DEIS: HAZARDOUS WASTE TREATMENT FACILITY

DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE PROPOSED
ADVANCED TECHNOLOGY INCINERATION, INC.
HAZARDOUS WASTE TREATMENT FACILITY

Submitted by

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INTRODUCTION

The management of hazardous wastes has become the environmental issue of the 1980s. The Environmental Protection Agency has made two key decisions for the management of hazardous waste:

1. Landfills will no longer be used for the disposal of hazardous waste.

2. Incineration is the preferred treatment method for organic wastes that cannot be eliminated through source reduction or recycling.

The Environmental Protection Agency did not anticipate the "Not In My Back Yard" syndrome, which has emerged as the primary response to the siting of hazardous waste treatment facilities. The result of the "Not in My Back Yard" syndrome is a gridlock situation for hazardous waste management. Although 80% of all hazardous waste continues to be disposed of in landfills, no significant progress is being made to develop treatment capability to accommodate the elimination of land disposal capability.

The current hazardous waste disposal cost of $500 to $750 per barrel is an incentive for the illegal disposal of hazardous waste. Because of the Federal land disposal ban, Hawaii may soon find itself in the position of being unable to dispose of hazardous waste at any price. In addition, the ocean transport of Hawaii's hazardous waste presents the potential for catastrophic environmental damage, such as the recent Prince William Sound crude oil spill.

The evidence of improper hazardous waste management is manifested in the degradation of Hawaii's water supply, which is presently contaminated with a number of carcinogens, such as chloroform and carbon tetrachloride.

Incineration is a highly developed technology for the treatment of organic hazardous waste. The capability of hazardous waste incinerators to destroy more than 99.99% of the hazardous waste treated has been demonstrated in more than 100 test burns and trial burns.

Numerous Health Risk Assessments have demonstrated that the health risks associated with incinerator emissions are comparable to common activities such as a single chest X-ray, driving a car 300 miles, flying 1,000 miles in an airplane, drinking 30 diet sodas, or eating 40 tablespoons of peanut butter in a lifetime.

Because of the unstable hazardous waste management situation on the mainland, the appropriateness of incineration as a hazardous waste treatment technology, and the insignificant health risk associated with the operation of a hazardous waste incineration facility; Advanced Technology Incineration, Inc. proposes the operation of a hazardous waste incineration facility in Hawaii.

This Environmental Impact Study will evaluate the potential environmental impacts of a proposed hazardous waste treatment facility. The proposed project location will be the Campbell Industrial Park. The Environmental Impact Study will address all potential environmental impacts, and will place special emphasis on analyzing the potential health risks associated with the proposed project.

Advanced Technology Incineration, Inc. looks forward to the opportunity to address any issues raised in the review of the Draft Environmental Impact Statement.

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List of Acronyms and Abbreviations

ADI	Allowable Daily Intake
ATI	Advanced Technology Incineration, Inc.
BACT	Best Available Control Technology
B(a)P	Benzo(a)Pyrene
$Ca(OH)_2$	Calcium Hydroxide
CaCl2	Calcium Chloride
CFR	Code of Federal Regulations
CO	Carbon Monoxide
cu m	Cubic Meter
dBA	Decibel, A Weighting
DOH	State of Hawaii Department of Health
DRE	Destruction and Removal Efficiency
DREP	Particulate Destruction and Removal Efficiency
EADI	Estimated Allowable Daily Intake
EEL	Environmental Exposure Limit
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
F	Degrees Farenheit
GI	Gastrointestinal
GLC	Ground Level Concentration
H_2O	Water
HCl	Hydrogen Chloride
HRA	Health Risk Assessment
in	Inch

List of Acronyms (Continued)

ISC	Industrial Source Complex Dispersion Model
ISCST	Industrial Source Complex Short Term Dispersion Model
N	Nitrogen
NH_3	Ammonia
NO_2	Nitrogen Dioxide
NSR	New Source Rule
OHC	Organic Hazardous Constituent
OHW	Organic Hazardous Waste
PAH	Polynuclear Aromatic Hydrocarbon
PIC	Product of Incomplete Combustion
POHC	Primary Organic Hazardous Constituent
PSD	Prevention of Serious Deterioration Rule
SO_2	Sulfur Dioxide
SPL	Sound Pressure Level
TCDD	Chlorinated Dioxins and Dibenzofuran Equivalent
TWI-3000	3,000 Ton Per Year Hazardous Waste Incinerator
ug	Microgram
W.C.	Water Column

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CHAPTER I: INTRODUCTION

1. PROJECT DESCRIPTION

"The management of chemical hazardous wastes has become the central environmental issue of the 1980s. Both the large number of abandoned waste sites on the U.S. Environmental Protection Agency's Superfund list and the cost of their cleanup are stark reminders of the consequence of inadequate hazardous waste management practices. Recent estimates indicate that in excess of 246 million metric tons of hazardous waste were generated in 1981 alone. It is clear that the significance of the hazardous waste problem can be attributed to both continuously increasing estimates of current waste generation and the inadequate processing strategies of past generations" (Cundy, 1986).

At the present time, hazardous waste generated in Hawaii is collected, transferred to bulk containers, and shipped to disposal or treatment facilities on the mainland. Because Federal Law will eliminate the land disposal of hazardous waste in 1991, and because of serious siting problems for hazardous waste treatment facilities due to the "Not in My Back Yard" syndrome, hazardous waste treatment facilities are not and will not be available to deal with the 80% of the total hazardous waste that is currently disposed of in landfills.

Because of the Federal restrictions on the use of landfills for the disposal of hazardous waste, Hawaii may eventually find itself unable to dispose of hazardous waste at any price. This situation is environmentally unacceptable, and could lead to serious hazardous waste management problems.

Incineration is the only technology available for the treatment of concentrated organic hazardous waste (Griffin, 1988). Incineration is a proven technology that has consistently demonstrated high performance and safe operation (Doucet, 1987). The emissions from hazardous waste incinerators are not significantly different from the combustion of fossil fuels (Lee, 1989). In many cases, the concentration of carcinogens in the stack gas from a hazardous waste incinerator is lower than the concentration of carcinogens in the air used to incinerate the hazardous waste (Lee, 1987).

The health risk associated with the operation of a properly designed and operated hazardous waste incinerator has repeatedly been demonstrated to be insignificant (Doucet, 1987). The risk of cancer for a person exposed to the maximum possible dose of emissions from a hazardous waste incinerator is less than 1 in 1,000,000, which is comparable to the risk associated with a single chest X-ray or driving a car 300 miles (Wilson, 1979).

Because of the relatively large volume of hazardous waste generated in Hawaii, the lack of reliable of hazardous waste treatment capability on the mainland, the suitability of incineration as an organic hazardous waste treatment technology, and the insignificant health risk associated with a properly designed and operated hazardous waste incinerator; Advanced Technology Incineration, Inc. (ATI) proposes the operation of a small scale hazardous waste incinerator to address the organic hazardous waste treatment needs for the state of Hawaii.

The proposed incinerator, the TWI-3000, will be located at Campbell Industrial Park. The proposed site will be located more than two miles away from the closest residence, school, or hospital. The proposed incinerator will use the Best Available Control Technology (BACT) to treat liquid organic hazardous waste in accordance with all United States Environmental Protection Agency (EPA) and State of Hawaii Department of Health (DOH) regulations. The proposed incinerator will be used to treat a maximum of two barrels of hazardous waste per hour.

2. ENVIRONMENTAL IMPACT STATEMENT METHODOLOGY

The purposes of the ATI Environmental Impact Statement (EIS) are presented below:

- To present the need for the proposed project.
- To present the hazardous waste treatment design and operating procedures that have been proposed for the project.
- To describe any potential environmental impacts which may be associated with the proposed project and the means which will be employed to reduce of eliminate any negative effects.
- To evaluate alternatives to the proposed project.
- To report citizen and public agency comments received during the planning phase and review of the Draft EIS.

The EIS is a public disclosure document written to describe the potential environmental effects of the proposed project and the measures that will be employed to reduce or eliminate negative effects. The proposed hazardous waste incineration facility could potentially produce environmental impacts in the following areas:

Topography
Geology
Surface Water
Groundwater
Climate
Air Resources
Biological Resources
Visual Access
Odor
Litter
Vectors
Public Health
Noise
Vibration
Traffic
Land Use Planning
Related Projects
Food Processing Facilities
Community Growth
Demography
Public Utilities
Community Services
Historical Resources
Setbacks

Wherever possible, the EIS contains quantitative estimates of the impact, particularly in the area of projected health risks. Mitigation measures have been incorporated into the design and operation of the proposed facility to reduce or eliminate negative environmental impacts.

The environmental setting for the proposed project is presented in Section II. A description of the proposed project is presented in Section III. An analysis of the projected environmental impacts of the proposed project is presented in Chapter IV. Alternatives to the proposed project are presented in Chapter V. The EIS Summary is presented in Chapter V, including mitigation measures for the proposed project, the relationship between short term uses of man's environment and the enhancement of long term productivity, and significant irreversible environmental changes which would be involved with the proposed project. The EIS bibliography and references cited are presented in Chapter VI. Chapter VII will be used to present responses to comments on the Draft EIS.

CHAPTER II: ENVIRONMENTAL SETTING

1. INTRODUCTION

The following criteria were used to identify a site for the proposed project:

- o The site should be located on land zoned for heavy industrial use.
- o The site should be located more than two miles from the closest sensitive receptor, such as a residence, school, or hospital.
- o The site should be located to minimize the impact of stack emissions upon potentially exposed individuals.

After a process of evaluating locations that meet the site selection criteria, the Campbell Industrial Park was selected as the most appropriate site for the proposed facility.

The proposed project will be located at the end of Kaomi Loop. A topographic map of the surrounding area is presented in Figure I-1. The site is located at Barbers Point, and is isolated from schools, residences, and hospitals. The topography of the surrounding area is virtually flat. No surface bodies of drinking water are located within two miles of the proposed facility.

A map of the adjoining properties is presented in Figure I-2. The parcels to the north, east, and south of the proposed project are undeveloped industrial lots. The Pacific Ocean is located to the west of the proposed site. The closest business to the proposed site is Unitek Environmental Services, which is presently used to store and transfer hazardous waste. The Hawaiian Cement Plant is located to the southwest of the proposed site, with its associated significant noise and dust impacts.

A 100-year floodplain map of the area is presented in Figure I-3. The proposed hazardous waste storage tanks and containment vessel will not be located in the 100-year floodplain, as presented in Figure I-4, the detailed topographic map.

A soils map of the surrounding area is presented in Figure I-5. The proposed site will be located on a stable coral plain, and is not projected to be exposed to significant seismic activity. Honolulu is not a political jurisdiction that is required to evaluate potential seismic activity as required in 40 CFR 264.

The proposed hazardous waste treatment facility is presented in Figure I-6. No hazardous waste will be stored, handled, or treated within 50' of the boundaries of the proposed site. The site will be surrounded with an 8' chain link fence topped with barbed wire and clearly marked with warning signs. The hazardous waste treatment facilities and equipment are presented in detail in Chapter III.

A thorough investigation of the site did not reveal any archeological formations or endangered plant or animal species.

A photograph of the proposed site is presented in Figure I-7.

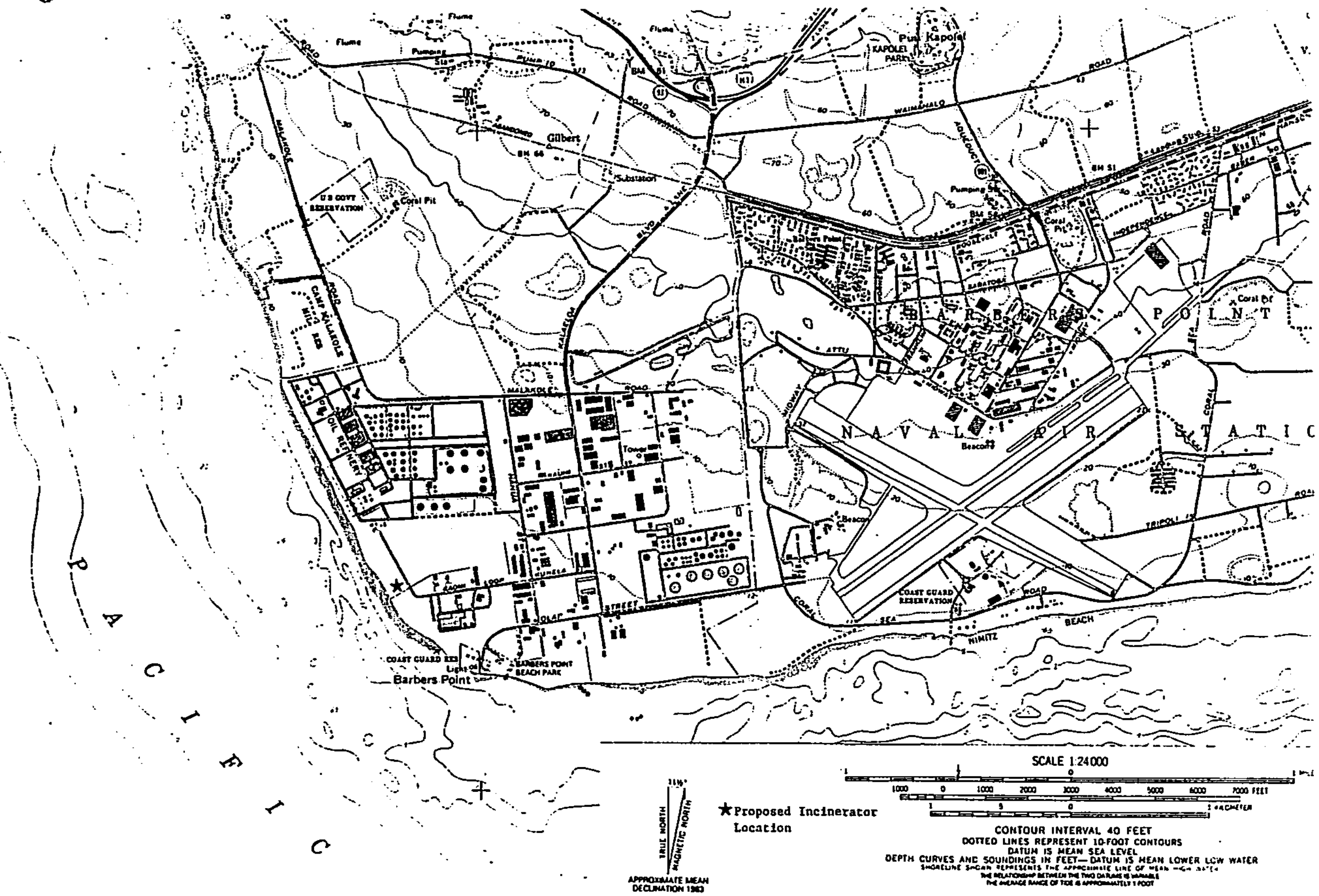
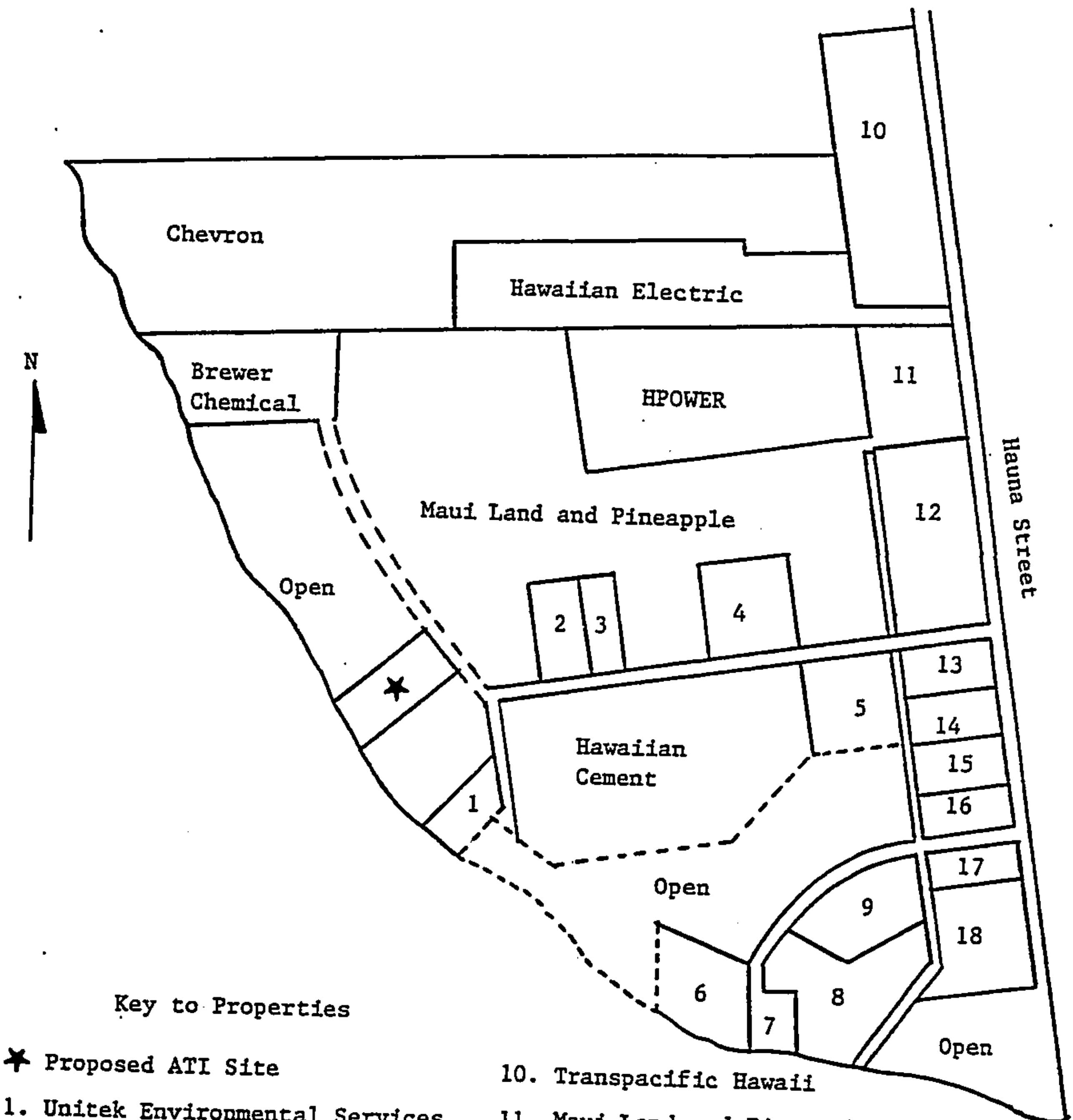


Figure II-1 USGS Topographic Map

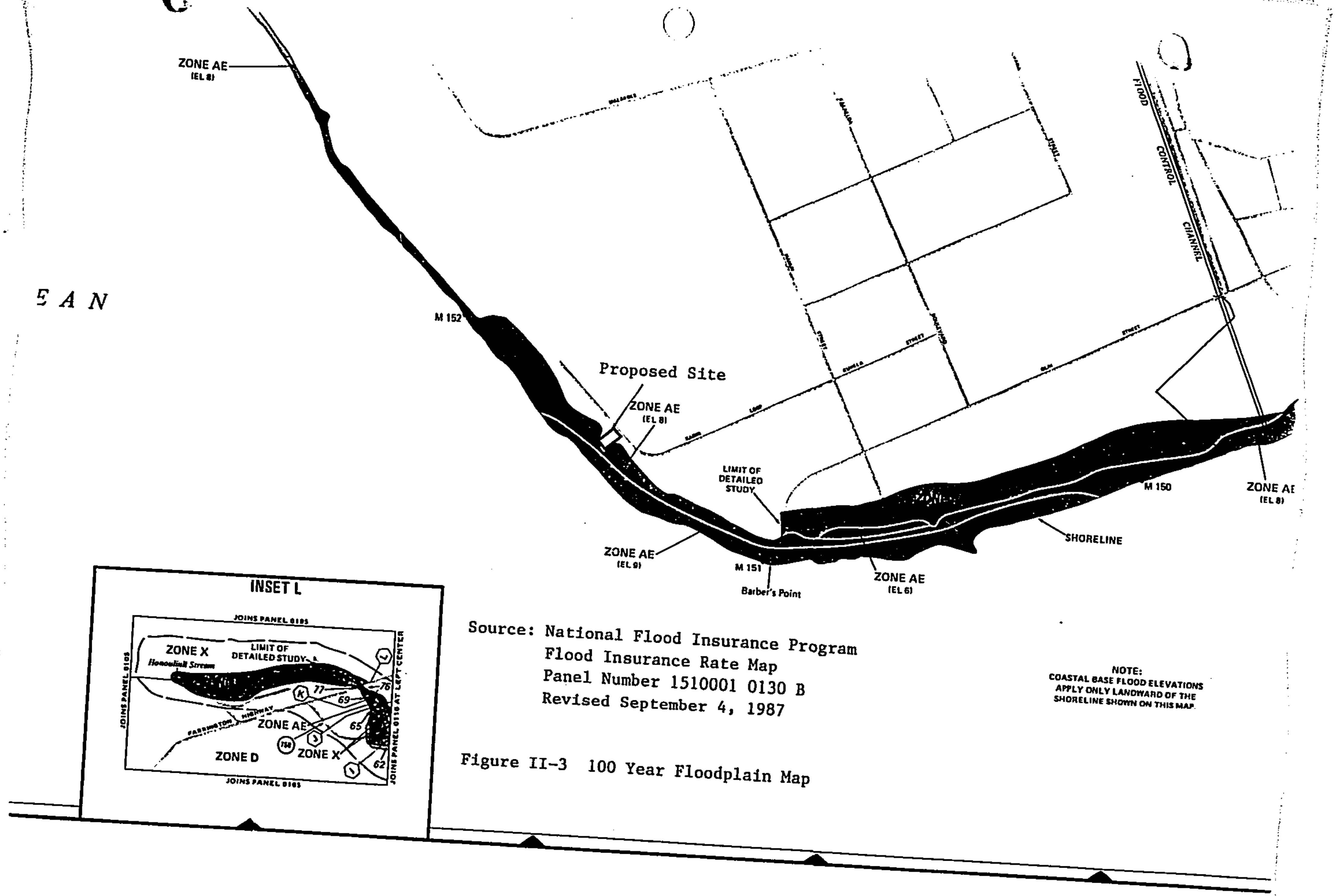


Key to Properties

✱ Proposed ATI Site

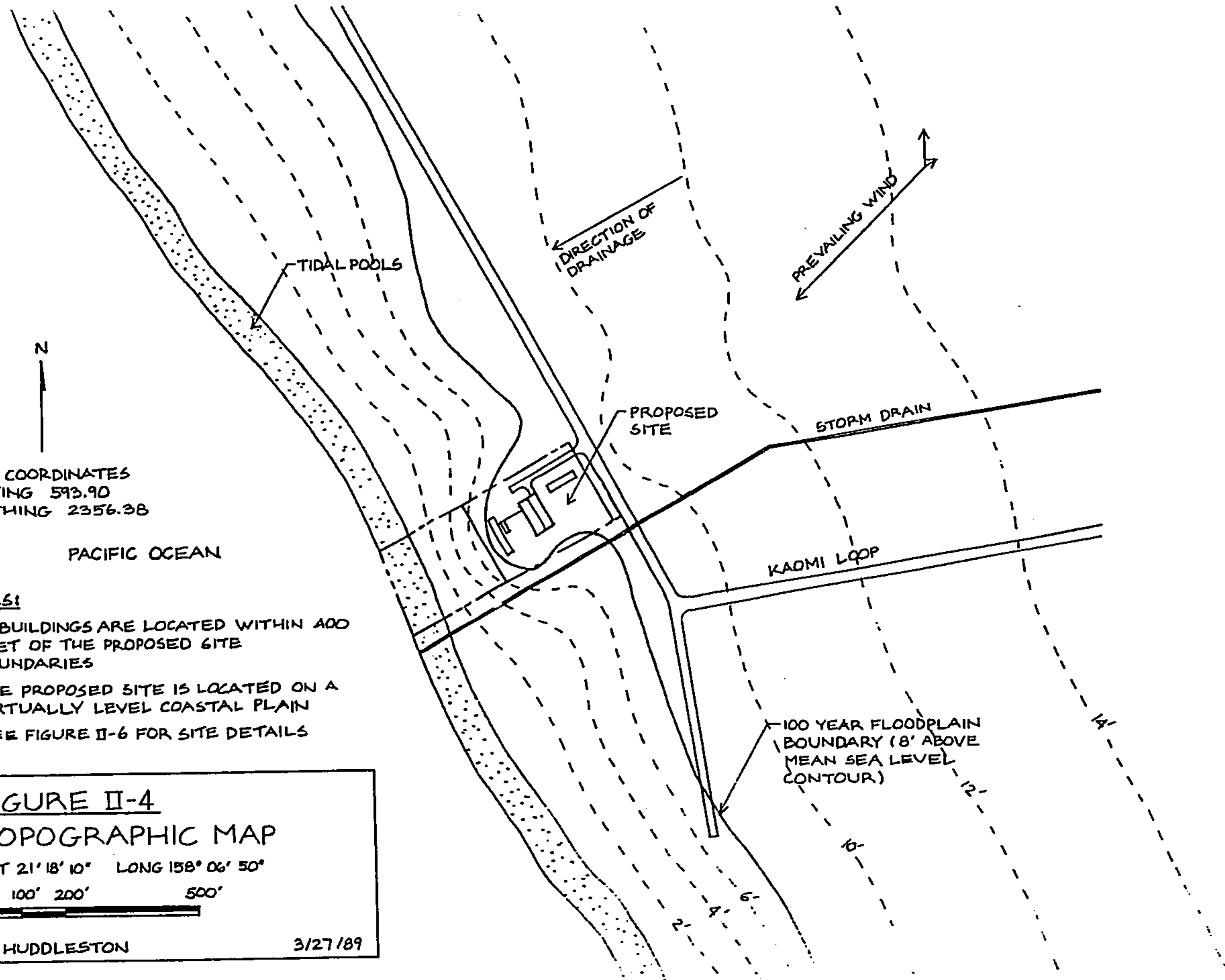
1. Unitek Environmental Services
2. Pacific Allied Products
3. Gaspro
4. HonoMach
5. Hawaii Concrete Products
6. Barbers's Pint Lighthouse
7. Germaine's Luau
8. Barber's Point Beach Park
9. Open
10. Transpacific Hawaii
11. Maui Land and Pineapple
12. Hawaii Western Steel
13. Mero Investments (Multi-tenant)
14. Arnon Adar (Multi-tenant)
15. Kamakani Services
16. Kamakani Services
17. C&F Machinery
18. Flynn-Lerner

Figure II-2 Map of Adjacent Properties



Source: National Flood Insurance Program
Flood Insurance Rate Map
Panel Number 1510001 0130 B
Revised September 4, 1987

Figure II-3 100 Year Floodplain Map



N

UTM COORDINATES
EASTING 593.90
NORTHING 2356.38

PACIFIC OCEAN

NOTES:

1. NO BUILDINGS ARE LOCATED WITHIN 400 FEET OF THE PROPOSED SITE BOUNDARIES
2. THE PROPOSED SITE IS LOCATED ON A VIRTUALLY LEVEL COASTAL PLAIN
3. SEE FIGURE II-6 FOR SITE DETAILS

FIGURE II-4
TOPOGRAPHIC MAP
LAT 21° 18' 10" LONG 158° 06' 50"
0 100' 200' 500'
B. HUDDLESTON 3/27/89

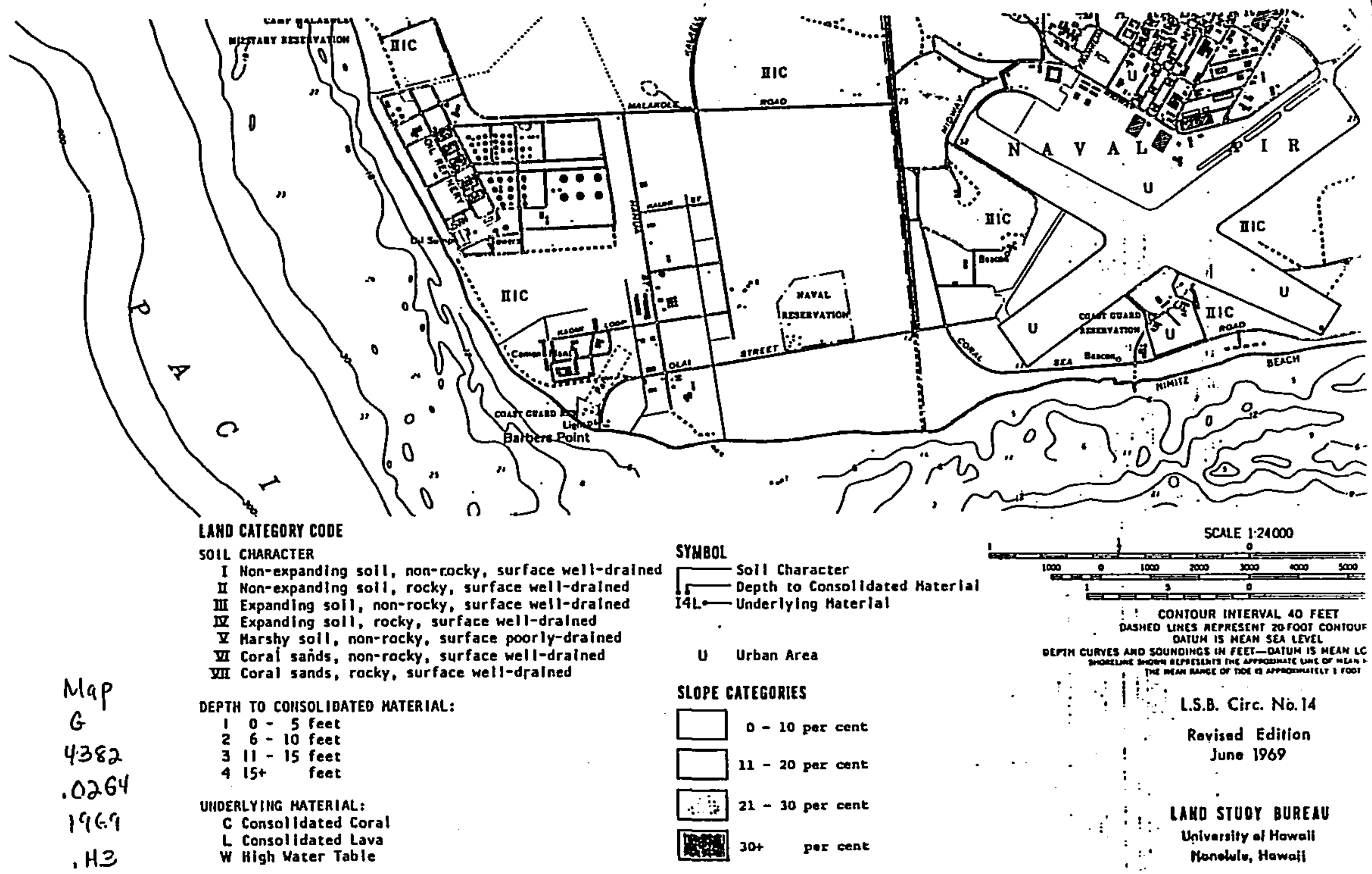


Figure II-5 Campbell Industrial Park Soil Map

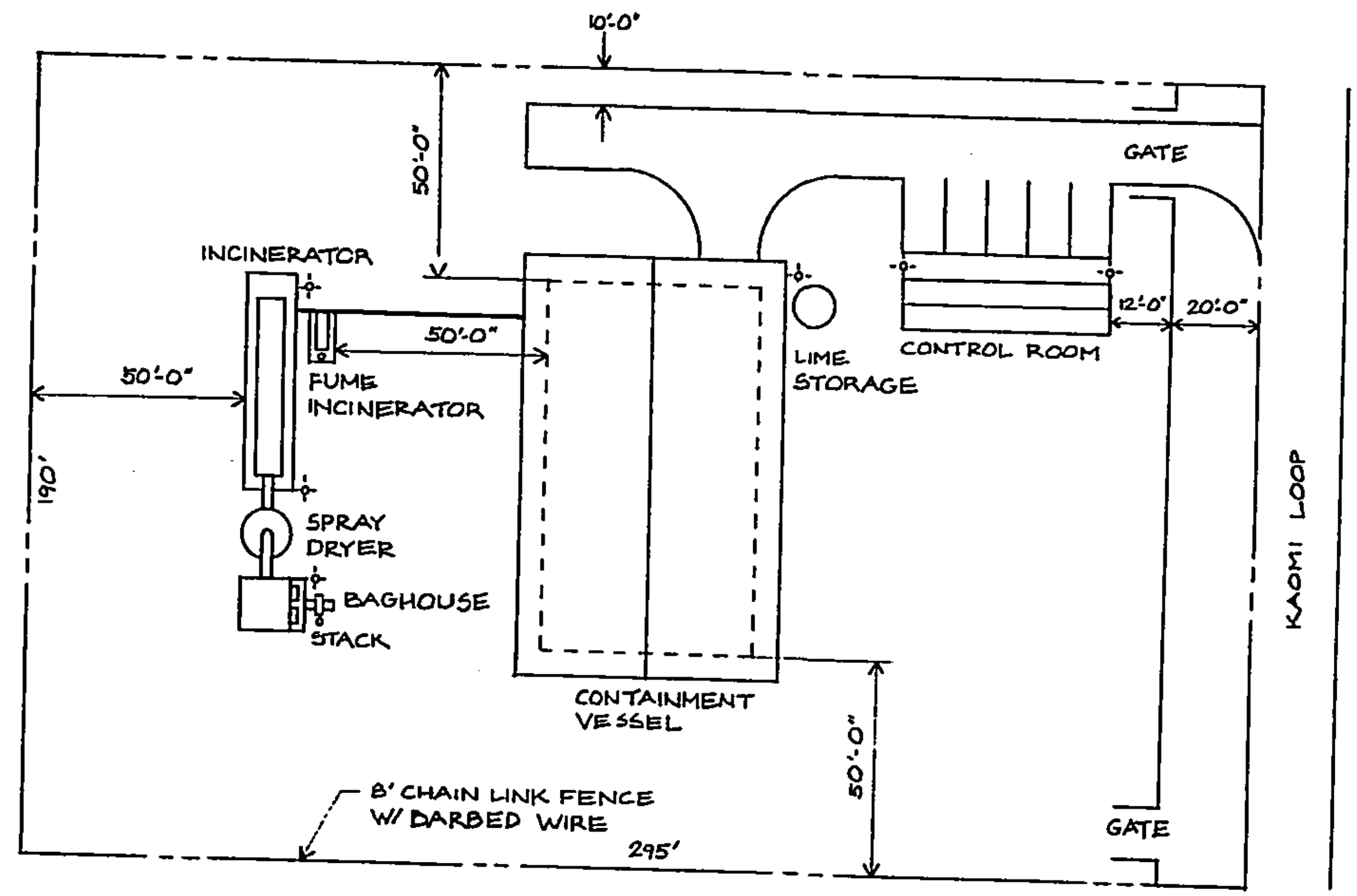


FIGURE II-6
ATI SITE PLAN

0 30' 60' 90'

B. HUDDLESTON

Figure II-7 Photograph of the Proposed Site

CHAPTER III: PROJECT DESCRIPTION

1. INTRODUCTION

The purpose of this chapter is to provide a description of the proposed project, including design features and operational procedures intended to minimize environmental impacts. In addition, this chapter will discuss the anticipated quantity of waste which will be treated, the types of wastes which will be treated, the amount of hazardous waste which will be generated, and the anticipated regulations and monitoring requirements for the proposed facility.

2. SOURCES OF HAZARDOUS WASTE

The industries located in Hawaii which generate hazardous waste are presented in Table III-1. Although the industries presented generate a significant percentage of the hazardous waste generated in Hawaii, it is essential to realize that consumers are a major, though unregulated, generator of hazardous waste.

The proposed incinerator has been sized on the basis that each citizen of the State of Hawaii will generate one gallon of hazardous waste per year. This hazardous waste generation rate includes paint, solvents, inks, glues, cleaners, paint removers, and used motor oil. The fact that the EPA has chosen not to regulate small generators of hazardous waste does not imply that the environmental damage associated with the improper management of hazardous waste created by small generators is insignificant. There are numerous examples of the EPA failing to deal effectively with hazardous materials. For example, the National Emission Standards for Hazardous Air Pollutants process has identified only 9 substances and regulated only benzene and vinyl chloride, although there are more than 300 suspected carcinogens used by industry. The EPA has been identified as a Potentially

Table III-1

Types of Industries that May Be Served by the TWI-3000

Aircraft Maintenance and Repair
Automobile Maintenance and Repair
Agriculture
Chemical Manufacturing
Construction
Electrical Power Generation
Military Installations, including Pearl Harbor, Hickam AFB, Schofield Barracks, Wheeler, Lualualei, and Kaneohe MCAS.
Paint Shops
Petroleum Refining
Ship Maintenance and Repair
Wood Treatment

The State Department of Business and Economic Development is encouraging the development of high technology industries in Hawaii, such as electronics manufacturing, aerospace, and scientific research. In addition, the average citizen of Hawaii is projected to generate one gallon of hazardous waste per year.

Responsible Party at a number of Superfund sites, which is the result of the EPA's reliance upon the land disposal of hazardous wastes. The EPA has been identified as a major reason for the inability of treatment facilities to begin operations as a result of the lack of qualified personnel available to review permit applications (Doucet,1987).

These statements are not intended to cast the EPA in a negative light; they are merely intended to point out that the regulatory requirements placed upon the EPA significantly exceed the ability of the EPA to adequately implement the requirements. The result is a policy of addressing the most significant problems in a reactionary method and assuming that the smaller problems will not have a significant environmental impact.

Unfortunately, this attitude links Hawaii to the mainland's environmental problems. In comparison to ecological disasters such as the San Gabriel Valley (the entirety of which is listed as a Superfund Site), Love Canal, or Times Beach; Hawaii's hazardous waste problems are indeed small. On the other hand, in comparison to the pristine environment which we enjoyed as little as 40 years ago, there has been a significant deterioration of Hawaii's environment.

The ultimate recipient for improperly managed hazardous waste is groundwater. Groundwater is an irreplaceable resource, and once contaminated, there is no practical method for cleaning groundwater. Table III-2 presents examples of groundwater contamination in Hawaii. It is evident from Table III-2 that the improper management of hazardous waste has led to significant contamination of Hawaii's groundwater. This problem can be avoided only through proper hazardous waste management, and incineration is the centerpiece for every country that has a successful hazardous waste management system, as opposed to the United States hazardous waste management system, which is reactionary in nature and cannot be judged as successful by any criteria.

In summary, the sources of hazardous waste are diverse, and

Table III-2 Examples of Hawaiian Groundwater Contamination

Contaminant	PPB	Well Description	Island	Sample Date	Confirm status	Limit of Det.	Well Number	Well Type
1,2 DiClpropane	0.800	Mililani Wells 1 P1	Oahu	09-27-83	C-1,N	NG	3-2800-01	D T2
1,2 DiClpropane	1.000	Mililani Wells 1 P3	Oahu	07-08-87	C-1	0.200	3-2800-03	D T2
1,2 DiClpropane	0.640	Mililani Wells 1 P4	Oahu	07-09-87	C-1	0.200	3-2800-04	D T2
1,2 DiClpropane	0.740	Mililani Wells II P5	Oahu	07-08-87	C-1	0.200	3-2859-01	D T2
1,2 DiClpropane	N.Q.	Waialua Sugar P 17	Oahu	07-08-87	U-	0.200	3-3404-02	I
1,2 DiClpropane	N.Q.	Waialua, Dole P 24	Oahu	07-22-87	U-	0.200	3-3102-01,02	I
1,2 DiClpropane	N.Q.	Waialua, Dole P 26	Oahu	07-22-87	U-	0.200	3-3203-02	I
1,2 DiClpropane	0.200	Waipahu Wells P 4	Oahu	09-27-83	C-1,N	NG	3-2400-03	D T4
2,4-D	0.040	Waialua Sugar	Oahu	08-25-86	U+	0.010	3-3506-03,04	I
Aldrin	0.001	OSCO WP 1, I & J	Oahu	09-02-86	U+	0.001	3-2301-09,10	I, D
Aldrin	0.001	Wilder Avenue Well	Oahu	08-26-86	U+	0.001	3-1849-16	D
Ametryn	0.200	Waialua Sugar P8, A-C	Oahu	09-26-84	U	0.100	3-3506-03,04	I
Atrazine	0.100	Barbers Point S 14	Oahu	09-26-84	U	0.100	3-2103-03	O
Atrazine	0.114	Hoaeae Wells P 1	Oahu	11-21-83	C-1	0.030	3-2301-34	D
Atrazine	0.083	Kunia Wells I P 1	Oahu	11-21-83	C-1	0.030	3-2302-02	D
Atrazine	0.060	OSCO Ewa Pump 8	Oahu	10-31-83	C-2	0.050	3-2202-15	D
Atrazine	0.100	OSCS Ewa Pump 15	Oahu	08-27-85	C-2	0.100	3-2202-21	I
Atrazine	0.100	Waialua	Oahu	09-24-84	U	0.100	3-3405-01	D
Atrazine	0.600	Waialua Sugar P8, A-C	Oahu	09-26-84	U	0.100	3-3506-03,04	I
Atrazine	0.020	OSCO Pump 6	Oahu	11-04-83	U	0.050	3-2459-01	Z
Benzene	1.500	Mililani Wells 1 P1	Oahu	08-30-83	U, R	NG	3-2800-01	D T2
Benzene	N.Q.	Mililani Wells 1 P2	Oahu	08-30-83	U, R	NG	3-2800-02	D T2
Benzene	0.360	Waipahu Wells P 4	Oahu	09-27-83	U, R	NG	3-2400-03	D T4
BrdiClmethane	1.700	Dairy Company	Oahu	05-19-86	C-7	0.200	3-2600-02	D
Bromoform	18.000	Dairy Company	Oahu	05-19-86	C-7	1.000	3-2600-02	D
Carbon TetraCl	0.300	Kunia Well 3, DM	Oahu	05-19-86	C-7	0.200	3-2803-05	D

Contaminant	PPB	Well Description	Island	Sample Date	Confirm status	Limit of Det.	Well Number	Well Type
Carbon TetraCl	0.500	Wahiawa Wells P 3	Oahu	05-19-86	C-7	0.200	3-2901-08	D
Carbon TetraCl	0.080	Wahiawa Wells P 1	Oahu	09-24-86	U	NG	3-2901-11	D
Carbon TetraCl	0.200	Wahiawa Wells P 2	Oahu	09-24-86	C-1	0.00005	3-2901-12	d
Carbon TetraCl	0.290	Mililani Wells 1 P1	Oahu	09-27-83	U, R	NG	3-2800-01	D T2
Carbon TetraCl	0.140	Waipahu Wells P 4	Oahu	09-27-83	N, R	NG	3-2400-03	D T4
Chloroform	0.700	Dairy Company	Oahu	05-19-86	C-7	0.200	3-2600-02	D
Chloroform	4.000	Waialua Sugar P8, A-C	Oahu	09-26-84	U	3.000	3-3506-03,04	I
Chloroform	3.200	Waipahu Wells P 4	Oahu	09-27-83	U, R	NG	3-2400-03	D T4
DDT	0.001	Kuou Well	Oahu	08-26-86	U+	0.001	3-2348-03	D
DiBr Clpropane	0.002	Waipahu Wells P 4	Oahu	09-27-83	U-	0.001	3-2400-03	D T4
DiBrClmethane	5.200	Dairy Company	Oahu	05-19-86	C-7	0.500	3-2600-02	D
DiBrClpropane	0.010	Hawaii Country Club	Oahu	01-23-83	C-3	0.010	3-2603-01	D
DiBrClpropane	0.002	Kunia Wells I P 1	Oahu	02-19-81	U+	NG	3-2302-02	D
DiBrClpropane	N.Q.	Kunia Wells I P 2	Oahu	08-09-83	U-	0.020	3-2302-01	D
DiBrClpropane	N.Q.	Kunia Wells I P 3	Oahu	12-01-83	U-	0.020	3-2302-04	D
DiBrClpropane	N.Q.	Kunia Wells I P 4	Oahu	08-09-83	U-	0.020	3-2302-03	D
DiBrClpropane	0.004	Kunia Wells II P 1	Oahu	02-19-81	C-3	NG	3-2402-01	D T1
DiBrClpropane	0.020	Kunia Wells II P 2	Oahu	12-21-82	C-3	0.010	3-2402-02	D T1
DiBrClpropane	0.400	Kunia Wells, Del Monte	Oahu	06-25-79	C-6	0.200	3-2703-01	Z @3
DiBrClpropane	0.043	Kunia Battery, DM	Oahu	05-30-80	U+	0.020	3-2803-05	D
DiBrClpropane	0.005	Mililani Wells 1 p1	Oahu	02-19-81	C-8	NG	3-2800-01	D T2
DiBrClpropane	0.012	Mililani Wells 1 P2	Oahu	02-09-82	C-8	0.008	3-2800-02	D T2
DiBrClpropane	0.004	Mililani Wells 1 P2	Oahu	09-19-81	C-1	NG	3-2800-03	D T2
DiBrClpropane	0.020	Mililani Wells 1 P4	Oahu	09-02-82	C-1	0.008	3-2800-04	D T2
DiBrClpropane	0.010	Mililani Wells II P5	Oahu	06-01-81	C-8	NG	3-2859-01	D T2
DiBrClpropane	0.021	Mililani Wells II P6	Oahu	10-19-82	C-5	0.009	3-2859-02	D T2

Contaminant	PPB	Well Description	Island	Sample Date	Confirm status	Limit of Det.	Well Number	Well Type
DiBrClpropane	0.015	Mililani Well 7	Oahu	08-10-83	C-3	NG	3-2600-03	Z
DiBrClPropane	N.Q.	Waialua	Oahu	07-15-83	U-	0.020	3-3405-02	D
DiBrClpropane	N.Q.	Waialua Sugar Pump 2	Oahu	08-20-84	U-	0.020	3-3307-01	I
DiBrClpropane	0.010	Waialua sugar P 17	Oahu	05-24-80	C-3	0.010	3-3404-02	I
DiBrClpropane	0.020	Waialua Sugar P 24	Oahu	05-27-80	C-1	0.020	3-3102-01,02	I
DiBrClpropane	0.037	Waialua Sugar P 25	Oahu	05-05-80	C-1	0.020	3-3203-01	I
DiBrClpropane	0.083	OSCO Waipahu P7	Oahu	07-24-85	U	0.010	3-2301-21	D
DiBrClpropane	N.Q.	Wahiawa Wells P 1	Oahu	10-27-83	U-	0.020	3-2901-11	D
DiBrClpropane	N.Q.	Wahiawa Wells P 3	Oahu	11-03-83	U-	0.020	3-2901-08	D
DiBrClpropane	0.020	Waialua sugar P 26	Oahu	02-24-83	C-3	0.020	3-3203-02	I
DiBrClpropane	N.Q.	Waialua Wells P2	Oahu	07-15-83	U+	0.020	3-3405-02	D
DiBrClpropane	0.010	Waiawa Shaft 16	Oahu	01-28-83	C-3	0.010	3-2558-10	D
DiBrClpropane	0.030	Waipio Hts P 1	Oahu	11-10-87	U+	0.020	3-2459-2-	d
DiClethylene	0.200	Kunia Well 3, DM	Oahu	05-19-86	C-7	0.200	3-2803-05	D
DiClpropene	0.087	Waipahu Wells P 4	Oahu	09-27-83	U, R	NG	3-2400-03	D T4
Dieldrin	0.008	Kalihi Well	Oahu	08-26-86	C-10	0.001	3-1952-06	D
Dieldrin	0.001	Kuou Well	Oahu	11-12-87	U	0.001	3-2348-03	D
Dieldrin	0.009	Manana Shaft, P1	Oahu	08-26-86	U+	0.001	3-2458-01	D
Dieldrin	0.009	Moanalua Wells 2	Oahu	08-26-86	C-10	0.001	3-2153-11	D
Ethylbenzene	3.600	OSCO WP 1, I & J	Oahu	09-24-84	U+	3.000	3-2301-09,10	I, D
Ethylene DiBr	N.Q.	Kunia Wells II P 1	Oahu	11-08-83	U-	0.020	3-2402-01	D T1
Ethylene DiBr	11.000	Kunia Well, Del Monte	Oahu	05-12-80	C-6	0.005	3-2703-01	Z @3
Ethylene DiBr	0.480	Kunia Battery, DM	Oahu	05-30-80	U+	0.100	3-2803-05	D
Ethylene DiBr	0.001	Mililani Wells 1 P1	Oahu	08-30-83	U-	0.001	3-2800-01	D T2
Ethylene DiBr	0.001	Mililani Wells 1 P2	Oahu	08-30-83	U-	0.001	3-2800-02	D T2
Ethylene DiBr	0.160	OSCS Pump 8B	Oahu	04-16-85	U	0.020	3-2301-22	I

Contaminant	PPB	Well Description	Island	Sample Date	Confirm status	Limit of Det.	Well Number	Well Type
Ethylene DiBr	N.Q.	OSCS Pump 17	Oahu	11-16-83	U-	0.020	3-2658-01	D T1
Ethylene dibr	0.020	Waipahu Exp II Well 1	Oahu	12-02-83	C-3	0.020	3-2400-05	Z
Ethylene DiBr	0.018	Waipahu Wells P 1	Oahu	07-06-83	C-3	0.015	3-2400-02	D T4
Ethylene DiBr	0.026	Waipahu Wells P 2	Oahu	07-06-83	C-3	0.015	3-2400-01	D T4
Ethylene DiBr	0.050	Waipahu Wells P 3	Oahu	07-01-83	C-1	0.050	3-2400-04	D T4
Ethylene DiBr	0.070	Waipahu Wells P 4	Oahu	06-29-83	C-1	0.050	3-2400-03	D t4
Ethylene DiBr	0.027	Waipio Hts II P 1	Oahu	02-18-87	U+	0.010	3-2500-01	D
Ethylene DiBr	0.023	Mililani Wells 1 P1	Oahu	08-30-83	U, R	NG	3-2800-01	D T2
Freon	5.200	Mililani Wells 1 P1	Oahu	09-27-83	U, R	NG	3-2800-01	D T2
Freon	2.000	Waipahu Wells P 4	Oahu	09-27-83	U, R	NG	3-2400-03	D T4
Freon II	0.400	Waipahu Wells P 4	Oahu	09-27-83	U, R	NG	3-2400-03	D T4
Lindane	0.001	Kalihi Well	Oahu	08-26-86	U+	0.001	3-1952-06	D
Lindane	0.001	Kuou Well	Oahu	08-26-86	U+	0.001	3-2348-03	D
Lindane	0.003	Manana Shaft, P1	Oahu	11-12-87	U	0.001	3-2458-01	D
Lindane	0.001	Waialua Sugar	Oahu	08-25-86	C-10	0.001	3-3506-03,04	I
Methylene Cl	4.000	Aiea C&H Refinery	Oahu	09-24-84	U*	3.000	3-2255-35	N
Methylene Cl	19.000	Waialua Sugar P8, A-C	Oahu	09-26-84	U*	3.000	3-3506-03,04	I
Phenols	2.000	Waiawa Shaft 16	Oahu	11-14-83	U	1.000	3-2558-10	D
TetraClethylene	3.000	Aiea C&H Refinery	Oahu	09-24-84	U	3.000	3-2255-35	N
TetraClethylene	N.Q.	Aiea Wells, BWS, P 2	Oahu	04-19-85	U-	0.010	3-2355-07	D @1
TetraClethylene	N.Q.	Barbers Point P 2	Oahu	04-18-85	U-	0.010	3-2103-03	O @1
TetraClethylene	N.Q.	Dairy Company	Oahu	04-22-85	U-	0.010	3-2600-02	D @1
TetraClethylene	N.Q.	Halawa Shaft USN	Oahu	04-24-85	U-	0.010	3-2255-32	D @1
TetraClethylene	N.Q.	Halawa Wells Pump 1	Oahu	04-19-85	U-	0.010	3-2255-37	D @1
TetraClethylene	0.200	Hawaii Country club	Oahu	04-15-85	C-1	0.010	3-2603-01	D @1
TetraClethylene	0.030	Kaamilo St. Well 1	Oahu	04-20-85	C-1	0.010	3-2356-58	D @1

Contaminant	PPB	Well Description	Island	Sample Date	Confirm status	Limit of Det.	Well Number	Well Type
TetraClethylene	0.030	Kaimuki Well	Oahu	04-23-85	C-1	0.010	3-1748-?	D@1
TetraClethylene	0.980	Kunia RU W 2, Army 2	Oahu	04-15-85	C-1	0.010	3-2803-03	N@1
TetraClethylene	N.Q.	Kunia TU,Army 1	Oahu	07-24-85	U-	0.010	3-2803-04	N@1
TetraClethylene	0.830	Kunia Well 3, DM	Oahu	04-15-85	C-1	0.010	3-2803-05	D@1
TetraClethylene	0.030	Manana Shaft, P 1	Oahu	04-18-85	C-1	0.010	3-2458-01	D@1
TetraClethylene	N.Q.	OSCO Waipahu P 1	Oahu	04-19-85	U-	0.010	3-2301-01	D@1
TetraClethylene	N.Q.	OSCO Waipahu P 7	Oahu	04-19-85	U-	0.010	3-2301-21	D@1
TetraClethylene	N.Q.	Palolo Well	Oahu	04-24-85	U-	0.010	3-1847-01	D@1
TetraClethylene	0.055	Schofield Shaft 3	Oahu	04-23-85	C-1	0.010	3-2901-03	D T3@1
TetraClethylene	0.180	Schofield Shaft 4	Oahu	04-23-85	C-1	0.010	3-2901-04	DT3@1
TetraClethylene	0.135	Wahiawa wells P 1	Oahu	05-03-85	C-3	0.005	3-2901-11	d
TetraClethylene	0.320	Wahiawa Wells P 2	Oahu	04-24-85	C-3	0.005	3-2901-12	D
TetraClethylene	0.390	Wahiawa Wells P 3	Oahu	04-15-85	C-1	0.010	3-2901-08	d@1
TetraClethylene	N.Q.	Waiawa Shaft 16	Oahu	04-18-85	U-	0.010	3-2558-10	D@1
TetraClethylene	N.Q.	Waimanalo Well P 1	Oahu	04-20-85	U-	0.010	3-2043-02	D@1
TetraClethylene	N.Q.	Waipio Hts II P 2	Oahu	6-17-85	U-	0.010	3-2500-02	D@1
TetraClethylene	0.020	Mililani Wells 1 P1	Oahu	09-27-83	U, R	NG	3-2800-01	D T2
TetraClethylene	0.600	Waipahu wells P 4	Oahu	09-27-83	U, R	NG	3-2400-03	D T4
Toluene	0.200	Kalihi Well	Oahu	08-26-86	U+	0.200	3-1952-06	D
Toluene	N.Q.	Mililani Wells 1 P1	Oahu	08-30-83	U, R	NG	3-2800-01	D T2
Toluene	N.Q.	Mililani Wells 1 P2	Oahu	08-30-83	U, R	NG	3-2800-02	D T2
TriClethylene	N.Q.	Aiea Gulch, Pump 2	Oahu	04-20-85	U-	0.500	3-2355-05	D
TriClethylene	0.710	Dairy company	Oahu	04-22-85	C-1	0.500	3-2600-02	D@1
TriClethylene	3.500	Kunia TU W 2, Army 2	Oahu	04-23-85	C-1	0.500	3-2803-03	N
TriClethylene	3.700	Kunia TU, Army 1	Oahu	07-24-85	C-1	0.500	3-2803-04	N@1
TriClethylene	2.600	Kunia Well 3, DM	Oahu	05-19-86	C-7	0.200	3-2003-05	D

Contaminant	PPB	Well Description	Island	Sample Date	Confirm status	Limit of Det.	Well Number	Well Type
TriClethylene	5.600	Schofield Shaft 3	Oahu	04-23-85	C-1	0.500	3-2901-03	D T3
TriClethylene	23.000	Schofield Shaft 4	Oahu	04-23-85	C-1	0.500	3-2901-04	D T3
TriClethylene	4.000	Schofield Wheeler AFB	Oahu	09-26-84	C-1	3.000	3-2901-07	D T3
TriClethylene	1.100	Waimanalo W 420	Oahu	08-25-86	U+	0.200	3-2043-02	D
TriClethylene	0.550	Waipio Hts II P 1	Oahu	01-20-86	C-1	0.500	3-2500-01	D
TriClethylene	0.520	Waipio Hts II P 2	Oahu	06-17-85	C-1	0.500	3-2500-02	D
TriClethylene	1.200	Waipahu Wells P 4	Oahu	09-27-83	U, R	NG	3-2400-03	D T4
TriClpropane	0.180	Haleiwa Wells Pump 1	Oahu	09-05-85	U	0.050	3-3405-03	D
TriClpropane	N.Q.	Haleiwa Wells Pump 2	Oahu	08-23-84	U-	0.200	3-3405-04	D
TriClpropane	0.130	Hawaii Country Club	Oahu	06-03-85	U	0.050	3-2603-01	D
TriClpropane	0.133	Hoaeae Wells P 1	Oahu	09-28-83	C-1	NG	3-2301-34	D
TriClpropane	0.210	Hoaeae Wells P 2	Oahu	07-03-84	C-1	0.200	3-2301-35	D
TriClpropane	0.110	Hoaeae Wells P3	Oahu	10-13-83	C-1	0.020	3-2301-37	D @2
TriClpropane	0.112	Hoaeae Wells P 4	Oahu	09-28-83	C-1	NG	3-2301-36	D @2
TriClpropane	0.145	Hoaeae Wells P 5	Oahu	09-28-83	C-1	NG	3-2301-38	D @2
TriClpropane	0.130	Hoaeae Wells P 6	Oahu	09-28-83	C-1	NG	3-2301-39	D @2
TriClpropane	0.060	Honouliuli Comm. Well	Oahu	07-01-85	U	0.050	3-2201-02	D
TriClpropane	0.250	Kunia Wells I P 1	Oahu	10-11-83	C-1	0.200	3-2302-02	D
TriClpropane	0.250	Kunia Wells I P 2	Oahu	09-26-83	C-1	0.200	3-2302-01	D
TriClpropane	0.300	Kunia Wells I P 4	Oahu	09-26-83	C-3	0.200	3-2302-03	D
TriClpropane	0.800	Kunia Wells II P 1	Oahu	09-26-83	C-3	0.200	3-2402-01	D T1
TriClpropane	0.950	Kunia Wells II P 2	Oahu	09-26-83	C-3	0.200	3-2402-02	D T1
TriClpropane	N.Q.	Kunia TU,Army 1	Oahu	07-24-85	U-	0.200	3-2803-04	N @1
TriClpropane	1.900	Mililani Wells 1 P1	Oahu	09-26-83	C-3	0.200	3-2800-01	D T2
TriClpropane	1.300	Mililani Wells 1 P2	Oahu	09-26-83	C-3	0.200	3-2800-02	D T2
TriClpropane	2.000	Mililani Wells 1 P3	Oahu	09-26-83	C-1	0.200	3-2800-03	D T2

assuming that industry's compliance with EPA and DOH regulations will protect Hawaii's environment from contamination by hazardous waste links Hawaii to the same procedures that have generated catastrophic environmental damage on the mainland.

3. PROJECT HISTORY

A. Incineration

"Incineration is a process that uses high temperature and long residence times to break down hazardous organic wastes into non-hazardous components. Incineration is a proven, readily available method for destroying hazardous wastes. It has demonstrated time and again, at numerous installations, that properly designed and operated hazardous waste incineration systems readily comply with stringent regulatory performance requirements-even under most upset conditions. This has been substantiated in more than 100 different trial burn, test burn, and pilot testing programs, during which an almost endless variety of hazardous types and forms have been incinerated under widely varying operating conditions. It appears evident that additional studies and research programs are not needed for the sole purpose of demonstrating the efficacy of hazardous waste incineration. Likewise, environmental assessments have repeatedly shown, both on a site-specific and nationwide basis, that properly designed and operated hazardous waste incinerators pose insignificant risks and negligible environmental endangerment"(Doucet, 1987).

"Currently, both industry and regulatory agencies prefer the use of incineration for waste disposal because it not only disposes of toxic organics permanently, but also produces no significant risk to the public when done properly. Since incineration is an expensive operation, it will be used by industry judiciously. Waste minimization will be the preferred approach" (Lee, 1987).

"The laws of thermodynamics dictate that all organic compounds can be destroyed given sufficient time, temperature, and oxygen (or turbulent mixing with air). The final composition of the flue gas is only a function of the elemental composition of the fuel, and is independent of the organic compound structure in the fuel" (Lee, 1987). Performance data conducted by the EPA at eight incinerators of different design, different operating conditions, burning different types of wastes, demonstrate stack concentrations that are consistently in a relatively narrow range of 1 to 100 nanograms of primary organic hazardous constituent per liter of flue gas, or around 0.1 to 20 ppbv. The unstable compounds were not detectable (typically less than 0.1 ppbv) as predicted by thermodynamics (Trenholm, 1984). The data indicates that the flue gas organics level (before dilution by ambient air) is not that much different from indoor and urban ambient air which contains 0.1 to 4 ppbv of various compounds " (Hartwell, 1985; Jones, 1985; Kowalski, 1985).

The preceding references demonstrate that incineration is a safe, proven, and effective method of dealing with organic hazardous waste. Indeed, for organic substances at concentrations of more than 0.1%, no other treatment technology exists (Griffin, 1988). Because of the appropriateness of incineration as a hazardous waste treatment technology, and because of the tremendous amount of risk associated with the ocean transport of hazardous waste (as demonstrated by the recent Prince William Sound environmental disaster), it is appropriate to pursue the development of a hazardous waste incineration capability for the state of Hawaii.

B. Advanced Technology Incineration, Inc.

ATI began research and development work for the proposed incinerator in July of 1975. A 1/10th scale working model of the burner/afterburner was designed, built, and tested to demonstrate the feasibility of a disc stabilized flame afterburner. A 1/12th scale air model of the was designed, built, and tested to study the velocity distribution and turbulence intensity distribution, as well as the combustion aerodynamics of the proposed burner/afterburner in 1976. A Department of Energy Research and Development Grant was issued in 1980 to build and test a full scale burner/afterburner. The performance of the burner/afterburner exceeded all existing regulatory requirements.

A computer model of the burner/afterburner was generated in 1984. A 1/4 scale mock-up of the proposed burner/afterburner was fabricated in 1985.

The feasibility of operating a hazardous waste incinerator at the Campbell Industrial Park was discussed with representatives of the Campbell Estate in January of 1987. No major objections to the proposed use of the land for the operation of a hazardous waste incinerator were raised, other than to require that all DOH and EPA requirements will be met. A formal request to incinerate hazardous waste at the proposed site was submitted to the Campbell Estate in April of 1988. The response on the part of the Estate was that a lease would be issued if ATI was able to obtain the [illegible] operate.

The proposed incinerator was discussed with [illegible] the House and Senate Environmental Committees, the Office of Environmental Quality Control, the State Planning Commission, the Department of Business and Economic Development, the Department of Sanitation, and members of the City Council in January of 1989. An information presentation was made to the [illegible] Community Association Number 23 in March of 1989. Based upon the positive response of the State, City, and Community [illegible] decision was made to submit an Environmental Impact S[illegible] the proposed project.

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The proposed incinerator was discussed with members of the House and Senate Environmental Committees, the Office of Environmental Quality Control, the State Planning Commission, the Department of Business and Economic Development, The Department of Sanitation, and members of the City Council in January of 1989. An information presentation was made to the Ewa Beach Community Association Number 23 in March of 1989. Based upon the positive response of the State, City, and Community leaders, the decision was made to submit an Environmental Impact Statement for the proposed project.

4. Project Objectives

The short term objective of the proposed project is to provide an environmentally beneficial hazardous waste treatment capability for the State of Hawaii to achieve the following objectives:

- o To destroy more than 99.7% of the 3,000 tons per year of hazardous waste treated in the proposed facility.
- o To collect more than 99.5% of the ash generated for re-incineration and encapsualization.
- o To minimize the vehicle emissions and risk associated with transporting Hawaii's hazardous waste to mainland treatment and disposal facilities.
- o To provide the State of Hawaii with a safe, reliable, and economic hazardous waste treatment capability that is not linked to the unstable hazardous waste treatment situation on the mainland.

The long term objectives of the proposed incinerator are presented below:

- o To analyze the incinerator emissions in order to quantify the health risk impact of a hazardous waste incinerator using the Best Available Control Technology while treating hazardous waste generated in Hawaii.
- o To provide a data base for the design and operation of a facility capable of dealing with Hawaii's total hazardous waste treatment requirements.

5. DESCRIPTION OF THE INCINERATOR DESIGN

A. Incinerator and Pollution Control System

The process flow diagram for hazardous waste received at the proposed facility is presented in Figure III-1. As presented in Figure III-1, hazardous wastes will be evaluated for treatability prior to transport to the ATI site. Hazardous wastes that may not be treated in the proposed incinerator will be transferred to bulk containers and shipped to mainland treatment facilities. The containers used to transport hazardous waste to the ATI site that cannot be re-used will be triple rinsed, crushed, and recycled as scrap steel.

The TWI-3000 Process Flow Diagram is presented in Figure III-2. The TWI-3000 Mass Balance Diagram is presented in Figure III-3. A schematic of the TWI-3000 burner and afterburner is presented in Figure III-4. A schematic of the TWI-3000 pollution control system is presented in Figure III-5. A schematic of the TWI-3000 ash collection system is presented in Figure III-6.

The hazardous waste feed and combustion air are mixed in a refractory lined combustion chamber at 2200 ± 200 F. The tangential introduction of secondary combustion air provides a swirling flow to maximize combustion efficiency and reduce the flame temperature to minimize the NO_2 generation rate. The waste feed is introduced through an air atomizing nozzle to maximize the atomization of the waste feed.

The products of combustion then enter the afterburner. The bluff body (disc) used to separate the burner from the afterburner generates a large scale recirculation zone in the afterburner to promote the intimate mixing of the products of combustion and the excess combustion air at a temperature of 1800 ± 200 F.

The TWI-3000 operating conditions have been chosen to maximize the destruction of hazardous waste and to minimize the generation of NO_2. The burner/afterburner residence time is 2.5 seconds, which significantly exceeds the BACT requirement of 2 seconds. An afterburner temperature of more than 1600 F has not demonstrated a significant increase in the organic hazardous constituent destruction and removal efficiency (Visali 1988, Lee, 1988). Ammonia (NH_3) injection is used to reduce the stack gas

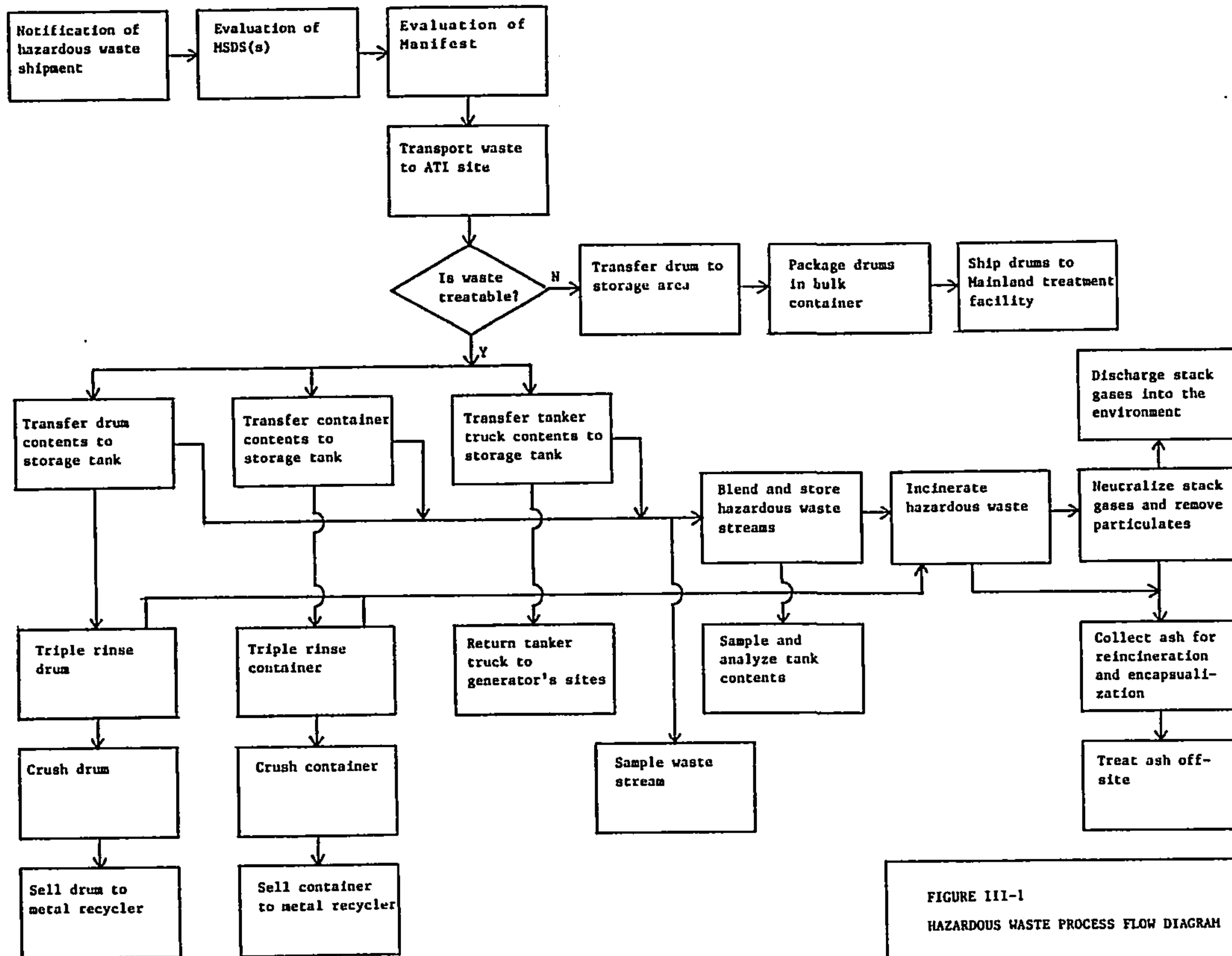

FIGURE III-1
HAZARDOUS WASTE PROCESS FLOW DIAGRAM

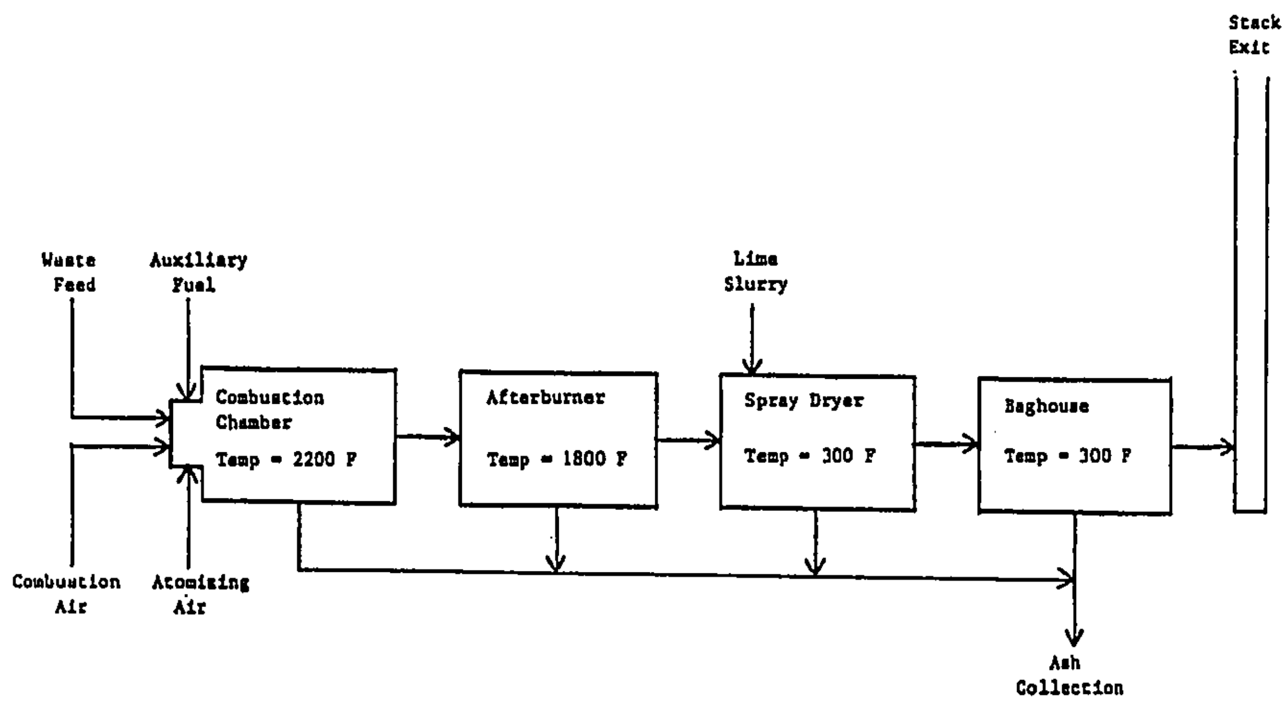

Figure III-2 ATI Incinerator Process Flow Diagram

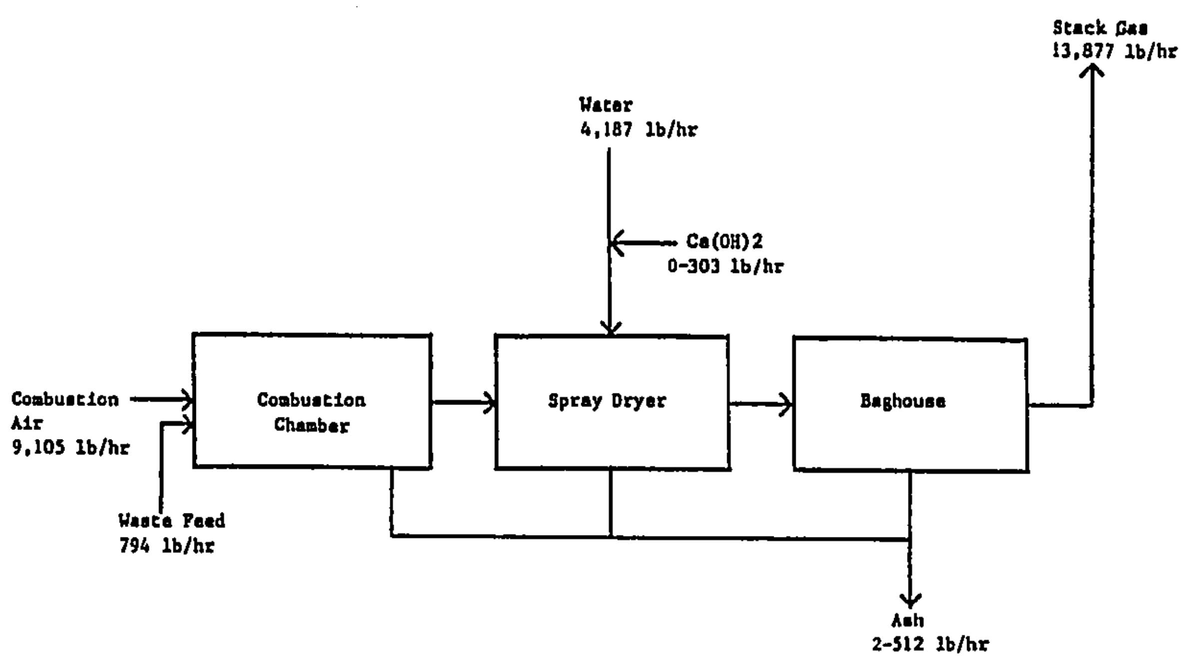

Figure III-3 TWI-3000 Mass Balance Diagram

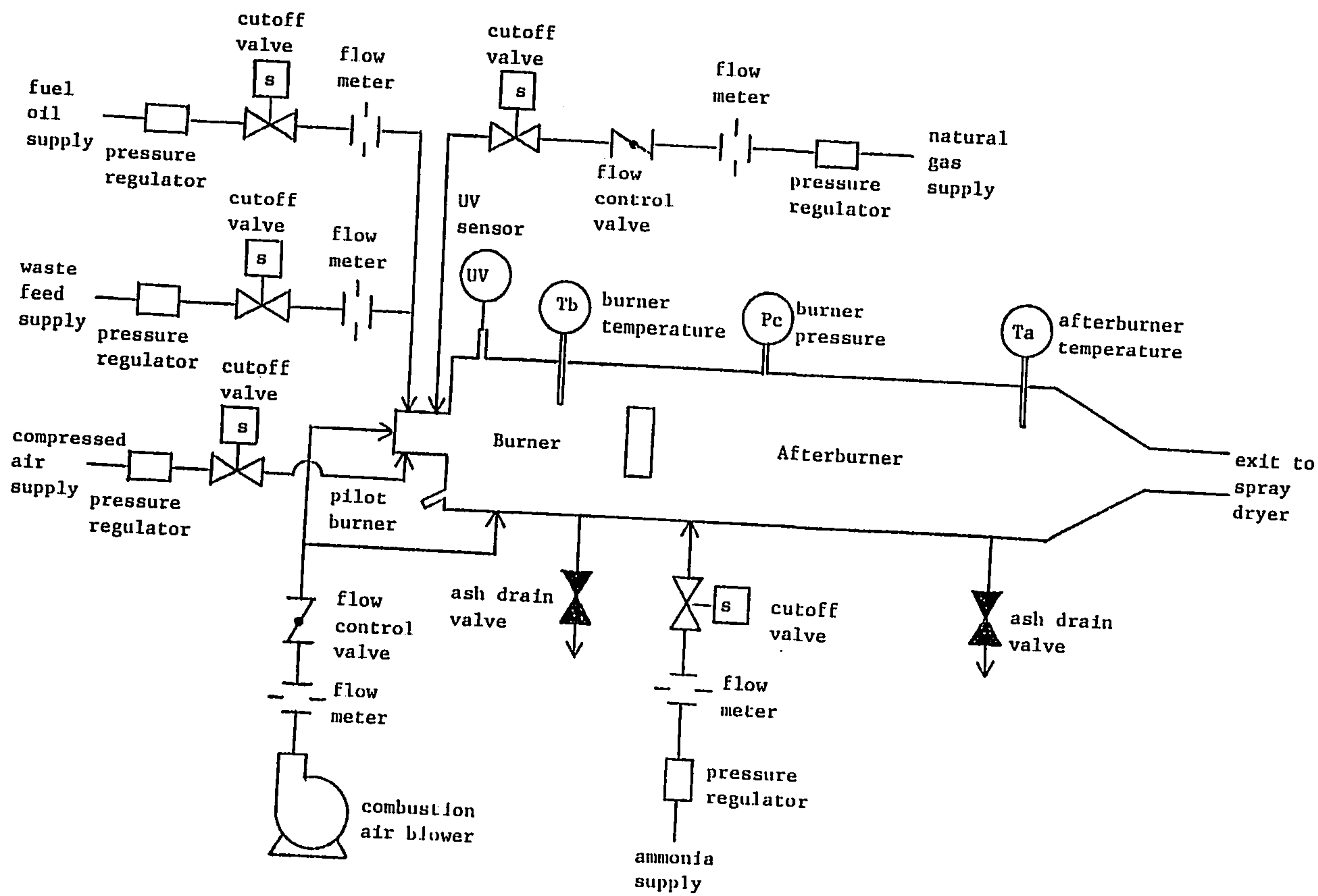

Figure III-4 TWI-3000 Burner and Afterburner Schematic

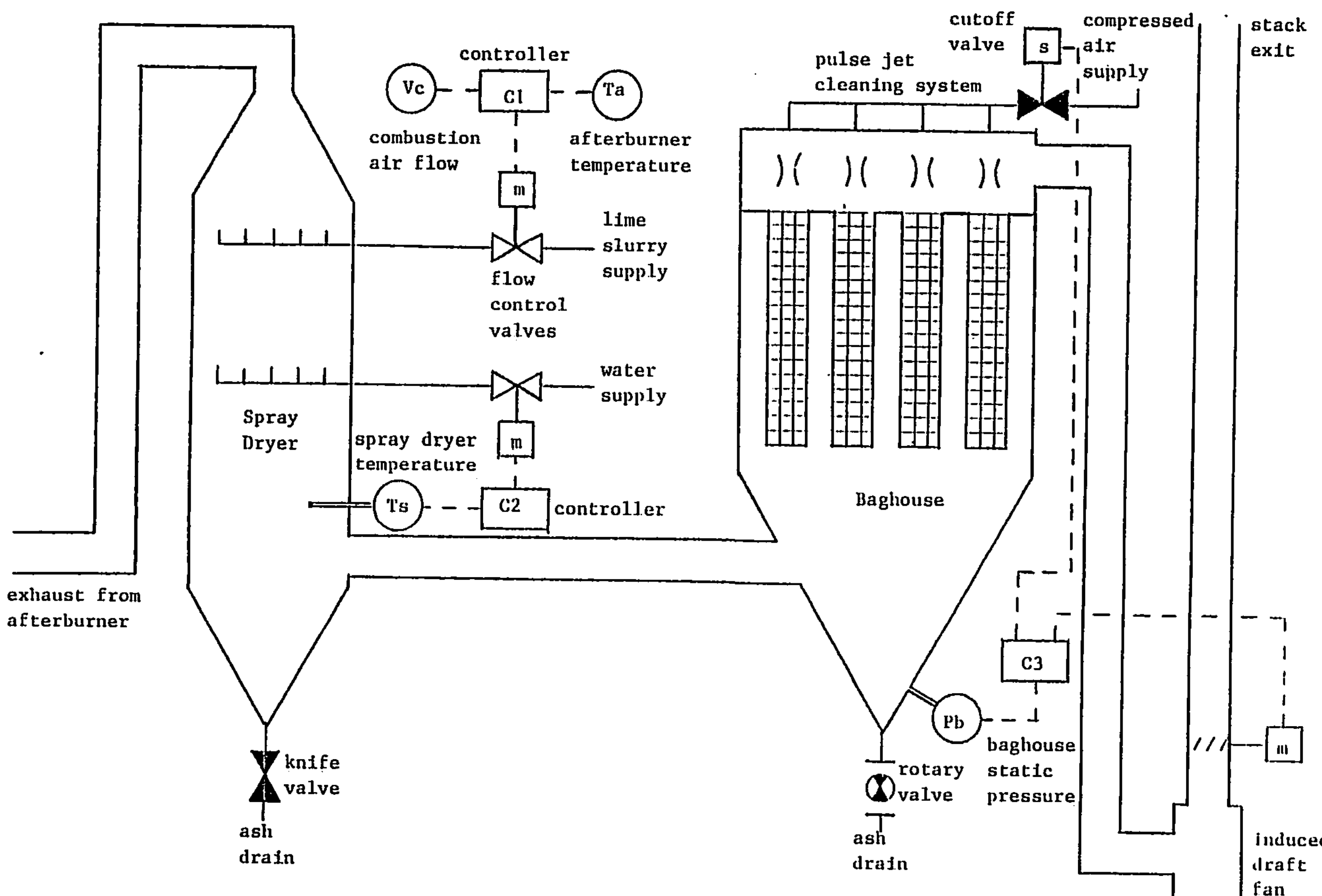

Figure III-5 TWI-3000 Air Pollution Control System Schematic

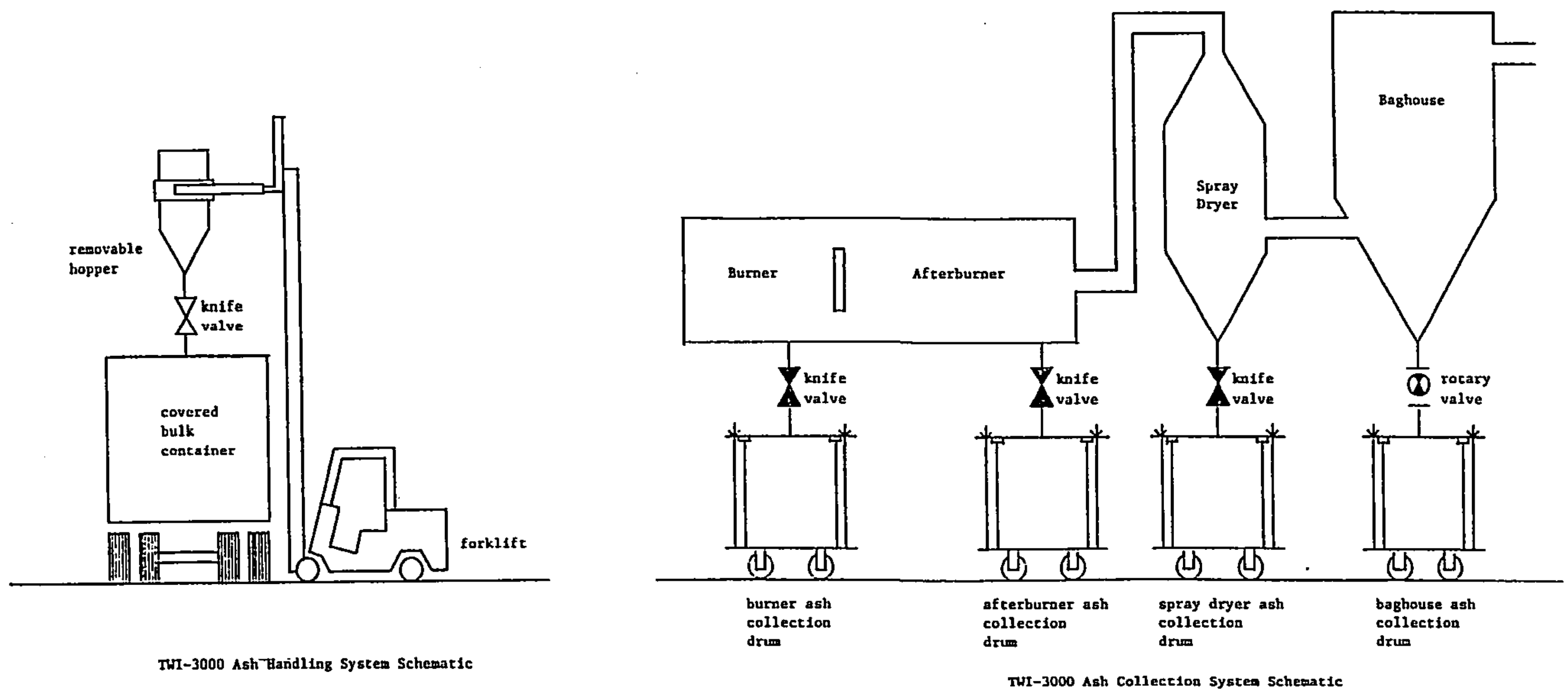

Figure III-6 Ash Collection System

NO_2 level, and NH_3 injection is effective only from 1600 to 2000 F (Lyon, 1987).

The TWI-3000 features a dry gas scrubbing technology and does not generate a water discharge. The products of combustion exit the afterburner and enter the spray dryer. A lime slurry is injected into the combustion products at the spray dryer inlet. The water in the lime slurry evaporates and reduces the temperature of the combustion products to 300 ± 50 F. The lime reacts with the hydrogen chloride, hydrogen fluoride, hydrogen bromide, and sulfur dioxide in the stack gas to form a neutral salt precipitate. A portion of the precipitate is collected in the spray dryer hopper and the remainder is collected in the baghouse.

The products of combustion exit the spray dryer and enter the baghouse. The particulates in the products of combustion are removed by singed nomex filter bags. When the pressure drop across the filter bags exceeds 8 in W.C., the pulse jet cleaning system automatically cleans the bags. A pulse of compressed air causes the bags to deform, which dislodges the filter cake which has built up on the bags. The particulates settle to the bottom of the baghouse hopper, where they are collected in the closed loop ash collection system.

The maximum projected TWI-3000 ash generation system is 512 pounds per hour, based upon a waste feed ash loading of 10% and a chlorine content of 30%. The typical ash projection rate is projected to be 25 pounds per hour, based upon a waste feed ash loading of 2% and a chlorine content of 1%. The ash is collected in a closed loop system, transferred to a bulk container, and shipped to a treatment facility for re-incineration and encapsualization.

The Summary of Design Information is presented in Table III-3. The TWI-3000 Materials of Construction are presented in Table III-4.

Table III-3

Summary Design Information

Parameter	Units	Primary Combustion Chamber	Secondary Combustion Chamber	Combined System
Type of Incinerator		Burner	Afterburner	--
Inside dimensions (diameter x length)	ft	4 x 8	4 x 27	--
Cross sectional area	sq ft	12.56	12.56	12.56
Volume	cu ft	100	339	439
Heat capacity	MM Btu/hr	6.4	0	6.4
Refractory thickness	in	8	8	8
Refractory conductivity	Btu-in/hr-sq ft-F	0.0015	0.0015	0.0015
Refractory surface area	sq ft	140	452	592
Cooled surface area	sq ft	0	0	0

Table III-4

TWI-3000 Materials of Construction

Component	Material of Construction
Burner/afterburner	Carbon steel (A-36) lined with Purolite 30 Insulating Refractory Castable coated with Troweleze refractory cement
Breeching	Carbon steel (A-36) lined with 3 in Purolite 30
Spray dryer	Carbon steel (A-36) lined with 3 in Kricon-22 high density refractory
Breeching	Carbon steel coated with silicone-epoxy paint
Baghouse	Carbon steel coated with silicone-epoxy paint
ID fan	Carbon steel coated with silicone-epoxy paint
Stack	Carbon steel coated with silicone-epoxy paint

B. Instrumentation

The Summary Table of Process Monitors is presented in Table III-5. The following operating parameters will be continuously recorded at one minute intervals and maintained on file for three years to verify the performance of the TWI-3000:

- Combustion air flow rate
- Waste feed flow rate
- Natural gas flow rate
- Lime slurry flow rate
- Burner temperature
- Afterburner temperature
- Stack gas CO level

The remainder of the TWI-3000 monitoring parameters will be recorded at one hour intervals and maintained on file for three years to verify the performance of the TWI-3000.

C. Emergency Waste Feed Cutoff System

The TWI-3000 interlock system has been designed to shut down the incinerator if any of the following systems are not operating properly:

- Combustion air supply
- Quench water supply
- Fuel oil supply
- Compressed air supply
- Natural gas supply

If any support system malfunctions, the interlock system will interrupt the supply of electrical power to the incinerator. All valves will return to the normally closed position, which will interrupt the flow of waste feed, fuel oil, natural gas, and ammonia into the burner. The combustion air blowers will coast to a stop. The high temperature of the incinerator refractory lining and the delay between the interruption of the waste feed flow and the time that the combustion air blowers coast to a stop will allow for the complete destruction of any waste feed in the

Table III-5

Summary Table of Process Monitors

Parameter	Location	Type of Monitor	Permanent Recorder	Operating Range	Units Recorded in Process Log
Waste feed flow rate rate	Vw--Feed line to burner nozzle	Mass flowmeter	yes	0-800	lb/hr
Auxiliary fuel flow flow rate	Va--Feed line to burner burner nozzle	Mass flowmeter	no	0-100	lb/hr
Natural gas flow rate	Vn--Feed line to burner nozzle	Mass flowmeter	no	0-100	cfm
Atomizing air pressure	Pa--Feed line to burner	Pressure transducer	no	40-150	psi
Burner temperature	Tp--Center of burner 6" from burner wall	Type R thermocouple	yes	2,200 ±200	F
Afterburner temperature	Ts--Afterburner exit 6" from burner wall	Type R thermocouple	yes	1,800 ±200	F
Spray dryer temperature	Tsd--Spray dryer outlet	Type T thermocouple	no	300 ±50	F
Baghouse temperature	Tb--Baghouse outlet	Type T thermocouple	no	300 ±50	F
Combustion air static pressure	Pc--static tap on combustion air supply duct	Pressure transducer	no	2-40	in W.C.
Combustion chamber static pressure	Ps--static tap at center	Pressure transducer	no	2-40	in W.C.

Table III-5 (Continued)

Parameter	Location	Type of Monitor	Permanent Recorder	Operating Range	Units Recorded in Process Log
Spray dryer pressure pressure drop	Psd--pressure across Ps and spray dryer outlet	Pressure transducer	no	0-10	in W.C.
Baghouse pressure drop	Pbd--pressure drop across filter bags	Pressure transduicer	no	0-10	in W.C.
Lime slurry flow rate	Vl--feed line to lime slurry injectors	Ultrasonic flow meter	yes	0-10	gpm
Lime slurry pH	pH--feed line to lime slurry injectors	Electrolytic cell	yes	0-14	pH
Combustion air flow rate	Vc--inlet to forced draft blower	Mass flowmeter	yes	2000 ±200	cfm
Stack gas CO level	CO--stack	Remote NDIR	yes	0-500	ppm
Stack gas opacity	OP--stack	Photoelectric	no	0-100	%

incinerator at the time of the shutdown.

The automatic waste feed cutoff system will interrupt the flow of hazardous waste into the incinerator if any design operating parameter is out of tolerance. The Automatic Waste Feed Cutoff System Alarm Setpoints are presented in Table III-6.

The interlock system and the emergency waste feed cutoff system are fully automatic, and do not require a response on the part of the incinerator operator. Both systems rely upon simple electro-mechanical components, and the failure of any component will result in a shutdown of the incinerator.

D. Waste Feed Storage

Storage tanks located in a containment vessel will be used to store the hazardous waste treated at the proposed facility prior to incineration. The containment vessel design is presented in Figures III-7 and III-8. Secondary containment will be provided in case of the failure of the primary containment vessel. A drain system will be provided to transfer any liquid in the containment vessel into a storage tank. A double polyethylene liner beneath the containment vessel will be used to prevent contact between the proposed site soil and hazardous waste in the event of a failure of the containment vessel integrity. The containment vessel will be covered to prevent contact between rainwater and hazardous waste in the containment vessel. A 6" curb will be used to prevent run-on from coming into contact with the interior of the containment vessel.

5. Characterization of Incinerator Operation

A. Operating Conditions

The TWI-3000 operating conditions are based upon meeting the BACT guidelines and the EPA incinerator performance guidelines. The TWI-3000 is a single operating condition incinerator. The

Table III-6

Automatic Waste Feed Cutoff System Alarm Setpoints

Parameter	Alarm Limit	Cut-off Limit	Cut-off Mechanism
Burner low temperature,F	2050	2000	Electromechanical relay (1)
Burner high temperature,F	2150	2400	Electromechanical relay (1)
Afterburner low temperature,F	1650	1600	Electromechanical relay (1)
Afterburner high temperature,F	1950	2000	Electromechanical relay (1)
Baghouse low temperature,F		250	Electromechanical relay (1)
Baghouse high temperature,F		350	Electromechanical relay (1)
Injector low temperature,F		200	Electromechanical relay (1)
Injector high temperature,F		500	Electromechanical relay (1)
Low quench water pressure,psi		40	Electromechanical relay (1)
Stack gas CO level	50	100	Electromechanical relay (1)
Combustion air high flow rate, cfm	2,150	2,200	Electromechanical relay
Low combustion air pressure, in W.C.		2	Electromechanical relay (1)
Baghouse high pressure, in W.C.		-1/2	Electromechanical relay (1)
UV sensor		off	Electromechanical relay (1)

(1) Interruption of the relay signal causes the waste feed cutoff valve to return to the normally closed position.

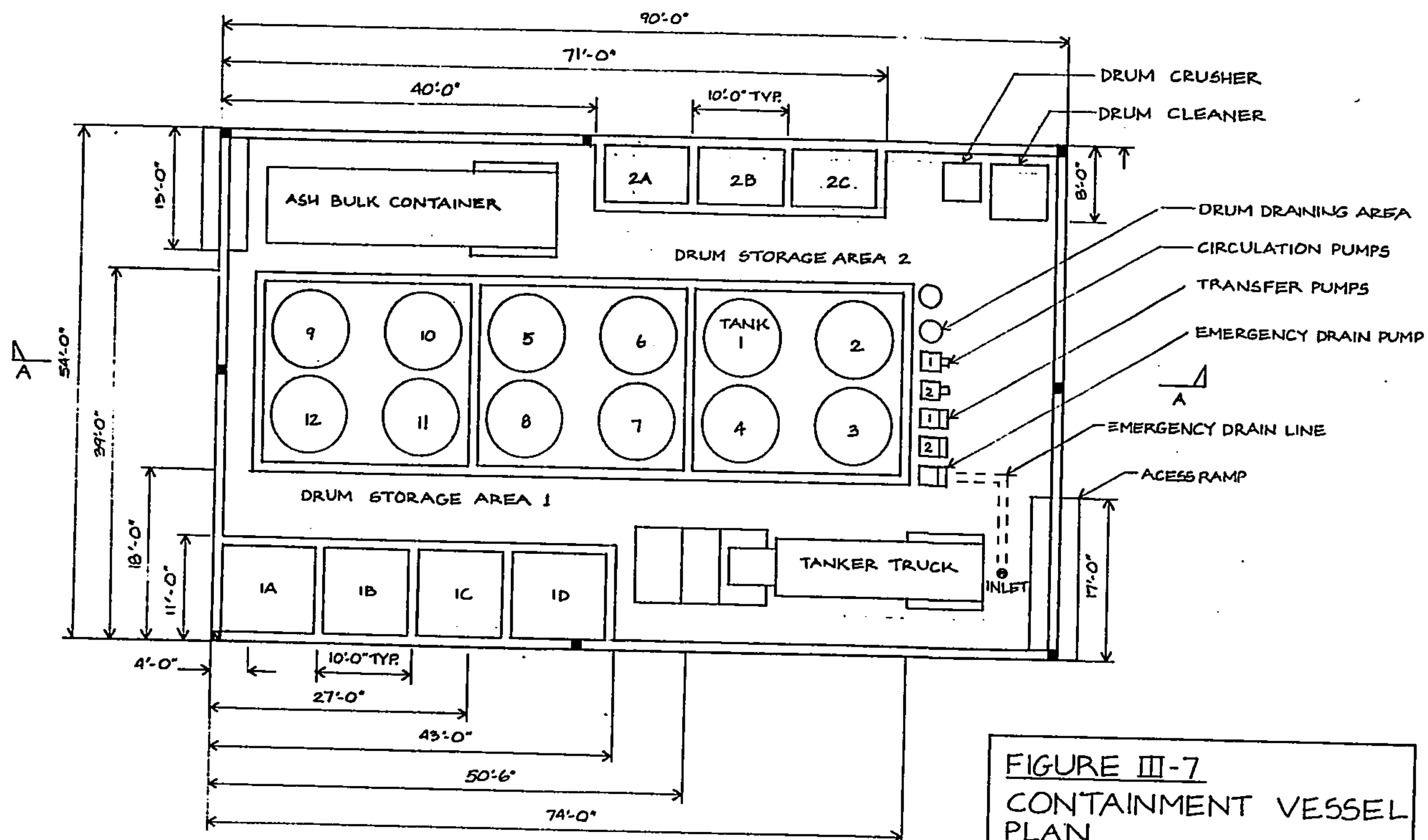

FIGURE III-7
CONTAINMENT VESSEL PLAN
0 5'-0" 10'-0" 20'-0"
B. HUDDLESTON 3/8/89

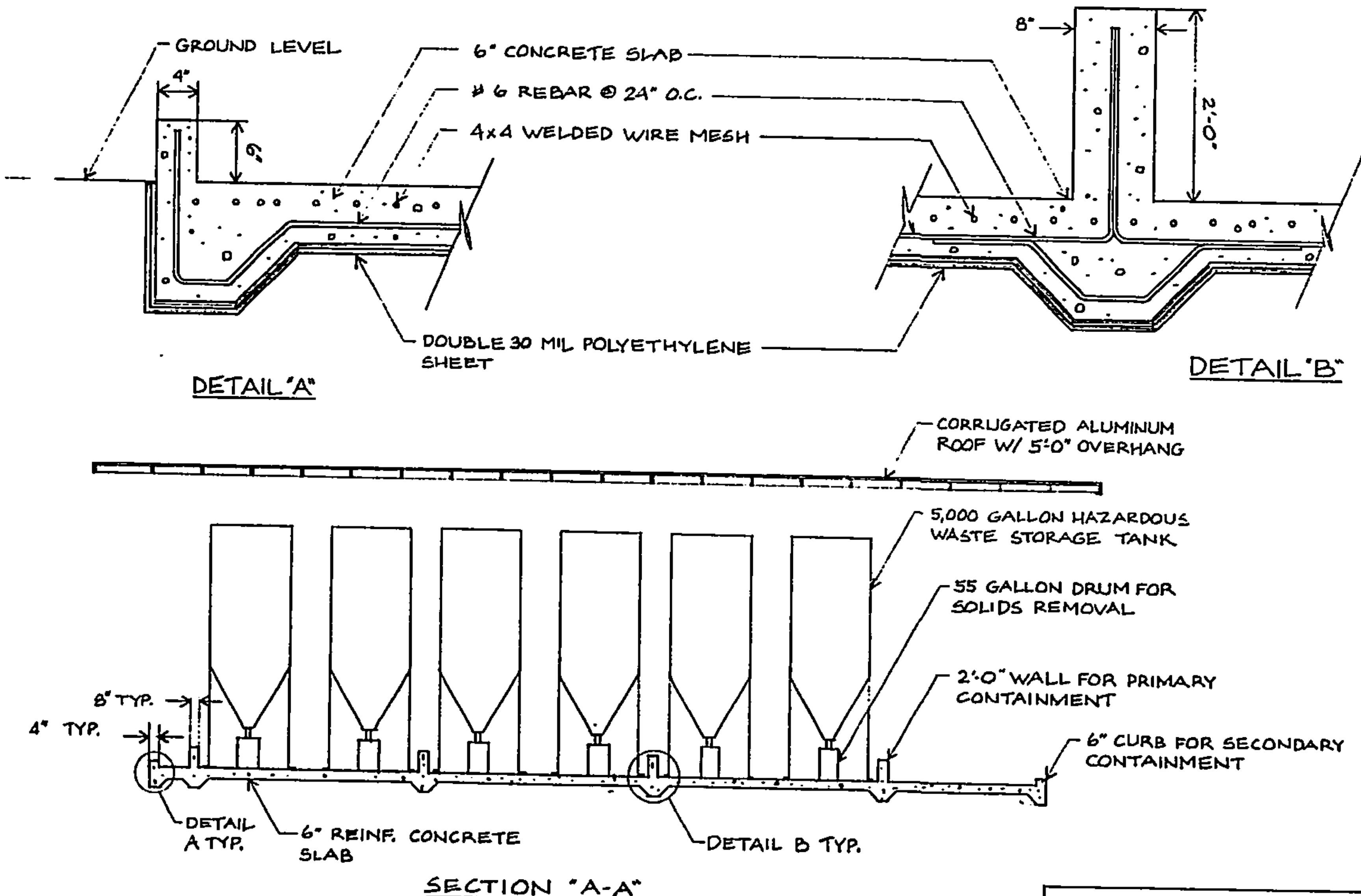

FIGURE III-8
CONTAINMENT VESSEL DETAILS

B. HUDDLESTON 3/12/89

combustion air flow rate is held constant at 2,000 ± 200 cfm, and the waste feed and auxiliary fuel flow rates are adjusted to provide an afterburner temperature of 1800 ± 200 F. The TWI-3000 operating conditions are presented in Table III-7.

B. Trial Burn

A trial burn will be performed to determine the performance of the TWI-3000 prior to full time operation of the proposed incinerator. The trial burn will be used to verify the following projected performance parameters:

- A Primary Organic Hazardous Constituent (POHC) DRE of more than 99.99%.
- A stack gas hydrogen chloride (HCl) removal efficiency of more than 99%.
- A stack gas particulate removal efficiency of more than 99.5%, and a stack gas particulate loading of less than 0.8 grains per dscf corrected to 7% O_2.

The Trial Burn Parameter Summary is presented in Table III-8. The trial burn will be performed by certified laboratory personnel and will be monitored by the EPA and the DOH.

6. Characterization of Waste Fuels

The composition of the waste feed is critical in determining the impact of emissions from the proposed incinerator. For this reason, each batch of waste feed will be analyzed prior to incinerating the waste. The Sampling, Quality Control, and Analysis Procedures are presented in Table III-9. The characteristics of the wasted feed that will be incinerated in the TWI-3000 are presented in Table III-10. The types of wastes which will be treated in the TWI-3000 are presented in Table III-11.

Table III-7

TWI-3000 Operating Conditions

Parameter	Operating Range
Burner temperature	2200 ± 200 F
Afterburner temperature	1800 ± 200 F
Combustion air flow rate	2000 ± 200 cfm
Combustion air delivery pressure	10 ± 10 in W.C.
Excess air ratio	150 ± 50%
Superficial combustion gas velocity through burner/afterburner	12 ± 3 fps
Stack gas flow rate (calculated)	5400 ± 400 acfm @ 300 F
Stack gas carbon monoxide concentration	< 100 ppm
Spray dryer temperature	300 ± 50 F
Quench water flow rate	1-8 gpm
Quench water pH	7-14 pH
Baghouse pressure drop	2-8 in W.C.
Baghouse temperature	300 ± 50 F
Waste feed flow rate	800 lb/hr maximum
Maximum chlorine input	240 lb/hr

Table III-8

Trial Burn Parameter Summary

Runs 1 & 2 (High and Medium Heating Value Wastes)

Matrix	Substance	Sampling Method	Preparation Method	Analytical Method	Detection Limit	Purpose
Waste Feed	Carbon tetrachloride	Tap(S004)	SW-846 5030	SW-846 8240	2.8 ppb	Calculation of POHC DRE
Waste Feed	Chlorine	Tap(S004)		ASTM D129	0.1%	Calculation of HCL removal efficiency
Stack Gas	Carbon tetrachloride	Tedlar bag (S010)	Direct injection	SW-846 8240	2.8 ppb	Calculation of POHC DRE
Stack Gas	Hydrogen chloride	Impinger w/ NaOH		Mercuric nitrate titration	1 ppm	Calculation of HCL removal efficiency
Stack Gas	Particulates	EPA M-5		EPA M-5	0.0001 gr/dscf	Calculation of particulate loading
Stack gas	Carbon monoxide	Continuous		NDIR	5 ppm	Compliance with 40 CFR 264.37
Ash	All ash will be assumed to be hazardous and will be collected for re-incineration and encapsualization unless analysis indicates that the ash is not hazardous.					

Table III-8 (Continued)

Run 3 (Synthetic Hazardous Waste Blend)

Matrix	Substance	Sampling Method	Preparation Method	Analytical Method	Detection Limit	Purpose
Waste Feed	Carbon tetrachloride	Tap(S004)	SW-846 5030	SW-846 8240	2.8 ppb	Calculation of POHC DRE
Waste Feed	Chloroform	Tap(S004)	SW-846 5030	SW-846 8240	1.6 ppb	Calculation of POHC DRE
Waste Feed	Chlorobenzene	Tap(S004)	SW-846 5030	SW-846 8240	6.0 ppb	Calculation of POHC DRE
Waste Feed	1,1,1-Trichloroethane	Tap(S004)	SW-846 5030	SW-846 8240	5.0 ppb	Calculation of POHC DRE
Waste Feed	Mercury	Tap(S004)	SW-846 7470	SW-846 7470	0.2 ppm	Calculation of Hg removal efficiency
Waste Feed	Lead	Tap(S004)	SW-846 3040	SW-846 7420	0.1 ppm	Calculation of Pb removal efficiency
Waste Feed	Chlorine	Tap(S004)		ASTM D129	0.1%	Calculation of HCL removal efficiency
Stack Gas	Carbon tetrachloride	Tedlar bag (S010)	Direct injection	SW-846 8240	2.8 ppb	Calculation of POHC DRE
Stack Gas	Chloroform	Tedlar bag (S010)	Direct injection	SW-846 8240	1.6 ppb	Calculation of POHC DRE
Stack Gas	Chlorobenzene	Tedlar bag (S010)	Direct injection	SW-846 8240	6.0 ppb	Calculation of POHC DRE
Stack Gas	1,1,1-Trichloroethane	Tedlar bag (S010)	Direct injection	SW-846 8240	5.0 ppb	Calculation of POHC DRE

Table III-8 (Continued)

Matrix	Substance	Sampling Method	Preparation Method	Analytical Method	Detection Limit	Purpose
Stack Gas	Pyro(a)Benzene	EPA MM-5	SW-846 3530	SW-846 8250	2.5 ppb	Health risk assessment
Stack Gas	TCDD	EPA MM-5	SW-846 3530	SW-846 8280	1.0 ng/cu m	Health risk assessment
Stack Gas	Benzene	Tedlar bag (S010)	Direct injection	SW-846 8240	4.4 ppb	Health risk assessment
Stack Gas	Vinyl chloride	Tedlar bag (S010)	Direct injection	SW-846 8240	1.0 ppb	Health risk assessment
Stack Gas	Nitrogen dioxide	Glass flask (S010)		Phenoldisul-fonic acid method	1 ppm	Health risk assessment
Stack Gas	Hydrogen chloride	Impinger w/ NaOH		Mercuric nitrate titration	1 ppm	Calculation of HCL removal efficiency
Stack Gas	Mercury	EPA M-5	SW-846 7470	SW-846 7470	0.2 ppb	Calculation of Hg removal efficiency
Stack Gas	Lead	EPA M-5	SW-846 3040	SW-846 7420	0.1 ppm	Calculation of Pb removal efficiency
Stack Gas	Particulates	EPA M-5		EPA M-5	0.0001 gr/dscf	Calculation of particulate loading
Stack gas	Carbon monoxide	Continuous		NDIR	5 ppm	Compliance with 40 CFR 264.37

Table III-9

Sampling, Quality Control, and Analysis Procedures

Sampling Device	Procedure
Containers - COLAWISA	SW-846 1.2.1.1
Pipes - dipper	SW-846 1.2.1.2
Solids - scoop and shovel	SW-846 1.2.1.7

Chain of Custody Procedures	
Sample Labels	SW-846 1.3.1
Sample Seals	SW-846 1.3.2
Field Log Book	SW-846 1.3.3
Chain of Custody Record	SW-846 1.3.4
Sample Analysis Request Sheet	SW-846 1.3.5
Shipping of Samples	SW-846 1.3.6
Receipt and Logging of Sample	SW-846 1.3.7
Assignment of Sample for Analysis	SW-846 1.3.9

Sampling Procedure	Procedure
Containers	SW-846 1.2.1.1
Pipes	SW-846 1.2.1.3
Solids	SW-846 1.2.1.7

Proximate Analysis	Procedure		Detection Limit
Carbon content	ASTM	E191	0.1%
Hydrogen content	ASTM	E191	0.1%
Chorine content	ASTM	D129	0.1%
Sulfur content	ASTM	D129	0.1%
Water content	ASTM	D95	0.1%
Ash content	ASTM	D182	0.1%
Density	ASTM	D105	0.1%
Viscosity	ASTM	A597	5 SSU

Table III-9 (Continued)

Directed Analysis	Procedure		Detection Limit
Arsenic content	SW-846	7060	1 ppm
Beryllim content	SW-846	7090	1 ppm
Cadmium content	SW-846	7130	0.1 ppm
Chromium content	SW-846	7190	0.1 ppm
Lead content	SW-846	7420	0.1%
Mercury content	SW-846	7470	1 ppm
Acrylonitrile	SW-846	8240	0.1%
Benzidene	SW-846	8250	0.1 ppm
Chloroethyl Ether	SW-846	8240	0.1%
Chloromethyl Ether	SW-846	8240	0.1 ppm
1,3-Butadiene	SW-846	8240	0.1%
Dichlorobenzidene	SW-846	8250	1 ppm
2,4-Dinitrotoluene	SW-846	8250	1 ppm
Diphenyl Hydrazine	SW-846	8250	1 ppm
Ethylene Dibromide	SW-846	8240	0.1%
Ethylene Dichloride	SW-846	8240	0.1%
Hexachlorobenzene	SW-846	8250	0.1 ppm
Hexachlorocyclohexane	SW-846	8250	0.1 ppm
Nitrosamines	SW-846	8250	1 ppm

Table III-10

TWI-3000 Waste Feed Characterization

Characteristic	Limitations on Hazardous Waste	Analysis Procedures
EPA waste wumber	The following EPA waste numbers will be treated in the TWI-3000: D001, F001, F002, F003, F004, F005, F006, K001, K048, K049, K050, K051, K052, K062, K086	Inspection of manifest
Heating value	> 8,000 Btu/lb	ASTM E191
Viscosity	< 5,000 SSU	ASTM A597
Physical form of non-liquids	Diameter < 0.01 inch	Passes through # 100 mesh
Range of concentration of POHCs	The average concentration of criteria pollutants over the lifetime of the facility must be less than the TWI-3000 Waste Feed Composition Guidelines	SW 846 8240, 8270, 7060, 7090, 7130, 7190, 7420, 7470
Chlorine concentration	< 30%	ASTM D129
Ash content	< 40%	ASTM D182

Table III-11

EPA Hazardous Wastes Which Will be

Treated in the ATI Incinerator

EPA Hazardous Waste Number	Description
D001	Ignitable wastes
F001	Halogentaed solvents used in degreasing
F002	Halogenated solvents
F003	Non-halogenated solvents
F004	Non-halogenated solvents
F005	Non-halogenated solvents
F006	Wastewater treatment sludges
K001	Wood preservation wastewater treatment sludge
K048	Dissolved air flotation float from the petroleum industry
K049	Slop oil
K050	Heat exchanger bundle cleaning sludge
K051	API separator sludge
K052	Tank bottoms
K062	Spent pickle liquor
K086	Ink formulations

8. Volume of Wastes to be Treated

The design capacity of the proposed incinerator is 800 lb/hr, or approximately two 55 gallon drums per hour, based upon a waste feed heating value of 8,000 Btu/lb. The design capacity of the proposed incinerator is 400 lb/hr based upon a waste feed heating value of 16,000 Btu/lb.

9. Projected Volume of Emissions

The emissions from the proposed incinerator stack will play a primary role in determining the environmental impact of the proposed incinerator. The projected emissions are based upon the performance of hazardous waste incinerators which are similar in design and operating conditions.

The projected stack gas CO level of 20 ppm is based upon performance similar to the EPA Office of Research and Development Portable Incinerator which was operated in Edison, New Jersey. (Yezzi, 1984). The EPA incinerator featured a similar afterburner size, geometry, temperature, and residence time.

The projected stack gas HCl removal efficiency of 99% is based upon performance similar to the measured performance of five spray dryer/fabric filter HCl pollution control systems (Frame, 1988). If the HCl removal efficiency is established to be less than 99% during the trial burn, the maximum waste feed chlorine concentration will be adjusted to generate less than 4.4 pounds of stack gas HCl per hour.

The particulate removal efficiency of 99.5% is based upon baghouse performance similar to the lowest baghouse particulate removal efficiency presented in a review of four spray dryer/baghouse air pollution control systems (Frame, 1988). Although the systems reviewed are significantly larger than the proposed ATI incinerator, the efficiency of a baghouse is a function of each filter bag performance, rather than the performance of the system as a whole; which allows for direct comparison between systems that are similar in design but dissimilar in scale.

The Estimated Maximum TWI-3000 Emission Rates and the reference cited are presented in Table III-12.

10. Projected Volume of Wastes to be Generated

The volume of waste which will be generated by the TWI-3000 is a function of the composition of the waste feed. The projected waste stream sources and generation rates are presented in Table III-13. The wastes generated by the TWI-3000 will be collected and shipped to a mainland treatment facility.

11. Interim and Ultimate Uses of the Proposed Site

The proposed site will be used as a hazardous waste treatment facility for 70 years. When the site is no longer going to be used to treat hazardous waste, the site will be closed by performing the following steps:

- All hazardous waste on the site will be treated or shipped to a hazardous waste treatment facility.
- All equipment and structures will be decontaminated.
- All hazardous waste generated during the decontamination process will be treated on-site or shipped to a hazardous waste treatment facility.
- All equipment and structures will be removed from the site.
- The site soil will be sampled and analyzed for contamination, and all contaminated soil will be treated on-site or removed from the site and disposed of in a hazardous waste landfill.
- An engineer registered in the State of Hawaii will certify that the site has been closed in accordance with all EPA and DOH requirements.

Table III-12

Estimated Maximum TWI-3000 Emissions

Substance	Concentration, ppb by weight	Mass Rate, lb/day	Mass Rate, lb/yr	Source
* Benzene	1.65	0.0007	0.244	1
Carbon tetrachloride	20.00	0.0081	2.965	2
Chloroform	82.75	0.0336	12.264	1
Ethylene dichloride	20.00	0.0081	2.965	2
Hexachlorobenzene	6.90	0.0028	1.022	1
Hexachloroethane	20.00	0.0081	2.965	2
* TCDD	1.75 10exp-4	6.39 10exp-8	2.33 10exp-5	1
Tetrachloroethane	20.00	0.0081	2.965	2
Tetrachloroethylene	2.71	0.0011	0.402	1
Trichloroethane	20.00	0.0081	2.965	2
* PAHs	0.016	6.47 10exp-6	0.002	1
* Vinyl chloride	0.71	2.90 10exp-4	0.106	1
* Nitrogen dioxide,ppm	75	30.39	11,092	3
Hydrogen chloride,ppm	6.6	2.66	971	1

Table III-12 (Continued)

Substance	Concentration, ppb by weight	Mass Rate, lb/day	Mass Rate, lb/yr	Source
Sulfur dioxide,ppm	1	0.39	143	1
* Carbon monoxide,ppm	20	8.10	2,956	2
Particulates > 10u	0.005 gr/dscf	1.72	628	4
Particulates < 10u	0.005 gr/dscf	1.72	628	4
Lead	2.76	0.00112	0.4098	1
Chromium	0.227	0.000092	0.0336	1
Nickel	0.125	0.000051	0.0186	1
Cadmium	0.0220	0.0000089	0.0032	1
Arsenic	0.0088	0.0000036	0.0013	1
Beryllium	0.0059	0.0000024	0.0009	1
Zinc	1.856	0.000752	0.2745	1
Cobalt	0.0691	0.000028	0.0102	1
Molybdenum	0.242	0.000098	0.0358	1
Barium	0.616	0.00025	0.0912	1
Selenium	0.00049	0.00000023	0.00007	1
Antimony	0.0108	0.0000044	0.0016	1

Table III-12 (Continued)

Substance	Concentration, ppb by weight	Mass Rate, lb/day	Mass Rate, lb/yr	Source
Copper	0.3948	0.00016	0.0584	1
Mercury	0.0121	0.0000049	0.0438	1
Vanadium	0.00025	0.00012	0.0438	1

* products of incomplete combustion

Sources:

1. Bright and Associates, 1985.
2. Trenholm, 1984.
3. Yezzi, 1982.
4. Flex Kleen, 1987.

Table III-13

Projected Facility Waste Generation Rate

Type of Waste	Source	Daily Generation Rate, lb	Monthly Generation Rate, lb	Annual Generation Rate, lb
Bottom ash	slag taps			
maximum		384	11,520	138,240
minimum		96	1,152	13,824
Fly ash	spray dryer baghouse			
maximum		11,904	357,120	4,285,440
minimum		768	23,040	276,480
Scrubber water	none (dry gas scrubbing technology)	0	0	0
Cleaning liquids	none (cleaning liquids will be incinerated)	0	0	0
Cleaning solids	spill collection wipe rags safety equipment	10	300	3,600
Lab materials	sampling bottles cal. standards vials	1	30	360
Total				
maximum		12,299	368,970	4,427,640
minimum		875	24,522	294,840

12. Regulations and Monitoring

A complex set of regulations and standards will govern the treatment of hazardous waste at the proposed facility. These regulations will be administered by City and County, State, and Federal agencies. The purpose of this section if the EIS is to describe the permitting and monitoring requirements for the proposed facility.

A. City and County

Since the proposed facility will be located within a Shoreline Management District, an EIS has been prepared to insure compliance with the Shoreline Management District requirements. A Type II Conditional Use Permit (CUP) application will be submitted to the Department of Land Utilization upon the completion of the EIS process. The CUP process includes a public hearing, and a CUP will not be issued until the questions raised at the public hearing have been addressed to the satisfaction of the Department of Land Utilization. The Building Department will issue permits for the construction of the incinerator, pollution control equipment, containment vessel, and control room upon completion of the CUP process. The Ewa Community association must approve the project prior to the issuing of Building Permits.

B. Department of Health

The Department of Health must issue a Permit to Construct prior to the construction of the proposed facility. The Permit to Construct is based upon a review of the proposed TWI-3000 Operating Plan and the Health Risk Assessment (HRA) for the proposed facility. Both documents have been submitted, reviewed, revised, and resubmitted to the DOH.

A Permit to Operate must be issued by the DOH prior to the full time operation of the proposed facility. The Permit to

Operate is based upon a review of the trial burn results. The trial burn must demonstrate that the proposed facility complies with all statutory regulations for the operation of an emission source.

C. Environmental Protection Agency

The EPA must issue a Permit to Construct prior to the construction of the proposed facility. The Permit to Construct is based upon a review of the TWI-3000 Operating Plan and HRA. The ATI Operating Plan has been reviewed, a Notice of Deficiency was prepared, the Operating Plan was revised and re-submitted, and the revised Operating Plan is presently under review by the EPA. A public hearing will be held prior to issuing a Permit to Construct, and all issues raised at the public hearing must be addressed to the satisfaction of the EPA prior to issuing a permit to construct.

The EPA must issue a Permit to Operate prior to the full time operation of the proposed facility. The trial burn must demonstrate the following performance objectives prior to issuing a Permit to Operate:

- A primary organic hazardous constituent destruction and removal efficiency of more than 99.99%.
- A stack gas hydrogen chloride removal efficiency of more than 99%.
- A maximum stack gas dust content of less than 0.08 grains per dry standard cubic foot corrected to 7% O_2.

The stack gas flow rate, afterburner temperature, waste feed flow rate, lime slurry flow rate, auxiliary fuel flow rate, and stack gas CO level must be monitored on a continuous basis and a permanent copy of the monitored performance parameters must be maintained on file for three years. All personnel who operate the proposed facility must complete a training program. An approved

Contingency Plan must be in place prior to the issuance of a Permit to Operate. Any incidents involving hazardous waste that may have a potential environmental impact must be reported to the EPA within 30 days of the incident. Any discrepancies in the hazardous waste manifests must be reported to the EPA within 30 days of the incident. The proposed facility must operate with a $2,000,000 sudden accidental liability insurance policy. An approved Closure Plan must be in place before a Permit to Construct will be issued. A performance bond must be posted to insure that the financial resources necessary to perform the Closure Plan will be available to perform the Closure Plan when hazardous waste will no longer be treated at the proposed facility.

D. Self Monitoring

The following information will be maintained on file on a permanent basis in the Facility Operating Record:

- Certificates of Training for all personnel.
- Medical records for all personnel, including pre-employment physicals, annual physicals, and discharge physicals.
- Copies of all hazardous waste manifests.
- Copies of all waste feed analysis results.
- Copies of all continuously monitored incinerator operating parameter hard copies.
- Copies of all incinerator operating parameter log sheets.
- Copies of all inspection log sheets.
- Copies of all Contingency Plan implementation summary reports.
- Copies of all accident reports.
- Copies of unmanifested waste reports.
- Copies of annual waste reports.

CHAPTER IV: ENVIRONMENTAL SETTING AND IMPACT ANALYSIS

1. INTRODUCTION

This chapter contains discussions of potential environmental impacts associated with the proposed project. Each of the environmental impacts is considered in the following format:

- o The environmental setting prior to the proposed project is described.
- o The impacts associated with the operation of the proposed project are described.
- o Measures that would reduce or mitigate the impacts of the proposed project are described.
- o If significant unavoidable impacts are anticipated, they are described.

2. REGIONAL ENVIRONMENT

The natural environment of Oahu is dominated topographically by the Koolau and Waianae mountain ranges, and meteorologically by the Tradewinds and Kona winds. The Schofield Plateau links the two mountain ranges together. The mountain ranges have a significant impact upon the micro-climates of different locations on the island. The eastern and northern sides of the mountain ranges have tropical climates, while portions of the southern and western sides of the mountains have semi-arid climates.

The Tradewinds disperse emissions generated on the island of Oahu, while onshore winds and Kona Winds tend to return the emissions to Oahu.

Oahu has an adequate supply of drinking water. However, there is evidence of contamination of the groundwater with hazardous waste, as presented in Table III-2 (p.III-4).

3. LOCAL ENVIRONMENT

A. General Description

The proposed hazardous waste treatment facility will be located at the Campbell Industrial Park. The park is an industrial center for the island of Oahu, and includes two oil refineries, a cement manufacturing facility, a chemical plant, a metal recycling center, and a municipal waste incinerator. The local environment is presented in detail in Section II.

B. Topography

Environmental Setting: The topography of the proposed site is presented in Figure II-1 (p. II-3). The topography of the land surrounding the proposed facility is virtually flat. There are no major or minor topographic feature located within two miles of the proposed site. The western portion of the proposed facility is located in a 100-year floodplain as presented in Figure II-4 (p. II-6). The relationship of the site to the 100 year floodplain is presented in Figure II-3 (p. II-5). The basis for the floodplain designation is the possibility of inundation by a storm surge or Tsunami. The maximum flood depth is projected to be 9 feet above sea level, as presented in Figure II-4.

Barbers point is exposed to westerly and southerly ocean swells. The presence of well established offshore reefs concentrates wave energy well out to sea, rather than allowing the wave energy to generate coastal damage. Hurricane Iwa caused widespread wave damage on Oahu. The eye of the storm passed approximately 200 miles west of Barbers Point. The strength of hurricane Iwa and the close proximity to Barbers Point would classify this situation as a worst case event. The storm damage analysis of Hurricane Iwa (Chiu, 1983) indicated that no damage occurred at Barbers Point, although the adjacent communities from Makaha to Nanakuli suffered extensive wave damage.

The potential for Tsunamis to the west of Hawaii is not major. The primary area of concern on the Hawaiian Islands are costal regions with northerly or southerly exposures, i.e. to the Aleutian Islands or South America. These regions are noted for major Tsunami generating earthquakes. An investigation of the historical record provided no indication of Tsunami damage in the Barbers Point Area. A major factor for the lack of damage is the physical behavior of Tsunamis. Whereas points concentrate wave energy and bays dissipate wave energy, bays concentrate Tsunami energy and points dissipate Tsunami energy. Because Barbers Point is a well defined point, the hydrological environment is not conducive to generating significant Tsunami inundation.

<u>Impacts</u>: The proposed incinerator and associated pollution control equipment will be fabricated off site. The containment vessel and internal access road will be located above grade, and will not require excavation for its construction. The construction and operation of the proposed incinerator will not require any significant modifications to the existing topography.

<u>Mitigation Measures</u>: none required.

<u>Unavoidable Significant Impacts</u>: none.

C. <u>Geology and Soils</u>

<u>Environmental Setting</u>: the proposed facility will be located on a costal plain. The geology of the proposed site is presented in Figure II-5 (p. II-7). The costal plain is geologically stable, and Oahu is not subject to seismic activity as presented in 40 CFR 264.90.a.2.

<u>Impacts</u>: the hazardous waste handles at the proposed facility will be isolated from the site soil by a containment vessel. The containment vessel features secondary containment in case of

failure of the primary containment and a double polyethylene container to prevent contact between hazardous waste and the site soil in case of a structural failure. The containment vessel capacity is greater than 125% of the 5,000 gallon tanks used to store hazardous waste. In case of a spill within the containment vessel, an emergency drain system will be in place to drain the spilled material into an intact storage tank.

In case of a spill outside of the containment vessel, an approved Contingency Plan will be in place to allow for rapid treatment of the spill. Major spill abatement equipment and personnel will be available, including spill control pillows, absorbent material, and, if necessary, vacuum trucks with capacity greater than the capacity of the largest storage tank.

Mitigation Measures: The prevention of contact between the hazardous waste treated at the proposed facility and the site soil has been incorporated into the design and operation of the proposed facility, including primary and secondary containment. In case of an emergency, the equipment and personnel necessary to deal with the emergency will be available and a Contingency Plan has been prepared to insure that the proper procedures will be followed. If the soil on the site is contaminated with hazardous waste, the soil will either be treated on site or transported to a Class I landfill .

Analysis of the site soil is an integral part of the Closure Plan. The site soil will be analyzed for contamination with hazardous waste, and any contaminated soil will either be treated on site or transported to a Class I landfill. A professional engineer certified in the State of Hawaii will certify that the site has been closed in accordance with the EPA approved Closure Plan. A performance bond guaranteeing the performance of the Closure Plan will be posted prior to receiving hazardous waste on site.

Unavoidable Significant Impacts: None.

D. Surface Water

Environmental Setting. No surface water will be located on the proposed site or within two miles of the proposed site, as presented in Figure II-1 (p. II-3). The amount of drainage from the proposed site is a function of the amount of rainfall, which is intermittent. The annual rainfall at the proposed site is 18 to 40 inches. The majority of the rainfall occurs between November and March. Runoff flows will occur during and after heavy rains and last varying lengths of time depending upon the storm duration. The drainage from the site will run into the storm drain adjacent to the site and/or directly into the ocean.

Impacts: The surface water on the proposed site will not come into contact with the hazardous waste on the proposed site for the following reasons:

- The hazardous waste will be in a closed container, such as a drum, storage tank, or pipe, at all times prior to treatment.
- The storage tanks will be located in containment vessels.
- The containment vessel contents will be isolated from run on by a 6" curb.
- The containment vessel will be covered.
- All leaks and spills outside of the containment vessel will be remediated immediately as presented in the Contingency Plan.
- Any rainfall collected in the containment vessel will be transferred to a storage tank and treated as hazardous waste.

Mitigation Measures: The runoff from the proposed site will not be contaminated with hazardous waste. The maximum runoff rate will be absorbed by the existing storm drain system. No mitigation measures will be required for the proposed facility.

Unavoidable Significant Impacts: None.

E. Groundwater

Environmental Setting: The depth to groundwater at the proposed site is greater than 5 feet.

Impacts: The ATI containment vessel has been designed to accommodate spills associated with routine operations, as well as a failure of a storage tank, tanker truck, or primary containment vessel. The containment vessel includes secondary containment and a double polyethylene liner to prevent leakage in case of structural failure. The only potential source of groundwater contamination would be a failure of a tanker truck while the truck is transiting the internal access road. The Contingency Plan will be in place to insure that the equipment, personnel, and emergency response procedures will be available to deal with a major spill outside of the containment vessel.

The mixing depth, i.e. the depth to which incinerator emissions will penetrate the soil, is projected to be 15 cm (USNRC, 1977). The mixing depth is significantly less than the depth to groundwater at the proposed site. Similar hazardous waste incinerators have not caused an increase in the concentration of hazardous substances in the soil surrounding the facility (Badsha, 1985). It follows that the emissions will not have an impact upon the groundwater in the area surrounding the site.

Mitigation Measures: The mitigation measures required to protect groundwater are to inspect the tanks, valves, piping, and fitting on a daily basis for leaks on a daily basis, to inspect the integrity of the containment vessel on a daily basis, and to follow the Contingency Plan in case of a spill outside of the containment vessel. If necessary, any contaminated soil with the potential to contaminate groundwater will be treated on site or removed from the site and transported to a Class I landfill.

Unavoidable Significant Impacts: None.

F. Climate

Environmental Setting: The Honolulu climate is characterized by tropical conditions, with warm wet winters and warm dry summers. Tradewinds serve to moderate the climate in both the winter and the summer, although the Tradewinds are more consistent in the summer months. A semi-permanent high pressure system northeast of the islands is the primary reason for the mild climate.

Three wind movement patterns effect air movement at the proposed site: the Tradewinds, Kona winds, and sea/land winds. The Tradewinds blow approximately 80% of the time from the northeast at 10 to 20 mph. Kona winds blow from the south during the winter months and are associated with high temperatures and humidity. During the winter months, a sea/land breeze develops due to differential heating of the air over land and water masses. The sea land breeze occurs when both the Tradewinds and Kona winds are not blowing.

Impact: The scale of the proposed project is too small to have a significant effect on the micro-climate of the Campbell Industrial Park.

Mitigation Measures: None required.

Unavoidable Significant Impacts: None.

G. Air Resources

Environmental Setting: Hawaii is able to enjoy the cleanest air in the United Sates due to the relatively small population, the lack of major industry, and geographical isolation. The State of Hawaii is in compliance with the Clean Air Act standards for criteria pollutants, and Hawaii releases approximately 1,000,000 pounds of toxic air contaminants per year, which is the lowest rate of any State.

Because of the concentration of heavy industry at the Campbell Industrial Park, the air quality at the park is lower than the remainder of the State. The existing air quality for criteria pollutants is presented in Table IV-1. The modeled 24-hr SO_2 concentration of 224 ug/cu m is close to the National Ambient Air Quality Standard (NAAQS) of 365 ug/cu m. The modeled 3-hr SO_2 concentration of 1025 ug/cu m is close to the NAAQS of 1300 ug/cu m. However, the maximum SO_2 GLCs were re-modeled for the HPOWER facility PSD Application, and the re-modeling demonstrated a maximum 3-hr SO_2 concentration of 512 ug/cu m and a maximum 24-hr SO_2 concentration of 91 ug/cu m, which are well below the NAAQSs.

<u>Impacts</u>:

1. Vehicle Emissions: the volume of vehicle emissions generated by the proposed facility is presented in Table IV-2. Table IV-2 demonstrates that the projected volume of vehicle emissions generated by the proposed facility is 2.2 lb/day.

2. Dust Emissions: the proposed facility is projected to release 0.41 lb/day of dust based upon a stack gas flow rate of 5,4000 acfm and a stack gas particulate loading of 0.01 gr/dscf @ 7% O_2.

A potential source of dust emissions will be the failure to follow the ash handling procedures presented in the ATI Operating Plan. An Employee Training Plan has been developed to insure that the proper operational procedures are followed.

Significant dust generation has not been associated with the proper operation of a liquid injection hazardous waste incinerator.

Table IV-1

Existing Air Quality Based on Department of Health Monitoring and Computer Modeling Studies for Campbell Industrial Park, Oahu

Pollutant	Annual	Quarterly	2nd Higest 24-Hour	2nd Highest 8-Hour	2nd Highest 3-Hour	2nd Highest 1-Hour
SO_2	39		224		1025	
TSP	50		95			
NO_2	14					
CO				4.8		7.5
O_3						92
Pb		0.8				

Notes:
1. All concentrations in ug/cu m except CO in mg/cu m.
2. SO_2 values based upon ISCST and COMPLEX-1 modeling.
3. TSP based on DOH monitoring at Barbers Point (1984).
4. NO_2 values based upon last monitoring by DOH (1976).
5. CO values based upon DOH urban monitoring (1884).
6. O_3 values based upon DOH Sand Island Monitoring (1984).
7. Pb values based upon DOH urban Honolulu (Liliha) monitoring (1984).

Table IV-2

Facility Vehicle Emissions

Assumptions:

1. The average distance from the hazardous waste generation site to the proposed incinerator is 20 miles, or 40 miles per trip.
2. The distance from the proposed incinerator to an ash disposal facility is 25 miles, or 50 miles per trip, and 1 trip is required per week.
3. The vehicle emission rate is 27.66 grams/mile (1).
4. The average specific gravity of the hazardous waste incinerated is 1.0.

1. Vehicle miles required to operate the TWI-3000.

Total vehicle miles required to haul hazardous waste to TWI-3000 = average distance to generators site x

$$\frac{\text{annual capacity, lb}}{\text{density of waste feed x 5,000 gal/truckload}}$$

$$= \frac{\text{40 miles x 800 lb/hr x 24 hr/day x 330 day/year}}{\text{8.328 lb/gal x 5,000 gal/truckload}}$$

= 6,086

Total vehicle miles required to support incinerator operations =

$$\frac{\text{average trip length x number of days of operation}}{\text{days per trip}}$$

Table IV-2 (Continued)

$$= \frac{20 \text{ miles} \times 330 \text{ days}}{2 \text{ days per trip}}$$

= 3,300 miles

Total vehicle miles required to haul ash to a treatment facility = distance to disposal site x weeks of operation x loads per week

= 50 miles x 1 load/week x 48 weeks

= 2,400

Total vehicle miles required to operate incinerator = 6,086 + 3,300 + 2,400

= 11,786

2. Vehicle emissions generated by TWI-3000 $= \frac{\text{total vehicle miles} \times \text{emission rate per miles}}{453 \text{ g/lb}}$

$$= \frac{11{,}786 \text{ miles} \times 27.66 \text{ g/mile}}{453 \text{ g/lb}}$$

= 719.6 lb

(1) EMPAC 6, Report 2, prepared by the SCAQMD

3. Incinerator Emissions: The operation of the proposed incinerator will result in stack emissions. This section will quantify the projected emissions and discuss potential impacts within the framework of applicable air quality regulations. The projected TWI-3000 emission rates are presented in Table III-12 (p. III-41).

The Industrial Source Complex Short Term (ISCST) dispersion model was used to determine the Ground Level Concentration (GLC) of incinerator emissions from the proposed facility. The ISCST model uses hourly meteorological data collected from 1967 to 1971 at Barbers Point to determine the maximum average annual, 24-hr, 8-hr, and 1-hr GLC of incinerator emissions. A summary of the parameters used to run the ISCST model is presented in Table IV-3. The model was run to determine the location of the points of maximum impact, which are less than 800 m from the stack. A map of the receptor points is presented in Figure IV-1. A summary of the ISCST model output is presented in Table IV-4. A comparison of the Federal and State Ambient Air Quality Standards to the Projected TWI-3000 emissions is presented in Table IV-5.

The New Source Rule (NSR) establishes thresholds that require the use of BACT, the use of offsets, the requirement to comply with all applicable air quality regulations, and that the new source will not cause a violation or make measurably worse any NAAQS. The threshold values for the NSR and the projected TWI-3000 emissions rates are presented in Table IV-6. Table IV-6 indicates that the proposed incinerator will not exceed the NSR threshold values.

The Prevention of Serious Deterioration (PSD) Rule is designed to protect air that is relatively clean while allowing growth in areas that currently meet NAAQSs. If a facility emits more than the threshold amounts under the PSD rule, then the project must use the BACT, complete an ambient air quality modeling analysis, and monitor emissions from the facility. The PSD Rule thresholds and the projected TWI-3000 emission rates are presented in Table IV-7. Table IV-7 indicates that the projected

Table IV-3

Air Quality Dispersion Modeling Assumptions

Stack height	60' (18.29 m)
Stack flow rate	5,400 acfm
Stack velocity	90.0 ft/sec (27.43 m/sec)
Stack temperature	300 F (422.0 K)
Stack inside diameter	13.5" (0.356 m)
Local topography	flat
Deposition velocity	2 cm/sec
Stack tip downwash option	on
Building wake effects	not used (no building within 10 building heights)
Dispersion mode	rural
Regulatory default option	on

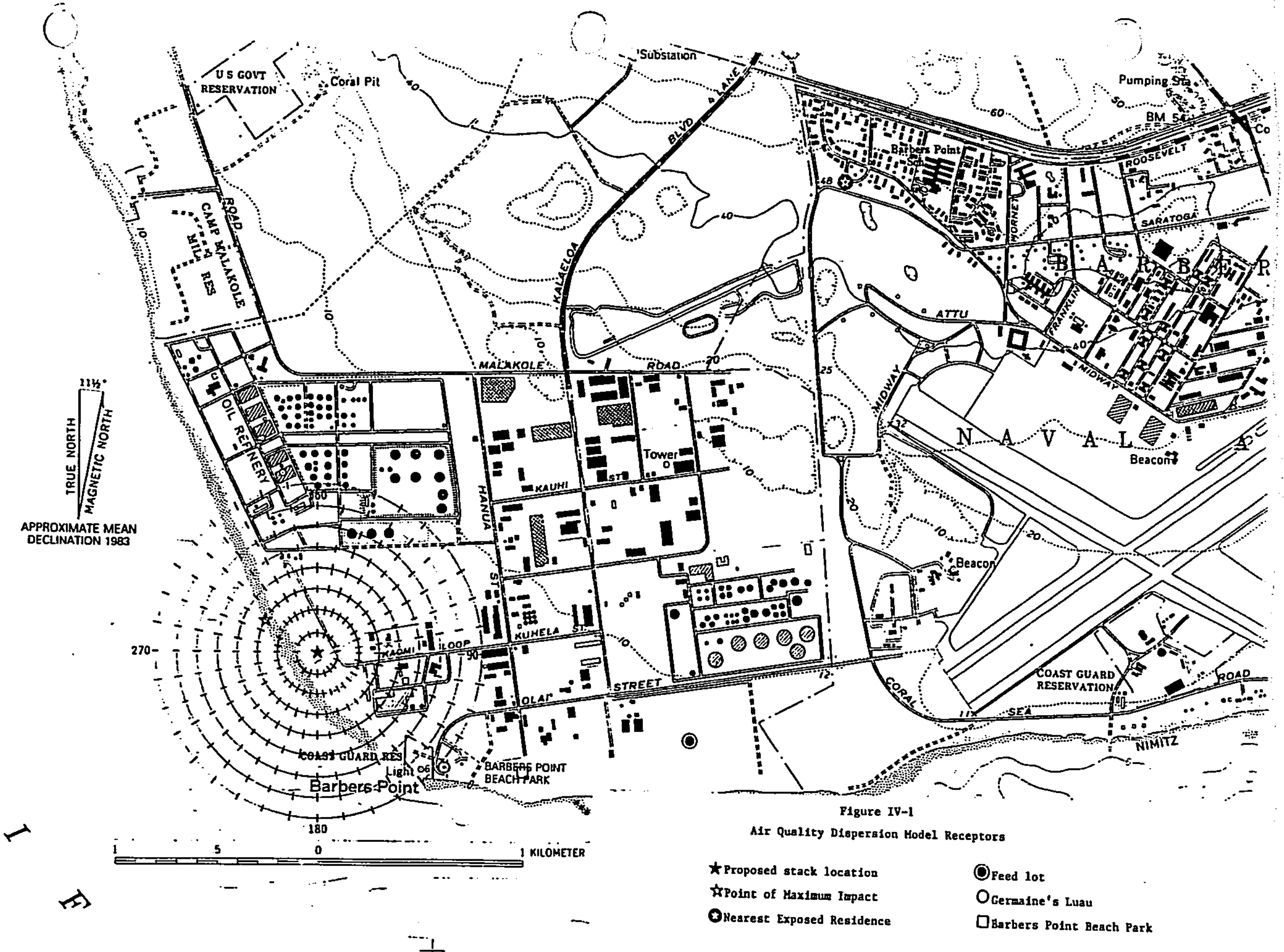

Figure IV-1
Air Quality Dispersion Model Receptors

★Proposed stack location
☆Point of Maximum Impact
Nearest Exposed Residence
Feed lot
Germaine's Luau
Barbers Point Beach Park

Table IV-4

Summary of Air Dispersion Modeling

Year/ Location m	Maximum Average GLC,ug/cu m	Maximum 24-hr GLC, ug/cu m	Maximum 8-hr GLC,ug/cu m	Maximum 1-hr GLC,ug/cu
1967	0.90215 310° 300 m	12.66807 20° 300 m Day 167	25.17545 20° 200 m Day 167 Period 2	46.17770 50° 400 m Day 225 Hour 18
1968	0.98805 300° 300 m	12.33012 20° 500 m Day 21	29.18182 360° 300 m Day 150 Period 2	45.87335 160° 400 m Day 158 Hour 17
1969	0.84595 210° 200 m	11.86670 340° 500 m Day 1	23.29220 340° 200 m Day 125 Period 2	44.97203 60° 400 m Day 150 Hour 17
1970	0.79521 290° 200 m	11.61478 210° 400 m Day 327	24.03023 330° 300 m Day 287 Period 2	45.97026 30° 400 m Day 286 Hour 17
1971	0.88181 310° 300 m	14.70993 360° 500 m Day 82	23.31549 330° 300 m Day 38 Period 2	65.49580 310° 200 m Day 365 Hour 11
Feed Lot	0.05500 120° 1900 m			
Closest Residence	0.03914 50° 3450 m			
Fish Habitat	1.32478			

Table IV-4 (Continued)

Year/ Location m	Maximum Average GLC,ug/cu m	Maximum 24-hr GLC, ug/cu m	Maximum 8-hr GLC,ug/cu m	Maximum 1-hr GLC,ug/cu
Germaine's Luau	0.07819 130o 825 m			
Barbers Point Beach Park	0.10696 120o 1200 m			

Table IV-5

Comparison Federal and State Air Quality Standards
to Projected TWI-3000 Emissions

Pollutant	Ambient Air Quality Standard			TWI-300 Emissions, ug/ cu m
	Averaging Time	State, ug/cu m	Federal, ug/cu m	
Carbon Monoxide	1-hr	10,000	36,000	2.78
	8-hr	5,000		1.34
Nitrogen Dioxide	1-hr	70	20	10.43
	1-yr		100	0.16
Sulfur Dioxide	3-hr	400		0.13
	24-hr	80		0.03
	1-yr	20	80	0.002
Total Suspended Particulates	24-hr	100	260	0.26
	1-yr	55	75	0.02

Table IV-5 (Continued)

Pollutant	Ambient Air Quality Standard			TWI-300 Emissions, ug/ cu m
	Averaging Time	State, ug/cu m	Federal, ug/cu m	
Lead	Quarterly	1.5	1.5	0.00005
Ozone	1 hr	100	236	0.0

Example: TWI-3000 1-hr NO_2 GLC $= \frac{30.39 \text{ lb/day} \times 453 \text{ g/lb} \times 65.49580 \text{ ug/cu m / g/sec}}{60 \text{ sec/min} \times 60 \text{ min/hr} \times 24 \text{ hr/day}}$

$= 10.43$ ug/cu m

Source: Table III-12, "Estimated Maximum TWI-3000 Emissions" and Table IV-4, "Summary of Air Dispersion Modeling".

Table IV-6

Comparison of New Source Rule Thresholds to Projected TWI-3000 Emissions

Pollutant	Threshold Emission Rate, lb/day	Threshold Emission Rate, lb/day
Carbon monoxide	550	8.10
Sulfur dioxide	150	0.39
Nitrogen oxides	100	30.39
Particulate matter	150	3.44
Hydrocarbons	75	0.0082
Lead compounds	3	0.00112

Table IV-7

Comparison of Prevention of Serious Deterioration Rule Thresholds to Projected TWI-3000 Emissions

Pollutant	Threshold Emission Rate, ton/year	TWI-3000 Emission Rate, ton/year
Asbestos	0.007	0
Beryllium	0.0004	0.0000004
Fluorides	3	0.438
Hydrogen Sulfide	10	0
Mercury	0.1	0.00002
Sulfur Dioxide	40	0.07
Sulfuric Acid Mist	10	0
Total Reduced Sulfur	1	0

TWI-3000 emissions are well below the PSD Rule thresholds. It should be noted that the proposed facility complies with all of the PSD Rule requirements. A comparison of the PSD de minimus thresholds and the maximum Ground Level Concentration (GLC) of emissions from the proposed incinerator is presented in Table IV-8. Table IV-8 indicates that the proposed facility will not have a significant impact using the PSD Rule de minimus thresholds as a criteria.

The DOH requires that no person shall cause or permit the emission from any incinerator of particulate matter to exceed 0.20 pounds per one hundred pounds of refuse charged. The projected TWI-3000 particulate emission rate is 0.02 pounds per one hundred pounds of refuse charged. The DOH limits the increase in the ambient SO_2 and particulate levels from an emission source. A comparison of the allowable incremental increase in the SO_2 and particulates with the GLC of emissions from the proposed incinerator is presented in Table IV-9. Table IV-9 indicates that the proposed facility will not exceed the allowable incremental increases for a Class II area.

4. Construction Emissions: The majority of the construction for the proposed facility will take place off site. The incinerator, pollution control system components, storage tanks, and control room will be fabricated off-site. The containment vessel and internal access road construction will not require any excavation. The construction of the proposed facility is not projected to generate significant dust emissions.

<u>Mitigation Measures</u>: the proposed hazardous waste treatment system has been designed and will be operated to minimize the impact of the facility upon the air quality at the Campbell Industrial Park. The following features have been incorporated into the design of the facility to achieve this goal:

o A fully enclosed waste feed storage and handling system. All

Table IV-8

Comparison of the GLC of the Estimated Maximum Daily Emissions from the Proposed Incinerator and the Prevention of Significant Deterioration Rule Monitoring Levels for Criteria Pollutants

Pollutants

Pollutant	Averaging Period	De Minimus Concentration, ug/cu m	Maximum Incinerator Emission Concentration, ug/cu m (1)
TSP	24-hr	10	0.26
SO2	24-hr	13	0.03
NO2	Annual	14	2.4
CO	3-hr	575	1.3
Pb	24-hr	0.1	9.0x10e-5
O3	NA	0	0
Hg	24-hr	0.25	3.7x10e-7
Be	24-hr	5.0x10e-4	1.8x10e-7
Vinyl chloride	24-hr	15	2.2x10e-5
Fluorides	24-hr	0.25	0.15 (2)

(1) Based upon Table II-12, "Estimated Maximum TWI-3000 Emissions".

(2) Based upon a waste feed fluorine content of 1% and a DRE of 90%.

Table IV-9

Comparison of the GLC of the Maximum Allowable Emissions from the Proposed Incinerator and the Allowable Increase Over Baseline Concentrations in Class II Areas

Substance	Averaging Period	Maximum Increase Over Baseline, ug/cu m	Maximum Incinerator Emission Concentration, ug/cu m (1)
Particulate matter	Annual geometric mean	19	1.6
	24-hr maximum	37	14.6
Sulfur dioxide	Annual arithmetic mean	20	2.1
	24-hr maximum	91	31.5
	3-hr maximum	512	88.5

(1) Based upon Table IV-14, "TWI-3000 Waste Feed Composition Guidelines".

fumes will be vented to the incinerator or to a fume incinerator when the TWI-3000 is not in operation.

- An integrated burner/afterburner with a residence time of more than two seconds and an operating temperature of 1800 ± 200 F.
- Ammonia injection for the reduction of NO_2 emissions.
- A dry gas scrubbing system for the neutralization of acid stack gases.
- A baghouse for the control of stack gas particulate emissions.
- A fully enclosed ash collection, handling, and storage system.
- An interlock system designed to automatically shut down the incinerator if any piece of equipment required for the safe operation of the incinerator malfunctions.
- An emergency waste feed cutoff system to interrupt the flow of waste feed into the incinerator if any design operating parameter is out of tolerance.
- Continuous monitoring and recording of the significant operating parameters to insure compliance with the conditions of the Permit to Operate.

Unavoidable Significant Impacts: None.

H. Public Health

Environmental Setting: The State of Hawaii enjoys the longest average life expectancy of any State, as well as the cleanest water, the cleanest air, the most beautiful environment, and the best recreational opportunities. This is due in large part to the lack of significant sources of pollution other than the automobile.

The average death rate from cancer is 1 in 4, or 250,000 per 1,000,000 lifetime fatalities. Hawaiian's are exposed to significant amounts of carcinogens from automobile emissions (benzene), dietary sources (pyro(a)benzene in burnt food, psoralens in celery, nitrosamines in bacon, alfatoxin in peanut butter, hydrazine in mushrooms, and alcohol), and drinking water (chloroform, trichloroethylene, ethylene dibromide, methylene chloride, benzene, and carbon tetrachloride).

Impact: No other aspect of the proposed facility has been subject to greater scrutiny than the public health impact. A Health Risk Assessment (HRA) has been prepared in accordance with the EPA guidelines.

1. Health Risk Assessment:

Health Risk Assessments (HRAs) are documents that use procedures developed by the Nuclear Regulatory Commission and the EPA to determine the effect of an emission source upon the maximum exposed individual. The fundamental concept of the ATI HRA is to control the composition of the waste feed in order to prevent the cancer risk for the maximum exposed individual from exceeding 1 in 1,000,000. Since the cancer risk for the maximum exposed individual will be less than 1 in 1,000,000, the exposed population is less than 1,000,000 persons, and the Ground Level Concentration (GLC) of incinerator emissions at the closest residence is less than 5% of the GLC at the point of maximum impact, the total number of cancer cases which will be generated by the proposed facility is projected to be significantly less than 1.

The ATI HRA is based upon the following assumptions:

1. The acceptable cancer risk for the maximum exposed individual is less than one in one million. Since the cancer risk for the maximum exposed individual is less than one in one million, and the maximum exposed population is less than one million, the societal cancer burden is less than one.

2. The maximum GLC of incinerator emissions will be below the level which would expose an individual to the recommended Environmental Exposure Limit or the Allowable Daily Intake for any substance emitted from the proposed incinerator.

3. The dose from each environmental exposure route for each substance emitted from the TWI-3000 stack is equal to:

dose,mg/kg-day = concentration of the substance in the exposure route medium,mg/kg x daily consumption rate,kg x exposure medium uptake rate / body weight,kg

3. The cancer risk from inhalation of a substance is equal to:

cancer risk = maximum annual ground level concentration of incinerator emissions,ug/cu m x unit risk factor,(ug/cu)e-1

4. The cancer risk from ingestion of a substance is equal to:

cancer risk = ingestion dose,mg/kg-day x potency slope,(mg/kg-day)e-1

5. The percentage of the total cancer risk from the inhalation exposure route is equal to:

% of total risk from inhalation = inhalation cancer risk / total cancer risk

6. The ground level concentration of incinerator emissions that will generate an acceptable cancer risk is equal to:

$$\text{GLC,ug/cu m} = \frac{\text{acceptable cancer risk x \% of risk from inhalation}}{\text{unit risk factor}}$$

7. The ground level concentration of a substance that makes up 100% of the waste feed is equal to:

GLC,ug/cu m = substance emission rate,g/sec x GLC predicted by the Industrial Source Complex dispersion model,ug/cu m / g/sec

8. The maximum concentration of a substance in the waste feed that will satisfy carcinogenicity criteria is equal to:

$$\text{maximum concentration,\%} = \frac{\text{GLC that will generate an acceptable cancer risk,ug/cu m}}{\text{GLC generated when the substance makes up 100\% of the waste feed, ug/cu m}}$$

9. The safety factor for exposure to the exposure to the recommended Environmental Exposure Limit is equal to:

$$\text{safety factor} = \frac{\text{maximum annual 1-hr GLC of incinerator emissions, ug/cu m}}{\text{recommended Environmental Exposure Limit, ug/cu m}}$$

10. The safety factor for exposure to the recommended Allowable Daily Intake of a substance from incinerator emissions is equal to:

$$\text{safety factor} = \frac{\text{maximum daily dose of incinerator emissions, mg/kg-day from exposure to the maximum average annual GLC of incinerator emissions, ug/cu m}}{\text{recommended Allowable Daily Intake, mg/kg-day x percentage of dose from inhalation}}$$

The ATI Health Risk Assessment is based upon performing the following steps:

1. The acceptable health risk criteria are defined.
2. The maximum average annual, 24-hr, and 1-hr concentrations of incinerator emissions are defined using 5 years of hourly meteorological data from Barbers Point and the EPA Industrial Source Complex Short Term dispersion model.
3. The potential environmental exposure routes are defined.
4. The unit risk factor and potency slopes are defined for each

carcinogenic substance.

5. The product of incomplete combustion (PIC) emissions rates are defined.

6. The dose and the associated risk from each environmental exposure route is defined.

7. The percentage of the total risk from each environmental exposure route is defined.

8. The incremental risk from products of incomplete combustion is determined.

9. The maximum concentration of each substance in the waste feed that will not exceed the acceptable cancer risk, including products of incomplete combustion, is determined.

10. The maximum concentration of each substance in the waste feed that will not exceed the recommended Environmental Exposure Limit is determined.

11. The maximum concentration of each substance in the waste feed that will not exceed the Allowable Daily Intake is determined.

12. The TWI-3000 Waste Feed Composition Guidelines are generated.

13. The test procedures and detection limits required to analyze hazardous waste samples to determine if the waste complies with the Waste Feed Composition Guidelines are defined.

A flow chart of the ATI Health Risk Assessment methodology is presented in Figure IV-2. By defining the allowable concentration of each priority hazardous substance in the waste feed, and analyzing the waste feed prior to incineration, it will be possible to insure that the operation of the proposed incinerator does not generate a significant risk for the maximum exposed individual or any member of the surrounding communities.

2. Carcinogenic Risks:

A Risk Assessment Program (RAP) was written to determine the maximum concentration of a specific carcinogenic substance that may be present in the waste feed blend that will not generate more than a 1 in 1,000,000 chance of cancer for a person exposed to the maximum dose of carcinogens, including PICs, emitted by the TWI-3000.

The RAP performs the following steps:

1. The input parameters are loaded into the program. The input parameters are listed in the tabular output in order to confirm that the correct assumptions were used to run the program.

2. The percentage of the total risk associated with each environmental exposure route is determined. The percentage of the total risk associated with each environmental exposure route is listed in a tabular output for each of the hazardous substances of major concern.

3. The risk associated with each product of incomplete combustion is calculated, totaled, and printed in the tabular output.

4. The maximum allowable concentration of specific carcinogens in the waste feed is determined.

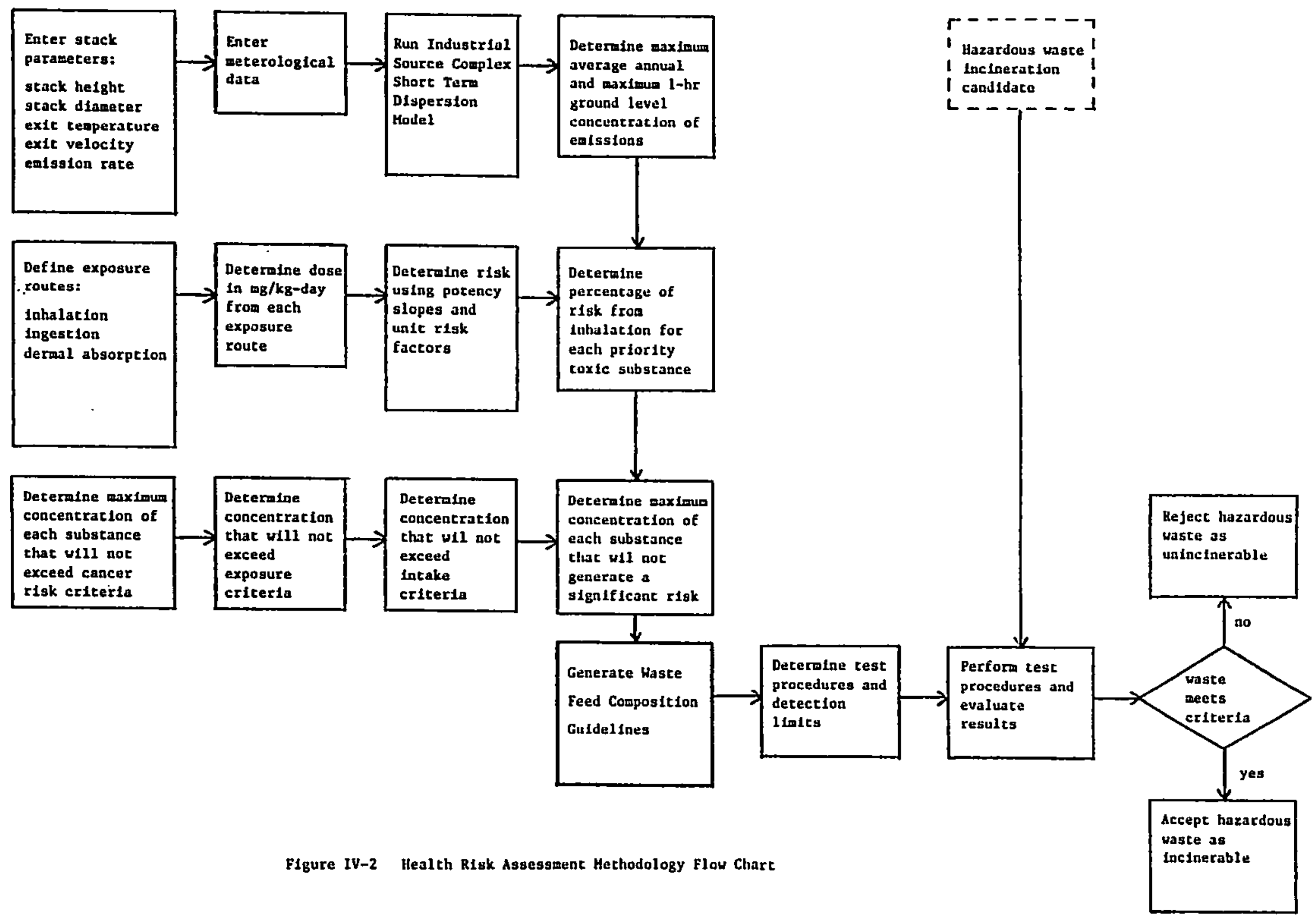

Figure IV-2 Health Risk Assessment Methodology Flow Chart

A summary of the projected incinerator and pollution control system performance used to generate the RAP are presented below:

DRE for organic hazardous constituents	= 99.99%
DRE for hydrogen chloride	= 99%
DRE for SO_2, HF, HBr	= 90%
DRE for mercury	= 30%
DRE for heavy metals	= 99.5%

The industrial site exposure scenario assumes that the maximum exposed individual is exposed to the maximum average annual GLC on land, since 70 years of continuous exposure at sea is considered to be an unrealistic assumption. The maximum exposed individual is exposed to the following environmental exposure routes:

1. Inhalation
2. Dermal absorption
3. Dust and soil inhalation
4. Dust and soil ingestion
5. Ingestion of fish from water exposed to emissions
6. Ingestion of milk from cows exposed to emissions
7. Ingestion of beef from cows exposed to emissions

The ingestion of home grown vegetables or mother's milk is not considered to be significant because no homes are located within two miles of the proposed site. A RAP for the residential exposure scenario was run, including all of the above exposure routes as well as the ingestion of home grown vegetables and mother's milk. The residential site exposure scenario results in a cancer risk that is less than 5% of the industrial site exposure scenario due to the significantly lower GLC of incinerator emissions, as presented in Table IV-4 (p. IV-15).

The RAP output is presented in Table IV-10. The first output table presents the basic assumptions used to run the program, the substances of concern, the soil elimination rate constant, the vegetable uptake rate, the body elimination rate constant, the bio-accumulation factor, the plant, soil, cow's milk, beef, fish, and mother's milk ingestion uptake rates; the unit risk factor, the potency slope, the vapor pressure, and the projected destruction and removal efficiency for each substance of concern. If a plant, soil, cow's milk, beef, fish, or mother's milk uptake rate is set to zero, the exposure route is not considered to be significant.

The second output table is a printout that is used to check the soil concentration, plant deposition concentration, and air concentration generated by the RAP.

The third output table presents the percentage of risk associated with each environmental exposure route for the industrial site exposure scenario, as well as the incremental risk associated with PICs.

The fourth output table presents the maximum concentration of individual carcinogens in the TWI-3000 waste feed that will generate a maximum annual GLC that will cause a 1 in 1,000,000 chance of cancer for an individual exposed to the maximum projected dose from all environmental exposure routes for 70 years, including the incremental risk associated with PICs.

Because the ATI incinerator features an afterburner temperature of 1,800 ± 200 F, a residence time of more than 2 seconds (EPA guidelines for incinerators with a OHC DRE of 99.9999%), and proprietary turbulence generating features, it is reasonable to assume that the OHC DRE will be greater than 99.99%. For example, the EPA-ORD incinerator operated in Edison, NJ demonstrated a DRE for carbon tetrachloride of more than 99.99997 (Yezzi, 1984), which is considered to be one of the most difficult to incinerate hazardous substances. The ENSCO incinerator operated in Arkansas demonstrated a DRE of more than 99.999999 (Acharya, 1987) for PCB, which is also difficult to

Table IV-10 Health Risk Assessment Program Output

INPUT PARAMETERS

body weight, kg	70.00
inhalation rate, cu m/day	20.00
exposure period,years	70.00
lifetime in years	70.00
soil density, kg/cu m	1500.00
soil mixing depth, m	.15
inhalation absorption rate, ratio	1.00
dermal absorption rate, ratio	.01
soil loading rate, mg/day	541.000
soil inhalation rate, mg/day	1.199
soil ingestion rate, mg/day	.070
above ground vegetable intake rate, kg/day	.0190
below ground vegetable intake rate, kg/day	.0100
maximum average annual GLC @ 1g/sec, ug/ cu m	.98805
maximum annual 1-hr GLC @ 1 g/sec, ug/ cu m	65.49580
ratio of feed lot annual GLC to maximum GLC	.05566
ratio of fish habitat GLC to maximum GLC	1.34080
deposition velocity,m/sec	.02
maximum unit risk,dimensionless	.100000E-05
waste feed rate, lb/hr	800.00
plant weathering constant	.0387
body elimination rate constant	.0005130
fish ingestion rate, kg/day	.0324
beef ingestion rate, kg/day	.108
milk ingestion rate, kg/day	.584

substance	soil elimination rate constant	vegetable uptake rate	body elimination rate constant	bio accumu-lation
Acrylonitrile	1.00000	2.00000	.10E+01	.00E+00
Allyl Chloride	1.00000	2.00000	.10E+01	.00E+00
Benzene	1.00000	2.00000	.10E+01	.00E+00
Benzidene	1.00000	2.00000	.10E+01	.00E+00
Benzo(a)pyrene	.03470	.15000	.51E-03	.92E+03
Chloroethyl Ether	1.00000	2.00000	.10E+01	.00E+00
Chloromethyl Ether	1.00000	2.00000	.10E+01	.00E+00
1,3-Butadiene	1.00000	2.00000	.10E+01	.00E+00
Carbon Tetrachloride	1.00000	2.00000	.10E+01	.00E+00
TCDD	.05780	.01000	.51E-03	.50E+04
Chlorinated Ethanes	1.00000	2.00000	.10E+01	.00E+00
Chloroform	1.00000	2.00000	.10E+01	.00E+00
Dichlorobenzidene	1.00000	2.00000	.10E+01	.00E+00
2,4-Dinitrotoluene	1.00000	2.00000	.10E+01	.00E+00
Diphenyl Hydrazine	1.00000	2.00000	.10E+01	.00E+00
Ethylene Dibromide	1.00000	2.00000	.10E+01	.00E+00
Ethylene Dichloride	1.00000	2.00000	.10E+01	.00E+00

Epichlorhydrin	1.00000	2.00000	.10E+01	.00E+00
Ethylene Oxide	1.00000	2.00000	.10E+01	.00E+00
Formaldehyde	1.00000	2.00000	.10E+01	.00E+00
Hexachlorobenzene	1.00000	2.00000	.10E+01	.16E+05
Hexachlorocyclohexane	1.00000	2.00000	.10E+01	.00E+00
Methylene Chloride	1.00000	2.00000	.10E+01	.00E+00
Nitrosamines	1.00000	2.00000	.10E+01	.00E+00
Phenols	1.00000	2.00000	.10E+01	.10E+04
PCBs	.03470	2.00000	.51E-03	.67E+06
Trichloroethylene	1.00000	2.00000	.10E+01	.00E+00
Vinyl Chloride	1.00000	2.00000	.10E+01	.00E+00
Beryllium	1.00000	.00400	.10E+01	.10E+03
Cadmium	1.00000	.22000	.10E+01	.30E+03
Chromium	1.00000	.00500	.10E+01	.34E+01
Nickel	1.00000	.06000	.10E+01	.11E+01
Arsenic	1.00000	.01500	.10E+01	.40E+01
Antimony	1.00000	.06100	.10E+01	.40E+02
Copper	1.00000	.28000	.10E+01	.20E+03
Lead	1.00000	.01500	.10E+01	.30E+03
Manganese	1.00000	.08600	.10E+01	.10E+03

Mercury	1.00000	.33000	.10E+01	.50E+04
Hafnium	1.00000	.00000	.10E+01	.00E+00
Selenium	1.00000	.02500	.10E+01	.40E+03
Tin	1.00000	.01000	.10E+01	.10E+03
Vanadium	1.00000	.00350	.10E+01	.10E+04
Zinc	1.00000	1.00000	.10E+01	.10E+04
Hydrogen Chloride	1.00000	.00000	.10E+01	.20E+01
Sulfur Dioxide	1.00000	.00000	.10E+01	.20E+01

substance	plant ingestion uptake rate	soil ingestion uptake rate	cow milk ingestion uptake rate	beef ingestion uptake rate	fish ingestion uptake rate	milk ingestion uptake rate
Acrylonitrile	1.00	1.00	.00	.00	.00	.00
Allyl Chloride	1.00	1.00	.00	.00	.00	.00
Benzene	1.00	1.00	.00	.00	.00	.00
Benzidene	1.00	1.00	.00	.00	.00	.00
Benzo(a)pyrene	1.00	1.00	1.00	1.00	1.00	.00
Chloroethyl Ether	1.00	1.00	.00	.00	.00	.00
Chloromethyl Ether	1.00	1.00	.00	.00	.00	.00
1,3-Butadiene	1.00	1.00	.00	.00	.00	.00
Carbon Tetrachloride	1.00	1.00	.00	.00	.00	.00
TCDD	1.00	1.00	1.00	1.00	1.00	.00
Chlorinated Ethanes	1.00	1.00	.00	.00	.00	.00
Chloroform	1.00	1.00	.00	.00	.00	.00
Dichlorobenzidene	1.00	1.00	.00	.00	.00	.00
2,4-Dinitrotoluene	1.00	1.00	.00	.00	.00	.00
Diphenyl Hydrazine	1.00	1.00	.00	.00	.00	.00
Ethylene Dibromide	1.00	1.00	.00	.00	.00	.00
Ethylene Dichloride	1.00	1.00	.00	.00	.00	.00

Epichlorhydrin	1.00	1.00	.00	.00	.00	.00
Ethylene Oxide	1.00	1.00	.00	.00	.00	.00
Formaldehyde	1.00	1.00	.00	.00	.00	.00
Hexachlorobenzene	1.00	1.00	.00	.00	1.00	.00
Hexachlorocyclohexane	1.00	1.00	.00	.00	.00	.00
Methylene Chloride	1.00	1.00	.00	.00	.00	.00
Nitrosamines	1.00	1.00	.00	.00	.00	.00
Phenols	1.00	1.00	.00	.00	1.00	.00
PCBs	1.00	1.00	1.00	1.00	1.00	.00
Trichloroethylene	1.00	1.00	.00	.00	.00	.00
Vinyl Chloride	1.00	1.00	.00	.00	.00	.00
Beryllium	1.00	1.00	.00	.00	1.00	.00
Cadmium	1.00	1.00	.00	.00	1.00	.00
Chromium	1.00	1.00	.00	.00	1.00	.00
Nickel	1.00	1.00	.00	.00	1.00	.00
Arsenic	1.00	1.00	.00	.00	1.00	.00
Antimony	1.00	1.00	.00	.00	1.00	.00
Copper	1.00	1.00	.00	.00	1.00	.00
Lead	1.00	1.00	.00	.00	1.00	.00
Manganese	1.00	1.00	.00	.00	1.00	.00

Mercury	1.00	1.00	.00	.00	1.00	.00
Hafnium	1.00	1.00	.00	.00	1.00	.00
Selenium	1.00	1.00	.00	.00	1.00	.00
Tin	1.00	1.00	.00	.00	1.00	.00
Vanadium	1.00	1.00	.00	.00	1.00	.00
Zinc	1.00	1.00	.00	.00	1.00	.00
Hydrogen Chloride	1.00	1.00	.00	.00	.00	.00
Sulfur Dioxide	1.00	1.00	.00	.00	.00	.00

	inhalation unit risk factor (ug/cu m)e-1	ingestion potency slope (mg/kg-day)e-1	vapor pressure	destruction and removal efficiency, %
Acrylonitrile	.680E-04	.525E+00	83.000000	.9999
Allyl Chloride	.590E-05	.206E-01	295.000000	.9999
Benzene	.530E-04	.170E+00	75.000000	.9999
Benzidene	.670E-01	.234E+03	.000000	.9999
Benzo(a)pyrene	.170E-02	.115E+02	.000000	.9999
Chloroethyl Ether	.330E-03	.114E+01	30.500000	.9999
Chloromethyl Ether	.270E+01	.930E+04	36.300003	.9999
1,3-Butadiene	.670E-04	.430E+00	910.000000	.9999
Carbon Tetrachloride	.420E-04	.130E+00	91.000000	.9999
TCDD	.240E+01	.831E+04	.000000	.9999
Chlorinated Ethanes	.220E-04	.730E-01	62.000000	.9999
Chloroform	.230E-04	.810E-01	160.000000	.9999
Dichlorobenzidene	.480E-03	.169E+01	.000000	.9999
2,4-Dinitrotoluene	.190E-03	.680E+00	.000000	.9999
Diphenyl Hydrazine	.220E-03	.770E+00	.000000	.9999
Ethylene Dibromide	.720E-04	.240E+00	11.000000	.9999
Ethylene Dichloride	.220E-04	.730E-01	62.000000	.9999
Epichlorhydrin	.120E-05	.990E-02	13.000000	.9999

Ethylene Oxide	.880E-04	.000E+00	1095.000000	.9999
Formaldehyde	.130E-04	.460E-01	4433.000000	.9999
Hexachlorobenzene	.490E-03	.167E+01	.000000	.9999
Hexachlorocyclohexane	.570E-03	.200E+01	.000000	.9999
Methylene Chloride	.410E-05	.750E-02	350.000000	.9999
Nitrosamines	.430E-01	.150E+03	1.730000	.9999
Phenols	.570E-05	.200E-01	.360000	.9999
PCBs	.120E-02	.434E+01	.000000	.9999
Trichloroethylene	.130E-05	.110E-01	71.600006	.9999
Vinyl Chloride	.270E-05	.230E+01	2580.000000	.9999
Beryllium	.240E-02	.840E+01	.000000	.9950
Cadmium	.120E-01	.400E+02	.000000	.9950
Chromium	.150E+00	.510E+03	.000000	.9950
Nickel	.480E-03	.170E+01	.000000	.9950
Arsenic	.430E-02	.150E+02	.000000	.9950
Antimony	.000E+00	.000E+00	.000000	.9950
Copper	.000E+00	.000E+00	.000000	.9950
Lead	.000E+00	.000E+00	.000000	.9950
Manganese	.000E+00	.000E+00	.000000	.9950

Mercury	.000E+00	.000E+00	.000000	.3000
Hafnium	.000E+00	.000E+00	.000000	.9950
Selenium	.000E+00	.000E+00	.000000	.9950
Tin	.000E+00	.000E+00	.000000	.9950
Vanadium	.000E+00	.000E+00	.000000	.9950
Zinc	.000E+00	.000E+00	.000000	.9950
Hydrogen Chloride	.000E+00	.000E+00	760.000000	.9900
Sulfur Dioxide	.000E+00	.000E+00	760.000000	.4500

SUBSTANCE	SOIL CONCENTRATION AS A FUNCTION OF ISCST OUTPUT MG/KG	PLANT DEPOSITION AS A FUNCTION OF ISCST OUTPUT MG/KG	AIR CONCENTRATION AS A FUNCTION OF ISCST OUTPUT MG/KG
Acrylonitrile	.93E-04	.93E-04	.82E-05
Allyl Chloride	.33E-04	.33E-04	.82E-05
Benzene	.10E-03	.10E-03	.82E-05
Benzidene	.99E+00	.12E-01	.82E-05
Benzo(a)pyrene	.74E+00	.12E-01	.82E-05
Chloroethyl Ether	.21E-03	.21E-03	.82E-05
Chloromethyl Ether	.18E-03	.18E-03	.82E-05
1,3-Butadiene	.13E-04	.13E-04	.82E-05
Carbon Tetrachloride	.86E-04	.86E-04	.82E-05
TCDD	.48E+00	.12E-01	.82E-05
Chlorinated Ethanes	.12E-03	.12E-03	.82E-05
Chloroform	.54E-04	.54E-04	.82E-05
Dichlorobenzidene	.99E+00	.12E-01	.82E-05
2,4-Dinitrotoluene	.99E+00	.12E-01	.82E-05
Diphenyl Hydrazine	.99E+00	.12E-01	.82E-05
Ethylene Dibromide	.49E-03	.49E-03	.82E-05
Ethylene Dichloride	.12E-03	.12E-03	.82E-05

Epichlorhydrin	.42E-03	.42E-03	.82E-05
Ethylene Oxide	.11E-04	.11E-04	.82E-05
Formaldehyde	.35E-05	.35E-05	.82E-05
Hexachlorobenzene	.99E+00	.12E-01	.82E-05
Hexachlorocyclohexane	.99E+00	.12E-01	.82E-05
Methylene Chloride	.28E-04	.28E-04	.82E-05
Nitrosamines	.22E-02	.22E-02	.82E-05
Phenols	.80E-02	.80E-02	.82E-05
PCBs	.74E+00	.12E-01	.82E-05
Trichloroethylene	.10E-03	.10E-03	.82E-05
Vinyl Chloride	.55E-05	.55E-05	.82E-05
Beryllium	.49E+02	.61E+00	.41E-03
Cadmium	.49E+02	.61E+00	.41E-03
Chromium	.49E+02	.61E+00	.41E-03
Nickel	.49E+02	.61E+00	.41E-03
Arsenic	.49E+02	.61E+00	.41E-03
Antimony	.49E+02	.61E+00	.41E-03
Copper	.49E+02	.61E+00	.41E-03
Lead	.49E+02	.61E+00	.41E-03
Manganese	.49E+02	.61E+00	.41E-03

Mercury	.13E-02	.13E-02	.58E-01
Hafnium	.49E+02	.61E+00	.41E-03
Selenium	.49E+02	.61E+00	.41E-03
Tin	.49E+02	.61E+00	.41E-03
Vanadium	.49E+02	.61E+00	.41E-03
Zinc	.49E+02	.61E+00	.41E-03
Hydrogen Chloride	.15E-02	.15E-02	.82E-03
Sulfur Dioxide	.83E-01	.83E-01	.45E-01

% OF TOTAL RISK	INHL	SOIL INH	SOIL ING	DERMAL	PLANT	MILK	FISH	DAIRY
Acrylonitrile	99.99068	.00012	.00710	.00211	.00000	.00000	.00000	.00000
Allyl Chloride	99.99850	.00002	.00113	.00034	.00000	.00000	.00000	.00000
Benzene	99.99580	.00005	.00320	.00095	.00000	.00000	.00000	.00000
Benzidene	68.93687	.40462	23.62242	7.03611	.00000	.00000	.00000	.00000
Benzo(a)pyrene	17.23201	.14708	8.58706	2.55772	.00000	.00000	.09779	71.37836
Chloroethyl Ether	99.99051	.00012	.00722	.00215	.00000	.00000	.00000	.00000
Chloromethyl Ether	99.99182	.00011	.00624	.00186	.00000	.00000	.00000	.00000
1,3-Butadiene	99.99895	.00001	.00083	.00025	.00000	.00000	.00000	.00000
Carbon Tetrachloride	99.99654	.00005	.00264	.00079	.00000	.00000	.00000	.00000
TCDD	29.82477	.08428	4.92073	1.46567	.00000	.00000	.47082	63.23370
Chlorinated Ethanes	99.99490	.00007	.00388	.00115	.00000	.00000	.00000	.00000
Chloroform	99.99757	.00003	.00189	.00056	.00000	.00000	.00000	.00000
Dichlorobenzidene	68.76381	.40687	23.75401	7.07531	.00000	.00000	.00000	.00000
2,4-Dinitrotoluene	68.41109	.41147	24.02223	7.15520	.00000	.00000	.00000	.00000
Diphenyl Hydrazine	68.89116	.40521	23.65720	7.04647	.00000	.00000	.00000	.00000
Ethylene Dibromide	99.97887	.00028	.01607	.00479	.00000	.00000	.00000	.00000
Ethylene Dichloride	99.99490	.00007	.00388	.00115	.00000	.00000	.00000	.00000
Epichlorhydrin	99.95445	.00059	.03468	.01033	.00000	.00000	.00000	.00000
Ethylene Oxide	100.00003	.00000	.00000	.00000	.00000	.00000	.00000	.00000

Formaldehyde	99.99985	.00000	.00012	.00004	.00000	.00000	.00000	.00000
Hexachlorobenzene	67.16737	.38471	22.46004	6.68989	.00000	.00000	3.29800	.00000
Hexachlorocyclohexane	68.83751	.40591	23.69801	7.05863	.00000	.00000	.00000	.00000
Methylene Chloride	99.99934	.00001	.00052	.00015	.00000	.00000	.00000	.00000
Nitrosamines	99.89928	.00131	.07660	.02281	.00000	.00000	.00000	.00000
Phenols	99.31738	.00475	.27748	.08265	.00000	.00000	.31776	.00000
PCBs	17.31772	.07903	4.61380	1.37425	.00000	.00000	38.26384	38.35138
Trichloroethylene	99.98845	.00015	.00878	.00262	.00000	.00000	.00000	.00000
Vinyl Chloride	99.93855	.00080	.04675	.01392	.00000	.00000	.00000	.00000
Beryllium	68.87599	.40512	23.65199	7.04491	.00000	.00000	.02198	.00000
Cadmium	69.88245	.39147	22.85487	6.80748	.00000	.00000	.06372	.00000
Chromium	69.50845	.39716	23.18721	6.90648	.00000	.00000	.00073	.00000
Nickel	68.63676	.40852	23.85043	7.10402	.00000	.00000	.00024	.00000
Arsenic	68.96181	.40428	23.60280	7.03026	.00000	.00000	.00088	.00000
Antimony	68.88509	.00000	.00000	.00000	.00000	.00000	.00000	.00000
Copper	68.86086	.00000	.00000	.00000	.00000	.00000	.00000	.00000
Lead	68.84573	.00000	.00000	.00000	.00000	.00000	.00000	.00000
Manganese	68.87599	.00000	.00000	.00000	.00000	.00000	.00000	.00000
Mercury	98.42935	.00000	.00000	.00000	.00000	.00000	.00000	.00000

Hafnium	68.89114	.00000	.00000	.00000	.00000	.00000	.00000	.00000
Selenium	68.83061	.00000	.00000	.00000	.00000	.00000	.00000	.00000
Tin	68.87599	.00000	.00000	.00000	.00000	.00000	.00000	.00000
Vanadium	68.74001	.00000	.00000	.00000	.00000	.00000	.00000	.00000
Zinc	68.74001	.00000	.00000	.00000	.00000	.00000	.00000	.00000
Hydrogen Chloride	99.99934	.00000	.00000	.00000	.00000	.00000	.00000	.00000
Sulfur Dioxide	99.99930	.00000	.00000	.00000	.00000	.00000	.00000	.00000

UNIT RISK DUE TO PICs .311723E-08

SUBSTANCE	UNIT RISK FACTOR	CONCENTRATION IN uG/CU M	UNIT RISK	% OF WASTE FEED
Acrylonitrile	.680000E-04	.0146587	.996884E-06	147.352890
Allyl Chloride	.590000E-05	.1689608	.996884E-06	1698.437500
Benzene	.530000E-04	.0188083	.996884E-06	189.066132
Benzidene	.670000E-01	.0000103	.996884E-06	.103106
Benzo(a)pyrene	.170000E-02	.0001010	.996884E-06	1.015769
Chloroethyl Ether	.330000E-03	.0030206	.996884E-06	30.363556
Chloromethyl Ether	.270000E+01	.0000004	.996884E-06	.003711
1,3-Butadiene	.670000E-04	.0148787	.996884E-06	149.564362
Carbon Tetrachloride	.420000E-04	.0237345	.996884E-06	238.585190
TCDD	.240000E+01	.0000001	.996884E-06	.001245
Chlorinated Ethanes	.220000E-04	.0453106	.996884E-06	455.473389
Chloroform	.230000E-04	.0433417	.996884E-06	435.681641
Dichlorobenzidene	.480000E-03	.0014281	.996884E-06	14.355773
2,4-Dinitrotoluene	.190000E-03	.0035894	.996884E-06	36.081177
Diphenyl Hydrazine	.220000E-03	.0031217	.996884E-06	31.379684
Ethylene Dibromide	.720000E-04	.0138427	.996884E-06	139.150055
Ethylene Dichloride	.220000E-04	.0453106	.996884E-06	455.473389
Epichlorhydrin	.120000E-05	.8303580	.996884E-06	8346.968750

Ethylene Oxide	.880000E-04	.0113282	.996884E-06	113.874146
Formaldehyde	.130000E-04	.0766832	.996884E-06	770.839111
Hexachlorobenzene	.490000E-03	.0013665	.996884E-06	13.736307
Hexachlorocyclohexane	.570000E-03	.0012039	.996884E-06	12.102026
Methylene Chloride	.410000E-05	.2431408	.996884E-06	2444.111572
Nitrosamines	.430000E-01	.0000232	.996884E-06	.232810
Phenols	.570000E-05	.1736980	.996884E-06	1746.055664
PCBs	.120000E-02	.0001439	.996884E-06	1.446163
Trichloroethylene	.130000E-05	.7667447	.996884E-06	7707.511719
Vinyl Chloride	.270000E-05	.3689895	.996884E-06	3709.175049
Beryllium	.240000E-02	.0002861	.996884E-06	.057526
Cadmium	.120000E-01	.0000581	.996884E-06	.011673
Chromium	.150000E+00	.0000046	.996884E-06	.005464
Nickel	.480000E-03	.0014255	.996884E-06	.286633
Arsenic	.430000E-02	.0001599	.996884E-06	.032148

MAXIMUM CONCENTRATION IN WASTE FEED,%

	DRE=99.99	DRE=99.999	DRE=99.9999
Acrylonitrile	147.3529	1473.5288	14735.2891
Allyl Chloride	1698.4375	16984.3750	169843.7500
Benzene	189.0661	1890.6614	18906.6133
Benzidene	.1031	1.0311	10.3106
Benzo(a)pyrene	1.0158	10.1577	101.5769
Chloroethyl Ether	30.3636	303.6355	3036.3555
Chloromethyl Ether	.0037	.0371	.3711
1,3-Butadiene	149.5644	1495.6436	14956.4375
Carbon Tetrachloride	238.5852	2385.8518	23858.5195
TCDD	.0012	.0125	.1245
Chlorinated Ethanes	455.4734	4554.7344	45547.3398
Chloroform	435.6816	4356.8164	43568.1641
Dichlorobenzidene	14.3558	143.5577	1435.5774
2,4-Dinitrotoluene	36.0812	360.8118	3608.1177
Diphenyl Hydrazine	31.3797	313.7969	3137.9685
Ethylene Dibromide	139.1501	1391.5005	13915.0039
Ethylene Dichloride	455.4734	4554.7344	45547.3398
Epichlorhydrin	8346.9687	83469.6875	834696.8750

Ethylene Oxide	113.8741	1138.7415	11387.4141
Formaldehyde	770.8391	7708.3906	77083.9375
Hexachlorobenzene	13.7363	137.3631	1373.6306
Hexachlorocyclohexane	12.1020	121.0203	1210.2026
Methylene Chloride	2444.1116	24441.1172	244411.1875
Nitrosamines	.2328	2.3281	23.2810
Phenols	1746.0557	17460.5547	174605.5625
PCBs	1.4462	14.4616	144.6163
Trichloroethylene	7707.5117	77075.1250	770751.1875
Vinyl Chloride	3709.1750	37091.7500	370917.5000
Beryllium	.0575	.0575	.0575
Cadmium	.0117	.0117	.0117
Chromium	.0055	.0055	.0055
Nickel	.2866	.2866	.2866
Arsenic	.0321	.0321	.0321

incinerate. Both of these incinerators feature combustion chamber temperatures, residence times, and air pollution control devices that are similar to the ATI incinerator. For these reasons, it is reasonable to assess the health risk of the ATI incinerator with a OHC DRE of more than 99.99%.

The DRE assumptions for HCl, SO2, mercury, heavy metals, and other non-combustibles will remain the same for all projected performance scenarios.

The fifth Risk Assessment Program output table presents the maximum concentration (%) of hazardous substances in the waste feed that will satisfy the stated carcinogenic health risk criteria with a OHC DRE of 99.999% and 99.9999%.

The calculations used to project the risk associated with PIC emissions based upon the percentage of risk from each environmental exposure route and the calculations used to determine the acceptable risk from carcinogenic components in the waste feed are presented in Table IV-11.

3. Environmental Exposure Limits:

The Environmental Exposure Level (EEL) assessment is based upon comparing the maximum hourly GLC (ug/cu m) generated by the ATI incinerator emissions to weighted Occupational Exposure Limits (OELs). The sources of Occupational Exposure Limits are presented below. The most conservative Occupational Exposure Limit is used in all cases for the HRA.

1. Federal Ambient Air Quality Standards
2. National Institute of Occupational Safety and Health (NIOSH) Recommended Exposure Levels (RELs)
3. American Council of Government and Industry Hygienists (ACGIH) Threshold Limit Values (TLVs)
4. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs)

Table IV-11

Industrial Site Exposure Scenario

PIC Health Risk Assessment

	Emission rate, lb/hr	GLC, ug/cu m per g/sec	Unit Risk Factor	% of risk from Inhalation
TCDD	6.39E-08	9.88E-01	2.40E+00	2.98E+01
Benzene	6.70E-04	9.88E-01	5.30E-05	1.00E+02
PAHs	6.47E-06	9.88E-01	1.70E-03	1.72E+01
Vinyl chloride	2.90E-04	9.88E-01	2.70E-06	9.99E+01

	Emission rate, g/sec	GLC, ug/cu m	Incremental Risk
TCDD	3.35E-10	3.31E-10	2.66E-09
Benzene	3.51E-06	3.47E-06	1.84E-10
PAHs	3.39E-08	3.35E-08	3.31E-10
Vinyl Chloride	1.52E-06	1.50E-06	4.06E-12
Total			3.18E-09

Several carcinogenic substances do not have published OELs, since exposure to any of these substances in the workplace is to be avoided. The OEL for bis-chloromethyl ether will be used in these cases, since bis-chloromethyl ether is a highly potent carcinogen (potency slope = 1/9,300 mg/kg-day), and bis-chloromethyl ether has a published REL of 5.0 ug/cu m.

The EELs for substances evaluated in the HRA are presented in terms of ug/cu m in order to allow direct comparison the maximum annual 1-hr concentration of TWI-3000 emissions as predicted by the ISCST dispersion model.

The Occupational Exposure Limits are based upon 8-hour time weighted averages (TWAs). Since the operation of the TWI-3000 is continuous, the NIOSH RELs, ACGIH TLVs, and OSHA PELs must be weighted to reflect continuous exposure.

The weighting factor is determined as presented below:

$$\text{weighting factor} = \frac{\text{number of hours in the work week}}{\text{number of hours in the week}}$$

$$= \frac{40 \text{ hours}}{168 \text{ hours}} = 0.23809$$

Ambient Air Quality Standards have been established by the EPA for lead (1.5 ug/cu m) and vinyl chloride (10 ppb). These EELs will not be weighted, since they are air quality standards rather than Occupational Exposure Limits.

The concentration of each carcinogenic substance in the waste feed is based upon the allowable concentration of the substance in the waste feed that will satisfy the carcinogenic risk criteria. The concentration of non-carcinogenic heavy metals is assumed to be 40%, i.e. the maximum proposed non-combustible content in the waste feed. The concentration of chlorine and sulfur is assumed to be 30%. If the projected safety factor for a substance is less than two, the EEL analysis program reduces the projected concentration of the substance in the waste feed and recalculates the associated GLC and safety factor until the safety factor is at least 2.

The relationship between the maximum annual 1-hr GLC of emissions from the TWI-3000 and the weighted EELs for each substance of concern are presented in Table IV-12. Table IV-12 is based upon a maximum annual 1-hour GLC of 68.35370 ug/cu m for a substance emitted from the TWI-3000 stack at a rate of 1 g/sec.

4. Allowable Daily Intake:

The Allowable Daily Intake (ADI) of a substance is the amount of the substance that may be ingested daily for a lifetime without producing adverse non-carcinogenic effects. The ADI is expressed in units of mg/kg-day. Formal ADIs for some substances have been developed by the U.S. EPA and the National Academy of Sciences. In many cases, a formal ADI has not been developed for a substance. In these cases a projected ADI was determined using the following formula:

$$\text{ADI, mg/kg-day} = \frac{\text{EEL, ug/cu m} \times \text{hours in the work week used to determine the EEL} \times \text{inhalation rate, cu m/day}}{\text{hours in the week} \times \text{body weight, kg} \times \text{safety factor} \times \text{ug/mg}}$$

$$= \frac{\text{EEL} \times 40 \times 20}{168 \times 70 \times 10 \times 1000}$$

A safety factor of 10 was used as a default value to account for sensitive receptors. In cases where the ADI is based upon a

Table IV-12 Comparison of TWI-3000 Emissions to Recommended Environmental Exposure Levels

SUBSTANCE	EXPOSURE LIMIT UG/CU M	SOURCE	WEIGHTED EXPOSURE LIMIT UG/CU M	WASTE FEED CONCENTRATION %	INCINERATOR EMISSION CONCENTRATION UG/CU M	SAFETY FACTOR
Acrylonitrile	4500.00	ACGIH	1071.43	147.35	.972	1102.6
Allyl Chloride	3000.00	NIOSH	714.29	1698.44	11.200	63.8
Benzene	3000.00	NIOSH	714.29	189.07	1.247	572.9
Benzidene	5.00	ACGIH	1.19	.10	.001	1750.9
Benzo(a)pyrene	200.00	OSHA	47.62	1.02	.007	7109.1
Chloroethyl Ether	30000.00	ACGIH	7142.86	30.36	.200	35673.7
Chloromethyl Ether	5.00	ACGIH	1.19	.00	.000	48645.3
1,3-Butadiene	22000.00	ACGIH	5238.09	149.56	.986	5311.0
Carbon Tetrachloride	12000.00	NIOSH	2857.14	238.59	1.573	1816.0
TCDD	.01	LOAEL	.00	.00	.000	289.9
Chlorinated Ethanes	4000.00	NIOSH	952.38	455.47	3.004	317.1
Chloroform	50000.00	ACGIH	11904.76	435.68	2.873	4143.6
Dichlorobenzidene	5.00	ACGIH	1.19	14.36	.095	12.6
2,4-Dinitrotoluene	1500.00	OSHA	357.14	36.08	.238	1501.0
Diphenyl Hydrazine	5.00	ACGIH	1.19	31.38	.207	5.8
Ethylene Dibromide	326.00	NIOSH	77.62	139.15	.918	84.6
Ethylene Dichloride	4000.00	NIOSH	952.38	455.47	3.004	317.1

Epichlorhydrin	7600.00	ACGIH	1809.52	8346.97	55.043	32.9
Ethylene Oxide	1800.00	OSHA	428.57	113.87	.751	570.7
Formaldehyde	1500.00	ACGIH	357.14	770.84	5.083	70.3
Hexachlorobenzene	5.00	ACGIH	1.19	13.74	.091	13.1
Hexachlorocyclohexane	500.00	EPA	119.05	12.10	.080	1491.7
Methylene Chloride	261000.00	NIOSH	62142.86	2444.11	16.117	3855.7
Nitrosamines	5.00	ACGIH	1.19	.23	.002	775.4
Phenols	500.00	ACGIH	119.05	1746.06	11.514	10.3
PCBs	1.00	NIOSH	.24	1.45	.010	25.0
Trichloroethylene	135000.00	NIOSH	32142.86	7707.51	50.826	632.4
Vinyl Chloride	34.40	DHS	8.19	618.59	4.079	2.0
Beryllium	.50	NIOSH	.12	.06	.019	6.3
Cadmium	50.00	ACGIH	11.90	.01	.004	3093.5
Chromium	1000.00	OSHA	238.10	.01	.002	132182.6
Nickel	1000.00	ACGIH	238.10	.29	.094	2519.7
Arsenic	2.00	NIOSH	.48	.03	.011	44.9
Antimony	500.00	OSHA	119.05	10.00	3.297	36.1
Copper	100.00	OSHA	23.81	10.00	3.297	7.2
Lead	6.30	DHS	1.50	2.06	.679	2.2
Manganese	10000.00	ACGIH	2380.95	10.00	3.297	722.2

Mercury	50.00	ACGIH	11.90	.12	5.526	2.2
Hafnium	500.00	OSHA	119.05	10.00	3.297	36.1
Selenium	200.00	OSHA	47.62	10.00	3.297	14.4
Tin	2000.00	OSHA	476.19	10.00	3.297	144.4
Vanadium	50.00	NIOSH	11.90	10.00	3.297	3.6
Zinc	5000.00	OSHA	1190.48	10.00	3.297	361.1
Hydrogen Chloride	7000.00	OSHA	1666.67	30.00	19.780	84.3
Sulfur Dioxide	1300.00	NIOSH	309.52	3.87	140.490	2.2

No Observable Adverse Effects Level (NOAEL) or Lowest Observable Adverse Effects Level (LOAEL), a safety factor of 1,000 was used to account for the uncertainty in determining the ADI. The EEL derivation method is not intended to be used for the evaluation of community air pollution effects, but this method has been used by the U.S. EPA (1980) and some state agencies (Michigan Department of Natural Resources, 1984) to develop permissible exposure standards for contaminants in air and water.

Table IV-13 presents the ADI, the source used to determine the ADI, the safety factor incorporated into the ADI, the daily dose from exposure to emissions from the TWI-3000, the concentration of the substance in the waste feed used to determine the dose, and the safety factor for each substance of special interest evaluated in the ATI HRA.

The ATI HRA accounts for all environmental exposure routes in determining the dose from incinerator emissions. The dose from inhalation of TWI-3000 emissions is divided by the percentage of the total dose acquired by inhalation in order to account for environmental exposure routes other than inhalation. It is assumed that the potency for inhaled substances is the same as the potency for ingested substances in determining the non-carcinogenic effects of exposure to emissions from the TWI-3000.

5. Waste Feed Composition Guidelines

The HRA was used to generate a set of Waste Feed Composition Guidelines, which are presented in Table IV-14. By limiting the average composition of the waste feed treated in the proposed incinerator to less than the values presented in Table IV-14, it will be possible to satisfy the following health risk criteria:

- o The cancer risk for the maximum exposed individual will be less than 1 in 1,000,000.
- o The number of cases of cancer generated by the proposed incinerator will be less than 1.

Table IV-13 Comparison of TWI-3000 Emissions to Allowable Daily Intakes

SUBSTANCE	EADI MG/KG-DAY	SOURCE	SAFETY FACTOR	DOSE MG/KG-DAY	CONCENTRATION %	SAFETY FACTOR
Acrylonitrile	.03060	AGCIH	10.0	.000278	147.35289	110.21
Allyl Chloride	.02040	NIOSH	10.0	.003200	1698.43750	6.37
Benzene	.02040	NIOSH	10.0	.000356	189.06613	57.27
Benzidene	.00003	ACGIH	10.0	.000000	.10311	120.65
Benzo(a)pyrene	.00003	ANPE	10.0	.000011	1.01577	2.43
Chloroethyl Ether	.20400	ACGIH	10.0	.000057	30.36356	3565.60
Chloromethyl Ether	.00003	ACGIH	10.0	.000000	.00371	4862.19
1,3-Butadiene	.14965	ACGIH	10.0	.000282	149.56436	531.06
Carbon Tetrachloride	.08160	NIOSH	10.0	.000450	238.58519	181.52
TCDD	.00000	LOAEL	1000.0	.000000	.00015	1.05
Chlorinated Ethanes	.02721	NIOSH	10.0	.000858	455.47339	31.71
Chloroform	.34010	ACGIH	10.0	.000821	435.68164	414.31
Dichlorobenzidene	.00003	ACGIH	10.0	.000032	11.62818	1.07
2,4-Dinitrotoluene	.01020	OSHA	10.0	.000099	36.08118	102.65
Diphenyl Hydrazine	.00003	ACGIH	10.0	.000033	12.15713	1.02
Ethylene Dibromide	.00220	NIOSH	10.0	.000262	139.15005	8.39
Ethylene Dichloride	.02720	NIOSH	10.0	.000858	455.47339	31.69
Epichlorhydrin	.05170	ACGIH	10.0	.015734	8346.96875	3.29

Ethylene Oxide	.01220	OSHA	10.0	.000215	113.87415	56.86
Formaldehyde	.01020	ACGIH	10.0	.001452	770.83911	7.02
Hexachlorobenzene	.00003	ACGIH	10.0	.000031	11.12641	1.09
Hexachlorocyclohexane	.00340	EPA	10.0	.000033	12.10203	102.65
Methylene Chloride	1.77550	NIOSH	10.0	.004605	2444.11157	385.56
Nitrosamines	.00003	ACGIH	10.0	.000000	.23281	77.43
Phenols	.00300	NOAEL	1000.0	.002981	1571.44995	1.01
PCBs	.00001	NOAEL	1000.0	.000007	.62253	1.00
Trichloroethylene	.91830	NIOSH	10.0	.014523	7707.51172	63.23
Vinyl Chloride	.00130	DHS	100.0	.001166	618.58545	1.11
Beryllium	.00500	EPA	100.0	.000008	.05753	635.58
Cadmium	.00034	ACGIH	10.0	.000002	.01167	216.10
Chromium	.00480	EPA	500.0	.000001	.00546	6482.92
Nickel	.01000	EPA	100.0	.000039	.28663	254.23
Arsenic	.00140	EPA	10.0	.000004	.03215	318.85
Antimony	.00040	EPA	1000.0	.000386	2.82430	1.04
Copper	.00068	OSHA	10.0	.000654	4.78297	1.04
Lead	.00026	EPA	5.0	.000254	1.85302	1.03
Manganese	.06800	ACGIH	10.0	.001368	10.00000	49.73
Mercury	.00034	ACGIH	10.0	.000330	.02465	1.03

Hafnium	.00340	OSHA	10.0	.001367	10.00000	2.49
Selenium	.00304	EPA	15.0	.001368	10.00000	2.22
Tin	.01360	OSHA	10.0	.001368	10.00000	9.95
Vanadium	.00034	NIOSH	10.0	.000313	2.28768	1.08
Zinc	.03400	NIOSH	10.0	.001370	10.00000	24.81

Table IV-14 TWI-3000 Waste Feed Composition Guidelines

	MAXIMUM CONCENTRATION IN WASTE FEED,%			
	DRE=99.99	DRE=99.999	DRE=99.9999	SAFETY FACTOR
Acrylonitrile	147.3529	1473.5288	14735.2891	110.21
Allyl Chloride	1698.4375	16984.3750	169843.7500	6.37
Benzene	189.0661	1890.6614	18906.6133	57.27
Benzidene	.1031	1.0311	10.3106	120.65
Benzo(a)pyrene	1.0158	10.1577	101.5769	2.43
Chloroethyl Ether	30.3636	303.6355	3036.3555	3565.60
Chloromethyl Ether	.0037	.0371	.3711	4862.19
1,3-Butadiene	149.5644	1495.6436	14956.4375	531.06
Carbon Tetrachloride	238.5852	2385.8518	23858.5195	181.52
TCDD	.0002	.0015	.0151	1.05
Chlorinated Ethanes	455.4734	4554.7344	45547.3398	31.71
Chloroform	435.6816	4356.8164	43568.1641	414.31
Dichlorobenzidene	11.6282	116.2818	1162.8176	1.07
2,4-Dinitrotoluene	36.0812	360.8118	3608.1177	102.65
Diphenyl Hydrazine	12.1571	121.5713	1215.7134	1.02
Ethylene Dibromide	139.1501	1391.5005	13915.0039	8.39
Ethylene Dichloride	455.4734	4554.7344	45547.3398	31.69
Epichlorhydrin	8346.9687	83469.6875	834696.8750	3.29

Ethylene Oxide	113.8741	1138.7415	11387.4141	56.86
Formaldehyde	770.8391	7708.3906	77083.9375	7.02
Hexachlorobenzene	11.1264	111.2641	1112.6409	1.09
Hexachlorocyclohexane	12.1020	121.0203	1210.2026	102.65
Methylene Chloride	2444.1116	24441.1172	244411.1875	385.56
Nitrosamines	.2328	2.3281	23.2810	77.43
Phenols	1571.4500	15714.5000	157145.0000	1.01
PCBs	.6225	6.2253	62.2526	1.00
Trichloroethylene	7707.5117	77075.1250	770751.1875	63.23
Vinyl Chloride	618.5854	6185.8555	61858.5469	1.11
Beryllium	.0575	.0575	.0575	635.58
Cadmium	.0117	.0117	.0117	216.10
Chromium	.0055	.0055	.0055	6482.92
Nickel	.2866	.2866	.2866	254.23
Arsenic	.0321	.0321	.0321	318.85
Antimony	2.8243	2.8243	2.8243	1.04
Copper	4.7830	4.7830	4.7830	1.04
Lead	1.8530	1.8530	1.8530	1.03
Manganese	10.0000	10.0000	10.0000	49.73

Mercury	.0247	.0247	.0247	1.03
Hafnium	10.0000	10.0000	10.0000	2.49
Selenium	10.0000	10.0000	10.0000	2.22
Tin	10.0000	10.0000	10.0000	9.95
Vanadium	2.2877	2.2877	2.2877	1.08
Zinc	10.0000	10.0000	10.0000	24.81
Hydrogen Chloride	30.0000	30.0000	30.0000	84.26
Sulfur Dioxide	3.8742	3.8742	3.8742	2.20

- o The recommended Environmental Level or Allowable Daily Intake will not be exceeded for any substance emitted from the proposed incinerator.

The sum of the concentration of all substances in the waste feed must not exceed the guidelines. Each tank of waste feed will be analyzed prior to incineration using the procedures presented in Table III-9 (p. III-35).

6. Criteria Pollutants:

A comparison of the health effects of criteria pollutants and the associated GLC of criteria incinerator emissions is presented in Table IV-15. Table IV-15 demonstrates that the GLCs of criteria pollutants emitted by the proposed incinerator are significantly below the level which may generate significant health effects.

7. Competing Risks:

The concept in a 1 in 1,000,000 risk, which is the maximum possible risk of generating cancer for the maximum exposed individual, can be put into perspective by comparing the risk associated with common activities that may occur in a lifetime, which are presented in Table IV-16. It is essential to realize that the background cancer rate is 250,000 in 1,000,000. In addition, many toxicologists and epidemiologists are uncomfortable with the methods used to extrapolate low dose responses from high dose bioassys, as well as the procedures used to relate animal study data to human dose response curves (Ames, 1983). The projected cancer rate is an upper bound risk estimate, and the actual cancer risk may be several orders of magnitude lower.

It is also essential to realize that a large percentage of naturally occurring substances are carcinogenic. For example,

Table IV-15

Health Effects of Air Pollutants

Pollutant	Concentration/ Exposure Time, ug/ cu m	Observed Health Effects at Specified Concentration (1)	Concentration of TWI-3000 Emissions, ug/cu m
Ozone	500/1 hr	Increased frequency of asthma attacks.	0
	599/1 hr	Cough, chest discomfort and headache.	
	739/2 hr	Decline in pulmonary function in healthy individuals.	
Carbon Monoxide	14,478 - 20,973/ 8-hr	Can cause decreased exercise in patients with angina pectoris.	1.34 8-hr
	58,259/1-hr	Can cause impairment of time interval estimation and visual function.	2.78 1-hr
Nitrogen Dioxide	211/ minutes	Sensory responses may be elicited or altered.	10.43 1-hr
	Daily peak exceeds 861 on 10 % of days for 12 months	May cause some impairment of pulmonary function and increased incidence of acute respiratory disease.	0.16 1-yr

Table IV-15 (Continued)

Pollutant	Concentration/ Exposure Time, ug/ cu m	Observed Health Effects at Specified Concentration	Concentration of TWI-3000 Emissions, ug/cu m
Nitrogen Dioxide (Continued)	2,871/short term	Can cause difficulty in breathing for healthy as well as bronchitic groups.	10.43 1-hr
Lead	3.2/7 weeks	Increase in blood levels which may impair or decrease hemoglobin synthesis.	0.00005 1-yr
Sulfur Dioxide/ TSP	99 SO_2 and 100 TSP/yr	May cause higher frequencies of respiratory ailments	0.02 1-yr

(1) South Coast Air Quality Management District, "Summary of Air Quality in the South Coast Air Basin of California, 1983."

Table IV-16

Risks Which Increase the Chance of Death By

1 x10exp-6 (1 in 1,000,000)

Activity	Cause of Death
Smoking 1.4 cigarettes	Cancer, heart disease
Drinking 1/2 liter of wine	Cirrhosis of the liver
Travelling 6 minutes by canoe	Accident
Travelling 10 miles by bicycle	Accident
Traveling 300 miles by car	Accident
Flying 1,000 miles by jet	Accident
Flying 6,000 miles by jet	Cancer caused by cosmic radiation
One chest x-ray	Cancer caused by radiation
Eating 40 tablespoons of peanut butter	Cancer caused by acrylonitrile monomer
Drinking 30 12-oz cans of	Cancer caused by saccharin
Eating 100 charcoal-broiled steaks	Cancer from benzo(a)pyrene
Living in Southern California for seven months	Earthquake

Source: Wilson, R. "Analyzing the Daily Risks of Life". Technology Review, 1979 pp. 41-46.

Alfatoxin B-1, which is found in peanut butter at typical concentrations of 2 ppb, is virtually identical in toxicity to 2,3,7,8-tetrachloro dibenzo-p-dioxin (Wilson, 1986), which is found in virtually all combustion products (Lee, 1987). The stack gas TCDD concentration is projected to be 0.0004 ppb, which means that the cancer risk from eating peanut butter is 100,000 times greater than breathing the TCDD in the same weight of stack gas.

The American Society of Mechanical Engineers has examined public health records in 30 densely settled residential neighborhoods located within 1,000 yards of incinerators. No evidence of acute or chronic health effects were found (Kemp, 1984).

Mitigation Measures: the following mitigation measures have been incorporated into the design and operation of the proposed facility to minimize the public health impact of the proposed facility:

- The use of the BACT to maximize the reduction of toxic air contaminants.
- The generation of a set of Waste Feed Composition Guidelines to insure that the operation of the proposed incinerator complies with the acceptable health risk criteria.
- A set of waste feed analysis procedures that will insure that the waste feed complies with the Waste Feed Composition Guidelines.
- An emergency waste feed cutoff system to insure that the operation of the incinerator complies with the design operating parameters.
- A comprehensive recordkeeping system to monitor the waste feed analysis results and the incinerator operating parameters to provide hard data that the incinerator will be operated within the conditions of the Permit to Operate.

Significant Environmental Impact: None.

I. Biological Resources

Environmental Setting: The proposed site consists of an unimproved industrial lot. The site is surrounded by industrially zoned property. No significant biological resources that will be adversely effected by the construction of the proposed project were observed during a thorough inspection of the proposed site. This is due in large part to the small size of the proposed site and the fact that the proposed site consists of a grass field. The Office of Environmental Quality Control has not found any rare, threatened, or endangered animal or plant species on the proposed site.

Impacts: The portions of the site that are not used as operating areas will continue to be covered by grass. Every effort will be made to minimize the impact of construction and operations on the existing flora and fauna.

Mitigation Measures: None required.

Unavoidable Significant Impacts: None.

J. Visual Access

Environmental Setting: The proposed facility will be located in and industrial park. The environmental setting is presented in detail in Section II.

Impacts: The proposed facility will be surrounded by an 8' chain link fence topped with barbed wire with provision for eliminating a line of sight through the fence. The fence will be an effective visual barrier for operations at the proposed site. The roof of the containment vessel, the upper 2' of the incinerator, the upper 20' of the spray dryer and baghouse, and the upper 52' of the stack will be visible from outside of the facility. The view of the proposed facility from Kaomi Loop is presented in Figure IV-3.

The sections of the proposed facility that will be visible from Kaomi Loop are not inappropriate for the environment in which the facility will be located. No residences, parks, schools, or hospitals will be exposed to the visual impact of the proposed facility. The view of the proposed facility from the Pacific Ocean will not be significantly different from the existing view of the Hawaii Cement Company, Unitek Environmental Services, Brewer Chemical, and the Standard Oil refinery.

Mitigation Measures: An 8' chain link fence with slats to eliminate the view through the fence.

Unavoidable Significant Impacts: None.

K. Odor

Environmental Setting: The proposed site is presently free of odors.

Impact: The maximum 1-hr GLC of incinerator emissions is 0.14 ppm SO_2, which is approximately 7% of the odor threshold of 2 ppm. This level is based upon a waste feed sulfur content of 2.54%. although the normal waste feed sulfur content is projected to be less than 0.5%. The maximum 1-hr GLC of all other substances treated in the proposed incinerator is lower than SO_2. The maximum GLC of incinerator emissions is below the threshold of smell.

Mitigation Measures: The proposed incinerator has been designed as a totally sealed system. The combustion chamber, afterburner, and spray dryer are capable of handling more than ten times the design operating pressure. These pieces of equipment, as well as the baghouse, storage tanks, pipes, valves, and fittings, will be

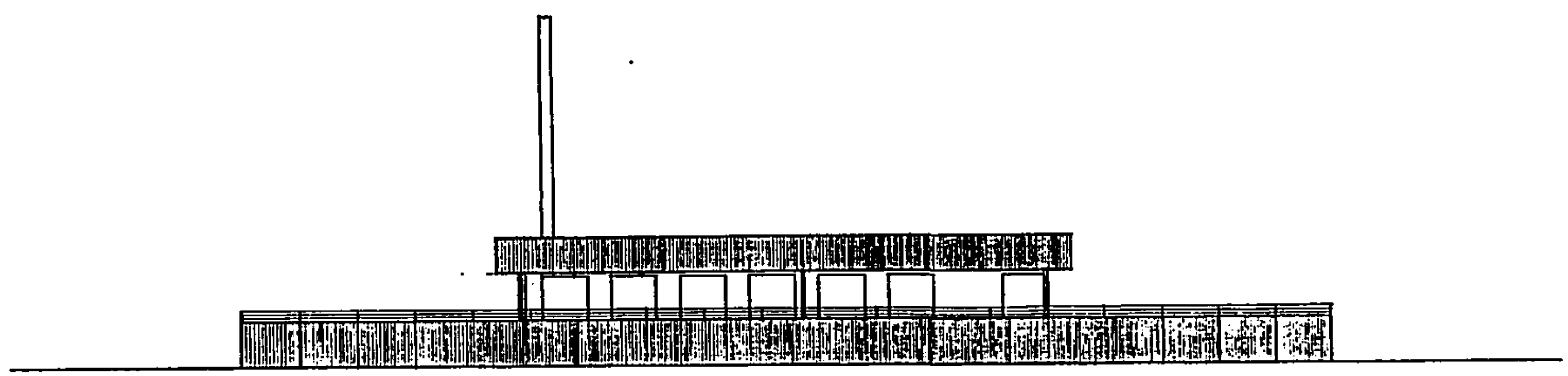

Figure IV-3 View of the Proposed Facility from Kaomi Loop inspected on a daily basis for leaks.

The baghouse operates at a negative static pressure, i.e. below atmospheric. If the baghouse static pressure approaches atmospheric, the interlock system will automatically shut down the incinerator. If a leak develops in the baghouse, outside air will be entrained into the baghouse rather than particulate laden stack gas leaking into the environment.

The waste feed storage and handling systems are totally sealed systems, and feature a vent system. Any emissions from these two systems will be transferred into the burner/afterburner. A fume incinerator will be provided to incinerate fumes when the TWI-3000 is not operating.

The ash generated by the TWI-3000 will be collected using a totally sealed system, which will prevent ash from entering the environment. The collected ash will be transferred to a bulk container using a totally sealed system, and the ash bulk container will remain sealed at all times.

Unavoidable Significant Impacts: None.

L. Litter

Environmental Setting: The Proposed site is presently free of litter.

Impacts: The hazardous waste which will be handled by the proposed facility will be in closed containers. Containers will be opened only to add or remove waste. Litter generating wastes will not be handled at the proposed facility.

Mitigation Measures: Since litter generating waste will not be handled at the proposed facility, mitigation measures will not be required.

Unavoidable Significant Impacts: None.

M. Vectors

Environmental Setting: A vector is defined as any animal such as a rodent, insect, or bird, which is a potential carrier of disease. A significant number of insects and birds are present at the proposed site.

Impacts: Since the hazardous waste which will be handled at the proposed facility will be in containers at all times, the potential for contact between the hazardous waste and vectors will not exist.

Mitigation Measures: In order to prevent hazardous emissions from the proposed facility, all wastes handled will be in closed containers at all times. Containers will be opened only to add or remove wastes.

Unavoidable Significant Impacts: None.

N. Noise

Environmental Setting: The proposed facility will be located in an industrial setting.

Impacts: The significant noise sources for the proposed facility are the combustion air fan, the induced draft fan, the waste feed pumps, the fuel oil pumps, the air compressor, and the stack exit. The projected noise level 1 meter from each significant noise source is presented in Table IV-17. The total Sound Pressure Level (SPL) generated by the proposed facility is projected to be 85.7 dBA @ 1 m from the noise source. The maximum SPL generated by the proposed facility is projected to be 61.7 dBA at the facility property line. The SPL generated by the proposed facility at the nearest sensitive receptor, Germaine's Luau, is less than 50 dBA. The calculations used to predict the

Table IV-17

Sound Pressure Level Generated by the TWI-3000

	SPL, dBA @ 1 m	-dBA	+dBA
Air Compressor	80	0	80
Combustion Air Blower	77	-3	1.75
Induced Draft Fan	77	-3	1.75
Waste Feed Transfer Pump	71	-9	0.55
Waste Feed Pressurization Pump	71	-9	0.55
Fuel Oil Transfer Pump	71	-9	0.55
Fuel Oil Pressurization Pump	71	-9	0.55
Total			85.7

Table IV-18

Sound Pressure Level Calculations

1. Sound pressure level generated by the TWI-3000 at the Property Line.

From Table IV-18, SPL @ 1 m from TWI-3000 = 85.7 dBA

Distance to property line = 50 ft

SPL @ 2 m = 85.7 - 6 dB = 79.7 dB

SPL @ 4 m = 79.7 - 6 dB = 73.7 dB

SPL @ 8 m = 73.7 - 6 dB = 67.7 dB

SPL @ 16 m = 67.7 - 6 dB = 61.7 dB

Projected SPL at property line = 61.7 dBA

2. Sound Pressure Level Generated by the TWI-3000 at the Nearest Sensitive Receptor

SPL @ 16 m from TWI-3000 = 61.7 dBA

Distance to nearest sensitive receptor (Germaine's Luau) = 825 m. Since SPL drops by 6 dB for each doubling of the distance between the source and the receiver:

SPL @ 32 m = 55.7 dB

SPL @ 64 m = 49.7 dB

SPL @ 128 m = 43.7 dB

SPL @ 256 m = 37.7 dB

SPL @ 512 m = 31.7 dB

Projected TWI-3000 SPL at nearest sensitive receptor = < 50 dB

SPLs are presented in Table IV-18.

The noise generated by the tanker trucks, flatbed trucks, and automobiles used to support the proposed facility are not projected to be discernible against the existing vehicle traffic noise at the Campbell Industrial Park.

Mitigation Measures: Because of the industrial location of the proposed facility, the noise generated by the facility is not projected to have a significant impact or to require mitigation measures. The primary concern in this case is the protection of workers, and mitigation measures will include enclosing a major noise source such as the air compressor, providing noise abatement material on the combustion air blower and induced draft fan, and limiting the stack velocity to less than 100 ft/sec.

Unavoidable Significant Impacts: None.

O. Vibration

Environmental Setting: The proposed site is currently free of significant vibration. Peak vibration velocities of 0.01 in/sec are noticeable, 0.1 in/sec are annoying, and vibration velocities must be greater than 0.5 in/sec to be damaging to structures.

Impacts: The potential sources of vibration at the proposed facility are the combustion air blower, the induced draft fan, the air compressor, the pumps, and truck traffic. All rotating equipment will be mounted on vibration dampers, not only to reduce structure-borne vibration but also to prolong the life of the equipment. The vibration generated by the truck traffic required to support the proposed facility is not projected to be discernable against the vibration generated by the exiting truck traffic used to support operations at the Campbell Industrial Park.

Mitigation Measures: All rotating equipment will be mounted in vibration dampers.

Unavoidable Significant Impacts: None.

P. Traffic Circulation

Environmental Setting: The entrance to the proposed project is located in an industrial area. The area is routinely used by automobiles and trucks to support the surrounding industrial operations. Kaomi loop is presently an unimproved road that is not used for significant automobile or truck traffic.

Impacts: The projected volume of traffic which will be generated by the proposed facility is a maximum of four tanker trucks, four flatbed trucks, and twenty automobiles per day.

The impact of the maximum projected traffic burden is not projected to be discernable against the existing traffic used to support operations at the Campbell Industrial Park.

Mitigation Measures: None Required.

Unavoidable Significant Impacts: None

Q. Relevant Planning for Land Use

Environmental Setting: The proposed site is zoned for heavy industrial use.

Impacts: The use of the proposed site for a hazardous waste treatment facility is consistent with the Honolulu General Plan. Since the proposed site is located in a Shoreline Management Area, an EIS has been prepared. A Type II Conditional Use Permit will be submitted to the Department of Land Utilization when the EIS process has been completed.

Mitigation Measures: None required.

Unavoidable Significant Impacts: None.

R. Related Projects

Environmental Setting: The Campbell Industrial Park is the primary location for heavy industry in the State of Hawaii. The HPOWER facility is being developed to the northeast of the proposed facility. A large scale power generation facility is being developed to the east of the proposed facility.

In addition, the West Beach hotel, condominium, golf course, and marina is being developed to the north of the proposed facility, and major residential development is taking place in the adjoining communities of Ewa Beach and Makakilo.

Impact: The proposed facility is buffered from any non-industrial development by the Standard Oil refinery to the north, the HPOWER facility to the east, the Hawaiian Cement facility to the south, and the Pacific Ocean to the west. The proposed facility will not be visible to any non-industrial development.

The HRA demonstrated that the impact of the emissions from the proposed facility will be below the level which will have a significant health risk impact for the maximum exposed individual, much less an individual who is not located at the point of maximum impact. The health risk impact for the nearest residential location is less than 5% of the impact at the point of maximum impact used to generate the Waste Feed Composition Guidelines.

Due to the small scale of the proposed facility, as well as the state-of-the-art design and operation of the waste feed handling, storage, incineration, pollution control, and ash collection facility; the impact of the proposed facility will not be discernable for occupants of adjacent industrial or non-industrial developments.

Mitigation Measures: None required.

Unavoidable Significant Impacts: None.

S. Growth Inducing Impact

Environmental Setting: The State of Hawaii is making an effort to end the reliance of the state's economy upon tourism, the military, sugar cane, and pineapple. A prime area of interest is high-technology industry, since high-tech industries have demonstrated significant economic growth, and Hawaii is well suited to attracting the highly qualified personnel required for high-tech industries.

A popular conception of high-tech industries is that they are not "smokestack" industries, and they are therefore pollution free. This is a misconception, since high-tech industries are significant generators of hazardous waste. The wastes generated by high-tech industries are highly toxic, and in many cases are carcinogenic. In addition, because of their small size, many high-tech industries are below the thresholds for reporting hazardous wastes, and are therefore virtually unregulated. San Jose, which is a prime example of a high-tech community, suffers from severe groundwater contamination problems due to the indiscriminate disposal of solvents. The San Gabriel valley, which has long been a center for high-tech industries, also suffers from severe groundwater contamination problems. Groundwater remediation in the San Gabriel Valley is projected to cost $800,000,000 and to require a minimum of 50 years.

These problems could have been avoided through proper hazardous waste management techniques, but the present cost of site remediation is astronomical. Hawaii does not need to repeat the mistakes of the mainland.

Impacts: The availability of a stable, reliable, and economical hazardous waste treatment capability will allow for the realization of the economic diversification goals defined by the Department of Business and Economic Development.

Mitigation Measures: None Required.

Unavoidable Significant Impacts: None.

T. Demographic Characteristics

Environmental Setting: Hawaii represents the most diverse demographic population in the United States.

Impacts: The proposed facility will provide full time employment for twelve people. Every effort will be made to train members of the local communities for the relatively high paying jobs which will be provided by the proposed facility. The proposed project is too small to have a significant impact upon the demographic makeup of the surrounding communities.

Mitigation Measures: None Required.

Unavoidable Significant Impacts: None.

U. Public Utility Network

Environmental Setting: Electrical power is provided for the Campbell Industrial Park by the Hawaiian Electric Company. Natural gas is provided by the Honolulu Gas Company. Telephone communications are provided by Hawaiian Telephone. Water is provided by the Honolulu Board of Water Supply. Sewage removal is provided by the Department of Sanitation.

Impacts: The proposed facility will require 70 KWH of electrical power on a continuous basis, which is not projected to have a significant impact on the existing electrical power generation and distribution capability.

The projected natural gas utilization rate is 1,000,000 cu ft/yr, which is not projected to have a significant impact upon the existing gas supply and distribution capability.

The proposed facility will use three telephone lines, which is not projected to have a significant impact upon the existing telecommunications capability.

The proposed facility is projected to use 3,400,000 gallons of water per year, which is not projected to have a significant impact upon the existing water supply and distribution capability. The water supply does not need to be drinking quality.

The proposed incinerator will use a dry gas scrubbing technology and will not generate a water discharge. The estimated maximum sewage generation rate is 100 gallons per day and is not projected to have a significant impact upon the existing sewage collection and treatment capability.

Mitigation Measures: None Required.

Unavoidable Significant Impacts: None.

V. Public Services

Environmental Setting: Medical and paramedic services will be provided for the proposed facility by Kaiser Hospital. The Honolulu Police Department will provide law enforcement services. The Honolulu Fire Department will provide fire protection services.

Impacts: ATI will inform Kaiser Hospital as to the type of operation, the substances that will be present on the site, and the potential injuries associated with the operation of the facility prior to the operation of the proposed facility. Kaiser Hospital will provide infrequent use of hospital and paramedic services throughout the lifetime of the facility.

The Honolulu Police Department will be informed as to the type of operation and the substances that will be on the site prior to the operation of the proposed facility. The proposed facility will be surrounded with an 8' chain link fence topped with barbed wire and clearly marked with warning signs to prevent unauthorized entry into the facility. ATI personnel will be present on the site 24 hours per day when the facility is in operation. It will be necessary for an unauthorized individual to trespass and to make a concerted effort in order to come into contact with the wastes treated at the proposed facility. The proposed facility will not create any need for increased law enforcement efforts in the City of Honolulu.

The Honolulu Fire Department will be informed as to the Hazardous Materials Inventory, the type of operation, the substances which may be present at the proposed facility, the types of injuries which may be anticipated from the operation of the proposed facility, and the Contingency Plan prior to the operation of the proposed facility. Certain fire risks will be associated with the operation of the proposed facility. These risks will be limited to sudden accidental events, since the facility equipment and operating procedures have been designed to minimize or eliminate the possibility of fire or explosion.

Mitigation Measures: The following measures will be taken to minimize the impact of the proposed facility upon community services:

- A chain link fence to prevent unauthorized entry.
- A 50 ft buffer between the property lines and the facility equipment.
- 24-hour per day security when the facility is in operation.
- Pre-operation coordination with the Kaiser Hospital, the Police Department, and the Fire Department.

- o A fire detection system, alarm system, and automatic shutdown system.
- o A foam generating system.
- o Portable fire extinguisher throughout the facility.
- o The use of explosionproof construction.
- o A no smoking policy.
- o The preparation and distribution of a Contingency Plan.

Unavoidable Significant Impacts: None

W. Historical Resources

Environmental Setting: A thorough investigation of the site has not revealed any indication of archeological or paleontological resources. An investigation of the historical record has not revealed and record of archeological resources on the proposed site.

Impact: All construction at the proposed site will take place above grade, so no significant excavations will be required for the construction of the proposed facility. The construction and operation of the proposed facility is not projected to have a significant impact upon the historical resources of the proposed site.

Mitigation Measures: The excavation work that will be performed to construct the internal access road and the containment vessel will be monitored for artifacts, and any artifacts discovered during the excavation will be reported to the Department of Land and Natural Resources Historic Sites Section. All work at the site will cease until all of the unearthed artifacts have been characterized, and if necessary, removed from the site.

Unavoidable Significant Impacts: None.

X. SETBACKS

Environmental Setting: Not Applicable

Impacts: The setbacks for the proposed facility are presented below:

Parameter	Setback, ft
Distance from property boundary line to high water mark	150
Distance from property boundary line to hazardous waste handling, storage, and treatment facilities	50
Distance from property boundary line to external access road	20
Distance from property boundary line to internal access road	15

Mitigation Measures: None Required.

Unavoidable Significant Impacts: None.

Y. PERCEIVED ENVIRONMENTAL IMPACT

Environmental Setting: "One major obstacle facing this country regarding hazardous waste disposal is people's (both technical and non-technical) handling of the problem as an emotional issue. Unfortunately, wastes are generated by every one of us either directly or indirectly. Wastes are generated as byproducts of making goods or merchandise which we all use and enjoy. The need for proper waste disposal is not someone else's problem but our common problem. While the quantity of waste will be reduced through waste minimization, some amounts will always remain. This is true in any human activity" (Lee, 1987).

"The role of the general public relative to the growth and application of increased hazardous waste incineration cannot be overemphasized. By and large, the general public has a fear and mistrust of the technology, and most are reluctant or unwilling to accept any new installation no matter what the 'experts' claim performance will be. For example, most lay people are simply not aware that modern, high-temperature incineration is radically different from systems of 30 to 40 years ago. Consequently, a majority of the general public are prey to the misinformation, false claims, and exaggerations of 'special interest' groups and activists whose primary objectives and motivations are to prohibit or shut-down hazardous waste incineration facilities.

In view of the fact that the EPA has repeatedly endorsed hazardous waste incineration as a viable and recommended technology, they and other related regulatory agecies must be prepared and willing to take a hard stand in such cases where 'anti-incinerator' protests and objections are based strictly upon emotional or selfish concerns. On the other hand, they must continually strive to identify, properly assess and responsibly act upon genuine environmental and technological issues" (Doucet, 1987).

Impacts: The perceived impacts of the proposed facility will be presented in the form of commonly stated concerns and the appropriate response.

Concern: Incineration is an incentive for the generation of hazardous waste.

Response: This position is maintained by many members of the environmental community, as well as some members of regulatory agencies such as the DOH. This position assumes that incineration is a "cheap" process that will encourage hazardous waste generators to abandon source reduction and recycling efforts.

It is worth noting that no member of the economic community has ever supported this position. The efficient allocation of resources is the fundamental guideline for all economic behavior. Incineration is not an inexpensive process, and treatment costs are as high as $ 750 per barrel for difficult to incinerate wastes. No company will pay from $ 200 to $ 750 per barrel to dispose of wastes that could be eliminated through source reduction or recycling. Incineration will be used only after all source reduction and recycling options have been eliminated, primarily for economic reasons.

This position makes the implicit assumption that incineration is a disposal technology. 40 CFR 260.10 provides the following definition: " 'Thermal Treatment' means the treatment of hazardous waste in a device which uses elevated temperature as the primary means to change the chemical, physical, or biological character or composition of the hazardous waste. Examples of thermal treatment are incineration, molten salt, pyrolosis, calcination, wet air oxidation, and microwave discharge."

This position also fails to differentiate between toxic wastes and hazardous wastes. The elimination of toxic wastes through source reduction and recycling is an achievable goal. Indeed, the removal of carcinogens and heavy metals from the hazardous waste stream will be highly beneficial to the operation of the proposed incinerator. However, the elimination of wastes which are defined as hazardous by the characteristic of flammability would require the elimination of virtually all production, transportation, and communication services, i.e. an unrealistic objective.

Concern: Incineration emissions are more toxic than emissions from combustion sources such as automobiles.

Response: A combustion process such as an automobile involves a combustion chamber residence time of less than 1/10th of a second, high pressure, cold combustion chamber walls, and fuels that are difficult to burn in order to prevent detonation. The proposed incinerator will feature a combustion chamber residence time of more than two seconds, low pressure, hot combustion chamber walls, and a variety of substances to be incinerated.

A long combustion chamber residence time insures the efficient destruction of orgnics in the incinerator waste feed. "A large post-flame combustion zone or a secondary combustion chamber is always used to provide a more than adequate buffering zone for the destruction of organics. The importance of the secondary combustion zone in a state-of-the-art incinerator cannot be overemphasized" (Lee, 1987). On the other hand, the short residence time found in automobile engines results in low combustion efficiency and the associated high emission rate of products of incomplete combustion, particularly benzene. The concentration of benzene in the stack gas of a typical hazardous waste incinerator is 20 ppb. The concentration of benzene in the exhaust of an automobile using unleaded gasoline is 30,000 ppb , and is 38,000 ppb in an automobile engine run on unleaded gasoline (Riondia, 1986). It is worth noting that benzene is a potent carcinogen, and is the primary source of cancer risk from environmental exposure.

The high combustion chamber pressures in automobiles result in high NO2 generation rates in comparison to hazardous waste incinerators. The low combustion chamber wall temperatures in automobile engines result in low overall combustion efficiency, which is reflected in the high CO emission rates associated with automobile engines.

In addition, automobile emissions contain significant amounts of dioxin (Marklund, 1987), pyro(a)benzene (Springer, 1973), cadmium, chloroform, lead, ethylene dibromide, and ethylene dichloride (CARB, 1984). Based upon benzene alone, the cancer risk associated with emissions from automobile engines is more than 1,000 times greater than the cancer risk associated with emissions from hazardous waste incinerators. This relative risk ratio has been verified by numerous studies (SCAQMD, 1987).

Concern: Significant health risks are associated with the operation of hazardous waste incinerators.

Response: Section IV.H demonstrated that limitations will be placed upon the composition of the wastes incinerated in the proposed incinerator to insure that the cancer risk associated with the proposed incinerator will be less than 1 in 1,000,000 for the maximum exposed individual, and less than one case of cancer for the State of Hawaii. This is the same risk that is associated with a single chest X-ray, drinking one liter of wine, or driving 300 miles in a car (Wilson, 1979). It is also essential to realize that the background cancer rate in the U.S. is 250,000 cases per 1,000,000 people.

The assumption is often made that we are exposed to a significant amount of man made carcinogens, that "natural" chemicals are inherently non-carcinogenic, and that the presence of a carcinogen in the part per billion range is a source of concern. In reality, we are ingesting in our diet at least 10,000 times more by weight of natural pesticides than man-made pesticide residues (Ames, 1983). Only a few dozen of the thousands of natural toxic chemicals present in the diet have been tested by bioassays. A sizeable portion of those that have been tested are carcinogens, and many others have been shown to be mutagens (Ames, 1983). Examples of common dietary carcinogens are psoralens in celery, hydrazine in mushrooms, and allyl isothiocyanate in brown mustard. Alfatoxin B-1, which is present in peanut butter at an average concentration of 2 ppb, is one of the most potent known carcinogens, and is comparable in potency to 2,3,7,8-TCDD, the most potent form of dioxin (Crouch and Wilson, 1987). The total amount of browned and burned material eaten in a typical day is at least several hundred times more than that inhaled form air pollution (Ames, 1983).

The percentage of cancer deaths in the U.S. population attributeable to different causal factors is presented below (Doll, 1981):

Factor or Class of Factors	Best Estimate	Range of Acceptable Estimates
Tobacco	30	25-40
Alcohol	3	2-4
Diet	35	10-70
Food additives	<1	<1-2
Reproductive and sexual behavior	7	1-13
Occupation	4	2-8
Pollution	2	<1-5
Industrial products	<1	<1-2
Medicines and medical procedures	1	<1-3
Geophysical factors (sunlight)	3	2-4
Infection	10	1-?
Unknown	?	?

This table indicates that <u>all</u> sources of pollution, including water pollution, generate approximately 2% of all cancers. When major emission sources such as automobiles and power generation are taken into account, the remaining percentage of cancers attributeable to all other industrial sources is significantly less than 1%. The health risk associated with the proposed hazardous waste incinerator cannot be considered as significant in comparison to either other sources of pollution or to sources of cancer other than pollution.

<u>Concern</u> : Incinerators are an unproven technology, and there

is no way to know if the incinerator is operating properly.

Response: "Incineration is a proven, readily available method for destroying hazardous wastes. It has been demonstrated time and again, at numerous installations, that properly designed and operated hazardous waste incineration systems readily comply with stringent regulatory and performance requirements. This has been substantiated in more than 100 different trial burn and test burn programs" (Doucet, 1987).

"An incinerator operated under the current RCRA regulation is basically a failsafe system. Several critical parameters must be continuously monitored to assure continued performance levels comparable to those achieved during the trial burn. Any deviation will result in the automatic shutoff of all hazardous waste feeds" (Lee, 1987). The stack gas CO level is used as an indicator of the incinerator performance. CO is much more thermally stable than any organic substance of product or incomplete combustion (Chang, 1986). Flame studies have shown that for a pre-mixed flame, the POHCs are destroyed within 0.5 mm of the flame zone, and the more stable PICs are destroyed within 2 mm of the flame zone, whereas CO is not destroyed until about 30 mm of the flame zone (Lee, 1987). This indicates that CO exists in the combustion chamber well after the POHCs and PICs have been destroyed. The stack gas CO level serves as a very conservative performance indicator (Lee, 1987), and an increase in the stack gas CO level will shut down the incinerator before any significant emissions occur. Even during an upset condition, the POHC DRE remains very high. During an upset condition study performed by the EPA, the average stack gas CO level was 500 ppm, with spikes as high as 2,000 ppm, and the DRE for all test compounds was greater than 99.99% (EPA, 1986a). A stack gas CO level of 100 ppm will interrupt the flow of waste feed into the proposed incinerator.

Mitigation Measures: ATI has made a significant effort to communicate with community leaders, special interest groups, and concerned individuals. Hazardous waste management is an extremely complicated subject, not only from a technical standpoint, but also from a psychological standpoint. ATI is willing to address any environmental or technical concern about the proposed facility based upon 15 years experience in hazardous waste management, as well as the state-of-the-art in hazardous waste knowledge as provided by the University of California at Los Angeles Hazardous Waste Management Program.

Significant Environmental Impact: The proposed facility will reduce the volume of the hazardous waste treated by more than 99.7%, and the toxicity of the organic hazardous waste treated by more than 99.99%.

CHAPTER V: ALTERNATIVES

1. Introduction

The improper management of liquid organic hazardous waste presents the potential for significant ecological damage. Many existing soil and groundwater contamination problems could have been avoided if incineration had been used to destroy the hazardous waste rather than introducing the hazardous waste into the environment.

The elimination of land disposal for hazardous waste disposal will not only cause large increases in the cost of hazardous waste disposal, but will also present the possibility of hazardous waste treatment capability being unavailable at any price. Extremely expensive or non-existent hazardous waste treatment capability, as well as major loopholes in current hazardous waste management regulations, may create increased incentives for illegal disposal and the associated significant ecological damage.

If ATI is not allowed to construct the proposed facility, other alternatives will be utilized for the treatment of Hawaii's hazardous waste. This Section will analyze these alternatives.

2. No Project Alternative

The "No Project" alternative is defined as the decision not to operate a hazardous waste treatment facility at the proposed site. Choosing not to build and operate the proposed facility will require that more than 6,000,000 pounds per year of hazardous waste be eliminated, recycled, treated, or disposed of using another method. The alternative methods are presented in the following four sections.

A. Source Reduction

Source reduction is the preferred method of hazardous waste management. Source reduction prevents the generation of hazardous waste at the source, rather than attempting to use remedial solutions after the waste has been generated. The volume of hazardous waste generated has been reduced significantly since 1982, due in large part to the rapidly increasing cost of waste disposal and the continuing liability associated with hazardous waste landfills. However, in spite source reduction, the volume of hazardous waste generated in Hawaii remains significant. In addition, the major loopholes in existing regulations tend to underestimate the total volume of hazardous waste, since a major source of hazardous waste, consumers, has been completely exempted. Incineration will not be used to treat any hazardous waste that could be eliminated through source reduction, since the high cost of incineration will be an incentive for generators to minimize their hazardous waste generation rate.

B. Recycling

Recycling is also a preferred method of hazardous waste management. Numerous methods exist for hazardous waste recycling, the primary methods being filtration and distillation. The recycled waste is processed and sold as a new material, often at a lower specification than the original material. Recycling is particularly appropriate for solvents which are used for cleaning purposes. In spite of the economic and environmental attractiveness of recycling, the total percentage of recycled materials and the total number of recycling companies has been declining steadily since 1982.

Used motor oil is a prime example of the pitfalls of recycling under current regulations. Although the total volume of used motor oil continues to increase as the total number of vehicle miles in Hawaii increases, the number of service stations that are willing to accept used motor oil is decreasing. This is because if a single unscrupulous individual includes a chemical such as paint thinner or parts cleaner with a batch of used motor oil, the entire batch of motor oil is no longer recyclable, and the recycler must bear the cost of disposing of the oil as hazardous waste. Since the individual service station owner is not going to be able to analyze each batch of used motor oil, the owner is not willing to take the risk of accepting used motor oil from outside sources.

Hazardous waste will continue to be recycled whenever possible. The high cost of incineration is an incentive for hazardous waste generators to maximize the recycling of hazardous waste.

C. Landfills

Landfills are based upon introducing the hazardous waste into the environment and assuming that either natural barriers such as clay liners, or man-made barriers such as polyethylene sheets, will isolate the hazardous waste from the environment on a permanent basis. Landfills are being eliminated as a method of hazardous waste disposal by the Federal government due to significant groundwater contamination problems associated with virtually all landfills. Although 80% of the hazardous waste generated in the United States is presently disposed of in landfills, landfills will no longer be used for hazardous waste disposal in 1991 unless it can be demonstrated that the disposal of the waste in a landfill does not provide the potential for release of the waste into the environment. This clause allows for the development of encapsualization technologies which will permanently isolate the waste from the environment.

D. Deep Well Injection

Deep well injection is used to inject hazardous waste into the environment at depths of more than 2,000 feet. The deep well injection takes place beneath the aquifer level. The water at this level contains a significant percentage of salt due to the high temperature and pressure of the water. Deep well injection is hampered by the lack of knowledge about sub-surface geological formations. Isoclines are a particular source of concern, since strata with a vertical orientation negate the effects of deep well injection and present the potential for direct contamination of the aquifer. In addition, the failure of the deep well injection casing provides a direct path to the aquifer. Although the exact status of deep well injection is unclear, the EPA is not expected to renew any deep well injection permits, which will eliminate this disposal technique.

3. Environmental and Social Effects of the No Project Alternative

A. Regional Effects

The alternatives for hazardous waste disposal are in the process of being eliminated by the EPA, as discussed in the previous section. Incineration has been designated as the EPA as the treatment method of choice for organic hazardous waste. The EPA Office of Research and Development has invested millions of dollars in the development of incineration technology.

The risk associated with using a hazardous waste incinerator equipped with the BACT and using a set of waste feed composition guidelines is significantly lower than the risk associated with collecting the hazardous waste, transporting the waste on the public highways to a transfer facility at the Campbell Industrial Park, transporting the waste to Honolulu Harbor, loading the waste onto a freighter, unloading the waste at a mainland harbor, transporting the waste to a treatment or disposal facility, and either treating or disposing of the waste.

The recent Prince William Sound accident involving the Exxon Valdez demonstrated that despite the many advances in ocean transport technology, a major accident is virtually inevitable. If the Exxon Valdez had been carrying hazardous waste rather than crude oil, the ecological damage would have been orders of magnitude more significant than the crude oil spill.

The transport of hazardous waste to the mainland for treatment involves significantly higher toxic air contaminant emissions, vehicle emissions, hours required to transport the waste on the public highways, and hours required to transport the waste at sea; as well as higher treatment or disposal costs and greater uncertainty associated with the availability of treatment capability. A summary of the regional effects of the "No Project" alternative is presented in Table V-1. Table V-1 demonstrates that the proposed facility has a significantly lower environmental impact than the current method utilized for hazardous waste disposal.

4. Alternative Use of the Project Site

If the proposed facility is not operated, the proposed site will either remain undeveloped or will be used for other industrial uses.

5. Alternative Project Sites

The State of Hawaii does not have a large amount of industrially zoned land. The Campbell Industrial is the primary site for heavy industry. The Campbell Industrial Park was selected as the site for the HPOWER facility after alternative sites were designated as unacceptable. The existing uses of the adjacent properties are consistent with the operation of the proposed facility.

A prime benefit of the proposed site is the isolation from residences, schools, or hospitals. The HRA demonstrated that the cancer risk for the maximum exposed individual at the nearest residence is less than 1/20th of the risk at the site selected to generate the Waste Feed Composition Guidelines. This is in spite of the fact that a very conservative set of assumptions was used

Table V-1

Regional Effects of the "No Project" Alternative

Impact	TWI-3000	Landfill
Total volume of hazardous waste introduced into the environment	16,712 lb/yr	6,339,772 lb/yr
Total emissions	14,728 lb/yr	301,564 lb/yr
Total hours required to transport hazardous waste on the public highways	76 hr/yr	772 hr/yr
Total vehicle emissions	730 lb/yr	3,772 lb/yr
Ocean transport required	no	yes
Continuing liability	no	yes
Potential for groundwater contamination	no	yes

to determine the cancer risk for the maximum residential exposure.

An added benefit of the proposed site is that the proposed site is isolated from any existing or proposed buildings and the associated building wake effects. In addition, due to the location of the site and the direction and consistency of the Tradewinds, the emissions generated by the proposed facility will be dispersed in an unpopulated area off of Barbers Point the vast majority of the time. It is essential to realize that the dispersion model used to evaluate the impact of emissions of the proposed facility takes Kona Winds and calm periods into account in determining the maximum GLC of incinerator emissions used to perform the HRA.

Discussion with the Office of State Planning in January of 1989 revealed that no other site is being considered as an appropriate site for a hazardous waste treatment facility. The Campbell Industrial Park was selected at the most appropriate site for the incinerator proposed by the Office of Environmental Quality Control, as well as a hazardous waste storage facility.

The industrial zoning of the proposed site, the lack of sensitive receptors within two miles of the proposed site, the existing use of adjacent properties, and the lack of downwind receptors designate the proposed site as the most appropriate location in the State of Hawaii for a hazardous waste treatment facility.

6. Summary

The proposed hazardous waste treatment facility will provide the State of Hawaii with a safe, effective, and economical hazardous waste treatment capability. Source reduction and recycling should be implemented to the maximum extent possible, although the remaining volume of hazardous waste will be substantial, particularly as the problem of consumer generated waste is addressed in the future. The land disposal of hazardous waste and deep well injection of hazardous waste are environmentally unacceptable hazardous waste disposal methods. The environmental impact associated with the proposed facility is significantly lower than the environmental impact associated with the existing hazardous waste disposal methods.

The proposed site is the most appropriate location for a hazardous waste treatment facility on the basis of zoning, the lack of sensitive receptors within two miles of the proposed site, and existing utilization of the adjacent properties.

CHAPTER VI: ENVIRONMENTAL IMPACT SUMMARY

1. Projected Environmental Impact for the Proposed Facility

The projected environmental impacts of the proposed hazardous waste treatment facility are presented below:

Air Quality: The proposed facility will use the BACT for the thermal treatment of hazardous waste. The emissions from the proposed facility are projected to be below the New Source Rule and Prevention of Serious Deterioration Rule thresholds, as well as the DOH prohibitory requirements. The incremental increase in the GLC if SO_2 and particulates from the proposed facility is below the allowable increase in a Class II area. The maximum GLC of any emission from the proposed facility is below the threshold of smell.

Public Health: The operation of the proposed facility will meet the following health risk criteria:

- An individual exposed to the maximum possible dose of emissions from the proposed incinerator will have less than a 1 in 1,000,000 chance of developing cancer as a result of the exposure.
- The proposed facility will cause less than one additional case of cancer in the State of Hawaii over the lifetime of the facility.
- The maximum 1-hr GLC of incinerator emissions is below the level which would expose an individual to the recommended Environmental Exposure Limit for any substance emitted from the proposed facility.
- The maximum average annual GLC of incinerator emissions is

below the level which would expose an individual to the Allowable Daily Intake of any substance emitted from the proposed facility.

The proposed facility features a totally sealed ash collection and storage capability. All ash will be collected for re-incineration and encapsualization.

All hazardous waste handled and stored at the proposed facility will remain in a container at all times. The containers will be opened only to add or remove hazardous material.

Water Quality: The proposed incinerator features a dry gas scrubbing technology and will not generate a water discharge. The incinerator, hazardous waste storage tanks, and waste feed handling system will be located in a covered containment vessel with secondary containment to prevent contact between the hazardous waste treated at the proposed facility and rainfall, run-on, and groundwater. Any water collected in the containment vessel will be transferred to a storage tank and treated as hazardous waste.

Noise: The highest acoustical impact at the proposed site boundary is projected to be 61.7 dBA. The highest acoustical impact at the closest sensitive receptor is projected to be 40 dBA.

Traffic: The projected traffic burden of four trucks and 20 automobiles per day is not projected to be discernable against the traffic supporting industrial operations at the Campbell Industrial Park at the present time.

Visual Access: The portions of the proposed facility that will be visible from outside of the site are appropriate for the industrial setting of the proposed facility.

No unavoidable significant environmental impacts are projected to be associated with the proposed facility as presented in Section IV. The category of environmental impact, the significant environmental impact, the justification for the evaluation of the significant environmental impact, and the EIS Section number which provides an analysis of the environmental impact is presented in Table VI-1.

2. Mitigation Measures

The mitigation measures for each potential environmental impact route are presented with the analysis of each impact route in Chapter IV. As demonstrated in Table VI-1, the proposed facility is not projected to generate a significant environmental impact. Mitigation measures have been incorporated into the design and operation of the proposed facility, including the use of the BACT, a set of Waste Feed Composition Guidelines and the associated waste feed analysis procedures, a trial burn to verify the projected performance of the incinerator and pollution control systems, a covered containment vessel with secondary containment, and a fume incinerator.

Although every precaution has been taken to prevent accidents, including an emergency waste feed cutoff system and a comprehensive interlock system, the possibility of a major spill, fire, or explosion is unavoidable. ATI has prepared a Contingency Plan which defines the chain of authority, emergency response procedures, and reporting requirements in case of a major spill, fire, or explosion. ATI will operate with a $ 2,000,000 sudden accidental insurance policy to provide the financial resources necessary to implement all aspects of the contingency plan, including site remediation.

ATI will operate with an approved Closure Plan which defines the steps that must be taken when hazardous waste will no longer be treated at the proposed facility, as well as the criteria for designating the site as free of contamination. An engineer

Table VI-1

Significant Environmental Impacts of the Proposed Project

Environmental Impact Source	Significant Environmental Impact	Justification	Source
Topography	None	No modifications will be made to the existing topography.	Section IV.3.B
Geology	None	No modifications will be made to the existing geology. No hazardous waste will be stored or treated within a 100-year floodplain.	Section IV.3.C
Surface Water	None	The hazardous waste will be isolated from contact with surface water.	Section IV.3.D
Groundwater	None	The hazardous waste will be isolated from contact with ground water.	Section IV.3.E
Climate	None	The scale of the proposed facility will be too small to have any effect upon the climate.	Section IV.3.F
Air Resources	None	The proposed facility emissions will be lower than the New Source Rule thresholds.	Section IV.3.G

Table VI-1 (Continued)

Environmental Impact Source	Significant Environmental Impact	Justification	Source
Air Resources	None	The proposed facility emissions will be below below the Prevention of Serious Deterioration Rule thresholds.	Section IV.3.G
		The proposed facility emissions will not exceed the allowable incremental increase in criteria pollutants.	
Public Health	None	The cancer risk for the maximum exposed individual will be less than 1 in 1,000,000.	Section IV.3.H
		The proposed facility will generate less than one case of cancer in the State of Hawaii.	
		The ground level concentration of the facility emissions will be less than the Allowable Daily Intake level.	
		The ground level concentration of the facility emissions will be less than the recommended Environmental Exposure Limit level.	
Biological Resources	None	No rare, threatened, or endangered biological resources are present on the proposed site.	Section IV.3.I

Table VI-1 (Continued)

Environmental Impact Source	Significant Environmental Impact	Justification	Source
Visual Access	None	The visual impact of the proposed facility will be appropriate in an industrially zoned area.	Section IV.3.J
Odor	None	The maximum ground level concentration of emissions will be below the threshold of smell.	Section IV.3.K
Litter	None	The hazardous waste will be in a liquid form and will not involve litter.	Section IV.3.L
Vectors	None	The hazardous waste will be isolated from insects, birds, and rodents.	Section IV.3.M
Noise	None	The SPL generated by the proposed facility will be 76 dBA at the property line. The SPL generated by the proposed facility will be less than 50 dBA at the nearest sensitive receptor.	Section IV.3.N
Vibration	None	Vibration generated by the proposed facility equipment will be absorbed by dampers.	Section IV.3.O

Table VI-1 (Continued)

Environmental Impact Source	Significant Environmental Impact	Justification	Source
Vibration	None	Vibration generated by support traffic will not be detectable against the background vibration level of existing traffic.	Section IV.3.O
Traffic	None	Traffic associated with the operation of the proposed incinerator will be less than 2% of existing traffic.	Section IV.3.P
Land Use Planning	None	The use of the land for hazardous waste treatment will be consistent with the Honolulu General Plan.	Section IV.3.Q
Related Projects	None	The proposed project will be isolated from new non-industrial development by existing industrial buffer zones.	Section IV.3.R
Growth Inducing	None	The proposed project will provide a reliable hazardous waste treatment capability for the State of Hawaii, which will allow for the implementation of economic diversification without adverse environmental impacts.	Section IV.3.S

Table VI-1 (Continued)

Environmental Impact Source	Significant Environmental Impact	Justification	Source
Demographic	None	The proposed facility will provide full time employment for twelve members of the surrounding communities.	Section IV.3.T
Public Utilities	None	The water, electricity, natural gas, sewer, and telephone requirements will not require any significant modifications to existing utilities.	Section IV.3.U
Community Services	None	The proposed project will use hospital, fire, and police services on an emergency basis only.	Section IV.3.V
Historical	None	Existing historical resources will not be modified or altered. Any discoveries will be reported to the Department of Land and Natural Resources.	Section IV.3.W
Setbacks	None	The proposed facility will be located 150 feet from the shoreline.	Section IV.3.X
Perceived Impact	None	Perceived impacts will be addressed upon the basis of experience and published data.	Section IV.3.Y

certified in the State of Hawaii will certify that the site has been closed in accordance with the requirements of the Closure Plan. The EPA requires that a performance bond be posted prior to receiving hazardous waste on-site in order to insure that the funds necessary for closure will be available when hazardous waste will no longer be treated at the proposed facility.

The Contingency Plan, sudden accidental insurance, Closure Plan, and Closure Plan Performance Bond will insure than any unforeseeable environmental impact stemming from an emergency situation is dealt with to the satisfaction of the agencies responsible for the protection of human health and the environment.

3. <u>The Relationship Between Local Short Term Uses of Man's Environment and the Enhancement of Long Term Productivity</u>

The long term productivity of the citizens of Hawaii is dependent upon the availability of clean air, clean water, and clean soil. Chapter IV demonstrated that the proposed facility will not have a significant impact upon the air quality, soil quality, or water quality of the local or regional environment.

Hawaii's ecology is particularly sensitive to the effects of the improper management of hazardous waste, since the distance between sources of illegal disposal and the groundwater supply is very short. Table III-2 (p. III-4) demonstrates that the improper management of hazardous waste has led to the contamination of Hawaii's water supply. Table III-2 should not be interpreted as being comprehensive, it merely reflects the presence of specific chemicals that were chosen for analysis.

Experience on the mainland has demonstrated that the consequences of improper hazardous waste management are very destructive to the environment. Hawaii cannot, and should not, learn this lesson firsthand. In the case of groundwater contamination, by the time the problem has been discovered, it is already too late. There is no evidence of successful groundwater contamination remediation to date: the only solution is to close the wells effected by the contamination. Hawaii does not enjoy the luxury of being able to import water from remote sources, as is the case on the mainland.

The use of the proposed site for hazardous waste treatment is unique in the sense that the short term use of the land for hazardous waste treatment will lead to direct enhancement of the long term productivity for all of the Hawaiian islands.

4. Significant Irreverseable Environmental Changes Which Would Be Involved in the Proposed Action

Extensive measures have been incorporated into the design an operation of the proposed incinerator to prevent the possibility of contact between the hazardous waste treated and the environment. Chapter IV demonstrated that no significant environmental impact will be associated with the proposed facility, primarily because the proposed facility is a treatment facility rather than a disposal facility.

The proposed facility will operate with an EPA and DOH approved Operating Plan, and approved Environmental Impact Report, and a Conditional Use Permit. The proposed facility will provide waste feed analysis results and incinerator operating parameters in the Facility Operating Record.

The proposed facility will operate with an approved Contingency Plan, sudden accidental liability insurance, a Closure Plan, and a Closure Plan performance bond.

The emissions from the proposed incinerator will not have a significant air quality impact, generate a significant cancer risk for the maximum exposed individual, exceed the recommended Environmental Exposure Level, or exceed the Allowable Daily intake for any substance emitted form the incinerator. The facility will not generate a water discharge, and all ash will be collected for reincineration and encapsualization.

When the facility will no longer be used to treat hazardous waste, all hazardous waste will be removed from the site, all equipment and structures will be decontaminated and removed from the site, and the site soil will be analyzed, and if necessary, removed, to return the site to its original condition.

No significant irreversible environmental impacts will be associated with the proposed project.

CHAPTER VII: BIBLIOGRAPHY AND REFERENCES CITED

Acharya, P., 1987. PCB Trial Burn in a Modular, Moveable Incinerator, Journal of the American Pollution Control Association, Vol. 24, No. 1.

Ames, B.N, R. Magaw, L.S. Gold, 1987. Ranking Possible Carcinogenic Hazards. Science 236:27.

Ambrose, A. M. et al., 1976. Long Term Toxicological Assessment of Nickel in Rats and Dogs. Journal of Food and Science Technology 13:181-187.

Atchison, G. J., Murphy, B. R., Bishop, W. E., McIntosh, A. W. and Mayes, R. A., 1977. Trace Metal Contamination of Bluegill (Lepomis Macrochirus) from Two Indiana Lakes. Trans. Am. Fish Soc. 106:637-640.

Badsha, K., G. Eduljee, and N. Scudamore, 1986. Environmental Monitoring for PCB and Heavy Metal in the Vicinity of a Chemical Waste Disposal Facility - II. Chemosphere, Vol. 15, No. 7, pp 947-957.

Baes, C.F., R. D. Sharp, A. L. Sjoreen and R. W. Shor, 1984. A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides Through Agriculture. Oak Ridge National Laboratory, U.S. Department of Energy, ORNL-5786, DE 85 000287, September 1984.

Barsotti, D. A. and J. R. Allen, 1975. Effects of Polychlorinated Biphenyls in Reproduction in the Primate. Federation Proceedings, 34(3):328.

Barsotti, D. A., 1981. Gross, Clinical, and Reproductive Effects of Polychlorinated Biphenyls (PCBs) in the Rhesus Monkey. Dissertation Abstracts International, 41(10-B):3744-3745.

Bell, J.G., C.L. Keen, B. Lonnerdal, 1987. Effect of Infant Cereals on Zinc and Copper Absorption During Weaning. AJDC, Volume 141, Oct.

Bowen, H. J. M., 1966. Trace Elements in Biochemistry. Academic Press, New York.

Bright and Associates, 1986. Health Risk Assessment for Emissions from the Proposed CTTS Hazardous Waste Incinerator.

Bright and Associates, 1986. Addendum to the Health Risk Assessment for Emissions from the Proposed CTTS Hazardous Waste Incinerator.

Calamari, D., Gaggins, G. F., and Pachchetti, G., 1982. Toxicikinetics of Low Levels of Cd, Cr, Ni and their Mixtures in Long-term Treatment of Salmo Giardneri. Chemosphere 11:59-70.

California Air Resources Board, 1984. Preliminary Inventory, Substances of Special Interest. Prepared by the Stationary Source Emissions Section, Emission Inventory Branch, Technical Support Division.

Casey, C., M.C. Neville, 1987. Studies in Human Lactation 3: Molybdenum and Nickel in Human Milk During the First Month of Lactation. American Journal of Clinical Nutrition. 45:921-6.

Chang, L. H., 1943. The Fecal Excretion of Polycyclic Aromatic Hydrocarbons Following their Administration to the Rat. Journal of Biological Chemistry, Volume 151, No. 93.

Chang, W.D., S.B. Karra, S.M. Senkan, 1986. Molecular Beam Mass Spectroscopic Study of Trichloroethylene Flames. Environmental Science Technology, 20: 1243.

Chiou, C. T., 1985. Soil Sorption of Organic Vapors and Effects of Humidity on Sorptive Mechanism and Capacity. Environ. Sci. Technol., Vol. 19, No 12, 1196-1200.

Chiu, A. N., 1983. Hurricane Iwa, Hawaii, November 23, 1982. National Academy Press, Washington D.C.

Crouch, E.A., R. Wilson, 1987. Risk Assessment and Comparisons: An Introduction. Science 236:267.

Cundy, V.A., J.S. Morse, 1986. Practical Incinerator Implications from a Fundamental Flat Flame Study of Dichloromethane Combustion. Journal of the Air Pollution Control Association, Vol. 36, No. 7.

Crump, K.S., 1984. A new Method for Determining Allowable Daily Intakes. Fundamental and Applied Toxicology, Vol. 4, pp. 854-871.

Czuczawa, J.M., R. A. Hites, 1986. Airborne Dioxins and Dibenzofurans: Sources and Fates. Environmental Science Technology, Vol. 20, No. 4, pp. 195-200.

Doll, R., R. Peto, 1981. The Causes of Cancer. Oxford University Press, Oxford, England.

Doucet, L. G. 1987. Incineration of Hazardous Waste Critical Review Papers, Journal of the Air Pollution Control Association, Vol. 36, No. 7.

Doull, J., Klassen, C.D. and M. O. Amdur, 1980. Toxicology. MacMillian Publishing Co., New York, 2nd Ed.

Eduljee, G., K. Badsha and L. Price, 1985. Environmental Monitoring for PCB and Heavy Metals in the Vicinity of a Chemical Waste Disposal Facility - I. Chemosphere, Vol. 14, No. 9, pp 1371-1382.

Eduljee, G., 1987. Volatility of TCDD and PCB. Chemosphere, Vol. 16, No. 4, pp 907-920.

Edwards, N. T., 1983. Polycyclic Aromatic Hydrocarbons (PAH's) in the Terrestrial Environment-A Review. Journal of Environmental Quality, Vol. 12, No. 4, pp. 427-441.

Ellwardt, P., 1977. Variations in Content of Polycyclic Aromatic Hydrocarbons in Soils and Plants by Using Municipal Wastes Components in Agriculture. Soil Organic Matter Studies, Volume II. International Atomic Energy Agency, Vienna, Austria. IAEA-SM-211/31, pp. 291-298.

Flex Kleen, 1987. Vendor performance quote based upon air-to-cloth ratio and performance of similar systems.

Frame. G.B. Air Pollution Control Systems for Municipal Solid Waste Incinerators. Journal of the American Pollution Control Association, Volume 38, No. 8, p. 1081-1087.

Friberg, L., T. Kjellstrom, G. Nordberg, and M. Piscator, 1979. Cadmium, in Handbook on Toxicology of Metals. L. Friberg, G.F. Nordberg, and V.b. Vouk, eds. Elsevier, New York, NY.

Fries, G. F., and G. S. Marrow, 1975. Retention and Excretion of 2,3,7,8-Tetrachlorodibenzo-p-dioxin by Rats. Journal of Agriculture and Food Chemistry, 23(2):265-269.

Gaggi, C. and E. Bacci, 1985. Accumulation of Chlorinated Hydrocarbon Vapors in Pine Needles. Chemosphere, Vol. 14, No. 5, pp 451-456.

Gerhardt, E.H and Carlson, R. M. 1978. Hepatic Mixed Function Oxidase Activity in Rainbow Trout Exposed to Several Polycyclic Aromatic Hydrocarbons. Environ. Res. 17:284-195.

Griffin, R. D. 1988. Principles of Hazardous Materials Management. Lewis Publishers, Inc., Chelsea, Michigan.

Grimmer, G., 1983. Environmental Carcinogens: Polycyclic Aromatic Hydrocarbons. CRC Press, Boca Raton, FL.

Hartwell, T.D. et al, 1985. Levels of Volatile Organics in Indoor Air, presented at the 78th APCA Annual Meeting, Detroit, June 1985.

Hawley, J. K., 1985. Assessment of Health Risk from Exposure to Contaminated Soil. Risk Analysis, Vol.5, No. 4, pp. 289-302.

Herbes, S. E., and L. R. Schwall, 1978. Microbial Transformation of Polycyclic Aromatic Hydrocarbons in Pristine and Petroleum Contaminated Sediments. Applied and Evironmental Microbiology 35(2):306-316.

Herbes, S. E., 1981. Rates of Microbial Transformation of Polycyclic Aromatic Hydrocarbons in Water Sediments in the Vicinity of Coal-Coking Wastewater Discharge. Applied and Environmental Microbiology 41(1):20-28.

Hood, R. D., G. C. Vedel-Macrander, M. J. Zaworotko, F. M. Tatum, and R. G. Meeks, 1987. Distribution, Metabolism, and Fetal Uptake of Pentavalent Arsenic in Pregnant Mice Following Oral Intraperitoneal Administration. Tetraology. 35:19-25.

ICAIR, Inc., 1985. Draft Superfund Public Health Evaluation Manual. ICF Incorporated, 1950 K Street, N. W., Washington, D. C.

Jones, A.D., J.G. Williams, 1985. Results of the U.S. Environmental Protection Agency's Air Toxics Analysis in Philadelphia, presented at the 78th APCA Annual Meeting, Detroit, June 1985.

Jensen, D. J., R. A. Hummel, N. H. Mahle, C. W. Kocher, and H. S. Higgers, 1981. A Residue Study on Beef Cattle Consuming 2,3,7,8-Tetrachlorodibenzo-p-dioxin. Journal of Toxicology and Environmental Health 14:47-93.

Journal of the Air Pollution Control Association, Incineration of Hazardous Waste - Critical Review Discussion Papers, Volume 37, No. 9, September, 1987, pp. 1011-1023.

Kashimoto, T., H. Miyata, N. Kumta, et al., 1981. Role of Polychlorinated Dibenzofuran in Yusho (PCB Poisoning). Archives Environmental Health 36:321-326.

Kemp, C. C. 1984. Plain Talk About Dioxin. Waste Age, 1984.

Kobayashi, K., Akitake, H., and Manabe, K., 1979. Relation Between Toxicity and Accumulation of Various Chlorophenols in Goldfish. Bull. Jpn. Soc. Sci. Fish. 45(2):173-175.

Kotin, P., H.L. Falk, and R. Busser, 1959. Distribution, Retention, and Elimination of C14-3,4-Benzopyrene After Administration to Mice and Rats. Journal of the National Cancer Institute 23:541-555.

Kowalski, J.D. et al, 1985. Ambient Sampling and Analysis to Halogenated Hydrocarbons and Benzene, presented at the 78th APCA Annual Meeting, Detroit, June 1985.

Kroll, P. T., P. Williamson. Application of Dry Flue Gas Scrubbing to Hazardous Waste Incineration. Journal of the Air Pollution Control Association, Vol. 36, No.11, pp. 1258-1263.

Kuroki, H., and Y. Masuda, 1978. Determination of Polychlorinated Dibenzofuran Isomers Retained in Patients with Yusho. Chemosphere 7(10):771-777.

Kuroki, H. and Y. Masuda, 1980. Accumulation of Polychlorinated Dibenzofurans in the Livers of Monkeys and Rats. Food and Cosmetic Toxicology 18:387-392.

Laska, A. L., Bartell, C. K., and Laseter, J. L., 1976. Distribution of Hexachlorobutadiene in Water, Soil, and Selected Aquatic Organisms Along the Lower Mississippi River, Louisiana. Bull. Environ. Contam. Toxicol., 15:535-542.

Lee, K. C. 1987. Incineration of Hazardous Waste Critical Review Discussion Papers. Journal of the Air Pollution Control Association, Vol 37, No. 9.

Lee, K. C., 1988. Research Areas for Improved Incineration System Performance. Journal of the Air Pollution Control Association, Vol. 38, No. 12.

Loden, M., 1986. The in Vitro Permeability of Human Skin to Benzene, Ethylene Glycol, Formaldehyde, and n-Hexane. Acta Pharmacol. et Toxicol. 58:382-389.

Lodenius, M., A. Seppanen, S. Autio, 1987. Sorption of Mercury in Soils with Different Humus Content. Bulletin of Environmental Contamination and Toxicology. 39:593-600.

Lonnerdal, B., 1985. Dietary Factors Affecting Trace Element Bioavailability from Human Milk, Cow's Milk, and Infant Formulas. Progress in Food and Nutrition Science. 9:35-62.

Lyon, R. K. 1987. Thermal DeNO$_x$ Controlling Nitrogen Oxide Emissions by a Non-Catalytic Process. Envron. Sci. Technol. 31:321.

Mackenzie, R. D. et al., 1958. Chronic Toxicity Studies: II. Hexavalent and Trivalent Chromium Administered in Drinking Water to Rats. A.M.A. Archives of Industrial Health 18:232-234.

Marklund, S., C. Rappe, M. Tysklind, 1987. Identification of Dibenzofurans and Dioxins in Exhausts from Cars Run on Leaded Gasoline. Chemosphere, Vol. 16, No. 1.

Marks, L. S., T. Baumeister, E. A. Avallone, T. Baumeister, 1978. Standard Handbook for Mechanical Engineers, 8th Ed. McGraw-Hill Book Company.

Michigan Department of Natural Resources, 1984. Staff Report: Support Document for the Proposed Rule 57 Package. Environmental Protection Bureau, Lansing, MI.

Middaugh, D. P., Davis, W. R., and Yoakum, R. L. 1975. The Response of Larval Fish, Leistomus Xanthurus, to Environmental Stress Following Sublethal Cadmium Exposure. Mar. Sci. 19:13-19.

Murray, F. J., F. A. Smith, K. D. Nitschke, G. G. Humiston, R. J. Kociba, and B. A. Schwetz, 1979. Three Generation Reproduction Study of Rats Given 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) in the Diet. Toxicology and Applied Pharmacology 50:241-251.

National Academy of Sciences, 1983. Polycyclic Aromatic Hydrocarbons: Evaluation of Sources and Effects. Committee on Pyrene and Selected Analogues. National Academy Press, Washington D. C.

National Research Council, 1977. Drinking Water and Health. Volume I. National Academy of Sciences, Washington, D. C. Pp. 750-753.

Ninmo, D. R., Hansen, D. M., Couch, J. A., Cooley, N. R., Parrish, P. R., and Lowe, J. I. 1975. Toxicity of Aroclor 1254 and Its' Physiological Activity in Several Estuarine Organisms. Arch. Environ. Contam. Toxicol. 3:22-39.

Oberg, T., J. P. Aittola, J. G. T. Bergstrom, 1985. Chlorinated Aromatics from the Combustion of Hazardous Waste. Chemosphere, Vol. 14, No. 2, pp. 215-221.

Olie, K., M. V. D. Berg, O. Hutzinger, 1983. Formation and Fate of PCDD and PCDF from Combustion Processes. Chemosphere, Vol. 12, No. 4/5, pp. 627-636.

Otani, Y., H. Emi, C. Kanaoka, S. Matsui, 1984. Environ. Sci. Technol., 18, 793-796.

Otani, Y., 1986. Adsorption of Mercury Vapor on Particles. Environ. Sci. Technol., 20,735-738.

Otto, D. A., V. A. Benignus, K. E. Muller, and C. N. Barton, 1981. Effects of Age and Body Lead Burden on CNS Function in Young Children, I: Slow Cortical Potentials. Electroencephalography and Clinical Neurophysiology 52:229-239.

Otto, D. A., V. A. Binignus, C. Barton, K. Seiple, J. Prah, and S. Schroeder, 1982. Effects of Low to Moderate Lead Exposure on Slow Cortical Potentials in Young Children: Two-Year Follow-Up Study. Neurobehavioral Toxicology and Teratology 4:733-737.

Patterson, B. W., S. L. Hansard, C. B. Ammerman, P. R. Henry, L. A. Zech, and W. R. Fisher. Kinetic Model of Whole-Body Vanadium Metabolism. Studies on Sheep. American Journal of Physiology, 1986. 20:R235-R332.

Pocchiari, F., A. DeDominico, V. Silano, and G. Zappani, 1983. Environmental Impact of the Accidental Release of Tetrachlorodibenzo-p-dioxin (TCDD) at Seveso (Italy). in Accidental Exposure to Dioxins. F. Couilston and F. Pocchari, Eds. Academic Press, New York, NY.

Poiger, H. and C. H. Schlatter, 1980. Influence of Solvents and Adsorbents on Dermal and Intestinal Absorption of TCDD. Food and Cosmetic Toxicology, Volume 18, pp. 477-481.

Poiger, H., and C. Schlatter, 1985. Pharmacokinetics of 2,3,7,8-TCDD in Man. Abstract 49, published in the Program of the International Symposium on Chlorinated Dioxins and Related Compounds, Bayreuth.

Poiger, H., and C. Schlatter, 1986. Pharacokinetics of 2,3,7,8-TCDD in Man. Chemosphere 15:1498-1494.

Radian Corporation, 1986. Stanisalaus Waste-to-Energy Facility Health Risk Assessment. Sacramento, CA.

Radian Corporation, 1987. Miliken Waste-to-Energy Project Health Risk Assessment. Sacramento, CA.

Raghib, M.H., W. Chan, O. M. Rennert, 1986. Comparative Biological Availability of Manganese from Extrinsically Labelled Milk Diets Using Sucking Rats as a Model. British Journal of Nutrition. 55:49-58.

Rappe, C., S. Karklund, P. A. Bergquist, M. Hansson, 1983. Polychlorinated Dibenzo-p-furans and Other Polynuclear Aromatics Formed During Incineration and Polychlorinated Biphenyl Fires, in Chlorinated Dioxins and Dibenzofurans in the Total Environment, L. H. Keith, G. Choudhary, and C. Rappe. Ann Arbor Science.

Rappe, C., P. A. Bergquist, M. Hansson, L. O. Kjeller, G. Lindstrom, S. Marklund, and M. Nygren, 1984. Chemistry and Analysis of Polychlorinated Dioxins and Dibenzofurans in Biological Samples, in Banbury Report 18: Biological Mechanisms of Dioxin Action. A. Polland and R. Kimbrough, Eds. Cold Springs Harbor Laboratory. Pp. 17-25.

Riondia, D., M. Cooke, R.K. Haroz, 1986. Mobile Source Emissions Including Polycyclic Organic Species. D. Reidel Publishing Co., Dordrecht, Boston, Lancaster.

Ryu, J. E., E. E. Ziegler, F. E. Nelson, and S. J. Fomon, 1983. Dietary Intake of Lead and Blood Lead Concentration in Early Infancy. American Journal of Diseases of Children 137:886-891.

Sandstrom, B., A. Almgren, B, Kivitso, and A. Cederblad, 1987. Zinc Absorption in Humans Based on Rye, Barley, Oatmeal, Triticale and Whole Wheat. American Institute of Nutrition. 117:1989-1902.

Sandstrom, B., L. Davidson, A. Cederblad, R. Eriksson and B. Lonnerdal, 1987. Manganese Absorption and Metabolism in Man. Acta Pharmacologica et Toxicologica. 59:7.

Schlede, E., R. Kuntzman and A. H. Conney, 1970a. Stimulatory Effect of B(a)P and Phenobarbitol Pretreatment on the Biliary Excretion of P(a)B Metabolites in the Rat. Cancer Research, 30:2898-2904.

Schlede, E., R. Kuntzman, S. Haber, and A.H. Conney, 1970b. Effect of Emzyne Induction on the Metabolism and Tissue Distribution of B(a)P. Cancer Research. 30:2893-2897.

Shariatpanahi, M., 1986. Accumulation of Cadmium, Mercury, and Lead by Vegetables Following Long-Term Land Application of Wastewater. The Science of the Total Environment. 52:41-47.

Shroeder, H. A., M. Mitchner, and A. P. Nason, 1970. Zirconium, Niabliu, Antimony, and Lead in Rats: Life Term Studies. Journal of Nutrition 100:59-68.

Shroeder, H. A., M. Mitchner, 1975. Life-Term Studies in Rats: Effects of Aluminum, Barium, Beryllium, and Tungsten. Journal of Nutrition 105:421-427.

Schroeder, H. A., J. J. Balassa, and W. H. Vinton, Jr., 1965. Chromium, Cadmium, and Lead in Rats: Effects on Life Span, Tumors, and Tissue Levels. Journal of Nutrition 86:51-66.

Simms, R. C. and R. Overcash, 1983. Fate of Polynuclear Aromatic Hydrocarbons (PNA) in Soil-Plant Systems. Residue Reviews 88:2-68.

Sittig, M., 1985. Handbook of Toxic and Hazardous and Carcinogens, 2nd Ed. Noyes Data Corporation.

South Coast Air Quality Management District,1987. The Magnitude of Ambient Air Toxics Impact from Existing Sources in the South Coast Air Basis, 1987 Air Quality Management Plan Revision, Working Paper No. 3, Planning Division.

South Coast Air Quality Managment District,1988. Multi-Pathway Health Risk Assessment Input Parameters Guidance Document. Prepared By Clement Associates, Inc. under contract # 8798. June, 1988.

Springer, G.S., D.J. Patterson, 1973. Engine Emissions, Pollutant Formation and Measurement. Plenum Press, New York-London.

Sullivan, M. F., B. M. Miller, and J. C. Goebel, 1984. Gastrointestinal Absorption of Metals (Cr, Zn, Tc, Cd, Sn, Pm, and Pu) by Rats and Swine. Environmental Research. 35:439-453.

Swenson, M. J., 1980. Duke's Physiology of Domestic Animals. 8th Edition, Comstock Publishing, London.

Taylor, M. L., T. O. Tiernan, J. H. Garret, G. F. VanNess, J. G Solch, 1983. Assessments of Incineration Processes as Sources of Supertoxic Chlorinated Hydrocarbons: Concentrations of Polychlorinated Dibenzo-p-dioxins/Dibenzofurans and Possible Precursor Compounds in Incinerator Effluents, in Chlorinated Dioxins and Dibenzofurans in the Total Environment, L. H. Keith, G. Choudhary, and C. Rappe. Ann Arbor Science.

Thibodeaux, L. J., 1983. Offsite Transport of 2,3,7,8-Tetrachlorinated-p-dioxin from a Production Disposal Facility, in Chlorinated Dioxins and Dibenzofurans in the Total Environment, L. H. Keith, G. Choudhary, and C. Rappe. Ann Arbor Science.

Thiernan, T. O., M.L. Taylor, J. H. Garret, G. F. VanNess, J. G. Solch, D. A. Deis, D. J. Wagel, 1983. Chlorobenzodioxins, Chlorobenzofurans, and Related Compounds in the Effluents from Combustion Processes. Chemosphere, Vol. 12, No. 4, pp. 595-606.

Til, H. P., H. R. Immel, and V. J. Feron, 1983. Lifespan Oral Carcinogenicity Study of Vinyl Chloride in Rats. Final Report. Civo Institutes TNO. Report No. V83.285/291099.

Trenholm, A., 1984. Performance Evaluation of Full-Scale Hazardous Waste Incineration. PB 85-1295000, EPA, Washington D.C., 1984, Vols. 1-5.

Tsang, W., W. Shaub, 1981. Chemical Processes in the Incineration of Hazardous Materials. Presented at the American Chemical Society Symposium on Detoxification of Hazardous Wastes, New York, August, 1981.

Tschirley, F. H., 1986. Dioxin. Scientific American, Vol. 254, No. 2, pp. 29-35.

Tuey, D. B., 1980. Toxiconetics, in Introduction to Biochemical Toxicology. E. Hodgson and F. E. Guthrie, Eds. Elsevire, New York. Pp 40-65.

Urano, K., C. Murata, 1985. Adsorption of Principal Chlorinated Orgainic Compounds on Soil. Chemosphere, Vol.14, pp. 293-299.

U.S. Department of Agriculture, 1963. Consumption of Foods. Consumer and Economics Institute, Agricultural Research Service, Washington D.C., Agricultural Handbook No. 8.

U.S. Department of Agriculture, 1972. Food Consumption of Households in the United States, Seasons and Year, 1965-66. U.S. Department of Agriculture, Agricultural Research Service, Washington, D. C.

U.S. Department of Health Services, 1985. NIOSH Pocket Guide to Chemical Hazards. GPO 017-033-00342-4.

U.S. Environmental Protection Agency, 1979a. AIRDOSE-EPA: A Computerized Methodology for Estimating Environmental Concentrations and Doses to Man from Airborne Releases of Radionuclides. Office of Radiation Programs, Washington, D. C. EPA 520/1-79/009.

U.S. Environmental Protection Agency, 1979b. Industrial Source Complex (ISC) Dispersion Model User's Guide. Research Triangle Park, NC. EPA-450/4-79-030.

U.S. Environmental Protection Agency, 1979c. Water Related Fate of 129 Priority Pollutants. Office of Water and Planning Standards, Office of Water and Waste Management, Washingtom, D. C.EPA 440/4-79/029a and b.

U.S. Environmental Protection Agency, 1980a. Dietary Consumption Distribution of Selected Food Groups for the U.S. Population. Environmental Protection Agency, Office of Toxic Substances, Washington, D.C. EPA 560/11-80/012.

U.S. Environmental Protection Agency, 1980b. Water Quality Criteria Documents Availability (Final). Federal Register 45:79316-79379.

U.S. Environmental Protection Agency, 1983. Health Assessment for Inorganic Arsenic. Environmental Criteria and Assessment Office, Research Triangle Park, NC. EPA 600/8-83-038, NTIS PB 86-134491.

U.S. Environmental Protection Agency, 1984a. Health Effects Assessment for Cadmium. Office of Research and Development, Office of Health and Environmental Assessment, Environmental Criteria and Assessment office, Cincinnati, OH. EPA 540/1-86/038.

U.S. Environmental Protection Agency, 1984b. Health Assessment Document for Chromium. Final Report. Environemntal Criteria and Assessment Office, Research Triangle Park, NC. EPA 600/8-83/014f.

U.S. Environmental Protection Agency, 1984c. Health Effects Assessment for Lead. Office of Research and Development, Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH. EPA 540/1-86/055.

U.S. Environmental Protection Agency, 1984d. Health Effects Assessment for Manganese (and Compounds). Office of Research and Development, Office of Health and Environmental Assessment, Environmental Criteria and Assessment office, Cincinnati, OH. EPA 540/1-86/054.

U.S. Environmental Protection Agency, 1984e. Health Effects Assessment for Nickel. Office of Research and Development, Office of Health and Environmental Assessment, Environmental Criteria and Assessment office, Cincinnati, OH. EPA 540/1-86/018.

U.S. Environmental Protection Agency, 1984f. Health Effects Assessment for Polycyclic Aromatic Hydrocarbons (PAHs). Office of Research and Development, Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH. EPA 540/1-86/013.

U.S. Environmental Protection Agency, 1984g. Health Effects Assessment for Hexavalent Chromium. Office of Research and Development, Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH. EPA 540/1-86/019.

U.S. Environmental Protection Agency, 1984h. Health Effects Assessment for Sulfuric Acid. Office of Research and Development, Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH. EPA 540/1-86/031.

U.S. Environmental Protection Agency, 1984i. Health Effects Assessment for Mercury. Office of Research and Development, Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH. EPA 540/1-86/042.

U.S. Environmental Protection Agency, 1984j. Health Effects Assessment for Trivalent Chromium. Office of Research and Development, Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH. EPA 540/1-86/055.

U.S. Environmental Protection Agency, 1984k. Health Effects Assessment for Zinc (and Compounds). Office of Research and Development, Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH. EPA 540/1-86/048.

U.S. Environmental Protection Agency, 1984l. Ambient Water Quality Criteria for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin, EPA 440/5-84-007.

U. S. Environmental Protection Agency, 1984m. Ambient Water Quality Criteria for Mercury. Office of Water Regulations and Standards. Washington, D. C. EPA 440/5-84-026.

U. S. Environmental Protection Agency, 1985. Health Assessment Document for Chloroform. Office of Health and Environmental Assessment. EPA-600/8-84/004F.

U.S. Environmental Protection Agency, 1985a. Health Assessment Document for Polychlorinated Dibenzo-p-Dioxins. EPA 600/8-84/014F.

U.S Environmental Protection Agency, 1985b. Interim Procedures for Evaluation Air Quality Models: Experience with Implementation. EPA 450/4-85/006.

U.S. Environmental Protection Agency, 1985c. Arsenic Health Advisory. Draft. Office of Drinking Water, Washington, D.C.

U.S. Environmental Protection Agency, 1985d. Chromium Health Advisory. Draft. Office of Drinking Water, Washington, D.C.

U.S. Environmental Protection Agency, 1985e. Hexachlorobenzene Health Advisory. Draft. Office of Drinking Water, Washington, D.C.

U.S. Environmental Protection Agency, 1985f. Nickel Health Advisory. Draft. Office of Drinking Water, Washington, D.C.

U.S. Environmental Protection Agency, 1985g. 2,3,7,8-Tetrachlorodibenzo-p-dioxin Health Advisory. Draft. Office of Drinking Water, Washington, D.C.

U.S. Environmental Protection Agency, 1985h. Vinyl Chloride Health Advisory. Draft. Office of Drinking Water, Washington, D.C.

U.S. Environmental Protection Agency, 1985i. Cadmium Health Advisory. Draft. Office of Drinking Water, Washington, D.C.

U.S. Environmental Protection Agency, 1985j. Lead Health Advisory. Draft. Office of Drinking Water, Washington, D.C.

U.S. Environmental Protection Agency, 1985k. Nickel Health Advisory. Draft. Office of Drinking Water, Washington, D.C.

U.S. Environmental Protection Agency, 1986a. Handbook, Permit Writers Guide to Test Burn Data, Hazardous Waste Incineration. EPA 625/6-86/012, September 1986.

U.S. Environmental Protection Agency, 1986b. Superfund Public Health Evaluation Manual. Office of Solid Waste, Washington D.C. EPA 540/1-86/060.

U.S. Environmental Protection Agency, 1987a. Burning of Hazardous Waste in Boilers and Industrial Furnaces. Federal Register 52:16982-17050.

U.S. Environmental Protection Agency, 1987b. The Integrated Risk Information System (IRIS). (Official IRIS 1st Edition - January 31, 1987). Unpublished Computer Database.

U.S. Nuclear Regulatory Commission, 1975. Reactor Safety Study: An Assessment of Risks in the U.S. Commercial Power Plant, Appendix VI. Calculation of Reactor Accident Consequences. Washington D.C. NTIS PB76-248-206.

Visali, J. R., 1988. A Comparison of Dioxin, Furan, and Combustion Gas Data from Test Programs at Three MSW Incinerators. Hazardous Waste Management, Volume 37, No. 12, 1451-1463.

Wang, D. T., and O. Mercesz, 1982. Occurrence and Potential Uptake of Polynuclear Aromatic Hydrocarbons for Highway Traffic Origin by Proximally Grown Food Crops, in Polynuclear Aromatic Hydrocarbons: Physical and Biological Chemistry. Proceedings of the Sixth International Symposium on Polynuclear Aromatic Hydrocarbons Held at the Batelle Columbus Laboratories, October 27-29, 1981. M. Cooke, A. J. Dennis and G.L. Fisher, Eds. Battelle Press, Columbus, OH. pp. 885-896.

Wilson, J. T.,C. G. Enfield, W. J. Dunlap, R. L. Crosby, D. A. Foster, L. B. Baskin, 1981. Transport and Fate of Selected Organic Pollutants in a Sandy Soil, Journal of Environmental Quality, Vol. 10, pp. 501-506.

Wipf, H.K., E. Homberger, N. Neuner, V.B. Ranalder, W. Vettev, and J.P. Vuilleumier, 1982. TCDD Levels in Soil and Plant Samples from the Seveso Area, in Chlorinated Dioxins and Related Compounds: Impact on the Environment. O. Hutzinger, R.W. Frei, E. Meriam. and F. Pocchiari, Eds. Pergamon Press, Elmsford, NY.

Yezzi, J. J. et al, 1984. Results of the Trial Burn of the EPA-ORD Mobile Incinerator Systems. Proceedings of the 1984 National Waste Processing Conference, ASME, pp. 514-534.

Young, A. L., 1983. Long Term Studies on the Persistence and Movement of TCDD in a Natural Ecosystem, in Human and Environmental Risks of Dioxin and Related Compounds, edited by R.E. Tucker et al. New York: Plenum Puiblishing Company, pp. 173-190.

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