INTERIM REPORT
OF THE
WASTE DISPOSAL OPTIONS
REVIEW COMMITTEE
(WDOR)
FOR THE
MANAGEMENT, COLLECTION, TREATMENT AND
DISPOSAL OF MUNICIPAL SOLID WASTE
IN THE CAYMAN ISLANDS

DECEMBER 15, 2002
(REVISED JUNE 5, 2003)
EXECUTIVE SUMMARY

The Waste Disposal Option Review (WDOR) Committee was established by the Cayman Islands Government to evaluate, select and make recommendations on the preferred solid waste treatment and disposal option(s) in accordance with the Terms of References (TOR) agreed with the Ministry (P, C, W & IT). The committee consisted of persons representing a wide cross section of Government agencies and the private sector.

This interim report reviews historical and technical information and makes recommendations for preferred technology options, timelines, planning issues, land acquisition, fee structure and the establishment of a Solid Waste Authority. A time frame of 20 years was used as the planning period for the new solid waste treatment and disposal facility. This interim report is presented to Government for acceptance and action so that the committee can proceed on the basis that Government supports its recommendations.

The main recommendations and observations of the committee are:

1. The existing George Town Landfill will reach capacity by mid 2005.
2. The available land area at or near the existing landfill (together with the adjacent, Government- and privately-owned, lands) is not adequate to allow a landfill-only option for the design period of 20-25 years.
3. A reasonable estimated time for a new treatment and disposal facility to become fully operational is early 2006.
4. The selected technology for treatment and disposal of waste is a hybrid system comprising:
   a) A waste-to-energy system (Autoclave system),
   b) Composting of the yard waste,
   c) Shredding of used tires,
   d) Recycling (aluminium, ferrous materials, waste oils, lead-acid batteries), and
e) Disposal of mainly biologically inert materials (glass, plastics, building rubble) on a properly engineered landfill.

5. The new waste treatment and disposal facility will be located at and adjacent to the present site of the George Town Landfill. Four adjacent privately owned properties totalling 28.7 acres are identified for purchase.

6. Five properties (totalling 45.8 acres) east of the Esterley Tibbetts Highway must be rezoned to Heavy Industrial to increase space for the solid waste treatment and disposal facility. Due to the tight timeframe to establish a new facility, Government is urged to pursue this as a matter of high priority.

7. Legislation is to be drafted and passed to establish a Solid Waste Authority (SWA) with the duty to manage the collection, treatment and disposal of solid waste.

8. The existing garbage fee structure is to be abandoned and the Solid Waste Authority’s expenditure will be covered by a waste disposal fee on imported goods. The Economics Research Unit will be tasked to work out a proper fee structure.

9. The applicable United States Environmental Protection Agency emission standards are to be adopted as baseline environmental standards.

10. The waste treatment/disposal system is to be acquired under a lease-to-purchase agreement (i.e., the successful company will finance 100% of the capital cost) and operated under private interest under a contract with the SWA.

11. The pre-qualified companies will bid on this project in accordance with the Central Tenders Committee and Public Sector Investment Committee Guidelines.

12. The WDOR committee will review the returned tenders and make recommendations to the Central Tenders Committee for Award of the contract.

13. Government is to amend/renegotiate the existing exclusive licences granted under the Electricity Law to facilitate third parties to generate and sell electricity to CUC.

14. Selection of treatment and disposal for the Sister Islands will be determined after a final decision has been made for Grand Cayman.
FULL INTERIM REPORT

OF THE WASTE DISPOSAL OPTIONS REVIEW COMMITTEE (WDOR)

FOR THE MANAGEMENT, COLLECTION, TREATMENT AND DISPOSAL OF MUNICIPAL SOLID WASTE IN THE CAYMAN ISLANDS
# TABLE OF CONTENTS

## EXECUTIVE SUMMARY

## FULL INTERIM REPORT

- Introduction 2
- Terms of Reference 2
- Waste Stream 3
- Siting, Zoning and Land Acquisition 4
- Ownership and Operational Arrangements 6
- Establishment of a Solid Waste Authority 7
- Fees for Service 7
- Environmental Standards 8
- Prequalification and Tendering Process 9
- Requirements of Selected System 11
- Brief Description of Reviewed Treatment and Disposal Options 12
  - Landfill 13
  - Windrow Composting 13
  - In-Vessel Composting 14
  - Waste-To-Energy Options 14
    a) Mass Burn 14
    b) Modular Combustion 15
    c) Refuse Derived Fuel (RDF) 15
    d) Pyrolysis 16
    e) Gasification 16
    f) Autoclave 16
- Selection of Waste Treatment / Disposal System 17
- Project Timelines 20
- Comments and Observations of CUC 20
- Other Issues of Concern 21
- Committees and Members 21

## APPENDICES

1. Memorandum with Original Terms of Reference and Establishment of WDOR 23
2. Table 1.0 DEH Assumptions For Population Growth And Waste Generation 24
3. Table 2.0 DEH Estimates On Growth In Population And Waste 25
4. Table 3.0 DEH Estimates On Waste Composition 26
5. Memorandum to Planning Department re: Rezoning 27
6. Map of Area for Proposed Solid Waste Treatment and Disposal Facility 28
7. Chart of Project Timelines 29
8. Minutes of Meeting with CUC 30
9. Committees and Members 31
INTRODUCTION

In July 2002 Executive Council of the Cayman Islands Government established a Waste Disposal Options Review (WDOR) Committee, under the auspices of the Ministry of Planning, Communications, Works & Information Technology (Min. P.C.W. & I.T.), to recommend the preferred waste treatment and disposal option(s) for the Cayman Islands after the Alternative Systems Waste Analysis (ASA) report was tabled in the Legislative Assembly earlier this year.

The ASA was completed by the Department of Environmental Health (DEH) along with consultants from Post, Buckley, Schuh and Jernigan (PBS&J) of the United States, in March 2001.

The ASA report analysed the existing situation and recommended four future possible alternative waste treatment and disposal options namely: Landfill only, Landfill with Windrow composting; Landfill with in-vessel composting and Waste-to Energy. However, the report did not clearly recommend a particular system for the Cayman Islands.

TERMS OF REFERENCE (TOR)

The Waste Disposal Option Review (WDOR) Committee's task was to evaluate, select and make recommendations on the preferred waste collection, treatment and disposal system in accordance with the Terms of References (TOR) and the deadlines. The original TOR's and the establishment of the WDOR committee are shown in Appendix 1.

The amended TOR's are as follows:

a) To act as an overall steering committee in the consideration and selection of the most appropriate and cost-effective solid waste solution(s) for the Cayman Islands.

b) To develop an Interim Report detailing: waste stream size and growth probabilities, waste stream content applicable for burning, applicability of mining current landfill site, value figure(s) to be used when assessing energy/sales potential, regulatory framework to be followed, acceptable ownership / operational arrangements, parameters to be included in all proposals, options for Cayman Brac and Little
Cayman, and the comparison method to be used when evaluating competing proposals.

(c) To consider and make recommendations regarding siting issues for any waste treatment or disposal option.

(d) To consider and recommend the preferred waste disposal option for Grand Cayman.

(e) To prepare the necessary Requests for Proposals (RFP) documentation and implement schedules, timelines and deadlines for the completion of all submissions, evaluations and reports.

(f) To review and assess all waste disposal proposals.

(g) To establish a technical subcommittee to provide assistance.

(h) To submit a Final Report which reviews the proposals utilising the methods developed in the Initial Report and makes recommendations to Government on the most appropriate way forward.

(i) The Committee shall complete items; (a), through (d), and (g) by December 15, 2002.

The items in italics are the items, which have been modified since the WDOR Committee was initially formed. Items (c) and (d) are new additions and the deadline date in (i) has been altered to require only items (a) through (d), (g) and potentially (e) to be completed by the deadline of December 15, 2002 for the Interim Report.

The WDOR Committee has made the following decisions, recommendations, and observations, which have been organised, thematically for ease of interpretation.

**WASTE STREAM**

1) Waste Stream Size: It is recommended that high, low, and average waste stream size estimates be utilised in the amounts listed below.

   a) The low waste stream size estimate is based on:

      (i) A waste generation rate of 1.06 tons/person/year in year 2000,

      (ii) A 1% per year increase in the waste generation rate,

      (iii) A Grand Cayman population equivalent (resident pop. + tourist pop.) of 46,062 in 2001, and
(iv) An annual population increase of 2% per year.

b) The high waste stream size estimate is based on:

(i) A waste generation rate of 1.32 tons/person/year in year 2000,
(ii) A 1% per year increase in the waste generation rate,
(iii) A Grand Cayman population equivalent (resident pop. + tourist pop.) of 46,062 in 2001, and
(iv) An annual population increase of 4% per year.

c) The average waste stream size estimates is the average of the high and low estimates for any one-year. The attached Table 1.0 entitled: DEH Assumptions for Population Growth and Waste Generation and Table 2.0 entitled: DEH Estimates on Growth in Population and Waste, detail the low, high, and average growth rates as accepted by the Committee. The tables are in Appendix 2 and 3, respectively.

d) Based on the aforementioned waste stream size estimates it is anticipated that the existing landfill will reach capacity by July 2005.

2) Cayman Brac and Little Cayman Population Figures were accepted by the Committee as being 1,822 and 115 respectively in 1999, with growth rates at or below those estimated for Grand Cayman.

3) Waste Stream Composition: The Committee accepted the values for waste stream composition as defined in the attached Table 3.0 entitled DEH Estimates on Waste Composition and shown as Appendix 4.

SITING, ZONING AND LAND ACQUISITION

4) It is recommended that the existing landfill site, and lands in the same area, be utilised for ongoing waste treatment / disposal. A variety of issues were put forth for continuing on the same site, including but not limited to:

a) General acceptance by the public, as it is already an existing waste disposal site,
b) The area is already zoned heavy industrial,
c) The site is in close proximity to major transportation routes,
d) The majority of the solid waste on Grand Cayman is generated within close proximity to the existing site and therefore cost for hauling will be lower,
e) There would be no need to construct a transfer station thus avoiding additional operation and capital costs,
f) The existing location better facilitates the transfer of on-site generated electricity into the Caribbean Utilities Company (CUC) Ltd.'s distribution system,
g) There is a lack of other available land on Grand Cayman which would allow the development of a treatment / disposal facility based on site size, location in relation to water lenses, zoning, and other environmental and social factors.
h) The existing landfill could eventually be mined, which will open up the existing site as new landfill area and there would be no need to relocate from that site in the foreseeable future.

Table 1 (on the following page) summarizes the present zoning and land use of the Government- and privately-owned parcels adjacent to, and including, the existing landfill.

It is recommended that the Ministry P,C,W, & IT pursue a rezoning to Heavy Industrial of those parts of five properties located east of the Esterley Tibbetts Highway: Block 13C Parcel 1 (20.6 acres, Crown owned), Block 13D Parcel 1 (17.0 acres, Crown owned), Block 13D Parcel 259 (7.4 acres, privately owned), Block 13D Parcel 260 (0.1 acre, privately owned) and Block 13D 261 (0.7 acres, privately owned). Note: half of Block 13C Parcel 1 is already zoned Heavy Industrial. Refer to Appendix 5 for a memorandum to the Planning Department requesting rezoning that will now need to expand to include a few other small land parcels.

Although, the rezoning issue could be included in the Development Plan Review exercise, it is strongly recommended that in view of the tight timeframe, the Ministry pursue this on its own as a matter of high priority.

5) It is recommended that the Cayman Islands Government purchase one privately owned property: Block 13D, Parcel 2 (20.5 Acres), and the portions east of the Esterley Tibbetts Highway of three privately owned properties: Block 13D, Parcel 259 (7.4 acres), Block 13D
260 (0.1 acre), and Block 13D 261 (0.7 acre). These lands will be required to provide adequate space and buffering, irrespective of the treatment / disposal system selected. Refer to Appendix 6 for a map of the area, which also indicates the properties requiring land acquisition and rezoning.

<table>
<thead>
<tr>
<th>Block/Parcel</th>
<th>Total Area of Parcel (acres)</th>
<th>Usable Area of Parcel (acres)</th>
<th>Current Zoning</th>
<th>Current Land use</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Heavy Industrial (acres)</td>
<td>Other (acres)</td>
<td>Existing Landfill (acres)</td>
<td>Landfill Ancillaries, Pond,Buffer (acres)</td>
<td>Still Available (acres)</td>
<td></td>
</tr>
<tr>
<td>Government-owned land</td>
<td></td>
<td></td>
<td>23.1</td>
<td>20.6</td>
<td>17.2</td>
<td>14.2</td>
<td>12.3</td>
<td></td>
</tr>
<tr>
<td>13C/1</td>
<td>48.0</td>
<td>43.7</td>
<td>23.1</td>
<td>20.6</td>
<td>17.2</td>
<td>14.2</td>
<td>12.3</td>
<td></td>
</tr>
<tr>
<td>13D/1</td>
<td>20.0</td>
<td>17.0</td>
<td>10.3</td>
<td>17.0</td>
<td>10.3</td>
<td>0.8</td>
<td>16.2</td>
<td></td>
</tr>
<tr>
<td>13D/287</td>
<td>10.3</td>
<td>10.3</td>
<td>10.3</td>
<td>10.3</td>
<td>10.3</td>
<td>0.8</td>
<td>16.2</td>
<td></td>
</tr>
<tr>
<td>Sub-Total:</td>
<td>71.0</td>
<td>33.4</td>
<td>37.6</td>
<td>27.5</td>
<td>15.0</td>
<td>28.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Privately-owned land</td>
<td></td>
<td></td>
<td>20.5</td>
<td>7.4</td>
<td>7.4</td>
<td>7.4</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td>13D/2</td>
<td>20.5</td>
<td>20.5</td>
<td>7.4</td>
<td>7.4</td>
<td>7.4</td>
<td>7.4</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td>13D/259</td>
<td>16.0</td>
<td>7.4</td>
<td>7.4</td>
<td>7.4</td>
<td>7.4</td>
<td>7.4</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td>13D/260</td>
<td>1.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>13D/261</td>
<td>10.0</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Sub-Total:</td>
<td>28.7</td>
<td>20.5</td>
<td>8.2</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>28.7</td>
<td></td>
</tr>
<tr>
<td>Total for all parcels:</td>
<td>99.7</td>
<td>53.9</td>
<td>45.8</td>
<td>27.5</td>
<td>15.0</td>
<td>57.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Area situated east of Esterley Tibbetts Hwy, and south of MRCU dykes

Table 1: Present zoning and land use of the Government- and privately-owned parcels adjacent to, and including, the existing landfill.

6) It is recommended that future planning exercises, such as the Development Plan Review, consider future expansion of the waste management option, as required.

**OWNERSHIP AND OPERATIONAL ARRANGEMENTS**

7) It is recommended that any waste treatment / disposal system (e.g. waste-to-energy or innovative systems) not be purchased outright and operated by Government, but be
acquired by Government under a lease-to-purchase agreement and operated by private interest under Government contract.

8) It is recommended that any operating contract entered into by Government be on the basis of a guaranteed monthly fee to cover capital investment, overheads, etc., with a per ton treatment / disposal fee.

9) It is recommended that a 7 – 10 year contract / finance period be used as the basis for any contract with a waste treatment / disposal company.

10) It is recommended that Government amend/renegotiate the existing exclusive licenses granted under The Electricity Law to allow third parties to generate electricity and sell the excess to CUC to facilitate waste-to-energy as a treatment option.

ESTABLISHMENT OF A SOLID WASTE AUTHORITY

11) It is recommended that an Authority be established which would be responsible for the contract management of the treatment / disposal operation.

12) It is recommended that the same Authority manage the residential and commercial waste collection services. It is recognised that these services could be privatised in the future.

13) It is recommended that enabling legislation be drafted to allow the necessary framework for the Authority to operate.

FEES FOR SERVICE

14) It is recommended that the current garbage fee structure be abandoned.

15) It is recommended that the Customs Department collect up-front fees for the waste collection, treatment and disposal services. This system will allow Government to collect disposal fees at the time the goods enter the country, based on a userpay philosophy. These fees could be accomplished (for example) by adding a small percentage on all incoming goods (which eventually require treatment and disposal); as a means to fund the
waste collection, treatment / disposal operation and other related solid waste services (e.g., collection of indiscriminate litter and beach cleaning).

16) It is recommended that the Economics Research Unit (ERU) be tasked with investigating the viability and impact of these fees, which are required to generate the associated revenue for the Solid Waste Authority. This method of funding the Solid Waste Authority's work eliminates many problems, which currently exist with the cost of revenue collection, delinquent fees, and uncollectable debts. It also reduces the risk of illegal dumping, as no tipping fees will be required although a user-pay philosophy is implemented.

17) It is recommended that all up-front fees collected by the Customs Department be paid to the Solid Waste Authority.

ENVIRONMENTAL STANDARDS

18) It is recommended that the United States Environmental Protection Agency (EPA) standards be adopted as a baseline standard for all waste treatment and disposal operations. The major reasons for choosing the EPA over the European Union (EU) standards are that:

   a) The EPA standards are generally stricter than those currently in use in the EU.
   b) American based labs, due to their close proximity to the islands, quick turnaround times and cost-effectiveness, will most likely carry out any testing required. These labs are already familiar with the EPA tests and standards.

19) It is recommended that where more stringent environmental standards are required they will be specified in the Request For Proposals (RFP).

20) It is recommended that if during the term of the contract, the contractually specified environmental standards become more stringent than those originally outlined in the RFP, the contractor be reimbursed the full substantiated cost of retrofitting and any increased operating costs.
21) It is recommended that the operators of the treatment / disposal operation be made fully responsible for all monitoring of environmental standards utilising an independent certified laboratory in accordance with applicable standards.

22) It is recommended that Government agencies be provided with access to all sites at the treatment / disposal operation for independent sampling, testing of emissions or other matters relating to regulatory control.

PREQUALIFICATION & TENDERING PROCESS

23) It is recommended that companies be pre-qualified for the selected waste treatment / disposal option via a Request for Expressions of Interest (REI). The REI should include information such as:

   a) Technology details including environmental impacts and residual details,
   b) Information on plants currently utilising proposed technology,
   c) Company experience in the field,
   d) Senior staff experience,
   e) Method of financing the project,
   f) References.

24) It is recommended that a maximum of 5 companies be selected through the REI process. These companies shall be pre-qualified based on pre-set parameters set and evaluated by the WDOR Committee.

25) It is recommended that a full Request For Proposal (RFP) package be prepared and sent to the pre-qualified companies following the Central Tenders Committee and Public Sector Investment Committee Guidelines.

26) It is recommended that prior to providing a full RFP for the treatment / disposal of waste in Cayman, all pre-qualified companies are required to attend a multi-day "Pre-Bid Conference" organised by the Department of Environmental Health. The purpose of this conference is to give all bidders equal opportunity to obtain information from and/or speak to the appropriate persons in Cayman regarding issues such as:
a) Labour Law and Work Permit issues,
b) Cost of insurance,
c) Duty costs on various items,
d) Rates of pay,
e) Exchange rates and banking on island,
f) Incorporating a company,
g) Trade & Business Licensing Board requirements,
h) Utility rates (electrical, telephones, water, etc.),
i) General cost of living indicators,
j) Construction costs particular to the Island,
k) Shipping costs, and
l) Planning Application Process.

27) It is recommended that the following parameters be included in all proposals:

a) Detailed outline of the proposed treatment / disposal method,
b) Anticipated volumes of by-products produced, type and proposed methods to manage these by-products,
c) Spatial requirements of proposed treatment / disposal method,
d) Monthly cost to cover capitalisation of building and all equipment,
e) Cost per ton to cover operational costs, expansion costs, and equipment,
f) Replacement costs,
g) Schedule of items to be supplied,
h) Maintenance and equipment replacement schedules,
i) Expansion schedule and funding method,
j) Anticipated staffing schedule,
k) Expected environmental impacts and adherence to selected environmental standards,
l) Expected energy generation,
m) Expected downtime for preventative maintenance and anticipated repairs, and alternate plans for waste processing during these events,
n) Plan for unanticipated downtime for repairs and plans for waste processing during these periods,
A time schedule to start up, and

Clear consequences for failure to meet any of the contracted requirements.

28) It is recommended that an RFP package be prepared similar to the one received from a municipality in Florida, but modified to suit the Cayman Islands' requirements.

29) It is recommended that the proposals be compared on the basis of overall cost, which includes the cost of processing, disposal, land use, etc. The WDOR Committee will evaluate the proposals and make a recommendation to the Central Tenders Committee based on their pre-set criteria.

30) It is recommended that the successful company be the party making all Planning Department applications. If after making every reasonable effort, the selected waste treatment / disposal company is unable to obtain the requisite Cayman Islands Government permits and approvals which is necessary for their system to set up and operate, the funds expended by the company will be reimbursed under the terms provided by the RFP.

REQUIREMENTS OF SELECTED SYSTEM

31) The WDOR considered that the selected waste treatment/disposal method should:

a) Be capable of staying in compliance with agreed environmental standards, with limited environmental risks in the event of malfunctioning of the plant,
b) Increase the recycling of waste products such as glass, aluminium, Ni-Cd and lead-acid batteries, ferrous metals,
c) Provide useful or revenue-generating by-products such as compost, fuel and electricity,
d) Significantly improve the existing waste treatment and disposal system,
e) Reduce the quantity of waste discharged into the landfill by diversion, recycling and reduction, thus extending the useful life of the landfill,
f) Process all waste generated on the island including hazardous and biomedical wastes,
g) Have a minimum negative impact on the environment (air, land or water-based), therefore toxic end products cannot be generated or must be minimised.

h) Be able to withstand salt air and highly corrosive environments,

i) Be based on well proven and tested technologies, and similar methods must have been successfully operated, other than on pilot projects, for a period of at least 3 years,

j) Have built-in redundancy of critical items, and allow replacement of worn parts/units without detriment to the operation of the entire plant,

k) Be capable to being easily upgraded/extended.

BRIEF DESCRIPTION OF REVIEWED TREATMENT AND DISPOSAL OPTIONS

32) The WDOR committee examined the pros and cons of the four treatment and disposal options referred to in the ASA report and agreed with most of the findings listed in that document:

The Committee explored the relative costs of different waste management options. In general, the original costs in the ASA study were very close to the re-evaluated cost. The relative cost difference between the landfill-only and waste-to-energy (incineration) alternatives was approximately US $7 per ton (the treatment/disposal costs were re-evaluated at US 27 and US$ 34 per ton respectively). (Note: The average solid waste generation rate (per population equivalent) on Grand Cayman is approximately 1 ton per year).

It must be noted, however, that no detailed cost data were available on the selected hybrid waste-to-energy system, and an accurate cost estimate could therefore not be made. However, the competitive tendering procedure will result in the least cost for the selected treatment/disposal method.

Some of the comments of the ASA report are restated below. For those treatment options not covered in the ASA report, a brief description has been provided below.
LANDFILL
The use of a landfill-only may be one of the least costly, low technology and most straightforward of all options. However the Committee did not consider this the most suitable method for the long-term treatment and disposal of solid waste on Grand Cayman. This is mainly due to the large area of land required, the limited suitable available land and its cost, and environmental concerns such as pollution (e.g., resulting from spontaneous combustion of landfilled wastes, and air blown litter), nuisances (such as odours, flies, rodents, etc.) and contamination risks (e.g., leachate).

The available land area (together with the adjacent lands, as discussed earlier in this report) is not adequate to allow a landfill-only option for the design period of 20-25 years. It is estimated, based on the anticipated waste stream, that this land area will only be adequate for a period of 10-12 years, after which no further options will be available for this site, and another location will have to be found. (Note: For the present Government-owned properties alone, the available land area will only be adequate for a period of less than 7 years (2006-2012). This would result in other problems such as the issue of rezoning land to heavy industrial, the high probability of delays with the planning process caused by objections and appeals (the "not in my backyard" syndrome) and hauling of wastes to a "pristine" site.

Additionally, the landfill only option does not facilitate recycling of certain components and causes difficulties for (future) energy recovery.

It is very important to note, however, that independent of the treatment and disposal method selected a properly engineered landfill (i.e., with a protective liner) will be required but on a smaller scale to deal with only those waste products that cannot be processed by the selected treatment and disposal method.

WINDROW COMPOSTING
This option is fairly economical. However there is the potential for odours, fly and rodent breeding, if the process is not properly operated and maintained. The process is more labour intensive and a significant portion of the waste products will still have to be disposed of in a landfill. Consequently, a similar situation will occur in relation to the landfill only, as stated above, although to a lesser extent.
The benefits of this system would be the elimination of vegetative matter from the landfill (accounting for nearly 20% of the incoming solid waste), increased revenue from the sale of the product (compost) to the general public, and the reduction of the quantity of material required for purchase as landfill cover (if compost is used for that purpose). Unfortunately, no detailed analysis has been carried out on the marketability of locally produced compost.

IN-VESSEL COMPOSTING
This process is an 'upgrade' of the windrow composting process, but a more expensive alternative. The in-vessel composting allows for better operational control (particularly with respect to odour and pests) and consequently more products can be handled (e.g., food waste) and in a shorter time than windrow composting.

The benefits of this process are similar to that of windrow composting.

WASTE-TO-ENERGY OPTIONS
Waste-to-energy (WTE) is the controlled incineration or processing of solid waste with energy recovery. Combustion of solid waste can result in up to 90% reduction of waste volume and up to 75% reduction in weight. WTE processes also provide the opportunity for energy recovery and utilisation (i.e., generation and sale of electricity).

The three most widely used and technically proven WTE technologies are (a) mass-burn combustion, (b) modular combustion, and (c) refuse-derived-fuel (RDF) production and combustion.

Several other emerging WTE technologies have been pilot-tested, and are now commercially available. These include (d) pyrolysis, (e) gasification, (f) autoclave, fluidised-bed combustion, anaerobic digestion, and other related processes that convert solid waste to gaseous, liquid, or solid fuel through thermal processing.

a) Mass Burn
This is the simplest and most common form of incineration. Mass-burn systems generally consist of two or three (reciprocating grate or rotary kiln) combustion units ranging in capacity from 200 to 750 tons per day each. These facilities can accept
refuse that has undergone little pre-processing other than the removal of oversized items.

b) Modular Combustion

Modular combustors are usually prefabricated units with relatively small capacities between 15 and 100 tons of solid waste per day. Typical facilities have between two and four units for a total plant capacity of 30 and 400 tons per day. The majority of modular units produce steam as the sole energy product.

On average, capital costs per ton of capacity are lower for modular units than for mass-burn plants.

Based on the above information, many of the Mass Burn and Modular Combustion facilities are designed for large-scale waste treatment and disposal and may not be applicable for the current and projected waste stream for Grand Cayman (approximately 200 tons/day in 2004). Consequently, the capital investment and the cost of operating and maintaining such a facility could be very high.

c) Refuse-derived-fuel (RDF)

RDF is a result of mechanically processing solid waste to separate the combustible fraction from the non-combustibles, such as glass, metals and cinders. RDF is typically shredded into uniformly sized particles or densified into “briquets” to produce a storable, transportable, and more homogeneous fuel for combustion.

The main pollutants of concern with incineration of solid waste are dioxins, acid gases, nitrogen oxides, heavy metals and particulates. These are present in the bottom ash, fly ash and combustion gases. Fly ash can contain sufficient dioxins (a carcinogen) and metals to require it to be treated as a hazardous waste. The other air pollutants (acid gases, particulates) can harm people with respiratory illnesses. Although metals are inert, and give off no energy when they are incinerated, the high temperatures cause metals to be partially “volatilised”, resulting in the release of toxic fumes and fly ash.
Sorting of the solid waste to remove non-combustibles prior to loading the incinerator may reduce these concerns, but this is an unattractive undertaking (due to malodours, health risks, and safety issues).

d) Pyrolysis
This is the thermal decomposition of organic material at elevated temperatures in the absence of air or oxygen. The process produces a mixture of combustible gases, primarily methane, complex hydrocarbons, hydrogen, and carbon monoxide, and liquids (oils) and solid (char) residues. The gas can be used in combustion turbines for electric generators.

e) Gasification
This is a special type of pyrolysis where thermal decomposition takes place in the presence of a small amount of oxygen or air.

Mass burn incinerators and thermal gasification processes share some of the same environmental problems, but the gas produced by thermal gasification processes can be scrubbed to remove contaminants prior to combustion, so air emissions may be easier to control than with mass burn incinerators.

There are only a handful of large-scale thermal gasification demonstration projects in Europe and the United States, and several commercial sites in Japan. Therefore, the technical and economic feasibility has not yet been fully demonstrated. Increased emphasis upon resource recovery and renewable energy, however, may make these processes more attractive in the future.

f) Autoclave
A more recent development is the Autoclave system, a well-tested process for medical and clinical waste.

In this process the unsorted solid waste is shredded and loaded “batch-wise” into a pressure vessel (A typical system comprises two or more parallel units, typically 5–20 tons per cycle per unit). Steam is injected into the vessel up to 75 psi pressure at 160 degree centigrade (320 degrees Fahrenheit) and held at that pressure and
temperature for 60-90 minutes, which effectively sterilises the material. To ensure thorough penetration and treatment the vessel rotates throughout the treatment period.

After removal from the pressure vessel, the inert materials (e.g., sterilised plastics (lumped together due to the heat), glass, ferrous and non-ferrous metals) can be easily separated from the organic waste using mechanical means (e.g., sieves, magnets, eddy-current and air separators).

The organic waste, which is now broken down into fibres (referred to in the industry as “fluff”), can be dewatered using presses and be partially dried using waste heat. The “fluff” can then be fed directly into the grate of the steam generating boilers to make steam to process the next load of waste, or (if available in excess) to generate electricity. Alternatively, the “fluff” can be fed directly to pyrolysis, gasification or other thermal processes to generate electricity.

The operating temperatures of the Autoclave process are much lower than those of the incineration units, and therefore dioxins and furans are not formed and are therefore of no concern.

The emissions from combustion of the “fluff” are minimal because all harmful elements such as plastics and metals would have been removed, and consequently, expensive gas scrubbers and particulate bag filters are not required.

**SELECTION OF WASTE TREATMENT / DISPOSAL SYSTEM**

33) The WDOR committee concluded that only a hybrid waste system comprising of several different treatment methods could satisfy all the treatment and disposal situations on the islands.

34) It is recommended that the yard waste (hauled to the landfill site by nurseries and landscapers) is kept separate from the general waste stream, and either be chipped (for mulch) or treated to form compost. Yard waste comprises approximately 20% of the waste stream, and offers therefore a very attractive recycling opportunity. It is acknowledged that
the success of a composting program is determined in large part by the market for the material, which is not known at this time. It may be possible to give the mulch/compost away, but not to sell it. The cost of mulching/composting, less the revenue from the sale of these products, can be weighted against the cost of processing the yard waste in the main treatment/disposal method.

35) It is recommended that tires are kept separate from the general waste stream and be shredded into small pieces and used as landfill cover. Although they have a relatively high energy content, incineration of tires is both costly and complex, while stockpiling used tires pose serious threats in the form of fire hazard and mosquito breeding.

36) It is recommended that the main waste treatment / disposal method be the Autoclave system (a Waste-To-Energy (WTE) technology):

The municipal solid waste is collected and hauled to the site, where it is shredded (without the need to sort) and loaded by conveyors into the pressure vessel for treatment.

The inert (sterilised) materials are then separated from the organic waste:
- Rotary trommel screens can sort materials by size,
- Ferrous metals are removed using magnetic separators,
- Non-ferrous materials are removed using eddy-current and air separators,
- Plastic and glass are also removed mechanically.

The separated materials are then transported by enclosed conveyors to dedicated areas for further treatment (e.g., shredding, consolidation etc.)

The organic waste ("fluff") is dewatered using presses and partially dried using waste heat and fed directly into the grate of the steam generating boilers to make steam to process the next load of waste. Due to the difficulties in disposing of large amounts of waste heat, it is not recommended to use boilers to generate electricity. However, thermal processes could be used to produce combustible gas from the "fluff" for use in a gas turbine to generate electricity, the sale of which is a source of revenue.
Only sterilised, biologically inert materials (plastics, building waste, glass) are deposited into the landfill, which do not generate any leachate, decompose or emit odours. Therefore, they do not require as much landfill cover, do not attract pests (vermin) or create nuisance problems.

Some glass and building waste (rubble) can be separated prior to or after treatment and processed for use as cover material at the landfill site.

37) The successful company will be responsible to separate and store the ferrous and non-ferrous materials and ship them off island. These materials will not be allowed to be deposited in the landfill: Aluminium has a relatively high market value and this will be a source of revenue. Ferrous materials have a much lower market value, and the potential revenue will very likely not offset the cost of shipping. However, the additional cost could easily be offset by the profit on shipping the aluminium.

38) Hazardous (biomedical) waste is collected and must be kept separately from the general waste stream. It is recommended that this waste is destroyed in a separate Biomedical /Multi-Purpose Incinerator, similar to the existing incinerator. This incinerator can also be utilised to destroy the occasional load of confidential documents, old currency, confiscated illicit drugs, and other hazardous wastes that are suitable for destruction through incineration. The relatively small quantities of ash from the incinerator can be disposed in the landfill.

39) It is recommended that (other hazardous wastes such as) lead-acid batteries and waste oil continue to be shipped to the United States or other markets for recycling.

40) Given the time frame the Committee was not able to review the treatment/disposal methods for miscellaneous hazardous wastes (e.g., pesticides, oil-based paints, Ni-Cd batteries, household and laboratory chemicals, and specialised process wastes); white goods and derelict vehicles. It is acknowledged that the RFP must address this issue and specify the method for these waste streams.

41) It is recommended that the mining of the existing landfill site not be considered at this stage, as the existing landfill is still considered “active” and mining it may create significant
hazards and nuisances (e.g., explosions and fires due to gases; health risks due to toxic fumes, odour problems; and safety issues such as sharp contaminated objects, etc.).

Eventually (approximately 15 years after closure of certain cells in the landfill and all waste therein has sufficiently stabilised) sections of the landfill may be mined. The majority of the excavated material will be compost, plastics (which would not have degraded), and other inert materials (e.g., building rubble, glass, tires, etc.).

This will reclaim the existing site as new landfill area and there would be no need to relocate from that site in the foreseeable future. In addition, valuable landfill cover material (e.g., building rubble, glass, and prior landfill cover material) can be recovered for further use.

42) It is recommended that Cayman Brac's and Little Cayman's waste treatment / disposal options not be fully explored until a final decision has been made for Grand Cayman such that linkages may then be explored utilising a cost benefit analysis.

PROJECT TIMELINES

43) A reasonable estimated time for a new treatment and disposal facility to become fully operational is early 2006, which is approximately 6 months after the existing landfill site is estimated to have reached its capacity. Therefore, a number of critical deadlines must be met as shown on the Project Timeline Chart in Appendix 7.

COMMENTS AND OBSERVATIONS OF CUC

44) The complete minutes of the meeting with CUC, to discuss their potential role if some form of waste-to-energy project were to be chosen, are included as Appendix 8. The main points from the meeting include:

a) CUC is only interested in purchasing power, not steam or fuel pellets.
b) CUC is willing to pay $0.06 to $0.07 CI per kWh with no restrictions on generating times or amounts, providing that this is less than 10 MW.
c) There is a possibility for future price negotiation when the supply proves itself to be stable.

d) CUC recommended utilising multiple smaller treatment / energy generation modules, rather than a “single-train” incinerator / boiler system.

e) CUC also recommended, from their experience, that the treatment using pyrolysis and generating a gas, which could be directly burned in a gas turbine, could be explored since many of the problems they encounter with the disposal of waste heat would be much alleviated under this scenario.

f) CUC’s Vice President – Production and Engineering has volunteered to be a non-voting technical advisor to the WDOR Committee if requested.

OTHER ISSUES OF CONCERN

45) The Committee accepted that further discussion of the buffer zones around the intended treatment / disposal site would be necessary when project specifics were better known. Items including wind direction, impact on adjacent properties, treatment / disposal method and feedback from relevant agencies such as Planning, Environment, Water Authority and Environmental Health would all be necessary factors used to formulate the type and size of buffers necessary.

46) The WDOR committee also recognised that other functional aspects of the existing Environmental Health Department would need to be further considered as to whether they will be incorporated as part of the Solid Waste Authority or become more of a regulatory agency depending on the final approach adopted.

COMMITTEES AND MEMBERS

47) The WDOR Committee comprised selected Governmental agencies, the Water Authority and representatives from the private sector. A separate technical subcommittee was created to deal with most of the technical data and details for the various waste treatment and disposal systems. A list of committee members and meetings attended is shown in Appendix 9.
APPENDICES
MEMORANDUM

TO:   Deputy Financial Secretary  
      Chief Engineer, PWD  
      Director of Planning  
      Director of Environment  
      Director, Water Authority

FROM: Permanent Secretary, Planning, Communications, Works & Information Technology

DATE:  4th July 2002

SUBJECT: Waste Disposal Options Review (WDOR) Committee

I am directed by the Governor-in-Council to advise that approval has been given for the establishment of the Waste Disposal Options Review (WDOR) Committee.

The committee will be chaired by the Permanent Secretary, PCW&IT and membership will be comprised of the Director of Environmental Health, Assistant Director - Solid Waste, as well as Heads of Department/Statutory Authority (or their designate) from Planning, Environment, Water Authority, Public Works and Finance & Economics as well as Mr. Daniel Scott of the Fiscal Advisory Group.

The Terms of Reference for the WDOR Committee are as follows:

a) Act as the overall steering committee in the consideration and selection of appropriate and cost-effective solid waste solution(s) for the Cayman Islands. Contract awards will be subject to the Central Tenders Committee process.

b) Develop an Interim Report consisting of the following details which will be issued to all entities interested in submitting proposals:

   i. Waste stream (current size and future growth predictions);
   ii. Waste stream content applicable for burning or British Thermal Unit (BTU) value;
   iii. Assessment of applicability of mining current landfill;
   iv. Value figures(s) to be used when assessing energy/sales potential;
v. Specify the regulatory framework to be followed (i.e. US-EPA, EU)
vi. Acceptable ownership/operational arrangements;
vii. Parameters for proposals;
viii. Waste disposal options for the Sister Islands;
ix. Comparison method to be used when evaluating competing proposals.

c) Prepare the necessary Request for Proposals (RFP) documentation and implement schedules, timelines and deadlines for the completion of all submissions, evaluations and reports.

d) All waste disposal proposals should be reviewed and assessed under the direction of the WDOR Committee.

e) The WDOR will establish a technical subcommittee to provide assistance and will be chaired by the Director, DEH and include any other members or designates from the main committee or other individuals chosen by the main committee including but not limited to independent experts or consultants.

f) Submit a Final Report, which reviews the proposals utilizing the methods developed in the Initial Report, with recommendations to Government on the most appropriate way forward.

g) Final Report shall be submitted to the Ministry by 15th December 2002.

On behalf of the Honourable Minister, PCW&IT I would like to take this opportunity to thank you in advance for your assistance in this important project and ask that agencies now forward names of persons nominated to serve on the WDOR Committee.

Thank you for your attention.

T C HUBBELL
Senior Assistant Secretary
For Permanent Secretary

Cc Hon. Minister, PCW&IT
Director, Environmental Health (Acting)
Assistant Director – Solid Waste DEH
Mr. Daniel Scott, Fiscal Advisory Group
APPENDIX

2
### TABLE 1.0

**DEH Assumptions For Growth of Population and Waste Generation**

<table>
<thead>
<tr>
<th>a</th>
<th>1,214,757 by DoT</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>3,328 = a / 365</td>
</tr>
<tr>
<td>c</td>
<td>80.0% estimate by DEH</td>
</tr>
<tr>
<td>d</td>
<td>90.0% estimate based on 6hrs or half of waking day spent in Cayman</td>
</tr>
<tr>
<td>e</td>
<td>1,331 = b * c * d</td>
</tr>
<tr>
<td>f</td>
<td>334,071 by DoT</td>
</tr>
<tr>
<td>g</td>
<td>5.8 estimate based on DoT avg. for Hotel and Apt. durations</td>
</tr>
<tr>
<td>h</td>
<td>5,400 = f / 365 * g</td>
</tr>
<tr>
<td>i</td>
<td>6,751 = e + h</td>
</tr>
<tr>
<td>j</td>
<td>37,083 by 1999 census</td>
</tr>
<tr>
<td>k1</td>
<td>HIGH Population Growth Rate Estimate: 4.0% High Estimate based on Statistics average of last 20 years</td>
</tr>
<tr>
<td>k2</td>
<td>DEH estimated figure</td>
</tr>
<tr>
<td>k3</td>
<td>Population Growth Rate 1999 - 2000: 3.6% Statistics Office</td>
</tr>
<tr>
<td>k4</td>
<td>Population Growth Rate 2000 - 2001: 2.7% Statistics Office</td>
</tr>
<tr>
<td>l</td>
<td>=K1 or K2 estimate based on Cayman growth rate</td>
</tr>
<tr>
<td>m</td>
<td>1.0% estimate based on US figures</td>
</tr>
<tr>
<td>n</td>
<td>0.843 tons/yr/person (2000 US average)</td>
</tr>
<tr>
<td>o</td>
<td>20.5% DEH figures for Industrial, C&amp;D, Medical wastes etc.</td>
</tr>
<tr>
<td>p</td>
<td>25.0% n/(1-(r)*n/0)</td>
</tr>
<tr>
<td>q</td>
<td>0.217 tons/yr/person n + p</td>
</tr>
<tr>
<td>r</td>
<td>1.061 tons/yr/person n + o</td>
</tr>
<tr>
<td>s</td>
<td>44,000 Tons (DEH scale records of 5 months extrapolated for 1 yr)</td>
</tr>
<tr>
<td>t</td>
<td>44,000 Cayman 1999 disposal rate</td>
</tr>
<tr>
<td>u</td>
<td>1.010 = s / ((+1)-(k1*2))</td>
</tr>
<tr>
<td>v</td>
<td>57,379 Tons (DEH scale records of 9 months extrapolated for 1 yr)</td>
</tr>
</tbody>
</table>

**For the purposes of providing a LOW estimate of waste generation the following figures will be used:**

- **Annual US Waste Generation Rate 2000**: 1.061 = r
- **Grand Cayman Population Equivalent 1999**: 43,545 = (1 + 1 - (1 * K2 * 2))
- **LOW Population Growth Rate Estimate**: 2.0% = k2
- **Annual Waste Generation Rate Increase**: 1.0% = m

**For the purposes of providing a HIGH estimate of waste generation the following figures will be used:**

- **Cayman 2000 disposal rate**: 1.318 = v
- **Grand Cayman Population Equivalent 1999**: 43,545 = (1 + 1 - (1 * k2 * 2))
- **HIGH Population Growth Rate Estimate**: 4.0% = k1
- **Annual Waste Generation Rate Increase**: 1.0% = m

**For the purposes of providing an AVERAGE estimate of waste generation the following figures will be used:**

- **Average Of High and Low Disposal Rate 1999**: 1.177
- **Grand Cayman Population Equivalent 1999**: 43,545 = (1 + 1 - (1 * k2 * 2))
- **Average of High and Low Population Growth Rates**: 3.0%
- **Annual US Waste Generation Rate 2000**: 1.0% = m

---

Waste Disposal Options Review Committee (WOOR) - Interim Report
APPENDIX

3
# Table 2.0

## DEH Estimates on Growth in Population and Waste

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>1999</td>
<td>43,545</td>
<td>1.050</td>
<td>45,724</td>
<td>43,545</td>
<td>1.305</td>
<td>56,905</td>
<td>43,545</td>
<td>1.177</td>
</tr>
<tr>
<td>2001</td>
<td>2001</td>
<td>46,062</td>
<td>1.071</td>
<td>49,341</td>
<td>46,062</td>
<td>1.331</td>
<td>61,303</td>
<td>46,062</td>
<td>1.201</td>
</tr>
<tr>
<td>2002</td>
<td>2002</td>
<td>48,894</td>
<td>1.082</td>
<td>50,831</td>
<td>48,894</td>
<td>1.344</td>
<td>64,393</td>
<td>48,894</td>
<td>1.213</td>
</tr>
</tbody>
</table>

... (continued for other years)
APPENDIX

4
MEMORANDUM

TO: Director of Planning

FROM: Acting Permanent Secretary, Planning, Communications, Works & Information Technology.

DATE: 20th September 2002

SUBJECT: Request for Rezoning – 13C/1 & 13D/1

Further to a memo from the Acting Director, Environmental Health dated 9th September 2002, which followed on the advice and recommendation of the Waste Disposal Options Review (WDOR) Committee, I am now directed by the Honourable Minister, PCW&IT to request that the Central Planning Authority give consideration to rezoning the following two parcels of Crown property in George Town to Heavy Industrial.

- Block 13C, Parcel 1
- Block 13D, Parcel 1

Please action this proposal as part of the ongoing review of the Development Plan 1997 and we thank you for your assistance in this regard.

T C HUBBELL

Cc Hon. Minister, PCW&IT
Acting Director, DEH
TABLE 3.0
DEH ESTIMATES ON WASTE COMPOSITION

<table>
<thead>
<tr>
<th>MATERIAL TYPE TO DEH LANDFILL</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>35.5%</td>
</tr>
<tr>
<td>Business</td>
<td>30.1%</td>
</tr>
<tr>
<td>Yard Waste</td>
<td>15.9%</td>
</tr>
<tr>
<td>Construction/Demolition</td>
<td>15.0%</td>
</tr>
<tr>
<td>Recyclable Materials</td>
<td>1.9%</td>
</tr>
<tr>
<td>Public Drop-Off</td>
<td>1.0%</td>
</tr>
<tr>
<td>Biomedical</td>
<td>0.3%</td>
</tr>
<tr>
<td>Other</td>
<td>0.3%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

DEH ESTIMATES ON WASTE COMPOSITION

<table>
<thead>
<tr>
<th>Description</th>
<th>Estimated Average Composition</th>
<th>Lower Planning Range</th>
<th>Upper Planning Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newsprint</td>
<td>5.0%</td>
<td>0.2%</td>
<td>9.8%</td>
</tr>
<tr>
<td>Glass Bottles</td>
<td>2.8%</td>
<td>1.2%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Glass Other</td>
<td>0.7%</td>
<td>0.0%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Aluminum Cans</td>
<td>0.8%</td>
<td>0.5%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Aluminum Other</td>
<td>0.4%</td>
<td>0.0%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Plastic Bottles</td>
<td>1.9%</td>
<td>1.3%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Plastic Other</td>
<td>9.1%</td>
<td>7.1%</td>
<td>11.0%</td>
</tr>
<tr>
<td>Wood</td>
<td>7.3%</td>
<td>4.6%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Dirt, Brick, Rubble</td>
<td>3.7%</td>
<td>1.6%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Yard Waste</td>
<td>18.6%</td>
<td>12.9%</td>
<td>24.4%</td>
</tr>
<tr>
<td>Metal Cans</td>
<td>2.0%</td>
<td>1.3%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Ferrous metal</td>
<td>2.3%</td>
<td>0.9%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Non-Ferrous Metal</td>
<td>0.7%</td>
<td>0.3%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Corrugated Cardboard</td>
<td>11.7%</td>
<td>6.6%</td>
<td>16.9%</td>
</tr>
<tr>
<td>Office Paper</td>
<td>1.8%</td>
<td>0.4%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Other Paper</td>
<td>12.6%</td>
<td>9.8%</td>
<td>15.4%</td>
</tr>
<tr>
<td>Textiles</td>
<td>5.3%</td>
<td>3.1%</td>
<td>7.4%</td>
</tr>
<tr>
<td>Food Waste</td>
<td>5.4%</td>
<td>3.9%</td>
<td>7.0%</td>
</tr>
<tr>
<td>misc. Organics</td>
<td>5.5%</td>
<td>3.7%</td>
<td>7.2%</td>
</tr>
<tr>
<td>Misc. Other</td>
<td>2.4%</td>
<td>0.8%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

ESTIMATED ANNUAL VOLUMES OF OTHER ITEMS COLLECTED BY THE DEH

- Lead Acid Batteries: 240 tons
- Waste Oil: 42,400 gallons
- Contaminated Waste Oil: 10,600 gallons (contaminated by Halogenated Hydrocarbons)
APPENDIX
Area for Proposed Solid Waste Treatment and Disposal Facility
Appendix 8

Minutes of the Meeting between CUC Officials and WDOR Representatives
Held Tuesday, September 3, 2002

Present were:  
Mr. Roydell Carter  
Mr. Tim Hubbel  
Mr. Tom van Zanten  
Mr. Rob McCullough  
Mr. Peter A. Thomson  
Mr. Richard Hew  
Mr. Robert L. Smith  
Department of Environmental Health  
Ministry of P.C.W. & IT  
Water Authority  
Department of Environmental Health  
Caribbean Utilities Company, Ltd.  
Caribbean Utilities Company, Ltd.  
Caribbean Utilities Company, Ltd.

Mr. Hew welcomed the Government representatives to CUC's facilities.

Mr. Carter, and the Government Delegation, provided some background information on the Waste Disposal options Review (WDOR) Committee's goals and why the Committee had requested a meeting with Senior CUC staff. This information included the following points:

- The WDOR Committee was formed by government and is charged with the responsibility of exploring all the waste disposal options and making a recommendation to government by December 15, 2002, on the most appropriate disposal method for Grand Cayman. The Committee is also charged with putting together an initial report by the same deadline, which will outline all the necessary information to be included in a Request for Proposal Package.

- The WDOR Committee is aware that CUC has been approached by a number of companies interested in providing unsolicited proposals to the DEH. It is the WDOR Committee's desire to formalize all quotations and provide all potential submitters with similar information.

- The WDOR Committee also wanted to explore CUC's interest in a waste-to-energy project as this is one potential outcome of our study.

The Delegates from CUC provided the following information during the meeting:

- CUC would only be interested in purchasing electricity and had no desire to accept steam, gas or other fuel types from a waste-to-energy project. They furthermore confirmed that the length of a steam pipeline to the current landfill was very likely unpractical due to the distance and losses which would be incurred.

- There is a 69kV line at the landfill site which could be fed into by a generating system; however, it would be far more cost effective to feed into one of the smaller 13kV lines, provided the power generation was on the anticipated scale of 3-4 MW.

- CUC indicated that there would be a high degree of difficulty tying into, and therefore selling, any power into their grid from locations out toward East End or North Side.

- CUC would be interested in purchasing up to 10 MW of power and would base their pricing on fuel avoidance costs. The pricing would therefore be $0.06 - $0.07/Ct/kWh. CUC noted that this amount includes the duty, which will be lost to government by the avoidance of the fuel tax.

- CUC also noted that their current License would have to be amended to allow their purchase of electricity produced by another entity.
• CUC noted that there would be no strings attached to the purchase of the electricity (e.g. no guaranteed supply, nor generation times) but if the system proves to be reliable, CUC may be able to renegotiate the supply contract for a higher price which may well then require generation guarantees.

• CUC noted that their rationale for any potential future agreement with a waste to energy project would be based on no increased fees to their customers or losses to their shareholders. Up to that point they are willing to co-operate to whatever degree possible to help government in this regard.

• During the meeting, discussions took place around some of the potential projects that had already come before CUC. CUC staff cautioned the Committee about "single-train" systems of a single incinerator/boiler due to the problems they've heard about in Bermuda. When the possibility of generation of a gas fuel via pyrolysis was discussed CUC seemed enthused by the idea and recommended use of a gas turbine to convert the gas to electricity.

• When the potential of taking CUC's waste oil into a new facility came up, CUC indicated that they would pay the same rate to the facility as they are currently incurring for shipment and treatment to the US.

• CUC graciously volunteered the services of their Vice-President (Production and Engineering) Mr. Robert L. Smith, as a technical advisor to the WDOR Committee if requested. CUC was aware that this advisor status would be non-voting to avoid even the appearance of impropriety since CUC would potentially be signing a contract with the winning bid, if energy generation is a part of that proposal.

Minutes prepared by Mr. Rob McCullough of DEH and proofed by Mr. Robert Smith of CUC.
APPENDIX
Waste Disposal Options Review (WDOR) Committee Membership

<table>
<thead>
<tr>
<th>Department/Statutory Authority/Group</th>
<th>Committee Representative(s)</th>
<th>Meetings Represented by Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of PCW&amp;IT</td>
<td>Keamery Gornez, Permanent Secretary, Tim Hubbell, Senior Assistant Secretary.</td>
<td></td>
</tr>
<tr>
<td>Department of Environmental Health</td>
<td>Roydell Carter, Director. Robert McCullough, Assistant Director (Operations). Bentley Vaughan, Building Development Control Officer.</td>
<td>9</td>
</tr>
<tr>
<td>Water Authority</td>
<td>Gelia Frederick-van Genderen, Director. Thomas van Zanten, New Works Engineer Hendrik van Genderen, Water Resources Engineer</td>
<td>8</td>
</tr>
<tr>
<td>Department of Environment</td>
<td>Gina Ebanks-Petrie, Director. Scott Slaybaugh, Assistant Director (Operations).</td>
<td>7</td>
</tr>
<tr>
<td>Planning Department</td>
<td>Kenneth S. Ebanks, Director. Christine Malcom, Assistant Director (Policy Development) Robert Lewis, Assistant Director (Current Planning).</td>
<td>7</td>
</tr>
<tr>
<td>Public Works Department</td>
<td>Colford Scott, Chief Engineer. Mark Scottland, Deputy Chief Engineer.</td>
<td>6</td>
</tr>
<tr>
<td>Portfolio of Finance &amp; Economics</td>
<td>Kenneth Jefferson, Assistant Financial Secretary.</td>
<td>1</td>
</tr>
<tr>
<td>Fiscal Advisory Group</td>
<td>Daniel Scott, Member.</td>
<td></td>
</tr>
</tbody>
</table>

Notes
* Permanent Secretary PCW&IT declared a potential conflict of interest of Chairing the WDOR Committee, since the Ministry would need to analyze the document prior to presentation to EXCO.

1. A Technical Subcommittee established by the WDOR offered technical advice to the Committee. This committee met 8 times.

2. A meeting between representatives of the WDOR and Caribbean Utilities Company Ltd. (CUC) was held. Attendees were Tim Hubbell (Ministry of PCW&IT), Roydell Carter and Robert McCullough (DEH), Tom van Zanten (WA), and CUC representatives Peter A. Thompson, Richard Hew and Robert L. Smith.

3. The WDOR Committee held nine (9) meetings between August 2nd 2002, and December 15th, 2002.