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ENVIRONMENTAL ASSESSMENT OF THE IMPACT OF A 240 TONS/DAY WASTE-TO-ENERGY POWER PLANT ON CABRAS ISLAND, GUAM

by

GEOFFREY K. BURKE, P.E.
Post Office Box 7233
Tamuning, Guam 96911

For

The Guam Energy Office
DR. DOUGLAS R. SMITH, Director

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SECTION ONE

INTRODUCTION

Purpose and Need

This environmental assessment is intended to ascertain the environmental effects of the operation of a 240 ton per day, municipal solid waste incinerator making steam which drives a turbine generator to produce the equivalent of 4.5 MW of electrical power at or near the Cabras Power Plant. The environmental effects of the proposed projects should be understood prior to the committment of considerable resources toward their construction. The net effect of this proposed project is to reduce the burden on the Ordot and military landfills, by reducing volume to one-fifth the municipal solid waste (MSW) volume, thereby extending the landfill lives five fold, and by recovering electrical or steam energy to reduce electrical power consumption. Secondary effects include reducing operational problems associated with the Ordot landfill i.e. odors, top soil use, erosion, combustion of buried MSW, rodents, and flies.

Background

This recent history of the waste-to-energy plant begins during the mid-1970's when the environmental quality and energy crisis concerns converged. This situation helped to develop, what were then called, resource recovery processes.

There were about five general approaches to converting solid waste into energy, usually with front end material recovery for such materials as aluminum. These processes were:

1. Water-walled Incinerators: These units burn unprocessed solid waste to generate steam usually for manufacturing processes or heating of buildings. This concept has been in wide use throughout Europe for several decades and is known as the Von Roll process. The Wheelabrator-Frye company has marketed their refuse boiler in the U.S. using this technique.

2. Shredded Waste: In this process, refuse is shredded and separated into light (organic) and heavy (inorganic) fractions. The light fraction is used as a fuel substitute in utility and industrial furnaces. It has been used primarily in coal-burning utility boilers such as at the Union Electric Company St. Louis plant. The use of this process in oil burning utility boilers requires major new investment in particulate emission control devices and ash removal facilities. Considerable added investment in boiler modifications, and the absence of alkaline ash components from coal, pose a corrosion threat to boiler tubes in existing oil-fired plants that are retrofitted to use this process.

3. Pulped Waste: This technique blends the refuse into a wet pulp and then separates the organic and inorganic fractions. The organic fraction is dewatered and burned, or some of it may be recovered as fiber. The Black Clawson company has pioneered this wet-pulped refuse derived fuel (RDF) process. The process is geared for front end resource recovery. It affords a higher single pass recovery of the organic fraction from municipal solid waste (MSW) than the standard air classification technique, and the resulting RDF is of more uniform

quality. However, the elimination of water from the pressed pulp carries a heavy energy loss penalty. The pressed product still contains about 50% moisture content, and thus requires a specially designed furnace for combustion that is not as efficient as dry processing. The pulp can be dried to 20% moisture content in a three-stage rotary drier, and then pulverized or pelleted. But, these steps take much energy away as station losses from the final energy product.

4. Pyrolysis: Consists of the chemical decomposition of MSW in a high temperature and controlled oxygen atmosphere, yielding oil or gas, which, in turn, is burned in an afterburner or conventional boiler. Several patented pyrolysis techniques have been promoted. These include the Monsanto Langard Pyrolisis System (1,000 tons per day (TPD), plant in Baltimore), the Occidental "Flash Pyrolysis" process (2,000 TPD demonstration plant in San Diego), the Carborundum Torrax System, and the Union Carbide Purox System. Most of these processes use some resource separation and recovery either in front of, or as an output of, the pyrolysis.

5. Methane Generation: Methane gas is produced by the decomposition of the organic wastes in MSW in this process. The methane is burned as gaseous fuel for conventional boilers. There are readily available organic waste sources that do not have such a high non-organic composition as MSW. And, conversely, MSW is a better incineration material than methane gas source. Since 1975, landfill methane gas recovery has become the prime methane recovery technique. It is a technique usually retrofitted to landfills to recovery energy from previous MSW deposits. As of 1983, there were 26 municipal landfill methane gas recovery projects in the U.S., versus two

methane and one ethanol gas recovery operations producing fuel outside of landfills. The average production per landfill is about 2 MW.

The U.S. Conference of Mayors, Resource Recovery Activities report appearing in the September/October 1983 issue of "City Currents" lists the existing Resource Recovery Facilities in the U.S. and is contained in Appendix I. We can see from this list that the present trend in resource recovery is for the mass burning of MSW in modular incinerators to produce process steam or electricity (60 of 90 facilities), while another 19 facilities shred and employ front end resource recovery before burning the Refuse Derived Fuel (RDF) to generate steam or electricity. Of the remaining 11 facilities, two use the methane generation process, one produces ethanol, one facility employs the wet pulp method, and no facilities are listed using the pyrolysis incineration technique. One other 1980's development that should be noted from this listing is the use of smaller modular incinerators to mass burn MSW. Thirteen of the 60 modular incinerators are between 7 (TPD) and 60 (TPD) in capacity, and another 13 of these units are between 72 and 125 TPD. Thus, mass burning modular incinerators are being matched to the community's MSW disposal and energy end user's needs. This enables a more efficient pairing of MSW source with energy end user.

The Guam Energy Office, during 1978 - 1982 negotiated with Inter Energy Inc. of New York to build a waste-to-energy power plant near the Cabras Power Plant site. The waste-to-energy plant would tie into the Island-wide Power System electrical distribution grid at the Cabras substation and was proposed to have common use of the Cabras Unit infrastructure. The project was to be in conjunction with the construction and operation of a land-based Ocean Thermal Energy Conversion (OTEC) power plant at

Cabras. The OTEC was to be in the range of 50-100 Megawatts (MW) while the waste-to-energy plant was estimated to produce 4 MW and burn 200 TPD of MSW. The waste-to-energy plant was to be constructed first, in about 1983.

The waste-to-energy facility recently was resurrected when officials from Inter Energy Inc. revisited Guam in 1984. In meetings with the Governor and with the Director of the Guam Energy Office, plans were again discussed for Inter Energy Inc. to construct and operate a 200 - 240 TPD water walled incinerator plant at the Cabras site. The plant was estimated to produce the equivalent of between 4 and 5 megawatts of power per day. It would employ a baghouse and ash quench pit with ash and flyash disposal at the Ordot and/or Navy Landfill to control emissions of these pollutants from the facility. If necessary, gaseous emissions would be scrubbed out to meet allowable ambient air quality standards of the Guam Environmental Protection Agency. There are no emission standards for gaseous pollutants for Guam except for SO_x. The facility would cost about 15 million dollars to construct and about 3 million dollars a year to operate. Revenues from electrical power sales to the IWPS would be about 2 million dollars per year. The shortfall of $1,000,000 per year in cash flow would be raised with a $13-14 per ton tipping fee paid to the plant operator by private and public collectors, including the military collectors, delivering MSW to the facility. Of course the Ordot landfill would have to limit acceptance of trash by these public and private collectors or impose a landfill tipping fee of its own. The simpler solution would be for GPA to accept a higher cogeneration sales rate. i.e. 11¢/KWH would provide profitability with no tipping fee.

The proposed site of the waste-to-energy facility, as previously mentioned, is behind or next to Unit #2 of the Cabras Power Plant. This site would require some filling and compacting before laying the ele-

vated concrete tipping floor. Also, a paved access road, capable of handling the MSW collection vehicles, would be needed. For the purposes of this environmental assessment, the proposed waste-to-energy plant site is assumed to be directly adjacent to Cabras Unit #2. A location map of the proposed waste-to-energy plant is contained in Appendix II.

Applicable Laws, Regulations, and Government Interrelationships

Foremost in existing laws and regulations impacting on the proposed facility are the air and water pollution control regulations promulgated and enforced by the Guam Environmental Protection Agency. The air pollution control regulations are probably the standards most impacting on the facility. Chapters Nine, titled, "Control of Particulate Emission from Incinerator: Design and Operation", and Fifteen, "Standards of Performance For New Stationary Sources", concern the air pollution control regulations governing the facility as an air emission source. These chapters are included in Appendix III. Water pollution control standards are not as critical to this facility which will discharge less water effluent than effluents from the nearby Piti Plant Units #2 and #3 that will be phased out during the 1980's. Likewise, a similar permit must be obtained from the GEPA for air, water, and aquifer clearances.

Several other governmental regulations must be addressed by consulting with the responsible agency to obtain the applicable clearances. These include, historical preservation (DPR), fish and wildlife habitat protection (Dept. Agr.) endangered species clearances (Dept. Agr., and U.S. Department of Fish and Wildlife), Coastal Zone Management, (Bureau of Planning), and Zoning (TPC). However, none of these regulations appear to be adversely impacted by this facility that is to be placed on the

grounds of an existing power plant whose output is many times that of the proposed facility and which is located in a higly disturbed tidal area that was filled during the construction of the Cabras Plant in 1972-73. This area is noted on the site map in Appendix II.

Clearances and coordination must be made to the IWPS for connection to the power grid, and specifically with GPA regarding cogeneration sales to the utility. Also, "tipping fee" laws need to be passed to insure MSW collectors to deposit their loads at the waste-to-energy facility. Federal cooperation is needed from the Navy for their MSW collections to be dumped at the waste-to-energy plant. Of course, a DPW Building Permit must be obtained and Business Licenses and an Employer Identification Number obtained from the Dept. of Revenue and Taxation and from the U.S. IRS, respectively.

Concerns and Issues

Many of the concerns and issues regarding this facility have been addressed in the preceeding subsection. The overall effect of this facility is very positive in that it is recovering energy from the MSW while significantly reducing the volume of material going into the Ordot and military landfills. This extends the life of these facilities about fivefold, and reduces operational problems, and costs. These environmental benefits will be discussed in greater detail in the following sections, but suffice to say that public concerns and issues will predominantly center on increased collection costs and an increase in enforcement against illegal dumpers and dumps. There will be several opportunities for public involvement prior to the construction of the facility and during it's operation, especially during the permit and clearance application processes described in the previous subsection.

SECTION TWO

ALTERNATIVES

As with any proposed change of this magnitude, there are several alternatives to the proposed project. The most probable alternative are:

A. The proposed project, that of constructing a 240 tons per day (TPD) water-walled incinerator coupled with a turbine-generator producing approximately 4.5 megawatts and located next to the Cabras Power Plant.

B. The use of a 240 TPD water-walled incinerator tied into the Cabras boiler feedwater loop to preheat the feedwater before going to the Cabras boiler, thereby increasing the efficiency of the Cabras units. The facility would be located adjacent to the Cabras Power Plant. This is a close variation of the proposed project.

C. No action being taken resulting in the military and Ordot landfills being used for MSW disposal.

D. The present status being maintained as described in Alternative C with the addition of methane gas extraction from the buried MSW at the Ordot and Navy landfills to directly power electrical generators on site that are tied into the IWPS power grid on a cogeneration arrangement.

E. The use of several, modular, mass fired, incinerators coupled to boilers and turbine generators providing electrical power

to large, point source, electrical power consumers such as the shopping centers.

F. Using small modular incinerator facilities as described in Alternative E at MSW Transfer Stations located in the villages.

SECTION THREE

ENVIRONMENTAL QUALITY FACTORS

There are many environmental qualities that should be considered. These include, but are not limited to, the following:

1. Facility Air Pollution
   a. Particulate Emissions
   b. Gaseous (SO_x, HC, NO_x, CO and Photochemical Oxidants)
   c. Thermal
   d. Fugitive Dust
   e. Odor

2. Facility Water Pollution
   a. Runoff
   b. Wastewater
   c. Condensing (cooling) Water/Thermal
   d. Blowdown/Washdown

3. Noise Pollution
   a. Collection Vehicles
   b. Loaders
   c. Plant Equipment

4. Collection Vehicle Pollution
   a. Gas/Oil
   b. Exhaust Emissions
   c. Odors
   d. Fugitive MSW

5. Wildlife and Habitat

6. Aquifer

7. Material Resources
   a. Collection Vehicles
   b. Roadwear
   c. Gas/Oil Vehicles
   d. Fuel Oil
   e. Electrical Energy (Includes IWPS resources to produce this energy.)

8. Human Environment
   a. Economics (money) Standard of Living
   b. Historic Preservation
   c. Recreation

SECTION FOUR

ENVIRONMENTAL IMPACTS

This section will evaluate in detail the environmental quality affected by the proposed project described in the preceeding Section as Alternative A. The variation of the proposed project, listed as Alternative B will be evaluated similarly. The environmental quality impacted by the remaining alternatives will not be evaluated.

A. Proposed Project

1. Facility Air Pollution

a. Particulate Emissions - Significant particulate emissions are produced by water-walled incineration of MSW. These emissions, if uncontrolled, would probably violate the air emission standards of the GEPA. However, ambient and emission quality standards can be maintained by using a baghouse which can achieve 98% - 99% collection efficiency. However, when the baghouse is down for repair, plant operation must be curtailed to prevent adverse point source particulate pollution from the facility. The emission standard for incinerators is .2 pounds per 100 pounds of refuse burned.

b. Gaseous Emissions (SO_x, HC, NO_x, photochemical oxidants, CO) - The incineration of MSW produces less sulfur dioxide per unit of energy than the

existing power plant emissions of Cabras and Piti. NO_x formation is limited due to the lower incinerator combustion atmosphere temperature which is below the ideal formation temperature for NO_x. Emissions of CO are even lower. 50 TPD plants have tested at NO_x levels below 200 ppm and CO levels below 50 ppm. Therefore, no significant deterioration in the air quality of the Cabras - Piti area would result from the proposed project. In fact, the air quality should improve as emissions from the Piti plant are replaced by the overall cleaner emission of the proposed facility, which would result in a net decrease in the emission of these pollutants in the area. There are no emission standards for CO, NO_x or HC. Guam (GEPA) only has ambient air quality standards for these pollutants. These Ambient Air Quality Standards are listed in Appendix III.

c. Thermal - There would be a net increase in air thermal loading of the immediate area due to the slightly lower thermal efficiency of the proposed facility. However, that net increase is less than can be detected by an individual at the property line boundary of the Cabras Island Road. Thus this environmental quality factor is not significantly compromised by the proposed facility.

d. Fugitive Dust - There will undoubtably be an increase in fugitive dust in the area, however, when compared with the reduction of activity and fugitive dust emissions at the landfills, the overall effect of the proposed facility will be a net reduction in fugitive dust emissions between the facility and

landfills. Mitigation of fugitive dust can have significant results at the proposed facility site by paving all vehicle travel surfaces, quenching ash in a wet pit and keeping the ash wet and covered until deposited at the landfill.

e. Odor - Odors will not be a major problem at the site. Again, the odor emission of the facility will be less than odors produced by the landfill operations, especially those from Ordot. Also, as the inert ash replaces the odorous MSW at the landfills, the odors at the landfills will be less over time. It should be noted that the main reason for a lack of odors from the facility is that the MSW is incinerated about as fast as it is delivered. The longest residence time of MSW at the proposed facility is less than three days. The average residence time of MSW is measured in hours before it is reduced to an inert ash. The incineration is maintained above 1200 degrees F. No odors are produced from MSW at a temperature above 1200 degrees F. Therefore, the incineration of MSW by the facility will not produce odors. MSW waste-to-energy plants in operation throughout the U.S. have no significant odors from operation. Conversely, landfills have significant decomposition of MSW over a long period of time. There will be no significant odor pollution from the proposed facility.

2. Facility Water Pollution

a. Storm Runoff - There will be more organic material in storm runoff from the access apron road and turn around area due to occasional MSW spills. This may result in the mild bacteriological contamination of runoff water. Again, this potential pollution effect will be less than the existing pollution by runoff at the Ordot landfill. The spillage will be

insignificant compared to wholesale MSW landfilling. The tipping floor will be located inside a Butler type warehouse with drainage from the tipping floor going to the ash quenching pit. The residue water is evaporated or taken out with the ash as the moisturizer. Therefore, no significant pollution is anticipated from this storm runoff.

b. Wastewater - Sanitation wastewater will not be a significant pollution factor since the facility will be connected to the Cabras sewer line.

c. Condenser Cooling Water/Thermal - The seawater cooling loop for the condenser will be similar to those used at the Piti and Cabras Plants. The net pollution will be negligible from this source since it will essentially replace the cooling water discharge from the adjacent Piti Units it is replacing in generating capacity. The Piti Plant has had as much as 75 MW of operational capacity. The condenser cooling water flow with the proposed facility and Piti units will be less than the flow with the previous Piti Plant capacity. The condenser piping will be new and not as corroded as the existing Piti Plant piping, so metal contamination should also be less with the proposed facility on line. No adverse impact is expected from this source.

d. Blowdown/Washdown - The collection, and loader vehicle and tipping floor washdown water will be funneled to the ash pit. The ash pit will not pose a contamination problem. Facility equipment blowdown (boiler) will be vented to the ash pit also.

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could be piped
sump.

3. Noise Pollution - The Cab
industrial zoned area with o
stalled electrical generating ca
the Commercial Port in the imme
proposed facility. The combined noi
facility's operation is miniscule in
existing noise level of the area. The noise
from the proposed facility is insignificant.

4. Collection Vehicle Pollution - The net added pollution caused by the collection vehicles delivering to the proposed facility is a function of its location in relation to the collection truck routes and the Ordot and Navy landfills. The Naval Station landfill is 5.5 miles and the Ordot landfill is 9.0 miles from the proposed facility. In the case of collection trucks, many of them pass close to the proposed facility on their way to their respective landfills along Marine Drive.

The Municipal Solid Waste Energy Conversion Study prepared by Barrett, Harris and Associates, Inc. noted the 1983 quantities of MSW generated on Guam in yd^3 and, based on density, the tons per day collected. According to this information, and that of recent consultations, Commercial Sanitation collection vehicles total about 14 trips per day, Basula vehicles 2 trips per day, and DPW vehicles 14 trips per day. Assume Navy PW vehicles at 10

trips per day. Private construction commercial and private trips are estimated to total an equivalent of 20 collection vehicle trips. This makes an estimated total of 60 trips per day for the proposed facility. Assuming 10 of the trips displace those for the Navy landfill from the Naval Station, Naval Magazine and Apra Heights. Another 40 trips per day are assumed to be from Northern and Eastern Guam displaced from the Ordot landfill to the proposed facility.

5.5 miles x 10 trips = 55 vehicle miles
9.0 miles x 40 trips = 360 vehicle miles
Total: 415 vehicle miles per day

This is the collection vehicle estimated additional pollution potential caused by the proposed facility. This environmental impact is measurable, but again not very significant in motor fuel and oil spillage. The same insignificance applies to the other pollution factors of exhaust emissions, odors and fugitive MSW associated with increased collection vehicle mileage.

5. Wildlife and Habitat - The proposed facility is to be located in a heavily disturbed area next to fuel tanks, transmission lines and power plants. Further investigation of the proposed site by officials of the the Department of Agriculture, Aquatic and Wildlife Division is needed before construction. However, initial observation indicates insignificant impact on wildlife and habitat at the proposed facility site.

6. Aquifer - The proposed facility location does not impact on the aquifer of Northern Guam. Therefore, no adverse impact on this environmental quality factor caused by the proposed facility.

7. Material Resourses

   a. Collection Vehicle Repairs - By replacing the worn road and soft shoulder and dusty and muddy conditions of the landfills, with the concrete tipping floor and paved access of the proposed plant, collection vehicle maintenance will require fewer repairs and materials. The net effect of the facility on this factor is an improvement.

   b. Roadwear - The additional 415 vehicle miles per day by collection vehicles is again very insignificant in road wear characteristics considering the few vehicle miles as compared with total vehicle miles on Guam, less than ½ of one percent of total vehicle miles traveled daily on Guam.

   c. Gas/Oil - Similarily, the extra 415 vehicle miles per day plus about 80 vehicle miles per day for the ash truck equals 495 vehicle miles per day at about 14 miles per gallon equals about 35 gallons per day in additional vehicle fuel required by the proposed facility. Again, this is insignificant in terms of the total motor vehicle fuel use per day on Guam.

   d. Fuel Oil - The proposed facility generating at 4.5 megawatts per hour x 24 hours per day x 330 days per year equals 35,640,000 KWH/year saved in generation.

At an average rate for the IWPS of 13.0 KWH/gallon, this amounts to a residual fuel oil savings for the IWPS of 2,741,538.5 gallons. This is quite an environmental improvement in fuel oil savings.

e. Electrical Energy - The aforementioned estimated savings in KWH/year equals 35,640,000. The savings in generation enables the retirement of older, power generating capacity with resultant savings in repair materials and other material resources. This is a significant improvement in this material resource factor.

8. Human Environment

a. Economics/Standard of Living - This factor would be enhanced by the proposed facility. The waste-to-energy plant would directly employ about 30 people. The added MSW collection effort anticipated would employ another six people. Additionally, the cash flow from the proposed facility operations would have a greater turnover on every dollar spent (i.e. about 7 to 1), since the resource is locally generated versus for foreign supply of residual fuel oil, the payment for which, leaves the island with much less left on Guam and with much less turnover of every dollar (i.e. about 3 to 1). A large segment of the fuel savings is transferred into wages of the employees of the proposed facility, and into supplies and utilities, all of which are locally supplied. The dollar savings in KWH supplied by the proposed facility amounts to $2,851,200 a year.

b. Historic Preservation - In consultation with the

Department of Parks and Recreation Historic Preservation Section, it appears the proposed site does not pose any threat to historic preservation activities. A clearance in this matter from the Department is required prior to the construction of the facility, but it is not anticipated that this factor is compromised.

c. Recreation - There is no recreational activity conducted at the proposed facility site. Therefore this environmental factor is not affected.

B. Cabras Steam Plant

This alternative comprises a 240 TPD water-walled mass incinerator tied into the Cabras I and II Unit boiler feedwater loop to preheat the feedwater and thereby increase the efficiency, and hence fuel requirements of the Cabras units.

This variation of the proposed project is nearly the same in environmental effects except for the lack of need of a condenser and thus, condenser water/thermal discharges and pollution effects would be eliminated.

This variation does not require as much capital investment and hence material resource depletion for equipment in that electrical switchgear, condenser and condensing water pumps and piping, turbine-generator and some structural components will not be needed with this alternative. Also, wastewater and blowdown can be connected to the Cabras plant sewer more readily, and water treatment equipment of Cabras would main-

tain the circulation water quality. Therefore, capital investment in material resources would be less. However, the technical merits of this alternative are questionable. The Cabras Units are very efficient and cooresponding complex. Feedwater preheating is limited. Too much will upset the turbine-boiler balance, probably losing turbine efficiency at a greater loss in plant efficiency than can be saved in fuel consumption. It appears this feedwater heating "window" is too narrow to capitalize on. This technique may be more feasibile with Piti Units 4 and 5 or 2 and 3, but probably still not as feasible as Alternative A.

C. Status Quo

Failure to take any action will result in significant environmental pollution and resource waste to continue. As mentioned in the anlysis for the projected facility, the energy recovery of the MSW will be lost. Without the proposed facility, or its alternative, the environmental problems produced by landfilling, in particular those of the Ordot landfill, will continue.

The Ordot landfill has, and will continue to have, occasional burning of MSW inside the landfill, producing pungent gaseous pollutants and particulate emissions. The fugutive dust produced at the landfills, and wind blown dust and debris will continue to be more than that produced with the proposed facility in operation. Ordors from the organic decay of MSW will increase at a greater rate, and this will continue to offer a habitat for flies, roaches and rodents and other scavaging animals. MSW is not a natural habitat for wildlife.

Although, the Ordot landfill is not listed as a water pollution source, its runoff and percolation produce wastewater entering the river valley below. Flying debris will continue to litter the roadway to the landfill through Ordot village including past the church and school. Greater wildlife and habitat disturbance is made by the Ordot landfill operation than the proposed facility would.

Most important, each and every year without the proposed facility in operation, the IWPS power plants will continue to burn about 2,750,000 gallons of high sulfur residual fuel oil to produce about 35,640,000 KWH, spending more than $3,000,000 to produce this energy. These numbers and wastage will increase at a rate of 3% per year as additional MSW is generated.

SECTION FIVE

CONSULTATION AND COORDINATION

Consultations and coordination efforts required before implementing construction of the proposed facility have been identified in the first Section of this assessment. This Section describes the primary environmental clearances required.

A. State Historic Preservation - September 14, 1984 conversation with Mr. Richard Davis, Historic Preservation Officer, Department of Parks and Recreation. Once the site has been identified by parcel and lot in accordance with Department of Land Management policies, a letter describing the site must be sent to the Department of Parks and Recreation denoting any previous disturbance of the proposed site and including a description of the present condition of the site. The developer will then receive a written clearance after site inspection by a representative of the Section.

B. Fish and Wildlife Coordination - September 14, 1984 conversation with Mr. Anderson, Aquatic and Wildlife Division, Department of Agriculture. Developer must send a letter to Mr. Harry Kami, Chief of Aquatic and Wildlife Division, identifying site and proposed project. After site inspection, written comments will be given to the developer identifying precautions, if any, which need to be taken.

C. Endangered Species Clearance - September 14, 1984 conversation with Mr. Anderson. Actions to take are same as in Item B. In

addition, clearance is required from U.S. Department of Fish and Wildlife, due to the fact that many of Guam's bird species are now on the U.S. Endangered Species List.

D. Coastal Zone Management - September 14, 1984 conversation with Mr. Mike Hamm, Coastal Zone Manager, Bureau of Planning. The CZM clearance application form must be completed by the developer prior to construction. Coastal Zone Manager will then provide written comments on procedures to be complied with.

E. Aquifer Clearance - September 13, 1984 conversation with Mr. Gary Stillberger, Guam Environmental Protection Agency. The proposed site is not in the Northern aquifer area. Therefore, no clearance is required.

F. Guam Air and Water Pollution Control Permits - September 14, 1984 meeting with Mr. Gary Stillberger. Air and Water Pollution Control Permits must be obtained before initiating construction. Developer must complete and submit permit application forms which can be obtained from the GEPA office in Harmon.

There are other clearances, permits and licenses required of the developer prior to initiating construction and/or operation. These requirements have been briefly outlined in Section One.

SECTION SIX

FINDINGS

It is the finding of this Environmental Assessment that the proposed facility would result in a significant environmental improvement over the present action of landfilling of MSW. Particulate emissions pose the greatest environmental concern from the proposed facility, but the planned use of a baghouse with ash removal will mitigate this potential pollution source. Planned conformance of the facility to the GEPA permit conditions will not result in any significant adverse environmental impact. Overall, when compared with the reduction in landfill environmental pollution caused by the operation of the proposed facility, a significant environmental quality improvement will be achieved by the operation of the proposed facility.

Therefore, in conformance with the requirements of the National Environmental Policy Act and the regulations governing Environmental Assessments, a finding of no significant impact (FONSI) has been made for the proposed facility, both for Alternative A and B of the proposed project as listed in Section Two of this Environmental Assessment.

Alternative A appears to be more feasible than Alternative B when considering the technical aspects of coupling into an existing steam plant of the IWPS.

RECOMMENDED REFERENCES

by Title

Beverage Container Report, Guam Environmental Protection Agency, May 1984.

City Currents, U.S. Conference of Mayors, Washington D.C., September/October 1983 and 1984 issues.

Guam Air Pollution Control Standards and Regulations, Guam Environmental Protection Agency, adopted November 18, 1971.

Guam Solid Waste Management Plan, Guam Environmental Protection Agency, December, 1981, revised May 1984.

Hotline, Consumat Systems Inc., Richmond Virginia.

Municipal Solid Waste Energy Conversion Study for Guam and American Samoa, Barrett, Harris and Associates, Inc. in association with Gibbs and Hill, Inc., Honolulu, Hawaii, March 1984.

Solid Waste Management and Resources Recovery Feasibility Study For The Territory of Guam, Dames and Moore, Honolulu, Hawaii, July 1978.

Solid Waste Management In The Territory of Guam, Harry R. Little, U.S. Department of Health, Education, and Welfare, Public Health Service, 1969.

Solid Waste Status Report, Guam Environmental Protection Agency, January 1975.

APPENDEX I

Resource Recovery Activities Report

CITY CURRENTS

CITIES AS ENERGY PRODUCERS SEPTEMBER/OCTOBER 1983

Report on Semiannual Survey: Resource Recovery Activities

This issue of *City Currents* is devoted to the "Resource Recovery Activities" report, giving the results of the semiannual survey of resource recovery projects conducted by the U.S. Conference of Mayors. This survey reports a total of 98 facilities in the United States that are operating, in shakedown, under construction or nearing construction. Five plants are reported operating in Canada.

These resource recovery facilities vary widely in size; the smallest listed processes seven tons per day (TPD), while the largest is a 3000 TPD plant. Of the facilities that are now operating or in shakedown, 40 fall into the size range of less than 500 TPD. Seven are in the medium-size category, between 500 and 1000 TPD, while 10 have design capacity of 1000 TPD or more. A breakdown according to status reveals 52 facilities operating, 5 in shakedown, 11 under construction, and 22 nearing construction stages. In addition, the report lists 90 communities that are in earlier planning stages for resource recovery projects.

The listing also includes eight facilities that have suspended operations for a variety of technical and economic reasons. About half of these facilities are expected to resume operations in the future.

In terms of processing capacity, the plants that are now operating and in shakedown have a combined design capacity of about 27,000 tons of municipal solid waste (MSW) per day. The facilities under construction and nearing construction stages will add another 31,000 TPD of design capacity. Using the EPA estimate of 150 million tons of MSW per year generated in the U.S., this combined total of 58,000 tons per day is roughly one-eighth of the estimated daily MSW generation in the United States.

The second section of Resource Recovery Activities reports on projects to recover methane-containing gas from existing landfills. This gas, which is about half methane and half carbon dioxide, can be used as-is, often to power electrical generators, or it can be cleaned to pipeline quality and used as a substitute for natural gas. Landfill gas recovery began in California about 1975; most of the projects are still located there, but the practice has begun to spread to other parts of the country in recent years. This issue reports 26 landfill gas recovery projects in the United States and one in Canada. (For more information on landfill gas recovery, see an article in the July/August issue of *City Currents*.)

This semiannual report is made possible by the continuing cooperation of the project managers, solid waste officials, equipment suppliers, systems contractors, consultants and others who respond to our inquiries. The Conference of Mayors is grateful for their cooperation. We welcome comments on Resource Recovery Activities and we invite information on any projects that may have been omitted, so that we may include them in future issues.

NEW TELEPHONE NUMBER

The Conference of Mayors is installing a new telephone system. Beginning on November 21, 1983, all calls should go through the Conference's main number: (202) 293-7330.

Until November 21, calls dealing with City Currents, resource recovery, and other programs of the Office of Development Programs should continue to use (202) 293-7520.

Tax Legislation

Senate Committee Reports Leasing Bill; House Panel Restricts Use of IDBs

On October 31, 1983, the Senate Finance Committee reported out S.2062, the Omnibus Reconciliation Act of 1983. This omnibus bill includes the provisions of S.1564, the Senate leasing bill. Sections 131-132 of the bill include restrictions of tax benefits that before were available for property used by tax-exempt entities. These provisions, by redefining the distinction between a "lease" and a "service contract," would have severely restricted traditional urban waste-to-energy development. Working with the Senate Finance staff, the U.S. Conference of Mayors and the National Resource Recovery Association devised a special rule for solid waste disposal facilities, cogeneration and alternative energy facilities, clean water projects and energy management services. The special rule will allow private firms to continue their development of these projects for public entities and to retain tax benefits that are essential for their economic feasibility.

In order for a facility to qualify as a service contract, and thereby retain tax benefits, the tax-exempt entity *cannot*:

- operate the facility;
- bear any significant financial burden if there is non-performance under the contract (other than for reasons beyond the control of the service provider);
- receive any significant financial benefit if operating costs of the facility are reduced as the result of technological changes or other effeciencies introduced by the service provider; or
- have an option to purchase, or be required to purchase, all or a port of the facility at a fixed and determinable price (other than at fair market value).

A tax-exempt entity, however, still has the right to inspect the facility, exercise its sovereign power, and to act in the event of a breach of contract. Furthermore, cities will be able to receive revenues from energy sales without jeopardizing the facilities' status under this special rule.

S.2062 was also reported out of the Budget Committee

See LEGISLATION page 20

Resource Recovery Activities

Resource Recovery Activities, a report on resource recovery facilities in the United States and Canada, is compiled twice a year by the United States Conference of Mayors and is published in *City Currents* in the March/April and September/October issues.

The report is broken into three segments: (1) facilities that are operating, under contruction or nearing construction stages to recover materials and energy from municipal solid waste; (2) projects that recover methane gas from municipal solid waste landfills; and (3) jurisdictions that report being committed to some form of resource recovery, with facilities in various planning stages. The list does not include the growing number of communities that conduct source separation programs and/or magnetically separate ferrous metals from mixed refuse.

Although every effort has been made to ensure that the report is complete and current, the status of many of the projects can change at any time. For clarification or additional information on a specific facility, we suggest that you write directly to the source given for that listing. If you are aware of any planned or operating facilities that are not listed in this report, we would welcome information for inclusion in future reports.

The Conference of Mayors is grateful for the contributions and cooperation of each project representative, as well as state and local officials and industry representatives who have helped us to compile this information.

Materials and Energy Recovery Facilities

Location and Major Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
ALABAMA						
Huntsville (Redstone Arsenal) U.S. Army; Redstone Arsenal (owner & operator); Sanders & Thomas, Inc (designer) (Mfr Kelley Co.)	Mass burning in modular incinerator	Steam for heating & process	50	3.2	In shakedown	Jimmy Stevens Resident Engineer's Office U.S. Army Corps of Engineers P.O. Box 8162 Redstone Arsenal, Ala 35808
Tuscaloosa Tuscaloosa Solid Waste Authority; Consumat Systems, Inc (designer), Almon & Associates (Mfr Consumat)	Mass burning in modular incinerator	Steam for process & heating by B.F. Goodrich Co	300	8.5	Under construction; start-up expected in 1/84	Charles Orr Almon Associates P.O. Drawer 2729 Tuscaloosa, Ala 35403
ARKANSAS						
Batesville City (Mfr Consumat)	Mass burning in modular incinerator	Steam	D-50 T-41	1.2	Operational since 5/81	Jim Shirrell, Mayor Municipal Bldg 170 S. Forth St. Batesville, Ark. 75201

*D = Design capacity, T = Actual throughput (recent average)

Location and Major Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
ARKANSAS (cont'd)						
North Little Rock City (owner); U.S. Recycle Corp.; Consumat Systems, Inc. (operator) (Mfr: Consumat)	Mass burning in modular incinerator	Steam for use by Koppers Co. (wood treating)	D-100 T-100	1.45	Operational since 9/77	Gene Green Consumat Systems, Inc P.O. Box 3457 North Little Rock, Ark 72117
Osceola City (owner); Consumat Systems, Inc. (operator) (Mfr: Consumat)	Mass burning in modular incinerator	Steam for heating & process at Crompton Osceola Co. (textile mfg)	D-50 T-48	1.2	Operational since 1/80	R.E. Prewitt, Mayor City Hall Osceola, Ark. 72370
CALIFORNIA						
Susanville Lassen Community College; Lassen County; Lahontan Alternative Energy Systems (project mgr); Koepf & Lang (designer); Bruun & Sorensen	Mass burning of municipal waste and wood chips; electricity generation	Steam & electricity for use by College; excess electricity sold to utility; excess steam sold to industry	96	4.1	Under construction; start-up expected in early 1984	Dr. Warren Sorensen President Lassen Community College P.O. Box 3000 Susanville, Calif. 96130
CONNECTICUT						
Bridgeport Conn. Resources Recovery Auth.; Occidental Petroleum Corp. and Combustion Equipment Assoc. (designer/operator); Greater Bridgeport Regional Solid Waste Commission	Shredding, air classification, magnetic separation, Eco-Fuel® II production process	Eco-Fuel® II (powdered fuel) for use in utility boiler, ferrous metals	1800	53	Plant is closed due to CEA's financial difficulties; negotiations with Occidental concluded unsuccessfully; presently in arbitration	Lynn C. Healey Executive Assistant Conn. Resources Recovery Authority 179 Allyn St. Hartford, Conn. 06103
Windham Town of Windham (Mfr: Consumat)	Mass burning in modular incinerator	Steam	D-108 T-125	4.125	Operational since Nov. 1981; steam was used by Kendall Co.; Kendall plant closed in Summer 1983; negotiations proceeding with new energy customer	Louise Guarnaccia First Selectman Town of Windham Town Office 979 Main St. Willmantic, Conn. 06226
DELAWARE						
Wilmington Delaware Solid Waste Authority (owner); EPA; Raytheon Service Co. (designer/operator)	Shredding, air classification, magnetic separation, froth flotation, other mechanical separation; aerobic digestion	RDF, ferrous & nonferrous metals; glass, humus	1,000 tpd municipal solid waste co-processed with 350 tpd of 20% solids digested sewage sludge	72.3	Construction completed; undergoing functional testing; full operation expected in 1/84	Pasquale S. Canzano Chief Engineer Delaware Solid Waste Authority P.O. Box 455 Dover, Del. 19901
FLORIDA						
Dade County (Dade County Solid Waste Resource Recovery Plant) County (owner); Parsons & Whittemore, Inc. (designer); Resources Recovery (Dade County), Inc. (subsidiary of Parsons & Whittemore) (operator)	Hydrasposal™ (wet pulping), magnetic and other mechanical separation	Electricity for sale to utility, ferrous metals, aluminum & other nonferrous metals	D-3000 T-3000	165	Operational since 1/82	Dennis Carter, Asst County Manager Room 911 Dade County Courthouse 73 W. Flagler St. Miami, Fla. 33130

Location and Major Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
FLORIDA (cont'd)						
Dade County (Banyan-Dade Resource Recovery, Ltd.) Dade County; Banyan Resource Recovery, Inc. (develop, manage, design); Banyan-Dade Resource Recovery, Ltd. (own/operate)	Phase I—materials recovery & shredding; Phase II—gasification of RDF to produce low Btu gas to fuel engine/generators (8-9 MW)	Phase I—ferrous metals, aluminum, color-sorted glass, corrugated; Phase II—electricity for sale to Fla. Power & Light Co.	750	4 (Phase I) 10 (Phase II)	Phase I operating; Phase II to be constructed in 1984	Peter M. Hodapp Chief Mech. Engr. Banyan Resource Recovery, Inc. Suite 711 7515 Greenville Ave. Dallas, Texas 75231
Lakeland City (operator and joint owner with Orlando Utility Commission); C.T. Main, Inc. (power plant designer); Horner & Shifrin, Inc. (waste processing plant designer)	Shredding, magnetic separation, burning RDF with coal	Steam to produce electricity for use by City of Lakeland and Orlando Utility Commission, ferrous metals	D-300 T-200	5 (for waste processing plant)	Operational, processing all of Lakeland's MSW (approx. 200 tpd)	Jack A. Libey Director, Power Production Dept. of Electric & Water Utilities 1000 E. Parker St. Lakeland, Fla. 33801
Mayport Naval Station U.S. Navy (owner); Southern Technologies, Inc. (operator)	Mass burning	Steam for use by base and ships	D-2 TPH T-120 tons per week (5 days)	2.3	Operational	Mike McVann Code N43 Naval Station Mayport, Fla. 32228
Orange County (Walt Disney World) U.S. Dept. of Energy, Idaho Operations Office; Reedy Creek Utilities (owner/operator); Andco, Inc.	Slagging pyrolysis incineration (Andco-Torrax)	High temperature hot water for heating and cooling at Walt Disney World	100	15	Testing completed on simulated nuclear wastes and municipal waste; not operating due to unfavorable economics	Carl P. Gertz Project Manager U.S. Dept. of Energy 550 Second St. Idaho Falls, Idaho 83401
Pinellas County County; UOP, Inc. (owner/operator)	Mass burning, mechanical separation of metals after burning	Electricity for use by Fla. Power Corp., ferrous & nonferrous metals	2000	160	Fully operational since 5/83; plans for expansion to 3000 tpd now underway, with construction scheduled for early 1984	Don F. Acenbrack Director, Solid Waste Mgmt. Dept. Pinellas County 2800 110 Ave. No. St. Petersburg, Fla. 33702
Pompano Beach Waste Management, Inc.; U.S. Dept. of Energy; Jacobs Engineering Co. (designer)	Shredding, magnetic and other mechanical separation, anaerobic digestion of light fraction with sewage sludge	Methane gas, carbon dioxide	50-100	3.65	Operational (demonstration plant)	H.T.D. Sjoberg Dir. of Resource Recovery Waste Management, Inc. 10008 N. Dale Mabry Hwy. Suite 115 Tampa, FL 33618
Tampa City (owner); Waste Management, Inc. (design/construct/operate)	Mass burning	Electricity for use by Tampa Electric Co.	1000	63.5 (1981 dollars)	Financing completed, bonds sold; construction began in 4/83 with operation expected in 1986	Richard D. Garrity Urban Environmental Coordinator City Hall Plaza 5 North Tampa, Fla. 33602
HAWAII						
Honolulu City and County of Honolulu	Firing of RDF or mass burning of MSW for generation of steam or electricity	Steam or electricity	1800	150-200	Contract negotiations underway with two proposers	Frank Doyle, Chief Div. of Refuse Collection & Disposal Dept. of Public Works City & County of Honolulu Honolulu, Hawaii 96813

Location and Major Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
IDAHO						
Bannock County County, partnership of WIDJAC Corp. and Foster & Marshall/ American Express (owner/operator) (boiler mfr: Detroit Stoker/Keeler Boiler)	Mass burning in modular water-wall incinerators	Electricity for Idaho Power Corp; steam for process use by FMC Corp.	200	10	Groundbreaking scheduled for late 1983 with startup in 1984	Orv Wilmot or Paul Warner WIDJAC Corp. 10604 N.E. 38th Place Suite 222 Kirkland, Wash. 98033
Burley Cassia County; Thermal Reduction Co. (operator) (Mfr: Consumat)	Mass burning in modular incinerator	Steam for J.R. Simplot Co. (potato processing)	D-50 T-50	1.5	Operational since 1/82	Doyle Cahoon Thermal Reduction Co., Inc. P.O. Box 548 Heyburn, Idaho 83336
ILLINOIS						
Chicago (Northwest Waste-to-Energy Facility) City; Metcalf & Eddy, Inc. (designer)	Mass burning in water-wall incinerators, ferrous recovery from ash (intermittent)	Steam for process use on-site and by Brach Candy Co., ferrous metals	D-1600 T-1250	23	Operational	Emil Nigro Coordinating Engineer Dept. of Streets & Sanitation Room 700, City Hall Chicago, Ill. 60602
Chicago (Southwest Supplementary Fuel Processing Facility) City; Ralph M. Parsons Co. and Consoer, Townsend & Assoc. (designer)	Shredding, air classification, magnetic separation	RDF for use by utility; ferrous metals	1000	19	Off-stream to review experience and evaluate future operations; decisions pending	(Same as previous listing)
IOWA						
Ames City; (owner/operator); Gibbs, Hill, Durham & Richardson, Inc. (designer)	Baling waste paper, shredding, magnetic separation, air classification, screening, other mechanical separation	RDF for use by utility, baled paper, ferrous metals and aluminum	D-200 T-180	6.3	Operational since 9/75	Arnold Chantland, Dir. Dept. of Public Works City Hall 5th and Kellog St. Ames, Iowa 50010
KENTUCKY						
Campbellsville City (owner); Consumat Systems, Inc. (builder/operator) (Mfr: Consumat)	Mass burning in modular combustion units	Steam for process use by Union Underwear Co.	100	4 (appx.)	Construction to begin in fall 1983, with start-up expected 1/85	Jim Cravens Deputy Executive Director Campbellsville Housing & Redevelopment Authority P.O. Box 459 Campbellsville, KY 42718
Knox U.S. Army (owner) (Mfr: Burnzol)	Mass burning in modular incinerator	Steam for heating & air conditioning at hospital	40	1.9	Construction completed, but modifications needed before full-scale operations can begin	Paul E. Frye, Jr. Master Planner ATZK-EH-PS Ft. Knox, Ky. 40121

Location and Major Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
UISIANA						
New Orleans City; Waste Management, Inc. (owner/operator); National Center for Resource Recovery, Inc. (designer)	Shredding, air classification, magnetic and other mechanical separation	Ferrous metals, aluminum, glass	D-770 T-650	9.1	Shredding/landfilling and ferrous recovery operational; aluminum recovery in shakedown; glass recovery discontinued	Clifford Scineaux, Dir Dept. of Sanitation City Hall New Orleans, La. 70112
MAINE						
Auburn City (owner); Consumat Systems, Inc. (operator) (Mfr: Consumat)	Mass burning in modular incinerator	Steam for heat and process at Pioneer Plastics	D-200 T-170	3.98	Operational since 4/81	Robert Belz Public Works Auburn City Hall 45 Spring St. Auburn, Maine 04210
MARYLAND						
Baltimore (Southwest Resource Recovery Facility) City; Baltimore County; Northeast Md. Waste Disposal Authority; Baltimore Refuse Energy Systems Co. (a Signal RESCO partnership) (owner/operator/designer)	Mass burning in waterwall furnace, electricity generation, ferrous recovery from ash	Electricity for sale to Baltimore Gas & Electric Co; ferrous metals	2010	185 (including escalation during construction period)	Construction (demolition of pyrolysis plant) began 11/82; revenue bonds sold 1/83; operation expected 4/85	Michael Gagliardo Northeast Maryland Waste Disposal Authority Redwood Center Suite 503 131 E. Redwood St. Baltimore, Md. 21202
Baltimore County County; Maryland Environmental Service; Teledyne National (designer/operator)	Shredding, magnetic and other mechanical separations	RDF, ferrous metals, glass	D-1200 T-850	11.0	Operational; recovering ferrous metals and glass, producing shredded RDF; All products marketed	Kenneth Cramer Teledyne National Padonia Centre, Ste. 401 30 E. Padonia Rd. Timonium, Md. 21093
MASSACHUSETTS						
Braintree City (owner/operator); Camp, Dresser & McKee Inc. (designer)	Mass burning in waterwall furnace	Steam (half of steam produced used by Art & Leather Co.)	D-240 T-180	2.8	Operational; currently running one boiler while making modifications to the other	Paul Jenner, Gen. Mgr. Braintree Thermal Waste Reduction Center Ivory Street Braintree, Mass. 02184
East Bridgewater City of Brockton and nearby towns; Combustion Equipment Assoc. (designer); PCN Enterprises (owner)	Shredding; air classification; magnetic separation; other mechanical separation and production of Eco-Fuel® II	Eco-Fuel® II for industrial boiler; ferrous metals	300 tpd being landfilled, with excess trucked to other landfills	10-12	Plant has been sold by CEA to PCN Enterprises; currently operated as a landfill, but may be reactivated into a resource recovery facility	M.G. Magoulas Corp. Vice Pres., Engineering Combustion Equipment Assoc. 136 East 57th St. New York, N.Y. 10022
Haverhill & Lawrence Refuse Fuels (owner); BE&C Engineers, Inc. (Boeing subsidiary) (design & construction); Cities of Haverhill & Lawrence & other communities in service area	Shredding, magnetic separation, trommel screening at recovery facility in Haverhill; burning RDF for cogeneration of steam and electricity in Lawrence	Steam and electricity for industrial use; surplus electricity sold to utility	1300	99.5	Under construction; operations scheduled for late 1984	James E. Ricci, Vice Pres. Refuse Fuels, Inc. P.O. Box 187 Bradford, Mass. 01830

Location and Major Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
MASSACHUSETTS (cont'd)						
North Andover Signal RESCO; Roy F. Weston; Mass. Bureau of Solid Waste Disposal, Dept. of Environmental Affairs; participating communities	Mass burning in water-wall furnace, electricity generation	Electricity for sale to utility	1500	196	Under construction	John F. Albis Project Mgr 128 Main St North Andover Mass 01845
Pittsfield City, Vicon Recovery Assoc.; (owner/operator/designer)	Mass burning in modular incinerator	Steam for process & heating by Crane & Co.	D-240 T-240	10.8	Operational since 3/81	Joseph J. Domas, Jr., Pres. Vicon Recovery Assoc. P.O. Box 100, Butler Center Butler, N.J. 07405
Rochester Town and several nearby communities; Energy Answers Corp. (owner); Smith & Mahoney, P.C., and Gordon L. Sutin Assoc. (designers)	Shredding, magnetic separation, burning PRF in semi-suspension stoker-grate boiler, nonferrous recovery from ash, generation of electricity	Electricity for sale to Commonwealth Electric; ferrous and nonferrous metals	1500	136	Contracts for waste being signed; financing being arranged; construction expected to begin in 1984	Dr. George M. Mallan President Energy Answers Corp. 1 Steuben Place Albany, N.Y. 12207
Saugus Thirteen communities including Saugus and part of northern Boston; RESCO (owner/operator)	Mass burning in water-wall furnaces, magnetic separation	Steam for electrical generation and industrial use, ferrous metals	D-1500 T-1200	50	Operational	John M. Kehoe, Jr. Signal RESCO Liberty Lane Hampton, N.H. 03842
MICHIGAN						
Detroit City; Combustion Engineering, Inc.	Flail milling, trommel screening, secondary shredding, burning RDF in on-site dedicated boilers, electricity generation in 47 Mw turbo-generator	Steam for Detroit Edison's central heating system; electricity for sale to Detroit Edison; ferrous metals	3000	150	Negotiating with Combustion Engineering prior to contract signing; tax counsel review and permit applications in process; preparing a revenue bond issue with equity participation to finance the facility	Michael Brinker Dept. of Public Works City of Detroit City-County Bldg., Rm. 513 Detroit, Mich. 48226
MINNESOTA						
Collegeville St. John's University; Basic Environmental Engineering (designer) (Mfr: Basic)	Mass burning in modular incinerator	Steam for heating, electricity generation & other uses by university	D-58 T-55	2.4	Operational since 11/81	Rev. Gordon Tavis St. John's University Collegeville, Minn. 56321
Duluth Western Lake Superior Sanitary District (owner/operator); Consoer, Townsend & Assoc. (designer)	Shredding, magnetic separation, air classification, secondary shredding, fluidized bed incineration of RDF and sludge	RDF, ferrous metals, steam for heating and cooling of plant and to run process equipment	400 of MSW, 340 of 20% solids sewage sludge	19	Refuse processing facility temporarily shut down due to explosion in 7/82; other fuels being used to incinerate sludge and produce steam	John Klaers Western Lake Superior Sanitary Dist. 27th Ave. West & The Waterfront Duluth, Minn. 55806
Red Wing City (owner/operator); Henningson, Durham & Richardson (designer) (Mfr: Consumat)	Mass burning in modular incinerator	Steam for S.B. Foot Tanning Co.	72	2.5	Operational since 9/82	Dean Massett Council Administrator Box 34 Red Wing, Minn. 55066

Location and Major Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
NEW JERSEY						
Essex County Essex County; Newark, Port Authority of NY & NJ; Browning-Ferris Industries	Mass burning for electricity generation	Electricity for sale to utility	2250	200	Negotiating contracts with BFI; construction scheduled for spring 1984 with start-up in spring 1987 will include intermediate processing facility on-site for source separated materials	Stephen S. Passage Resource Recovery Manager Port Authority of NY & NJ 62 South 1 World Trade Center New York, N.Y. 10048
Ft. Dix U.S. Army; Sanders & Thomas, Inc. (consulting engineer)	Mass burning in modular incinerator	Steam for heating on base	80	6	Design completed; project on hold; decision on whether to proceed expected within several months	Rene Santiago U.S. Army Corps of Engineers New York District 26 Federal Plaza New York, N.Y. 10007 Attn: NANEN-ME
NEW YORK						
Albany City (owner) and 13 nearby communities; Smith & Mahoney (designer); Aenco, Inc. (processing plant operator); N.Y. State (steam plant owner/operator)	Processing plant; shredding, magnetic separation; steam plant: burning PRF in stoker-grate boiler; ash processing center: ferrous, nonferrous & aggregate recovery from boiler ash	Processed refuse fuel (PRF), steam for heating and cooling state offices, ferrous & nonferrous metals, boiler aggregate	D—750 tons per shift T—750 tons per shift	28.2 (11.6 processing plant; 15 steam plant, 1.6 ash processing center)	Operational	Patrick Mahoney Smith & Mahoney, P.C. 79 N. Pearl St. Albany, N.Y. 12207
Cuba (Cattaraugus County Refuse-to-Energy Facility) Cattaraugus County (owner); Barton & Loguidice, P.C. (designer) (Mfr: R.W. Taylor Steel Co.)	Mass burning in modular incinerator	Steam for process at Cuba Cheese Co.	D-112 T-120	5.5	Operational since 2/83	William White Refuse Administrator Cattaraugus County 289 Center St. Salamanca, N.Y. 14779
Dutchess County County (owner); Pennsylvania Engineering Corp. (design/build/operate)	Mass burning in O'Connor rotary combustor for generation of steam and electricity; ferrous metals recovery	Steam for sale to IBM Corp.; electricity to utility; ferrous metals	400	30	Revenue bonds to be sold in fall 1983, construction expected to begin in late 1983 with operation in 1985	Robert J. Vrana Commissioner of Solid Waste Management Dutchess County 22 Market St Poughkeepsie, N.Y. 12601
Glen Cove City (owner); William F. Cosulich and Ernest F.W. Frank (designer)	Mass burning in stoker-fired furnace with centrifuged sewage sludge	Electricity for sewage treatment plant and incinerator; excess to Long Island Lighting Co.	250	34 (22 for mass burning unit; 12 for sewage plant)	Operational since 8/83	Joseph P. Hurley Dir. of Public Works City Hall Bridge St. Glen Cove, N.Y. 11542
Hempstead Town; Hempstead Resources Recovery Corp. (subsidiary of Parsons & Whittemore, Inc.) (owner/operator)	Hydrasposal™ (wet pulping), magnetic and other separation, burning of RDF in air-swept spout spreader stoker boilers	Electricity from utility-owned turbine generators, color-sorted glass, aluminum, ferrous metals	2000 (11,000 tons/week)	130	Temporarily shut down by joint agreement between Town and HRRC until EPA establishes uniform standards or guidelines for testing of dioxins	James L. McGiffin General Manager Hempstead Resources Recovery Corp P.O. Box 5010 Roosevelt Field Station Garden City East, N.Y. 11530

Location and Type Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
W YORK (cont'd)						
Monroe County County (owner); Raytheon service Co. (designer/operator); CH2M Hill (owner's representative)	Shredding, air classification, froth flotation, magnetic and other separation	RDF for use by utility as supplemental boiler fuel, ferrous metals, nonferrous metals, glass	D-2000 T-400	62.2	Recovery facility in shakedown; RDF receiving/storage facility complete, test-burning RDF	Howard Christensen Director Dept. of Solid Waste 110 Colfax St. Rochester, N.Y. 14606
Niagara Falls Hooker Energy Corp. (Occidental Chemical Corp.) (owner/operator)	Shredding, air classification, magnetic separation, burning shredded refuse	Steam for use by chemical plant; electricity sold to power company grid; ferrous metals	D-2000 T-1500	100+	Operational	Gary F. Blasius Plant Manager Hooker Chemical Co. P.O. Box 344 Niagara Falls, N.Y. 14302
New York (Betts Avenue Incinerator) City	Mass burning in refractory furnace	Steam for heating and processes in-plant and adjacent City garages	1000 (present throughput 500)	5-waste heat boiler (1965); 24-modifications (1980)	Electrostatic precipitator being installed and other modifications being made; expect to resume 1000 tpd operation upon completion in 1983	Paul Gregory Planner Dept. of Sanitation Office of Resource Recovery 51 Chambers St., Rm. 830 New York, N.Y. 10007
Oceanside Township of Hempstead (owner/operator); Charles R. Velzy (designer)	Mass burning in water-wall furnace	Steam (60,000 lbs./hr.) used in-plant for electricity	D-750 T-450	9	Operational	Al Albanese Supt., Sanitation Township of Hempstead 1600 Merrick Rd. Merrick, N.Y. 11566
Oneida County County (owner/operator) (Mfr: R.W. Taylor Steel Co.)	Mass burning in modular combustion units	Steam for heating, hot water & other use by Griffis Air Force Base	200	11	Under construction; operation expected in mid-1984	Robert F. Hasemeier Deputy Commissioner Oneida County Dept. of Public Works Div. of Solid Waste Mgmt. 800 Park Ave., 9th Flr. Utica, NY 13501
Onondaga County Onondaga County Resource Recovery Agency (owner); UOP, Inc. (designer/builder/operator)	Mass burning, ferrous metals recovery	Electricity for Niagara Mohawk Power Corp.; ferrous metals	1400	101	In final contract negotiations; bond sale anticipated in Fall 1983; construction expected to begin in Spring 1984	William O. Thomas Director Onondaga County Resource Recovery Project 1100 Civic Center 421 Montgomery St. Syracuse, N.Y. 13202
Oyster Bay Town of Oyster Bay Industrial Development Agency; Blount, Inc./Blount-Fichtner, Inc. (designer/operator); Lockwood, Kessler & Bartlett, Inc. (consultant)	Mass burning, electricity generation	Electricity for Long Island Lighting Co.	1000	N/A	Contract negotiations under way; construction expected to begin in 1984 with operation in 1987	Karl J. Leupold Chairman Town of Oyster Bay Industrial Development Agency 150 Miller Place Syosset, N.Y. 11791
Washington County County; Vicon Recovery Systems (design, own, operate) (Mfr: Enercon)	Mass burning in modular incinerator, cogeneration of steam and electricity	Steam for industrial use; electricity for sale to utility	240	11	Negotiating steam purchase agreement; construction expected to begin in 1984	Robert Page Planning Director Washington County County Office Bldg. Fort Edward, N.Y. 12828
Westchester County (Peekskill) County & 35 municipalities; Signal RESCO (owner/operator)	Mass burning in water-wall furnace, electricity generation, ferrous metal recovery from ash	Electricity for Consolidated Edison Co., ferrous metals	2250	179	Construction began 4/82; start-up scheduled for 4/84 with commercial operation 7/84	Edward K. Davies Deputy Commissioner, Solid Waste Mgmt Rm. 522, County Office Bldg. White Plains, N.Y. 10601

Location and Major Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
NORTH CAROLINA						
New Hanover County New Hanover County (owner); Clark-Keith Co.; Charles R. Velzy Assoc. (designer); George Campbell Assoc.	Mass burning in water-wall boilers; cogeneration of steam and electricity	Steam for use by W.R Grace Co (agrochemical mfr); electricity for sale to Carolina Power & Light	200	13 (approx)	Under construction, start-up expected in Fall 1984	Ed Hilton Director Engineering & Facilities New Hanover County 320 Chestnut St., Room 601 Wilmington, N.C. 28401
NORTH DAKOTA						
Williston City; WIDJAC Corp.	Mass burning; cogeneration of steam & electricity	Steam for process use by Hardy Salt; electricity for sale to utility	100	4.5	Awaiting final energy contracts; groundbreaking expected in 1983	Orv Wilmot Managing Director WIDJAC Corp. 10604 N.E. 38th Place Suite 222 Kirkland, Wash. 98033
OHIO						
Akron City; (owner); Tricil Resources, Inc. (operator) B&W	Shredding, magnetic separation, burning RDF in semi-suspension stoker-grate boiler	Steam for urban and industrial heating and cooling, ferrous metals, hot water for residential and commercial heating	D-1000 T-900	80	Modifications and performance test successfully completed in 12/82; plant is certified and fully operational; steam and hot water being generated by burning refuse	Dave Chapman 203 Municipal Bldg. 166 South High St. Akron, Ohio 44308
Columbus City (owner/operator); Alden E. Stilson Assoc. (designer)	Shredding, magnetic separation, burning of shredded refuse with supplemental coal in semi-suspension stoker-grate boiler to produce steam and generate electricity	Electricity for city customers	2000 (3000 peak)	175	Under construction; operation expected in Fall 1983	Henry A. Bell, P.E. Superintendent Div. of Electricity City of Columbus 90 W. Broad St. Columbus, Ohio 43215
OKLAHOMA						
Miami City; (owner); Consumat Systems, Inc. (operator); Resource Recovery Systems	Mass burning in modular incinerator	Steam for industrial use by B.F. Goodrich Co.	D-108 T-72	3.14	Operational since 11/82	Steve Solomon Resource Recovery Systems 6440 Avondale Dr. Suite 201 Oklahoma City, Okla. 73116
Oklahoma City City; CMI Energy Conversion Systems (owner/operator/designer)	Phase I—shredding, ferrous & nonferrous metals separation; thermal reduction (burning in rotary drum furnace) and electricity generation Phase II—anerobic digestion of organic msw & sewage	Electricity & methane gas for sale to Okla. Gas & Electric Co.; ferrous & nonferrous metals	5600 tons per week (Phases I & II)	29	Phase I startup testing completed; continuous operation expected to begin in late 1983; preparing for construction of Phase II	Chester Brooks CMI Energy Conversion Systems, Inc. 2525 Northwest Expressway Suite 108 Oklahoma City, Okla 73112

Location and Major Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
OKLAHOMA (cont'd)						
Tulsa Tulsa Authority for the Recovery of Energy; Steam Supply Corp., subsidiary of Alternate Energy Systems, Inc. (owner); Midwesco, Inc. (designer & contractor)	Mass burning, cogeneration of steam and electricity	Steam for sale to Tulsa Refining, Inc., electricity for sale to Public Service Co. of Okla	690	44	Construction expected to begin in late 1983 with operation in late 1985	Lester M. McCright Alternate Energy Systems, Inc 4425 East 31st St Suite J Tulsa, Okla 74135
OREGON						
Lane County County (owner); Allis-Chalmers Corp. (designer); Western Waste Corp. (operator)	Shredding, air classification, magnetic separation	RDF, ferrous metals	500	2.1	Making preparations for demolition of plant and sale of equipment; decision not to operate based on lack of funds to develop facility and poor market conditions	Mike Turner Administrative Assistant Lane County Public Service Div. Public Works Dept. 125 East 8th Ave. Eugene, Ore. 97401
Marion County County; Trans Energy Systems, Inc. (owner/operator/designer)	Mass burning in water-wall furnaces, magnetic separation from ash	Electricity for local utility, ferrous metals	550	40 (1985)	Contracts signed between County and Trans Energy, and utility and Trans Energy; construction expected to begin in early 1984 with operation in late 1986	Randall Franke Board of Commissioners Marion County Courthouse Salem, Ore. 97301
PENNSYLVANIA						
Erie City; Pa. Dept. of Env. Resources; O'Brien & Gere (designer)	Shredding, mechanical separation, air classification, densification of RDF	Densified RDF for use as fuel by local industry, ferrous metals, glass	150	3.7	Negotiating with 3 potential contractors to construct, own & operate a waste-to-energy plant	Wasinder S. Mokha, P.E. City Engineer City of Erie 626 State St. Erie, Pa. 16501
Harrisburg City (owner/operator); Gannett, Fleming, Corddry and Carpenter, Inc. (designer)	Mass burning of MSW and sewage sludge in waterwall furnace, bulky waste shredding (steam driven), magnetic separation	Steam for utility-owned district heating system and for city-owned sludge drying system, ferrous metals	D-720 T-520	8.3	Operational; sludge drying facility in test	Paul W. Bricker Gannett, Fleming, Corddry and Carpenter, Inc P.O. Box 1963 Harrisburg, Pa. 17105
RHODE ISLAND						
Johnston R.I. Solid Waste Mgmt. Corp.; Blount Energy Resources Corp. (designer, contractor, owner, operator)	Mass burning for generation of electricity	Electricity for sale to utility	1500	100	Central Landfill site in Johnston selected; municipal contract negotiations underway; construction expected to begin in spring 1984	Deborah Herz Public Information Officer R.I. Solid Waste Mgmt. Corp. 39 Pike St. Providence, R.I. 02903
SOUTH CAROLINA						
Johnsonville (Wellman Energy Plant) Wellman Industries (owner/operator); Williamsburg and Georgetown Counties (Mfr: Consumat)	Mass burning in modular incinerator	Steam for process use by Wellman Industries	D-50 T-50	2.5	Operational since 11/81; 60% of waste burned is MSW, remainder is in-plant industrial waste	William Miles Wellman Industries, Inc. P.O. Box 186 Johnsonville, S.C 29555

Location and Major Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
TENNESSEE						
Dyersburg City (owner/operator); Colonial Rubber Works, Inc. (Mfr: Consumat)	Mass burning in modular incinerator	Steam for process & heat at Colonial Rubber Works	D-100 T-82	2	Operational since 9/80	Alderman Bob Kirk Colonial Rubber Works, Inc Dyersburg, Tenn 38024
Gallatin Resource Authority in Sumner County (County & Cities of Gallatin and Hendersonville) (owner/operator)	Mass burning in water-wall rotary combustor for cogeneration of steam & electricity	Steam for industrial processing and electricity for sale to TVA	200	10	Operational since 12/81	Jerry H. Metcalf Project Manager P.O. Box 967 Gallatin, Tenn. 37066
Lewisburg City (Mfr: CICO)	Mass burning in modular incinerator	Steam for industrial use by Heil-Quaker Corp.	D-60 T-35-40	1.75	Operational since 1980	John D. Lambert City Manager 505 Ellington Pkwy. Route 1 Lewisburg, Tenn. 37091
Nashville Nashville Thermal Transfer Corp. (owner/operator); I.C. Thomasson & Assoc., Inc. (designer)	Mass burning in water-wall incinerator	Steam and chilled water for urban heating and cooling	D-720 T-400	24.5	Operational since 1974; expansion to be completed in late 1985, increasing design capacity to 1120	James T. Hestle General Manager Nashville Thermal Transfer Corp. 110 First Ave. South Nashville, Tenn. 37201
TEXAS						
Gatesville (Texas Dept. of Corrections) Texas Dept. of Corrections (Mfr: Consumat)	Mass burning in modular incinerator	Steam for kitchen & laundry	D-7 T-7	2	Operational	R.E. Howell Chief, Bldg. & Eng. Mgmt. Construction Div. Texas Dept. of Corrections P.O. Box 99 Huntsville, Texas 77340
Palestine (Beto Unit, Texas Dept. of Corrections) Texas Dept. of Corrections (Mfr: Consumat)	Mass burning in modular incinerator	Steam for kitchen & laundry	D-28 T-28	.3	Operational	(same as Gatesville, Texas)
Waxahachie City (owner/operator); Synergy Systems Corp. (Mfr: Synergy Systems)	Mass burning in modular incinerator	Steam for industrial use by International Aluminum Extruders	D-60	2.2	Operational since 7/82; selling only about 10% of steam produced due to low demand by customer	Bob Sokoll City Manager P.O. Box 757 Waxahachie, Texas 75165
VERMONT						
Burlington City (owner/operator); University of Vermont; Medical Center Hospital of Vermont; William F. Cosulich Assoc. (consulting engineer)	Mass burning, ferrous recovery from ash	Steam for district heating at U. of Vt. & Medical Center Hospital; ferrous metal	120	11.5	Project on hold, undergoing review	James R. Ogden Supt. of Streets P.O. Box 849 Burlington, Vt. 05402
Rutland Rutland County Solid Waste District; Vicon Recovery Systems (full-service contractor) (Mfr: Enercon)	Mass burning in modular incinerator	Electricity	240	11	Contracts signed; construction to begin in near future, with startup expected in 11/84	Jonathan Gibson District Manager Rutland County Solid Waste District P.O. Box 965 Rutland, Vt. 05701

Location and Major Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
IRGINIA						
Hampton City (operator); U.S. Government (owner); NASA Langley Research Center; U.S. Air Force at Langley Field; J.M. Kenith Co. (designer/builder)	Mass burning in water-wall furnace	Steam for use by NASA Langley Research Center	D-200 T-200	10 3	Operational since 9/80	Frank H. Miller, Jr Dir. of Public Works Hampton, Va 23669
Harrisonburg City (owner & operator); William F. Cosulich Assoc. (consulting engineer)	Mass burning	Steam for heating & cooling at James Madison Univ.	100	8	Operational since 12/82	John E. Driver Asst. City Manager Municipal Bldg. 345 S. Main St. Harrisonburg, Va. 22801
Newport News (Ft. Eustis) U.S. Army (Mfr: Consumat)	Mass burning in modular incinerator	Steam for heating, hot water & cooking	D-40 T-30+	1.7	Operational since 12/80	John Roth Deputy Director of Engineering & Housing DEH Bldg. 1407 Ft. Eustis, Va. 23604
Norfolk (Norfolk Naval Station) U.S. Navy (owner); Public Works Center, Norfolk Naval Station (operator)	Mass burning in water-wall furnace	Steam for use by facilities at Norfolk Naval Station	360 (two 180-tpd boilers operated alternately)	2.2 (1967)	Operational	Commanding Officer Navy Public Works Center Attn: Director of Utilities Norfolk, Va. 23511
Petersburg United Bio-Fuel Industries, Inc. (owner); Teledyne National (designer); Raphael Katzen Assoc.; Foster Wheeler Synfuels Corp.	Phase I—shredding, magnetic and other separation, burning of RDF for 25 MW electricity generation; Phase II—ethanol production from corn, 20 million gal/yr, or possibly 50 tpd cellulose-alcohol R&D facility; Phase III—ethanol production using licensed process of enzymatic hydrolysis of cellulose to alcohol, 37.5 million gal/yr	Phase I—ferrous and nonferrous metals, glass, electricity for sale to utility, steam for in-plant use; Phase II & III—ethanol, CO_2, dried grain supplement (DGS), distiller's dried grain supplement (DDGS)	2000 (peak) 1350 initial	100 (Phase I) 135 (Phase II) 136 (Phase III)	Preliminary design completed; groundbreaking expected in late 1983 with start-up 22 months later for Phase I	Francis B. Richerson V.P. of Engineering United Bio-Fuel Industries, Inc. P.O. Box 1312 Richmond, Va. 23210
Portsmouth (Norfolk Naval Shipyard) U.S. Navy (owner); Public Works Dept., Norfolk Naval Shipyard (operator)	Mass burning in water-wall furnace	Steam for use by facilities at Naval Shipyard	160 (two 80-tpd boilers, operated alternately)	4.5	Operational	Commander Norfolk Naval Shipyard Attn: Public Works Officer Portsmouth, Va. 23709
Portsmouth (Southeastern Tidewater Energy Project) Southeastern Public Service Authority of Va.; Henningson, Durham & Richardson (architect/engineer); Norfolk Naval Shipyard	Shredding, air classification, magnetic and other separation	RDF for burning in new RDF/coal-augmented power plant to be built at Naval Shipyard, providing steam and electricity for Shipyard and ships; ferrous and nonferrous metals	2000	70	Contracts in approval process; operation projected for late 1987	Durwood S. Curling Executive Director Southeastern Tidewater Energy Project 16 Koger Executive Center, Suite 129 Norfolk, Va. 23502

Location and Major Participants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
VIRGINIA (cont'd)						
Richmond Henrico County; Henrico Resource Development Partners (owner/operator)	Trommel screening, shredding in a pressure vessel, magnetic separation, hand-picking aluminum & glass	RDF burned with coal at local manufacturing plants; ferrous metals, aluminum, glass	400	2.1	Temporarily shut down for equipment change	G. Carl Mahler, Jr General Partner Henrico Resource Development Partners 9019 Forest Hill Ave Richmond, VA 23235
Salem City (Mfr: Consumat)	Mass burning in modular incinerator	Steam	100	1.9	Operational	William Paxton, Jr. City Manager P.O. Box 869 Salem, Va. 24153
WASHINGTON						
Tacoma City (owner/operator); Boeing Engineering (designer)	Shredding, air classification, magnetic separation	RDF, ferrous metals	500	2.5	Operational; running periodically to produce RDF for test burning	Bill Larson, Proj. Mgr. Refuse Utility 740 St. Helens Ave. Rm. 332 Tacoma, Wash. 98402
WISCONSIN						
Madison City (owner/operator); City & M.L. Smith Environmental (designer)	Shredding, magnetic separation, trommel screening, secondary shredding	RDF burned with coal at Madison Gas & Electric Co. for electricity generation; RDF burned with coal at Oscar Mayer Foods Corp. for steam production; ferrous metals	D-400 T-250	2.5	Refuse processing & burning at Madison Gas & Electric operational since 1/79; Oscar Mayer installation operational since 6/83	Robert Vetter Div. of Engineering Rm. 115, City-County Bldg. Madison, Wis. 53709
Waukesha City (owner/operator); Donohue & Assoc. (incinerator designer); Sanders & Thomas, Inc. (heat recovery system designer)	Mass burning in refractory furnace	Steam for local industry and sewage treatment plant	D-175 T-140	Incinerator .7 (1971) Heat recovery system 3.9 (1979)	Incinerator operating since 1971; waste heat recovery boiler added in 1979; operating and sending steam to local industry and sewage plant	Rodney Vanden Noven Dir. of Public Works 201 Delafield St. Waukesha, Wis. 53186
CANADA						
ONTARIO						
Hamilton Regional Municipality of Hamilton-Wentworth (owner); Tricil Ltd. (operator); C.L. Sutin & Assoc. (designer)	Shredding, magnetic separation, semi-suspension burning in dedicated spreader stoker boilers	Electricity for Ontario Hydro, steam for in-plant use, ferrous metal	D-500 T-450	9† (1972)	Operational since 1972; 4.0 MW turbine generator added and operating since 11/82	Joseph Kennedy Director, Resource Recovery Programs Tricil Ltd. 89 Queensway West, Mississauga, Ontario L5B 2V2
Toronto Ontario Ministry of the Environment (owner); Browning-Ferris Industries (operator); Kilborn Ltd. (designer) (Mfr: Consumat)	Shredding, air classification, secondary shredding, screening, mass burning in modular incinerator with heat recovery, ferrous cleaning; also transfer operation	Ferrous metal, RDF, compost; hot water for plant heating	Resource recovery—220; transfer facility—600	15†	Operational since 3/77	Neal R. Ahlberg Supervisor Ontario Centre for Resource Recovery 35 Vanley Crescent Downsview, Ontario M3J 2B7

cation and ior ticipants	Processes	Products & Uses	Capacity* (tons per day)	Capital Costs ($ millions)	Status	Source
INCE EDWARD LAND						
ndale nce Edward Island ergy Corp. (owner); cil Ltd. esigner/operator)	Mass burning in modular incinerator	Steam for heating/cooling at hospital complex	108	8.2†	Operational since 2/83	(Same as Hamilton, Ontario)
JEBEC						
ontreal ty (owner/operator); ominion Bridge-Sulzer,	Mass burning in water-wall furnaces	Steam used by City offices & facilities and private customers	1200	14.7†(1967)	Operational since 1970; 18 industrial and commercial customers served by 7 mile pipeline; electrostatic precipitator being changed for more efficient ones, cyclones added	Michel Jodoin Superintendent Solid Waste Disposal Division City of Montreal 1266 Des Carrieres Montreal, Quebec H2S 2A8
uébec uebec Urban Community (owner); Montenay, Inc. operator); Dominion Bridge-Sulzer, Inc.	Mass burning in water-wall furnace	Steam, used for industrial process by paper mill	1000	25† (1974)	Operational since 1974	Michel Roux Centre de Récupération Communauté Urbaine de Québec 900 rue Industrelle Québec, Québec G1J 3V9

†Canadian dollars.

Methane Recovery from Landfills

Location and Major Participants	Output or Gas Produced; Million ft³/day	Captial Costs ($ millions)	Status	Source
CALIFORNIA				
Azusa Azusa Land Reclamation Co. (wholly owned subsidary of the Southwestern Portland Cement Co.)	Low Btu gas; 1.7	N/A	Operational	F.T. Sheets III Azusa Land Reclamation Co. 1201 W. Gladstone St. Azusa, Calif. 91702
Brea (Olinda Landfill) Getty Synthetic Fuels, Inc.; Orange County	Gas to power 5300 KW generator; electricity sold to So. Cal. Edison	N/A	Operation scheduled for late 1984	William R. Taylor Getty Synthetic Fuels, Inc. 2750 Signal Parkway Signal Hill, Calif. 90806
Carson Watson Biogas Systems; SCS Engineers, Inc.	Medium Btu gas to power generators, producing electricity for sale to So. Cal. Edison (1.7 Mw)	N/A	Collection system complete; operations expected in Oct. 1984	Joseph V. Seruto, Pres. Watson Biogas Systems 22010 S. Wilmington Ave. Suite 207 Carson, Calif. 90745

Location and Major Participants	Output or Gas Produced, Million ft³/day	Capital Costs ($ millions)	Status	Source
CALIFORNIA (cont'd)				
Corona Watson Biogas Systems; Lockman and Assoc.	Medium Btu gas to power generators, producing electricity for sale to utility (5 Mw)	N/A	Contracts signed with City and southern Calif. Edison; operation expected in March 1985	(Same as Carson, Calif.)
City of Industry (Industry Hills Convention Center City; National Engineering Co.	Medium Btu gas for boiler fuel at Industry Hills Convention Center; .5 (approx.)	.60	Operational since 2/81	Bryan A. Stirrat National Engineering Co. 255 N. Hacienda Blvd. Industry, Calif. 91744
Duarte Watson Biogas Systems; Lockman and Assoc.	Medium Btu gas to power generators, producing electricity for sale to utility (2.3 Mw).	N/A	Operational	(Same as Carson, Calif.)
Los Angeles (Bradley East Landfill) Genstar Gas Recovery Systems, Inc.	Medium Btu gas used as supplemental fuel in steam generating plant by L.A. Dept. of Water & power; 3.0.	N/A	Operational since 9/80	Kenneth Wuest Genstar Gas Recovery Systems, Inc. 177 Bovet Rd., Suite 550 San Mateo, Calif. 94420
Martinez Getty Synthetic Fuels, Inc.; Acme Fill Corp.; Contra Costa County Sanitation District	Medium Btu gas used as industrial fuel by Contra Costa Sanitation District; 2.0	N/A	Operational since 4/82	(Same as Brea, Calif.)
Menlo Park Genstar Gas Recovery Systems, Inc.	Phase I—Medium Btu gas used as fuel for motor generators; electricity sold to utility (1.0 MW) Phase II—1.0 MW addition to above project	N/A	Phase I—operational since 12/82 Phase II—Operation expected in 8/83	Same as Los Angeles, Calif.
Monterey Park Getty Synthetic Fuels, Inc.; Operating Industries, Inc.; Southern California Gas Co.	High Btu gas for sale to So. Cal. Gas Co.; 4.0	N/A	Operational since 8/79	(Same as Brea, Calif.)
Mountain View City of Mountain View; EPA; Pacific Gas & Electric Co.; Dept. of Energy	High Btu gas; 0.5	.85	Demonstration plant; currently operating and producing 0.3 MMSCFD of treated gas with a HHV of 850-950 Btu/SCF; expansion of system and modernization of plant underway, will boost capacity to 1.0 MMSCFD	Max Blanchet Pacific Gas & Electric Co. 245 Market St. San Francisco, Calif. 94106
Palos Verdes Getty Synthetic Fuels, Inc.; Los Angeles County Sanitation Dist.; Southern California Gas Co.	High Btu Gas for sale to So. Cal. Gas Co.; 1.0	N/A	Operational since 1975	(Same as Brea, Calif.)
San Fernando Getty Synthetic Fuels, Inc.; Browning-Ferris Industries; Newhall Refinery	Medium Btu gas used by Newhall Refinery; 1.1	N/A	Operational since 11/81	(Same as Brea, Calif.)
San Jose Genstar Gas Recovery Systems, Inc.; Browning-Ferris Industries	Medium Btu gas used as fuel for motor generator; electricity sold to utility (2.0 MW)	N/A	Operation expected 10/83	Same as Los Angeles, Calif.
San Leandro Getty Synthetic Fuels, Inc.; Oakland Scavenger Co.; Domtar Gypsum America	Medium Btu gas used by Domtar Gypsum America; 3.0	N/A	Operational since 7/81	(Same as Brea, Calif.)
Santa Clara County Genstar Gas Recovery Systems, Inc.; Guadalupe Rubbish Disposal Co.	Medium Btu gas used as fuel for motor generators; electricity sold to utility (1.5 MW)	N/A	Operation expected 10/83	(Same as Los Angeles, Calif.)

...cation and ...or ...rticipants	Output or Gas Produced, Million ft³/day	Captial Costs ($ millions)	Status	Source
...LIFORNIA (cont'd)				
...n Valley (Sheldon-Arleta Landfill Gas Recovery Project) ...ty of Los Angeles Departments of ...ublic Works and Water & Power	Low Btu gas used as fuel by L.A. Dept. of Water & Power; 1.5	2.5	Operational	Mike Miller Senior Sanitary Engineer L.A. Bureau of Sanitation Room 1410, City Hall East Los Angeles, Calif. 90012
...Wilmington ...Watson Biogas Systems; SCS Engineers, Inc.	2.5	N/A	Operational	(Same as Carson, Calif.)
ILLINOIS				
Blue Island City; Getty Synthetic Fuels, Inc.; Clark Oil & Refining Corp.	Medium Btu gas used by Clark Oil; 4.0	N/A	Operation scheduled for 12/83	(Same as Brea, Calif.)
Calumet City Getty Synthetic Fuels, Inc.; Waste Management, Inc.; Natural Gas Pipeline Co. of America	High Btu gas for sale to local utility; 2.5	N/A	Operational since 12/80	(Same as Brea, Calif.)
MICHIGAN				
Riverview Watson Biogas Systems; SCS Engineers	Medium Btu gas for sale to industrial user; 2.5	N/A	Contracts with city signed; applications for construction permits submitted; user negotiations proceeding	(Same as Carson, Calif.)
NEW JERSEY				
Cinnaminson Sanitary Landfill (Div. of Waste Management, Inc.); Public Service Electric & Gas Co.; Hoeganaes Corp.	Medium Btu gas (570 Btu/SCF); 0.75 (Used in-plant by Hoeganaes Corp.)	N/A	Operational since 8/79; modifications planned to improve service reliability, gas quality and quantity	Jim Pardus Public Service Electric & Gas Co. of N.J. 80 Park Plaza T-16A Newark, N.J. 07101
NEW YORK				
Staten Island (Fresh Kills Landfill) Getty Synthetic Fuels, Inc./Methane Development Corp.; City of New York; Brooklyn Union Gas Co.	High Btu gas for sale to Brooklyn Union Gas Co.; 5.0	N/A	Operational since 7/82	(Sames as Brea, Calif.)
NORTH CAROLINA				
Winston-Salem City	Medium Btu gas used as supplemental fuel in dual-fuel diesel engine to generate electricity for sewage treatment plant	Less than $25,000 for wells and pipeline	Operational since 9/81	Lee Byerly Supervisor Archie Elledge Wastewater Treatment Plant 2801 Griffith Rd. Winston-Salem, N.C. 27103
OREGON				
Oregon City Rossman's Landfill (owner); CH2M Hill (engineers)	Raw landfill gas (400 Btu/cf); 2.6	.5 (collection system only)	Collection system completed; negotiating with potential users for the recovered gas	Jack W. Parker President Rossman's Landfill, Inc. 1101 17th St. Oregon City, Ore. 97045

Location and Prior Participants	Output or Gas Produced; Million ft³/day	Capital Costs ($ millions)	Status	Source
VERMONT				
Brattleboro New England Alternate Fuels	Gas to power generators (300 KW); electricity sold to Central Vermont Public Service	0.365	Operational since 8/82, adding more generating capacity	Louis Audette New England Alternate Fuels P.O. Box 921 Brattleboro, Vt. 05301
CANADA				
Kitchener, Ontario Regional Municipality of Waterloo (owner); Bestpipe, Div. of Lake Ontario Cement Ltd.; Federal Government of Canada; Province of Ontario	Medium Btu gas (approx. 39 MM ft³/year) for use as boiler fuel by Bestpipe	.53	Phase I complete but not operating continuously due to poor gas production from landfill site; Phase II construction in doubt	John Pawley Director of Engineering Operations Regional Municipality of Waterloo Marsland Centre Waterloo, Ontario N2J 4G7

Planned Resource Recovery Facilities

ALASKA
- Sitka

CALIFORNIA
- Alameda
- Berkeley
- City of Commerce
- Fresno
- Eureka
- Gardena
- Long Beach
- Los Angeles
- Richmond
- San Diego
- San Francisco
- San Leandro
- Selma
- Stockton
- Tri-Cities (Fremont, Union City, Newark)
- Ukiah
- Ventura County
- Wilmington

CONNECTICUT
- Hartford
- Naugatuck
- New Brittan
- New Haven
- North Haven
- Norwalk
- Southbury
- Wallingford
- Waterbury

FLORIDA
- Boca Raton
- Broward County
- Escambia County
- Hillsborough County

GEORGIA
- Savannah

INDIANA
- Indianapolis
- Valparaiso

KENTUCKY
- Middlesboro

MAINE
- Bangor/Brewer
- Bath-Brunswick Area
- Biddeford/Saco
- Lewiston
- Portland
- Rockland/Rockport
- Waterville/Winslow

MARYLAND
- Harford County

MASSACHUSETTS
- Boston
- Fitchburg
- Franklin County
- Kingston
- Millbury
- Plainville (128 West)
- Springfield

MICHIGAN
- Flint
- Grand Rapids
- Menominee
- Muskegon

MINNESOTA
- Ramsey & Washington Counties

MISSISSIPPI
- Pascagoula

MISSOURI
- Kansas City
- St. Louis

MONTANA
- Laurel

NEBRASKA
- Lincoln

NEW HAMPSHIRE
- Nashua

NEW JERSEY
- Camden County
- East Brunswick
- Middlesex County
- Ocean County
- Union County

NEW YORK
- Babylon
- Broome County
- New York
- North Hempstead
- Oswego County
- St. Lawrence County

NORTH CAROLINA
- Burke County

OHIO
- Cleveland
- Montgomery County

PENNSYLVANIA
- Philadelphia

PUERTO RICO
- Caguas
- San Juan

TENNESSEE
- Chattanooga

TEXAS
- Cleburne
- Lubbock

UTAH
- Davis County

VIRGINIA
- Galax
- Hopewell
- James City County
- Richmond

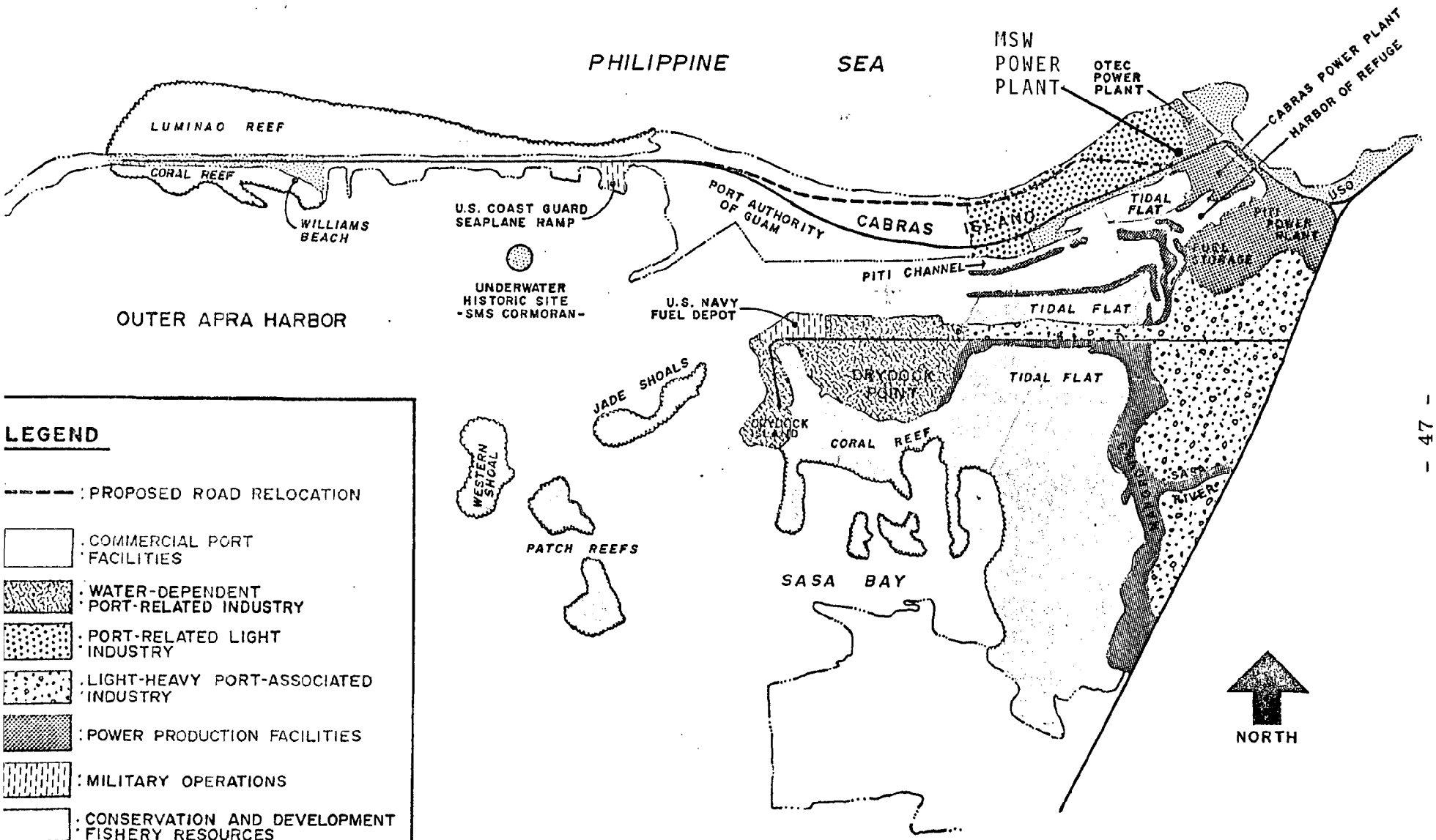
WASHINGTON
- Bellingham
- Sequim
- Spokane

APPENDIX II

Cabras Island Map

OPTIMAL LAND-USE PLAN FOR CABRAS ISLAND AND SURROUNDING AREAS

Map no. 4



LEGEND

- PROPOSED ROAD RELOCATION
- COMMERCIAL PORT FACILITIES
- WATER-DEPENDENT PORT-RELATED INDUSTRY
- PORT-RELATED LIGHT INDUSTRY
- LIGHT-HEAVY PORT-ASSOCIATED INDUSTRY
- POWER PRODUCTION FACILITIES
- MILITARY OPERATIONS
- CONSERVATION AND DEVELOPMENT FISHERY RESOURCES
- RECREATION
- CONSERVATION OF WETLANDS

APPENDIX III

GEPA Air Pollution Control Standards

CONTROL OF PARTICULATE EMISSION FROM INCINERATOR: DESIGN AND OPERATION

9.1 This regulation applies to any incinerator used to dispose of refuse by burning or the processing of salvageable material by burning. Nothwithstanding definitions in other regulations, as used in this regulation, the word "refuse" includes garbage, rubbish, trade wastes, leaves, salvageable material and agricultural wastes. the word "incinerator", as used in this regulation, includes incinerators, and other devices, structures, or contrivances used to burn refuse or to process refuse by burning.

9.2 No person shall cause or permit to be emitted into the open air from any incinerator, particulate matter in the exhaust gases to exceed 0.20 pounds per 100 pounds of refuse burned.

9.3 Emission tests shall be conducted at maximum burning capacity of the incinerator.

9.4 The burning capacity of an incinerator shall be the manufacturer's or designer's guaranteed maximum rate of such other rate as may be determined by the Administrator in accordance with good engineering practices. In case of conflict, the determination made by the Administrator shall govern.

9.5 For the purposes of this regulation, the total of the capacities of all furnaces within one system shall be considered as the incinerator capacity.

9.6 No residential or commercial single-chamber incinerator shall be used for the burning of refuse for a period in excess of eighteen (18) months after the adopted date of this regulation.

9.7 All new incinerators and all existing incinerators within eighteen (18) months after adopted date of this regulation shall be multiple-chamber incinerators, provided that the Administrat may approve any other type of incinerator if it is demonstrated such design provides equivalent performance.

9.8 Incinerators shall be designed and operated in such manner as is necessary to prevent the emission of objectionable odors.

9.9 No person shall burn or cause or permit the burning of refuse in any installation which was designated for the sole purpose of burning fuel.

CHAPTER FIFTEEN

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES

15.1 General

(a) The Environmental Protection Agency Regulations on Standards of Performance for New Stationary Sources (40 CFR, Part 60) designated in Part 15.2 are incorporated by reference as they exist on the date of adoption and promulgation by the Board into those Regulations as amended by the word or phrase substitutions given in Part 15.3. References for specific documents containing the complete text of subject regulations are given in Appendix A.

(b) In the event any conflict between the Regulations contained in this Chapter and Regulations contained in other chapters, the Regulations of Chapter 15 will take precedence for standards of performance for new stationary sources, unless the existing Regulations are more stringent.

(c) DEFINITION - For purposes of this Chapter, the definitions listed in Section 60.2 Subpart A, Part 60, Title 40 of the Code of Federal Regulations will apply.

15.2 Designated Standards of Performance.

15.2.1 Subpart D - Fossil-Fuel Fired Steam Generators (units of more than 250 million BTU per hour heat input).

15.2.2 Subpart E - Incinerators (units of more than fifty (50) tons per day charging rate).

15.2.3 Subpart F - Portland Cement Plants (kiln, clinker cooler, raw mill system, finish mill system, raw mill dryer, raw material storage, conveyor transfer points, bagging and bulk loading and unloading systems).

15.2.4 Subpart G - Nitiric Acid Plants (nitric acid product units).

15.2.5 Subpart H - Sulfuric Acid Plants (sulfuric acid production units).

15.2.6 Subpart I - Asphalt Concrete Plants (dryers, systems for screening, handling, storing, and weighing hot aggregate, systems for loading, transferring, and storing mineral filler; systems for mixing asphalt concrete; and the loading, transfer and storage systems associated with emission control systems).

15.2.7 Subpart J - Petroleum Refineries (fluid catalytic cracking unit catalyst regenerators, fluid catalytic cracking unit incinerator waste heat boilers and fuel gas combustion devices).

15.2.8 Subpart K - STORAGE - Storage vessels for Petroleum Liquids (storage vessels with a capacity greater than 40,000 gallons).

15.2.9 Subpart L - Secondary Lead Smelters (pot furnaces of more than 550 pounds charging capacity, blast (cupola) furnaces and reverberatory furnaces).

15.2.10 Subpart M - Secondary Brass and Bronze Ingot Production Plants (reverberatory and electric furnaces of 2,205 pounds or greater production capacity and blast (cupola) furnaces of 550 pounds per hour or greater production capacity).

15.2.11 Subpart N - Iron and Steel Plants (basic oxygen process furnace).

15.2.12 Subpart) - Sewage Treatment Plants (incinerators which burn the sewage produced by municipal sewage treatment facilities).

15.2.13 Subpart P - Primary Copper Smelters (dryer, roaster, smelting furnace, and copper converter).

15.2.14 Subpart Q - Primary Zinc Smelters (roaster and sintering

AMBIENT AIR QUALITY STANDARDS

2.1 The following air quality standards are the desirable levels of ambient air quality for the Territory of Guam. Based on present knowledge, these levels are not expected to produce health hazards or impairment, injury to agricultural crops and livestock, damage to or deterioration of property, and hazards to air and ground transportation, or in any manner, interfere with the protection of the public welfare.

2.2 AMBIENT AIR QUALITY STANDARDS*

Pollutant	Level not to exceed	****Remarks
Sulfur oxides	60 micrograms/m^3 (0.02 ppm)	a
	**365 micrograms/m^3 (0.12 ppm)	b
	1,300 micrograms/m^3 (0.5 ppm)	e
	650 micrograms/m^3 (0.25 ppm)	g
Particulate matter	60 micrograms/m^3	c
	150 micrograms/m^3	b
	***360 micrograms/m^3	d
Carbon monoxide	10 milligrams/m^3 (9 ppm)	d
	40 milligrams/m^3 (35 ppm)	e
Photochemical oxidants	160 micrograms/m^3 (0.08 ppm)	e
Hydrocarbons	160 micrograms/m^3 (0.24 ppm)	f
Nitrogen oxides	100 micrograms/m^3 (0.05 ppm)	a

*These standards are the same as the existing National Secondary Ambient Air Quality Standards except as otherwise noted.

**National Primary Standard

***Extrapolated Standard from 150 ug/m^3 (b)

****REMARKS

a Annual arithmetic mean

b Maximum 24-hour concentration not to be exceeded more than once a year

c Annual geometric mean

d Maximum 8-hour concentration not to be exceeded more than once a year

e Maximum 1-hour concentration not to be exceeded more than once a year

f Maximum 3-hour concentration not to be exceeded more than once a year

g Maximum 4-hour concentration not to be exceeded more than once a year

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