

## **SOLID WASTE MANAGEMENT PROGRAM**

**(BH-0008)**

### **EXECUTIVE SUMMARY**

**BORROWER AND GUARANTOR:** Government of the Commonwealth of the Bahamas

**EXECUTING AGENCY:** Department of Environmental Health Services of the Ministry of Consumers Welfare and Aviation

**AMOUNT AND SOURCE:**

|                            |                     |
|----------------------------|---------------------|
| IDB:                       | US\$23,500,000 (OC) |
| Local counterpart funding: | US\$ 10,000,000     |
| Total:                     | US\$33,500,000      |

**FINANCIAL TERMS AND CONDITIONS:**

|                             |  |
|-----------------------------|--|
| Amortization period:        | 20 years                                       |
| Disbursement period:        | 3.5 years                                      |
| Interest rate:              | variable                                       |
| Inspection and supervision: | 1%   |
| Credit fee:                 | 0.75%  |
| Currency:                   | U.S. dollars from the Single Currency Facility |

**OBJECTIVES:** The objective of the project is to support the GOBH to improve solid waste management services for New Providence and the Family Islands. The improved systems will aim to be efficient, financially sustainable, protect the environment and the standard of public health in the Commonwealth of The Bahamas.

**DESCRIPTION:** The project will consist of the following components: (i) priority investments for disposal facilities at New Providence and ten of the Family Islands: Abaco, Andros, Bimini, Cat Island, Eleuthera, Great Exuma, Grand Bahama, Inagua, Long Island and San Salvador (US\$21 million); (ii) Hazardous waste disposal (US\$600,000); (iii) Institutional support of DEHS and studies (US\$800,000) and; (iv) an environmental health education and awareness program (US\$600,000).

The New Providence disposal system will include two components: (i) The Harrold Road sanitary landfill and; (ii) a yard waste shredding facility. The Family Islands will have 18 modified sanitary landfills and four transfer stations.

A central hazardous waste storage facility will be constructed adjacent to the Harrold Road site. Small hazardous waste containment facilities will be built

at each of the sanitary landfills at the Family Islands.

DEHS will be strengthened in supervisory and financial management. The activities will include technical assistance and training at all levels.

The environmental health education component will educate, inform and increase the awareness of the general public in the following areas: waste generation, storage and containerization, collection scheduling and procedures, litter, illegal dumping, bulky waste materials, backyard composting, waste materials exchange and derelict vehicles.

**PROJECT'S ROLE  
IN THE BANK'S  
COUNTRY AND  
SECTOR STRATEGY:**

The Bank's strategy in The Bahamas is to support the Government's continuing efforts to improve sustained economic growth by improving competitiveness, diversifying the economy, improving intersectoral linkages, and effectively managing the country's environment for sustainable development. As part of the strategy, the Bank supports the necessary environmental regulation of new regulatory framework and policies.

The proposed operation will contribute to the protection of the environment and the improvement of sanitary conditions in the country. By strengthening the role of the public sector in environmental regulation and monitoring, as well as by establishing the mechanisms for cost recovery, the operation will improve the efficiency of the solid waste management system and enhance the preservation of natural resources and health conditions in the islands.

**ENVIRONMENTAL/  
SOCIAL REVIEW:**

The environmental aspects of this project are overwhelmingly positive because benefits are derived from the totality of the program's components. Namely, improved final waste disposal for New Providence with a sanitary land fill, modified landfills in the Family Islands, improved collection, reduction of illicit dumping, initiation of a hazardous waste handling and storage program, improved institutional ability to manage, regulate and monitor the solid waste sector, initiation of derelict vehicle recycling, and educational programs to assist in raising the consciousness of the population for anti-littering, composting and recycling.

**BENEFITS:**

The proposed Program will result in significant environmental and health benefits from improved collection, transportation, disposal and the reduction of littering and illicit dumping. This will lead to a cleaner environment, less water and soil pollution, with a resulting positive impact on quality of life, recreation and health.

From the economic point of view, the benefits of the Program can be measured as foregone damage costs if the Program is not implemented. These are principally: (i) losses in tourist revenue; (ii) costs associated with increasing nuisance associated with overall solid waste mismanagement; (iii) costs associated with health problems; (iv) costs associated with loss of ecosystems; and (v) replacement costs of contaminated groundwater resources.

**RISKS:**

Risk: The institutional capacity of DEHS to fulfill its mandate as the environmental enforcing agency of the GOBH and to maintain responsibility for the New Providence residential collection and disposal services. Mitigating factors: (i) All operating functions within DEHS will be consolidated under a specific unit reporting to the Deputy Director presently responsible for the existing Roads and Parks Division, while separating the supervisory and regulatory functions under a different Deputy Director; (ii) Performance and efficiency indicators for the collection and disposal activities will be implemented and monitored; (iii) DEHS will be strengthened to supervise and monitor the compliance with the operating and environmental standards.

**POVERTY TARGETING:**

This program does not qualify as a poverty targeted investment.

**SPECIAL  
CONTRACTUAL  
CONDITIONS:**

As conditions precedent to first disbursement the Bank will require:

(i) The creation and proper staffing of the Project Executing Unit with a project director, an engineer, a financial officer and an administrative assistant officer (see paragraph 3.2).

(ii) The contracting of the engineering supervision firm (see paragraph 3.4).

Other conditions

(i) Cost recovery. Previous to the awarding of the contract to construct the Harrold Road sanitary

landfill, evidence of the approval of the tipping fees, to cover the cost of operation, maintenance and depreciation of the new disposal facilities (see paragraph 3.15)

(ii) Recognition of local counterpart contribution. The Bank may recognize as part of the local counterpart contribution the equivalent of US\$3.0 million as part of the expenditures in the construction of the disposal facilities at Bimini and North Eleuthera as established in paragraph 3.24 and incurred up to 18 months prior to approval of the loan.

(iii) Efficiency and performance indicators. The results of the efficiency and performance indicators, as well as financial measures taken to defray the cost of the disposal of imported goods shall be shared with the Bank on an annual basis within the 90 days following the end of each calendar year during the period of project execution and for five (5) consecutive years thereafter (see paragraph 3.15). The target value to be achieved by the indicators will be those set in paragraph 3.7. The monitoring of the indicators will be a responsibility of the Director of the DHS, the results will be made available to the public.

**EXCEPTIONS TO BANK** See below.  
**POLICY:**

**PROCUREMENT**  
**METHOD:**

The procurement of works, goods and consulting services will take place in accordance with Bank policy. International competitive bidding will be obligatory for purchases of more than US\$250,000 for goods and services and US\$2.0 million for construction works. Bidding of amounts below these ceilings will take place in accordance with local legislation.

The GOBH has requested the continuation of the services of the consulting firm hired to prepare the pre-feasibility and feasibility studies as the engineering supervision firm of the project. The exception should be granted based upon the considerations presented in paragraph 3.5.

## **I. FRAME OF REFERENCE**

### **A. Macroeconomic aspects**

- 1.1 Generally sound monetary and fiscal policies, together with increased private investor confidence, contributed to a GDP growth of 3% and to an increase in consumer prices of only 0.5% in the Commonwealth of The Bahamas in 1997. Strong growth in construction, driven by public investments and hotel expansions, and in tourism were major forces of the economic expansion. Parallel to this, unemployment rate fell to 9.8% in 1997 from 11.5% in 1996 and official international reserves rose to US\$218 million at the end of the year. The construction boom fueled a surge in the demand for private sector domestic credit, a tightening of bank liquidity and higher imports. The strong growth in foreign exchange demand for imports was offset by higher private capital inflows and the receipts from Government's external bond issue.
- 1.2 There was an improvement in the financial operations of the Central Government in 1997, despite higher growth of capital outlays. The deficit in Central Government finances was reduced to US\$24.2 million from US\$31.9 million in the previous fiscal year. The overall fiscal deficit, which represents around 2% of GDP, was offset by strong growth in savings by the rest of the public sector, resulting in an actual decline in net domestic credit to the public sector. Financing the deficit was almost entirely met from the local financial system. Public debt and debt service remained manageable, with total debt of Central Government representing 35% of GDP. Balance of fiscal accounts is critical to avoid unsustainable consumption demand levels, widen the external current account deficit, and drain external reserves.
- 1.3 Over the medium to long term, maintaining a competitive tourism sector, as the leading sector in a more diversified economy, will depend heavily on appropriate provision of public services and conservation of the countries' natural environment.

### **B. Solid waste management in The Bahamas**

- 1.4 The disperse geography of the country of more than 700 islands with only a few mostly sparsely populated islands and an economy heavily dependent in tourism focused around beaches and the marine environment, present particular challenges for solid waste management, particularly finding appropriate final disposal sites. Bahamians and visitors generate approximately 264,000 tons of solid waste annually. About 77% of this total is generated in New Providence, 17% on Grand Bahama, and the rest in the other Family Islands. The solid waste generated, even on the most lightly populated islands, cannot be transported economically to a regional or a central disposal facility, therefore separate solid waste disposal solutions are needed for each separate island.

- 1.5 Improper solid waste disposal practices have negative effects on both human health and on the aesthetic aspects of the landscape. Another serious threat is pollution of the scarce and valuable water resources of the islands. Lack of appropriate management includes: (1) inappropriate waste disposal practices; (2) inefficient collection and containment and; (3) conflicting objectives embodied within the institutional framework, and weak enforcement of litter laws and regulations.

#### 1. Waste disposal practices

- 1.6 Solid waste generated on New Providence is currently disposed of at the Harrold Road landfill, the only disposal facility of the island. The landfill operated by the Department of Environmental Health Services (DEHS), consists of a 100 acre site with about 45 acres having been utilized since 1972. Many operational and technical problems are present at the site, such as: insufficient and poor quality cover material; minimal compaction of the waste; lack of control of the facility permitting hazardous waste to be indiscriminately dumped; lack of leachate control; and scavenging allowed at the working face.
- 1.7 Despite poor management of the landfill, no appreciable impact on the groundwater from movement of the leachate, due to the hydrologic conditions of the site, has been detected. Impacts are noticed; spontaneous fires occur and birds, domestic animals, rodents, and flies feed on the decomposing organic waste. Uncontrolled scavenging presents both health and safety concerns. There is indiscriminate dumping of trash along roadside and in vacant lots all over the island.
- 1.8 The Family Islands have a proliferation of official and unofficial dump sites, illegal dumping occurs widely. Disposal sites are the responsibility of the Local Boards. The typical model of disposal in all the Family Islands' settlements is to dump, burn and sporadically push the burned material aside to make room for more refuse. Most of the official dump sites do not comply with minimal technical standards and their operation poses a high risk to the health of the inhabitants and causes pollution to the surrounding environment. Many sites are located in marshes, along sea shores, near airports, or near water supply fields and future groundwater-supply reserve lands.
- 1.9 Adequate financial resources are usually not available to properly place, compact and cover the waste and sufficient cover material is lacking in many of the islands. Operating guidelines are not available to assist the Local Boards to properly operate the refuse disposal facilities.

#### 2. Refuse collection

- 1.10 DEHS provides residential and small business refuse collection in New Providence through its Waste Management Division, While most of

the commercial collection is provided by private operators. Out of the 204,000 annual tons collected in New Providence, DEHS collects 59,000 tons, of which, 70% is residential and 30% is commercial. Private contractors haul approximately 145,000 tons of mostly commercial refuse annually, 72% of the total refuse collected. The services provided by DEHS are lacking proper containerization, adequate equipment and equipment management practices.

- 1.11 On all the Family Islands, collection services are contracted out to private contractors by the Local Boards. Population size and special geographic characteristics create unique conditions for each island. Low collection frequency and improper storage and containerization results in fly and insect infestation and odor problems from putrescent garbage.
- 1.12 Waste minimization is a minimal part of current solid waste management practices. Re-use programs are more common than the recycling programs currently operating in the islands. The total waste diverted from the landfill has increased from 4% (7,700 tons) in 1995 to 6% (11,900 tons) in 1996. This trend should continue if the recycling market for these commodities remains strong and if the existing arrangements (preferential shipping rates, back hauling) can be maintained.

### 3. Institutional and regulatory framework

- 1.13 The Environmental Health Services Act of 1987 and the Health Rules provide the regulatory framework for solid waste management in the Commonwealth and the Act establishes overall responsibility under the Ministry of Health. The Department of Environmental Health Services, operating within the Ministry, and under the same Act, assists in carrying out these functions. DEHS has been shifted to the new Ministry of Consumers Welfare and Aviation, and the Act is under review to be amended to reflect this change. DEHS is responsible for collection and disposal of solid waste in New Providence, and the Grand Bahama Port Authority is responsible for collection and disposal of solid waste in Freeport and the central area of Grand Bahama. In the Family Islands the responsibility lies with the Local Governments, with DEHS as advisor, and the Local Boards of works responsible for collection and disposal of refuse.
- 1.14 The Environmental Health Services Act promotes environmental protection in order to ensure human health. It comprises a large set of regulations related to the emission of contaminants to air, water and soil. The Act provides for the establishment of authorized dumps, but makes no provision for design, siting and operation. Collection and transportation of solid waste is generally covered and provisions prohibiting littering are included. However, there is little evidence of enforcement of litter provisions. DEHS's responsibilities include implementing general health measures, as well as protective measures against pollution, environmental monitoring, information dissemination,

research, personnel training in aspects of environmental health, and execution and management of environmental programs.

- 1.15 Although DEHS has been able to respond to the many health related issues that have risen under its existing multidisciplinary mandate, the system has not been able to adapt as well to the expanding needs in the provision of cost effective refuse collection and disposal service to its users on New Providence. Its primary responsibility lies in monitoring environmental performance for health and environmental protection. However, waste collection and disposal services, while only a secondary function, have had major financial implications for the DEHS. In attempting to comply with its diverse responsibilities, encompassing regulatory, supervisory and operational functions, DEHS faces conflicts imbedded within its organizational structure.
- 1.16 Other legislation relevant to solid waste management includes the Local Government Act of 1996 and the Water and Sewer Corporation Act. The latter places water resources use under the control and administration of the government, and creates an authority to oversee water management and protection, the Water and Sewage Corporation. The Water Supplies (Out Islands) Act regulates water management in the Family Islands.

C. Recent government activities

- 1.17 In the past year the Government has made advances in solid waste management. Along with proposing new regulations and amendments to the existing Act, progress has been made in the management of the Harrold Road land fill through the provision of better and more regular cover material which has reduced fires and odor, the improvement of the financial management system in DEHS and the purchase of new collection vehicles. DEHS has also constructed new modified landfills in Bimini and North Eleuthra, is developing recycling agreement with a private firm for the disposal of derelict vehicles, and has developed environmental education curriculum and presented workshops in domestic recycling, composting and litter control.
- 1.18 Cabinet has given DEHS the mandate to finalize the introduction of tipping fees to coincide with the opening of the new sanitary landfill at Harrold Road and has requested that draft regulations for an environmental levy be produced expeditiously for their consideration. The draft has been circulated to relevant Government agencies for comment before being adjusted and sent to Cabinet for a decision. It is anticipated that the matter should reach Cabinet in early 1999 and possible introduction with the July 1999-2000 budget year.
- 1.19 The DEHS is in the process of establishing a comprehensive accounting and financial management system that will provide primary financial accounting functions, as well as enhanced reporting capabilities to facilitate the solid waste management



requirements to be implemented under the project. Implementation of this system will lead to increased efficiency and more effective operational control and management.

- 1.20 The Ministry of Education of the Commonwealth of The Bahamas, in collaboration with the Pan American Health Organization (PAHO) has launched a school-based project on reduction, reuse and recycling of garbage from households and schools. The project involves the development of educational resource materials, training of teachers in the implementation and use of the resource material, provision of educational resource materials to all government schools, and increased public awareness and exposure to the implementation of the 3-R principles (reduce-reuse-recycle). The Ministry of Tourism has also been involved in the promotion of workshops on the environment.

D. Project's role in the Bank's country strategy

- 1.21 The Bank's strategy in The Bahamas is to support the Government's continuing efforts to improve sustained economic growth by improving competitiveness, diversifying the economy, improving intersectoral linkages, and effectively managing the country's environment for sustainable development. As part of the strategy, the Bank supports the necessary environmental regulation of new regulatory framework and policies. The proposed operation will contribute to the protection of the environment and the improvement of sanitary conditions in the country. By strengthening the role of the public sector in environmental regulation and monitoring, as well as by establishing the mechanisms for cost recovery, the operation will improve the efficiency of the solid waste management system and enhance the preservation of natural resources and health conditions in the islands.

E. Experience in the sector

- 1.22 The Bank has no prior experience financing solid waste management in the country. The Bank has financed two short-term technical cooperations, one to assess the presence of potentially toxic chemicals and to recommend adequate means for the collection of residential and commercial waste and the other to improve administrative functioning of DEHS, the government institution responsible for solid waste management. DEHS has been responsible for the preparation of the pre-investment studies of the program financed by the technical cooperation ATN/JF-4727-BH and the PPF 1009/OC-BH.

F. Project design

- 1.23 The proposed integrated solid waste management program will improve the environmental and health conditions of the most populated islands of The Bahamas by addressing the deficiencies in the management of the sector that have led to environmental pollution

and degradation, and threats to the level and quality of human health and of tourism development.

- 1.24 DEHS already plays a key role in being the environmental supervisor of the GOBH. It is proposed that this mandate be strengthened, reinforcing the role of inspection services through giving it expanded powers to inspect and enforce the licensing, approval and regulation of waste discharges to the environment. DEHS will continue providing residential collection services and will be in charge of the operation and maintenance of the new sanitary landfill at Harrold Road. Efficiency and performance indicators will be implemented and monitored to assure the quality and cost of the services provided by DEHS.
- 1.25 In order to fulfill the expanded role of DEHS in environmental control, monitoring and enforcement, expansion of its capacity will be necessary, particularly in the Family Islands. Qualified health inspectors will be hired to work at the Family Islands. These staff will be essential in monitoring solid waste disposal and for health inspection support for Local Boards.
- 1.26 The GOBH will implement a derelict vehicle recovery program consisting of a team to patrol the islands, monitor areas where vehicles are typically abandoned, and ensure processing and subsequent removal and exportation of the hulks. The removal would be contracted to local trucking companies to deliver the vehicles to licensed scrap auto dealers.
- 1.27 Environmental health education and community awareness will be an important part of the proposed strategy. It would include a broad campaign directed to Bahamians and visitors. Better compliance with litter laws will also be enforced.

## II. THE PROJECT

### A. Purpose

- 2.1 The objective of the project is to support the GOBH to improve the solid waste management services for New Providence and the Family Islands. The improved systems will aim to be efficient, financially sustainable, protect the environment and the standard of public health in the Commonwealth of the Bahamas.

### B. Description of the project

- 2.2 The project will consist of the following components: (1) priority investments for disposal facilities at New Providence and ten of the Family Islands: Abaco, Andros, Bimini, Cat Island, Eleuthera, Great Exuma, Grand Bahama, Inagua, Long Island and San Salvador; (2) Hazardous waste disposal; (3) Institutional support of DEHS and studies; and (4) an environmental health education and awareness program.

#### 1. Investments for disposal facilities

##### a. Disposal facilities at New Providence

- 2.3 The New Providence general waste disposal system includes the following two components: (i) The Harrold Road sanitary landfill; (ii) a yard waste Shredding facility.

##### (i) The Harrold Road landfill (US\$8.2 million)

- 2.4 The bioreactive sanitary landfill consist of 5 cells, each with an expected life span of approximately four years, the first two cells will be develop as part of the proposed program. The landfill covers an area of 135 acres. It will keep a total of 4.5 million tons of refuse for the 20 years design period with a total landfill volume of 7.9 million cubic yards, including cover material. The liner system is a 60 mil, High Density Polyethylene (HDPE) geomembrane with a double layer installed under lecheate collection trenches. The lecheate collection system will drain by gravity to a sump located on the east side of the landfill. The lecheate will be recirculated to direct application at the working phase. A 100 foot wide strip between the buffer zone and the landfill cells has been incorporated into the design to accommodate perimeter drainage, access and cover material stockpiling.
- 2.5 The main works will include: access road, office building, weigh scale, workshop building, perimeter fencing, groundwater monitoring wells. In addition, works for the first two cells include excavation of 950,000 cubic yards of material, base layer underliner installation, geomembrane liner (448,000 square yards) installation, sand lecheate collection layer and lecheate collection piping.

- 2.6 The equipment includes a landfill compactor, a tracked loader, a water tanker truck and a pick-up truck.

(ii) Yard waste shredding facility

- 2.7 A yard waste shredding facility will be financed, constructed and operated at the Harrold Road site. The facility will require 2.5 acres, it will include a receiving, processing and storage area of approximately 2,000 square yards, a Vermeer type shredder and a wheeled loader. Capital costs are estimated at US\$446,000. The shredder will provide additional cover material for the landfill, landfill airspace savings of up to 10% and low cost high quality feedstock for other composting programs.

b. Disposal facilities on The Family Islands (US\$12.8 million)

- 2.8 Eighteen modified sanitary landfills will be constructed on ten Family Islands. The modified landfills are engineered sanitary landfills with a reduced frequency of cover and compaction, due to the small size of the facilities. The majority of the landfills will be excavated cell/trenches mode, with cut material from successive trenches used for cover material. The bottom of the fill area and trench walls will be sealed with hot bituminous material. Lecheate will be collected and conveyed to bituminous-sealed recycling/evaporation ponds. Four low cost transfer stations will be constructed for Abaco, Eleuthera and Long Island. Annex 2.1 presents a summary of the proposed system.
- 2.9 The main works at the modified sanitary landfills include: site clearing, base excavation, access roads, storm water collection systems, perimeter fencing, storage buildings, chipper, lecheate collection piping, and bituminous treatment.

2. Hazardous waste disposal (US\$600,000)

- 2.10 A hazardous waste storage facility for the Bahamas will be constructed adjacent to the Harrold Road landfill site. The facility will provide eight bays for storage of hazardous waste and one bay for staging and processing the material. The storage bays will be 36 by 32 feet and 14 feet high, in order to accommodate a maximum of 30 standard, 52-inch barrel, HDPE pallets equipped with spill containment reservoirs. The walls and floor surfaces will be finished with a continuous impact and acid resistant coating. The facility will be equipped with an above-ground loading and unloading dock.
- 2.11 The main works will include a concrete slab, the building sumps and drains, monitoring system, laboratory equipment, fence and gates.
- 2.12 At The Family Islands simple facilities will be constructed, one at each landfill site. Prefabricated "poly-Safety Pack-Plus" equipment will be used within small shelters in fenced sites.

3. Institutional support of DEHS and studies (US\$800,000)

a. Institutional support of DEHS

- 2.13 DEHS will be strengthened in supervisory and financial management. The activities include: (i) technical assistance in: design and assessment of refuse collection routing; supervision of sanitary landfills; engineering designs and contract documents preparation; inspection and enforcement of licenses and permits; and environmental monitoring; (ii) training of inspectors, professionals and managers in technical and operational aspects of solid waste management.
- 2.14 The technical assistance will be provided by international consultants. The scope and terms of reference are in the technical files of the project. Also included is formal training in solid waste management, assistance for short courses, and participation of ten individuals in on-the-job training for up to three months with reputable solid waste management operators.

b. Studies

- 2.15 To improve the collection and containment of refuse in New Providence, an in-depth micro-routing study will be contracted to optimize routing structure, schedules and containment procedures. The goal is to maximize the efficiency of refuse collection, separate the material for yard waste shredding and composting purposes, provide a once-per-week minimum collection to every household and facilitate the separation of recyclables at the source. DEHS will implement the recommendations to optimize the collection routes of the residential areas with its own resources following the findings of the study.
- 2.16 After the new operational structure is in place and real costs are known, a study will be contracted to review the effectiveness of the implemented financial mechanisms.

4. Environmental health education and awareness (US\$600,000)

- 2.17 This component's goal is to educate, inform and increase the awareness of the general public in the following areas: waste generation, storage and containerization, collection schedule and procedures, litter, illegal dumping, bulky waste materials, backyard composting, waste materials exchange and derelict vehicles. The activities to be carried out include: (i) public education through media campaigns, printed material and seminars; (ii) technical assistance at the community level for backyard composting; (iii) community clean-up programs; and (iv) school age environmental contests.
- 2.18 Activities within the community will include warning signs, optional depositories such as permanent and temporary litter barrels in public spaces or skips at dump sites, and drop-off

depots for recyclables. The enforcement programs will deter would-be dumpers with the enforcement of existing litter law.

C. Cost and financing

- 2.19 The cost have been based upon final construction designs and operational manuals for the Harrold Road landfill, a conceptual design for the hazardous waste storage facility and prototype designs for the smaller modified sanitary landfills at the Family Islands presented by the international engineering firm contracted with resources of the PPF 1009/OC-BH. The cost of the studies, the environmental health education and institutional strengthening were based upon unit costs and amounts and levels of effort defined by the feasibility studies. All cost are referred to March of 1998.
- 2.20 The total cost of the project is estimated at US\$33.5 million equivalent, of which the bank will finance up to US\$23.5 million equivalent, or 70% of the total project cost. In addition to the Bank financing, the GOBH would finance the local counterpart of US\$10.0 million equivalent. The following table shows the components contributing to the cost of the project.

| COST AND FINANCING<br>(US\$ thousands) |        |        |        |       |
|--|--------|--------|--------|-------|
| CATEGORIES                             | IDB    | LOCAL  | TOTAL  | %     |
| I. ENGINEERING                         | 1,800  | 850    | 2,650  | 7,9   |
| 1.1 Engineering                        | 1,800  |        | 1,800  | 5,4   |
| 1.2 administration                     |        | 850    | 850    | 2,5   |
| II. DIRECT COST                        | 16,700 | 6,300  | 23,000 | 68,7  |
| 2.1 Disposal facilities                | 14,700 | 6,300  | 21,000 | 62,7  |
| 2.2 Hazardous waste                    | 600    |        | 600    | 1,8   |
| 2.3 Institutional Strengthening        | 800    |        | 800    | 2,4   |
| 2.4 Environmental Awareness            | 600    |        | 600    | 1,8   |
| III. RECURRENT COST                    |        | 2,000  | 2,000  | 5,6   |
| 3.1 Inspectors                         |        | 2,000  | 2,000  | 5,6   |
| SUBTOTAL                               | 18,500 | 9,150  | 27,650 | 82,5  |
| IV. FINANCIAL COST                     | 2,835  | 176    | 3,011  | 9,0   |
| 4.1 Interests                          | 2,600  | 0      | 2,600  | 7,8   |
| 4.2 Commitment fee                     | 0      | 176    | 176    | 0,5   |
| 4.3 FIV                                | 235    | 0      | 235    | 0,7   |
| V. UNALLOCATED COST                    | 2,165  | 679    | 2,839  | 8,5   |
| 5.1 Escalation                         | 450    | 300    | 750    | 2,2   |
| 5.2 Contingencies                      | 1,715  | 374    | 2,089  | 6,2   |
| TOTAL                                  | 23,500 | 10,000 | 33,500 | 100,0 |
| PERCENTAGE                             | 70     | 30     | 100    |       |

2.21 Terms of financing. Financing will be from Ordinary Capital, for disbursement in US dollars from the single currency option available pursuant to bank policy. The following terms would apply to the proposed loan: (i) variable interest rate; (ii) 0.75% credit fee; (iii) 1% inspection and supervision fee; (iv) 3.5 year disbursement period; (v) 3 year grace period; and (vi) 20-years amortization period.

### III. EXECUTION OF THE PROJECT

#### A. Executing agency

- 3.1 The Department of Environmental Health Services (DEHS) of the Ministry of Consumers Welfare and Aviation will be the executing agency for the project. A Project Executing Unit will be created within DEHS. A Project Director will head the PEU and will be supported by a project engineer who would liaise directly with the consulting firm for engineering supervision. The PEU will also be supported by a qualified financial officer for financial and accounting management of the project and an administrative assistant for day-to-day office management. The organization of the PEU would remain unchanged for the execution of the project. DEHS will assign two additional staff to coordinate the training and the educational and community awareness components.
- 3.2 The creation of the PEU and the required staffing, the Project Director, engineer, administrator and the finance officer, will be a condition prior to first disbursement.
- 3.3 The PEU will be responsible for the administration of the loan and will collaborate with the other areas of DEHS, which will receive institutional strengthening.
- 3.4 An engineering firm will be contracted to supervise the construction of the Harrold Road sanitary landfill and related facilities and the 18 modified sanitary landfills at the Family Islands. The main responsibilities of the firm will be: to assist the PEU in administering the construction contracts; provide technical support and guidance to the PEU and the contractors; and verify the compliancy with engineering designs and standards. A resident manager will be responsible for the daily operations and will be the liaison with the PEU. The contracting of this firm will be a condition prior to first disbursement.
- 3.5 The GOBH has requested the continuation of the services of Stanley International Inc., the consulting firm hired to prepare the pre-feasibility and feasibility studies, as the engineering supervision firm of the project. The exception should be granted based upon the following considerations: (i) Stanley was selected as a very clear winner in the open bidding process to select a company for the first phase (pre-feasibility studies) financed by the Bank with resources from the ATN/JF/4727/BH and later contracted to prepare the feasibility studies with resources from the PPF-BH-0003/OC; (ii) It has completed all the studies on time and within budget. The reports have been considered very good and has been accepted by the GOBH and the Bank; (iii) The knowledge of the Bahamas and the project experience accumulated by Stanley gives them a distinct advantage in the engineering supervision of the project.



B. Mechanisms for execution of the project

- 3.6 In addition to the establishment and proper function of the PEU within the structure of DEHS, some institutional adjustments will be implemented to effectively manage the solid waste activities in the Bahamas. DEHS will maintain the overall responsibility for the program, its regulatory and supervisory functions will be strengthened. DEHS will continue providing collection services to residential costumers and will be in charge of the operation and maintenance of the sanitary land fill at Harrold Road.
- 3.7 In order to assure the quality and cost of the services to be provided by DEHS, efficiency and performance indicators will be adopted, monitored and reported to the Bank as part of the yearly progress reports. These indicators will be: 1) increase existing loader productivity rate from 28 pounds/man-minute to at least 50 pounds/man-minutes; 2) collection trucks fully loaded before traveling to the landfill with a target of at least two truck-loads per day; 3) a target of 750 kg/m<sup>3</sup> of compact waste density (CWD) will be set for the Harrold Road landfill; 4) mandatory compliance with environmental standards as specified in the operational manuals; and 5) Reduce the number of complaints by 20 percent by the end of the execution of the project. Additional indicators may be presented as part of the first year report and will be reported thereafter. The monitoring of the indicators will be a responsibility of the Director of the DEHS, the results will be made available to the public.
- 3.8 The recommended organizational realignment and structure of DEHS is presented in Annex III-1. All operational aspects will be under the responsibility of a Deputy Director, mainly Refuse Collection and Disposal as well as Roads and Parks, as two different Divisions. The regulatory and inspectorate role will be under a different Deputy Director with three Divisions Health Inspectorate, Technical Support and Administrative Support. The Health Inspectorate will provide support to the Local Boards at the Family Islands.
- 3.9 DEHS will be responsible for the initial development of the Family Islands waste disposal and transfer facilities. This will include the supervision of the contracts for the construction of the facilities. Upon completion of the works, ownership of the facilities will be vested with the respective local government District Councils. The DEHS Health Inspectors will monitor and enforce environmental health and solid waste management operations in the Family Islands.
- 3.10 Construction of the disposal facilities at Bimini and North Eleuthera were contracted in June 1997, completed in December 1997, and the sites are in operation. The international consulting firm contracted to assess the feasibility of the program supervised the construction of the landfills and transfer station. The construction of the remaining works, i.e. the New Providence landfill and related works, the solid waste facilities in the other

Family Islands, and the hazardous waste treatment and storage facilities, will be contracted following Bank procedures.

- 3.11 At the Family Islands, the private sector will continue operating the disposal facilities through management contracts. Local contractors will be selected through a competitive process for the operation and maintenance of the new disposal facilities. The project team has reviewed and approved the tender documents to carry out the local competitive process.
- 3.12 Consulting firms will be contracted to execute the environmental health education and public awareness activities, as well as the studies of the institutional strengthening component, and financial mechanisms under the supervision of DEHS. Once the financial mechanisms study is completed the GOBH will submit to the Bank an action plan based on the results of that study.
- 3.13 The execution of the institutional strengthening activities will be phased to ensure that DEHS is adequately prepared to supervise and monitor the disposal operations once they begin. The DEHS will submit, to the Bank, a final revised program for environmental education, waste reduction activities, and a final detailed list of the institutional strengthening activities as a condition prior to the disbursement of the component.
- 3.14 In order to improve the collection system and to achieve success in implementing the collection beat design an improved collection plan will be implemented by DEHS. The new plan will include: (i) standardization of existing waste containers; (ii) collection only from the curb; (iii) full loading of collection vehicles before traveling to the landfill; (iv) upgrading of collection equipment and; (v) incentives to attain higher productivity.
- 3.15 In order to obtain the quality of service required, improve efficiency levels and to achieve the financial sustainability of the proposed system, the government will assume the following commitments to be established: (1) Before the awarding of the contract to construct the sanitary landfill at Harold Road, evidence of the approval of tipping fees to cover the cost of operation, maintenance and depreciation of the new disposal facilities; (2) The results of the monitoring of the efficiency and performance indicators described in paragraph 3.7, as well as the financial measures taken to defray the cost of the disposal of imported goods, shall be shared with the Bank on an annual basis within the 90 days following the end of each calendar year during the period of project execution and for five (5) consecutive years thereafter.

C. Implementation schedule

- 3.16 Implementation includes the execution of seven contracts for construction of physical works for the following facilities: (i) the first stage of the sanitary landfill at Harrold Road and

ancillary works; and (ii) the construction of 18 modified sanitary landfills and four transfer stations at the Family Islands, six local contracts.

- 3.17 The GOBH has already initiated the tender process with an invitation for pre-qualification of contractors having been published. The short-list of firms has been submitted to the Bank and approved by the Country Office. The selection process will be carried out during the first quarter of 1999. Works are schedule to start during the second quarter of 1999.
- 3.18 In addition to the physical works, other activities to be financed include: (i) purchase of equipment for the operation of the Harrold Road landfill; (ii) consultancy for the feasibility studies contracted under the PPF 1009/OC-BH; (iii) environmental health education and community awareness campaigns; and (iv) institutional strengthening of DEHS. Annex III-2 presents a tentative timetable of the calls for bids and the estimate accounts involved.

D. Procurement

- 3.19 Bank procedures will apply in the procurement of works, goods and consulting services. International competitive bidding will be obligatory for purchases of more than US\$250,000 for procurement of goods and related services and US\$2.0 million for construction works. The bidding of amounts below these ceilings will take place in accordance with local legislation. The Bank's procedures for international public bidding, which include pre-qualification, will be followed for the selection of the contractor for construction of the Harrold Road landfill.

E. Execution period and investment schedule

- 3.20 The estimated execution of the project will be three years from the date of the loan contract signing. The following table presents a summary of the projected disbursement schedule, indicating the sources of financing. Investments in the first year after loan signature include recognition of local counterpart contribution of approximately US\$3.0 million to cover the cost. Final designs and bidding documents are ready for all the facilities.

| INVESTMENT SCHEDULE<br>Direct cost (US\$000) |      |       |       |    |
|--|------|-------|-------|----|
| YEAR   | IDB  | LOCAL | TOTAL | %  |
| 1  | 11.5 | 4.5   | 15.0  | 55 |
| 2  | 3.7  | 2.3   | 6.0   | 22 |
| 3  | 3.2  | 2.85  | 6.05  | 23 |
| TOTAL  | 18.0 | 9.65  | 27.65 |    |

F. Land acquisition

- 3.21 DEHS is the owner of the property on which the Harrold Road landfill will be constructed. However, it will be necessary to acquire land for the sanitary landfills and transfer stations on some of The Family Islands. Given the very small amount of land required and the provisions of Bahamian law which permit compulsory land acquisition for public use, no problems are expected in this regard. In keeping with the Bank's policy, before issuing calls for bids on works, the borrower will have to demonstrate to the Bank that it holds legal title to the lands on which the works are to be constructed. The purchase price of the land is included in the project cost and will be financed from counterpart funds.

G. Maintenance

- 3.22 The availability of adequate resources, including trained personnel to supervise and monitor the operations, is critical for implementation of a proper collection and disposal system. The project provides resources for institutional strengthening through financing of personnel. Within the first quarter of each year, beginning with the fiscal year after which the facilities are constructed and for five consecutive years, the DEHS would submit to the Bank, in a format to be agreed upon, a report explaining that the facilities are maintained in accordance with the maintenance requirements specified in the operation and maintenance contract with the private operators.

H. Retroactive financing

- 3.23 As part of project preparation, the equivalent of US\$800,000 was provided through a PPF loan to finance the feasibility and design studies of the solid waste management program. The first disbursement under the loan should include the amount spent from the PPF 1009/OC/BH, up to US\$800,000 maximum.
- 3.24 The selection process for the construction contractor for the Bimini landfill and North Eleuthera landfill and transfer station, was supervised by the Country Office to ensure that local procedures for competitive bidding were followed. It is proposed that, the Bank recognize, as part of the local counterpart contribution, the equivalent of US\$3.0 million as part of the cost of construction of these facilities, if the cost were incurred within 18 months prior to approval of the loan.

I. Supervision of the project

- 3.25 The Country Office in The Bahamas will be responsible for supervising the project. The Bank will establish inspection procedures so as to ensure satisfactory completion and verify compliance with agreed measures for environmental monitoring as part of the annual reports. The amount of US\$228,000 from the financing will be credited to the Bank's accounts to defray

expenses for inspection and supervision. The Logical Framework of the project presents the indicators to be used during the supervision of the execution. (See Annex III-3).

J. Environmental aspects

3.26 Environmental and social issues and the environmental feasibility of the project have been considered in the overall waste management program, in the original scoping for the site at Harrold Road, and as part of the selection process for the modified landfills on the Family Islands. The Phase I pre-feasibility studies produced an Initial Environmental Evaluation, a scoping exercise, in June, 1996. An in-depth Environmental Impact Assessment was completed as part of the Phase II feasibility studies in December 1997 and included social-cultural issues. Results of the EIA have been used to design the Harrold Road facility and to develop avoidance and mitigatory measures for negative impacts during construction and operation of the landfill. Operational guidelines are being prepared for the land fill, hazardous waste handling and storage, and the modified sanitary landfills on the Family Islands.

3.27 Consultations have been carried out with government officials in DEHS, Forestry, Education, Agriculture, Public Works, the Local Boards of Works and The Bahamas Environmental, Science and Technology Commission; with NGOs - The Bahamas National Trust and The Bahamas National Pride Association; and with people living in the area of the landfills and dumps. A public hearing on the landfill was conducted by DEHS in Nassau on March 23, 1998.

1. Beneficial impacts

3.28 The environmental aspects of this project are overwhelmingly positive because benefits are derived from the totality of the program's components, namely, improved final waste disposal for New Providence as a high technology sanitary land fill, modified landfills in the Family Islands, improved collection, reduction of illicit dumping, initiation of a hazardous waste handling and storage program, improved institutional ability to manage, regulate and monitor the solid waste sector, initiation of derelict vehicle recycling, and educational programs to assist in raising the consciousness of the population for anti-littering, composting and recycling.

2. Actual and potential negative impacts

a. New Providence

3.29 The actual and potential negative impacts will be minor and most environmental and social impacts will be avoidable and/or ameliorable. A program for environmental protection and mitigation and another for monitoring the effectiveness of the mitigation program have been prepared. These are detailed in the Environmental and Social Impacts Report.

- 3.30 The landfill at Harrold Road will take a 75 acre natural Caribbean pine stand with some mixed scrub, secondary vegetation - an unavoidable but not significant loss because of the extensive pine areas on New Providence Island. The amount of adverse visual impact of the new landfill will be minimal because of the natural pine barrier on three sides and the existing dump on the south. The old site will be covered and barrier of trees planted to complement those that are already growing naturally on the site will provide a visual barrier on the south. The 1500 ft setback of the landfill from the nearest institution/habitation will provide an adequate barrier.
- 3.31 Landfill leachate is of concern, with ground water so close to the surface at the site. Even though ground water quality tests in and around the present site do not indicate significant quantities of leachate in the surrounding ground water, a synthetic liner will be installed with leachate collection, recycling and safe disposal in an existing septage system.
- 3.32 A venting system will be installed to remove landfill gas, primarily methane, that will be produced through the microbial decomposition of the organic waste in the landfill. This will prevent fires that can occur from gas building up in pockets under the surface of the compacted waste. Odor from landfills is a product of garbage decomposition and the lack of daily cover over the active, open garbage face. If sufficient cover material is applied regularly, odor will not be a problem. Because of the number of residences that currently exist and the rate at which new houses are being built in the area, proper cover and maintenance is essential to prevent odor problems.
- 3.33 Dust is generated by machinery operating on the site and from vehicles bringing waste for disposal. Limiting access to the site and wetting road surfaces will easily control fugitive dust. Noise from bulldozers, trucks and from the organic waste shredding plant may be a problem. The barrier of trees around the site will help dampen the noise level. Operators at the shredding plant will wear ear protection.

b. The Family Islands

- 3.34 There will be a loss of mainly secondary growth forest ecosystems of no more than seven acres for any of the Family Island modified landfill sites. The landfills are primarily below ground and in isolated areas usually surrounded by trees; they will not present a visual problem.
- 3.35 Leachate from the landfills will be collected in the bottom of the cell/trench and gravity-fed to a treatment pond for evaporation and recycling. Although isolated from population centers, the landfill sites could have odor problems if cover is not applied at least weekly. The light use of the facilities is not expected to result in dust problems.

- 3.36 Transfer stations are potential sources of odor, can contaminate water and be unsightly if not properly operated. The stations will have closed containers and garbage compactors and will be fenced to prevent improper dumping.

c. Hazardous waste

- 3.37 Although there is little seriously toxic or hazardous waste produced in The Bahamas, care must be taken in handling and storing hazardous material. This waste will be transported to a central storage area at the Harrold Road landfill. Training in hazardous waste handling and storage will be conducted and the storage facilities will have approved storage containers and pallets and will be fenced.

3. Mitigation plan

- 3.38 A mitigation plan which will include the following will be implemented:
- a. Ground and surface water quality control, through leachate and runoff control.
  - b. Landfill gas will be vented to the atmosphere to prevent build up within the landfill and potential explosion or fire.
  - c. Aesthetic considerations were followed by locating the new landfill out of public sight, a 200 feet wide vegetation barrier will be located at the south side.
  - d. Landfill gas and water quality monitoring programs have been developed to regularly sample and analyze landfill gas, ground-water, leachate and surface water.
  - e. Strengthening of the DEHS is provided and is aimed at assuring good operations for the facilities and the program and improve regulatory control.

#### IV. THE BORROWER AND THE EXECUTING AGENCY

- 4.1 The borrower will be the Commonwealth of The Bahamas and the executing agency the Department of Environmental Health Services (DEHS) through a Project Executing Unit (PEU).
- A. The executing agency
- 4.2 The DEHS is a statutory body of the Government of The Bahamas which, under the provisions of the Environmental Health Services Act (1987), assists the Ministry of Health and Environment in promoting and protecting the public health and ensuring and providing for the conservation and maintenance of the environment. Since April 1997, ministerial responsibility for the DEHS was shifted from the Minister of Health and the Environment to the Minister of Consumer Welfare and Aviation. Legislation is under review to reflect this change, although it has already been concluded that only minor amendments and up-dating to the existing legislation and regulation would be needed.
- 4.3 The DEHS is charged with a number of different responsibilities in the following areas: the management and disposal of solid, liquid and gaseous wastes, food and drinks management, control of nuisances, rodents, insect pests, and general sanitation.
- 4.4 The DEHS has a Director, who is responsible for the department's overall management, and is organized in three divisions:
- a. Solid Waste Management Division - responsible for the collection and disposal of solid waste on New Providence.
  - b. Environmental Sanitation and Consumer Protection Division - responsible for sanitation inspection of residential and commercial premises, law and regulation enforcement and vector control.
  - c. Environmental Monitoring and Risk Assessment Division - responsible for sampling and analysis of drinking water, imported food, manufactured and restaurant prepared food, bottled water, soft drink supplies, water quality near the beaches, any other necessary environmental monitoring, and review of industrial or commercial environmental impact assessments submitted to the department.
- 4.5 As a result from the shifting of ministries, DEHS has also been given responsibility for the Roads and Parks Division, formerly part of the Ministry of Public Works. This change has not had major implications for the environmental and waste management functions of the DEHS.
- 4.6 DEHS has about 900 employees, of which about 100 are relief workers that are employed only when required. The Solid Waste Management



Division employs about 23% of the personnel, the Environmental Sanitation and Consumer Protection Division 10%, the Environmental Monitoring and Risk Assessment Division less than 2% and the Roads and Parks Division the remaining 65%.

- 4.7 About 12% of the commercial refuse collection service in New Providence is provided directly by the DEHS. However the department does not wish to continue commercial refuse collection and will phase-out this services by not renewing the contracts with their present customers, mostly small businesses.
- 4.8 DEHS provides refuse collection service in New Providence for all residential customers and operates the existing landfill at Harrold Road. It is estimated that collection costs in New Providence with the existing fleet, equipment type and operation practices are three or more times more costly than in North America cities and provide no better service.
- 4.9 Other providers for collection service are (i) the private sector, responsible for the remaining 88% of the commercial refuse collection in New Providence; (ii) the Bahamas Port Authority which has subcontracted to the private sector the refuse collection and the disposal in central Grand Bahama; and (iii) the Department of Local Government in the other areas of Grand Bahama and the other Family Islands, also through contracts with the private sector.
- 4.10 DEHS may charge fees for any of its functions under the Environmental Health Services Act. The fees, charges and the terms and conditions under which such fees should be paid are subject to the Regulations prescribed by the Minister and approved by Parliament, as are policies and annual budgets.

B. Financial analysis of DEHS

- 4.11 DEHS, as a statutory body of the Government of The Bahamas, is governed by special financial and audit rules. All accounts, records and financial procedures must be in accordance with the Financial Administration and Audit Act and with the Financial Regulations. DEHS does not have financial autonomy in key matters and all transactions are controlled by the Ministry of Finance. The treasury plays the role of internal auditor and is responsible for all payments on behalf of DEHS.
- 4.12 One year budgetary allocations to DEHS are the main source of financing for the department's activities. Amounts approved are allocated twice a year, January and July, in equal installments. The expenses budgeted by DEHS during the past four fiscal years have had an average rate of increase of 2.6% per year, and the total budget -which includes capital expenses and revenues- has had an increase of 11% in the last year, after being practically the same for three years. The actual spending of DEHS during this period has been well within limits of the estimated budget which

indicates a financial policy mainly directed to towards compliance with budget availability.

- 4.13 Although DEHS charges commercial customers for their refuse collection, revenues are below the costs of this service, and the collection rate is just slightly above 50%. The total amount billed during fiscal year 1996/1997 was B\$342.6 thousands, and collections for the same period were B\$187.93 thousands.
- 4.14 The following table presents a summary of the financial performance of DEHS in the past four fiscal years. Personnel costs represent about 70% of the total costs for the department and the Solid Waste Management Division accounts for nearly 60% of this same total. It should be noted that the costs presented in the following table refer exclusively to the activities currently carried out by DEHS. All additional costs originated by the new facilities and activities to be financed by the program, as well as the revenues to fund such activities are analyzed as part of the financial viability of the program in Chapter V.

|                                     | 1993/1994      | 1994/1995      | 1995/1996      | 1996/1997      |
|-------------------------------------|----------------|----------------|----------------|----------------|
| <b>Salaries, wages and benefits</b> | <b>5192.88</b> | <b>5273.68</b> | <b>5357.28</b> | <b>5503.33</b> |
| Director's office                   | 318.80         | 305.59         | 261.70         | 268.84         |
| Solid Waste                         | 3154.82        | 3154.49        | 2923.20        | 3002.89        |
| Health Inspectorate Sanitation      | 1458.74        | 1535.39        | 1777.28        | 1825.73        |
| Public Analyst Laboratory           | 260.52         | 278.20         | 395.10         | 405.87         |
| <b>Maintenance</b>                  | <b>876.34</b>  | <b>638.97</b>  | <b>652.53</b>  | <b>648.46</b>  |
| Director's office                   | 30.17          | 27.73          | 9.09           | 7.05           |
| Solid Waste                         | 798.32         | 564.17         | 623.25         | 614.26         |
| Health Inspectorate Sanitation      | 28.73          | 26.68          | 8.53           | 11.79          |
| Public Analyst Laboratory           | 20.10          | 20.39          | 11.66          | 15.36          |
| <b>Supplies and materials</b>       | <b>569.74</b>  | <b>622.60</b>  | <b>498.45</b>  | <b>491.08</b>  |
| Director's office                   | 23.49          | 25.67          | 35.58          | 24.42          |
| Solid Waste                         | 465.92         | 509.15         | 387.52         | 378.65         |
| Health Inspectorate Sanitation      | 65.69          | 71.79          | 40.01          | 49.77          |
| Public Analyst Laboratory           | 14.63          | 15.99          | 35.34          | 38.24          |
| <b>Contractual services</b>         | <b>990.69</b>  | <b>471.99</b>  | <b>473.54</b>  | <b>911.33</b>  |
| Director's office                   | 12.59          | 6.00           | 14.27          | 14.27          |
| Solid Waste                         | 828.00         | 309.16         | 167.47         | 608.51         |
| Health Inspectorate Sanitation      | 333.72         | 102.11         | 260.94         | 257.69         |
| Public Analyst Laboratory           | 174.55         | 54.72          | 30.86          | 30.86          |
| <b>Other</b>                        | <b>279.21</b>  | <b>290.09</b>  | <b>327.09</b>  | <b>369.66</b>  |
| Director's office                   | 72.83          | 78.70          | 84.44          | 87.28          |
| Solid Waste                         | 38.27          | 35.57          | 75.42          | 66.95          |
| Health Inspectorate Sanitation      | 153.54         | 160.32         | 156.43         | 200.47         |
| Public Analyst Laboratory           | 14.57          | 15.50          | 10.80          | 14.96          |
| <b>TOTAL EXPENDITURE</b>            | <b>7908.86</b> | <b>7297.33</b> | <b>7308.89</b> | <b>7923.86</b> |
| Director's office                   | 457.88         | 443.69         | 405.08         | 401.86         |
| Solid Waste                         | 5285.33        | 4572.54        | 4176.86        | 4671.26        |
| Health Inspectorate Sanitation      | 2040.43        | 1896.29        | 2243.19        | 2345.45        |
| Public Analyst Laboratory           | 484.37         | 384.80         | 483.76         | 505.29         |

- 4.15 DEHS has no autonomy to budget for buildings, equipment and vehicles by annual provisions. Therefore, expenditures that are

important for optimizing costs of service are simply deferred at the expense of service and the environment. Also, DEHS does not record costs like capital costs, inventory, insurance and in general any other costs of material or services provided by some other government department. Consequently, the costs of providing the services shown above are understated.

C. Changes in DEHS' role

- 4.16 The current role of DEHS is the direct operation of most of the solid waste system in New Providence. As a result of this program, the private sector will provide : (i) the collection of the remaining percentage of commercial refuse; (ii) the construction and operation of all the facilities at the Family islands that are being added to the system; and (iii) the transport of hazardous waste and management of the derelict vehicles program. The reasons for not giving private sector a higher participation are the government concerns about the existence of a monopoly and a strategy of having a ready backup capability to enforce collection requirements in case of an emergency.
- 4.17 DEHS will be responsible for the initial development of these facilities including their design and engineering, as well as the development and supervision of the operation contracts. In the case of the Family Islands landfills and transfer stations, upon completion of works ownership will be vested with the respective local government District Councils. DEHS will be in charge of the operation and maintenance of the Harrold Road landfill, retain control of the weight-bridge at the landfill and will control revenues from tipping fees.
- 4.18 Although no significant changes in the organizational structure of DEHS that now exists is envisioned, DEHS will require technical resources to strengthen the Solid Waste Management Division and the Environmental Sanitation and Consumer Protection Division. This change is part of the institutional support component of the program.
- 4.19 As a part of this new role, DEHS is acquiring a new financial management system that includes a new general ledger with budgeting and reporting capabilities, inventory control, and accounts receivable and payable modules. This new system is needed to provide proper cost accounting and management information, as well as cost recovery mechanisms, for the new solid waste management system. It is expected to be fully operational by January 30, 1999.

## V. VIABILITY AND RISKS

### A. Technical and environmental justification

- 5.1 The proposed integrated solid waste management program supports to the technically and environmentally viable minimum cost solution for the safe final disposal in New Providence and ten Family Islands over a 20 year project life. The program will provide an adequate level of protection for both human health and environment through the best engineering design and sound operation procedures. An assessment of technological alternatives was performed during the pre-investment studies. An engineered sanitary landfill was recommended as preferred option for New Providence, and modified sanitary landfills with transfer systems for the Family Islands.
- 5.2 The siting of the landfills was carefully scrutinized and included technical, environmental, social and economic criteria. On New Providence, three areas were identified for potential landfill sites. All were assessed, and the expansion of the existing Harrold Road site selected as the most appropriate for long term waste disposal. Further studies at the feasibility level confirmed the site as the preferred option. For the Family Islands, landfilling versus incineration was assessed. The modified sanitary landfill was chosen after strict regional guidelines for landfill siting were applied.
- 5.3 Final designs and bidding documents have been prepared for the sanitary landfill at Harrold Road and for the 18 modified landfills on the Family Islands. The solution for the Family Islands is simple because of the small daily quantity of waste generated. The proposed excavated cell/trench method of land filling is well suited for these islands. Local contractors have the capacity to operate and maintain the disposal sites. The larger sanitary landfill at Harrold Road will require a higher level of expertise to efficiently operate the facility. An experienced international expert in landfill management will support DEHS to guarantee a safe and affordable operation. The institutional strengthening component will ensure that DEHS is properly equipped to supervise the disposal operations and enforce the litter regulations.

### B. Financial viability

- 5.4 The objective of the financial analysis was to determine the amount and sources of revenues necessary to cover the operating, maintenance and depreciation costs of the solid waste management system, including both collection and disposal activities. The costs of the new derelict vehicle program were also considered. Since collection is currently funded through budgetary allocations, the primary focus of the analysis was centered in the facilities and activities added to the system.

- 5.5 The operating and maintenance costs of the new landfill, the shredding facility and the hazardous waste management facility in New Providence and the landfills and hazardous waste facilities in the Family Islands have been estimated assuming a reasonably efficient operation. Such costs include the recovery of all the investment equipment and a reasonable return on the capital invested, and they should be review once the operation of the new facilities is in place and actual data is available.
- 5.6 As sources of revenues, to cover the costs of the new facilities and activities, a combination of a tipping fee for commercial collection and an environmental levy on all retained imports was considered. The main rationale for the environmental levy is the fact that all retained import materials will be disposed of in the Bahamas. The starting value for the tipping fee has already been set at B\$10/ton for commercial collection. For the purpose of the analysis, an environmental levy of 0.5% of the value of the imports was considered. Given the level of retained imports in the past, it was estimated that such a levy could raise approximately B\$6 million per year.
- 5.7 The results of the analysis are shown in table 5.4. Revenues from tipping fees and the environmental levy are estimated to cover (i) 100% of the operating and maintenance costs of the new facilities; and (ii) 100% of the depreciation costs during the first five years and an average of 75% of such costs during the following four years. Due to the staged nature of the landfill construction works, the actual investment period is extended over 20 years. This program is only considering the first part of this total investment and therefore does not consider the new investments made during the last four years considered in the analysis. Provisions will have to be made at the time to ensure proper recovery of all depreciation costs.

| <p align="center"><b>TABLE 5.4</b><br/><b>COST AND FINANCING</b><br/><b>US\$000</b></p>                                    |                   |                   |                   |                   |                   |                   |                   |                   |                   |
|--|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| <b>COSTS</b>   | <b>Year<br/>1</b> | <b>Year<br/>2</b> | <b>Year<br/>3</b> | <b>Year<br/>4</b> | <b>Year<br/>5</b> | <b>Year<br/>6</b> | <b>Year<br/>7</b> | <b>Year<br/>8</b> | <b>Year<br/>9</b> |
| <b>New Providence</b><br>(Landfill, shredding<br>facility, derelict<br>vehicle program and<br>hazardous waste<br>facility) | 2354<br>490       | 2070<br>515       | 2326<br>515       | 2368<br>524       | 2426<br>717       | 2944<br>736       | 3088<br>759       | 2582<br>897       | 2642<br>1210      |
| O & M Costs<br>Depreciation of<br>facilities   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| <b>Family Islands</b><br>(Landfills, derelict<br>vehicle program and<br>hazardous waste<br>facility)                       | 2762<br>597       | 2801<br>597       | 2991<br>623       | 3016<br>918       | 3065<br>929       | 3140<br>940       | 3165<br>1252      | 3217<br>1263      | 3324<br>1274      |
| O & M Costs<br>Depreciation of<br>facilities   |                   |                   |                   |                   |                   |                   |                   |                   |                   |
| <b>TOTAL COSTS</b>   | 6203              | 5983              | 6455              | 6826              | 7137              | 7760              | 8264              | 7959              | 8450              |
| O & M Costs  | 5116              | 4871              | 5317              | 5384              | 5491              | 6084              | 6253              | 5799              | 5966              |
| Depreciation of<br>facilities  | 1087              | 1112              | 1138              | 1442              | 1646              | 1676              | 2011              | 2160              | 2484              |
| <b>TOTAL REVENUES</b>  | 6652              | 6789              | 6930              | 7073              | 7220              | 7371              | 7524              | 7682              | 7841              |
| Tipping fees   | 652               | 675               | 700               | 725               | 751               | 779               | 807               | 837               | 866               |
| Environmental levy   | 6000              | 6114              | 6230              | 6348              | 6469              | 6592              | 6717              | 6845              | 6975              |
| O & M Coverage Ratio   | 100%              | 100%              | 100%              | 100%              | 100%              | 100%              | 100%              | 100%              | 100%              |
| Depreciation Coverage<br>Ratio   | 100%              | 100%              | 100%              | 100%              | 100%              | 77%               | 63%               | 87%               | 76%               |

- 5.8 The rationale for the calculation of the proposed tipping fee and the environmental levy has been merely financial. That is, the idea was to use both mechanisms combined to make possible the cost recovery for the new facilities. This is a static approach since there is not a direct link between the tipping fee or the environmental levy levels and the marginal cost of the service. However the implementation of such a mechanism is an important improvement from the actual situation were there is no cost recovery at all. The study mentioned in paragraph 2.15 will provide further information on this matter, so the sources of revenues could be easily reviewed in the future when the expansion or new facilities will be needed. If the environmental levy were raised to 0.75% instead of 0.5%, revenues will be sufficient to cover the costs of an efficiently operated collection as well, therefore no budget allocations would be necessary there on. Any other combination of tipping fees and environmental levy would be acceptable provided that the total revenues were sufficient to cover the costs of the solid waste system.

- 5.9 In conclusion, the new elements of the solid waste system in Bahamas are expected to be financially sustainable through revenues from tipping fees and the environmental levy. This does not apply to the collection system in New Providence and Family Island, which will still have to rely on government funding no matter if they are operated by a public or a private entity. However, since the whole system has historically relied on public funding, the introduction on tipping fees and environmental levy to provide self-sustainability for the new system should be regarded as an important improvement.

C. Economic viability

1. Benefits

- 5.10 The proposed Program will result in significant environmental and health benefits when compared with the "no project" alternative. These benefits include reductions in: (i) the risk of groundwater contamination because existing landfill practices do not utilize adequate leachate containment; (ii) current levels of dust, litter, pests, debris, odor and other nuisances that are negatively affecting natural ecosystems and surrounding human communities; and (iii) illegal dumping in along roadsides and open areas.
- 5.11 From an economic point of view, the benefits of the Program can be measured as foregone costs if the Program is not implemented. These are: (i) losses in tourist revenue; (ii) costs associated with increasing levels of nuisances associated with overall solid waste mis-management; (iii) costs associated with health problems; (iv) costs associated with loss of environmental ecosystem losses; and (v) replacement costs of contaminated groundwater resources. The quantification of these foregone costs is not possible; however, they justify a project of this type.

2. Cost analysis

- 5.12 A least cost analysis was used to choose the final waste disposal and transportation method and location. This analysis allows choosing the alternative that minimizes the discounted investment and operating cost, given the existing waste volume levels and that appropriate environmental considerations in the design and operation have to be met. For all comparative analyses performed, costs were expressed in present value terms, using a discount rate of 12% and a 20-year planning horizon.

a. New Providence

- 5.13 Seven options for final waste disposal were evaluated for New Providence. These options include a combination of disposal methods, waste minimization, and sites.
- 5.14 Waste disposal methods considered for New Providence were sanitary landfilling and incineration. Both disposal methods were designed

to accommodate an average of 500 tons of waste daily, and would be operated to minimize environmental and health risks. The sanitary landfill option considers a proper containment system, leachate collection and management system, and appropriate cover material. The incineration option considered a combustion system to dispose of 85% of the waste stream and a sanitary landfill for ashes and non-combusting material.

- 5.15 Yard waste composting was evaluated as a waste minimization alternative. Three different composting methods were analyzed: shredding, windrow composting and in-vessel composting. Yard waste shredding option provides a suitable material for daily or intermediate cover for the landfill. Cover material is a scarce resource in The Bahamas. Shredding yard waste will reduce the waste stream by 10%. Both the windrow and in-vessel composting options allow the production of high-nutrient quality compost. Windrow composting reduces the waste stream by 6%, and in-vessel composting reduces it by 48%. Considering the volume reduction of the waste stream from these options and their present value cost <sup>1/</sup>, only shredding and in-vessel composting were considered economically feasible options.
- 5.16 Sites were selected using environmental and engineering criteria, including: (i) underground and surface water resources; (ii) terrestrial, aquatic and marine ecosystems; (iii) aesthetics; (iv) geotechnical and topography; and (v) social issues (local acceptance, airports, utilities). Two sites were selected using this procedure: Harrold Road, current disposal site near the waste generation centroid, and Clifton Pier, as potential site for incineration only.
- 5.17 Table 5.1 shows the results of the cost comparison analysis of seven waste disposal options. Costs include investment, operations, transportation and land. Incineration and in-vessel composting are mutually exclusive alternatives because the latter alternative will reduce the waste volume under the minimum level needed to operate the disposal option efficiently. The least cost disposal method for New Providence is a sanitary landfill at the Harrold Road site, with yard waste minimization.

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<sup>1/</sup> Present value capital and operating cost of shredding was estimated in US\$1,238; windrow composting, US\$3,321; and in-vessel composting, US\$27,874.



| TABLE 5.1<br>COMPARATIVE COST ANALYSIS OF WASTE DISPOSAL OPTION FOR NEW PROVIDENCE |         |
|--|---------|
| OPTIONS  | US\$000 |
| 1. Sanitary landfill at Harrold Road site.   | 26,731  |
| 2. Same as 1, including shredding.   | 26,285  |
| 3. Same as 1, including in-vessel composting.                                      | 43,057  |
| 4. Incinerator at Harrold Road Site.   | 122,357 |
| 5. Same as 3, including shredding.   | 123,112 |
| 6. Incinerator at Clifton Pier site. Ash/residue landfill at Harrold Road site.    | 126,057 |
| 7. Same as 5, including shredding.   | 126,812 |

b. Family Islands

5.18 Alternative waste disposal and transfer systems were evaluated for ten islands: Grand Bahama, Eleuthera, Andros, Abaco, Cat Island, Great Exuma, Bimini, Long Island, Inagua, and San Salvador. In Phase I, "modified" sanitary landfills were considered as an alternative due to smaller volumes of waste generated in most of these islands compared with those generated in New Providence <sup>2/</sup>. "Modified" landfills are engineered sanitary landfills in all respects, except that, instead of daily compaction and cover, waste covering, less frequently scheduled cover is acceptable. The cost of this alternative was compared with the cost of incineration of the municipal solid wastes (only combustion) with landfilling of ash, non-combustible material, and bulky and demolition wastes.

5.19 To determine the least cost disposal option, different cost scenarios were developed for population levels similar to those found in most of the Family Islands. Table 5.2 presents the result of the analysis. For all population levels, incineration is the most expensive option.

| TABLE 5.2<br>COST COMPARATIVE ANALYSIS OF DISPOSAL METHODS FOR DIFFERENT POPULATION LEVELS |                     |                          |
|--|---------------------|--------------------------|
| POPULATION (hab.)  | INCINERATION (US\$) | MODIFIED LANDFILL (US\$) |
| 400  | 1,575,897           | 1,126,137                |
| 750  | 1,748,400           | 1,305,364                |
| 1,100  | 2,155,133           | 1,505,167                |
| 1,800  | 3,019,865           | 1,869,906                |
| 5,500  | 4,114,215           | 3,639,646                |

<sup>2/</sup> Grand Bahama, Eleuthera, Abaco and Andros generate annually an average of 13,200 tons per island; the remaining islands, an average of 2,200 tons per island.

- 5.20 For the larger Family Islands (Eleuthera, Abaco, Long Island, Andros, and Cat Island), where island size and population distribution may imply cost tradeoffs between waste transportation and landfill investment, two options were evaluated for each island depending on its characteristics: (i) multiple, local, spatially distributed landfills <sup>3/</sup>, and (ii) one regional landfill with a low cost transfer system. The transfer system can have one to three, 5 ton/day transfer stations with corresponding roll-off containers and transfer trucks for hauling. In the cases of Abaco and Eleuthera, the multiple-landfill option also considers transfer systems to accommodate the geographic characteristics of those islands <sup>4/</sup>. Table 5.3 compares the costs of different disposal alternatives (including transfer systems) in present value terms.

| TABLE 5.3<br>COST COMPARISON ANALYSIS OF DISPOSAL AND TRANSPORTATION OPTION FOR FAMILY ISLANDS<br>(in US\$000) |                             |                             |
|--|-----------------------------|-----------------------------|
| ISLAND   | MULTIPLE-LANDFILL<br>OPTION | REGIONAL-LANDFILL<br>OPTION |
| Eleuthera  | 4,332 <sup>a/</sup>         | 4,775 <sup>c/</sup>         |
| Abaco  | 5,410 <sup>b/</sup>         | 6,606 <sup>c/</sup>         |
| Andros   | 3,261                       | 3,227 <sup>b/</sup>         |
| Long Island  | 3,545 <sup>b/</sup>         | 2,483 <sup>b/</sup>         |
| Cat Island   | 2,455                       | 1,983 <sup>b/</sup>         |

a/ Option considers one transfer station.

b/ Option considers two transfer stations.

c/ Option considers three transfer stations.

- 5.21 Based on the above results, three local landfills were justified for Abaco and Eleuthera, and one regional landfill is the optimal choice for Long Island and Cat Island. For Andros, the negligible difference in cost between the two options (four local versus one regional) makes either choice acceptable.
- 5.22 In Bimini, one regional landfill and a transfer station were economically justified based on the cost savings of US\$117,000, in present value terms, when compared with the cost of direct hauling.
- 5.23 For the smaller islands of Great Exuma, Inagua, Grand Bahama and San Salvador, where transportation distances are negligible, the

<sup>3/</sup> Up to four sites, depending on the size and geographic characteristics of the island.

<sup>4/</sup> A low-cost transfer system for Abaco and Eleuthera was examined as an alternative to direct haul of wastes by collection trucks to the respective disposal sites. For the three islands, a transfer system represents the least cost alternative. In the case of Abaco, the present value cost of a transfer system is approximately US\$91,000 less than the cost of direct hauling for the multiple-landfill option and US\$27,000 for the regional-landfill option. In the case of Eleuthera, the differences for the multiple- and regional-landfill options are respectively US\$46,000 and US\$134,000.

economies of scale traditionally observed in sanitary landfill investments justify one regional site in each island.

D. Benefits of the program

- 5.24 The implementation of the integrated solid waste management plan will result in institutional and operational enhancements aimed to improve the quality of residential garbage collection and other generation points. This will mean that there will be less garbage awaiting collection and disposal and less litter resulting from the dispersion of uncollected garbage by wind and animals. The enforcement will result in a reduction of illicit dumping and associated litter scattered about urban and country side environments. The risk of hazardous waste contamination will be ameliorated. Benefits from improved health conditions and environmental protection will support and maintain the high quality of tourism of the islands.

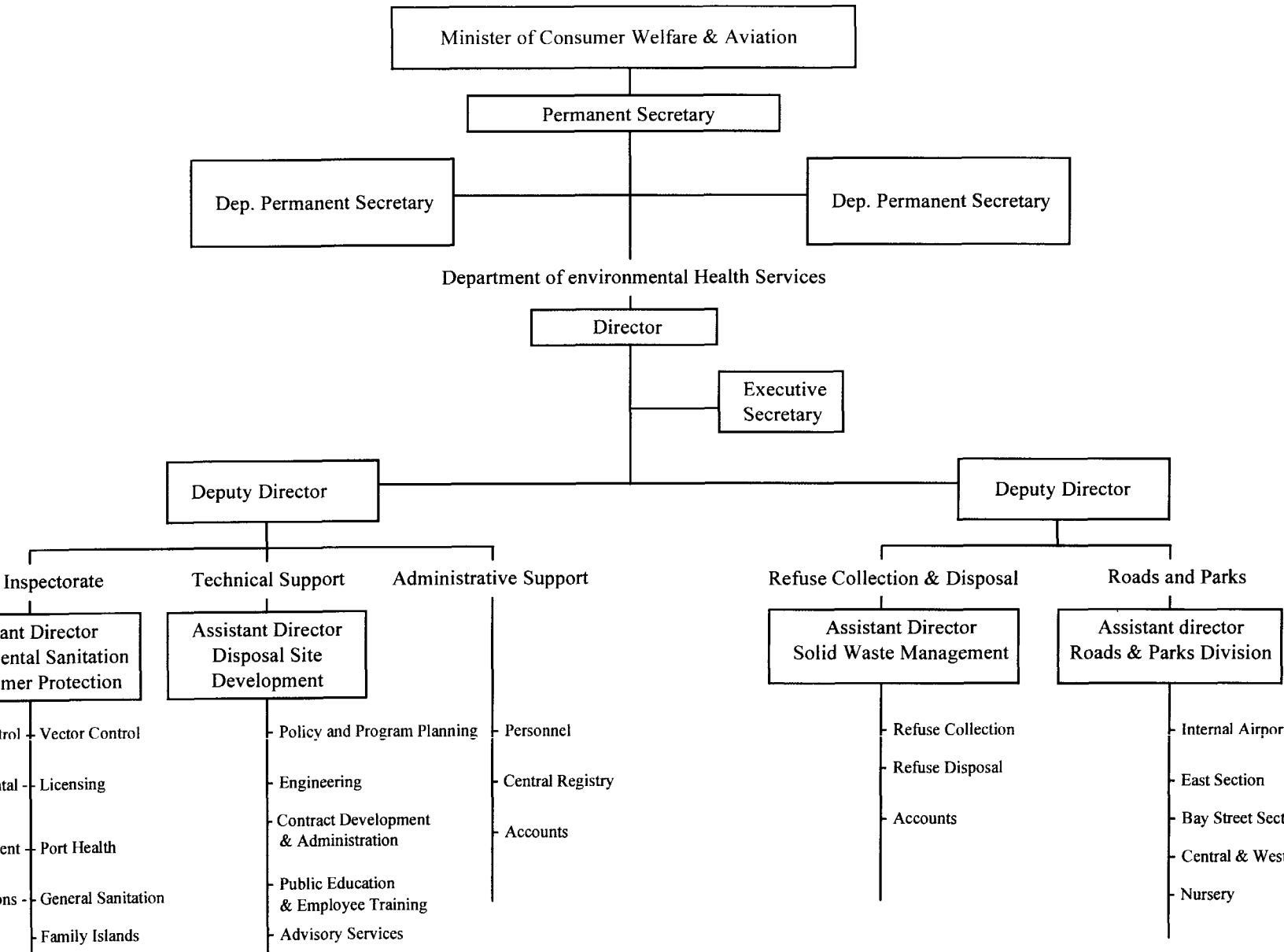
E. Issues and risks

- 5.25 The main risk is associated with the institutional capacity of DEHS to fulfill its mandate as the environmental enforcing agency of the GOBH and to maintain responsibility for the New Providence residential collection and disposal services. To minimize the risk all operating functions within DEHS will be consolidated under an specific unit reporting to the Permanent Secretary presently responsible for the existing Roads and parks Division, while separating the supervisory and regulatory functions under a different Permanent Secretary. Performance and efficiency indicators for the collection and disposal activities will be implemented and monitored. The project will provide DEHS with the resources to retain skilled engineering and technical personnel to effectively implement the proposed project.

# **Department of Environmental Health Services** **Proposed Organizational Structure**

ANNEX III-1

Page 1 of 1



BAHAMAS SOLID WASTE MANAGEMENT PROGRAM  
(BH-0008)

BIDDING SCHEDULE  
TENTATIVE PROCUREMENT PLAN

| PRINCIPAL PROCUREMENT                      | FINANCING BANK % | METHOD | PRE-QUALIFICATIONS | Amount<br>(US\$000s) | Publication date<br>(half of year) |
|--|------------------|--------|--------------------|----------------------|------------------------------------|
| <b>Items</b>                               |                  |        |                    |                      |                                    |
| 1. Monitoring equipment                    | 100              | ICB    | NO                 | 400.0                | 99/II                              |
| 2. Computers                               | 100              | ICB    | NO                 | 100.0                | 99/II                              |
| 3. Landfill equipment                      | 100              | ICB    | NO                 | 1,000.0              | 00/I                               |
| <b>Consulting</b>                          |                  |        |                    |                      |                                    |
| 1. Engineering supervision (firm)          | 100              | ICB    | YES                | 1,000.0              | 99/I                               |
| 2. Collection and containment study        | 100              | ICP    | NO                 | 150.0                | 99/I                               |
| 3. Cost recovery study                     | 100              | ICP    | NO                 | 100.0                | 00/II                              |
| 4. Environmental awareness (20 lots)       | 100              | LB     | NO                 | 600.0                | 99/I                               |
| 5. Institutional strengthening (training)  | 100              | ICP    | NO                 | 700.0                | 99/II                              |
| <b>Works and improvements</b>              |                  |        |                    |                      |                                    |
| 1. Harrold Road landfill                   | 70               | ICB    | YES                | 7,200.0              | 98/II                              |
| 2. Hazardous waste facility                | 100              | LB     | YES                | 600.0                | 99/II                              |
| 3. Family Island facilities (18 landfills) | 70               | LB     | YES                | 12,800.0             | 98/I to 99/II                      |
|  |                  |        |                    |                      |                                    |

- International calls for proposals
- International competitive bidding
- 1/ - Local bidding
- Local call for proposals

- Local bidding regulations
- under US\$10,000, contracts may be awarded without tenders.
- over US\$10,000 and less than US\$50,000, contracts may be awarded without tenders, but written quotation shall be obtained.
- over US\$50,000, tenders must be invited in the local press.

**BAHAMAS SOLID WASTE MANAGEMENT PROGRAM**  
**Logical Framework**

| Narrative Summary   | Verifiable Indicators   | Means of Verification  | Important Assumptions  |
|---|---|--|--|
| <p>improve health and environmental conditions and maintain attractiveness to tourists.</p>   | <p>1. National health indicators.</p> <p>2. Tourism statistics.</p>   | <p>1. Yearly reports of health and tourism indicators.</p>   | <p>1. Correlation between proper waste management and public health.</p> <p>2. Tourists numbers are influenced by environmental situation.</p>                       |
| <p>adequate disposal facilities.</p> <p>adequate waste disposal.</p> <p>technical support.</p> <p>environmental health education.</p> |   |  |  |
| <p>efficient disposal of solid waste</p>  | <p>1.1 Compaction of 750 kg/m<sup>3</sup> is obtained at the Harrold Road landfill.</p> <p>1.2 Odors not detectable from landfill-yard waste shredding facility.</p> <p>1.3 No increase in baseline contaminant concentration in downstream monitoring stations.</p> <p>1.4 Closure of existing dump.</p> <p>1.5 Odors not detectable from modified landfills at Family Islands.</p> <p>1.6 Closure of illegal dumps at the Family Islands.</p> | <p>1.1 Data received from landfill.</p> <p>1.2 No reports (negative) from residents in the district</p> <p>1.3 Data from monitoring program.</p> <p>1.4 Closure report</p> <p>1.5 No negative reports from residents and health inspectors.</p> <p>1.6 Closure reports</p> | <p>1. Other environmental factors constant or improve.</p> <p>2. No significant changes (different) from project growth assumptions in Bahamas' waste management</p> |

## BAHAMAS SOLID WASTE MANAGEMENT PROGRAM

## Logical Framework

| Narrative Summary                                       | Verifiable Indicators   | Means of Verification   | Important Assumptions  |
|---|---|---|--|
| disposal of hazardous waste.                            | <p>2.1 95% of the hazardous waste is stored at the constructed facility.</p> <p>2.2 No leakages and odors are reported from the HW storage facility.</p>  | <p>2.1 Data received from the landfill and HW storage facility.</p> <p>2.2 Data from the environmental monitoring program.</p>  |  |
| utions are strengthen.                                  | <p>3.1 90% compliance with collection schedule (once/twice/week).</p> <p>3.2 Complete and accurate environmental monitoring data collection.</p> <p>3.3 Accurate financial statements.</p> <p>3.4 Number of trained staff.</p>  | <p>3.1 Data from survey questionnaires.</p> <p>3.2 Environmental reports.</p> <p>3.3 Annual financial reports.</p> <p>3.4 Records from professional development.</p>  | The GOBH supports the development of DEHS.                   |
| minimization is achieved and<br>ion of illegal dumping. | <p>4.1 Quantity of per capita waste generated reduced 20% by 2005.</p> <p>4.2 &gt;75% favorable response in annual consumer satisfaction surveys.</p> <p>4.3 Tourist complaints about street side litter reduced by 50%.</p> <p>4.4 Number of illegal dumping sites reduce in 70% by the year 2000.</p> | <p>4.1 Data received from landfill and shredding facility.</p> <p>4.2 Results of test received, consultation with nearby residents.</p> <p>4.3 Data from tourist surveys &amp; questionnaires.</p> <p>4.4 Environmental audits.</p> | Changes in public attitudes and Demand for recyclable grows. |

BAHAMAS SOLID WASTE MANAGEMENT PROGRAM  
Logical Framework

| Narrative Summary   | Verifiable Indicators  | Means of Verification   | Important Assumptions  |
|---|--|---|--|
| al facilities built and in<br>ion.  | <p>1.1 First phase of the Harrold Road landfill built and in operation. Built by Dec. 1999 to specs.</p> <p>1.2 18 modified sanitary landfills built and in operation . Built by July. 2001 to specs.</p> <p>1.3 Hazardous waste disposal built and in operation by Dec. 31, 1999.</p> <p>1.4 A compaction target of 750 km/m<sup>3</sup> is achieved.</p> | <p>1.1 Direct observation &amp; inspection of facilities.</p> <p>1.2 Direct observation &amp; inspection of facilities.</p> <p>1.3 Direct observation &amp; inspection of facilities.</p> <p>1.4 Annual report.</p> | <p>(Output to purpose)</p> <p>1. Facilities well operated &amp; maintained.</p> <p>2. Legislation is enforced.</p> <p>3. Market for compost and recycling.</p> <p>4. Estimated waste generation accurate.</p> <p>5. Change in public's attitude actions.</p> |
| ion/awareness program<br>ented.   | <p>2.1 Environmental health education program is launched by January 1999.</p> <p>2.2 Promos on T.V., radio, newspapers by May 1999.</p> <p>2.3 Communal depots in operation.</p>  | <p>2.1 Report.</p> <p>2.2 Direct observation, newspaper copies.</p> <p>2.3 Direct observation and report.</p>   |  |
| s operative.<br>g study and implementation<br>ted.<br>recovery study completed. | <p>3.1 New DEHS structure in place by Oct. 1998.</p> <p>3.2 Vehicles collecting refuse on new routing system by June 1999.</p> <p>3.3 Plan of action for revised tipping fees and environmental levy.</p>  | <p>3.1 DEHS official notice.</p> <p>3.2 Residential surveys.</p> <p>3.3 Report with action plan approved.</p>   |  |



**BAHAMAS SOLID WASTE MANAGEMENT PROGRAM**  
**Logical Framework**

| Narrative Summary   | Verifiable Indicators | Means of Verification | Important Assumptions   |
|---|-----------------------|-----------------------|---|
| <p>solid waste facilities.</p> <p>private contractor.</p> <p>contractors.</p> <p>operational assistance</p> <p>m.</p> <p>consultants.</p> <p>land.</p> <p>financing.</p> <p>operational equipment.</p> <p>environmental education</p> <p>m.</p> <p>media campaign</p> <p>waste minimization</p> <p>procure goods.</p> <p>and implement.</p> <p>recommendations of institutional</p> <p>strengthening study.</p> <p>routing study.</p> <p>cost recovery study.</p> | <p>BUDGET</p>         | <p>ANNUAL REPORTS</p> | <p>(Activity to Output)</p> <ol style="list-style-type: none"> <li>1. Designs are feasible/ 'build</li> <li>2. Objections by public/ indivi</li> <li>handled.</li> <li>3. Climate conditions are favor</li> <li>4. Industrial relations are fav</li> <li>5. Private sector interest.</li> <li>6. Other proposals rejected if</li> <li>compatible.</li> <li>7. Posts created and filled.</li> <li>8. IDB will approve loans.</li> <li>9. Recommendations accepted by</li> <li>politicians.</li> <li>10. Timely action by other Gover</li> </ol> <p>Ministries (Legal Affairs, Hous</p> <p>Lands, Civil Service).</p> |

PROPOSED RESOLUTION

BAHAMAS. LOAN \_\_\_\_/OC-BH TO THE COMMONWEALTH OF THE BAHAMAS  
(Solid Waste Management Program)

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the Commonwealth of The Bahamas, as Borrower, for the purpose of granting it a financing for the improvement of the Solid Waste Management Program. Such financing will be for the amount of up to twenty three million five hundred thousand United States of America dollars (US\$23,500,000), from the Single Currency Facility of the ordinary capital resources of the Bank, and will be subject to the "Special Contractual Conditions" and the "Terms and Financial Conditions" set forth in the Executive Summary of the Loan Proposal.