.0 Sewerage Service

The National Water Commission (NWC) operates some 22 wastewater treatment facilities in St. Catherine; ***Table 2*** is a summary of the major facilities. Exhibits 1, 2 and 3 show the location and the extent of service area of the major facilities.

Treatment Plant	Design Capacity m^3/day	Areas Served		Estimated % increase in # HH served
		Original	Added	
Charliemont	360	Charliemont H/S	NIL	-
De La Vega City	1,590	De La Vega City H/S	Spanish Town Police Station	Marginal
Hamilton Gardens	760	Hamilton Gardens	Sections of Gregory Park	67
Horizon Park	1,900	Villa Nova, Horizon Park	Sydenham Villas, Sydenham Gardens, Sydenham Cottage, Wedgewood Gardens	166
Ebony Vale	1,140	Ebonyvale H/S	Royal Place Estate, Fairview H/S, Friendship Meadow H/S	~ 100
Twickenham Park	950	Twickenham Park	NIL	-
Independence City	15,900	Independence City, Waterford, Portsmouth	Portmore Mall/Town Centre, Independence City	
Bridgeport	9,000	Bridgeport, Westport, Westmeade, West Bay Site A & B, Bridgeview, Southborough, Sections of Congrieve Park, Mount Royal Estate	Marine Park, Edgewater, Garveymeade	49
Greater Portmore	18,180	Portmore Pines, West Cumberland, Braeton, Braeton Newton Christian Gardens, Greater Portmore, Sections of	Mainly expansion of households	~30
Ensom City	3,800	Ensom City	Ensom Green, Sections of Ensom Meadows, Ensom Acres	34
Eltham Park	4,500	Eltham Park, Eltham View	Eltham Acres, Angels Estate, Angels Grove, The Hampton, Eltham Vista	44
NOTE: HH - Household				

Table 2: Major Sewage Facilities - St. Catherine

In addition to more stringent effluent discharge standards, increased hydraulic loading to some plant as a result of increased flows from new housing developments, is resulting in several of the plants not meeting the discharge standard. The requisite expansion of the facility to accommodate increased flows, generally, has not taken place.

Table 3 shows the design capacity of the plants and the estimated average influent flows.

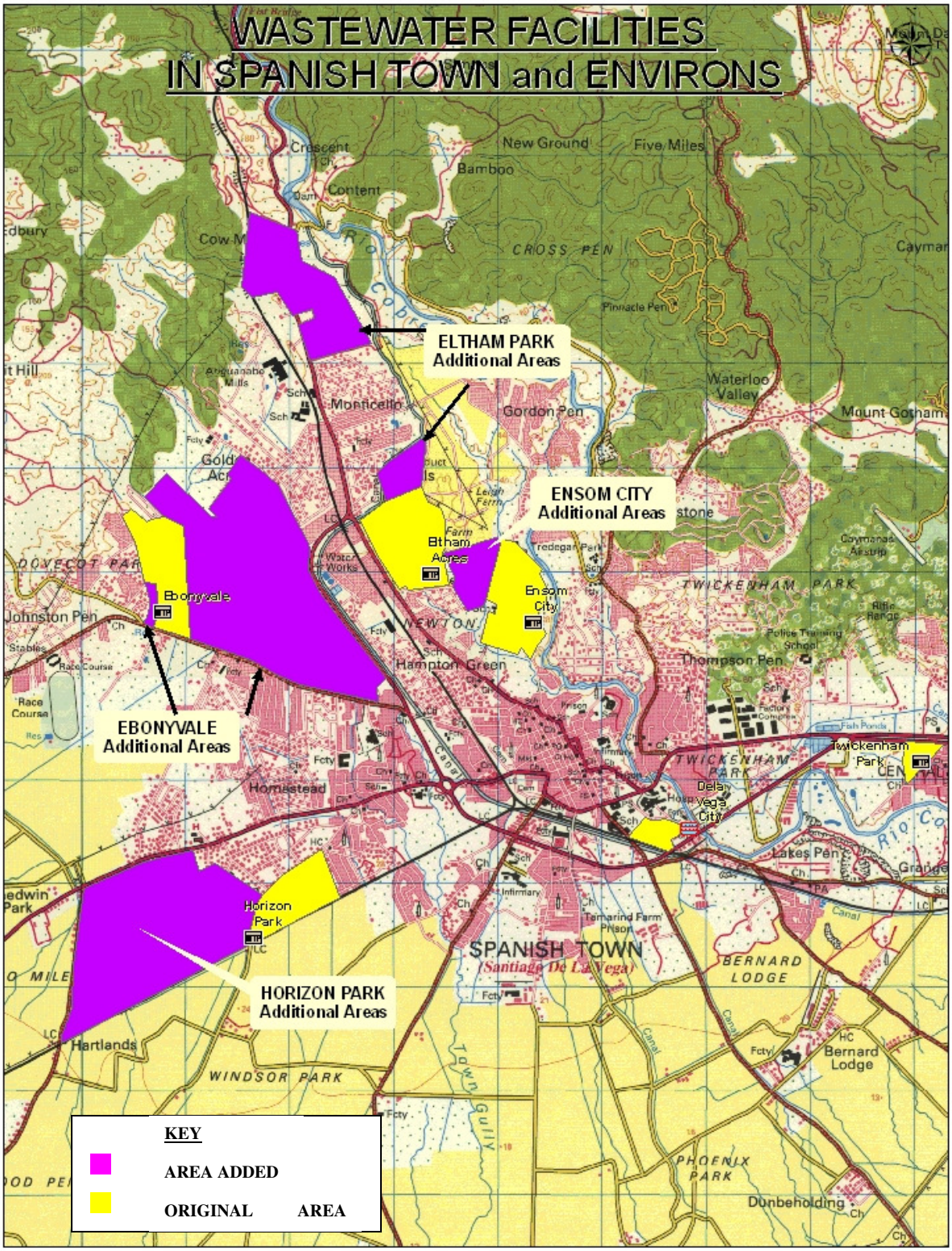

Exhibit 1: Wastewater Treatment Plant – Spanish Town & Environs

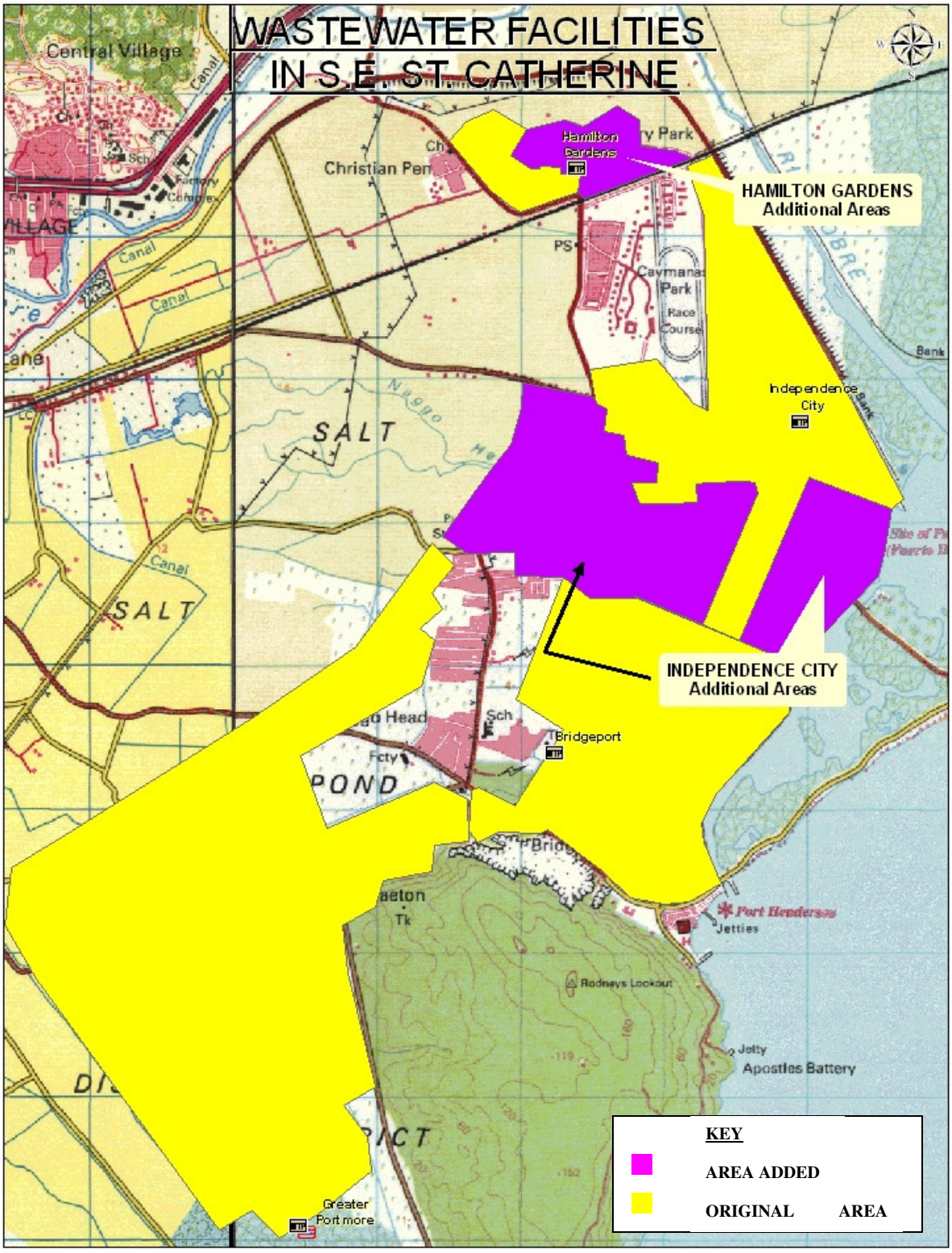

Exhibit 2: Wastewater Treatment Plant - North St. Catherine

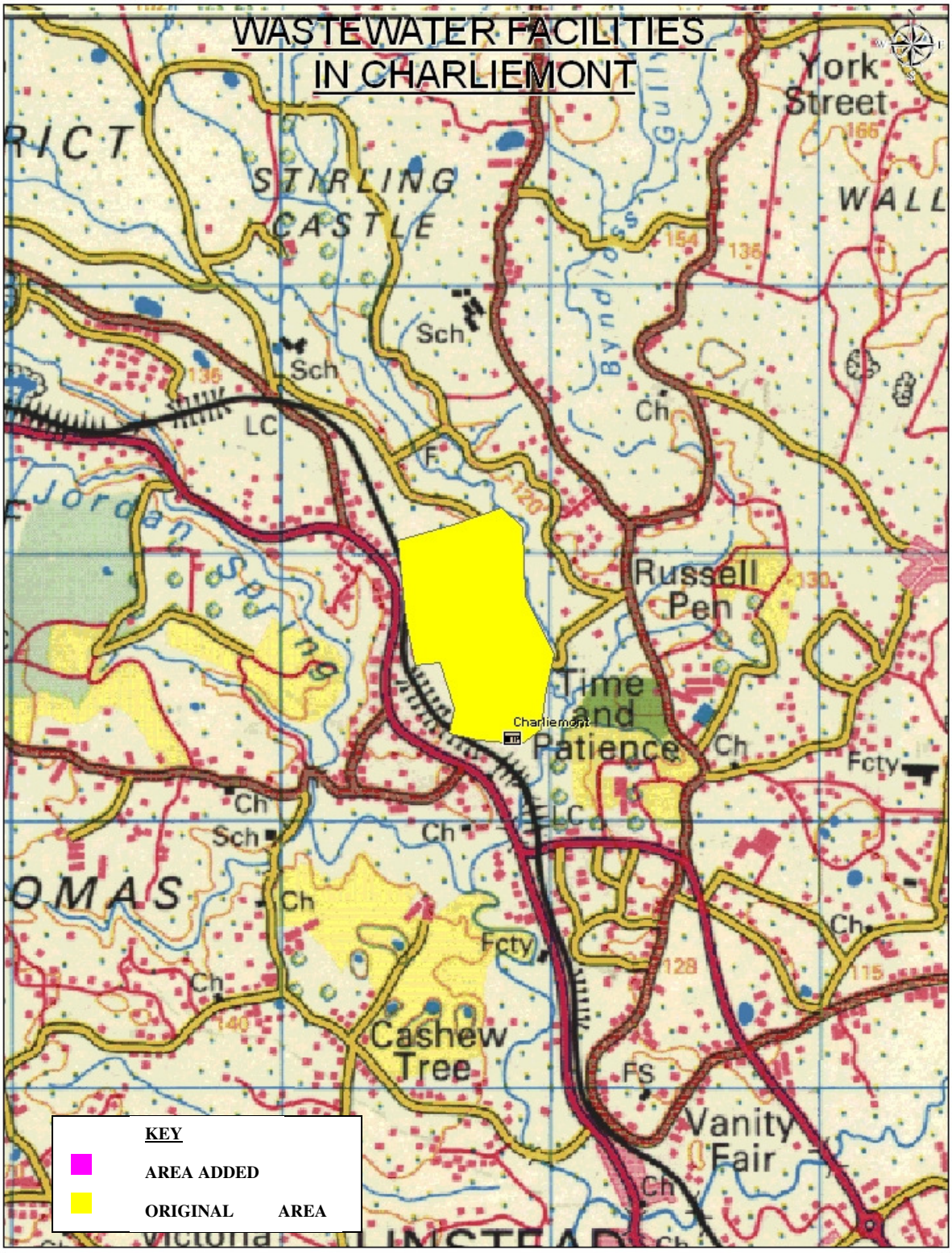

Exhibit 3: Wastewater Treatment Plant - South-east St. Catherine

Treatment Plant	Design Capacity MGD	Estimated Sewage Flow
Charliemont	0.10	0.10
De La Vega City	0.30	0.30
Hamilton Gardens	0.17	0.39
Horizon park	0.40	0.50
Ebony Vale	0.25	0.37
Twickenham Park	0.20	0.22
Independence City	3.00	3.10
Bridgeport	1.50	1.40
Greater Portmore	4.00	3.20
Ensom	0.70	0.70
Eltham	0.90	0.90

Table 3: Estimated Flows to treatment plant

2.1 Status of Treatment Facility

The most recent analysis on the operational efficiency of the plants showed increases in the biological loading to most of these facilities. This coupled with the increased hydraulic loading has a significant negative impact on plant operations. Laboratory analysis shows that the effluent quality of a number the facilities that were assessed over the period did not meet the required standard. Exhibit 6 outline the analysis results both influent and effluent at a number of the facilities in St. Catherine.

Based on the laboratory analysis undertaken, it must be noted that with the exception of phosphate removal, there is as much as over 90% removal of nutrient from the influent to the treatment plant (see Exhibit 4). In addition to tertiary treatment, additional technology is usually required to effect significant phosphate removal.

From the data presented in Exhibit 4, it can be noted that the NWC has been somewhat challenged in meeting the newly stipulated National Environment and Planning Agency (NEPA) discharge standard for sewage effluent. The current hydraulic loading at some plants exceed the design specification and therefore removal of the respective organic loading is often time not achieved. In particular, the new standard of 4 mg/l in sewage effluent for phosphate poses a

major challenge as none of the plants were designed for such removal of phosphate. Phosphate removal requires at minimum tertiary wastewater treatment and can be rather expensive. It is the Commission's position that reduced phosphate discharge from sewage treatment plants to the environment is best achieved by control at the input source.

	FACILITY *ANALYSIS DATE* PARAMETER	NEPA STANDARD	Hamilton Gardens	Independence City	Bridgeport	Charliemont Jun-08	Nightingale Grove	Eltham Park	Ebonyvale
INFLUENT	TSS (mg/l)		672	192	180	174	176	4765	316
	TOTAL PHOSPHATE (mg/l)		35	19.3	19	14.2	18.7	195	27.5
	TOTAL NITROGEN (mg/l)		73.68	36.2	44.93	38.76	29.39	143.53	57.5
	BOD (mg/l)		365.63	142.5	78.75	48.75	208.5	320.63	324.38
EFFLUENT	TSS (mg/l)	20	14	**276**	**228**	12	**136**	0	**34**
	TOTAL PHOSPHATE (mg/l)	4	**15.5**	**24.5**	**22.3**	**6.5**	**12.9**	**17.6**	**12**
	TOTAL NITROGEN (mg/l)	10	**19.17**	**51.1**	**31.52**	**12.78**	**29.82**	1.7	**NR**
	BOD (mg/l)	20	3.75	**261**	**73.5**	8.1	**33.75**	0.83	15.4

	FACILITY *ANALYSIS DATE* PARAMETER	NEPA STANDARD	Hamilton Gardens	Independence City	Bridgeport	Charliemont Jul-08	Nightingale Grove	Eltham Park	Ebonyvale	Ensom City
INFLUENT	TSS (mg/l)		326	160	144	264	216	3398	334	132
	TOTAL PHOSPHATE (mg/l)		43	23.8	13.6	18	25	159	23.7	10.9
	TOTAL NITROGEN (mg/l)		141.2	60.9	44	37.7	37.2	135.5	48.4	37.4
	BOD (mg/l)		573	280.5	228	219.75		455.25	21.44	225
EFFLUENT	TSS (mg/l)	20	2	**222**	**100**	6	**308**	4	**50**	**92**
	TOTAL PHOSPHATE (mg/l)	4	**13**	**25.7**	**22**	**7.5**	**17.8**	**18.9**	**14.6**	**13.8**
	TOTAL NITROGEN (mg/l)	10	**28.4**	**59.3**	**46.2**	**13.1**	**48.4**	**ND**	**23.5**	**16.9**
	BOD (mg/l)	20	**37.58**	**246**	**204**	**59.24**		4.35	**121.5**	**126.75**

	FACILITY *ANALYSIS DATE* PARAMETER	NEPA STANDARD	Hamilton Gardens	Independence City	Bridgeport	Charliemont Aug-08	Nightingale Grove	Eltham Park	Ebonyvale	Ensom City
INFLUENT	TSS (mg/l)		164	56	203	238	270	3706	162	1120
	TOTAL PHOSPHATE (mg/l)		16.2	18.2	17.7	19.1	23.4	55.6	19.2	38.4
	TOTAL NITROGEN (mg/l)		37.7	39.6	107.6	39.6	31.3	141	34.8	59
	BOD (mg/l)		470.2	418.5	378.75	185.19	654	163.5	446.25	651
EFFLUENT	TSS (mg/l)	20	**52**	**167**	**90**	**26**	**80**	12	**76**	**36**
	TOTAL PHOSPHATE (mg/l)	4	**17.1**	**21.6**	**19.9**	**7.2**	**21.3**	**23.5**	**20.5**	**15.8**
	TOTAL NITROGEN (mg/l)	10	**29.8**	**24.9**	**35.2**	**16.1**	**30.9**	0.3	**26.2**	**27.3**
	BOD (mg/l)	20	**317.25**	**485.25**	**633.75**	**341.25**	**467.25**	5.74	**304.5**	**376.5**

	FACILITY *ANALYSIS DATE* PARAMETER	NEPA STANDARD	Hamilton Gardens	Independence City	Bridgeport	Charliemont Sep-08	Nightingale Grove	Eltham Park	Ebonyvale	Ensom City
INFLUENT	TSS (mg/l)		178	314	568	72	166		122	
	TOTAL PHOSPHATE (mg/l)		21.5	22.2	21	7.7	18.8		12	
	TOTAL NITROGEN (mg/l)		23.7	51.7	51	19.7	21.7		25	
	BOD (mg/l)		450	377.25	NR	83.55	333		416.25	
EFFLUENT	TSS (mg/l)	20	**34**	**190**	**138**	8	**46**		**41**	
	TOTAL PHOSPHATE (mg/l)	4	**11.1**	**12.8**	**14.9**	**4.1**	**7.4**		**8**	
	TOTAL NITROGEN (mg/l)	10	**19.7**	**25.7**	**33**	9	**21**		**14**	
	BOD (mg/l)	20	**NR**	**341.25**	**312**	**210**	**NR**		**217.5**	

Exhibit 4: Analysis of sewage influent and effluent[1]

[1] NR – No response, ND – not detected

3.0 Maintenance Activities

In recent weeks the NWC has faced increased criticism from both the St. Catherine Parish Council and the Portmore Municipal for the lack of maintenance of its facilities and surrounding areas such as canals and drains in which effluents are discharged. It must be highlighted that failure of some of the facilities in some instances to meet the requisite environmental standard is not due primarily to the lack of maintenance.

Despite the challenges facing the NWC in providing adequate sewerage service given among others:

- the status of inherited plants,
- increased hydraulic loading,
- operating beyond the design treatment capacity and
- vandalism,

it must be noted that the NWC undertakes regular maintenance activities as part of its everyday functions in ensuring, as far as possible, proper treatment of sewage at the many facilities within the parish. This undoubtedly minimizes deviation in the treatment process.

With specific reference to the Greater Portmore treatment facility the NWC, has a maintenance contract in place which involves controlling the vegetative growth around and within the ponds. In addition we have, as a one-off gesture in the past, assisted the Portmore Municipality in maintaining a drain in the vicinity of this facility as part of our contribution as a good corporate citizen.

4.0 Proposed Works

The National Water Commission recognizes the need to address the negative impact from poorly treated sewage being discharged into the environment and has therefore been examining possible options to rehabilitate/expand, where possible, a number of its wastewater facilities. This has included engaging NEPA where a number of plants have been identified as being critical in terms of needing improvement works so as to improve the effluent discharge standard. Two options are currently being pursued by the National Water Commission to achieve such works are:

a) K-factor programme
b) CreW fund

The Commission under the Soapberry project, will seek to improve wastewater management in the St. Catherine region.

K-factor Programme

The NWC's k-factor programme arose under the new tariff arrangement effective May 2008, whereby it was recognized that a number of capital projects needed to be undertaken in order for the Commission improve its level of service. To meet this target the Commission is preparing a project document outlining capital works to be undertaken. These include works in both the water and wastewater sectors and the projects identified will address operational issues such as:

- Reducing the non-revenue water
- Extending the sewer network in KSA as well as
- Upgrading/rehabilitating a number of the existing sewer plants.

Included in the list of sewage treatment plants to be rehabilitated under the k-factor programme is the number of treatment plant in the St. Catherine area. These plans are currently being prioritized and works to be carried out finalized. Table 4 shows the preliminary listing of plants and works identified to be carried out.

	Plant Name	Treatment Technology	Proposed Budget /J$	Comments
Priority 1				
	Bridgeport T/P	Contact Stabilization	1,400,000,000.00	Rehab of air-diffuser system for the ntire plant; rehabilitate one of the four tanks. Activate 5th tank
	Horizon Park Treatment Plant	Oxidation Ditch	5,000,000.00	This plant suffers from major flooding which must be corrected for the proper O & M of the facility.
	Independence City T/P	Contact Stabilization	18,000,000.00	A forced air system using inefficient blowers and too much electrical energy. A rehab program should help in some electrical savings, this is however temporary as this facility
	Greater Portmore Ponds Treatment Plant	Ponds	4,000,000.00	This facility is being cleaned and the treatment process is being looked at with the view of improving the effluent produced.
Priority 2				
	Ensom City	Extended Aeration	4,000,000.00	A major overhaul of this facility is needed to ensure an improvement of the effluent being discharged.
	Twickenham Park Treatment Plant	Extended Aeration	3,000,000.00	This facility is slated to be taken out of service and the sewage transferred to a new facility being built to the South West of the present location.
	Hamilton Gardens, Charliemont	Oxidation Ditch	3,000,000.00	Equipment replacement will help in improving the operational integrity and effluent produced
	De La Vega City Sewage Treatment Plant	WSP	10,000,000.00	Major capital expenditure is needed to bring this facility up to the original capacity an acceptable level of O & M management.
Priority 3				
	Eltham Park Treatment Plant	Oxidation Ditch	100,000,000.00	A major upgrade expansion is slated for this facility.

Table 4: Proposed Works for selected WWTP under the K-factor programme

CReW fund

The Caribbean Regional Fund for wastewater (CReW) is being executed under the joint grouping of United Nations Environment Programme (UNEP) and Inter-America Development (IDB) seeking to finance wastewater projects within the Caribbean. Under the fund a 12 year, zero interest loan with a year's grace period, without need for a sovereign guarantee is being extended to the NWC. However, the CReW funds will not be available for lending until early 2010.

Financing under the CReW for the rehabilitation of the Ebonyvale and the Eltham Park Sewage Treatment Plants is being sought. Discussions are currently underway with the relevants persons from the IDB.

	Plant Name	Treatment Technology	Estimated Cost / US$	Comments
	Ebonyvale	Aeration lagoon	620,000	A major overhaul of this facility is needed to ensure an improvement of the effluent being discharged.
	Eltham Park	Oxidation Ditch	1,100,000	A major upgrade expansion is slated for this facility.

Table 5: Plants to be rehabilitate under the CReW fund

Soapberry

The Soapberry sewerage programme is designed to treat the wastewater/sewage generated in Kingston & St. Andrew as well as sections of Portmore, St. Catherine. The programme comprises some three phases.

Soapberry Phase I which was completed in mid 2008 involved:

- The construction of a 18 mgd treatment plant located at Soapberry, St. Catherine;
- Construction of trunk sewers; and
- Retirement of a number of existing sewerage facilities in the Kingston & St. Andrew

Phase II of the Soapberry programme, will involve redirecting flows from the existing Independence City and Bridgeport sewage treatment plants. This will involve decommissioning of both plants and their conversion to pumping/transfer station, as well as laying of trunk sewers to the treatment facility at Soapberry. The wastewater currently discharged to these plants will be pumped to the new Soapberry Ponds for treatment.

The estimated cost for undertaking works for Phase II of the Soapberry project is in the region of US$30 million.