



# OFFICE OF THE CITY AUDITOR

City and County of Honolulu  
State of Hawai'i



## Audit of the City's Synagro Contract

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A Report to the  
Mayor  
and the  
City Council of  
Honolulu

Report No. 08-03  
August 2008

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Mayor  
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of Honolulu

Submitted by

**THE CITY AUDITOR**  
CITY AND COUNTY  
OF HONOLULU  
STATE OF HAWAII

Report No. 08-03  
August 2008



## **Foreword**

This is a report of our Audit of the City's Synagro Contract. This audit was conducted pursuant to the authority of the Office of the City Auditor, as provided in the Revised Charter of Honolulu. The city auditor determined that this audit is warranted due to ongoing concerns about the design-build-operate contract for an In-Vessel Bioconversion Facility at the Sand Island Wastewater Treatment Plant and outstanding compliance issues related to the biosolids reuse requirements in the 1995 consent decree.

We wish to express our appreciation for the cooperation and assistance of the staff and management of the Department of Environmental Services and others who we contacted during this audit.

Leslie I. Tanaka, CPA  
City Auditor





# EXECUTIVE SUMMARY

## ***Audit of the City's Synagro Contract***

Report No. 08-03, August 2008

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This is a report of our Audit of the City's Synagro Contract. The audit was conducted pursuant to the authority of the Office of the City Auditor to self-initiate audits. The city auditor determined that this audit is warranted due to ongoing concerns expressed by the Honolulu City Council and the public relating to biosolids reuse, the benefits of the city's contract with Synagro-WWT, Inc. (Synagro) for an *In-Vessel Bioconversion Facility* (also referred to herein as the *biosolids facility*), significant project cost overruns, numerous change orders, delays, and outstanding compliance issues related to the 1995 consent decree.

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## **Background**

The Department of Environmental Services plans, directs, operates and administers the city's wastewater programs. The department is also responsible for the oversight of the biosolids facility at the city's largest plant, Sand Island Wastewater Treatment Plant, and to ensure that contractual obligations with Synagro to design, construct, operate and maintain the facility are met. The use of biosolids is monitored and must be in accordance with the provisions of the Clean Water Act and other federal and state regulatory requirements. The federal biosolids rule established by the U. S. Environmental Protection Agency (EPA) is contained in 40 CFR Part 503 entitled, *Standards for the Use or Disposal of Sewage Sludge*, and applied in state Department of Health water pollution and wastewater systems regulations. In addition, environmental compliance with the 1995 consent decree sets forth biosolids reuse requirements to be met by the city. The department is responsible for coordinating and managing activities relating to federal and state environmental requirements.

Our review focused on the beneficial sludge reuse requirements stated in the 1995 consent decree, the design-build-operate contracts awarded to Synagro in May 2002, and project costs for the biosolids facility at the Sand Island wastewater treatment plant. The timeframe for this audit was from December 31, 2005 to October 1, 2007, which corresponds to the deadline in the 1995 consent decree pertaining to the beneficial

sludge reuse project and recent operational performance of the Synagro biosolids facility at Sand Island.

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## Summary of Findings

### **Finding 1: The in-vessel bioconversion facility project at the Sand Island Wastewater Treatment Plant experienced construction delays and costly change orders.**

- Delays in construction included relocation of the facility, refurbishing/retrofitting the existing solids handling building, additional equipment, unanticipated delays in obtaining necessary permits, and operational changes for proper operations of the digester and heat drying system. The June 2007 fire also delayed testing of the sludge to pellets processes and acceptance of the biosolids facility.
- Twelve change orders increased the cost of the biosolids facility by over \$6.4 million since the original Synagro contract was executed in May 2002 for \$33,755,000.
- As of September 30, 2007, the facility is fully operational and processing all gravity-settled sludge from the Sand Island wastewater treatment plant, and has the capacity to process at least 10,000 dry tons per year of sewage sludge. The total cost for the in-vessel bioconversion facility is approximately \$40.9 million with project closeout expected in 2008. However, the facility's total cost cannot be determined until the final change order, Number 12 is finalized.
- The annual cost for the operation and maintenance of the facility by Synagro is approximately \$3,818,812 over the 15-year term of the contract. Synagro is also responsible for marketing, sales and beneficial reuse of the biosolid pellets. In addition, annual adjustments can be made for the agreed-upon disbursements. For sales to third parties, Synagro will rebate the city 60 percent of the net revenues collected over the base rate of \$20 per ton. Synagro will provide up to 2,000 tons per year of Class A fertilizer pellets to the city at no charge.

**Finding 2: The city's ability to achieve sludge reuse compliance with the consent decree appears close, but potential penalties could cost the city millions more.**

- Compliance with the 1995 consent decree requires the city to beneficially reuse sewage sludge as demonstrated through actual customer usage of the biosolid pellets as a soil amendment or plant fertilizer. This is essentially the last requirement to fulfill compliance with the consent decree's sludge reuse requirements.
- The state health department has confirmed that the biosolid pellets meet all federal and state biosolid regulations for land application, and thus, the city's compliance with the beneficial sludge reuse requirement appears close.
- Delays in completing the consent decree's sludge reuse requirements could cost the city millions in penalties. As part of the 1995 consent decree, the city agreed to stipulated penalties for failure to meet reuse conditions and deadlines for each day the consent decree's deadlines are not met by the city. We note that the EPA calculated accrued penalties relating to sludge reuse requirements at \$5,510,000 in 2003.

**Finding 3: The city's in-vessel bioconversion facility is anticipated to have some favorable outcomes, but challenges remain.**

- With the completion of construction and having state approval that the pellets meet Class A biosolid requirements, the environmental services department is poised to move forward with improved processes and treatment operations. The long term operation of the facility is anticipated to have benefits including the reduction of dewatered sludge disposed in the landfill and energy-efficient operations such as the use of biogas captured from the anaerobic digestion system to fuel the dryer operations and the digester's boiler.
- Challenges remain in completing the consent decree's biosolid reuse requirements, including approvals for the distribution of pellets from the state health department and ongoing public concerns about the use of biosolid pellets on Hawai'i soils, even though biosolid



fertilizer and compost products have been widely used across the country and in Hawai'i for many years, and despite state health department regulatory oversight.

- Implementation of test marketing, promotion and sales of the biosolid pellets and efforts to develop a local market of potential users are underway. However, public acceptance of the beneficial use of the pellets is questionable.

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## Recommendations and Response

The director of the Department of Environmental Services should:

- a. finalize Change Order Number 12, under the construction contract;
- b. ensure that Synagro fulfills its obligations to the city under the construction contract and then expedite closeout of the construction contract;
- c. ensure completion of the beneficial sludge reuse project including final submission of the written *Notification of Supplemental Environmental Project Completion* to the U.S. Environmental Protection Agency regarding completion of the beneficial sludge reuse supplemental environmental project as required in the 1995 consent decree;
- d. provide the city council with written annual status reports on the city's biosolids facility including total project cost for the Sand Island biosolids facility and closeout date of the Synagro construction contract, update on Synagro's revenue and non-revenue customers, revenue due to the city from biosolid pellets sales, tonnage landfilled, reused and sold, status of compliance with the consent decree requirement for completion of the beneficial sludge reuse supplemental environmental project including determination of issues, concerns, or penalties from EPA related to delays in meeting the consent decree's deadlines, and progress of the city's biosolids reuse program;
- e. ensure that Synagro fulfills its contractual responsibilities for the marketing, sales and reuse of pellets as soil amendment or plant fertilizer to more users; and

- f. pursue other initiatives and opportunities to minimize disposal of biosolid pellets in the landfill.

In its response to our draft report, the director thanked the city auditor for the opportunity to review and comment on the draft report. The department disagreed with our description of the project's delays and public concerns about biosolid pellets. The department noted that the project "experienced one significant delay and resulting increase in cost due to City Council's desire to have further testing and research of pellets safety completed." However, our discussion about delays is intended to provide readers with background information about the project which was almost two years behind the deadline date of December 31, 2005 for compliance with the 1995 consent decree. We have incorporated the department's suggestion that the project experienced delays.

The department also asserted that it is unaware of ongoing public concern about the use of biosolids; however we note that this information is based in part on discussions with those with direct knowledge of the biosolid marketing plans and explanation of the challenge to introduce biosolid fertilizer pellets to potential users unfamiliar with the product. In addition, our report noted that biosolid compost and fertilizer products have been widely used for many years across the country and in Hawai'i.

The department also provided additional information on the cost of one change order not made available to us by the end of our fieldwork. The department noted that another change order, Number 13 will add an additional \$600,000 to the total cost of the project, thus "the final contract price for Contract #F92642, Synagro-WWT, Inc. will be \$40,764,673.84, or \$7,009,673.84 above the original contract price." While this information is noteworthy, our report's information on the project's costs, including change orders, was accurate as of the end of our fieldwork. The department further disagreed with the description of change orders as costly and provided explanations about the project's change orders. While this additional information might help to provide a description and purpose for the various change orders, our audit objective was to assess the total project cost including all change orders.

We note that environmental services' response also provides current information after completion of our fieldwork regarding its efforts to secure a state Department of Health waiver on molybdenum necessary for distributing biosolid pellets, as well as clarification on state

regulations, HAR Section 11-11-8, relating to sewage and food crops. Since this information was beyond the scope of our audit we offer no comment.

The department did not comment on their plans or timetable for completing the remaining requirements of this project and the audit recommendations. In light of the possible penalties accruing each day, we maintain that it is in the city's fiduciary best interest to expedite efforts to formally complete the biosolid reuse requirements of the 1995 consent decree. Despite the assertions made in its response, the department's comments to us about the draft report did not change the substance of our findings. Finally, we appreciate the clarifying information and comments provided by the department, and changes, where appropriate, were made to the final report.

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**Leslie I. Tanaka, CPA**  
**City Auditor**  
**City and County of Honolulu**  
**State of Hawai'i**

Office of the City Auditor  
1000 Uluohia Street, Suite 120  
Kapolei, Hawai'i 96707  
(808) 768-3134  
FAX (808) 768-3135  
[www.honolulu.gov/council/auditor](http://www.honolulu.gov/council/auditor)

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# Chapter 1

## Introduction

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This audit was conducted pursuant to the Office of the City Auditor's (OCA) authority to self-initiate audits, as provided in the Revised Charter of Honolulu, and is included in OCA's Proposed Annual Work Plan for FY2007-08, as communicated to the mayor and the Honolulu City Council on June 1, 2007.

This audit responds to ongoing concerns expressed by the city council and the public relating to biosolids reuse and the benefits of constructing an *In-Vessel Bioconversion Facility* (also referred to herein as the *biosolids facility*) at the city's Sand Island wastewater treatment plant, significant project cost overruns, numerous change orders, delays, and outstanding compliance issues relating to the 1995 consent decree.

This audit reviews the beneficial sludge reuse requirements stated in the 1995 consent decree, the design-build-operate contracts awarded to Synagro-WWT, Inc. (Synagro) in May 2002, and project costs for an In-Vessel Bioconversion Facility at the Sand Island wastewater treatment plant.

The timeframe for this audit was from December 31, 2005 to October 1, 2007, which corresponds to the deadline in the 1995 consent decree pertaining to the beneficial sludge reuse project and recent operational performance of the Synagro biosolids facility.

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## Background

The use of biosolids is monitored and must be in accordance with the provisions of the Clean Water Act and other federal and state regulatory requirements. The federal biosolids rule established by the U. S. Environmental Protection Agency (EPA) is contained in 40 CFR Part 503 entitled, *Standards for the Use or Disposal of Sewage Sludge*, and interpreted and applied in state Department of Health water pollution and wastewater systems regulations, referenced primarily in Hawai'i Revised Statutes, Chapter 342D and Hawai'i Administrative Rules, Chapter 11-62. In addition, environmental compliance with the 1995 consent decree contains biosolids reuse requirements to be met by the city.



Biosolids are nutrient-rich organic materials resulting from the treatment of sewage sludge at wastewater treatment plants. Sewage sludge is the name for the solid, semisolid or liquid untreated residue generated during the treatment of domestic sewage in a treatment facility. When treated and processed, sewage sludge becomes biosolids that can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth.

The Department of Environmental Services (ENV) plans, directs, operates and administers the city's wastewater programs. This includes oversight of the biosolids facility to ensure that contractual obligations with Synagro to design, construct, operate and maintain the facility are met. The department is also responsible for coordinating and managing activities relating to federal and state environmental requirements, implementing regulatory controls through permitting, inspections, investigation, public education and overseeing the biosolids recycling initiative.

Located in Honolulu, the Sand Island wastewater treatment plant began operations in 1978 and is the city's largest plant treating the wastewater inflow for approximately 44 percent of the resident population of the entire island or about two-thirds of O'ahu's wastewater daily. Renovations and expansion of the facility have been ongoing to expand treatment plant capacity from 82 million gallons per day (mgd) to 90 mgd, improve plant hydraulic capacity, and increase solids handling capacity. The renovation and expansion include an ultraviolet disinfection unit, an effluent pump station, two primary clarifiers, a headworks facility and the in-vessel bioconversion or *biosolids* facility.

The city's newly constructed biosolids facility is capable of processing all gravity-settled sludge that flows from Sand Island's wastewater treatment processes. The facility is operated and maintained by Synagro under a 15-year operations and maintenance contract. The biosolids facility produces Class A biosolid fertilizer pellets, which are considered safe from both pathogens and vectors when applied in accordance with EPA standards and regulations at 40 CFR 503.

***Impetus for an in-vessel bioconversion facility at the Sand Island wastewater treatment plant***

According to the EPA, federal actions for failure to comply with environmental laws can be resolved through settlement agreements such as the 1995 consent decree. As part of a settlement with the EPA, the alleged violator can voluntarily agree to undertake *Supplemental Environmental Projects* related to a violation that mitigates the penalty

to be paid and also furthers EPA's goal of protecting and enhancing the public health and the environment. Since 1970, the EPA has been responsible for researching and setting national standards for a variety of environmental programs, and delegates to states the responsibility for issuing permits and for monitoring and enforcing compliance. Where national standards are not met, EPA can issue sanctions and take other steps to assist states in reaching the desired level of environmental quality.

### **1995 consent decree requires sludge reuse project**

On May 15, 1995, *Civil No. 94-00765DAE, United States of America and State of Hawai'i, et al, vs. City and County of Honolulu* entitled *Order for Entry of Consent Decree as Modified; Consent Decree as Modified by Stipulation* was filed in the U. S. District Court for the District of Hawai'i to remedy past violations and compel the city to embark on operational improvements in its management of the wastewater systems. This 1995 consent decree sets forth the settlement terms reached between the U. S. Environmental Protection Agency and the state Department of Health (DOH) and the city. The consent decree requires the city to rehabilitate and expand certain existing facilities, implement pre-treatment programs, institute efficient effluent and biosolids reuse, and construct new facilities.

The consent decree provided the impetus for the city to begin implementation of biosolid reuse activities as required by the provision for a supplemental environmental project to beneficially reuse sewage sludge. The consent decree states that the city must implement one or more of the following methods toward a beneficial sludge reuse project:

- recycling sludge into compost and marketing as a soil conditioner;
- agricultural use;
- energy production;
- conversion to fuel; or
- other uses approved by EPA.

Recognizing that the city was in the process of inviting bids for a Beneficial Sludge Reuse Project, an interim solution was acknowledged

by EPA, which also notified the state Department of Health. This interim solution involved the processing of sewage sludge from the city's Honouliuli wastewater treatment plant sent for further treatment of biosolids for beneficial reuse to the nearby Navy Biosolids Treatment Facility. This facility combined two waste streams, biosolids and greenwaste into biosolid compost used on military property in Hawai'i. The Navy started composting biosolids from the city's Honouliuli plant on December 14, 1998 and the city's first volume of compost was placed into beneficial reuse on August 25, 2000 with the delivery of 40 tons of biosolid compost to a University of Hawai'i demonstration project which utilized the compost as a soil amendment for growing trees.

### **Consent decree establishes project deadlines and stipulated penalties**

According to the consent decree, the city agreed to the following schedule for the production of beneficial sludge for reuse:

- two and one-half dry tons of municipal sludge per day by December 31, 1995;
- an additional two and one-half dry tons of municipal sludge per day by December 31, 1996; and
- at least ten dry tons of municipal sludge per day from January 1, 1998 until December 31, 2005.

Thus, the consent decree requires the city to reach the reuse capacity of 10 dry tons of sludge per day for seven years and achieve compliance by 2005. The consent decree further states that the reuse of sludge as landfill cover is considered a secondary method for beneficial reuse and should not be used unless all other methods are not feasible.

When the city fulfills compliance with the beneficial sludge reuse provisions, the consent decree requires the city to submit to EPA a written *Notification of Supplemental Environmental Project Completion* report which would consist of the appropriate supporting documentation summarizing the work that was done to complete the project, the amount of reuse achieved, and a detailed accounting of the costs incurred to complete the project.

### **Replacement of outmoded system for the treatment and disposal of sewage sludge needed at the Sand Island wastewater treatment plant**

Since 1981, the Sand Island wastewater treatment plant had used a low pressure oxidation (LPO) system for sludge stabilization, incineration for volume reduction, and disposal of incinerator ash in the landfill.

However, when the incinerator was shut down in 1996, an increased quantity of dewatered sludge (sludge cake) was disposed in the landfill instead of ash. The LPO stabilization process was becoming harder to maintain and expensive to operate; and the need to reduce the volume of treated dewatered sludge disposed in the landfill, prompted the department to analyze alternative sludge treatment processes.

### ***Construction of the Synagro in-vessel bioconversion facility***

After a lengthy review of several approved technologies during the procurement process, the city decided to pursue the construction of an in-vessel bioconversion facility using anaerobic digestion, heat drying and pelletization process to develop and implement a beneficial biosolids reuse program yielding a viable product meeting exceptional quality biosolids standards for beneficial reuse characteristics as an organic plant fertilizer. Having also determined that a closed treatment system was the preferred choice to avoid odor emissions, and also a continuous feed process for the anaerobic digestion of all of the primary sewage sludge for the Sand Island plant, the department embarked on a comprehensive design-build-operate process with Synagro for an in-vessel bioconversion facility with construction financed through the department's capital improvement program and thereby fulfill compliance with the beneficial sludge reuse requirements in the 1995 consent decree.

### **Invitation for bids began in 1999**

In 1999, the department solicited proposals and bids for a full-service, design-build-operate, contract for an *In-Vessel Bioconversion Facility* to perform at the required capacity and produce a marketable biosolids product as specified by the city. The design-build-operate procurement process had been previously utilized in two other major environmental projects: H-Power waste-to-energy plant and the Honouliuli wastewater treatment plant water reclamation facility. In evaluating a system tailored to the unique requirements of the city, the department was not only seeking to incorporate a system with the performance capacity to meet the requirements of the consent decree; but also a system that could accommodate future growth and meet stringent odor control requirements for both the processing site and the end product.

All prospective bidders were required to attend a mandatory pre-submittal conference. Following this meeting, interested bidders submitted their notice of intention to bid, qualifications and proposals. For this project, the departments of budget and fiscal services and corporation counsel provided financial and legal expertise to the environmental services department during the procurement process, selection of the contractor and development of the contract documents for the beneficial sludge reuse project.

Twenty-six interested bidders responded to the city's invitation for bids and after assessing technical qualifications, only those bidders whose technical proposals were qualified were invited to participate in the negotiation of a contract to design, construct and operate the biosolids facility. The city pre-qualified three proposals:

- green waste/biosolids in-vessel co-composting technology from Japan;
- green waste/biosolids digestion and in-vessel composting technology from Europe; and a
- dual proposal from a mainland biosolids contractor for either a green waste/biosolids in-vessel co-composting or a biosolids dryer/pelletizer with a continuation of the existing green waste offsite composting program.

Following site visits to observe the biosolid operations of the three qualified proposals, two were chosen to proceed with contract negotiations in August 2000. The project was awarded to Synagro on February 6, 2002 and the final contracts were signed on May 2, 2002. Based in Baltimore, Maryland, Synagro provides nonhazardous wastewater residuals management services and as a full-service provider was ultimately selected to design, build and operate a biosolids digestion, dewatering, heat drying and pelletization facility which the city would own.

### **Construction and operations/maintenance contracts executed in 2002**

The biosolids facility project awarded to Synagro was executed as two separate contracts: the design, construction and testing phase, and the operations and maintenance phase. Entitled *Contract for Design, Engineering, Construction and Testing of an In-Vessel*

*Bioconversion Facility for the City and County of Honolulu*, this construction contract provides for a total cost of \$33,755,000 to Synagro to furnish all equipment, accessories, structures, labor, materials, tools, supplies and appurtenances necessary to design, construct, shakedown and test an in-vessel bioconversion facility at the Sand Island wastewater treatment plant with a minimum capacity of processing 10,000 dry tons per year of sludge. In the second contract, *Contract for Operation and Maintenance of an In-Vessel Bioconversion Facility for the City and County of Honolulu*, Synagro agrees to operate and maintain the facility for an initial term of 15 years for an estimated annual fee of \$3,818,812; there is also an option to extend the contract for an additional ten years. In addition, Synagro is also responsible for the marketing, sale and beneficial reuse of the biosolid pellets.

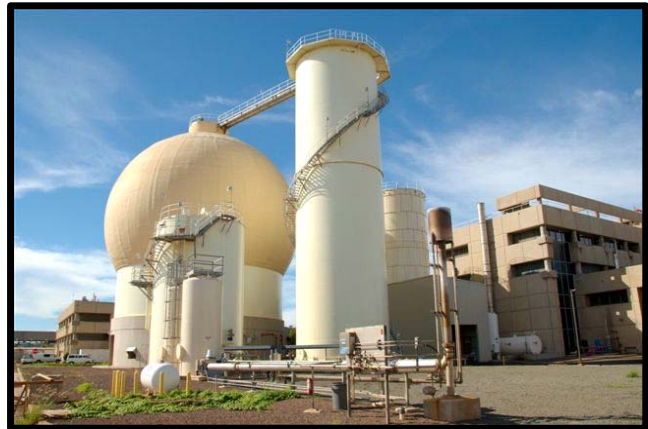
#### **Final acceptance of facility completed by October 1, 2007**

Synagro demonstrated final acceptance testing of the facility pursuant to the design, construction and testing contract on April 17, 2007; however, full operations were delayed due to a fire on June 14, 2007. Repairs needed to restore the facility were completed by the end of September 2007 and final acceptance of the facility was completed by October 1, 2007, at which time the city and Synagro also began to transition to the operations and maintenance contract.



**Exhibit 1.1**

**Front and Back View of the Sand Island In-Vessel Bioconversion Facility**



Source: Department of Environmental Services

***Department of Environmental Services oversees the city's wastewater treatment systems***

The Department of Environmental Services plans, directs, operates and administers the city's wastewater and solid waste programs. The mission of the department is to protect public health and the environment by providing effective and efficient management of the wastewater, storm water and solid waste disposal systems for the City and County of Honolulu.

As stated in the city charter, the powers and duties of the director of environmental services include:

- advising the director of design and construction concerning the planning and design of wastewater facilities;
- overseeing the operation and maintenance of sewer lines, treatment plants and pumping stations;
- monitoring the collection, treatment and disposal of wastewater;
- providing chemical treatment and pumping of defective cesspools;
- developing and administering solid waste collection, processing and disposal systems;

- promulgating rules and regulations as necessary to administer and enforce requirements established by law; and
- performing other such duties as may be required by law.

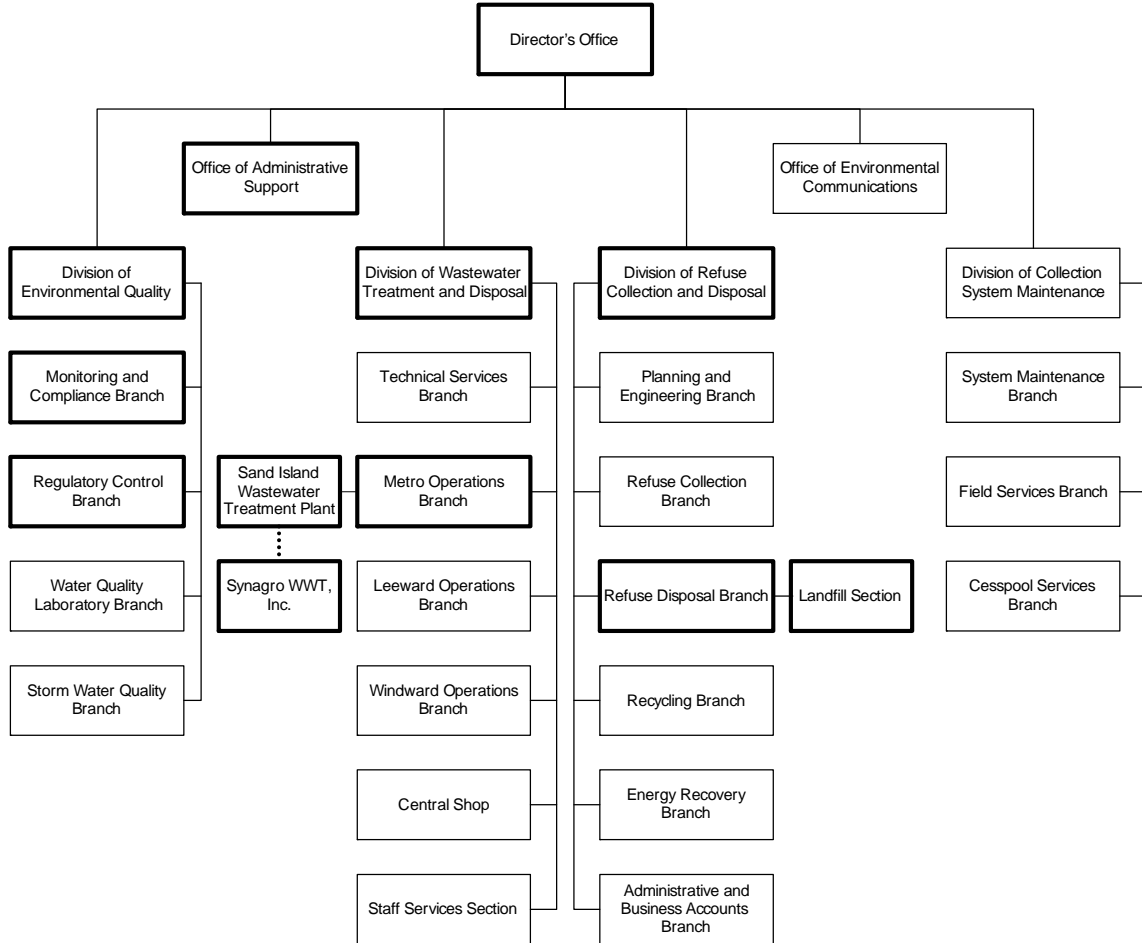
The director must have a minimum of five years of engineering experience, three of the five years in sanitary engineering and three years of administrative experience.

Under the leadership of the director, the department is organized into four operational divisions: Environmental Quality, Wastewater Treatment and Disposal, Collection System Maintenance, and Refuse Collection and Disposal. The department also includes the Offices of Administrative Support and Environmental Communications. Two divisions, the Refuse Collection and Disposal and the Wastewater Treatment and Disposal have operational responsibilities relating to treatment of sewage sludge or disposal of biosolids, while the Environmental Quality Division oversees departmental activities relating to state and federal environmental requirements.

### **Environmental services' management of the biosolids program**

The department's responsibilities for the city's sewage systems make it an integral part of public health and environmental issues on O'ahu. Wastewater operations annually collect, treat and dispose of more than 40 billion gallons of wastewater. Treatment of wastewater helps preserve both the quality of O'ahu waters and the land, augments residential and business development, and supports the local economy, including tourism. Of the city's nine wastewater treatment plants, the Sand Island wastewater treatment plant is the largest, serving the metropolitan area of Honolulu from Niu Valley-Paiko Peninsula to Moanalua-Aliamanu and processes approximately two-thirds of O'ahu's wastewater daily.

**Exhibit 1.2  
Organizational Chart of the Department of Environmental Services**



Note: Boxes in bold represent the organizational units associated with the monitoring of biosolids reuse requirements in the 1995 consent decree and the Sand Island in-vessel bioconversion facility project.

Source: Department of Environmental Services and Office of the City Auditor

**Sand Island administrators oversee the biosolids facility and the Synagro contract**

The superintendent of the Sand Island wastewater treatment plant oversees Synagro’s operations and maintenance of the biosolids facility. The superintendent is also directly supported by the chief of the wastewater and disposal treatment division. Both of these positions are situated at the Sand Island wastewater treatment plant. The superintendent has direct authority over all plant and pumping station

functions and personnel and is responsible for ensuring compliance with all pertinent federal, state and city requirements. Responsible for coordinating several ongoing new construction activities at the Sand Island wastewater treatment plant, the superintendent and the chief of the wastewater and disposal treatment division were designated as officers-in-charge to represent the city's interests along with the city's consultant, KFC Engineering Management, Inc. in project team coordination meetings throughout the construction and acceptance testing phases.

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## Audit Objectives

The objectives of the audit were to:

1. Determine costs and benefits of the city's contracts with Synagro for an in-vessel bioconversion facility at the Sand Island wastewater treatment plant and assess the extent to which the operations of the facility will enable the city to comply with U.S. Environmental Protection Agency and state environmental requirements.
2. Make recommendations as appropriate.

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## Scope and Methodology

This audit focused on compliance with the beneficial sludge reuse requirements in the 1995 consent decree and the management of the project for an in-vessel bioconversion facility between the city and its contractor, Synagro, for services to design, construct, test and subsequently operate and maintain the biosolids facility owned by the city. The timeframe for this audit was from December 31, 2005 to October 1, 2007, which corresponds to the deadline in the 1995 consent decree for the implementation of a beneficial sludge reuse project and recent operational performance of the in-vessel bioconversion facility at Sand Island.

We reviewed documents pertinent to the city's in-vessel bioconversion facility constructed to comply with the beneficial sludge reuse requirements in the 1995 consent decree, as well as the Clean Water Act, federal sewage sludge regulations in 40 CFR Part 503, and state wastewater permits and regulations. In addition, we reviewed applicable sections of the Hawai'i Revised Statutes, Hawai'i Administrative Rules, Revised Charter of Honolulu, and the Revised Ordinances of Honolulu. We also reviewed policies and procedures, financial summaries, the invitation for bids, contracts, contract amendments, change orders,

quarterly reports that the city submits to the U.S. Environmental Protection Agency and other documentation as it pertains to the in-vessel bioconversion facility project and benefits of the facility to the city. Finally, we reviewed studies, media coverage, and other literature relating to the treatment and reuse of municipal biosolids.

In addition to document reviews, we interviewed city administrators and employees of the departments of environmental services, and budget and fiscal services pertaining to the Synagro contracts. We assessed the extent to which administrative practices ensured compliance with federal and state environmental quality regulations. We interviewed representatives providing review or oversight on the city's in-vessel bioconversion facility from the EPA and the state Department of Health. We also interviewed representatives from Synagro and the city's construction management consultant. We conducted site visits at the Sand Island wastewater treatment plant, the in-vessel bioconversion facility, and the Waimanalo Gulch landfill.

This audit was conducted in accordance with generally accepted government auditing standards.

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# Chapter 2

## The City's In-Vessel Bioconversion Facility Experienced Delays and Costly Change Orders, and Benefits from the Project and Compliance with the Consent Decree Continue to be a Challenge

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As of October 1, 2007, construction was completed and the city's In-Vessel Bioconversion Facility at the Sand Island wastewater treatment plant was fully operational. The \$33,755,000 biosolids facility project experienced construction delays and a dozen costly change orders which increased the contract cost by over \$6.4 million. The 1995 consent decree required the city to implement a biosolids reuse project and meet a series of deadlines to beneficially reuse 10 dry tons of sludge per day for seven years by December 31, 2005. In 2003, the U.S. Environmental Protection Agency advised that the city's estimated daily penalties had grown to \$5,510,000. The city's ability to achieve sludge reuse compliance under the consent decree appears close, but potential penalties for continued delays could cost the city millions more.

The anticipated benefits of the biosolids facility include the reduction in the volume of treated sewage sludge from the Sand Island wastewater treatment plant that is disposed in the landfill, and the facility's energy-efficient design which captures methane gas from the digester to fuel the boiler and heat drying equipment. However, challenges remain with achieving the final consent decree requirement as the city must demonstrate beneficial reuse of the biosolid pellets. Distribution of the biosolid pellets is delayed until environmental services and Synagro obtain a variance on state regulations pertaining to a trace element concentration in the biosolid pellets from the state Department of Health.

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### Summary of Findings

1. The in-vessel bioconversion facility project at the Sand Island Wastewater Treatment Plant experienced construction delays and costly change orders.



2. The city's ability to achieve sludge reuse compliance with the consent decree appears close, but potential penalties could cost the city millions more.
3. The city's in-vessel bioconversion facility is anticipated to have some favorable outcomes, but challenges remain.

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## **The In-Vessel Bioconversion Facility Project at the Sand Island Wastewater Treatment Plant Experienced Construction Delays and Costly Change Orders**

Project delays and other obstacles reflected in twelve change orders increased the cost of the facility by over \$6.4 million from the original Synagro contract cost. Impacting the project from the start were delays in obtaining all necessary permits required for the construction to proceed which did not commence until September 2004, approximately two years after the contract was executed between the city and Synagro. Thereafter, there were additional changes necessary to resolve site and facility issues which in turn were costly. As of September 30, 2007, the total project cost for the in-vessel bioconversion facility at Sand Island is approximately \$40,892,748 with project closeout expected in 2008. With construction of the biosolids facility completed, Synagro is proceeding with its responsibilities under the operations and maintenance contract.

### ***Project delays and other obstacles increased construction costs***

Starting with a credit to adjust for costs due to the relocation of the facility, project delays and extra work requirements needed to construct the biosolids facility resulted in approximately \$4,000,000 in change order costs. Included are costs associated with refurbishing/retrofitting the existing solids handling building, design changes and associated delays and costs due to the remediation of soil conditions, additional piping required in the gravity thickener gallery, addition of a digester gas scrubber and sludge feed pumping system, and extra work necessary to correct a conflict with an existing ten-inch pipe. In addition, approximately \$2,000,000 is attributed to the 14-month delay from July 2003 to September 2004 due to unanticipated delays in obtaining necessary permits and the escalation of costs incurred by sub-contractors, Chicago Bridge and Iron Company (egg-shaped digester) and Andritz (heat drying equipment). Other change orders included sludge dewatering operations and related trucking costs, operational changes to utilize the facility's new centrifuges, and the installation of a permanent emergency generator.

### **Twelve change orders increased the biosolid facility's cost by \$6.4 million**

Since May 2002 when the original contract was executed for \$33,755,000, the costs for the biosolids facility project increased by \$6.4 million as a result of twelve change orders. However, we note that at the time of our fieldwork, the final change order, Number 12 was pending. Therefore, the total cost to construct the Synagro biosolids facility cannot be determined until the last change order is finalized. However, the estimated total project cost as of September 30, 2007 is approximately \$40,892,748 or an increase of approximately \$6.4 million over the original contract cost.

### **Fire delayed final acceptance and testing**

The city began providing sewage sludge to the biosolids facility on August 28, 2006 as part of Synagro's startup testing of the sludge digestion, heat treatment and pelletization processes and pollution control equipment installed at the facility to ensure that performance standards could be achieved. On November 9, 2006, the construction manager determined that the facility was substantially completed; and by April 2007, operations had been successfully tested. However, on June 14, 2007, a fire broke out in the drying room causing extensive damage to air and electrical ducts, further delaying closeout of the construction contract. While proceeding with restoration work on the facility due to the fire, the biosolids facility was capable of continuing to centrifuge sludge up to the dewatering process. Since the facility was insured under the Synagro insurance policy for the facility in accordance with the contract provisions, the chief of wastewater treatment and disposal division stated that the city did not incur costs for facility repairs from the fire damage. By September 24, 2007, repairs from the fire were completed by Synagro at a cost of approximately \$2,000,000 and with successful startup of the facility, heat dried pellets from the facility have since been reviewed by the state DOH as meeting all federal and state regulations for the land application of soil amendments derived from wastewater sludge.

### **Total project cost is approximately \$40,892,748**

The total project cost as of September 30, 2007 for the in-vessel bioconversion facility at Sand Island is approximately \$40,892,748 with project closeout expected in 2008, at which time the project's total cost can be determined.

This amount includes invoices paid to Synagro for design, construction and testing of the biosolids facility for approximately \$40,164,673, an increase of \$6,409,673 over the original contract price of \$33,755,000 and the contract price for construction management services provided by KFC Engineering Management, Inc. totaling \$728,075.

**Exhibit 2.1**

**Cost of the In-Vessel Bioconversion Facility Project at the Sand Island Wastewater Treatment Plant, as of September 30, 2007**

<i>Item</i>	<i>Description</i>	<i>Cost</i>
<b>Synagro WWT, Inc., Contract #F92642</b>	<b>Original contract price to design, construct and test an in-vessel bioconversion facility located at the Sand Island wastewater treatment plant.</b>	<b>\$33,755,000</b>
Change Order 1	Credit to the city for the savings associated with relocating the facility to the existing solids handling building.	(\$3,425,536)
Change Order 2	Costs associated with refurbishing/retrofitting the existing solids handling building and having to design/work around the existing utilities and constraints of the area.	\$2,585,875
Change Order 3	Costs to add a H2S scrubber system and a raw sludge feed pumping system.	\$662,902
Change Order 4	Costs to construct a containment enclosure and perform lead-based paint abatement in the dryer building; work needed to avoid conflict with existing pipe and installation of piles for the new egg-shaped digester foundation.	\$45,972
Change Order 5	Costs to install electrical duct lines and vaults; install duct lines between the transformer and Mechanical Transfer Switch and breaker pad foundations; manual transfer switch and associated hardware for emergency power system.	\$355,519
Change Order 6	39 calendar day extension granted for delays due to equipment manufacturer impacted by Hurricane Katrina.	\$0
Change Order 7	Time extensions due to rain out days in the month of March 2006	\$0
Change Order 8	Escalation of costs from a 14-month delay from July 2003 to September 2004 due to unanticipated delays in obtaining special management area use permits.	\$2,103,349
Change Order 9	Additional costs due to relocation, design and construction of the egg-shaped digester and sludge storage tank foundations.	\$546,000
Change Order 10	Costs for interim sludge dewatering services necessary for proper operations of the digester and heat drying system.	\$1,104,000
Change Order 11	Costs for temporary generator and relocation of existing centrifuge centrate, drain, and process water lines.	\$121,754
<i>Change Order 12 (pending)</i>	Costs to install permanent emergency generator, asphalt paving at the new dryer facility; odor control system modifications to meet Department of Health standards; and interim sludge dewatering services.	\$2,309,838
<b>Sub-Total Cost for Change Orders 1 to 12, Contract #F92642</b>		<b>\$6,409,673</b>
<b>Total Cost for Contract #F92642, Synagro WWT-Inc., as of September 30, 2007</b>		<b>\$40,164,673</b>
<b>Add: Construction Management Services, KFC Engineering Management, Inc., Contract #F26484</b>		<b>\$728,075</b>
<b>Total Project Cost, as of September 30, 2007</b>		<b>\$40,892,748</b>

Source: Department of Environmental Services

**Annual cost for operation and maintenance of biosolids facility approximately \$3,818,812**

The department has been working with Synagro on final construction contract closeout requirements, as well as the terms of the operations and maintenance contract. The city will pay Synagro approximately \$3,818,812 annually during the term of the operations and maintenance contract (O & M contract). The facility is currently fully operational and processing all gravity-settled sludge from the Sand Island wastewater treatment plant and has the capacity to process at least 10,000 dry tons per year of sewage sludge.

**Service fee to be negotiated annually**

The O & M contract establishes an annual service fee of \$3,818,812 which may be adjusted based on annual operations and maintenance expenses for processing sewage sludge into biosolid pellets and agreed-upon allowable reimbursable expenses. In addition, adjustments can be made for the agreed-upon disbursements from revenues collected over the base rate of \$20.00 per ton for all sales of pellets to third parties. The city is currently in negotiation with Synagro to determine operational and administrative responsibilities pertinent to the new facility.

**Synagro provided with 15-year initial term to operate and maintain facility**

The O & M contract provides Synagro with an initial term to operate and maintain the facility for 15 years. Synagro is also responsible for the marketing, sale and beneficial reuse of the biosolid pellets. Through a revenue sharing program with the city, Synagro will provide up to 2,000 tons per year of Class A fertilizer pellets to the city at no charge, and for sales to third parties, Synagro will rebate the city 60 percent of the net revenues collected over \$20.00 per ton. The contract has a *buyout* clause which gives the city the option to operate the facility. In addition, the O & M contract provides an option to renew for an additional 10 years. The services provided by Synagro to operate the facility include such items as:

- performing all maintenance, repairs and replacements to the facility;
- remaining open to receive primary sewage sludge on a continuous basis;
- processing not less than 10,000 dry tons per year of sewage sludge;

- producing recovered materials suitable for delivery and sale and use reasonable efforts to maximize revenues in accordance with all federal, state and local laws; and
- landscaping of the site.

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## **The City's Ability to Achieve Sludge Reuse Compliance with the Consent Decree Appears Close, But Potential Penalties Could Cost the City Millions More**

Compliance with the 1995 consent decree requires that the city *beneficially reuse* sewage sludge as demonstrated through actual customer usage of the biosolid pellets as a soil amendment or plant fertilizer. This is essentially the last requirement to fulfill compliance with the city's beneficial sludge reuse project requirement in the 1995 consent decree which the department projects will be achieved in 2008. Until completion of the beneficial sludge reuse project, significant penalties accrue each day beneficial sludge reuse deadlines in the 1995 consent decree are not met by the city.

## ***State confirms biosolid pellets meet all federal and state regulations***

Providing regulatory oversight, the state health department monitors and reviews data on pellet analyses to ensure that the biosolid pellets produced at the facility meet all federal and state regulations for land application. The wastewater management permit issued for the Sand Island wastewater treatment plant, Synagro in-vessel bioconversion facility, has been in effect since November 6, 2006 for the facility to operate the wastewater treatment works and sludge processing facility. This permit was issued in accordance with the federal Clean Water Act, Hawai'i Revised Statutes, Chapter 342D and Hawai'i Administrative Rules (HAR), Chapter 11-62 and sets forth the conditions for facility operations and use of biosolids.

After the damage to the facility from the June 2007 fire was repaired, Synagro resumed daily analysis of the biosolid pellets pursuant to permit requirements. According to correspondence from the state health department wastewater branch to the Synagro plant manager dated August 29, 2007, the health department found that the heat dried biosolid pellets produced at the Synagro facility met all federal and state biosolid regulations for land application. It also advised Synagro that it will continue to review future test analyses of the pellets to ensure all federal and state regulations are being met.

### **Analysis of pellets required**

According to the Synagro plant manager, the test analysis data on pellets continues to be submitted to the state health department. Daily data analysis of the Synagro biosolid pellets has been conducted since August 2007, and based on the health department's review, the heat dried pellets meet all federal and state regulations for the land application of soil amendments derived from wastewater sludge.

### **State monitors land application of biosolid pellets**

Receiving state health department approval that the Synagro biosolid pellets meet federal Class A exceptional quality standards was an important achievement for Synagro and the department. However, state regulations pertaining to the use of sewage sludge on vegetables and another involving the difference between federal and state ceiling limits of a trace element were issues under discussion between the Synagro and the state health department at the time of our fieldwork.

For years, organic compost made from city biosolids and city green waste has been used at city golf courses, landscaping and forestry purposes. However, state sanitation regulations, HAR Section 11-11-8, prevents the use of *sludge from sewage treatment* on vegetable crops. Synagro is aware of this limitation and has discussed this with the state health department and the environmental services department. At this time Synagro is focusing its efforts on non-food related agricultural uses for the biosolid pellets.

The U.S. Environmental Protection Agency's federal biosolids standards set limits for various elements and other chemicals that may be present. The federal standards allow states to set more restrictive limits. Ongoing analysis of the biosolid pellets has revealed fluctuations in the level of molybdenum between 12 parts per million (ppm) and 18 ppm. For this trace element, the federal biosolids standard has a ceiling concentration limit of 75 ppm; while Hawai'i's limit is 15 ppm. Our discussions with Synagro, state health department officials, and the EPA official monitoring compliance with the consent decree indicated that the parties have discussed the option of obtaining a variance to the state molybdenum limit. However, at the time of our fieldwork, Synagro has opted to wait until this issue is finalized with the state health department before proceeding with distribution efforts.



***Delays in completing the consent decree's sludge reuse requirements could cost city millions in penalties***

In 1995, the city agreed to implement a beneficial sludge reuse project. As part of the 1995 consent decree, the city also agreed to deadlines and stipulated penalties. According to the department's quarterly report ending September 2007 informing EPA of the status of the sludge reuse project, the activities for the beneficial sludge reuse project continue to be refined but have not yet been completed. We note that in 2003, EPA acknowledged compliance with the requirement to beneficially reuse 10 dry tons of sludge per day through the interim solution to co-compost Honouliuli wastewater treatment plant sewage sludge and city green waste, but emphasized that the city must not delay demonstrating biosolids reuse and reiterated that the agreement with the city to beneficially reuse 10 dry tons of sludge per day utilizing the services of the Navy biosolids compost facility at Barbers Point was only an interim solution.

**EPA calculated accrued penalties at \$5,510,000 in 2003**

When the city agreed to the terms of the consent decree's sludge reuse project, it also agreed to stipulated penalties for failure to fulfill the reuse conditions and deadlines. According to the 1995 consent decree, the stipulated penalties for failure to beneficially reuse specified amounts of biosolids by certain deadlines are assessed at \$1,000 per day for the first sixty (60) days of any such failure, and \$2,000 for each day thereafter.

We found that EPA indicated its concern in written correspondence to the city in 2003 and 2004 that the beneficial sludge reuse project had been delayed considerably and urged the city to move forward with the goals of the project or face penalties which the agency calculated in December 2003 to be approximately \$5,510,000. While formal action on penalties was pending at the time of our fieldwork, EPA continues to monitor progress on the city's beneficial sludge reuse project to ensure the city achieves full compliance with the 1995 consent decree. However, since penalties are calculated from the first missed deadline, the EPA could assess the city substantially more than \$5.5 million. Therefore, it is in the city's fiduciary best interest to fulfill the consent decree's requirements as soon as possible.

**Environmental services is complying with EPA's quarterly reporting requirement**

In accordance with the 1995 consent decree, the environmental services department submits quarterly reports to EPA on the biosolids reuse project including the construction schedule of the biosolids facility at the Sand Island wastewater treatment plant, along with other significant

wastewater treatment improvements and expansion projects. Completion of the long term beneficial sludge reuse program is delayed until beneficial reuse of biosolid pellets is demonstrated, which is essentially the last step for the city to achieve compliance with the beneficial sludge reuse requirements in the 1995 consent decree.

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## **The City's In-Vessel Bioconversion Facility is Anticipated to Have Some Favorable Outcomes, But Challenges Remain**

With the construction of the city's in-vessel bioconversion facility completed and having state approval that the pellets are able to meet Class A biosolid requirements, the environmental services department is poised to move forward with significantly improved processes and functioning of the city's biosolids treatment operations that are broad in scope and meet the city's need for Sand Island wastewater treatment plant expansion. The utilization of biogas, recovered from the digestion process, reduces dependence on expensive non-renewable fuel and with the production of Class A biosolid pellets, the Synagro facility is also anticipated to benefit consumers by providing an organic soil amendment and plant fertilizer. While favorable outcomes are anticipated, there are also challenges that remain since pellet distribution is currently on hold while awaiting approval for a variance from the state health department.

### ***Benefits of the facility at Sand Island wastewater treatment plant***

The long term operation of the Synagro biosolids facility is anticipated to have benefits as a component in the operations of the Sand Island wastewater treatment plant as it is one of several expansion projects assigned to meet projected population growth for Honolulu and make necessary improvements to meet the increased capacity for wastewater and biosolids treatment at the Sand Island wastewater treatment plant. Some of the anticipated benefits include the reduction of sludge disposed in the landfill and the use of biogas captured from the anaerobic digestion system to fuel the dryer operations and the digester's boiler.

### **Synagro's biosolids process reduces trucking and landfill disposal**

Synagro's anaerobic digestion, dewatering, heat drying and pelletization process significantly reduces the solids and liquids that comprise sewage sludge. While exact amounts were not available, rough estimates were provided. We were informed by the superintendent of the Sand Island wastewater treatment plant that approximately six to eight truckloads was the typical daily load of treated dewatered sewage sludge cake. With the dried biosolid pellets, one load of pellets is comparable to three truckloads of sludge cake. A Synagro representative stated that, for comparison, 5 truck loads per week of pellets would be hauled to the

landfill as opposed to 15 loads of sludge cake, such as during the period of time when the drum drying and pelletization systems were shut down after the June 2007 fire that damaged ductlines.

**Exhibit 2.2**  
**Biosolid Pellets and Truck Loading at**  
**the Sand Island Wastewater Treatment Plant**



Source: Synagro WWT-Inc.

According to department administrators, the primary benefit of the completed facility is the reduction of sewage sludge from the Sand Island wastewater treatment plant disposed in the landfill. Although the city continues to dispose the pellets in the landfill, they are Class A biosolid pellets that meet EPA biosolid beneficial reuse standards.

### **Methane captured from digester fuels certain operations**

The anaerobic digester generates methane gas used in the operations of the drum dryer equipment in the pelletization process and the boiler used to maintain the necessary temperature for the digestion process. According to the environmental assessment and Synagro documentation about the operations of the biosolids facility, methane or biogas, is a product of anaerobic digestion. Capturing and using the biogas provides a fuel for the energy intensive heat drying and boiler systems. This provides energy cost savings when it is used instead of more costly non-renewable fuel oil and electricity. The facility is considered energy-efficient since the digester and drum dryer operations are designed to be fueled by the digester biogas. The facility is expected to consume approximately 12,600 kilowatt hours per day of electrical power, 45,000 gallons per day of potable water, and 685 gallons per day of fuel oil (which includes the use of the biogas). Another reusable resource is the hot water used in the heat drying processes that is sent to the digester's heat exchanger to keep the contents of the digester at a constant temperature. When the dryer is not running, the methane gas fuels the digester's boiler which maintains the necessary temperature of the digester contents.

### ***Challenges remain in completing the consent decree's biosolid reuse requirements***

The environmental services department appears close to achieving compliance with the consent decree with the implementation of the beneficial sludge reuse project. However, challenges remain, including approvals for the distribution of pellets from the state health department, on-going public concerns about the biosolids facility, and the use of biosolid pellets on Hawai'i soils may hinder full implementation of the sludge reuse project.

### **Public acceptance of the beneficial use of the biosolid pellets questionable**

The beneficial reuse of treated sewage sludge or biosolids has been the subject of questions, testing by UH researchers, and analysis by state and federal regulators. In 2004, the University of Hawai'i Water Resources Research Center study on the Synagro biosolid pellets,

performed under the leadership of Dr. Roger Fujioka, found that the Synagro treatment complies with EPA biosolid regulations for allowable levels of most pathogens and microorganisms, and that nutrients, not toxic chemicals, are released from Synagro pellets. In addition, the state health department provides regulatory oversight on the use and disposal of sewage sludge/biosolids in accordance with the federal Clean Water Act and applicable federal and state environmental regulations. Despite the conclusions of the UH study and state approval confirming that the Synagro biosolid pellets are able to meet Class A exceptional quality biosolid standards, community concerns relating to public health continue regarding the land application of biosolid pellets in Hawai‘i.

### **Implementation of marketing, distribution, promotion and sales of pellets underway**

The city and Synagro are working with the state health department to address a variance for a trace element in the biosolid pellet well below EPA limits, but sometimes exceeding state limits. When resolved, Synagro must develop the local market of potential users of the biosolids. Synagro has contracted a local consulting company, Naholowa‘a Environmental Services to provide local marketing representation of the biosolid product under the direction of Synagro’s Organic Product Marketing Group. The current marketing plan has the replacement of commercial nitrogen fertilizer that is shipped into the state as the central theme, while creating a diversified customer base for the organic fertilizer pellets that focuses on soil amendment applications. Biosolids applied to the land can improve the chemical, biological and physical properties of soil by increasing the water-holding capacity, improving soil tilth or workability, and by providing micronutrients. An article on *Turf Fertilizers for Hawai‘i’s Landscapes* issued in October 2000 by the University of Hawai‘i, College of Tropical Agriculture and Human Resources, noted that *Milorganite*, a biosolid fertilizer product of the Milwaukee Sewerage Commission is a widely used organic nitrogen source on fine turf and has been commonly used across the country and on Hawai‘i’s golf courses for that purpose. We also note that the city’s biosolid compost product from the Navy Biosolids Treatment Facility has also been applied for beneficial reuse as turf fertilizer by the city. With the availability of the biosolid pellets produced at the Sand Island wastewater treatment plant, the department and Synagro are working to establish the pellets as a locally available and inexpensive source of organic fertilizer in Hawai‘i.



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## Conclusion

As of October 1, 2007, construction was completed and the city's in-vessel bioconversion biosolids facility at the Sand Island wastewater treatment plant was fully operational. Significantly, the environmental services department and the city's contractor Synagro have obtained state health department approval that the biosolid pellets produced from sewage sludge treated by the anaerobic digestion, dewatering, heat drying and pelletization facility are able to meet EPA Class A exceptional quality biosolid standards.

Impetus for this project came 12 years earlier when the city entered into the 1995 consent decree which required the city to implement a biosolid reuse project and meet a series of deadlines for beneficial reuse resulting in 10 dry tons of sludge per day from January 1, 1998 to December 31, 2005. In 2003, the U.S. Environmental Protection Agency advised that the city's estimated daily penalties had grown to \$5,510,000. Thus the city's ability to achieve sludge reuse compliance under the consent decree appears close, but potential penalties could cost the city millions more.

The \$33,755,000 biosolids facility project experienced construction delays and a dozen costly change orders which increased the contract cost over \$6.4 million. Although construction was completed, the twelfth and final change order was not finalized at the time of our fieldwork, thus, the total cost to design, construct and test the biosolids facility is estimated at \$40,892,748.

With the facility fully operational, the environmental services department and Synagro are transitioning to the 15-year operations and maintenance contract. While the city owns the biosolids facility, it will pay Synagro an annual fee of approximately \$3,818,812 to operate and maintain the facility, and also market the biosolid pellets. Contract provisions provide the city biosolid pellets, up to 2,000 tons per year without charge, and revenue sharing based on pellet sales. The anticipated benefits of the biosolids facility include the reduction in the volume of treated sewage sludge from Sand Island wastewater treatment plant disposed in the landfill, the facility's design which captures methane gas from the digestion phase used to fuel the boiler and heat drying operations which significantly improves biosolids treatment, capability to meet future needs to expand treatment plant capacity, and the production of a marketable organic soil supplement.

Challenges remain with achieving the final consent decree requirement for the city to demonstrate beneficial reuse of the biosolid pellets.

Distribution of the biosolid pellets is on-hold until the environmental services department and Synagro work with the state health department to obtain a variance on the state's limitation on a trace element's concentration. Disposal of biosolids in the landfill will likely continue until a sustainable market can be established. We believe that the environmental services department is on track to fulfill compliance with the biosolids reuse requirements in the 1995 consent decree now that the Sand Island biosolids facility is fully operational and converting sewage sludge to heat dried pellets that meet federal Class A exceptional quality biosolid regulations for land application.

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## Recommendations

The director of the Department of Environmental Services should:

- a. finalize Change Order Number 12, under the construction contract;
- b. ensure that Synagro fulfills its obligations to the city under the construction contract and then expedite closeout of the construction contract;
- c. ensure completion of the biosolids reuse project including final submission of the written *Notification of Supplemental Environmental Project Completion* to the U.S. Environmental Protection Agency regarding completion of the beneficial sludge reuse supplemental environmental project as required in the 1995 consent decree;
- d. provide the city council with written annual status reports on the city's biosolids facility including total project cost for the Sand Island biosolids facility and closeout date of the Synagro construction contract, update on Synagro's revenue and non-revenue customers, revenue due to the city from biosolid pellets sales, tonnage landfilled, reused and sold, status of compliance with the consent decree requirement for completion of the beneficial sludge reuse supplemental environmental project including determination of issues, concerns, or penalties from EPA related to delays in meeting the consent decree's deadlines, and progress of the city's biosolids reuse program;



- e. ensure that Synagro fulfills its contractual responsibilities for the marketing, sales and reuse of pellets as soil amendment or plant fertilizer to more users; and
- f. pursue other initiatives and opportunities to minimize disposal of biosolid pellets in the landfill.

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## Response of Affected Agency

### Comments on Agency Response

We delivered copies of our confidential draft report to the Department of Environmental Services on June 10, 2008 for review and comment. A copy of the transmittal letter is included as Attachment 1. On June 26, the department requested additional time to submit its response, and was granted an extension to July 10. On July 9, the director requested an additional week extension to July 17. The department submitted its written response on July 17, 2008, and we have incorporated the department's response as Attachment 2. However, due to space limitations and environmental concerns the department's marked-up copy of the entire draft report, included as Attachment 1 to the department's response, has been separated from the final audit report and is available for review in our office upon request.

In its response, the director thanked the city auditor for the opportunity to review and comment on the draft report. The department organized its response around: general comments, contract price, collateral benefits resulting from the project and product marketing. It disagreed with our description of the project's delays and public concerns about biosolid pellets. The department noted that the project "experienced one significant delay and resulting increase in cost due to City Council's desire to have further testing and research of pellets safety completed." However, our discussion about delays is intended to provide readers with background information about the project which was almost two years behind the deadline date of December 31, 2005 for compliance with the 1995 consent decree. We have incorporated the department's suggestion that the project experienced delays.

The department also asserted that it is unaware of ongoing public concern about the use of biosolids, however we note that this information is based in part on discussions with those with direct knowledge of the biosolid marketing plans and explanation of the challenge to introduce biosolid fertilizer pellets to potential users unfamiliar with the product. In addition, our report noted that biosolid compost and fertilizer products have been widely used for many years across the country and in Hawai'i, and despite state health department regulatory oversight.

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The department also provided additional information on the cost of one change order that was pending and not made available to us by the end of our fieldwork. In its response, the department noted that another change order, Number 13 will add an additional \$600,000 to the total cost of the project, thus “the final contract price for Contract #F92642, Synagro-WWT, Inc., will be \$40,764,673.84, or \$7,009,673.84 above the original contact price.” However while this information is noteworthy, our report’s information on the project’s costs, including change orders, was accurate as of the end of our fieldwork. The department further disagreed with the description of change orders as costly and provided explanations about the project’s change orders. While this additional information might help to provide a description and purpose for the various change orders, our audit objective was to assess the total project cost including all change orders.

We note that environmental services’ response also provides current information after the completion of our fieldwork regarding its efforts to secure a state Department of Health waiver on molybdenum necessary for distributing biosolid pellets, as well as clarification on state regulation, HAR Section 11-11-8, relating to sewage sludge and food crops. Since this information was beyond the scope of our audit we offer no comment.

Finally, the department did not comment on their plans or timetable for completing the remaining requirements of this project and the audit recommendations. In light of the possible penalties accruing each day, we maintain that it is in the city’s fiduciary best interest to expedite efforts to formally complete the biosolid reuse requirements of the 1995 consent decree. Despite the assertions made in its response, the department’s comments to us about the draft report did not change the substance of our findings. Finally, we appreciate the clarifying information and comments provided by the department, and changes, where appropriate, were made to the final report.



**OFFICE OF THE CITY AUDITOR**  
**CITY AND COUNTY OF HONOLULU**  
1000 ULUOHIA STREET, SUITE 120, KAPOLEI, HAWAII 96707 / PHONE: (808) 692-5134 / FAX: (808) 692-5135

LESLIE I. TANAKA, CPA  
CITY AUDITOR

June 10, 2008

*COPY*

Dr. Eric S. Takamura, Director  
Department of Environmental Services  
1000 Uluohia Street, Suite 308  
Kapolei, Hawai'i 96707

Dear Dr. Takamura:

Enclosed for your review are two copies (numbers 12 and 13) of our confidential draft audit report, *Audit of the City's Synagro Contract*. If you choose to submit a written response to our draft report, your comments will generally be included in the final report. However, we ask that you submit your response to us no later than 12:00 noon on Wednesday, June 25, 2008.

For your information, the mayor, managing director, and each councilmember have also been provided copies of this **confidential** draft report.

Finally, since this report is still in draft form and changes may be made to it, access to this draft report should be restricted to those assisting you in preparing your response. Public release of the final report will be made by my office after the report is published in its final form.

Sincerely,

A handwritten signature in cursive script, appearing to read "Leslie I. Tanaka".

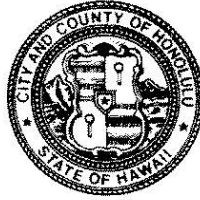
Leslie I. Tanaka, CPA  
City Auditor

Enclosures

DEPARTMENT OF ENVIRONMENTAL SERVICES  
**CITY AND COUNTY OF HONOLULU**

1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707  
TELEPHONE: (808) 768-3486 • FAX: (808) 768-3487 • WEBSITE: <http://www.envhonolulu.org>

MUFI HANNEMANN  
MAYOR



ERIC S. TAKAMURA, Ph.D., P.E.  
DIRECTOR

KENNETH A. SHIMIZU  
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.  
DEPUTY DIRECTOR

IN REPLY REFER TO:  
WTD 08-031

July 17, 2008

Mr. Leslie Tanaka, Director  
Office of the City Auditor  
City and County of Honolulu  
1000 Uluohia Street, Suite 120  
Kapolei, Hawaii 96707

Dear Mr. Tanaka:

Thank you for providing us the opportunity to review and comment on your Draft Report – Audit of the City’s Synagro Contract, Report No. 08-02, June 2008. We have taken the liberty of marking up the draft report for your reference. (Attachment 1)

**GENERAL COMMENTS**

1. On the Table of Contents Chapter 2 description, we request: a. deletion of the words “was Plagued with” and replaced with the word “experienced”, b. deletion of the word “Costly”. The project experienced one significant delay and resulting increase in cost due to City Council’s desire to have further testing and research of pellets safety completed, which thereby, delayed the issuance of the SMA and Air Permits. This delay was out of the control of both Synagro and ENV and we feel this point should also be included in the discussion of the project delays on Page 14.

We suggest the title of Chapter 2 be changed to “The City’s In-Vessel Bioconversion Facility Experienced Delays and Change Orders.” Further discussion of our reasoning for removing “Costly” can be found below in our discussion of the final contract price.

2. Chapter 1 – Introduction – Second paragraph.

We feel this paragraph should be deleted in its entirety, as it is completely subjective and, therefore inappropriate for an audit document. Use of “significant” and “numerous” to describe cost overruns and change orders is, again, subjective and in no way substantiated by comparison to other contracts or frequency or amount of change orders.

ENV and Synagro are not aware of any ongoing public concerns by the public or City Council as a whole and therefore this unsubstantiated statement should be removed from the report.



- Chapter 2 – Challenges remain in completing the consent decree’s biosolids reuse requirements.

Again, there are statements regarding “on-going public concerns” and “Public Acceptance...Questionable” that are not only inaccurate but lack any factual basis. These statements should be stricken from the report.

#### Final Contract Price

Upon execution of Change Order No.13, the final contract price for Contract # F92642, Synagro-WWT, Inc., will be \$40,764,673.84, or \$7,009,673.84 above the original contract price. Change Order No. 13 was necessary to extend the sludge dewatering and disposal services until September 30, 2007.

Of the \$7,009,673.84 increase in contract price, only \$1,442,324.84 reflects increases related to changes in construction scope of the facility. As a percentage of the original contract price, these changes reflect a 4.3% increase in the contract price. This is reflected in the table below.

As discussed above, the 14-month delay caused by the City Council’s desire to further test and research biosolids pellets in the interest of public safety resulted in the escalation of the contract price by Change Order No. 8 in the amount of \$2,103,349.00

Further, sludge dewatering and disposal accounted for \$3,464,000.00 of the increase in contract price. Interim sludge dewatering and disposal costs are authorized by Change Order No.10 in the amount of \$1,104,000.00, part of Change Order No. 12 in the amount of \$1,760,000.00 and lastly, Change Order No. 13 in the amount of \$600,000.00 totaling \$3,464,000.00. These costs, operational in nature and name, would have otherwise been incurred by the City’s Sand Island WWTP Operations, if the staff had chosen to continue dewatering themselves. However, the City’s old centrifuges were beyond economical repair and maintenance that it made more sense for the City to have Synagro perform this function with their more efficient, ready to use and new dewatering equipment rather than incurring substantial capital upgrades to replace its’ old centrifuges. Reporting that these were costly change orders is not accurate.

Total Increase in Contract Price:	\$7,009,673.84
Less: CO No.8 Escalation due to 14-month delay resulting From Council-requested pellets research and testing:	(\$2,103,349.00)
Less: Total Interim Sludge Dewatering and Disposal Costs From CO Nos.10, part CO 12, and CO 13 shown above:	(\$3,464,000.00)
Increase in Contract Price from construction scope changes:	\$1,442,324.84
Percentage of Original Contract Price of \$33,755,000	\$4.3%

While change orders in any amount can be viewed as “costly”, a public works project that has changes which amount to only 4.3% of the original contract price is generally viewed as a success.

### **COLLATERAL BENEFITS RESULTING FROM PROJECT**

We would like to state for the record the collateral benefits provided by the project:

1. This project helps the plant meet its' NPDES permit by eliminating the need for the old high maintenance Zimpro process thus avoiding the need to return the high soluble BOD return flow from this process to the headworks. This high soluble BOD could not be handled by the Sand Island primary treatment and would often be suspected of being a major factor in causing the plant not meeting the BOD effluent permit limit.
2. The volume of biosolids being disposed of at the landfill is greatly reduced lengthening the life of the landfill.
3. The biosolids pellets are now safely reused as soil conditioner and fertilizer.
4. It is contributing to the energy sustainability program of the City in that the methane gas is used for drying the sludge thus reducing our use of diesel fuel.
5. The potential or an opportunity for the cogeneration of electrical energy is made possible by this project if the excess methane generated by the digester will eventually be harnessed.

### **PRODUCT MARKETING**

1. The State DOH has clarified the section of HAR related to sewage and food crops. Biosolids products such compost and pellets meeting EQ standards are allowed. (Attachment 2)
2. The variance for Molybdenum was approved by DOH on March 27, 2008. The new limit is 25 ppm.
3. Since the variance for Molybdenum was received, Synagro has distributed 531.93 tons or 79%, of finished product to the market. (Attachment 3)

We request that an appendix to the audit report be made to cover the resolved molybdenum and food crop issues shown above.

We believe the above suggested changes and comments provide for a fair and balanced audit report. If you have any questions, please do not hesitate to contact Silvestre Ulep of my staff at 847-8300.

Sincerely,

  
Eric S. Takamura, Ph.D., P.E.  
Director



LINDA LINGLE  
GOVERNOR OF HAWAII



CHIYOME L. FUKINO, M.D.  
DIRECTOR OF HEALTH

STATE OF HAWAII  
DEPARTMENT OF HEALTH  
P.O. Box 3378  
HONOLULU, HAWAII 96801-3378

In reply, please refer to:  
File:

December 27, 2007

To Whom It May Concern:

From: Laurence K. Lau, Deputy Director for Environmental Health

Subject: Use of Properly Treated Wastewater Sludge or Biosolids as Fertilizer and Recycled Water for Irrigation for Vegetables

This memo follows up the Department's August 22, 2007 memo and clarifies the Department's position and affirms that properly treated wastewater sludge (also known as biosolids) may be used as a fertilizer or soil amendment, and the use of recycled water (treated wastewater) for irrigation for vegetables, when the treatment and uses comply with chapter 11-62, Hawaii Administrative Rules (HAR).

On August 22, 2007, the Department of Health's Sanitation Branch distributed a memo prohibiting sludge from being used as fertilizers on vegetable crops. As stated in that memo, HAR section 11-11-8, Vegetables, reads in part:

- (a) Fertilizer. It shall be unlawful to use human body discharges, whether in liquid or solid form as a fertilizer for plants raised for human consumption.
  - (1) Sludge from sewage treatment or waste waters from recycling plants shall not be used for fertilizing vegetables.

That rule applies to untreated sludge, and more generally to human body discharges that are not properly treated. There is another rule, Chapter 11-62, HAR, that allows the use of properly treated sludge and recycled water, and the department will amend its rules to clarify the situation. The department is not allowing the use of raw waste (night soil), untreated sludge or wastewater, or sludge or recycled water that is not properly treated.

Chapter 11-62, HAR, allows properly treated wastewater sludge from wastewater treatment plants to be used as fertilizer or soil amendment for use on food crops, including vegetables, or for other agronomic uses. Proper treatment requires meeting rigorous federal and state standards for the removal of pathogens and metals. Chapter 11-62 also allows the use of properly treated recycled water for irrigation in certain cases. Chapter 11-62's most recent amendments on wastewater sludge and recycled water were in 2004, and chapter 11-62's biosolids requirements are based closely on EPA regulations, 40 CFR Part 503. HAR chapter 11-11 was adopted in 1981, and HAR chapter 11-62 is the department's current thinking on the subject.

Compliance with HAR 11-62 adequately protects the community's health and safety. The use of properly treated wastewater sludge as a fertilizer or soil amendment and recycled water for irrigation is a well established nation-wide practice. Treated wastewater sludge from the mainland has been sold for years to Hawaii's farmers and gardeners as fertilizer and soil amendment without any reported illnesses. The Department is not allowing the use of raw wastewater or untreated sludge, or wastewater sludge or recycled water that does not meet HAR chapter 11-62.

The Department does promote the proper treatment and use of wastewater sludge and recycled water. We can better serve the environment by minimizing waste, and that can be promoted by turning wastes into resources. Using recycled water for irrigation can free potable water for human consumption. Using properly treated wastewater sludge and recycled water maximizes the return on current wastewater

December 27, 2007  
State of Hawaii - Department of Health

Attachment **2**

treatment expenses borne by the counties and ratepayers. We also note that fertilizer and soil amendments made from treated mainland wastewater sludge have been sold in to Hawaii farmers and gardeners for many years with no known harm to health, and properly treated local wastewater sludge can replace the imported sludge and keep money in our state's economy. We attach a table that summarizes the acceptable uses of recycled water, based on the degree of treatment.

There may be public concern about recent nation-wide recalls of vegetables due to E. Coli contamination. However, none of these recalls have been associated with the use of properly treated wastewater sludge on food crops or recycled water for irrigation of food crops. The department is not authorizing the sale or consumption of contaminated produce.

If there are any questions regarding this matter, please contact the department's Wastewater Branch at:

Wastewater Branch  
Phone (808) 586-4294  
919 Ala Moana Boulevard, Room 309  
Honolulu, Hawaii 96814

December 27, 2007  
State of Hawaii - Department of Health

**ATTACHMENT 2**

## Attachment 3

TICKET_NUM	SLUDGET	INVOICE_	ShippedTo	SHIP_DATE	MANIFST_NO	TONS
1280-08	PEX		KAPOLEI, HI	3/28/2008	32808	10.31
1278-08	PEX		KAPOLEI, HI	3/28/2008	32808	9.27
1281-08	PE	26349	EWA BEACH, HI	3/28/2008	0009-002	17.97
1282-08	PEX		KAPOLEI, HI	3/31/2008	33108	9.48
1283-08	PE	26349	EWA BEACH, HI	3/31/2008	0009-003	10.41
1284-08	PEX		KAPOLEI, HI	4/1/2008	40108	9.05
1287-08	PEX		KAPOLEI, HI	4/2/2008	40208	8.90
1285-08	PE	26428	EWA BEACH, HI	4/2/2008	0010-010	18.58
1286-08	PE	26428	EWA BEACH, HI	4/2/2008	0010-011	18.50
1288-08	PEX		KAPOLEI, HI	4/3/2008	40308	9.38
1290-08	PE	26428	EWA BEACH, HI	4/4/2008	0010-012	12.29
1291-08	PE	26398	EWA BEACH, HI	4/8/2008	0010-001	15.01
1293-08	PE	26398	EWA BEACH, HI	4/9/2008	0010-002	15.25
1292-08	PEX		KAPOLEI, HI	4/9/2008	40908	7.86
1294-08	PE	26398	EWA BEACH, HI	4/10/2008	0010-003	12.12
1295-08	PE	26398	EWA BEACH, HI	4/11/2008	0010-004	15.59
1296-08	PEX		KAPOLEI, HI	4/11/2008	41108	9.08
1298-08	PE	26428	EWA BEACH, HI	4/15/2008	0010-005	9.28
1299-08	PE	26428	EWA BEACH, HI	4/16/2008	0010-006	10.12
1300-08	PE	26428	EWA BEACH, HI	4/16/2008	0010-007	9.14
1301-08	PE	26428	EWA BEACH, HI	4/17/2008	0010-008	9.50
1303-08	PE	26428	EWA BEACH, HI	4/17/2008	0010-009	10.15
1302-08	PEX		KAPOLEI, HI	4/17/2008	41708	8.93
1304-08	PE	26428	EWA BEACH, HI	4/22/2008	0010-013	15.79
1305-08	PE	26428	EWA BEACH, HI	4/23/2008	0010-014	20.30
1308-08	PE	26428	EWA BEACH, HI	4/24/2008	0010-015	9.03
1307-08	PE	26428	EWA BEACH, HI	4/24/2008	0010-016	9.39
1310-08	PEX		KAPOLEI, HI	4/25/2008	42508	9.91
1309-08	PE	26428	EWA BEACH, HI	4/25/2008	0010-017	18.40
1311-08	PE	26428	EWA BEACH, HI	4/29/2008	0010-018	13.16
1312-08	PE	26428	EWA BEACH, HI	4/30/2008	0010-019	9.43
1315-08	PEX		KAPOLEI, HI	5/1/2008	50108	8.99
1313-08	PE	26523	EWA BEACH, HI	5/1/2008	0011-001	9.68
1314-08	PE	26523	EWA BEACH, HI	5/1/2008	0011-002	8.94
1316-08	PEX		KAPOLEI, HI	5/2/2008	50208	6.97
1317-08	PE	26523	EWA BEACH, HI	5/6/2008	0011-003	9.21
1318-08	PE	26523	EWA BEACH, HI	5/6/2008	0011-004	9.54
1319-08	PE	26523	EWA BEACH, HI	5/7/2008	0011-005	8.83
1320-08	PE	26523	EWA BEACH, HI	5/7/2008	0011-006	9.54
1321-08	PEX		KAPOLEI, HI	5/8/2008	50808	9.56
1322-08	PE	26523	EWA BEACH, HI	5/8/2008	0011-007	10.38
1323-08	PE	26523	EWA BEACH, HI	5/8/2008	0011-008	4.41
1324-08	PE	26523	EWA BEACH, HI	5/14/2008	0011-009	8.66
1325-08	PE	26523	EWA BEACH, HI	5/14/2008	0011-010	10.04
1326-08	PE	26523	EWA BEACH, HI	5/14/2008	0011-011	9.77
1328-08	PE	26523	EWA BEACH, HI	5/16/2008	0011-013	13.45
1327-08	PE	26523	EWA BEACH, HI	5/16/2008	0011-012	17.57
1331-08	PEX		KAPOLEI, HI	5/17/2008	51708	4.25
1330-08	PEX		KAPOLEI, HI	5/17/2008	51708	5.49
1332-08	PE	26546	EWA BEACH, HI	5/20/2008	0011-015	19.29
1333-08	PE	26546	EWA BEACH, HI	5/21/2008	0011-014	10.17
1334-08	PEX		KAPOLEI, HI	5/21/2008	52108	3.03
1335-08	PE	26546	EWA BEACH, HI	5/23/2008	0011-016	18.52
1336-08	PE	26546	EWA BEACH, HI	5/24/2008	0011-018	9.24
1337-08	PEX		KAPOLEI, HI	5/24/2008	52408	9.27
1338-08	PE	26546	EWA BEACH, HI	5/28/2008	0011-017	20.16
1339-08	PE	26546	EWA BEACH, HI	5/29/2008	0011-019	18.25
1341-08	PE		HI	5/29/2008	0012-001	7.76
1343-08	PE	26546	EWA BEACH, HI	5/31/2008	0011-020	9.39
1342-08	PE	26546	EWA BEACH, HI	5/31/2008	0011-021	9.72
Total Tons 3/28/08 to 5/31/08						671.66
Tons to Market						531.93 79%
Tons to Landfill						139.73 21%

ATTACHMENT 3

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