AIR QUALITY ANALYSIS

FOR THE

PINELLAS COUNTY RESOURCE RECOVERY FACILITY

AS PART OF THE

U.S. EPA PERMIT APPLICATION

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July, 1978

AIR QUALITY ANALYSIS

PURPOSE - It is the intent of this air quality analysis to identify the nature and characteristics of air emissions generated by the proposed solid waste resource recovery facility and their impacts on ambient total suspended particulate (TSP) and sulfur dioxide (SO_2) concentrations. The calculated consumption of Prevention of Significant Deterioration (PSD) increment by this facility and those pertinent major air pollution sources permitted since January 6, 1975, will also be estimated.

METHODOLOGY - The air quality models proposed by EPA[1] were utilized to calculate existing ambient air pollutant concentrations and the impact on these levels imparted by the proposed facility. Basically, the following dispersion models were applied:

- Climatological Dispersion Model (CDM) - A multiple source model, more appropos to urban areas (as opposed to AQDM); annual arithmatic mean concentrations of TSP and SO_2 are determined based on an inventory of areawide source emissions and local meteorologic conditions. The relative contribution of each source (point and area) at a given receptor site is also determined.

[1]EPA UNAMAP-III Series.

- CRSTER - A single source, short term model which identifies first and second maximum 3 hour, 24 hour and annual pollutant emissions for a saturated array of receptors.

- Point Maximum (PTMAX) - A single source model which calculates maximum downwind pollutant concentrations based on a given set of emission and meteorologic parameters.

The CDM model was utilized to determine the nature and sources of ambient TSP and SO_2 concentrations at selected receptor sites surrounding and including the facility. Those receptors chosen for the Pinellas Resource Recovery CDM modeling coincide with intermittent air quality monitors[2] maintained by Pinellas County.

CRSTER was employed to estimate 3 hour, 24 hour and annual TSP and SO_2 concentrations from the facility. Once the maximum concentration areas or 'hot spots' were determined, additional CRSTER runs of those major sources permitted since January 6, 1975, were completed. For these latter CRSTER runs receptor rings were situated at those 'hot spots' resulting from the proposed facility's emissions. From the model runs the PSD increment consumption by the proposed facility and those other facilities added since the baseline year was rendered. CRSTER models were run using one year's meteorologic data and several plant operating options; specifically:

2 Samples every six days, 365 days per year

- TSP, maximum emission rates, controlled (with three field electrostatic precipitators) - PSD 24 hour TSP increment consumption was determined from this run.
- TSP, average emission rates, controlled - PSD annual TSP increment consumption.
- SO_2, maximum emission rates[3] - PSD 3 hour and 24 hour SO_2 increment consumption were determined from this run.
- SO_2, average emission rates - PSD annual SO_2 increment consumption were determined from this run.

PTMAX models were run for each of the facility emission characteristics stated above; with this the estimated distances to maximum concentration areas and, consequently, the location of CRSTER model receptor ring distances for each case were determined.

Meteorologic data for the modeling efforts span the 1970-1974 period for the Tampa Airfield station. Due to the proposed location of the facility on a peninsula, the Tampa data were judiciously contrasted and compared to MacDill AFB[4] meteorologic data to evaluate the impact of such phenomenon as the land-sea breeze effect. The 1974 weather data were input to the CRSTER model.

[3] No SO_2 emission controls are proposed

[4] Also located on a peninsula in Tampa Bay

The emissions of the proposed solid waste resource recovery facility will in no way impact air quality in a Class I maintenance area; the most proximal such area is the Chassahowitzka National Wildlife Refuge situated over fifty miles to the north of the study area.

Based on discussions with federal, state, county and private concerns, and on the analysis and evaluation of existing study area air quality data, background values of 40.0 and 0.0 ug/m^3 for TSP and SO_2, respectively, were input to the CDM model.

RESULTS

- CDM - While the CDM calculations are quite general with respect to determinations of increment consumption, they do identify the relative contributions of TSP and SO_2 to a given receptor site from each inventoried area and point source. Table 1 summarizes the calculated long-term contribution of TSP and SO_2 for point, area and background sources at those receptors shown in Figure 1. From these data, it is quite apparent that the vast majority of ambient SO_2 concentration and a significant portion of TSP level at all receptors can be attributed to certain point source emitters. Breakdowns of major point sources which most substantially impact the Koger and Airport Receptors[5] are featured in Tables 2 and 3, respectively.

[5]Closest receptors to site, flanking north and east boundaries.

TABLE 1

RELATIVE CONTRIBUTION OF TSP AND SO_2 TO SELECTED CDM MODEL RECEPTORS

RECEPTOR	UTM Coord. X	UTM Coord. Y	Point Sources ug/m^3	Area Sources ug/m^3	Background ug/m^3	Total
Oakhurst	323.14	3080.59				
TSP			0.8	0.0	40.0	40.8
SO_2			13.4	0.0	0.0	13.5
Largo	323.55	3088.85				
TSP			0.8	0.1	40.0	41.0
SO_2			9.9	0.0	0.0	9.9
Koger	339.85	3082.74				
TSP			1.4	0.1	40.0	41.5
SO_2			16.2	0.0	0.0	16.3
Airport	333.50	3087.73				
TSP			1.1	0.3	40.0	41.4
SO_2			12.4	0.0	0.0	12.5
Woodlawn	336.49	3074.28				
TSP			0.7	0.0	40.0	40.7
SO_2			12.9	0.0	0.0	13.0
Clearwater	329.23	3095.00				
TSP			1.4	0.1	40.0	41.5
SO_2			10.1	0.0	0.0	10.2
Site	335.26	3084.39				
TSP			1.1	0.1	40.0	1.2
SO_2			12.8	0.1	0.0	12.9

FIGURE 1

LOCATION OF PROPOSED FACILITY
AND PINELLAS COUNTY AIR QUALITY MONITORS

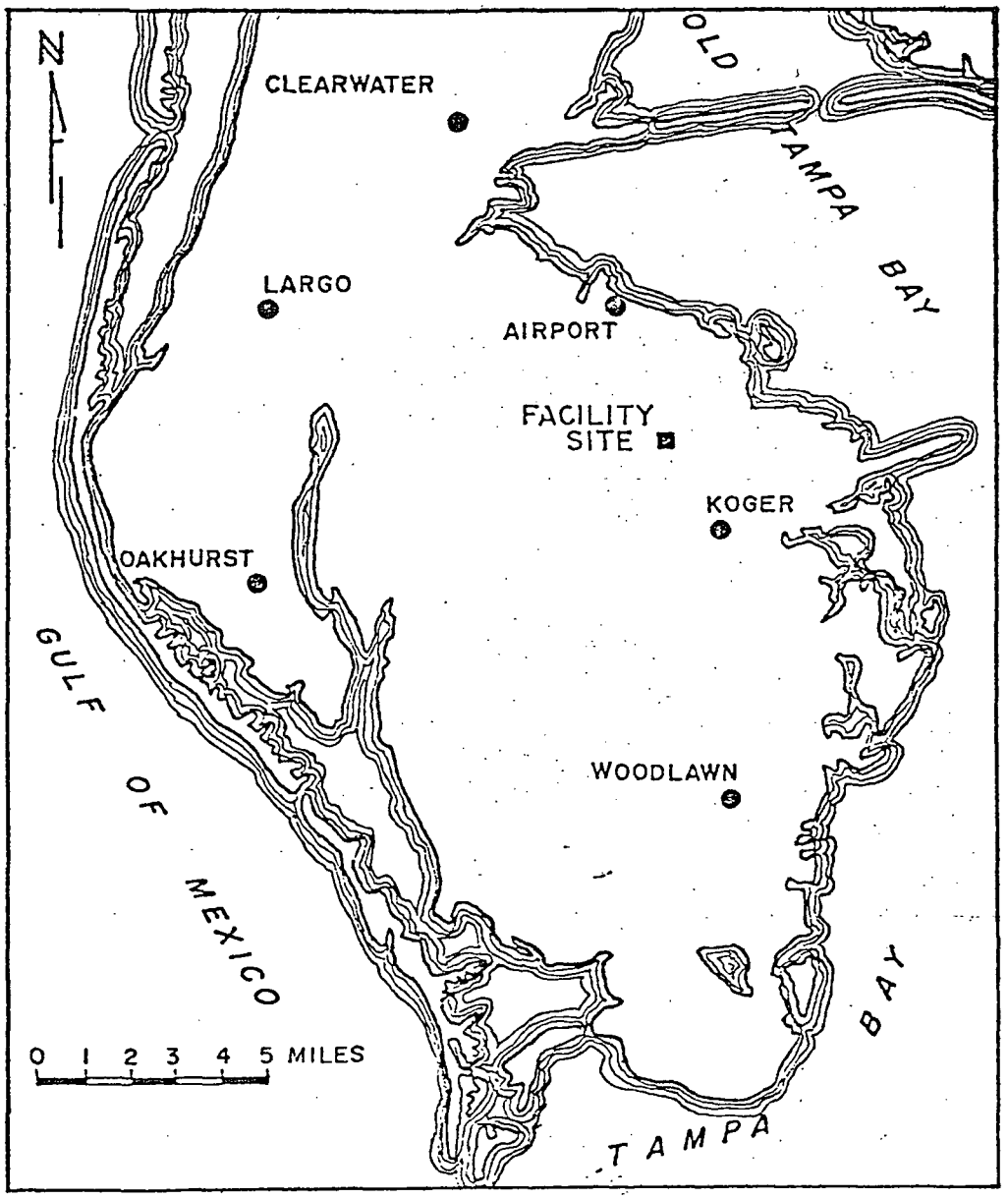


TABLE 2

TSP AND SO_2 CONTRIBUTIONS OF MAJOR SOURCES AT THE KOGER RECEPTOR

	Source	Contribution ug/m^3	Percent of Total Calculated Pollutant Concentration*
∘ TSP	-Florida Power Corp., Bartow Pipeline Heater	0.49	1.56
	-Florida Power Corp., Higgins Unit #2	0.20	0.63
∘ SO_2	-Florida Power Corp., Bartow Unit #1	1.76	10.8
	-Florida Power Corp., Bartow Pipeline Heater	1.74	10.7
	-Florida Power Corp., Bartow Unit #3	1.42	8.7
	-Tampa Electric Co.,** Big Bend Unit #1	1.37	8.4
	-Tampa Electric Co.,** Big Bend Unit #2	1.37	8.4
	-Florida Power Corp., Bartow Plant	1.34	8.2
	-Tampa Electric Co.,** Gannon Unit #6	0.87	5.3

* Including all area, point and background sources.

**Distant sources; indiscriminant acceptance of respective contributions for these stacks may compromise model limitations.

TABLE 3

TSP AND SO_2 CONTRIBUTIONS OF MAJOR SOURCES AT THE AIRPORT RECEPTOR

	Source	Contribution ug/m^3	Percent of Total Calculated Pollutant Concentration*
∘ TSP	-Florida Power Corp., Higgins Unit #2	0.20	0.63
∘ SO_2	-Tampa Electric Co.,** Big Bend Unit #2	1.22	9.79
	-Tampa Electric Co.,** Big Bend Unit #1	1.22	9.77
	-Tampa Electric Co.,** Gannon Unit #6	1.21	9.74
	-Florida Power Corp., Bartow Unit #1	0.68	5.46
	-Florida Power Corp., Bartow Unit #3	0.67	5.38
	-Tampa Electric Co.,** Big Bend Unit #3	0.64	5.12

* Including all area, point and background sources.

**Distant sources; indiscriminant acceptance of respective contributions for these stacks may compromise model limitations.

Generally, it can be stated that most of the SO_2 load at the proposed facility site can be traced to the Florida Power Bartow Plant and the Tampa Electric Big Bend Plant. This latter facility, situated on the eastern shore of Tampa Bay, emits the largest inventoried volume of SO_2 in the region; however, the large distance between the Big Bend Plant and the CDM receptors (upwards of 35.0 KM) should dissuade a prudent analyst from making dubious assumptions. Another large SO_2 source, the Florida Power Anclote Plant, emits that pollutant at a rate of 1631.9 grams per second; however, the northwesterly orientation and considerable distance from the power plant to the proposed facility, coupled with actual meteorologic conditions limit the impact of the Anclote emissions on the study area. Point sources contributing the most to TSP concentrations at the evaluated receptors are the Florida Power Higgens Unit #2, and the Florida Power Bartow Pipeline Heater.

∘ PTMAX - The PTMAX model was run utilizing those input variables shown on page 3; for each facility pollutant and emission rate the locations of areas of maximum concentrations were determined. For all model runs maximum concentration areas were generally located in the following distance ranges (kilometers): 0.80-0.90, 1.4-1.7, 2.5-3.5, 4.0-6.5, and 16.0-19.0. It should be noted that the validity of the 16.0-19.0 kilometer range is highly questionable as it is

doubtful that the input atmospheric stabilities persist at those distances; consequently, while those distances will be input to CRSTER as the outer receptor ring, the resulting calculations will be viewed with appropriate discretion.

- CRSTER - The facility operating options and stack data input to the CRSTER model are shown in Table 4; these data are extracted from the EPA air emission source construction and operation permit. The maximum pollutant concentrations and affected receptor locations for each CRSTER run is featured in Table 5. With respect to these modeling results, the following conclusions relative to the emission dispersal characteristics of the proposed facility are offered:
  - Maximum SO_2 and TSP concentrations occurred primarily from 1.0 to 6.5 kilometers out from the stack site; maximum concentrations at more distant receptors were infrequent (less than 11 days per 365 days, average; no receptor at such a distance recorded a maximum in the top 50 readings for any model run).
  - Maximum concentrations were recorded primarily during unstable meteorologic conditions; that is, the highest concentrations for SO_2 and TSP were noted during the noon to evening period during the summer and fall months. This phenomenon is no doubt attributable to

TABLE 4

EMISSION CHARACTERISTICS OF VARIOUS CRSTER MODEL RUNS	
	Emission Rate GM/Sec.
Maximum TSP, Controlled	10.33
Average TSP, Controlled	7.50
Maximum TSP, Uncontrolled	633.01
Maximum SO_2	31.120
Average SO_2	22.55
Stack Data	
Height (Meters)	49.07
Diameter (Meters)	2.74
Maximum Gas Exit Velocity (Meters/Sec.)	38.16
Average Gas Exit Velocity (Meters/Sec.)	27.72
Exit Gas Temperature (Degrees K)	521.89

TABLE 5

SYNOPSIS OF CRSTER MODEL RUNS				
	Max (UG/M^3)	Distance (KM)	Direction (^{o})	Allowable PSD Incr. UG/M^3
TSP, Max. Controlled 24 hour	0.97	3.5	240	37
TSP, Avg. Controlled Annual	0.09	3.0	90	19
TSP, Max. Uncontrolled 24 hour Annual	59.69 5.66	3.5 3.5	240 90	-- --
SO_2, Max. 3 hour 24 hour	12.82 3.21	1.9 3.0	270 90	512 91
SO_2, Avg. Annual	0.29	2.0	90	20

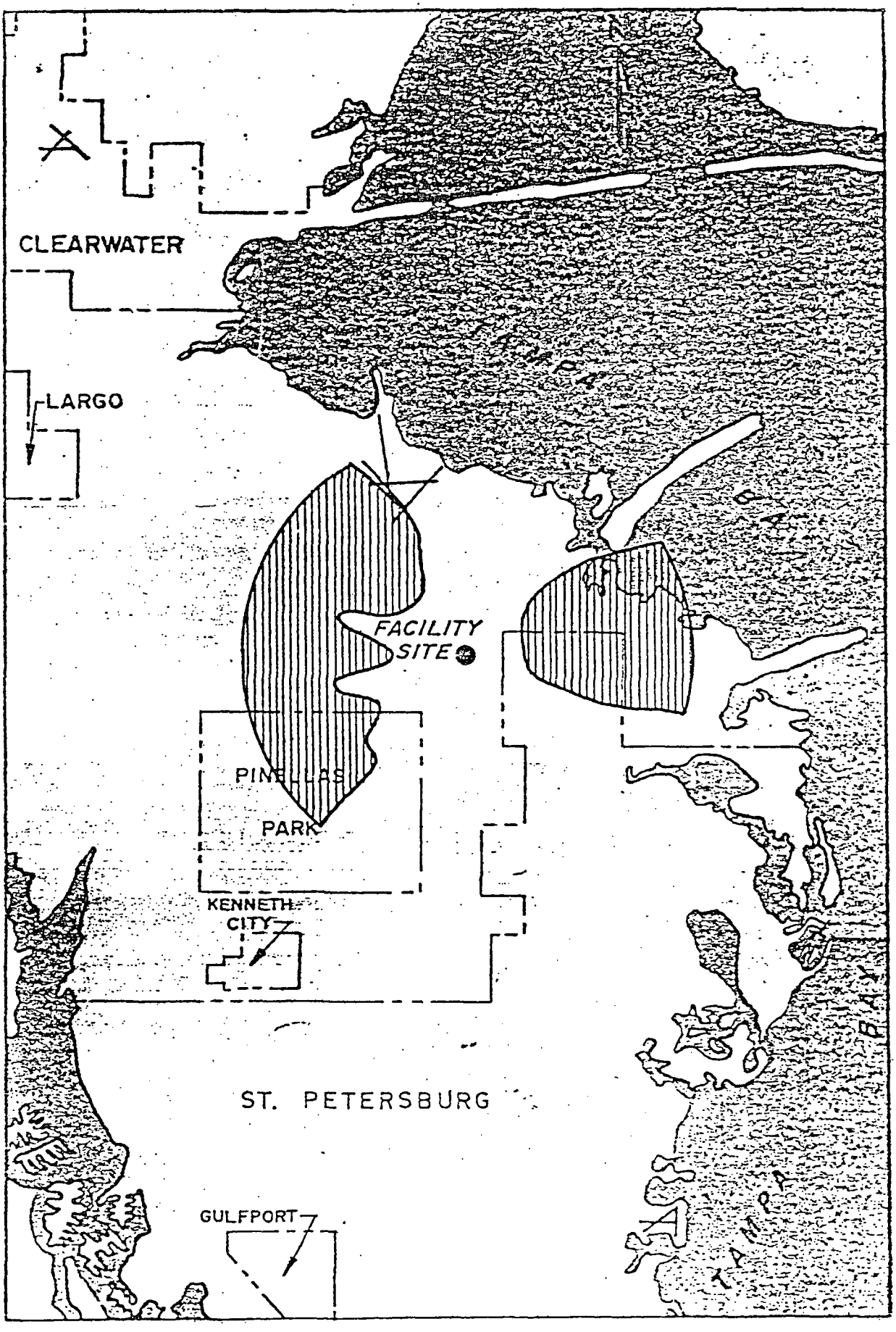
the high exit temperature of the facility emissions and their ability to penetrate such stable situations as a temperature inversion layer. The mixing of exit gases in a more unstable atmosphere is characterized by both upward and downward plume dispersal, hence the recording of maximum concentrations during these periods.

- The maximum values recorded for the resultant concentration from facility emissions are quite small and, by themselves, do not violate the allowable PSD increment for any situation with each pollutant.

Figures 2 through 6 illustrate the isopleths of maximum concentration for each pollutant and averaging time; specifically, with receptor ring distances designated, these are:

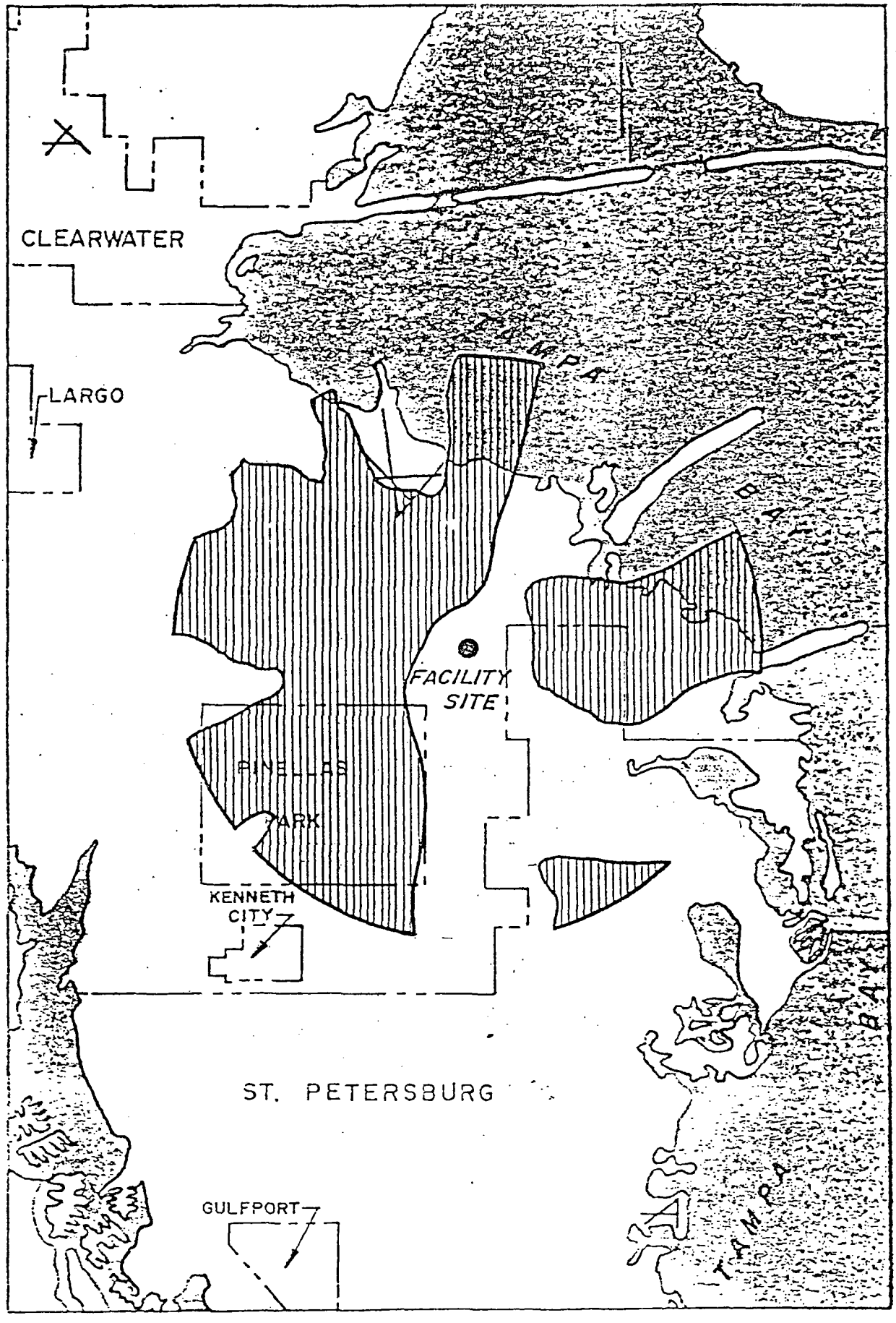
- Figure 2 - TSP, Annual Maximum Mean Concentrations; Ring Distances at 0.85, 1.60, 3.00 and 5.00 KM.
- Figure 3 - TSP, 24 Hour Maximum Concentrations; Ring Distances at 0.90, 1.80, 3.50 and 6.50 KM.
- Figure 4 - SO_2, 3 Hour Maximum Concentrations; Ring Distances at 0.90, 1.85, 3.00 and 5.00 KM.
- Figure 5 - SO_2, 24 Hour Maximum Concentrations; Ring Distances at 0.90, 1.85, 3.00 and 5.00 KM.
- Figure 6 - SO_2, Annual Maximum Mean Concentrations; Ring Distances at 0.85, 1.60, 2.00 and 5.00 KM.

CONCENTRATION (ug/m^3), TO 5.0 KILOMETERS

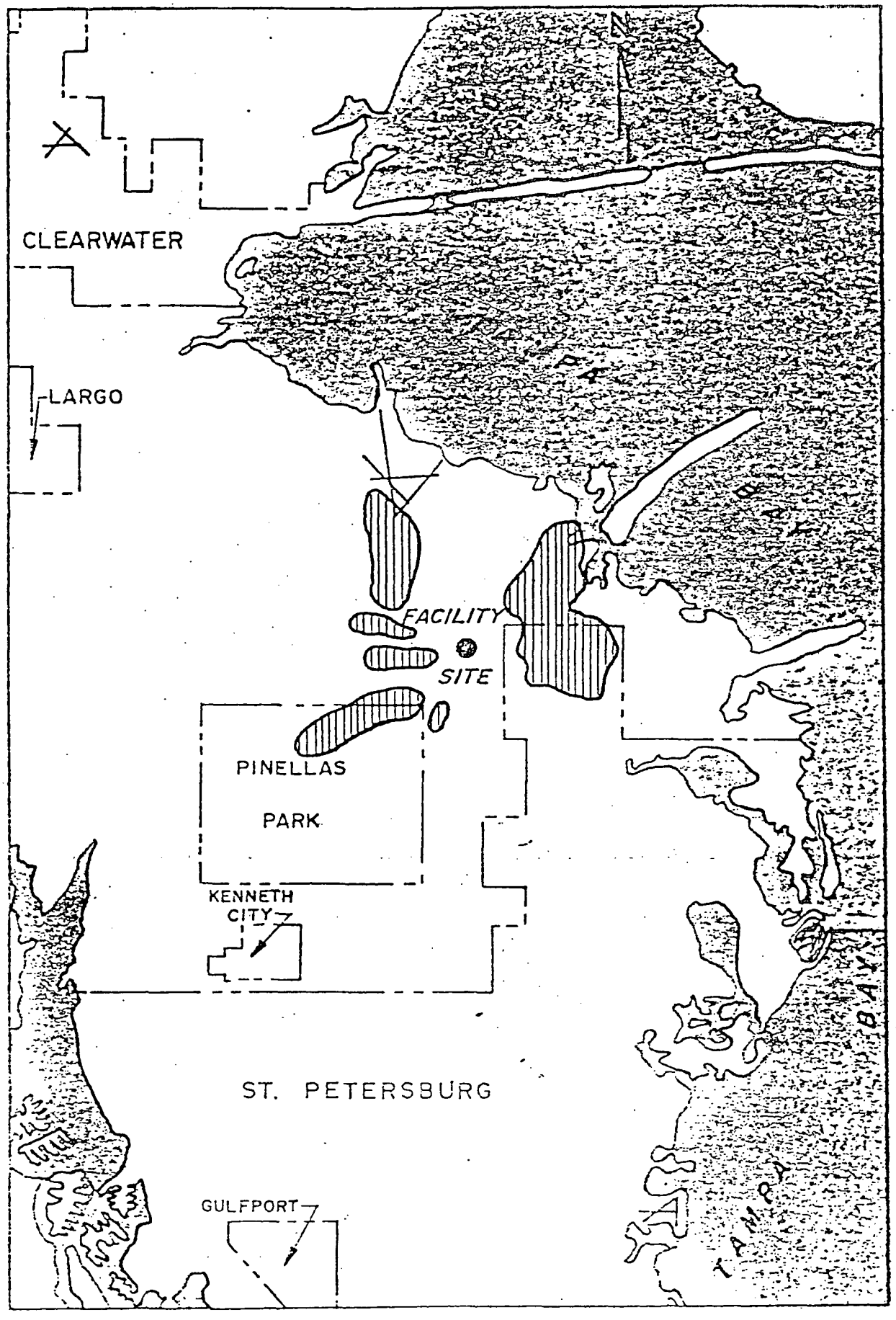


0.04 - 0.09 ug/m^3

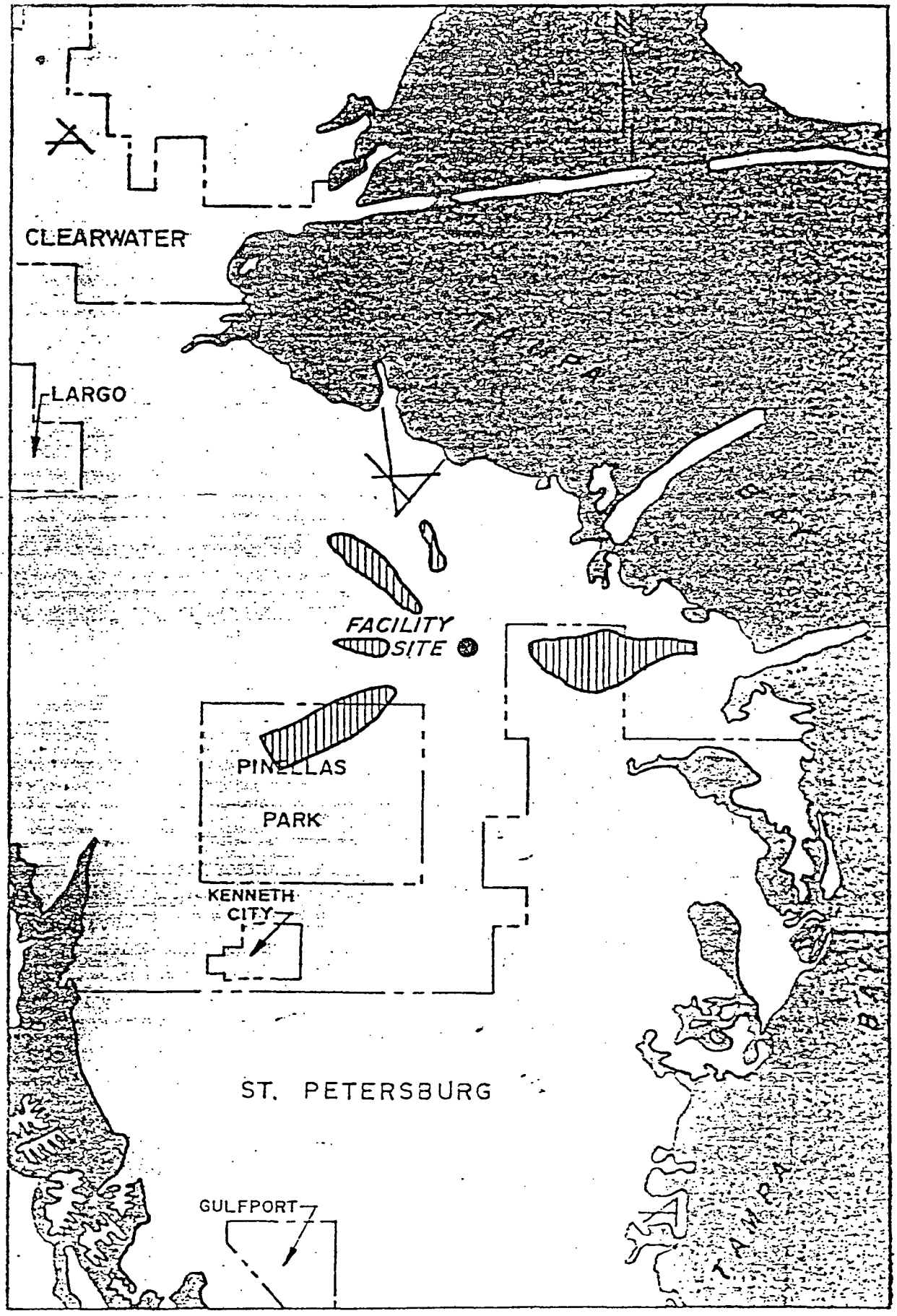
CALCULATED [illegible] 24-[illegible] CONCENTRATION
(ug/m-), TO 6.5 KILOMETERS



CALCULATED MAXIMUM 3-HOUR S... CENTRATION
(ug/m^3) TO 5.0 KILOMETERS

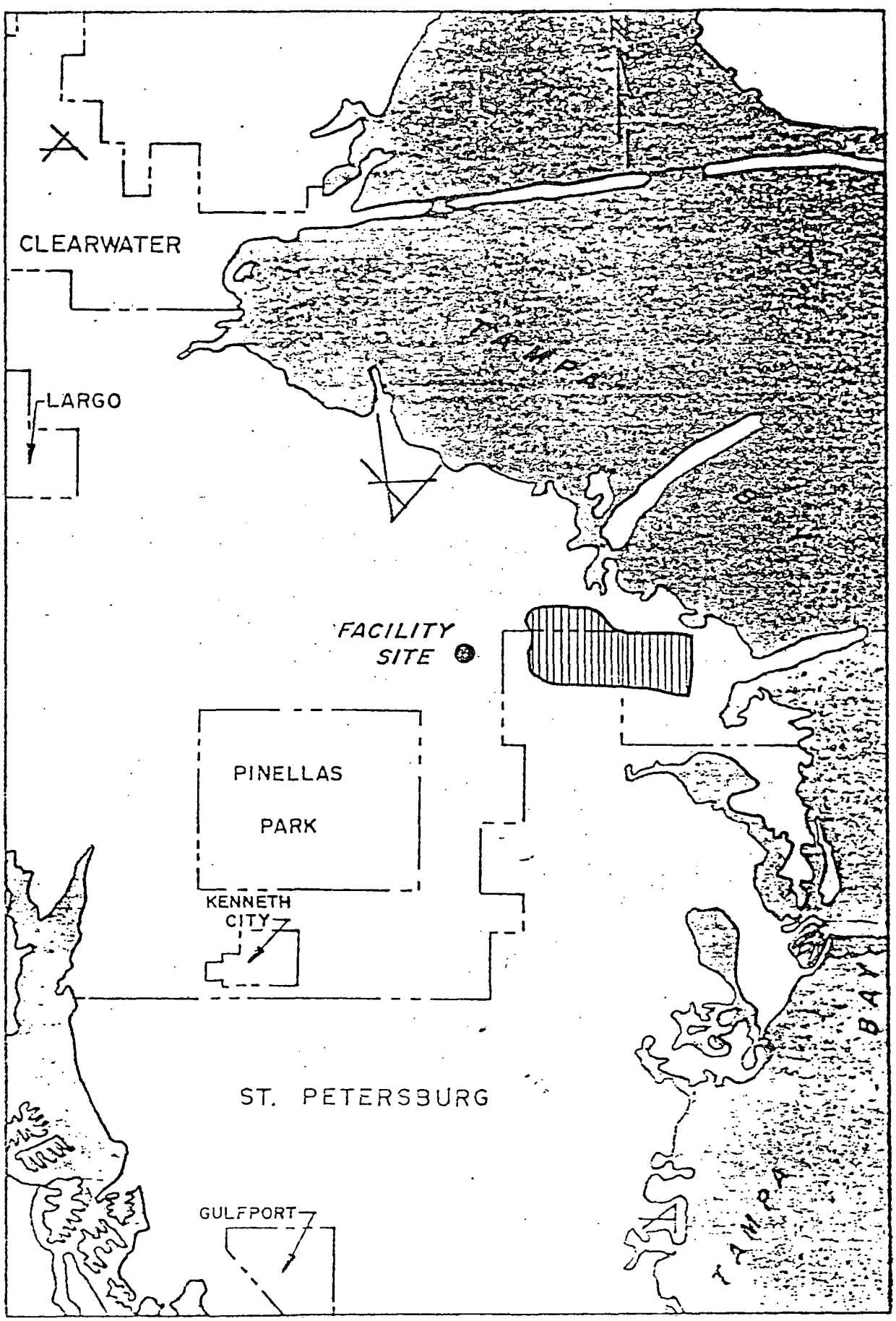


CALCULATED MAXIMUM 24 HOUR SO_2 CONCENTRATIONS,
ug/m^3 TO 5.0 KILOMETERS



2.0 - 3.2 ug/m^3

(ug/m^3), to 5.0 KILOMETERS



As previously cited, the readings recorded at distant receptors (greater than 15.0 KM) are viewed with some caution due to meteorologic factors; in addition, few maximum readings were calculated at these receptors. Consequently, the isopleths shown in Figures 2 through 6 are exclusive of the outer receptor ring.

• Other Major Sources Permitted Since January 6, 1975 - The area and point source emissions inventory, utilized for the CDM model, was submitted to the Florida Department of Environmental Regulation (Tampa), the Pinellas County Department of Environmental Management and the Hillsborough County Environmental Protection Commission so that their guidance concerning the selection of post-baseline permitted facilities would be received. Based on such input, the following sources have been designated as being permitted since January 6, 1975:

- Florida Power, Anclote - SO_2 and TSP
- Florida Power and Light, 2 Units at Willow Point - SO_2 and TSP
- Nord Southern Dolomite - SO_2 only
- Gardiniers, 1 Unit - SO_2 only
- Chloride Metals, 1 Unit - SO_2 only
- Tampa Electric, Big Bend - SO_2 and TSP

For each of these facilities and respective major emissions a CRSTER model was run with receptor ring distances coinciding with the 'hot spots' from each pollutant generated by

the proposed facility. Maximum readings recorded within these 'hot spots' from both the post-baseline source and the proposed facility will be utilized to estimate increment consumption. As meteorologic data for plume dispersal is randomly generated by the CRSTER model, the values obtained should not be taken as real-case situations; rather, they represent a worst case condition at a particular receptor and point in time. Furthermore, it should be clearly understood that the accuracy of the CRSTER model at distances greater than 15.0 KM becomes highly suspect as the probability for identical meteorologic conditions over such distances (as the model assumes) is very unlikely.

Table 6 features the pertinent data input to CRSTER for each 'new' major source.

- PSD Increment Consumption - Again, increment consumption by both the proposed resource recovery facility and those major sources permitted since January 6, 1975, were determined by inputting maximum, allowable emission rates for each source into the CRSTER model.

For the proposed facility the magnitude of increment consumption is featured in Table 5: those CRSTER results for the other major sources are shown in Table 7.

TABLE 6

MAJOR AIR EMISSION SOURCES PERMITTED SINCE JANUARY 6, 1975, AND RELEVANT CRSTER INPUT DATA

Source	Emissions		Stack Data			
	SO_2 (GM/Sec)	TSP (GM/Sec)	Height (M)	Diameter (M)	Flow (M/Sec)	Temp. (°C)
◦ Florida Power Corp., Anclote (Pasco County)	1631.9	58.08	152.1	3.66	49.95	143.3
◦ Florida Power & Light, Willow Point (Manatee Co.)	438.69	39.98	152.0	6.97	26.7	151.7
◦ Florida Power & Light, Willow Point (Manatee Co.)	666.2	37.71	152.0	8.05	20.7	151.7
◦ Nord Southern Dolomite (Manatee Co.)	3.22	0.22	16.76	1.22	12.9	76.7
◦ Gardiniers (Hillsborough County)	13.86	0.0	45.4	2.74	11.6	70.6
◦ Chloride Metals (Hillsborough County)	7.19	0.06	20.9	0.61	12.1	80.6
◦ Tampa Electric Co., Big Bend (Hillsborough County)	1153.0	10.32	149.4	4.57	33.0	137.0

TABLE 7

MAXIMUM CALCULATED CONCENTRATION (ug/m^3)
FOR EACH 'NEW' SOURCE MAJOR EMISSION
WHICH COINCIDES WITH PROPOSED FACILITY 'HOT SPOTS'

Major Source Permitted Since 1/6/75	SO_2 3 Hour	SO_2 24 Hour	SO_2 Annual	TSP 24 Hour	TSP Annual
Anclote	36.7	10.4	0.63	0.40	0.023
FPL Willow (Both Units)	17.4	3.80	0.39	0.37	0.030
Nord	1.77	0.22	0.01	NA*	NA*
Teco Big Bend	47.23	13.48	1.02	0.12	0.009
Gardiniers	5.84	1.59	0.10	NA*	NA*
Chloride	5.81	1.63	0.09	NA*	NA*

* Not a major (greater than 100 tons per year) emission.

To simply sum the increment consumption by each source to determine the remaining increment would be unsound. Since, as stated before, the post-baseline source modeling values obtained are construed as being worst case situations, they are, therefore, overestimates. However, it is quite obvious that even when utilizing these very high readings, the construction and operation of the proposed facility will not violate the allowable PSD increment at any averaging time for either pollutant. Specifically:

	SO_2 3 Hour	SO_2 24 Hour	SO_2 Annual	TSP 24 Hour	TSP Annual
Proposed Facility Increment	12.82	3.21	0.29	0.97	0.09
Other Source Increment	114.75	31.12	2.25	0.77	0.053
Total	127.57	34.33	2.54	1.74	0.14
Allowable	512	91	20	37	19