THE CITY OF JACKSONVILLE

DEPARTMENT OF PUBLIC UTILITIES

SOLID WASTE DISPOSAL DIVISION

EAST DUVAL SANITARY LANDFILL

APPLICATION TO CONSTRUCT AIR

POLLUTION SOURCE (LANDFILL GAS FLARE)

August 1990

Prepared by:

POST, BUCKLEY, SCHUH & JERNIGAN, INC.
Engineering - Planning - Architecture
6635 E. Colonial Drive
Orlando, Florida 32807

PBS&J
ENVIRONMENTAL LABORATORIES
6635 EAST COLONIAL DRIVE
ORLANDO, FLORIDA 32807
407/277-4443

August 27, 1990

Mr. Clair Fancy, P.E.
Bureau of Air Quality Management
Florida Department of Environmental Regulation
2600 Blair Stone Road
Twin Towers Office Building
Tallahassee, Florida 32301

Reference: East Duval Sanitary Landfill
Application to Construct Air Pollution
Source (Landfill Gas Flare)

Dear Mr. Fancy:

Pursuant to the requirement of specific condition Number 9 of the East Duval Sanitary Landfill Closure Permit Number SF16-155245, the City of Jacksonville, Solid Waste Disposal Division is pleased to submit four (4) copies of this Application to Construct Air Pollution Source (Landfill Gas Flare).

A check in the amount of $2,500 is enclosed as specified in Florida Administrative Code Rule 17-4.050.

If you have any questions or comments regarding this application, please do not hesitate to call.

Very truly yours,

PBS&J ENVIRONMENTAL LABORATORIES

Jerome J. Guidry, P.E.
Vice President

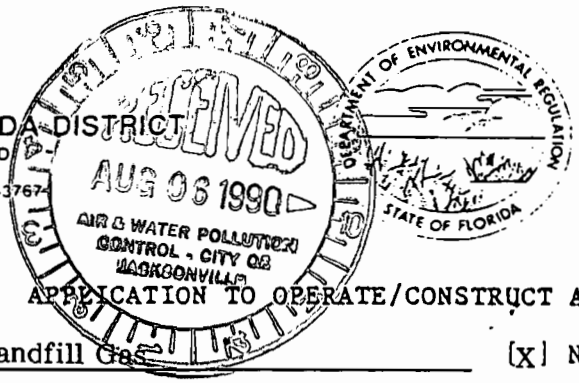
JJG:kf

cc: G. Threlkeld

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

$2,500 pd. 9-4-90 Receipt 151164

CENTRAL FLORIDA DISTRICT
3319 MAGUIRE BOULEVARD
SUITE 232
ORLANDO, FLORIDA 32803-3767



AC16-146047

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: Landfill Gas [X] New[1] [ ] Existing[1]

APPLICATION TYPE: [X] Construction [ ] Operation [ ] Modification

COMPANY NAME: City of Jacksonville COUNTY: Duval

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) Landfill Gas Flare

SOURCE LOCATION: Street 515 Girvin Road City Jacksonville, FL

UTM: East 454.95 km North 3355.57 km

Latitude 30 ° ~~16~~ 19 ' ~~40~~ 58 "N Longitude 81 ° 28 ' ~~30~~ 07 "W

APPLICANT NAME AND TITLE: George R. Knecht, P.E. Manager of Disposal

APPLICANT ADDRESS: Solid Waste Disposal Division, 1931 East Beaver Street Jacksonville, FL 32202

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of City of Jacksonville

I certify that the statements made in this application for a Construction permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: George R. Knecht

George R. Knecht, P.E. Manager of Disposal
Name and Title (Please Type)

Date: 6/25/90 Telephone No. (904) 630-0973

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been ~~designed~~/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

[1] See Florida Administrative Code Rule 17-2.100(57) and (104)

00103)

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed Jerome J. Guidry, P.E.

Post, Buckley, Schuh & Jernigan, Inc.
Name (Please Type)

6635 E. Colonial Drive, Orlando, Florida 32807
Company Name (Please Type)

Mailing Address (Please Type)

Florida Registration No. 32589 Date: 8-29-90 Telephone No. (407) 277-4443

SECTION II: GENERAL PROJECT INFORMATION

A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

The East Duval Sanitary Landfill will incorporate an active gas management system to collect and burn off, through the use of a flare, landfill gases. This project will result in full compliance with F.A.C. Rule 17-2, See Section IIA Attachment.

B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction March, 1991 Completion of Construction June, 1991

C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

Enclosed Ground Flare - $80,000.

D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

East Duval Sanitary Landfill Closure

DER file No. SF16-155245

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ;

if power plant, hrs/yr _____; if seasonal, describe: _____

F. If this is a new source or major modification, answer the following questions. (Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? NO

   a. If yes, has "offset" been applied? N/A

   b. If yes, has "Lowest Achievable Emission Rate" been applied? N/A

   c. If yes, list non-attainment pollutants. N/A

2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. NO

3. Does the State "Prevention of Significant Deterioriation" (PSD) requirement apply to this source? If yes, see Sections VI and VII. NO

4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? NO

5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? NO

H. Do "Reasonably Available Control Technology" (RACT) requirements apply to this source? NO

   a. If yes, for what pollutants? _____

   b. If yes, in addition to the information required in this form, any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justification for any answer of "No" that might be considered questionable.

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable: N/A

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		

B. Process Rate, if applicable: (See Section V, Item 1)

1. Total Process Input Rate (lbs/hr): N/A

2. Product Weight (lbs/hr): N/A

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

Name of Contaminant	Emission[1]		Allowed[2] Emission Rate per Rule 17-2	Allowable[3] Emission lbs/hr	Potential[4] Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	
CH4	55.4	242.7			See Section		
NOx	5.36	23.48			III C Attachment		
CO2	14,621	64,040					
CO	23.84	104.42					
N2	88,168	386,176					
O2	15,632	68,468					
H2O	7,188	31,483					

[1]See Section V, Item 2.

[2]Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

[3]Calculated from operating rate and applicable standard.

[4]Emission, if source operated without control (See Section V, Item 3).

D. Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
McGill Environmental Systems, Inc.		98% Expected		
Model EGF-60 (or equivalent)		Minimum Destruction		
		Efficiency		

E. Fuels N/A

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Fuel Analysis:

Percent Sulfur: _____ Percent Ash: _____

Density: _____ lbs/gal Typical Percent Nitrogen: _____

Heat Capacity: _____ BTU/lb _____ BTU/gal

Other Fuel Contaminants (which may cause air pollution): _____

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average N/A Maximum _____

G. Indicate liquid or solid wastes generated and method of disposal.

N/A

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: 40 ft. Stack Diameter: 7.6 ft.

Gas Flow Rate: 120,060 ACFM 26,450 DSCFM Gas Exit Temperature: 1400°F Min. 1800°F Normal 2000°F Max. °F.

Water Vapor Content: 5.7% by weight of H_2O in flue gas % Velocity: 44 FPS

SECTION IV: INCINERATOR INFORMATION N/A

Type of Waste	Type 0 (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq.& Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste _____

Total Weight Incinerated (lbs/hr) _____ Design Capacity (lbs/hr) _____

Approximate Number of Hours of Operation per day _____ day/wk _____ wks/yr. _____

Manufacturer _____

Date Constructed _____ Model No. _____

	Volume $(ft)^3$	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

Stack Height: _____ ft. Stack Diamter: _____ Stack Temp. _____

Gas Flow Rate: _____ ACFM _____ DSCFM* Velocity: _____ FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner

[ ] Other (specify) _____

Brief description of operating characteristics of control devices: _____

_____

_____

_____

_____

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

_____

_____

_____

_____

NOTE: Items 2, 3, 4, 6, 7, 8, and 10 in Section V must be included where applicable.

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight -- show derivation [Rule 17-2.100(127)]

2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.

3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).

4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, design pressure drop, etc.)

5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3 and 5 should be consistent: actual emissions = potential (1-efficiency).

6. An 8 1/2" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.

7. An 8 1/2" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).

8. An 8 1/2" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

9. The appropriate application fee in accordance with Rule 17-4.05. The check should be made payable to the Department of Environmental Regulation.

10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?

[ ] Yes [ ] No

Contaminant	Rate or Concentration
N/A	

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy)

[ ] Yes [ ] No

Contaminant	Rate or Concentration
N/A	

C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration
N/A	

D. Describe the existing control and treatment technology (if any). N/A

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:

*Explain method of determining

5. Useful Life:

6. Operating Costs:

7. Energy:

8. Maintenance Cost:

9. Emissions:

Contaminant	Rate or Concentration

10. Stack Parameters

a. Height: ft.

b. Diameter: ft.

c. Flow Rate: ACFM

d. Temperature: °F.

e. Velocity: FPS

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary). N/A

1.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

2.

a. Control Device:

b. Operating Principles:

c. Efficiency:[1]

d. Capital Cost:

e. Useful Life:

f. Operating Cost:

g. Energy:[2]

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

3.

a. Control Device: b. Operating Principles:

c. Efficiency:[1] d. Capital Cost:

e. Useful Life: f. Operating Cost:

g. Energy:[2] h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

4.

a. Control Device: b. Operating Principles:

c. Efficiency:[1] d. Capital Costs:

e. Useful Life: f. Operating Cost:

g. Energy:[2] h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

1. Control Device: Enclosed Ground Flare 2. Efficiency:[1] 98%+

3. Capital Cost: $80,000 4. Useful Life: 30+ years

5. Operating Cost: $5,000/year 6. Energy:[2] N/A

7. Maintenance Cost: $1,000/year 8. Manufacturer: McGill Environmental Systems, Inc. (or equivalent)

9. Other locations where employed on similar processes: N/A

a. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

[1]Explain method of determining efficiency.
[2]Energy to be reported in units of electrical power - KWH design rate.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

b. (1) Company:

(2) Mailing Address:

(3) City: (4) State:

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions:[1]

Contaminant	Rate or Concentration

(8) Process Rate:[1]

10. Reason for selection and description of systems:

[1]Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

SECTION VII - PREVENTION OF SIGNIFICANT DETERIORATION N/A

A. Company Monitored Data

1. _____no. sites _____ TSP _____( ) SO^{2}* _____ Wind spd/dir

Period of Monitoring ____/____/____ to ____/____/____
month day year month day year

Other data recorded _____

Attach all data or statistical summaries to this application.

*Specify bubbler (B) or continuous (C).

2. Instrumentation, Field and Laboratory

a. Was instrumentation EPA referenced or its equivalent? [ ] Yes [ ] No

b. Was instrumentation calibrated in accordance with Department procedures?

[ ] Yes [ ] No [ ] Unknown

B. Meteorological Data Used for Air Quality Modeling

1. _____ Year(s) of data from _____/_____/_____ to _____/_____/_____
month day year month day year

2. Surface data obtained from (location)_____

3. Upper air (mixing height) data obtained from (location)_____

4. Stability wind rose (STAR) data obtained from (location)_____

C. Computer Models Used

1. _____ Modified? If yes, attach description.

2. _____ Modified? If yes, attach description.

3. _____ Modified? If yes, attach description.

4. _____ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate
TSP	_____ grams/sec
SO^2	_____ grams/sec

E. Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description of point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

F. Attach all other information supportive to the PSD review.

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

PROJECT DESCRIPTION:

East Duval Sanitary Landfill Closure

TO WHOM IT MAY CONCERN:

This is notification that George R. Knecht, Manager of Disposal, has the authority to act on behalf of the City of Jacksonville as agent in applying for and obtaining site-related permits and approvals for the project described herein.

It is understood that this representation may be terminated by the undersigned at any time upon proper notice to the permitting agencies.

BY: _____ TITLE: Mayor

FOR: The City of Jacksonville

STATE OF FLORIDA,
COUNTY OF Duval

I, the undersigned authority, hereby certify that the foregoing is a true and correct copy of the instrument presented to me by THOMAS L HAZOURI as the original of such instrument.

WITNESS my hand and official seal, this 1 day of July, 1990.

_____
Notary Public

My commission expires NOTARY PUBLIC, STATE OF FLORIDA.
MY COMMISSION EXPIRES: OCT. 4, 1991.
BONDED THRU NOTARY PUBLIC UNDERWRITERS.

SMALLENBERGER ★ NOTARY PUBLIC ★ STATE OF FLORIDA ★ CHERI

cla/58/016
22-092.00/3.0

Section II A Attachment

NATURE AND EXTENT OF THE PROJECT

The City of Jacksonville began solid waste disposal operations at the East Duval Sanitary Landfill (the East Landfill) in November, 1974. Materials accepted at the East Landfill include Class I waste (residential, commercial, and industrial wastes) as well as Class III waste (construction and demolition debris). Less than 3,000 combined tons of both dry and wet ash from a Carbonaceous Fuel Boiler were also received from the Mayport Naval Station for disposal at the East Landfill. Additionally, a clay lined special waste pit was opened for a short time in which small quantities of special wastes were disposed of. Operations at the East Landfill are on-going and the landfill is expected to reach its capacity within 1-2 years.

The East Landfill (see Figure 1 for location) consists of approximately 136 acres with the waste disposal area occupying approximately 71 acres. The East Landfill is expected to achieve a 132' final height (this is approximately 110' above existing ground elevation).

The City of Jacksonville has committed to install an active landfill gas collection and flaring system (see Figures 2 and 3). Landfill gases will be actively withdrawn from the landfill through a system of specially designed extraction wells. Gases will be collected by producing a negative pressure in the wells with a system of blowers. The wells will be manifolded together and routed to a flare system where the gas will be burned to oxidize potential odor causing constituents and destroy the potentially explosive gases. Moisture will be removed from the collection system through a system of condensate traps located

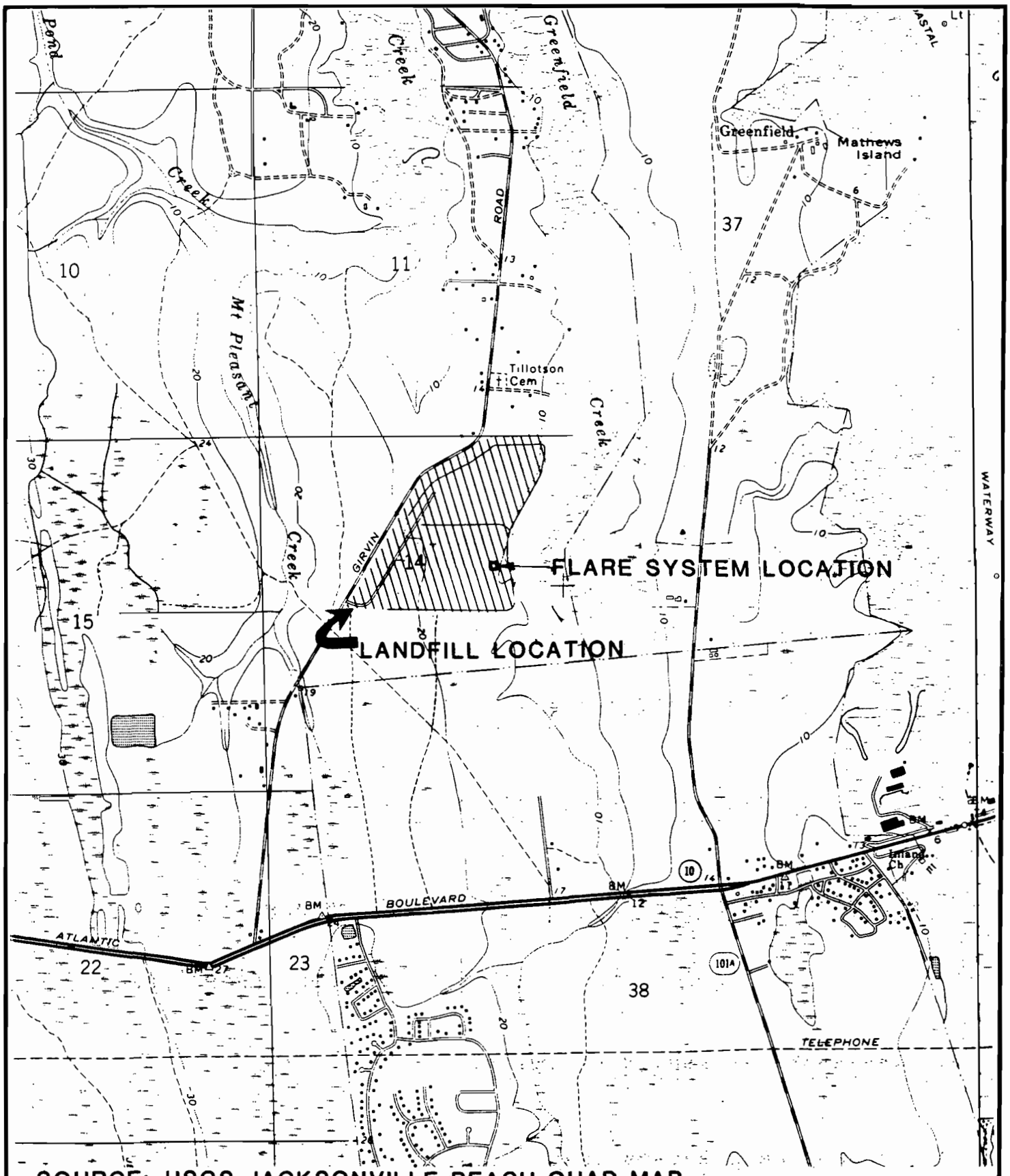
at low points of the collection pipe system and will be routed to an above ground condensate storage tank.

The blower system will be designed with three individual blower units connected in parallel between the well system manifold and the flare system. Two of the blower units will operate simultaneously under normal conditions, with the additional blower unit provided as stand-by for use during scheduled or unscheduled maintenance outages.

The McGill Environmental Systems, Inc. flare system (or equivalent) to be used will be an enclosed unit designed such that all combustion takes place in a refractory lined chamber. This will offer the greatest control of the combustion process, and no flame or lighting should be visible outside of the unit. A flame arrestor will be incorporated to prevent flame migration outside of the flare unit.

Sensors and alarms will be incorporated to monitor system performance. In the event of flame out or blower unit malfunction, responsible City personnel will be notified automatically, so that appropriate action will not be delayed.

While the City of Jacksonville currently plans to burn off the landfill gases with a flare system, the City may, at a later date, elect to sell the gas. The primary consideration by the City on this alternative (and any other alternatives to flaring the gas) will be odor control.



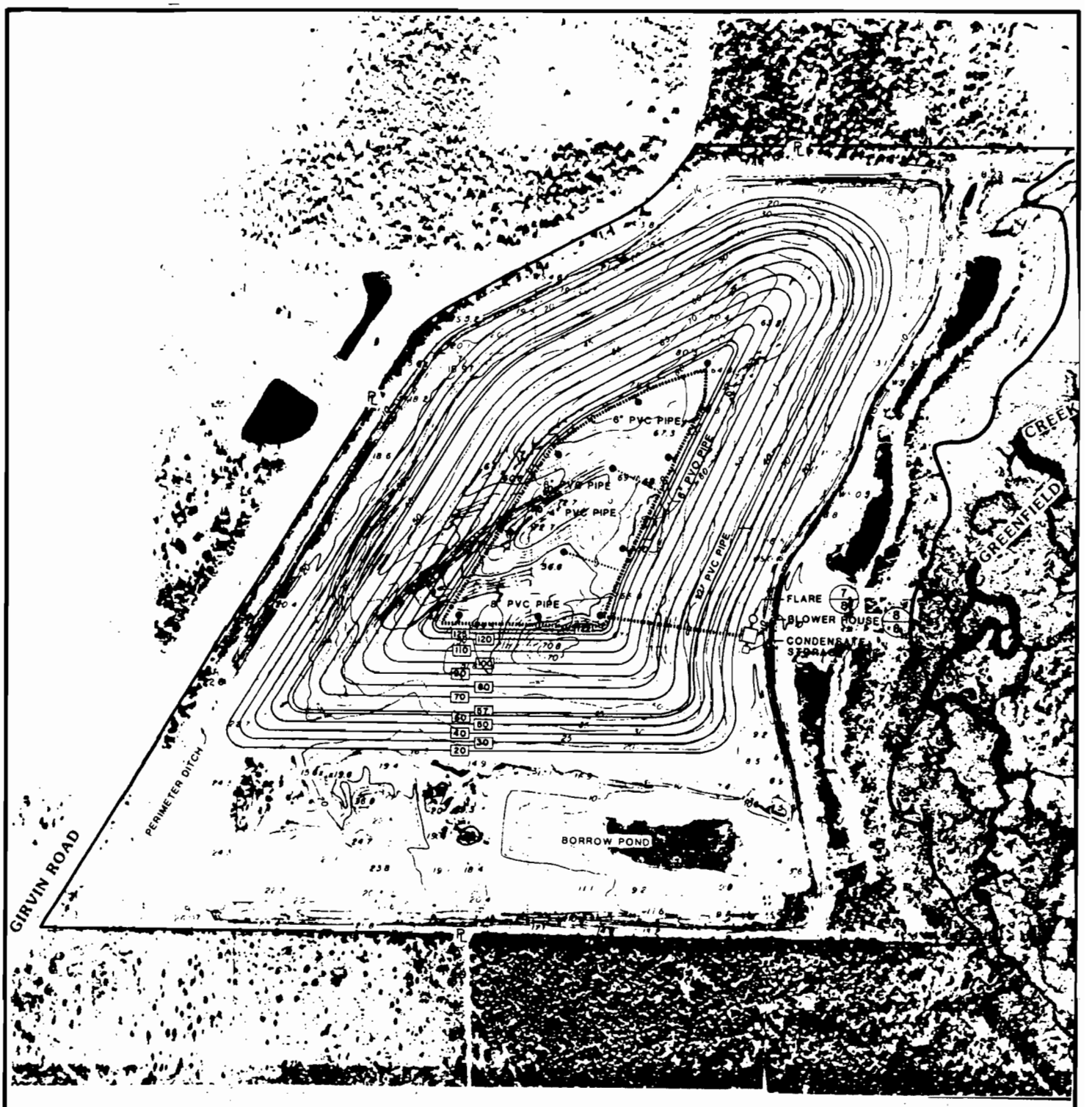
SOURCE: USGS JACKSONVILLE BEACH QUAD MAP
PHOTOREVISED 1981

PBS

EAST DUVAL SANITARY LANDFILL LOCATION MAP

FIGURE 1

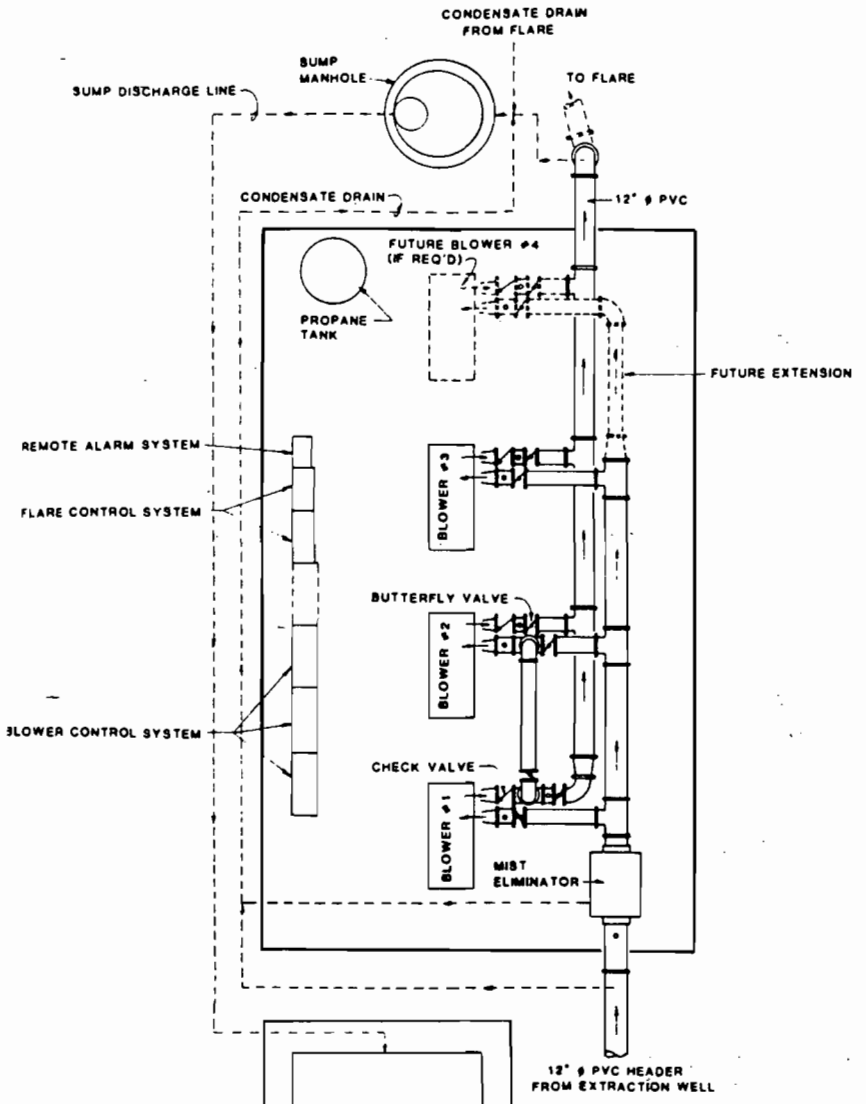
N69174

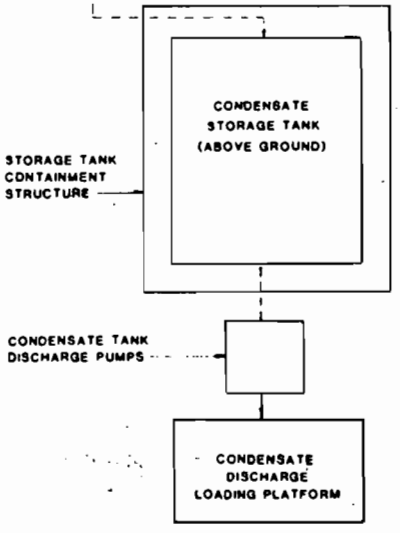


EAST DUVAL SANITARY LANDFILL
GAS MANAGEMENT FACILITY PLOT PLAN

FIGURE 2

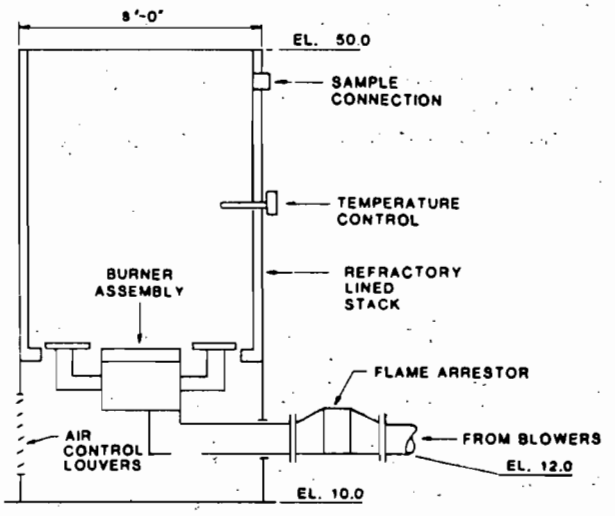
N69174





BLOWER HOUSE SCHEMATIC

N.T.S.



ENCLOSED FLARE SYSTEM PROFILE SCHEMATIC

N.T.S.

EAST DUVAL SANITARY LANDFILL - GAS MANAGEMENT FACILITY FLOW DIAGRAM

FIGURE 3

N69174

Section III C Attachment

AIRBORNE CONTAMINANTS EMITTED

The potential emissions of the landfill without the landfill cap (to contain the gas) and the active gas management system (to collect and burn the gas) are difficult to predict due to the varying nature and age of the garbage in the landfill. The attached landfill gas production model conservatively predicts a peak year average flow of approximately 2100 cfm. The composition of this gas can reasonably be expected to coincide with the values shown in Table 2-1, Typical Landfill Gas Composition at Various Sites. These are the potential emissions of the landfill without the landfill cap and active gas management system.

The emissions data for each contaminant in Section III C was provided by McGill Environmental Systems, Inc. based on an assumed 2100 cfm peak year average flow and an estimated 52% methane content.

KW/jdm/MISCII/018

22-092.00

East Landfill
City of Jacksonville
Jacksonville, Florida

LANDFILL GAS PRODUCTION MODEL
BASED ON THE PALOS VERDES KINETIC MODEL
VERSION 3.2 - MARCH 7, 1989

REFUSE QUANTITY & CHARACTERISTICS

ASSUMPTIONS:

TOTAL TONS OF REFUSE IN-PLACE=	3,720,500 TONS		FINAL MOISTURE CONTENT=	25%
REFUSE TEMPERATURE =	85 DEGREES F		YEARS LANDFILL WAS OPEN BEFORE CLOSURE =	0
INITIAL MOISTURE CONTENT =	35%		PERCENTAGE REDUCTION OF MOISTURE PER YEAR	
METHANE CONTENT =	52%		AFTER CLOSURE =	13%
AVERAGE REFUSE THICKNESS =	100 FEET OR	30.5 METERS		
AVERAGE IN-PLACE DENSITY =	1200 LB/CY OR	711.7 KG/CM		

REFUSE COMPOSITION

DECOMPOSIBILITY CLASS	COMPONENT	% WET WEIGHT	% WATER	% DRY WEIGHT	% VOLATILE SOLIDS (dry wt.)	% VOLATILE SOLIDS BIODEGRAD. (dry wt.)	METHANE GAS PRODUCTION PER LB OF REFUSE (cf-CH4/lb) wet	by class	ADJUSTED FACTORS (cf-CH4/lb)
Readily	Food Waste	14%	63%	5%	60%	50%	0.131	0.131	0.146
Moderate	Garden Waste	12%	48%	6%	70%	35%	0.129	0.610	0.679
	Paper Waste	42%	20%	34%	85%	20%	0.481		
Slowly	Plastic/Rubber	5%	13%	4%	95%	2%	0.007	0.020	0.022
	Textiles	2%	16%	2%	94%	5%	0.007		
	Wood	2%	14%	2%	85%	5%	0.006		
Inert	Metal	9%	3%	9%	-	-			
	Glass/Ceramics	11%	2%	11%	-	-			
	Ash/Dirt/Rock	3%	8%	3%	-	-			
	TOTAL	100%		75%		Total	0.761	0.761	0.847

GAS GENERATION FACTORS

DECOMPATIBILITY CLASS	READILY	MODERATELY	SLOWLY
Total % Dry Weight	5%	40%	8%
Methane Yield Factor (cf/dry ton)	5,627	3,409	568
Half-Life (yrs)	2	5	20
Ult.-Life (yrs)	6	15	60
Lag-Time (yrs)	0.2	0.8	4.4

KINETIC FACTORS GENERATION

DECOMPOSIBILITY CLASS	Assumed Half-Life (yrs)	Assumed Ult.-Life (yrs)	k1 (yrs-1)	k2 (yrs-1)
Readily	2	6	1.956	0.978
Moderate	5	15	0.782	0.391
Slowly	20	60	0.196	0.098

RADIUS OF INFLUENCE

METHANE PRODUCTION RATE (r) =	0.0003	cf/lb/day or	20.4 ml/kg/day or
(Note: r designed at a peak = 2 x average)			143 cf-CH4/cy-yr
RADIUS OF INFLUENCE (ROI) ASSUMED=	200	FEET	
ROI: HORZ. RADIUS/LF DEPTH RATIO =	2		
RADIUS OF INFLUENCE THEORETICAL=	136	FEET	
VOLUME OF INFLUENCE =	310,436	CY	

DESIGN FACTORS

NO. OF WELLS IN RECOVERY FIELD=	11		
AVE. RECOVERY RATE =	70.0%		
WELL FLOW RATE (LFG) =	114	CFM OR	53.7 L/SEC
MAX. WITHDRAWAL RATE =	190	CFM/WELL	
AVE. WITHDRAWAL RATE =	81	CFM/WELL	
MIN. WELL SIZE FOR PASSIVE VENTS =	14	INCHES	
MIN. WELL SIZE FOR ACTIVE VENTS =	8	INCHES	
WELL SPACING=	346	FEET WELL TO WELL	
LFG SYSTEM DESIGN RECOVERY RATE =	1,252	CFM	1.80 MMcfd Recovered
LFG SYSTEM MAXIMUM RECOVERY RATE =	2,093	CFM	
MAXIMUM PRODUCTION =	2,846,238	CF-CH4/DAY	
AVERAGE PRODUCTION =	1,215,647	CF-CH4/DAY OVER 9 YEARS	

Time (yrs)	Moisture Content	Moisture Content Factor Per Year	Methane Content Factor Per Year	Average Factor	Adjusted Factors (cf-CH4/lb)			Methane Yield Factor (cf-CH4/lb)		
					Readily	Moderate	Slowly	Readily	Moderate	Slowly
0.0	35.0%	1.07	1.04	1.11	0.146	0.679	0.022	5627	3409	568
0.2	34.2%	1.05	1.04	1.09	0.143	0.667	0.022	5524	3347	558
0.4	33.3%	1.03	1.04	1.07	0.140	0.654	0.021	5421	3284	547
0.6	32.5%	1.01	1.04	1.05	0.138	0.642	0.021	5319	3222	537
0.8	31.7%	0.99	1.04	1.03	0.135	0.629	0.020	5216	3160	527
1.0	31.0%	0.97	1.04	1.01	0.132	0.617	0.020	5113	3098	516
1.2	30.2%	0.95	1.04	0.99	0.130	0.605	0.020	5010	3035	506
1.4	29.5%	0.93	1.04	0.97	0.127	0.592	0.019	4907	2973	495
1.6	28.8%	0.91	1.04	0.95	0.124	0.580	0.019	4805	2911	485
1.8	28.1%	0.89	1.04	0.93	0.122	0.567	0.018	4702	2848	475
2.0	27.4%	0.87	1.04	0.91	0.119	0.555	0.018	4599	2786	464
2.2	26.7%	0.86	1.04	0.89	0.116	0.543	0.018	4496	2724	454
2.4	26.1%	0.84	1.04	0.87	0.114	0.530	0.017	4393	2662	444
2.6	25.5%	0.82	1.04	0.85	0.111	0.518	0.017	4291	2599	433
2.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
3.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
3.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
3.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
3.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
3.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
4.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
4.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
4.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
4.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
4.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
5.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
5.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
5.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
5.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
5.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
6.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
6.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
6.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
6.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
6.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
7.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
7.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
7.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
7.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
7.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
8.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
8.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
8.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
8.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
8.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
9.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
9.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
9.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
9.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
9.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
10.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
10.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
10.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
10.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
10.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
11.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
11.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
11.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
11.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
11.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425

12.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
12.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
12.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
12.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
12.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
13.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
13.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
13.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
13.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
13.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
14.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
14.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
14.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
14.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
14.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
15.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
15.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
15.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
15.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
15.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
16.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
16.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
16.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
16.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
16.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
17.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
17.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
17.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
17.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
17.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
18.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
18.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
18.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
18.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
18.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
19.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
19.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
19.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
19.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
19.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
20.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
20.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
20.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
20.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
20.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
21.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
21.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
21.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
21.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
21.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
22.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
22.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
22.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
22.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
22.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
23.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
23.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
23.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
23.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
23.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
24.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
24.2	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
24.4	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
24.6	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
24.8	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425
25.0	25.0%	0.80	1.04	0.83	0.109	0.508	0.016	4212	2552	425

Time (yrs)	Moisture Content	Readily - CH4 Production		Moderate - CH4 Production		Slowly - CH4 Production		Total - CH4 Production	
		cf	cum cf	cf	cum cf	cf	cum cf	cf	cum cf
0.0	35.0%	0	0	0	0	0	0	0	0
0.2	34.2%	5,096,978	5,096,978	8,402,652	8,402,652	64,151	64,151	13,563,781	13563781
0.4	33.3%	7,396,946	12,493,924	9,643,127	18,045,779	65,469	129,619	17,105,542	30669323
0.6	32.5%	10,730,896	23,224,820	11,062,753	29,108,532	66,790	196,409	21,860,438	52529761
0.8	31.7%	15,561,708	38,786,528	12,686,630	41,795,162	68,112	264,521	28,316,450	80846211
1.0	31.0%	22,558,479	61,345,007	14,543,222	56,338,384	69,434	333,955	37,171,135	118017346
1.2	30.2%	32,687,885	94,032,892	16,664,774	73,003,158	70,752	404,707	49,423,411	167440757
1.4	29.5%	47,345,747	141,378,640	19,087,779	92,090,937	72,065	476,772	66,505,592	233946349
1.6	28.8%	68,546,384	209,925,024	21,853,488	113,944,425	73,371	550,143	90,473,243	324419592
1.8	28.1%	99,194,888	309,119,912	25,008,481	138,952,906	74,665	624,808	124,278,034	448697626
2.0	27.4%	95,742,655	404,862,567	28,605,282	167,558,187	75,947	700,755	124,423,884	573121510
2.2	26.7%	76,973,296	481,835,863	32,703,042	200,261,229	77,212	777,967	109,753,549	682875059
2.4	26.1%	61,851,132	543,686,995	37,368,272	237,629,501	78,456	856,423	99,297,861	782172919
2.6	25.5%	49,672,661	593,359,657	42,675,645	280,305,146	79,678	936,101	92,427,983	874600903
2.8	25.0%	40,098,917	633,458,574	48,989,455	329,294,601	81,337	1,017,438	89,169,710	963770613
3.0	25.0%	32,974,950	666,433,524	57,287,703	386,582,304	84,582	1,102,020	90,347,235	1054117848
3.2	25.0%	27,116,626	693,550,150	66,991,578	453,573,882	87,957	1,189,977	94,196,161	1148314009
3.4	25.0%	22,299,090	715,849,240	78,339,178	531,913,060	91,466	1,281,443	100,729,734	1249043743
3.6	25.0%	18,337,437	734,186,677	91,608,930	623,521,990	95,115	1,376,557	110,041,482	1359085225
3.8	25.0%	15,079,611	749,266,289	107,126,425	730,648,415	98,909	1,475,467	122,304,945	1481390170
4.0	25.0%	12,400,570	761,666,859	125,272,404	855,920,819	102,856	1,578,322	137,775,829	1619166000
4.2	25.0%	10,197,487	771,864,345	146,492,102	**********	106,959	1,685,281	156,796,548	1775962547
4.4	25.0%	8,385,803	780,250,148	171,306,172	**********	111,226	1,796,508	179,803,201	1955765749
4.6	25.0%	6,895,982	787,146,130	200,323,459	**********	115,664	1,912,171	207,335,105	2163100854
4.8	25.0%	5,670,843	792,816,974	234,255,940	**********	120,278	2,032,449	240,047,061	2403147915
5.0	25.0%	4,663,362	797,480,336	273,936,190	**********	125,077	2,157,526	278,724,629	2681872544
5.2	25.0%	3,834,870	801,315,206	142,323,587	**********	130,067	2,287,593	146,288,523	2828161067
5.4	25.0%	3,153,568	804,468,773	131,612,603	**********	135,256	2,422,848	134,901,427	2963062494
5.6	25.0%	2,593,305	807,062,079	121,707,707	**********	140,652	2,563,500	124,441,664	3087504158
5.8	25.0%	2,132,579	809,194,658	112,548,233	**********	146,263	2,709,763	114,827,075	3202331233
6.0	25.0%	1,753,705	810,948,363	104,078,082	**********	152,098	2,861,862	105,983,886	3308315119
6.2	25.0%	1,442,142	812,390,506	96,245,377	**********	158,166	3,020,028	97,845,686	3406160805
6.4	25.0%	1,185,932	813,576,437	89,002,146	**********	164,477	3,184,505	90,352,554	3496513360
6.6	25.0%	975,239	814,551,676	82,304,026	**********	171,038	3,355,543	83,450,304	3579963663
6.8	25.0%	801,978	815,353,655	76,109,993	**********	177,862	3,533,405	77,089,833	3657053496
7.0	25.0%	659,499	816,013,154	70,382,110	**********	184,958	3,718,363	71,226,567	3728280063
7.2	25.0%	542,333	816,555,486	65,085,295	**********	192,337	3,910,700	65,819,965	3794100028
7.4	25.0%	445,982	817,001,468	60,187,108	**********	200,010	4,110,711	60,833,101	3854933128
7.6	25.0%	366,749	817,368,217	55,657,549	**********	207,990	4,318,701	56,232,288	3911165416
7.8	25.0%	301,592	817,669,809	51,468,875	**********	216,288	4,534,989	51,986,755	3963152172
8.0	25.0%	248,011	817,917,820	47,595,433	**********	224,917	4,759,905	48,068,361	4011220533
8.2	25.0%	203,950	818,121,770	44,013,497	**********	233,890	4,993,795	44,451,337	4055671869
8.4	25.0%	167,716	818,289,486	40,701,131	**********	243,221	5,237,016	41,112,068	4096783938
8.6	25.0%	137,920	818,427,406	37,638,047	**********	252,924	5,489,941	38,028,891	4134812829
8.8	25.0%	113,417	818,540,823	34,805,484	**********	263,015	5,752,956	35,181,916	4169994745
9.0	25.0%	93,267	818,634,090	32,186,094	**********	273,508	6,026,464	32,552,870	4202547614
9.2	25.0%	76,697	818,710,787	29,763,834	**********	284,420	6,310,884	30,124,952	4232672566
9.4	25.0%	63,071	818,773,859	27,523,869	**********	295,767	6,606,650	27,882,707	4260555273
9.6	25.0%	51,866	818,825,725	25,452,478	**********	307,567	6,914,217	25,811,911	4286367184
9.8	25.0%	42,652	818,868,376	23,536,977	**********	319,837	7,234,054	23,899,466	4310266650
10.0	25.0%	35,074	818,903,450	21,765,632	**********	332,597	7,566,652	22,133,303	4332399953
10.2	25.0%	28,843	818,932,293	20,127,595	**********	345,866	7,912,518	20,502,304	4352902257
10.4	25.0%	23,719	818,956,012	18,612,833	**********	359,665	8,272,183	18,996,216	4371898473
10.6	25.0%	19,505	818,975,517	17,212,069	**********	374,014	8,646,197	17,605,588	4389504061
10.8	25.0%	16,040	818,991,556	15,916,724	**********	388,935	9,035,132	16,321,699	4405825760
11.0	25.0%	13,190	819,004,746	14,718,863	**********	404,452	9,439,585	15,136,506	4420962265
11.2	25.0%	10,847	819,015,593	13,611,152	**********	420,588	9,860,173	14,042,586	4435004852
11.4	25.0%	8,920	819,024,513	12,586,804	**********	437,368	10,297,540	13,033,091	4448037943
11.6	25.0%	7,335	819,031,848	11,639,547	**********	454,817	10,752,357	12,101,699	4460139642
11.8	25.0%	6,032	819,037,879	10,763,578	**********	472,962	11,225,319	11,242,572	4471382214
12.0	25.0%	4,960	819,042,840	9,953,533	**********	491,831	11,717,149	10,450,324	4481832538

12.2	25.0%	4,079	819,046,919	9,204,451	**********	511,453	12,228,602	9,719,982	4491552520
12.4	25.0%	3,354	819,050,273	8,511,743	**********	531,857	12,760,459	9,046,954	4500599474
12.6	25.0%	2,758	819,053,031	7,871,166	**********	553,076	13,313,535	8,427,000	4509026475
12.8	25.0%	2,268	819,055,300	7,278,798	**********	575,141	13,888,676	7,856,208	4516882683
13.0	25.0%	1,865	819,057,165	6,731,011	**********	598,087	14,486,763	7,330,963	4524213645
13.2	25.0%	1,534	819,058,699	6,224,448	**********	621,948	15,108,711	6,847,930	4531061576
13.4	25.0%	1,261	819,059,960	5,756,009	**********	646,761	15,755,472	6,404,031	4537465607
13.6	25.0%	1,037	819,060,998	5,322,824	**********	672,564	16,428,035	5,996,424	4543462031
13.8	25.0%	853	819,061,851	4,922,239	**********	699,396	17,127,431	5,622,488	4549084519
14.0	25.0%	701	819,062,552	4,551,801	**********	727,299	17,854,729	5,279,801	4554364320
14.2	25.0%	577	819,063,129	4,209,242	**********	756,314	18,611,044	4,966,133	4559330453
14.4	25.0%	474	819,063,603	3,892,463	**********	786,488	19,397,532	4,679,425	4564009878
14.6	25.0%	390	819,063,994	3,599,524	**********	817,865	20,215,397	4,417,779	4568427658
14.8	25.0%	321	819,064,314	3,328,631	**********	850,494	21,065,892	4,179,446	4572607104
15.0	25.0%	264	819,064,578	3,078,125	**********	884,425	21,950,317	3,962,814	4576569919
15.2	25.0%	217	819,064,795	2,846,472	**********	919,710	22,870,027	3,766,399	4580336317
15.4	25.0%	178	819,064,973	2,632,252	**********	956,402	23,826,429	3,588,833	4583925150
15.6	25.0%	147	819,065,120	2,434,154	**********	994,558	24,820,988	3,428,859	4587354009
15.8	25.0%	121	819,065,241	2,250,965	**********	1,034,237	25,855,225	3,285,322	4590639331
16.0	25.0%	99	819,065,340	2,081,562	**********	1,075,498	26,930,723	3,157,159	4593796490
16.2	25.0%	82	819,065,422	1,924,908	**********	1,118,406	28,049,129	3,043,395	4596839885
16.4	25.0%	67	819,065,489	1,780,043	**********	1,163,025	29,212,154	2,943,135	4599783020
16.6	25.0%	55	819,065,544	1,646,081	**********	1,209,425	30,421,578	2,855,560	4602638581
16.8	25.0%	45	819,065,589	1,522,200	**********	1,257,675	31,679,253	2,779,920	4605418501
17.0	25.0%	37	819,065,627	1,407,642	**********	1,307,851	32,987,104	2,715,530	4608134032
17.2	25.0%	31	819,065,657	1,301,706	**********	1,360,028	34,347,132	2,661,765	4610795796
17.4	25.0%	25	819,065,682	1,203,742	**********	1,414,287	35,761,420	2,618,055	4613413851
17.6	25.0%	21	819,065,703	1,113,151	**********	1,470,711	37,232,130	2,583,883	4615997733
17.8	25.0%	17	819,065,720	1,029,378	**********	1,529,386	38,761,516	2,558,780	4618556514
18.0	25.0%	14	819,065,734	951,909	**********	1,590,401	40,351,917	2,542,324	4621098838
18.2	25.0%	12	819,065,746	880,270	**********	1,653,851	42,005,768	2,534,133	4623632970
18.4	25.0%	9	819,065,755	814,023	**********	1,719,832	43,725,601	2,533,864	4626166834
18.6	25.0%	8	819,065,763	752,761	**********	1,788,446	45,514,047	2,541,215	4628708049
18.8	25.0%	6	819,065,770	696,110	**********	1,859,797	47,373,843	2,555,913	4631263962
19.0	25.0%	5	819,065,775	643,722	**********	1,933,994	49,307,838	2,577,722	4633841684
19.2	25.0%	4	819,065,779	595,277	**********	2,011,152	51,318,990	2,606,433	4636448117
19.4	25.0%	4	819,065,783	550,477	**********	2,091,388	53,410,378	2,641,869	4639089985
19.6	25.0%	3	819,065,786	509,050	**********	2,174,825	55,585,203	2,683,877	4641773863
19.8	25.0%	2	819,065,788	470,740	**********	2,261,591	57,846,793	2,732,333	4644506195
20.0	25.0%	2	819,065,790	435,313	**********	1,210,864	59,057,657	1,646,178	4646152374
20.2	25.0%	2	819,065,792	402,552	**********	1,187,409	60,245,066	1,589,963	4647742336
20.4	25.0%	1	819,065,793	372,257	**********	1,164,409	61,409,475	1,536,667	4649279003
20.6	25.0%	1	819,065,794	344,241	**********	1,141,854	62,551,329	1,486,097	4650765100
20.8	25.0%	1	819,065,795	318,334	**********	1,119,736	63,671,065	1,438,072	4652203172
21.0	25.0%	1	819,065,796	294,377	**********	1,098,047	64,769,113	1,392,425	4653595597
21.2	25.0%	1	819,065,796	272,223	**********	1,076,778	65,845,890	1,349,001	4654944598
21.4	25.0%	1	819,065,797	251,736	**********	1,055,921	66,901,811	1,307,657	4656252255
21.6	25.0%	0	819,065,797	232,791	**********	1,035,467	67,937,278	1,268,259	4657520514
21.8	25.0%	0	819,065,798	215,272	**********	1,015,410	68,952,689	1,230,682	4658751196
22.0	25.0%	0	819,065,798	199,071	**********	995,742	69,948,430	1,194,813	4659946009
22.2	25.0%	0	819,065,798	184,089	**********	976,454	70,924,885	1,160,543	4661106552
22.4	25.0%	0	819,065,798	170,235	**********	957,540	71,882,425	1,127,775	4662234328
22.6	25.0%	0	819,065,798	157,423	**********	938,993	72,821,417	1,096,416	4663330744
22.8	25.0%	0	819,065,799	145,576	**********	920,804	73,742,222	1,066,380	4664397124
23.0	25.0%	0	819,065,799	134,620	**********	902,968	74,645,190	1,037,589	4665434713
23.2	25.0%	0	819,065,799	124,489	**********	885,478	75,530,667	1,009,967	4666444679
23.4	25.0%	0	819,065,799	115,120	**********	868,326	76,398,993	983,446	4667428125
23.6	25.0%	0	819,065,799	106,456	**********	851,506	77,250,500	957,963	4668386088
23.8	25.0%	0	819,065,799	98,445	**********	835,013	78,085,512	933,457	4669319546
24.0	25.0%	0	819,065,799	91,036	**********	818,838	78,904,351	909,874	4670229420
24.2	25.0%	0	819,065,799	84,185	**********	802,977	79,707,328	887,162	4671116583
24.4	25.0%	0	819,065,799	77,849	**********	787,424	80,494,752	865,273	4671981856
24.6	25.0%	0	819,065,799	71,990	**********	772,171	81,266,923	844,162	4672826018
24.8	25.0%	0	819,065,799	66,573	**********	757,214	82,024,138	823,787	4673649805
25.0	25.0%	0	819,065,799	61,563	**********	742,547	82,766,685	804,110	4674453914

ADJUSTED LFG RATES INCORPORATING LAG TIME

MAXIMUM PRODUCTION = 2,846,238 CF/DAY
AVERAGE PRODUCTION = 1,215,647 CF/DAY IN 9 YEARS
MAX. YEARLY MOVING AVERAGE = 2,867,334 CF/DAY

Time (yrs)	Readily (cf)	Moderate (cf)	Slowly (cf)	Total (cf)	Annual Total	
0.0	0	0	0	0		
0.2	0	0	0	0		
0.4	5,096,978	0	0	5,096,978		
0.6	7,396,946	0	0	7,396,946		
0.8	10,730,896	0	0	10,730,896		
1.0	15,561,708	8,402,652	0	23,964,360	47,189,180	9,437,836
1.2	22,558,479	9,643,127	0	32,201,606		15,878,157
1.4	32,687,885	11,062,753	0	43,750,638		23,608,889
1.6	47,345,747	12,686,630	0	60,032,377		34,135,975
1.8	68,546,384	14,543,222	0	83,089,606		48,607,717
2.0	99,194,888	16,664,774	0	115,859,662	334,933,889	66,986,778
2.2	95,742,655	19,087,779	0	114,830,434		83,512,544
2.4	76,973,296	21,853,488	0	98,826,784		94,527,773
2.6	61,851,132	25,008,481	0	86,859,613		99,893,220
2.8	49,672,661	28,605,282	0	78,277,943		98,930,887
3.0	40,098,917	32,703,042	0	72,801,959	451,596,733	90,319,347
3.2	32,974,950	37,368,272	0	70,343,222		81,421,904
3.4	27,116,626	42,675,645	0	69,792,270		75,615,001
3.6	22,299,090	48,989,455	0	71,288,545		72,500,788
3.8	18,337,437	57,287,703	0	75,625,141		71,970,227
4.0	15,079,611	66,991,578	0	82,071,190	369,120,368	73,824,074
4.2	12,400,570	78,339,178	0	90,739,748		77,903,379
4.4	10,197,487	91,608,930	0	101,806,417		84,306,208
4.6	8,385,803	107,126,425	64,151	115,576,378		93,163,775
4.8	6,895,982	125,272,404	65,469	132,233,855		104,485,517
5.0	5,670,843	146,492,102	66,790	152,229,735	592,586,133	118,517,227
5.2	4,663,362	171,306,172	68,112	176,037,646		135,576,806
5.4	3,834,870	200,323,459	69,434	204,227,763		156,061,076
5.6	3,153,568	234,255,940	70,752	237,480,259		180,441,852
5.8	2,593,305	273,936,190	72,065	276,601,561		209,315,393
6.0	2,132,579	142,323,587	73,371	144,529,537	1038876766	207,775,353
6.2	1,753,705	131,612,603	74,665	133,440,974		199,256,019
6.4	1,442,142	121,707,707	75,947	123,225,796		183,055,625
6.6	1,185,932	112,548,233	77,212	113,811,376		158,321,849
6.8	975,239	104,078,082	78,456	105,131,777		124,027,892
7.0	801,978	96,245,377	79,678	97,127,033	572,736,957	114,547,391
7.2	659,499	89,002,146	81,337	89,742,983		105,807,793
7.4	542,333	82,304,026	84,582	82,930,941		97,748,822
7.6	445,982	76,109,993	87,957	76,643,931		90,315,333
7.8	366,749	70,382,110	91,466	70,840,324		83,457,042
8.0	301,592	65,085,295	95,115	65,482,002	385,640,181	77,128,036
8.2	248,011	60,187,108	98,909	60,534,029		71,286,246
8.4	203,950	55,657,549	102,856	55,964,355		65,892,928
8.6	167,716	51,468,875	106,959	51,743,550		60,912,852
8.8	137,920	47,595,433	111,226	47,844,579		56,313,703
9.0	113,417	44,013,497	115,664	44,242,578	260,329,091	52,065,818
9.2	93,267	40,701,131	120,278	40,914,676		48,141,948
9.4	76,697	37,638,047	125,077	37,839,821		44,517,041
9.6	63,071	34,805,484	130,067	34,998,622		41,168,055
9.8	51,866	32,186,094	135,256	32,373,216		38,073,783
10.0	42,652	29,763,834	140,652	29,947,138	176,073,473	35,214,695
10.2	35,074	27,523,869	146,263	27,705,206		32,572,801
10.4	28,843	25,452,478	152,098	25,633,420		30,131,520
10.6	23,719	23,536,977	158,166	23,718,862		27,875,568
10.8	19,505	21,765,632	164,477	21,949,613		25,790,848
11.0	16,040	20,127,595	171,038	20,314,673	119,321,773	23,864,355

11.2	13,190	18,612,833	177,862	18,803,885		22,084,090			
11.4	10,847	17,212,069	184,958	17,407,874		20,438,981			
11.6	8,920	15,916,724	192,337	16,117,980		18,918,805			
11.8	7,335	14,718,863	200,010	14,926,209		17,514,124			
12.0	6,032	13,611,152	207,990	13,825,174	81,081,121	16,216,224			
12.2	4,960	12,586,804	216,288	12,808,052		15,017,058			
12.4	4,079	11,639,547	224,917	11,868,543		13,909,192			
12.6	3,354	10,763,578	233,890	11,000,823		12,885,760			
12.8	2,758	9,953,533	243,221	10,199,513		11,940,421			
13.0	2,268	9,204,451	252,924	9,459,644	55,336,574	11,067,315			
13.2	1,865	8,511,743	263,015	8,776,623		10,261,029			
13.4	1,534	7,871,166	273,508	8,146,208		9,516,562			
13.6	1,261	7,278,798	284,420	7,564,479		8,829,293			
13.8	1,037	6,731,011	295,767	7,027,815		8,194,954			
14.0	853	6,224,448	307,567	6,532,868	38,047,994	7,609,599			
14.2	701	5,756,009	319,837	6,076,548		7,069,584			
14.4	577	5,322,824	332,597	5,655,998		6,571,542			
14.6	474	4,922,239	345,866	5,268,580		6,112,362			
14.8	390	4,551,801	359,665	4,911,856		5,689,170			
15.0	321	4,209,242	374,014	4,583,577	26,496,558	5,299,312			
15.2	264	3,892,463	388,935	4,281,662		4,940,334			
15.4	217	3,599,524	404,452	4,004,193		4,609,973			
15.6	178	3,328,631	420,588	3,749,398		4,306,137			
15.8	147	3,078,125	437,368	3,515,639		4,026,894			
16.0	121	2,846,472	454,817	3,301,409	18,852,301	3,770,460			
16.2	99	2,632,252	472,962	3,105,313		3,535,190			
16.4	82	2,434,154	491,831	2,926,066		3,319,565			
16.6	67	2,250,965	511,453	2,762,484		3,122,182			
16.8	55	2,081,562	531,857	2,613,474		2,941,749			
17.0	45	1,924,908	553,076	2,478,029		2,777,073			
17.2	37	1,780,043	575,141	2,355,221		2,627,055			
17.4	31	1,646,081	598,087	2,244,198		2,490,681			
17.6	25	1,522,200	621,948	2,144,173		2,367,019			
17.8	21	1,407,642	646,761	2,054,424		2,255,209			
18.0	17	1,301,706	672,564	1,974,286		2,154,460			
18.2	14	1,203,742	699,396	1,903,152		2,064,047			
18.4	12	1,113,151	727,299	1,840,461		1,983,299			
18.6	9	1,029,378	756,314	1,785,701		1,911,605			
18.8	8	951,909	786,488	1,738,404		1,848,401			
19.0	6	880,270	817,865	1,698,142		1,793,172			
19.2	5	814,023	850,494	1,664,522		1,745,446			
19.4	4	752,761	884,425	1,637,191		1,704,792			
19.6	4	696,110	919,710	1,615,823		1,670,816			
19.8	3	643,722	956,402	1,600,127		1,643,161			
20.0	2	595,277	994,558	1,589,838		1,621,500			
20.2	2	550,477	1,034,237	1,584,716		1,605,539			
20.4	2	509,050	1,075,498	1,584,549		1,595,011			
20.6	1	470,740	1,118,406	1,589,147		1,589,675			
20.8	1	435,313	1,163,025	1,598,339		1,589,318			
21.0	1	402,552	1,209,425	1,611,977		1,593,746			
21.2	1	372,257	1,257,675	1,629,933		1,602,789			
21.4	1	344,241	1,307,851	1,652,093		1,616,298			
21.6	1	318,334	1,360,028	1,678,363		1,634,141			
21.8	0	294,377	1,414,287	1,708,665		1,656,206			
22.0	0	272,223	1,470,711	1,742,934		1,682,398			
22.2	0	251,736	1,529,386	1,781,122		1,712,635			
22.4	0	232,791	1,590,401	1,823,192		1,746,855			
22.6	0	215,272	1,653,851	1,869,123		1,785,007			
22.8	0	199,071	1,719,832	1,918,903		1,827,055			
23.0	0	184,089	1,788,446	1,972,535		1,872,975			
23.2	0	170,235	1,859,797	2,030,032		1,922,757			
23.4	0	157,423	1,933,994	2,091,418		1,976,402			
23.6	0	145,576	2,011,152	2,156,728		2,033,923			
23.8	0	134,620	2,091,388	2,226,008		2,095,344			
24.0	0	124,489	2,174,825	2,299,314		2,160,700			
24.2	0	115,120	2,261,591	2,376,711		2,230,036			

24.4	0	106,456	1,210,864	1,317,320	2,075,216
24.6	0	98,445	1,187,409	1,285,854	1,901,041
24.8	0	91,036	1,164,409	1,255,445	1,706,929
25.0	0	84,185	1,141,854	1,226,039	1,492,274

Table 2-1

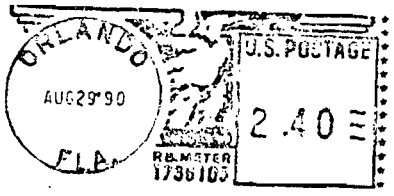
TYPICAL LANDFILL GAS COMPOSITION AT VARIOUS SITES
(Component Percentage, Dry Volume Basis)

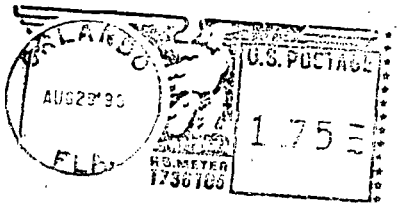
Compounds	Blanchet 1977	Ham et al 1977	Bray 1981	Cagliostro 1981	Elzy 1983
Methane	44.0	47.5	50.0	53.4	50.0
Carbon Dioxide	34.2	47.0	35.0	34.3	42.5
Nitrogen	20.8	3.7	13.0	6.2	5.4
Oxygen	1.0	0.8	1.7	0.05	0.2
Paraffin Hydrocarbons	-	0.1	-	0.17	-
Aromatic and Cyclic Hydrocarbons	-	0.2	-	-	-
Hydrogen	-	0.1	-	0.005	1.9
Hydrogen Sulfide	0.7	0.01	0.3	0.005	-
Carbon Monoxide	-	0.1	-	0.005	-
*Trace Compounds	-	0.5	-	-	-

*Trace compounds include: sulfur dioxide, benzene, toluene, methylene chloride, perchlorethylene, carbonyl sulfide, and vinyl chloride.

SOURCE: Final Report (August-July 1985); Landfill Gas: Resource Evaluation and Development - Gas Research Institute.

BEST AVAILABLE COPY





Fold at line over top of envelope to the right of the return address

CERTIFIED

P 011 611 773

MAIL

RETURN RECEIPT REQUESTED

ENVIRONMENTAL LABORATORIES
6635 EAST COLONIAL DRIVE
ORLANDO, FLORIDA 32807

TO: Bureau of Air Quality Management
Fl. Dept. of Environmental Regulation
2600 Blair Stone Road
Twin Towers Office Building
Tallahassee, FL 32301

ATTENTION: Clair Fancy, P.E.

Patti Adams -
Air Regulations

Solid Waste 10-13-92
Carl Schmidt.
407- 647- 7275
Xn 157.

PBS
WINTER PARK PL

PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.
ENGINEERING • PLANNING • ARCHITECTURE
800 N. MAGNOLIA AVENUE • SUITE 600
ORLANDO, FLORIDA 32803

SUNBANK / N. A
200 S. ORANGE AVE
ORLANDO, FL 328

Nº 1780

PAY ##2500.00##

DATE August 21, 1990

$ 2,500.00

TO THE ORDER OF Florida Department of Environmental Regulations

POST, BUCKLEY, SCHUH & JERNIGAN, INC.
OPERATIONAL ACCOUNT

Genevieve Hinds
AUTHORIZED SIGNATURE

"017800" :063102152: 621570202860611

UTM: East 454.95 km North 3355.57 km

Latitude 30 ° 19' 58" N Longitude 81 ° 28 ' 07 "W

APPLICANT NAME AND TITLE: George R. Knecht, P.E. Manager of Disposal

APPLICANT ADDRESS: Solid Waste Disposal Division, 1931 East Beaver Street Jacksonville, FL 32202

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of City of Jacksonville

I certify that the statements made in this application for a Construction permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: George R Knecht

George R. Knecht, P.E. Manager of Disposal
Name and Title (Please Type)

Date: 6/25/90 Telephone No. (904) 630-0973

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been ~~designed~~ examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

[1] See Florida Administrative Code Rule 17-2.100(57) and (104)

00031

THE CITY OF JACKSONVILLE
DEPARTMENT OF PUBLIC UTILITIES
SOLID WASTE DISPOSAL DIVISION

EAST DUVAL SANITARY LANDFILL
APPLICATION TO CONSTRUCT
AIR POLLUTION SOURCE
(LANDFILL GAS FLARE)