STORM WATER/LEACHATE MANAGEMENT PLAN
LENA ROAD LANDFILL
MANATEE COUNTY

Manatee County
Public Works Department
Solid Waste Section
3333 Lena Road
Bradenton Florida, 34202

November 1998

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I. INTRODUCTION

The purpose of this Storm Water/Leachate Management Plan (S/LMP) is to provide a general description of the design, operation and regulatory compliance of the Storm Water/Leachate Management System (S/LMS) at the Lena Road Landfill located in Bradenton Florida. The facility is owned by the Board of County Commissioners, with direct operational control by the Manatee County Department of Public Works, Solid Waste Section. This plan, along with accompanying documents, is part of an application for a new operating permit.

Manatee County owns approximately 1,200 acres designated for landfill operations, buffer area, wetland mitigation, storm water storage and waste water treatment. Approximately 320 acres are permitted by the Florida Department of Environmental Protection (FDEP) for landfill operations. The Lena Road Landfill consists of three stages of operation. Stage I is the existing 150-acre active disposal unit. Stage II is a 101-acre unit due north of Stage I. Currently no refuse is in Stage II. Stage III is a 71-acre unit west of Stage I. Refuse from an inactive landfill is located in Stage III. **Figure 1** is a site map of the Lena Road Landfill.

II. STORM WATER SYSTEM OVERVIEW

Stage I System

The Stage I storm water management system is independent of the storm water management systems for Stage II and III.

- Perimeter Ditches and Conveyances

Storm water from Stage I flows into a perimeter ditch system. Storm water enters the ditch system via direct rain fall, sheet flow down the outside slopes, and from drop inlets which drains runoff from the side slopes.

For a graphical representation of the following discussion please refer to the plan set entitled **Lena Road Landfill, Storm Water Ditch Improvements**. The west half of the north perimeter ditch, from station 41+35, and continuing along the west perimeter ditch, to station 14+00 is lined with 12" of 1 x 10^{-7} clay. South of station 14+00 storm water enters a 36" RCP and is conveyed to the storm water pond. The discharge elevation of the 36" RCP is 31 NGVD. At station 6+55 the 36" RCP is connected to a 42", type U, concrete end wall. The end wall is fitted with a flap gate to allow storage up to the control structure's window elevation 37 NGVD. Storm water entering the east half on the north perimeter ditch flows eastward, enters the east perimeter ditch and discharges into the storm water pond. These ditches are not lined with clay and are merely for conveyance of storm water to the storm water pond. Storm water entering this ditch system is due to direct rainfall, runoff down the side slopes or drop inlets from the closed section of the landfill.

- Storm water Pond

The ditch system drains to an 8-acre, 40 acre-feet storm water detention pond. The pond is located at the southwest corner of Stage I

- Filter Facility Intake structure

At the edge of the pond, at station 6+52, 15' west of the 36" RCP a 6' x 6', type J, control structure with a 30" sluice gate and over flow windows is connected to a 24" RCP. The invert elevation of the pipe is set at elevation 31 NGVD. Under normal operations the sluice gate is open allowing storm water to exit the pond through the 24" pipe. Should additional storage be required, the sluice gate is shut, allowing storm water to accumulate in the pond up to the desired elevation, not exceeding elevation 37 NGVD. At elevation 37 NGVD storm water enters the control structure via the over flow windows. Once storm water has entered the 24" RCP it flows to the head works of the storm water filter facility.

- Filter Facility

The filter facility is located northwest of the storm water pond. Its dimensions are approximately 110' (w) x 340' (l). Storm water entering the facility flows over the top of the filter bed at elevation 32.40 NGVD. The filter bed consists of silica sand with a uniformity coefficient greater than 1.5 and an effective grain size between 0.2 mm and 0.55 mm. Collection laterals of 6", 8" and 10", perforated PVC are laid 2 feet beneath the filter bed to collect the storm water. The laterals are laid in a gravel backfill. The gravel is a minimum of 6" below the invert of the laterals. The gravel and laterals are wrapped in a filter fabric. Thirteen clean outs and three manholes are installed to provide access for maintenance to the filter facility. To aid operators during general maintenance of the filter bed, traffic cones are installed to indicate the top of the filter bed. Storm water is conveyed from the laterals to two 18" RCP and conveyed to the Stage III south perimeter ditch.

- Outfall 001

The overflow weir for Stage I is outfall 001. The weir is set at elevation 36 NGVD. Once storm water has exited the out fall, it is conveyed to the Stage III south perimeter ditch, and subsequently into Cypress Strand Creek.

- Filter Facility Overflow Structure

Near the head works of the filter facility, at station 7+97, a 4' x 5', J box, connected to a 24" connector pipe is installed to periodically drain storm water from the filter facility for maintenance. The flow enters the conveyance piping. The 24" RCP is connected with a control structure to the 36" RCP at invert elevation 32.30 NGVD. Storm water exiting the overflow window of the facility's control structure enters the 36" RCP. The sluice gate prevents the flow of storm water directly from

the 36" RCP to the filter facility. The storm water flows in the 36" RCP to outfall 001 and subsequently to the Stage III south perimeter ditch

Stage II System

The Stage II storm water management system is independent of the storm water management systems for Stage I and III. The system consists of a perimeter ditch constructed with underdrains and drop inlets for the discharge of storm water. Emergency overflow weirs 005 and 006 discharge storm water from Stage II to Gates Creek. Because landfilling operations have not begun in Stage II, there is no runoff from the area to the perimeter ditch. Storm water entering the ditch system is due to direct rainfall or from intentionally pumping accumulated storm water inside the Stage II footprint directly into the perimeter ditch. Discharge to Gates Creek is via the underdrain system. No storm water has discharged to Gates Creek via emergency over weirs 005 and 006.

Stage III System

The Stage III storm water management system is independent of the storm water management systems for Stage I and II. However, like Stage II the system is a perimeter ditch with an underdrain and drop inlet. Storm water discharges via the underdrain to Cypress Strand Creek. Emergency overflow discharge weir 004 also discharges to Cypress Strand Creek. Refuse is buried in Stage III. The refuse is capped with an intermediate cover.

- Surface Drainage

Surface waters within the western portion of Stage III is collected by a surface water collection system. This system includes 8 surface water inlets and a pipe system that drains to Lift Station No. 3. The leachate and surface water from Stage III is pumped to the leachate storage pond and is then pumped to the WWTP for treatment. When the Stage III filling begins, the surface water will be directed by grading to perimeter storm water drainage ditches.

- Weir to Cypress Strand Creek

All Storm water discharges from Stage I exit the system and enter the Stage III south perimeter ditch. Referring to the above mentioned plan, set, a weir is installed in the south ditch at station 100+10. The weir's crest elevation is set at 30.50 NGVD. Two 12" DIP, with associated valveing, are constructed through the weir. The invert elevation of the pipes are 28.50. Storm water at this discharge is either to Cypress Strand Creek or pumped into Stage III west perimeter ditch.

- Weir to West Perimeter Ditch

A second weir set at elevation 33.7 maintains a head of storm water along the west Stage III perimeter ditch. Both weirs are designed to maintain a head of water in each ditch in an effort to

provide an inward gradient around the south and west portion of Stage III. Discharges to Cypress Strand Creek occur only when one or both weirs discharge over the design elevation.

- Outfall 004

Storm water discharging over the weir in the Stage III west perimeter ditch exits Stage III at outfall 004 via an underdrain and drop inlet. Cypress Strand Creek is the receiving body for all storm water discharges from Stage I and Stage III.

III. LEACHATE COLLECTION AND REMOVAL SYSTEM OVERVIEW

Stage I System

The Stage I LCRS is a perimeter underdrain around Stage I. The underdrain is approximately 10 feet inside the slurry wall and approximately 12 feet below grade. The underdrain is an 8-inch, perforate pipe surrounded by aggregate. The pipe and aggregate are wrapped in a geotextile. Manholes and cleanout are constructed to provide access for cleaning and repairs.

The slurry wall and underlying clay confining unit is the containment/barrier system designed to prevent leachate movement to the outside surficial aquifer. The slurry wall and LCRS is the FDEP approved method designed and constructed to minimize impacts, due to landfill operations, to the surrounding environment. The slurry wall is keyed into the underlying natural clay unit. The depth of the slurry wall varies, depending on depth to the clay unit.

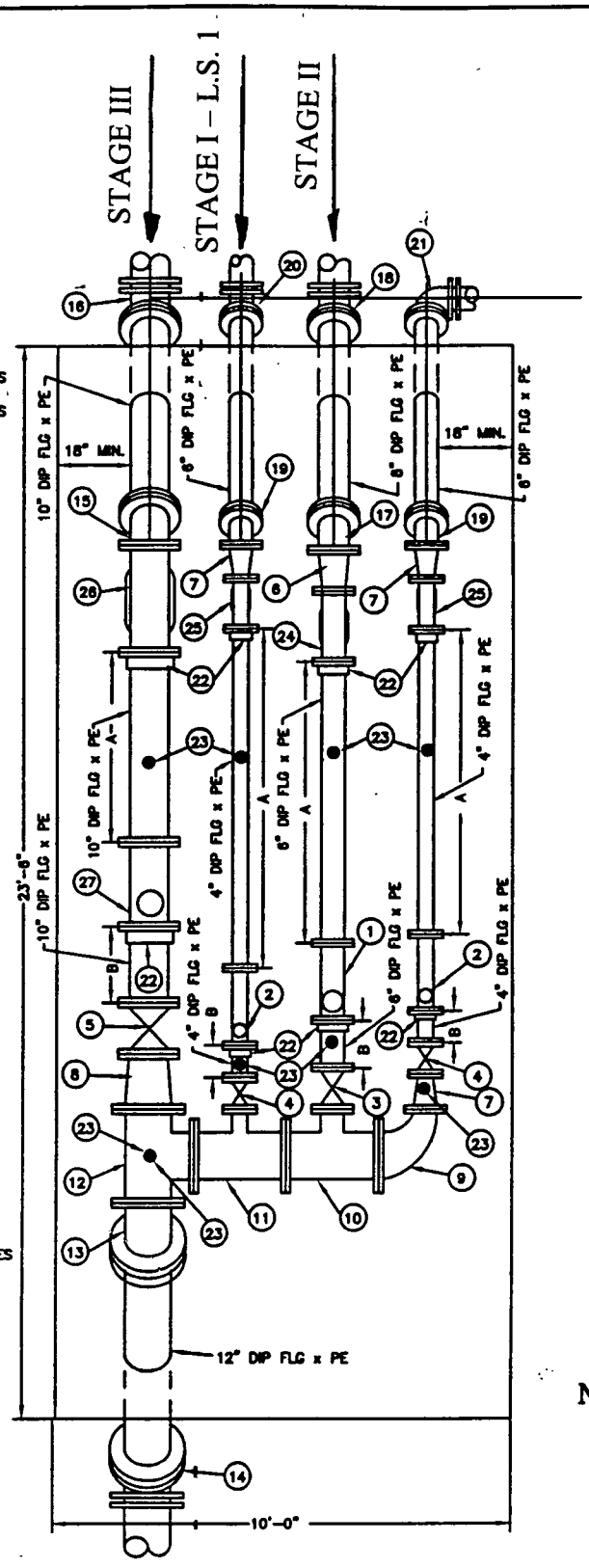
Two lift stations are used to pump collected leachate. Lift station No. 1 is located in the northwest corner of Stage I. Lift station No. 2 is located at the southwest corner of the Stage I landfill. Collected leachate enters the underdrain system and gravity flows back to either lift station. Both lift stations operate in the similar manner. Two submersible pumps deliver collected leachate from the lift station to the storage tank of the WWTP. The first pump is activated when the low level float senses leachate from the lift station. The pump will operate until the float sensor deactivates. If leachate enters the lift station at a faster rate than the first pump can draw it down, the high level float will activate the second pump to turn on. Upon deactivation of the high level float, the second pump will shut off. Lift stations can operate in the hand or automatic setting. Both lift stations are set to operate in the automatic mode. Both pumps are 10HP 230/60 1735 RPM. From the lift station, leachate is pumped through a 6-inch solid wall pipe to the metering station.

Metering Station

The metering station is shown on Page 4a. Four pipelines come to the Metering Station from the landfill. After metering, the pipelines are manifolded into a single 12-inch pipeline for pumping the leachate to the storage tank at the adjacent wastewater treatment plant. The meters for Stage I – Lift station 1 and Lift station 2 and Stage III will be recorded daily using Exhibit A. The Stage II Landfill has no solid waste, and so the pipeline from the Stage II pump station is not used.

LEGEND

A	MINIMUM DISTANCE SHALL BE 5 PIPE DIA.'S
B	MINIMUM DISTANCE SHALL BE 2 PIPE DIA.'S
1	6" McCROMETER MODEL NO. MF100 W/ FLOW STRAIGHTENING VANES
2	4" McCROMETER MODEL NO. MF100 W/ FLOW STRAIGHTENING VANES
3	6" OS & Y RESILIENT SEAT GATE VALVE
4	4" OS & Y RESILIENT SEAT GATE VALVE
5	10" OS & Y RESILIENT SEAT GATE VALVE
6	8"x 6" DI FLANGE REDUCER
7	6"x 4" DI FLANGE REDUCER
8	12"x 10" DI FLANGE REDUCER
9	12"x 6" DI FLANGE REDUCING ELBOW
10	12"x 6" DI FLANGE REDUCING TEE
11	12"x 4" DI FLANGE REDUCING TEE
12	12" DI FLANGE TEE
13	12" DI FLANGE 45° BEND
14	12" DI MJ 45° BEND W/ RETAINING GLANDS
15	10" DI FLANGE 45° BEND
16	10" DI MJ 45° BEND W/ RETAINING GLANDS
17	8" DI FLANGE 45° BEND
18	8" DI MJ 45° BEND W/ RETAINING GLANDS
19	DI FLANGE 45° BEND
20	6" DI MJ 45° BEND W/ RETAINING GLANDS
21	6" DI MJ 90° BEND W/ RETAINING GLANDS
22	UNI-FLANGE
23	PIPE SUPPORT
24	6" WYE STRAINER FEBCO MODEL 758 OR EQUAL
25	4" WYE STRAINER FEBCO MODEL 758 OR EQUAL
26	10" WYE STRAINER FEBCO MODEL 758 OR EQUAL
27	10" McCROMETER MODEL NO. MF100 W/ FLOW STRAIGHTENING VANES



LEACHATE TO STORAGE TANK
AT WASTE WATER TREATMENT PLANT

PLAN VIEW

METERING STATION DETAILS

NORTH

FIGURE 3 (REVISED 12/13/01)

PBS&J
330 SOUTH PINEAPPLE AVE.
SUITE 113
SARASOTA, FLORIDA 34236
Ph. (941) 954-4036

CLIENT
MANATEE COUNTY
PROJECT MANAGEMENT
DEPARTMENT
1026 26TH AVENUE EAST
BRADENTON, FLORIDA 34210

PROJECT
LENA ROAD LANDFILL LEACHATE
POND FACILITIES
METERING STATION

Stage II

The stage II LCRS is similar in design to the Stage I and III LCRS. The underdrain is installed to collect leachate which gravity flows it to a lift station. The underdrain is located inside the slurry wall. The slurry wall is keyed into the underlying clay unit to prevent movement of leachate to the outside surficial aquifer. Unlike Stage I and III, Stage II has collection laterals, which run the entire width of Stage II, spaced on 200-foot centers. However, until refuse is buried in Stage II, no leachate is produced. Because no leachate is produced, the inward gradient requirement around Stage II is not required or maintained. Ground water and rainwater collected in the underdrain system is not pumped to the Waste Water Treatment Plant. Rather, in emergency situations, the water within Stage II is pumped into the Stage II perimeter storm water ditch as described above.

Stage III

The stage III LCRS is similar in design to the Stage I and II LCRS. The underdrain runs along the north, south and west sides of Stage III. The north and south segments are approximately 10 feet inside the slurry wall, and the system along the west side is located approximately 17 feet inside the slurry wall. The north and west segments are graded to drain to the northwest corner of Stage III to Lift Station No. 3. The lift station pumps have a rated capacity of 800 gpm. A temporary lift station is located in the southwest corner of the Stage III area. It collects the leachate from the LCRS along the southern side of Stage III.

IV. OPERATIONAL PERFORMANCE OBJECTIVES

Objectives

It is the County's intent to maintain an inward gradient by collection and removal of leachate, with subsequent discharge to the WWTP. Staff will evaluate the following conditions in an effort to maintain water levels lower inside the slurry wall compared to the levels outside the slurry wall, or to recover the inward gradient within thirty days:

- Water Levels
- WWTP Availability
- Pumping Rates
- Seasonal Variations
- Unexpected or Scheduled Downtime

V. COMPLIANCE MONITORING AND EVALUATION

Monitoring Reports

Exhibit A is the Monthly Water Balance Report. This report is used to quantify the volume of leachate generated on a daily and per month basis from State I and III. Additional information includes:

- The volume of leachate pumped from Stage I Lift Station 1
- The volume of leachate pumped from Stage I Lift Station 2
- The volume of leachate pumped from Stage III
- The total volume of leachate pumped
- Daily rainfall in inches

The content and format of the report are approved by the FDEP. Exhibit B is the Monthly Leachate Tracking Summary. This report is used to summarize the following information by the month for the year:

- The volume of leachate pumped from Stage I
- The volume of leachate pumped from Stage III
- Total leachate
- Rainfall in inches

Exhibit C is the October 1998 Ground Water Gradient Monitoring Report. This report presents ground water elevations recorded at selected monitoring locations and compares them to the ground water elevations recorded at the piezometers. These locations are shown on **Figure 2** and listed on **Table 2.** An inward gradient is maintained when water elevations outside the slurry wall are higher than elevations recorded inside the slurry wall.

Leachate Monitoring

Leachate samples are collected annually and reported to FDEP. Samples are collected via grab, from each leachate lift station in Stage I and III, and combined for one composite sample. The event requires sampling for the following parameters:

Field Parameters	Laboratory Parameters
Specific Conductivity	Total Ammonia
pH	Bicarbonate
Dissolved Oxygen	Chlorides
Colors, Sheen	Iron
	Mercury
	Nitrate
	Sodium
	TDS
	40 CFR Part 258 Appendix I and Appendix II.

All sampling and testing is performed by a FDEP/FDH certified laboratory.

Ground Water Monitoring

Ground water samples are also collected semi-annually. Ground water samples are collected from all twenty seven (27) ground water monitoring wells shown on **Figure 2** and listed on **Table 1**. Samples are analyzed for the following parameters:

Field Parameters	Laboratory Parameters
Static Water Level	Total Ammonia –N
Specific Conductivity	Chlorides
pH	Iron
Dissolved Oxygen	Mercury
Turbidity	Nitrate
Temperature	Sodium
Colors, Sheen	TDS
	40 CFR Part 258 Appendix I

Gradient Monitoring

Ground water monitoring wells are installed around the perimeter of the landfill, outside the slurry wall, to monitor the shallow and deep artesian aquifers. Refer to **Table 1** for the name, type and aquifer monitored for each monitoring well.

Piezometers are installed around the perimeter of the landfill to measure depth to ground water of the shallow aquifer only. No ground water samples are collected from the piezometers. Refer to

Figure 2 for the location of monitoring wells and piezometers. Ground water elevations are obtained based on depth to ground water measurements and top of casing elevations. An inward gradient is observed when the ground water elevation recorded in a monitoring well is higher than the ground water elevation recorded in the corresponding piezometer. Depth to ground water measurements are taken monthly and reported to FDEP.

VI. MAINTENANCE PLAN

Storm Water System

Storm water perimeter ditches and the filter facility are inspected daily for sediment, wash outs, litter, vegetation and non performance. In the event of a side slope wash out the slope is repaired within 3 working days. Litter fences are installed along the top of bank of each ditch around Stage I to minimize litter from entering the ditch. Excessive vegetation is removed from the ditch system and storm water pond. Sediment is removed from the ditch and hauled to the working face. The manholes for the filter facility are inspected monthly or when a problem is suspected. If necessary the clean outs are flushed to promote drainage of the filter bed.

Leachate Collection and Removal System

Flow rates and quantities from lift stations 1, 2 and 3 are recorded and submitted to FDEP on a monthly basis, see Exhibit A. If a failure in the underdrain system is suspected, the system is videoed. When necessary, the underdrain is cleaned by hydro jetting. Manholes are visually inspected on a monthly basis. When necessary, the manholes are cleaned to promote drainage towards the lift station. The leachate storage pond side slopes are routinely mowed and maintained at approximately a 2:1 side slope. Accumulated sediment in the pond is routinely removed and landfilled. In the event a side slope failure repairs are made within one working week.

Table 1
Lena Road Landfill, Manatee County
Monitoring Well Data

Monitoring Well	Aquifer	Well Type
LRII-1	Surficial	Detection/Compliance
LRII-2	Surficial	Detection/Compliance
LRII-3	Surficial	Detection/Compliance
LRII-4	Surficial	Detection/Compliance
LRII-5	Surficial	Detection/Compliance
MW-1	Surficial	Background
MW-2	Surficial	Detection/Compliance
MW-3	Surficial	Detection/Compliance
MW-5	Surficial	Detection/Compliance
MW-6	Surficial	Detection/Compliance
CW-4	Surficial	Compliance
CW-5A	Surficial	Detection/Compliance
GC-1A	Surficial	Detection/Compliance
GC-2	Surficial	Detection/Compliance
GC-3	Surficial	Detection/Compliance
CG-4	Surficial	Detection/Compliance
GC-5	Surficial	Detection/Compliance
GC-6	Surficial	Background
SMR-1	Surficial	Background
SA-2	Deep	Detection/Compliance
SA-3	Deep	Detection/Compliance
SA-4	Deep	Detection/Compliance
SA-5	Deep	Detection/Compliance
SA-6	Deep	Detection/Compliance
SA-7	Deep	Detection/Compliance
SA-8	Deep	Detection/Compliance
SMR-2	Deep	Background

Table 2
Lena Road Landfill, Manatee County
Piezometer and Corresponding Monitoring Well

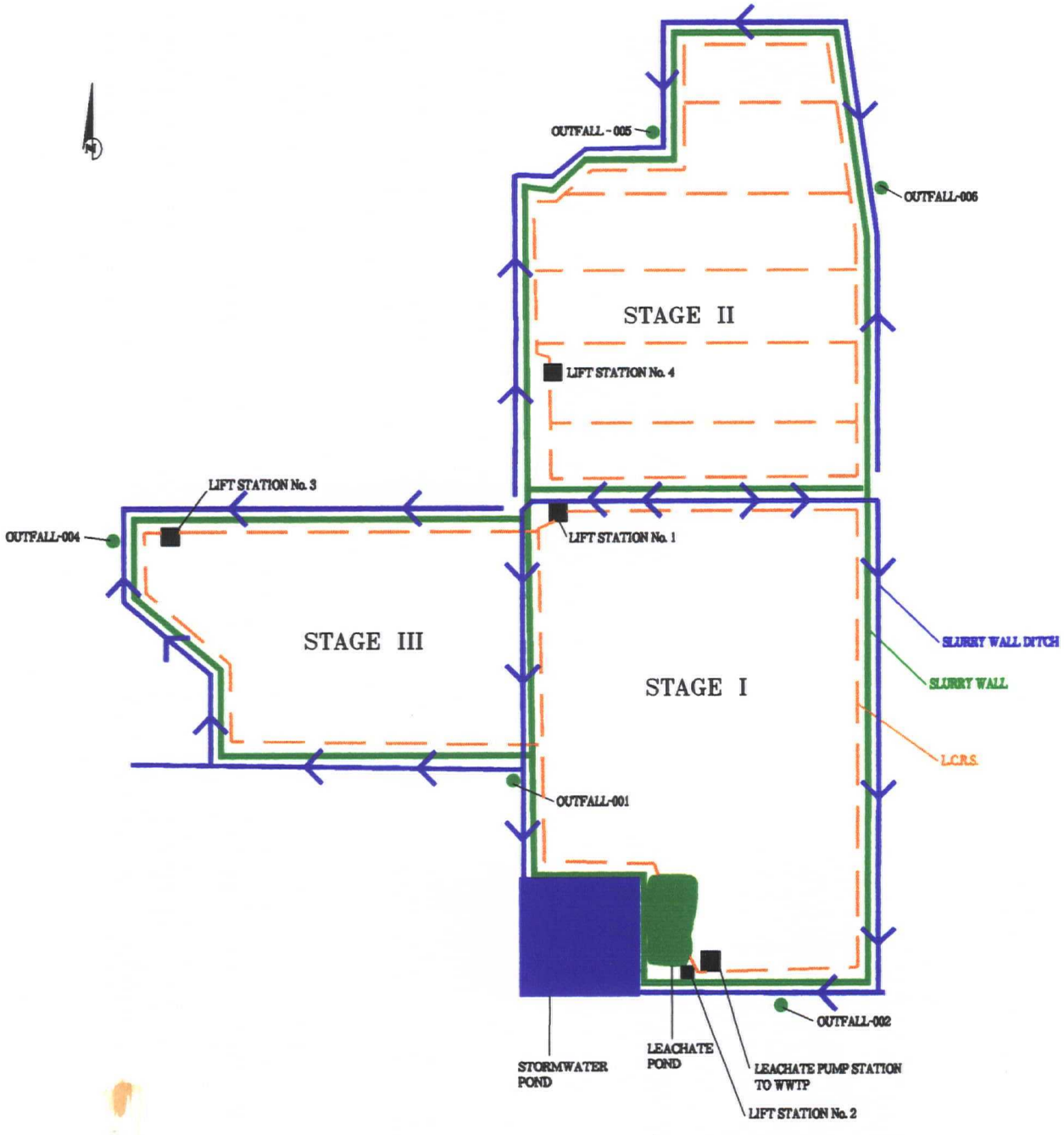
Piezometer	Monitoring Well
PZ-1	MW-5
PZ-2	MW-2
PZ-3A*	MW-1
PZ-4A	CW-4
PZ-5	CW-5A
PZ-6	SG-1
PZ-7	MW-6
PZ-8	LRII-5
PZ-9	LRII-4
PZ-10	LRII-2
PZ-11	LRII-1
PZ-12	GC-2
PZ-13	GC-3
PZ-14A	GC-4
PZ-15C	PZ-15A
PZ-16B	PZ-16A
PZ-17	SG-2
PZ-18	SG-3
PZ-19	PZ-11

*PZ-3A replaced PZ-3 (2nd revision)
January 30, 2002

STORMWATER LEACHATE MANAGEMENT PLAN

LENA ROAD LANDFILL

MANATEE COUNTY



MANATEE COUNTY PUBLIC WORKS DEPARTMENT

OPERATIONS PERMIT APPLICATION: AUGUST, 1998

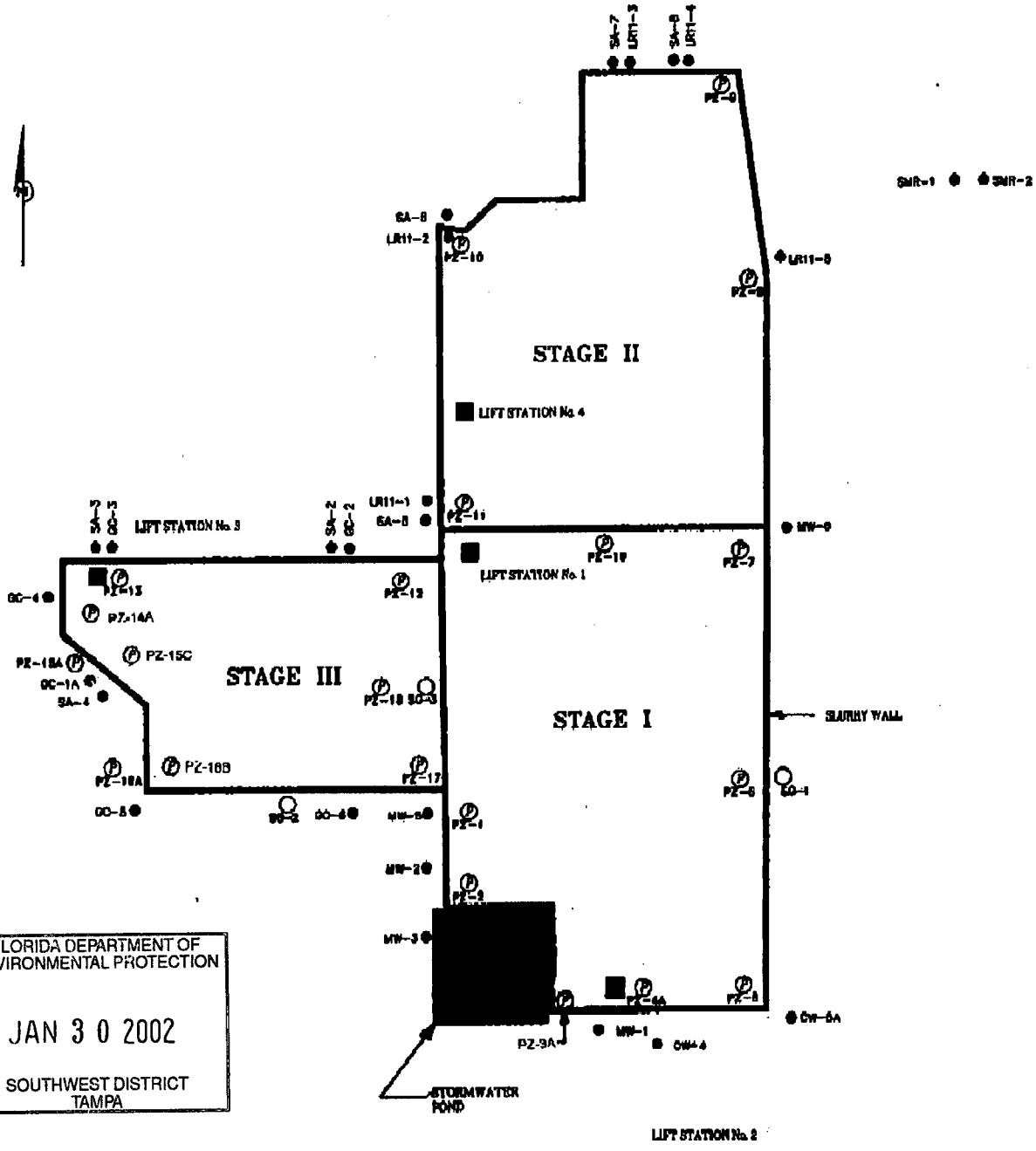
FIGURE 1

Prepared by: MCPWD – Mapping LEACHATE.DWG

STORMWATER LEACHATE MANAGEMENT PLAN

LENA ROAD LANDFILL

MANATEE COUNTY



FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

JAN 3 0 2002

SOUTHWEST DISTRICT TAMPA

Revised January 30, 2002 - PZ-3 replaced by PZ-3A

MANATEE COUNTY PUBLIC WORKS DEPARTMENT

OPERATIONS PERMIT APPLICATION: AUGUST, 1998

FIGURE 2

Prepared by: MCPWD – Mapping LEACHATE_2.DWG

EXHIBIT A

(REVISED DECEMBER 13, 2001)

MANATEE COUNTY SOLID WASTE MANAGEMENT FACILITY

LENA ROAD LANDFILL

MONTHLY WATER BALANCE REPORT

_____, _____
month year

A	B	C	D	E	F
DATE	LEACHATE STAGE I Lift Station 1	LEACHATE STAGE I Lift Station 2	LEACHATE STAGE III	TOTAL LEACHATE PUMPED	RAINFALL INCHES
01-Jan-00				0	
02-Jan-00				0	
03-Jan-00				0	
04-Jan-00				0	
05-Jan-00				0	
06-Jan-00				0	
07-Jan-00				0	
08-Jan-00				0	
09-Jan-00				0	
10-Jan-00				0	
11-Jan-00				0	
12-Jan-00				0	
13-Jan-00				0	
14-Jan-00				0	
15-Jan-00				0	
16-Jan-00				0	
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21-Jan-00				0	
22-Jan-00				0	
23-Jan-00				0	
24-Jan-00				0	
25-Jan-00				0	
26-Jan-00				0	
27-Jan-00				0	
28-Jan-00				0	
29-Jan-00				0	
30-Jan-00				0	
31-Jan-00				0	
TOTAL	0	0	0	0	0.00

Notes:

A - DATE OF READINGS.

B - LEACHATE PUMPED FROM STAGE I BY LIFT STATION 1 IN GALLONS SINCE PREVIOUS DATE RECORDED.

C - LEACHATE PUMPED FROM STAGE I BY LIFT STATION 2 IN GALLONS SINCE PREVIOUS DATE RECORDED.

D - LEACHATE PUMPED FROM STAGE III IN GALLONS SINCE PREVIOUS DATE RECORDED.

E - TOTAL LEACHATE PUMPED TO WWTP STORAGE TANK, WHICH IS THE SUM OF COLUMNS B + C + D.

F - RAINFALL RECORDED ON THIS DATE IN INCHES.

EXHIBIT B

(REVISED DECEMBER 13, 2001)
MANATEE COUNTY SOLID WASTE MANAGEMENT FACILITY
LENA ROAD LANDFILL
MONTHLY LEACHATE TRACKING SUMMARY -- _____ year

	A	B	C	D
MONTH	LEACHATE STAGE I	LEACHATE STAGE III	TOTAL LEACHATE	RAINFALL INCHES
JANUARY			0	
FEBRUARY			0	
MARCH			0	
APRIL			0	
MAY			0	
JUNE			0	
JULY			0	
AUGUST			0	
SEPTEMBER			0	
OCTOBER			0	
NOVEMBER			0	
DECEMBER			0	
TOTAL	0	0	0	0.00

Notes:

1. (A) Total leachate generated from Stage I.
2. (B) Total leachate generated from Stage III.
3. (C) Total leachate generate (Column A+B) and pumped to the WWTP storage tank.
4. (D) Total rainfall in inches.