PASCO COUNTY FLORIDA
OPEN SPACES. VIBRANT PLACES.

February 6, 2019

Ms. Ann Seiler
Florida Department of Environmental Protection
Siting Coordination Office
2600 Blair Stone Road
Tallahassee, FL 32399-9001

SUBJ: Pasco County Resource Recovery Facility
PA87-23
Request for Modification to Conditions of Certification

Dear Ms. Seiler:

Attached, please find the following two documents related to the subject facility:

- Revised Operations Plan for the Class I Landfill
- Request for Amendment to the Previous Approval of the Standing Beneficial Use of Bottom Ash Generated by the Pasco County Resource Recovery Facility

The purpose of this modification is two-fold in nature, as described below:

Revised Solid Waste Operations Plan

A critical component of the Pasco County Resource Recovery Facility is the Class I Landfill that receives combustion ash from the Resource Recovery Facility and overflow municipal solid waste that is periodically diverted from the Resource Recovery Facility. The current Conditions of Certification (PA 87-23C) incorporate a Landfill Operations Plan as an Attachment to the Conditions of Certification. The currently approved Landfill Operations Plan is over ten years old and pre-dates the Beneficial Ash Reuse Program discussed below. Our consulting engineer has developed a revised Landfill Operations Plan, which in addition to describing the Beneficial Ash Reuse Program, incorporates the following:

- Consolidates two previous Operations Plans from 2002 and 2008 into a single Landfill Operations Plan
- Revises the fill sequence for cells SW1 and SW2
- Provides for use of Alternate Daily Cover for the solid waste disposal cells
- More accurately describes the leachate metering procedures used at the landfill
- Codifies the Department's approval of the Beneficial Ash Reuse Program into the Conditions of Certification (as Appendix A to the new Landfill Operations Plan)
- Describes the ash processing procedures associated with ash reuse

Ms. Ann Seiler
February 6, 2019

Beneficial Use Approval Amendment

For the past several years, Pasco County has been diligently pursuing opportunities to beneficially utilize bottom ash as a construction material in roadway and building construction projects. Pasco County remains sincerely appreciative of your Department's willingness to work with us and our research partners at the University of Florida. This collaborative approach to analyzing the environmental merits of beneficial reuse of bottom ash has resulted in your Department's approval of three roadway construction applications, as well as approval for use in multi-use paths and in concrete slabs beneath structures, subject to a series of prescribed conditions.

As discussed with Department representatives last year, the previous approvals were based on a pilot project undertaken in 2014 and consistent with the authority described in Section 403.7045(5) of the Florida Statutes. Section 403.7045(5) of the Florida Statutes authorizes the Department to allow beneficial reuse of ash residue when an applicant demonstrates that "no significant threat to public health will result and that applicable Department standards and criteria will not be violated." A technical report entitled "Pasco County Use Case Scenarios to Examine the Recycling of Waste to Energy Bottom Ash in Road Construction Applications" was prepared by the University of Florida on behalf of the County and was submitted with the initial request in 2014.

To implement the pilot project in 2014, the research team (which included the Florida Department of Transportation) made certain assumptions related to roadway construction practices. Specifically, the roadway construction standard used to build the pilot project was derived from specifications applicable to multi-lane highways. Use of this standard resulted in a portion of the pilot road being constructed with 12 inches of ash as road base, overlain by 4 inches of asphalt base course. Accordingly, the Department's 2014 approval prescribed that future road base uses must utilize a minimum of 4 inches of asphalt placed on top of ash used as road base.

As our recycling initiative has progressed following the 2014 pilot project and Department approval, our team has identified potential projects that utilize a slightly different roadway construction standard that is more applicable to smaller roads (e.g. two-lane roads used for lower density traffic loads). At our request, Innovative Waste Consulting Services and JMG Engineering have prepared a technical memorandum entitled "Technical Evaluation for Reducing Pavement Layer Thickness for Treated Bottom Ash use as a Road Base Course". This document is attached here for your review along with an additional copy of the 2014 report. This technical memorandum presents the proposed amendments and supporting technical evaluation and justification for reconsideration of the prescribed condition related to asphalt thickness above ash used for road base.

Pasco County is committed to adhering to the remaining manners and techniques utilized in the construction of the demonstration road segments (as summarized in the attached report); adhering to construction, processing, and location constraints included in the initial approval and/or identified in the attached technical memorandum; and limiting use of the bottom ash to Pasco County projects (or those projects under the direct supervision of Pasco County).

Conclusion

We will be transmitting under separate cover a paper check in the amount of $10,000 to cover the application fee. We thank you for your timely review of this Request for Modification, and should you have any questions, please do not hesitate to contact either myself, Dr. Justin Roessler of my staff, Dr. Timothy Townsend of the University of Florida, or Mr. Jason Gorrie of JMG Engineering, Inc.

Sincerely,

John Power
Solid Waste Director
Pasco County Public Infrastructure

ATTACHMENTS

- Revised Landfill Operations Plan
- Technical Evaluation of Reduced Pavement Thickness over Road Base Course Constructed with Treated Bottom Ash

PASCO COUNTY FLORIDA
OPEN SPACES. VIBRANT PLACES.

WEST PASCO CLASS I LANDFILL OPERATIONS PLAN

Prepared for:

Pasco County Utilities
14230 Hays Road
Spring Hill, FL 34610

Prepared by:

JMG Engineering, Inc.
238 East Davis Blvd.
Suite 206
Tampa, FL 33606

February 2019

JASON M. GORRIE
LICENSE
No. 55341
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

Jason Gorrie, PE
Florida License No. 55341
2/6/2019

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1.0 General Description of the Solid Waste Complex

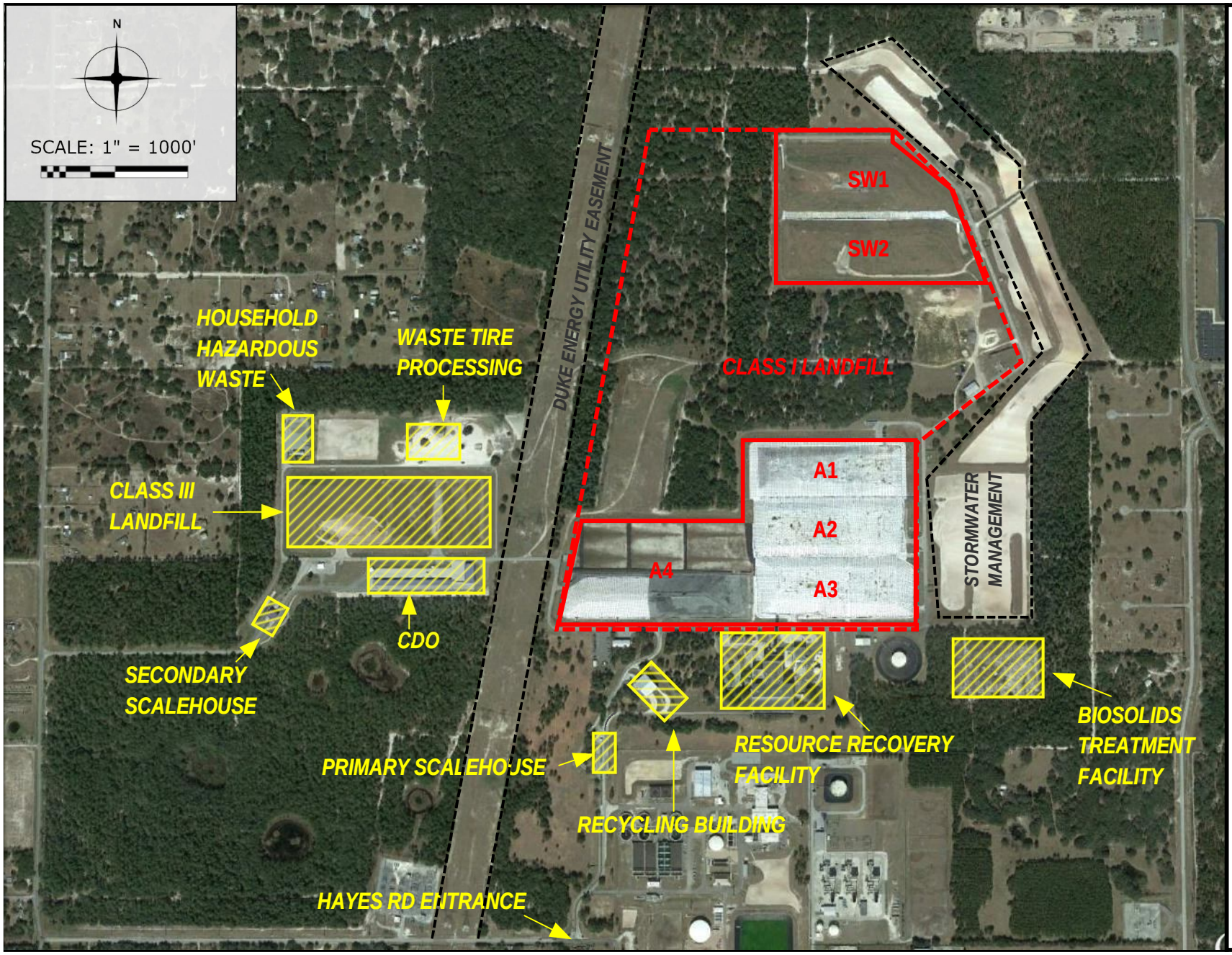
The West Pasco Class I Landfill (for which this Operations Plan has been prepared) is an integral component of the larger West Pasco Solid Waste Complex. The overall 800 acre Complex is comprised of the following components:

- The Pasco County Resource Recovery Facility;
- The West Pasco Class I Landfill (the component addressed by this Operations Plan);
- The West Pasco Class III Landfill;
- The West Pasco Materials Recovery Facility;
- Citizen's Drop Off Facility;
- The Pasco County Biosolids Treatment Plant, and;
- Various support structures, including two scalehouses, vehicle maintenance buildings, etc.

The main entrance of the West Pasco Solid Waste Complex is located at 14230 Hays Road in Spring Hill and is depicted on **Figure 1-1**. The majority of the complex is permitted under the Florida Electrical Power Plant Siting Act through Conditions of Certification No. PA 87-23C, however, the Class III Landfill and the Biosolids Treatment Plant are permitted through individual permits outside of PA 87-23C. The following solid waste management activities occur at the Complex:

- Scalehouse operations
- Solid Waste combustion at the Resource Recovery Facility
- Metals recovery in the Ash Storage Building of the Resource Recovery Facility
- Ash disposal in the Ash Monofill (currently Cell A4)
- Engineered Aggregate processing within the Ash Monofill (currently limited to Cell A4)
- Maintenance of temporary cover on the inactive cells of the Ash Monofill (Cells A1, A2, and A3)
- Solid Waste Disposal in the Solid Waste Landfill (currently Cell SW2)
- Maintenance of temporary cover on the inactive cell of the Solid Waste Landfill (Cell SW1)
- Construction and demolition (C&D) disposal within the Class III Landfill
- Yard waste processing
- White goods collection and recycling
- Household hazardous waste (HHW) collection
- Recycled materials processing
- Stormwater collection and treatment
- Landfill gas monitoring
- Groundwater monitoring
- Landfill leachate collection and transport
- Heavy equipment and vehicle maintenance
- Waste tire collection and processing

The entire 800-acre site is enclosed by a chain link fence or barbed wired fence to limit access. Public access is limited to two gates, both of which are monitored by Pasco County staff located in the scalehouses adjacent to the gates. After-hours access to the primary entrance gate off of Hays Road is monitored and controlled by the control room operator at the Resource Recovery Facility.



Site Plan

West Pasco Solid Waste Facility

Figure 1-1

2.0 Safety

2.1 Emergency Contacts and Reporting

Mr. John Power	Office	(727) 856-0119
Solid Waste Director	Cell	(813) 763-5881
Dr. Justin Roessler	Office	(727) 856-0119
Asst. Solid Waste Director	Cell	(352) 270-1454

The emergency contact individuals are subject to change. The Operations Plan will be updated if any changes occur. All accidents should be immediately reported to the Asst. Solid Waste Director. After immediately reacting to the accident (first aid or equipment repair), the Asst. Solid Waste Director or others designated by the Director will investigate the cause of the accident. A full accident report will be drafted and submitted to Solid Waste Director. The accident report will include all facts involved in the incident as applicable including, but not limited to, date, time of day, weather conditions, hauler vehicle traffic conditions, location on the landfill, equipment and personnel involved, circumstances leading to cause, and response. Photographs will be attached when applicable.

2.2 Operator and Hauler Requirements

Smoking is prohibited on and near the landfill cells and the working face. A spark from a lighter, cigarette, cigar, or pipe could ignite LFG. A sign at the scalehouse notifies anyone entering the landfill of the No-Smoking Policy. All Pasco County employees will enforce this policy in the field. “No Smoking” signs are posted at all entrances, roadways, and active areas.

Welding and oxy-acetylene cutting are prohibited near the landfill or working face. If a vehicle requires this type of maintenance, it shall be towed to an area away from LFG venting. If this is not possible, an employee trained in using a combustible gas meter will take a reading around the area to determine whether methane/combustible gases are absent and their concentrations if they are present.

2.3 Training, Equipment, and Materials

Safety materials and equipment include fire extinguishers at landfill sites and first aid kits that are easily accessible for field use. Other equipment provided by the County may include various types of Personal Protective Equipment (PPE) and protective disposable coveralls. Landfill field employees are required to wear appropriate clothing on the work site, such as steel-toed boots, long pants, and a shirt.

Pasco County Utilities maintains a pro-active approach to training by requiring key operating personnel attend the University of Florida’s Training, Research, and Education of Environmental Operations (TREEO) certification courses. All Operators and Spotters must attend and pass the Initial Training for Operators of Landfills and Waste Processing Facilities course. Within three years of passing the initial training course and every three years thereafter, each operator must complete an additional 16 hour refresher course. Additionally, all spotters must attend and pass the Initial Training Course for Spotters at Landfills, C&D Sites, and Transfer Stations. Within three years of passing the initial training course and every three years thereafter, each spotter must complete an additional 8 hour refresher course.

Copies of course completion certificates are kept on file within the Administration offices. The landfill has at least one trained operator on site during all times when the landfill receives waste. At least one trained spotter is at each working face at all times to detect unauthorized wastes when the landfill receives waste other than ash.

3.0 Organization

Pasco County Solid Waste is organized as follows:

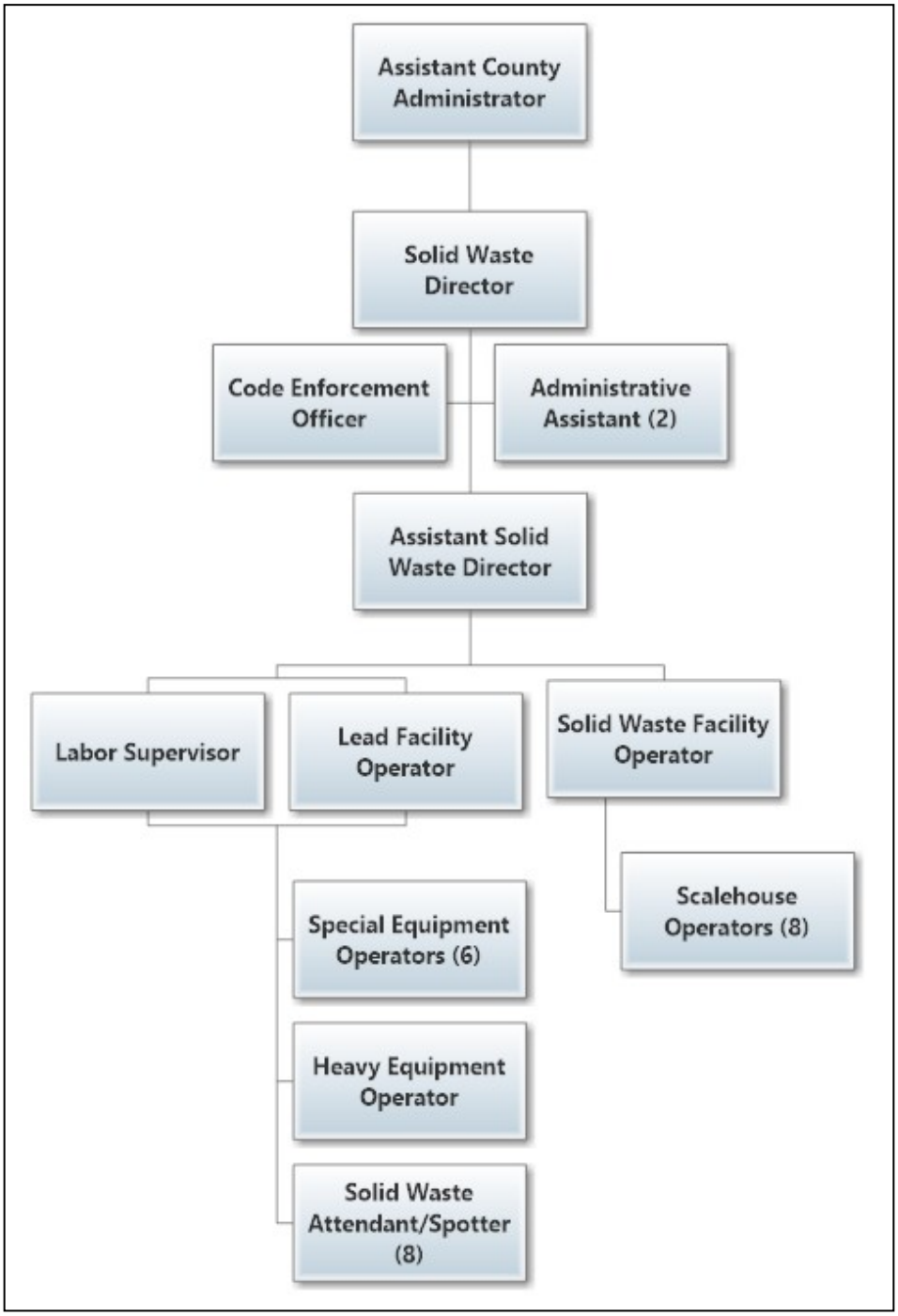


Figure 3-1
Organizational Chart

4.0 Scalehouse Operations

The scale operation is critical to the efficiency of the landfill facility. This operation serves several important functions including security, initial load checking, waste identification and segregation, traffic control, waste quantity recording, and financial documentation.

The primary scalehouse is the original to Facility, was constructed in 1990, and is approximately 1000 feet from the entrance gate on the main facility access road. The scale facility has a scalehouse, two inbound scales, one outbound scale, one inbound bypass lane, one outbound bypass lane, and a video surveillance system. Monitoring the movement of haul trucks and other vehicles is part of the duties of the Scalehouse Attendant. All traffic entering the facility must check in with the Scalehouse Attendant. Waste delivery vehicles are required to weigh in, and all visitors must first report in and state the purpose of their visit. A Scalehouse Attendant is maintained on duty during all periods when the facility is open.

A secondary scalehouse, constructed in 2011, is utilized primarily for citizens that choose to self-haul to the Citizens' Drop-Off facility. The secondary scalehouse has a scalehouse, one inbound scale, one outbound scale, one inbound bypass lane, one outbound bypass lane, and a video surveillance system.

Administration maintains communication with landfill staff via hand-held radios and cell phones. A sign at both entrances to the facility identifies the operating authority, hours and days of operation, waste disposal restrictions, and other information. Speed limit signs are posted along the main road leading to the active filling areas. Signs identifying roads leading to the Class I filling area are posted at the intersection of each road. Other miscellaneous signs direct customers to the other public facilities, including recycling drop-off containers, mulch, and tire disposal area.

4.1 Load Screening

The Scalehouse Attendant screens all loads as they are received at the scale facility. The Scalehouse Attendant performs two types of inspections on incoming waste loads per transaction: hauler interview, and visual inspections when visible from inside the scale facility.

The initial inspection of the incoming waste is conducted by the Scalehouse Attendant. This inspection includes identification from the driver of the type of waste and random visual inspections of the vehicle. The random visual inspections include looking for suspicious containers that may contain prohibited wastes and smoke rising from the payload area of the vehicle.

The types of businesses in the area that may generate prohibited wastes include automotive repair, painting, dry cleaning, fiberglass fabrication, and marine service. All incoming loads of waste should be checked for visual and olfactory indications. Indications of suspicious loads include the following:

- Hazardous placards or markings
- Drums
- Containerized liquids
- Powders or dusts
- Sludges
- Bright or unusual colors
- Chemical odors

4.2 Prohibited Wastes

The Scalehouse Attendant should also scan incoming loads for components that contain prohibited materials. Waste materials prohibited from disposal at the West Pasco Facility are listed below. Refer to Section 7.6 for handling and removal of prohibited wastes from the waste stream. References to sections where disposal is addressed are shown parenthetically. Please note that waste tires, white goods, yard waste, and other selected items are accepted at the Complex but diverted from the Class I cell.

- Lead Acid Batteries (8.7)
- Paint (8.4 and 8.5)
- Biomedical wastes (8.10)
- Whole tires (8.11)
- Used motor oil and oil filters (8.3)
- White goods (8.12)
- Household Hazardous Waste (8.1)
- Unknown Wastes (8.2)
- Septic/sewage/sludge except that bound for the Biosolids Processing Facility or meeting the definition of a solid waste in accordance with 62-701(107) and not prohibited by 62-701.300, FAC (8.10)
- Segregated Electronics (8.8)
- Contaminated Soils (8.9)

4.3 Waste Categories

Pasco County utilizes defined categories of types of waste received at the scalehouse. These categories of waste are designed to provide required reporting to FDEP as well as to properly manage the incoming waste. Each waste category is managed at a specific area of the Complex. The Scalehouse Attendant is responsible for directing the driver of the haul vehicle to the proper location in the landfill for unloading.

Table 4-1 lists all waste categories received at the Complex and the location for unloading within the Complex.

The tonnage of all waste categories is compiled monthly. The waste quantity reports are submitted annually to FDEP.

Table 4-1
PC Scales Waste Category Codes and Disposal Area

Code	Description	Disposal Area
AC	Air Conditioner	HHW
AR	Adopt a Road	RRF, Class I, Class III, Waste Tire
CCT	Coastal Cleanup	RRF, Class I, Class III, Waste Tire
CD	Construction Debris	Class III
CEE	Commercial Electronic Equipment	HHW
CM	Computer Monitor	HHW
COM	Computer without Monitor	HHW
EE	Electronic Equipment	HHW
FCY	Fuel Cylinder	HHW
HEL	Helium Tank	HHW
MET	Metal	Class III
MSW	Municipal Solid Waste – Residential	RRF, Class I
MSWC	Municipal Solid Waste – Commercial	RRF, Class I
OXY	Oxygen Tank	HHW
PT20	Propane Tank up to 20 gallons	HHW, Class III
PT50	Propane Tank up to 50 gallons	HHW, Class III
REF	Refrigeration	HHW
RIMS	Outbound Tire Rims	N/A
TC	Tire Chips	Waste Tire
TCOTR	Off road Tire Chips	Waste Tire
TLT	Toilet Recycling Program	Class III
TR	Tires	Waste Tire
TRE1	Tires (each) car or pickup	Waste Tire
TRE2	Tires (each) large truck or semi	Waste Tire
TVP	TV Projection and Console	HHW
TV1	TV up to 36” screen	HHW
WC	Wood Chips	RRF, Class I, Class III
WG	Outbound metal and white goods	N/A
YWC	Yard Waste Commercial	Yard Waste
YWR	Yard Waste Residential	Yard Waste

4.4 Data Recording and Reporting

Vehicles are first weighed at the scale with the gross weight of the vehicle recorded. Pasco County utilizes the software PC Scale to categorize and track inbound and outbounds loads. Following assignment of the appropriate commodity code into the PC Scale program, the Scalehouse Attendant then directs the vehicle to the appropriate area of the Complex to unload. The vehicle returns to the scale where the tare weight is recorded to determine the net weight of the material. Materials such as white goods, tires, and bulk yard waste are dropped off at the designated areas as shown on **Figure 1-1**. These areas are clearly indicated by signs.

5.0 Landfill Operator and Spotter Training Plan

Landfill Operator and Spotter training will comply with Rule 62-701.320(15), FAC.

Training courses, whether public or in-house, meet the requirements of Rule 62- 701.320(15), FAC and shall be certified by the FDEP Solid Waste Management Training Committee (SWMTC). This training plan, along with documents that record training plan implementation, are kept onsite and will be made available to FDEP's inspection staff upon request. Training records are also be kept by University of Florida Center for Training, Research, and Education for Environmental Occupations (TREEO).

5.1 Operators

New Supervisors hired by Pasco County Solid Waste will participate in 24 hours of initial training provided by an entity that has been pre-approved by the Department pursuant to Section 403.716, Florida Statutes. Within 3 years after passing the exam and every 3 years thereafter, Supervisors will participate in continuing education courses totaling 16 hours conducted by an approved provider.

5.2 Spotters

New spotters will participate in 8 hours of initial training provided by entities meeting the requirements of Rule 62-701.320(15), FAC. Every 3 years after initial training, landfill Spotters will participate in continuing education courses provided by approved entities totaling 4 hours.

6.0 Ash Monofill Operations

The Ash Monofill portion of the Class I Landfill receives only combustion residue (ash) from the Pasco County Resource Recovery Facility. Ash that is generated from the combustion process is directed to the dedicated Ash Storage Building at the Resource Recovery Facility, where it is periodically loaded within the building by a front-end loader into top loading trucks. The loaded trucks travel to the active ash disposal cell, where they are off-loaded. Ash hauling operations occur between 7 AM and 6 PM, Monday through Friday, or more frequently as needed.

The liner and leachate collection system have been constructed, one disposal unit at a time (A-1, A-2, A-3, A-4) with temporary roads and swales for access and surface-water management. The phasing plan for the currently active ash disposal cell (A4) is depicted in the drawing set dated July 2008 by CDM sheets C-6 through C-15A.

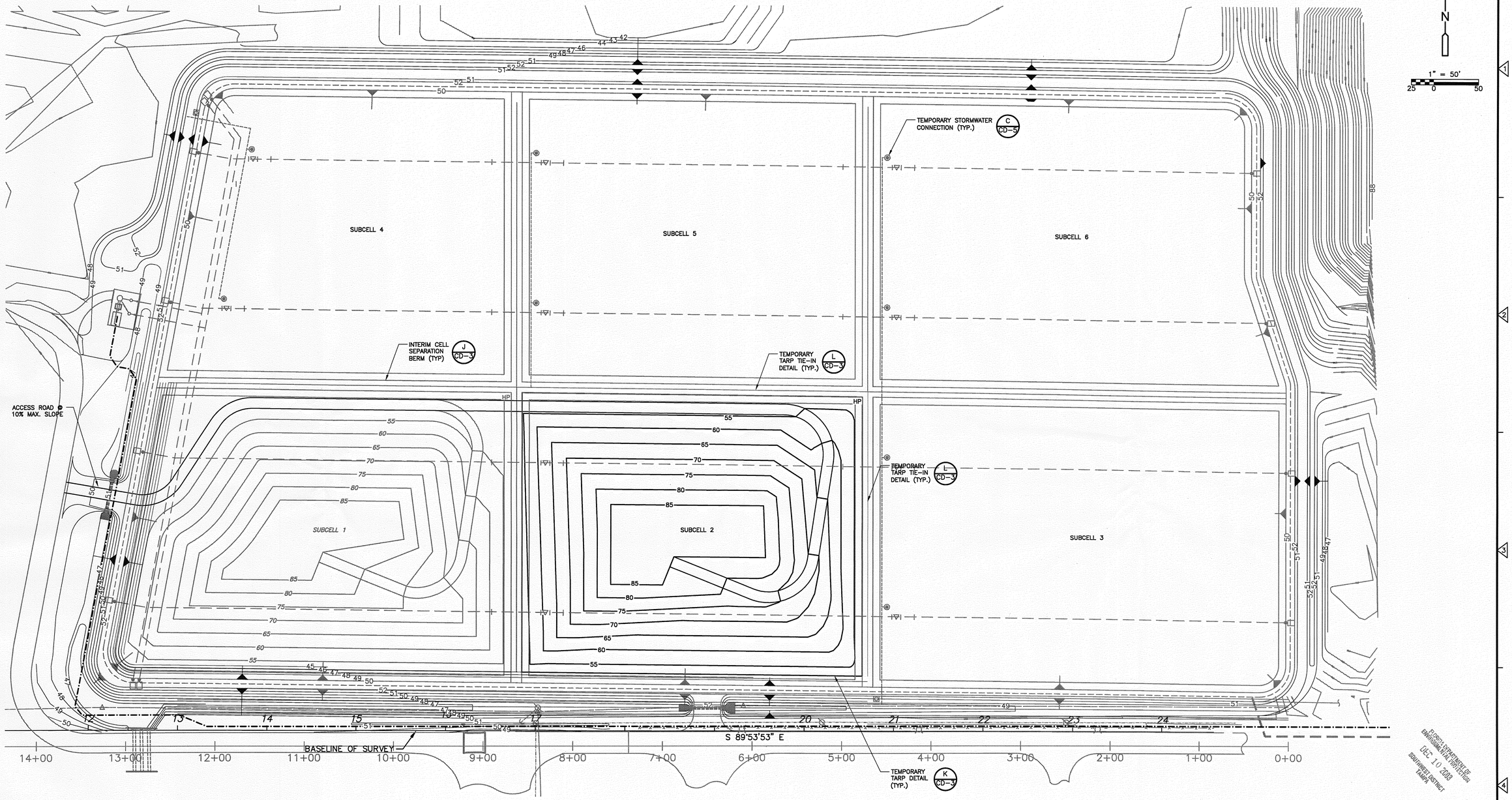
In general, waste filling is done in conjunction with the application of a rain tarp as intermediate cover to reduce leachate generation. As of November 2018, Cells A1, A2, and A3 are covered by such intermediate cover, with Cell A4 being the active disposal cell. It is anticipated that Cell A4 will remain active for at least 5 more years. The rain tarp is a 20 mil geomembrane that serves as intermediate cover for areas that are not expected to be used for disposal within 180 days. All precipitation on the landfill that comes in contact with the rain tarp (and not in contact with ash) is managed as non-contact stormwater.

Following is a detailed description of the sequence of Cell A-4 phase by phase:

6.1 Cell A4 Fill Sequence

Cell A-4 is divided into six sub-cells. The sub-cells are numbered from one to six, starting at the southwest corner of the overall progressing eastward (subcells 1, 2, and 3), then from the northwest corner progressing eastward (subcells 4, 5, and 6). The sequence of filling is depicted on drawings dated July 2008 by CDM, sheets C-6 through C-15A.

The general filling sequence is accomplished by filling in each sub-cell to an approximate elevation of 85 feet, with a side-slope of 3:1. A secondary berm (inside the sub-cell divider berms) around the Phase I fill area has been constructed to divert contaminated stormwater (leachate) to low areas as shown on sheet C6. Once all the sub-cells are complete, ash will be filled at a 3:1 slope up to the permitted height of Elevation 120 feet.



NOTE:

1. TEMPORARY TARP DETAIL WILL BE AS DETAILS K & L, SHEET CD-3, TO BE USED AS NECESSARY.
2. SEE LANDFILL OPERATIONS PLAN 3.6.1, PHASE 2.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
DEC 10 2008
SOUTHWEST DISTRICT TAMPA

AAMOD S. SONAWANE
LICENSE NO. 62526
STATE OF FLORIDA

DATE:
AAMOD S. SONAWANE
P.E NO. 62526

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. SONAWANE
DRAWN BY: P. ANDUZE
SHEET CHK'D BY: J. LADNER
CROSS CHK'D BY: P. STROBRIDGE
APPROVED BY: A. SONAWANE
DATE: NOVEMBER 2008

CDM
Camp Dresser & McKee, Inc.
1715 North Westshore Blvd Suite 875
Tampa, FL 33607
Tel: (813) 281-2900
FL COA No. EB-0000020
consulting • engineering • construction • operations

PASCO COUNTY, UTILITIES SERVICES BRANCH
PASCO COUNTY FLORIDA

WEST PASCO CLASS I LANDFILL
CELL A-4 CONSTRUCTION

PHASE 2 PLAN FOR
CELL A-4

PROJECT NO. 6104-46136
FILE NAME: C007STPL

SHEET NO.
C-7

Xref's: [CBASE MODEL, C-BASE, CEBASE-MOD 10-6-08, CONTOURS, LEACHATE, CONTOURS-2,] Images: []
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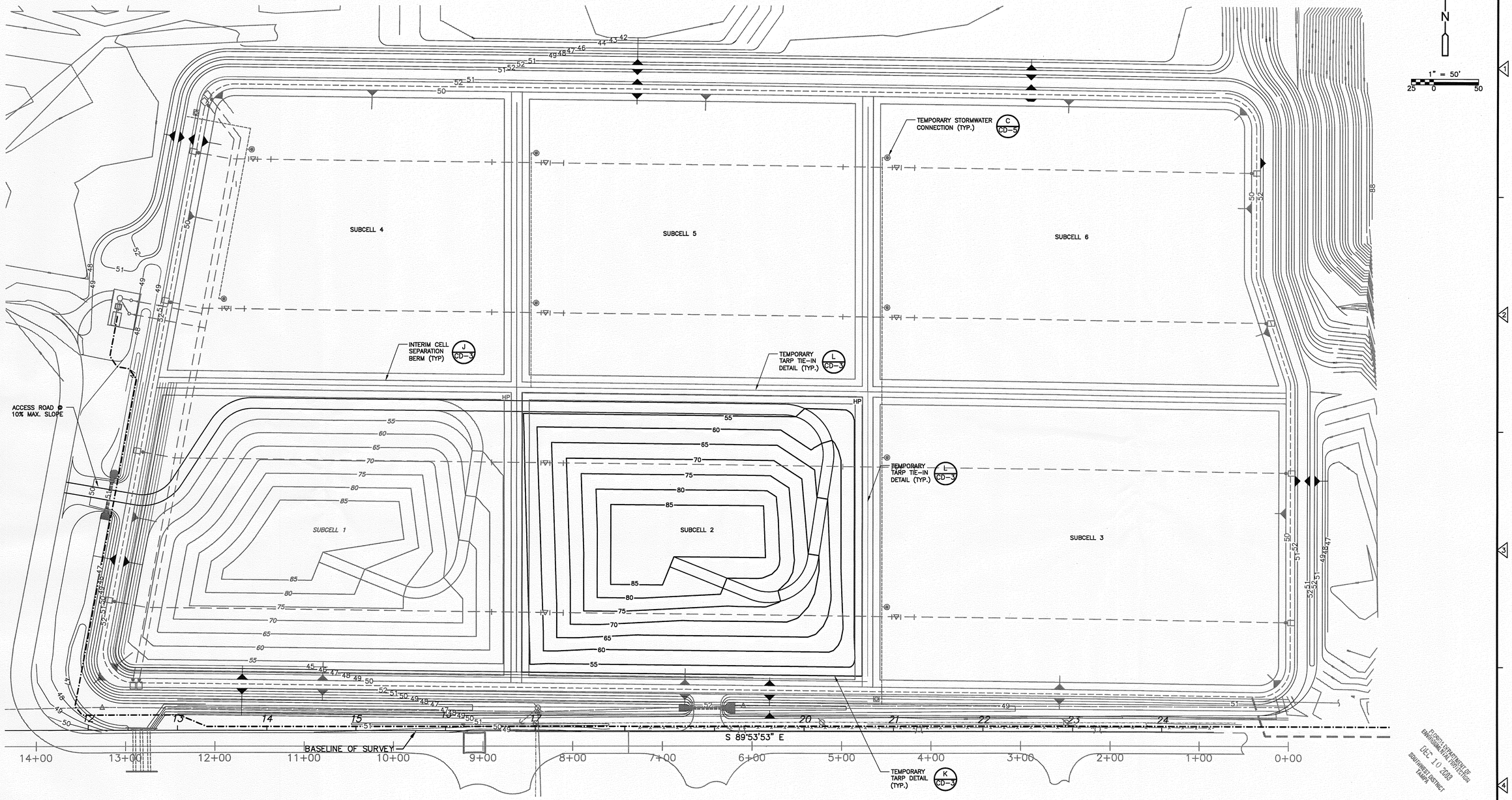

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2. SEE LANDFILL OPERATIONS PLAN 3.6.1, PHASE 2.

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CROSS CHK'D BY: P. STROBRIDGE
APPROVED BY: A. SONAWANE
DATE: NOVEMBER 2008

CDM
Camp Dresser & McKee, Inc.
1715 North Westshore Blvd Suite 875
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Tel: (813) 281-2900
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consulting • engineering • construction • operations

PASCO COUNTY, UTILITIES SERVICES BRANCH
PASCO COUNTY FLORIDA

WEST PASCO CLASS I LANDFILL
CELL A-4 CONSTRUCTION

PHASE 2 PLAN FOR
CELL A-4

PROJECT NO. 6104-46136
FILE NAME: C007STPL

SHEET NO.
C-7

Xref's: [CBASE MODEL, C-BASE, CEBASE-MOD 10-6-08, CONTOURS, LEACHATE, CONTOURS-2,] Images: []
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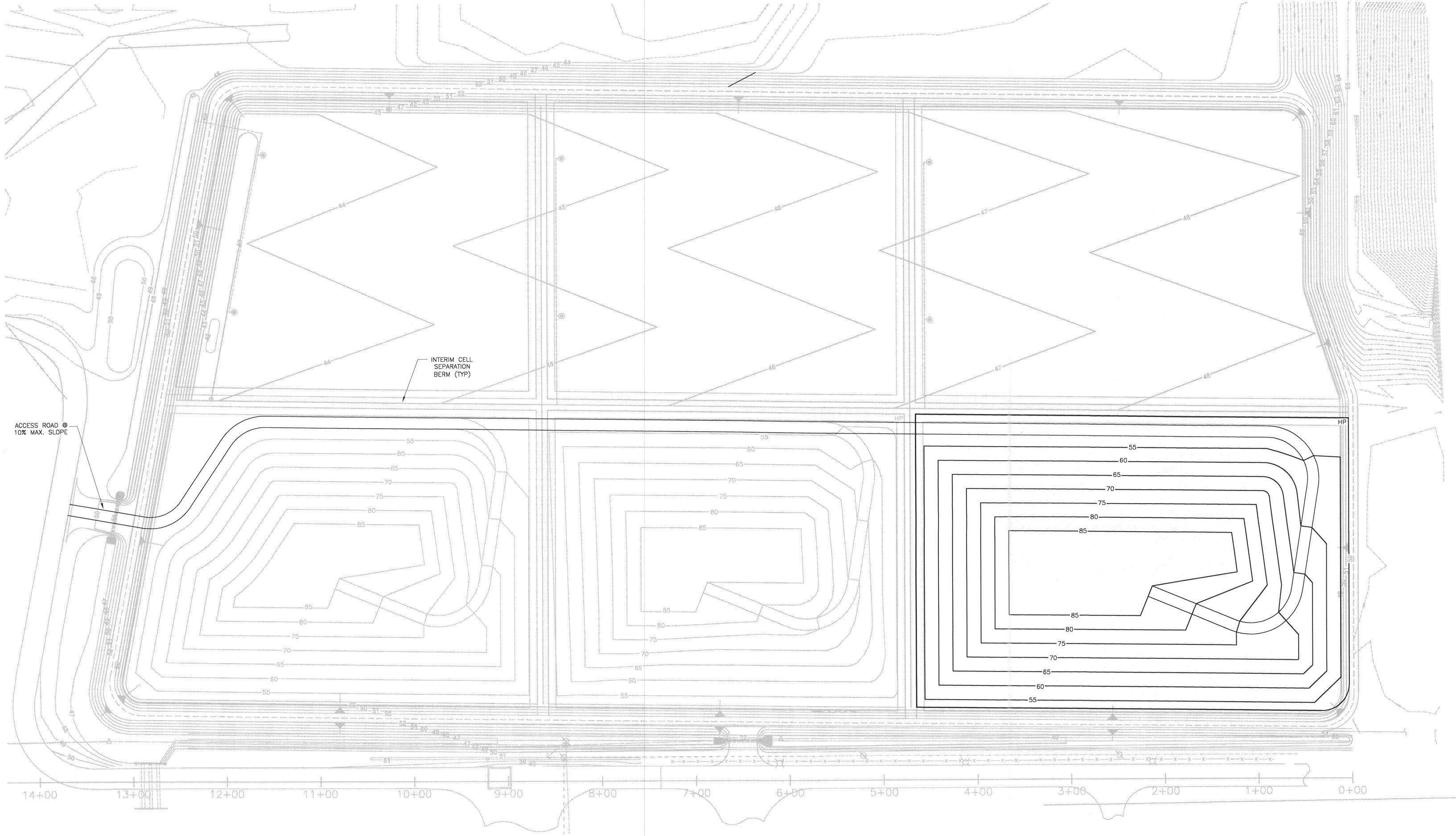


NOTE:

1. TEMPORARY TARP DETAIL WILL BE AS DETAIL K, SHEET CD-3, TO BE USED AS NECESSARY.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
JUL 28 2008
SOUTHWEST DISTRICT TAMPA

DATE:
AAMOD S. SONAWANE
P.E NO. 62526

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. SONAWANE
DRAWN BY: P. ANDUZE
SHEET CHK'D BY: J. LADNER
CROSS CHK'D BY: D. STROBRIDGE
APPROVED BY: A. SONAWANE
DATE: JULY 2008

CDM
Camp Dresser & McKee.
9659 Baypine Road, Suite 200
Jacksonville, FL 32256
Tel: (904) 731-7109
FL COA No. EB-0000020
consulting • engineering • construction • operations

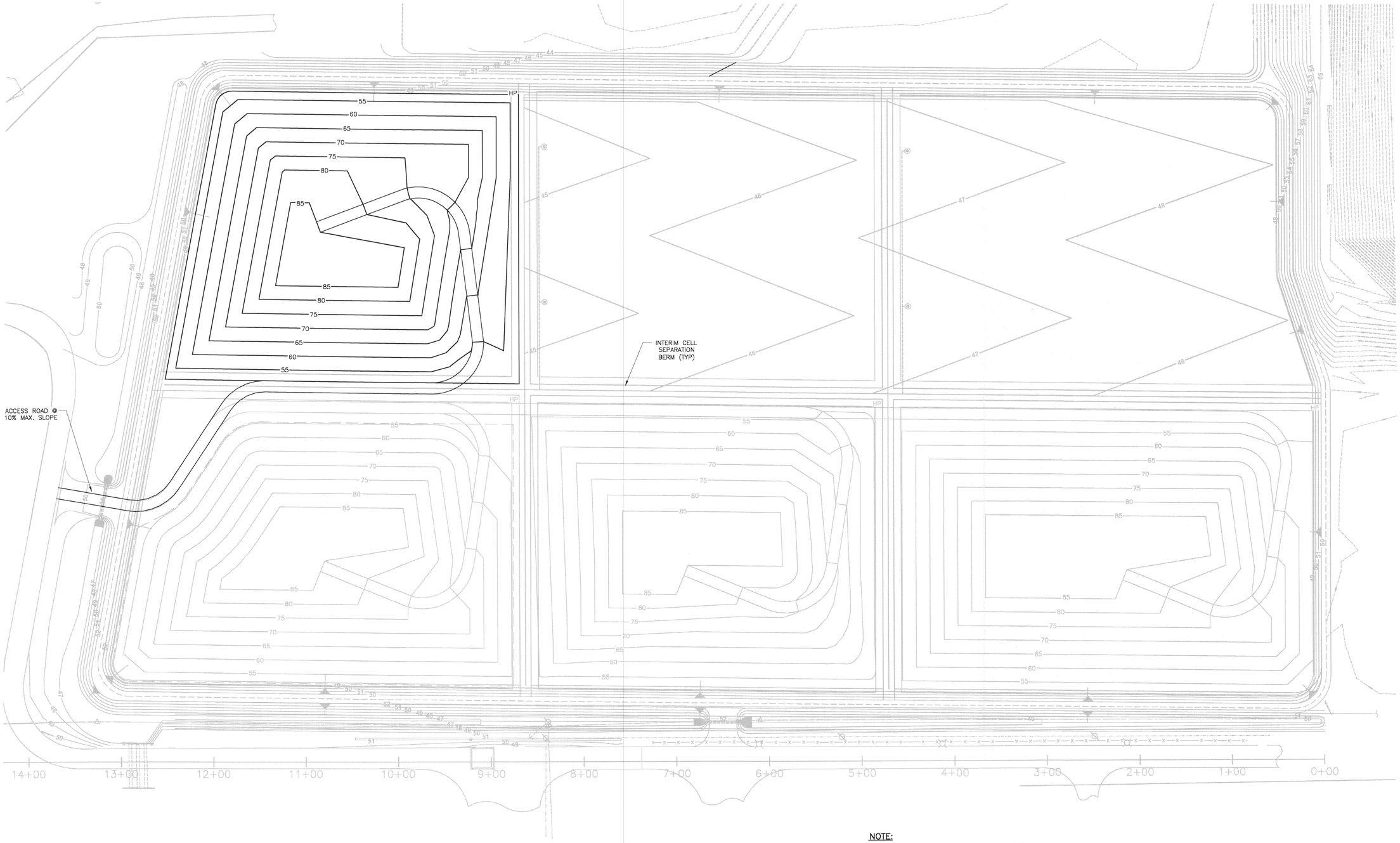
PASCO COUNTY, UTILITIES SERVICES BRANCH
PASCO COUNTY FLORIDA

WEST PASCO COUNTY LANDFILL
EXPANSION CELL A-4

PHASE 3 PLAN FOR
CELL A-4

PROJECT NO. 6104-46136
FILE NAME: C008STPL

SHEET NO.
C-8



NOTE:

1. TEMPORARY TARP DETAIL WILL BE AS DETAIL K, SHEET CD-3, TO BE USED AS NECESSARY.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
JUL 28 2008
SOUTHWEST DISTRICT TAMPA

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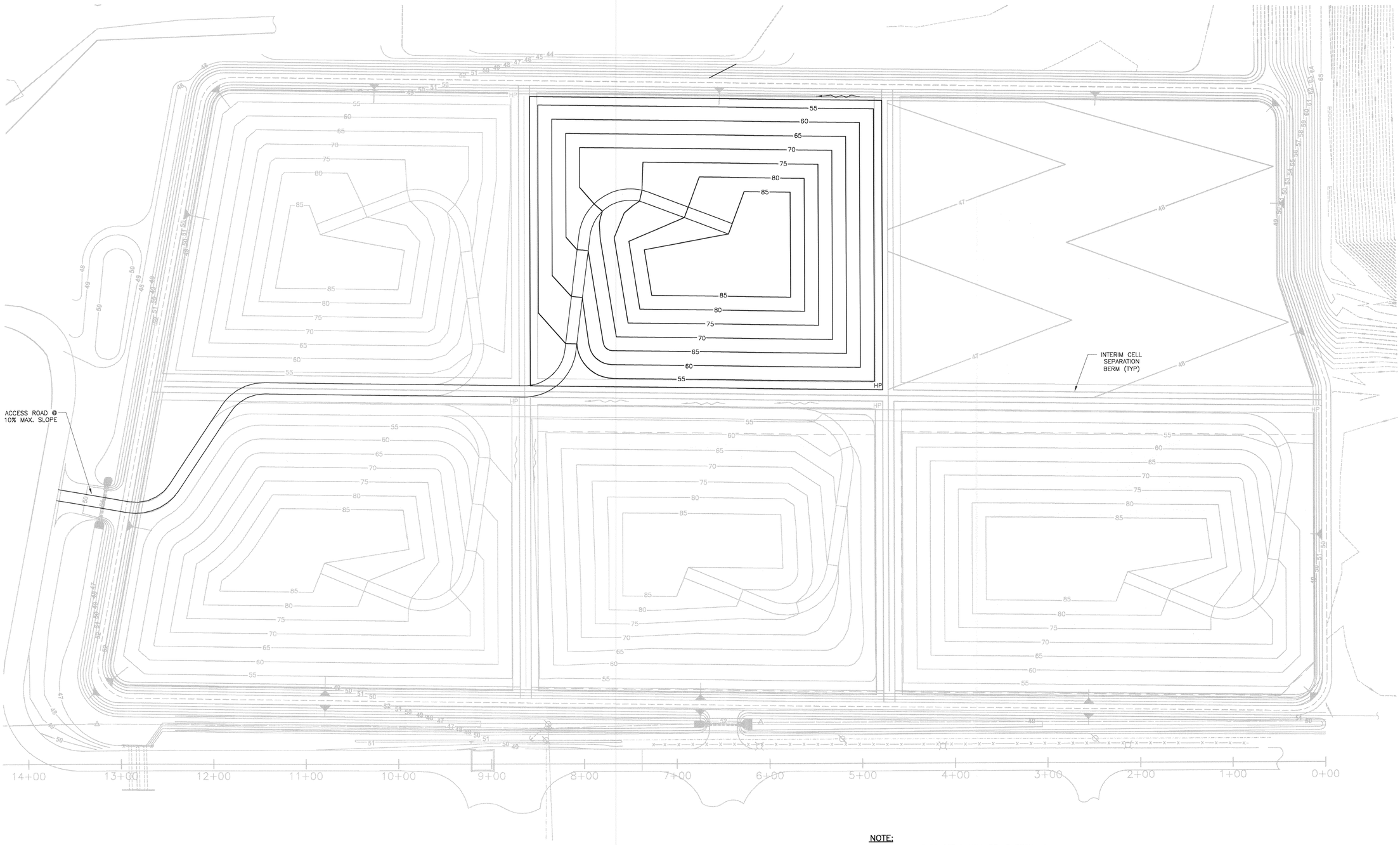
PASCO COUNTY FLORIDA

WEST PASCO COUNTY LANDFILL
EXPANSION CELL A-4

PHASE 4 PLAN FOR
CELL A-4

PROJECT NO. 6104-46136
FILE NAME: C009STPL

SHEET NO.
C-9



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FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
JUL 28 2008
SOUTHWEST DISTRICT TAMPA

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Jacksonville, FL 32256
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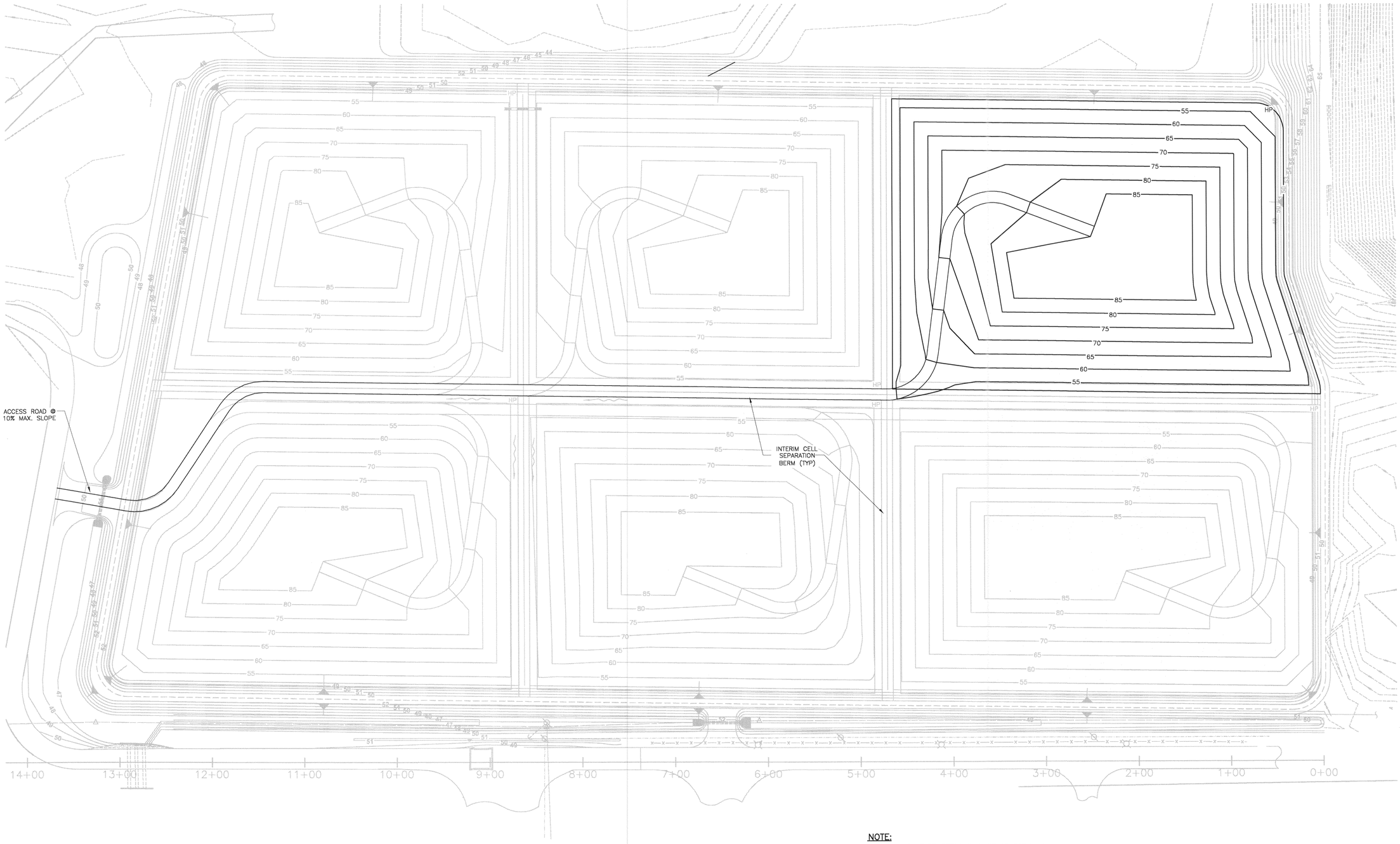
PASCO COUNTY FLORIDA

WEST PASCO COUNTY LANDFILL
EXPANSION CELL A-4

PHASE 5 PLAN FOR
CELL A-4

PROJECT NO. 6104-46136
FILE NAME: C01OSTPL

SHEET NO.
C-10



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1" = 50'

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NOTE:

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FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
JUL 28 2008
SOUTHWEST DISTRICT TAMPA

DATE:
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P.E NO. 62526

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. SONAWANE
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Camp Dresser & McKee
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Jacksonville, FL 32256
Tel: (904) 731-7109
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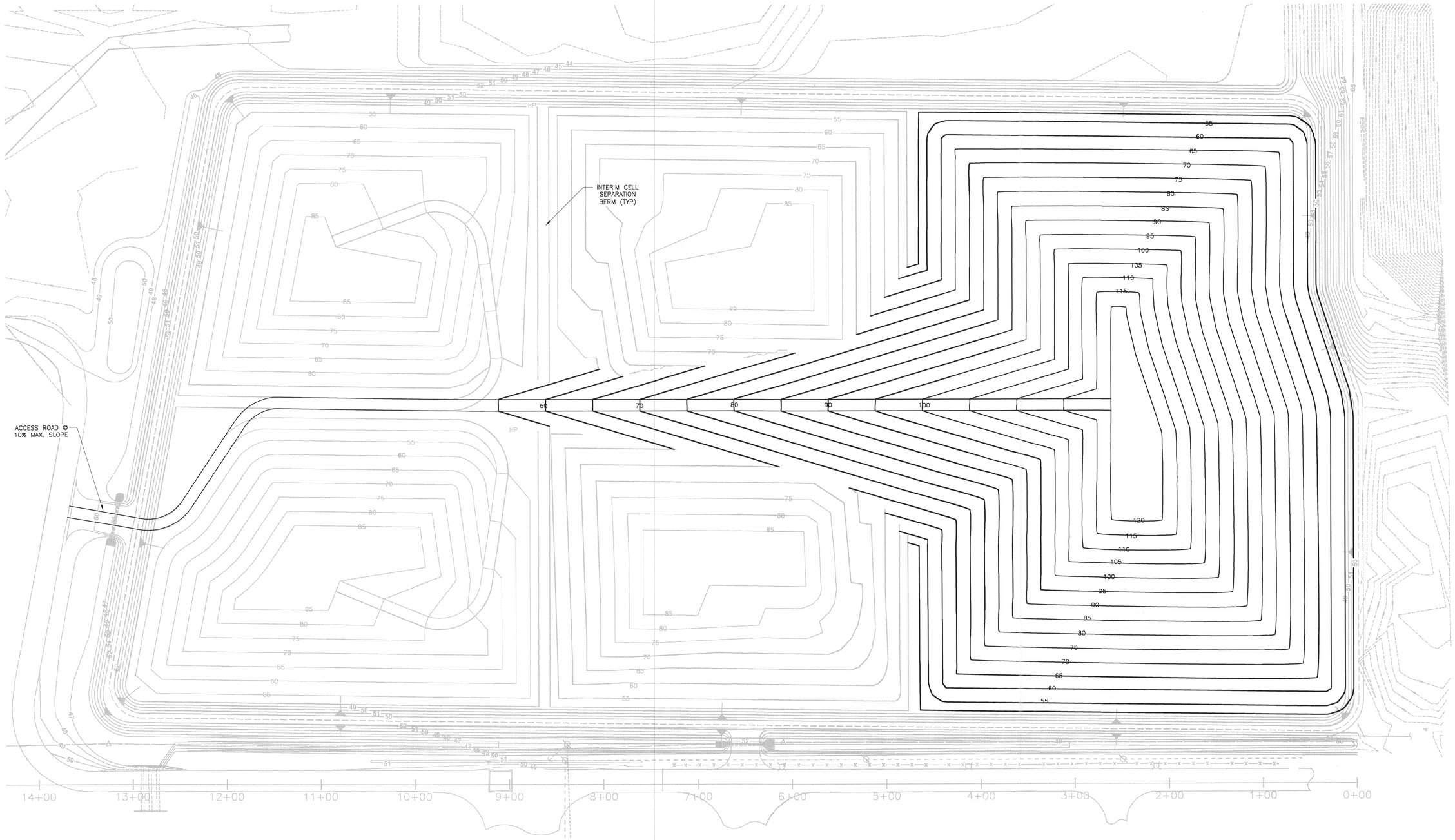
PASCO COUNTY FLORIDA

WEST PASCO COUNTY LANDFILL
EXPANSION CELL A-4

PHASE 6 PLAN FOR
CELL A-4

PROJECT NO. 6104-46136
FILE NAME: C011STPL

SHEET NO.
C-11



NOTE:

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FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
JUL 28 2008
SOUTHWEST DISTRICT TAMPA

DATE: 7/28/08
AAMOD A. SONAWANE
P.E NO. 62526

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. SONAWANE
DRAWN BY: P. ANDUZE
SHEET CHK'D BY: J. LADNER
CROSS CHK'D BY: D. STROBRIDGE
APPROVED BY: A. SONAWANE
DATE: JULY 2008

CDM
Camp Dresser & McKee.
8659 Baypine Road, Suite 200
Jacksonville, FL 32256
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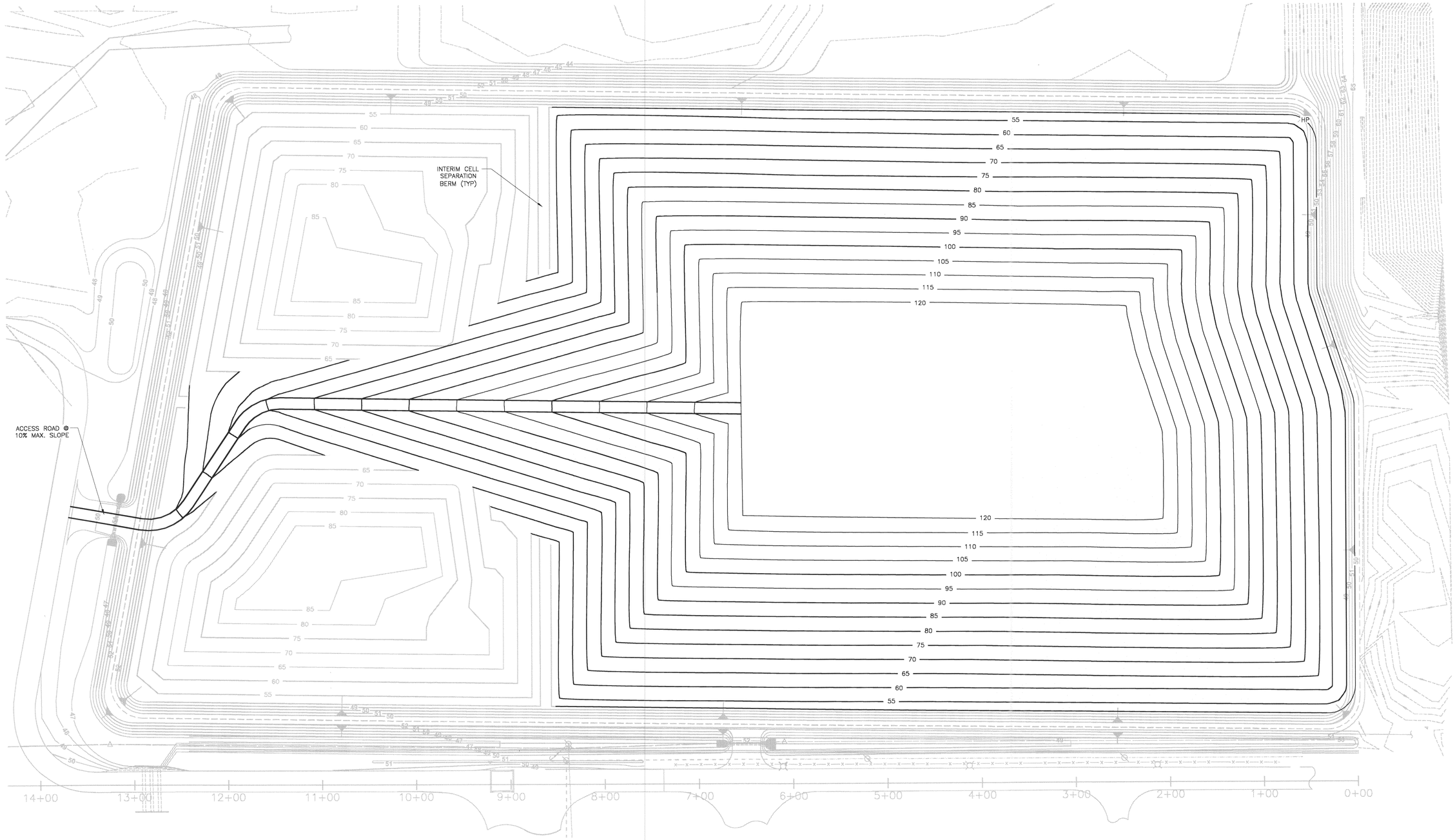
PASCO COUNTY, UTILITIES SERVICES BRANCH
PASCO COUNTY FLORIDA

WEST PASCO COUNTY LANDFILL EXPANSION CELL A-4

PHASE 7 PLAN FOR CELL A-4

PROJECT NO. 6104-46136
FILE NAME: C012STPL

SHEET NO.
C-12



NOTE:

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FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
JUL 28 2008
SOUTHWEST DISTRICT TAMPA

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P.E NO. 62526

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. SONAWANE
DRAWN BY: P. ANDUZE
SHEET CHK'D BY: J. LADNER
CROSS CHK'D BY: D. STROBRIDGE
APPROVED BY: A. SONAWANE
DATE: JULY 2008

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Camp Dresser & McKee.
8659 Baypine Road, Suite 200
Jacksonville, FL 32256
Tel: (904) 731-7109
FL COA No. EB-0000020
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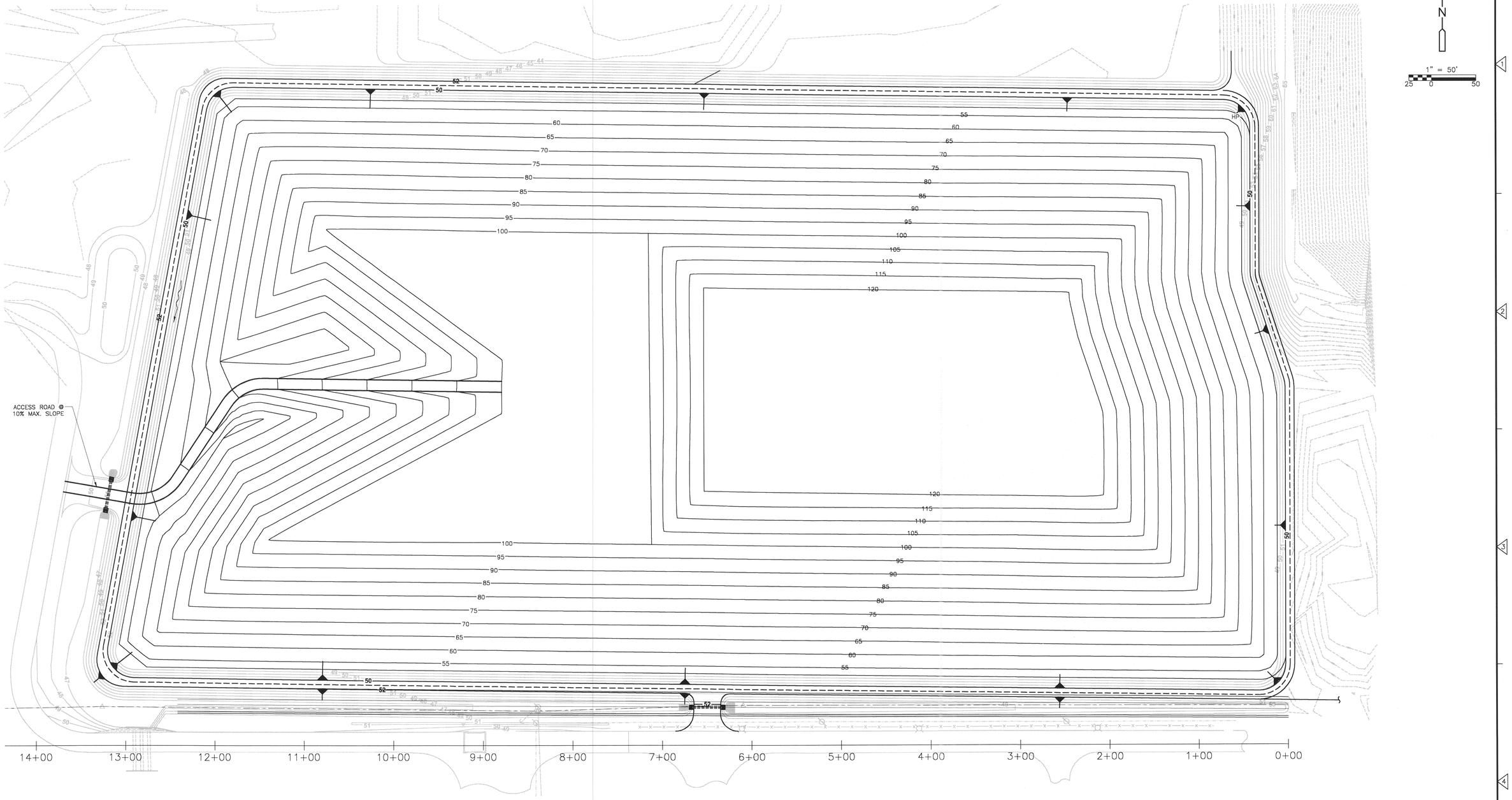
PASCO COUNTY FLORIDA

WEST PASCO COUNTY LANDFILL
EXPANSION CELL A-4

PHASE 8 PLAN FOR
CELL A-4

PROJECT NO. 6104-46136
FILE NAME: C013STPL

SHEET NO.
C-13



NOTE:

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FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
JUL 28 2008
SOUTHWEST DISTRICT TAMPA

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8659 Baypine Road, Suite 200
Jacksonville, FL 32256
Tel: (904) 731-7109
FL COA No. EB-0000020
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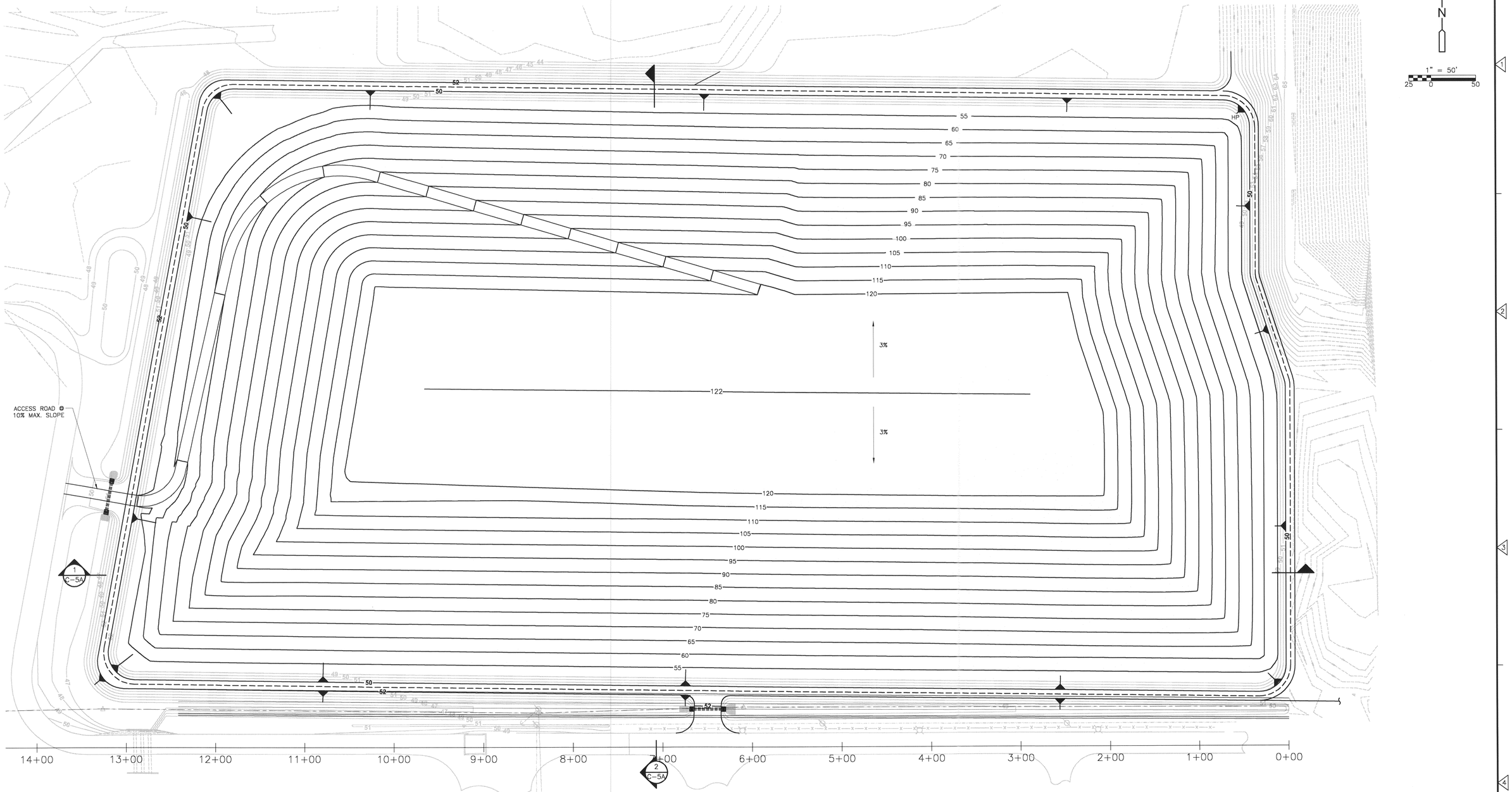
PASCO COUNTY FLORIDA

WEST PASCO COUNTY LANDFILL
EXPANSION CELL A-4

PHASE 9 PLAN FOR
CELL A-4

PROJECT NO. 6104-46136
FILE NAME: C014STPL

SHEET NO.
C-14



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FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
JUL 28 2008
SOUTHWEST DISTRICT
TAMPA

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Jacksonville, FL 32256
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FL COA No. EB-0000020
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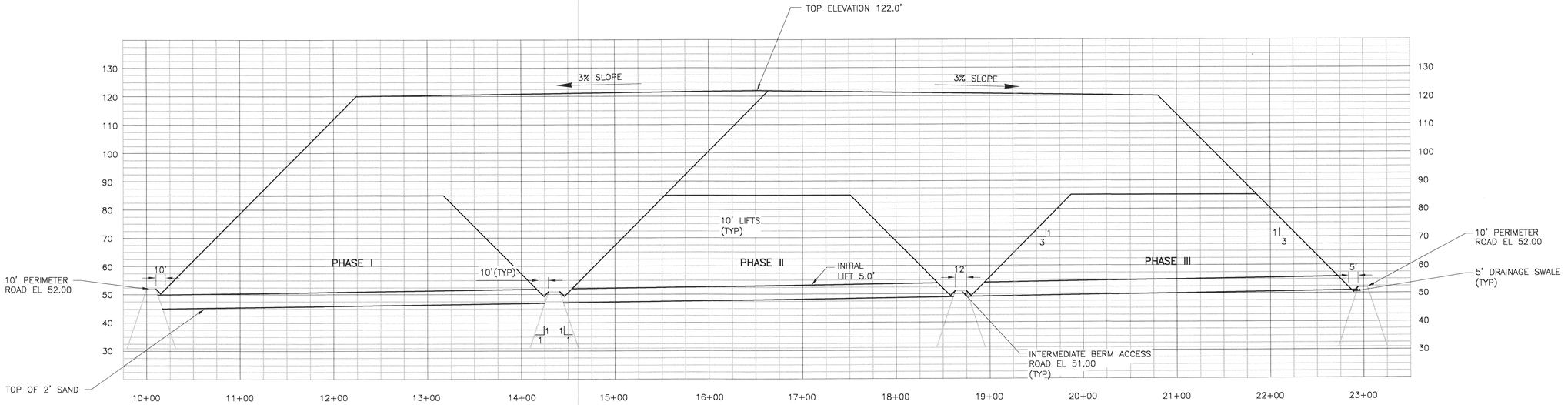
PASCO COUNTY FLORIDA

WEST PASCO COUNTY LANDFILL
EXPANSION CELL A-4

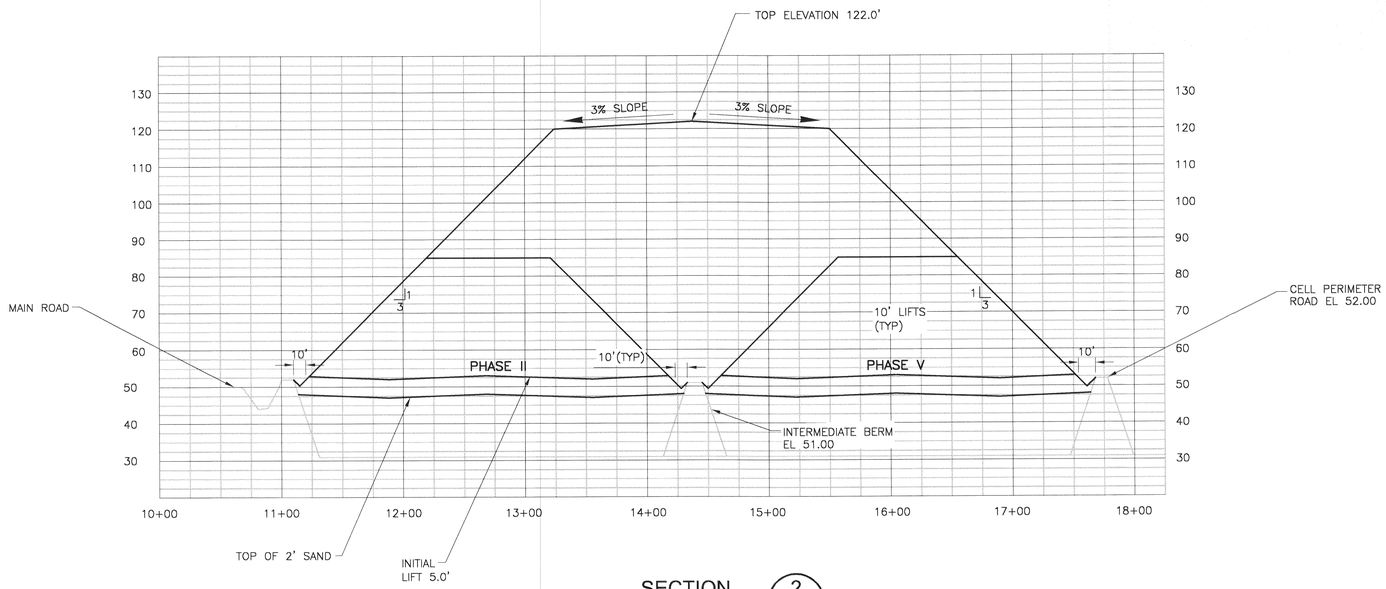
PHASE 9A PLAN FOR
CELL A-4

PROJECT NO. 6104-46136
FILE NAME: C015STPL

SHEET NO.
C-15



SECTION 1
1"=60' HOR
1"=20' VER
C-15



SECTION 2
1"=60' HOR
1"=20' VER
C-15

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
JUL 28 2008
SOUTHWEST DISTRICT TAMPA

AAMOD S. SONAWANE
STATE OF FLORIDA
LICENSE NO. 62526
DATE:
AAMOD S. SONAWANE
P.E NO. 62526

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: A. SONAWANE
DRAWN BY: D. SMITH
SHEET CHK'D BY: J. LADNER
CROSS CHK'D BY: P. STROBRIDGE
APPROVED BY: A. SONAWANE
DATE: JULY 2008

CDM
Camp Dresser & McKee.
8659 Baypine Road, Suite 200
Jacksonville, FL 32256
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PASCO COUNTY, UTILITIES SERVICES BRANCH
PASCO COUNTY FLORIDA

WEST PASCO COUNTY LANDFILL
EXPANSION CELL A-4

OPERATION PLAN - SECTIONS

PROJECT NO. 6104-46136
FILE NAME: C15ACLSC

SHEET NO.
C-15A

Xref's: [CDM_2436, CBASE MODEL,] Images: [] Last saved by: AUSTJD Time: 7/28/2008 9:44:23 AM
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The filling sequence for Ash Monofill Cell A4 is as follows:

6.1.1 Phase I - Filling in sub-cell 1

1. Flag the edge of the liner at the top of the berm or mark with traffic cones. Ash will not be placed within two feet of the flagged or marked line.

2. Close the ball valves in sub-cell 2 and 4. All other ball valves will be in open position. Install stormwater pumps in sub-cell 2 and sub-cell 4. Stormwater from all sub-cells except sub-cell 1 will be pumped to the surface drainage swales.

3. Place a berm/ swale around the active phase of the cell area. All waste and water in contact with waste will be contained within the bermed area. (See sheet C-6).

4. Ash will be unloaded from the entrance ramp to the cell and spread over the hvo feet of protective sand cover, constructing a platform. A minimum of 5 feet of initial lift will be placed and rolled to cover the sub-cell 1. The ash for the initial lift will be free from large, sharp objects that may damage the liner system.

5. Continue normal filling operation, maintaining the perimeter berm/ swale around the sub-cell 1. Filling the sub-cell 1 will be accomplished by constructing approximately 10-foot lifts, working in a general direction from south to north, and from west to east.

6. As the filling operation progresses, construct an access road using ash from the west of the sub-cell 1 as shown in sheet C-6, and provide drainage berm/ swales on both sides of the access road and around the perimeter of sub-cell 1 area. Only the portion of the access road within the landfill footprint shall be constructed of ash.

7. Continue the operation until the elevation of 85 feet is achieved as indicated in sheet C-6.

6.1.2 Phase II - Filling in sub-cell 2

1. Close the ball valves in sub-cell 3 and 4. All other ball valves will be in open position. Remove stormwater pumps for sub-cell 2 and install them in sub-cell 3. Stormwater from all sub-cells except sub-cells 1 and 2 will be pumped to the surface drainage swales.

2. Begin the filling operation in the Phase II area in a similar manner as in Phase I. Please see Sheet C7 for additional details.

6.1.3 Phase III - Filling in sub-cell 3

1. Close the ball valves in sub-cell 4. All other ball valves will be in open position. Remove stormwater pumps for sub-cell 3. Stormwater from all sub-cells except sub-cells 1, 2, and 3 will be pumped to the surface drainage swales.

2. Begin the filling operation in the Phase III area in a similar manner as in Phases I and II. Please see Sheet C8 for additional details.

6.1.4 Phase IV - Filling in sub-cell 4

1. Close the ball valves in sub-cell 5. All other ball valves will be in open position. Remove stormwater pumps for sub-cell 4 and install them in sub-cell 5. Stormwater from all sub-cells except sub-cells 1, 2, 3, and 4 will be pumped to the surface drainage swales.

2. Begin the filling operation in the Phase IV area in a similar manner as in Phases I, II, and III. Please see Sheet C9 for additional details.

6.1.5 Phase V - Filling in sub-cell 5

1. Close the ball valves in sub-cell 6. All other ball valves will be in open position. Remove stormwater pumps for sub-cell 5 and install them in sub-cell 6. Stormwater from all sub-cell 6 will be pumped to the surface drainage swales

2. Begin the filling operation in the Phase V area in a similar manner as in Phases I, II, III, and IV. Please see Sheet C10 for additional details.

3. The Aggregate Processing Operation described in Section 6.5 will take place within sub-cell 5. Once the sub-cell has been floored with ash, equipment will be placed in the approximate configuration shown on Figure 6-1. Please refer to Section 6.5 of this Operations Plan for a description of the Aggregate Processing operation.

6.1.6 Phase VI - Filling in sub-cell 6

1. All ball valves will be in open position. Remove stormwater pumps for sub-cell 6.

2. Begin the filling operation in the Phase VI area in a similar manner as in Phases I, II, III, IV, and V. Please see Sheet C11 for additional details.

6.1.7 Phase VII - Filling the valley between sub-cells 3&6 and 2&5

1. Begin filling the valley area from east to west. Fill the area by constructing approximately 10 foot lifts working in the general direction from south to north and towards the west. Continue the filling operation until approximate elevation of 85 feet.

2. Once filling the valley between sub-cell 3&6 and 2&5 is complete, build an appropriate ramp as to continue filling operation to the eastern parts of A-4 up to an elevation of 120. Please see Sheet C12 for additional details.

6.1.8 Phase VIII - Filling the valley between sub-cells 1&4

1. Extend the stormwater separation berm (approximately 2 feet) up the slope to the top of Cell A-4 berms as appropriate to provide leachate/ stormwater separation.

2. Begin filling the valley area from east to west. Fill the area by constructing approximately 10 foot lifts working in the general direction from south to north and towards the west. Continue the filling operation until approximate elevation of 85 feet.

3. Once filling the valley between sub-cell 1&4 is complete, build an appropriate ramp as to continue filling operation to the eastern parts of A-4 up to an elevation of 120. Please see Sheet C13 for additional details.

6.1.9 Phase IX – Final Fill Sequence

1. Construct temporary berms as necessary to provide leachate/stormwater segregation.

2. Begin filling the remaining valley areas from east to west. Fill the entire area by constructing 10 foot lifts working in the general direction from south to north and towards the east. Continue the valley filling operation until approximate achieving an elevation of 120 feet at a slope of 3:1. Continue the filling operation at a 3% slope at the top to an elevation of 122 feet.

3. See Sheets C14, C15, and C15A for details.

6.2 Ash Monofill Waste Inspection

Because the ash monofill receives only combustion residue (ash) from the Resource Recovery Facility, there is no need to deploy spotters to the working face. All Operators working within the ash monofill are trained to identify materials that may have inadvertently been loaded into the ash transport trucks and to segregate such materials if necessary. Such materials could be oversized material (such as white goods) that were segregated at the tipping floor of the Resource Recovery Facility. If such non-ash materials are identified at the monofill, they will be segregated and taken to the appropriate location within the larger Solid Waste Complex.

6.3 Ash Monofill Hauler Queuing

Private haulers are not authorized to utilize the ash monofill. All hauling of ash residue from the Ash Storage Building to the active cell is accomplished by a single contractor employed by the Resource Recovery Facility Operator (Covanta Pasco, Inc.). Hauling takes place Monday through Friday, or more frequently if needed. The Ash Storage Building is sufficiently sized to store several day's worth of ash.

6.4 Waste Compaction and Application of Cover

The ash is spread and compacted as necessary by a front-end loader. Because it contains no putrescible material, daily cover is not applied. On areas where no activity is expected for 180 days or more, a 20 mil geomembrane rain tarp may be installed to minimize leachate generation.

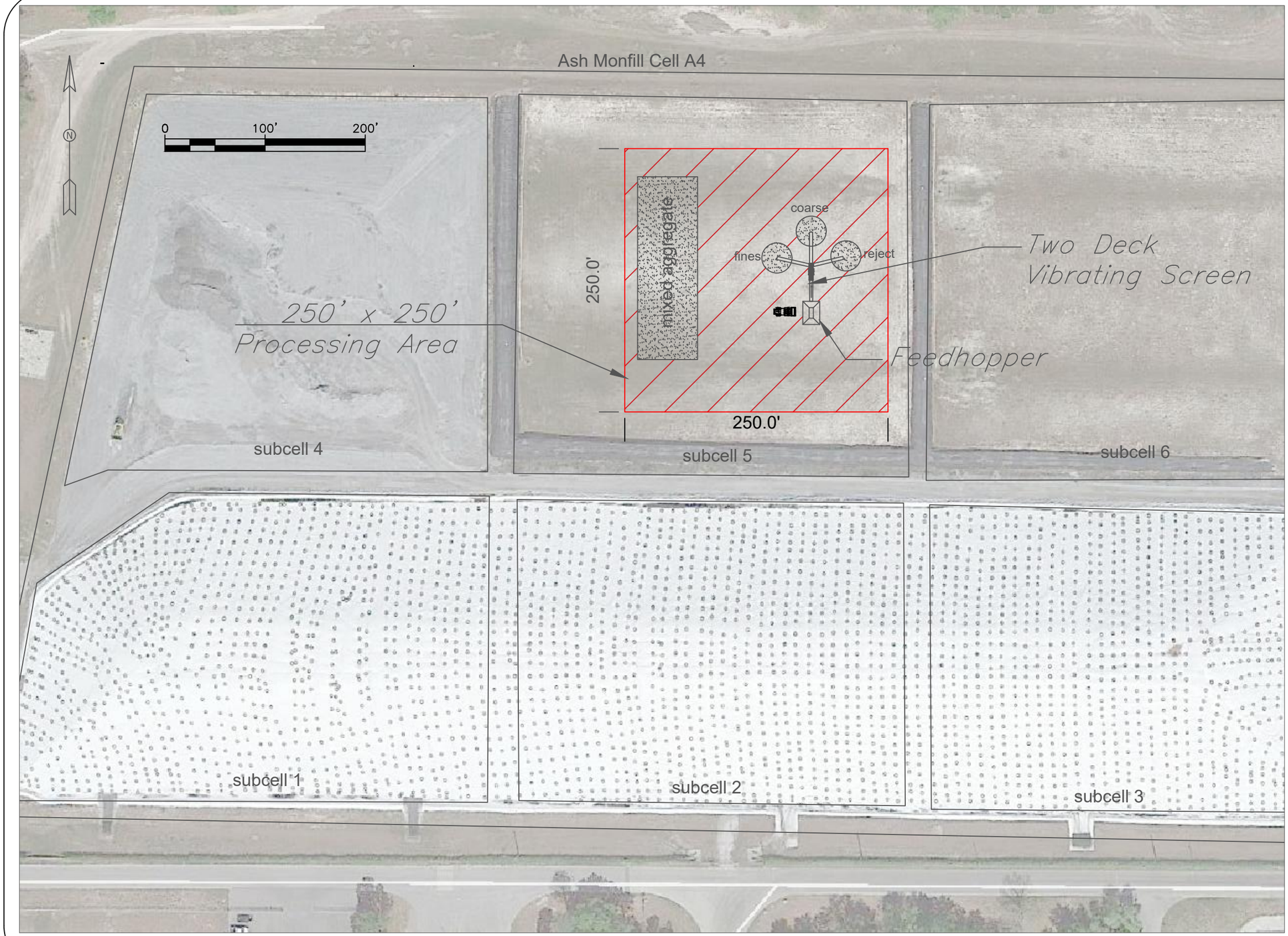
6.5 Engineered Aggregate Processing

In 2014, the FDEP approved the use of processed bottom ash as an engineered aggregate in certain roadway and building construction applications. A copy of the FDEP approval and subsequent modifications made thereto is included as **Attachment 1**. To enhance the properties of the bottom ash

for use as a construction material, it is necessary to process the bottom ash to achieve a specified gradation. To accomplish this, a two-deck vibrating screen will periodically be leased and positioned on subcell 5 of A4 as shown on **Figure 6-1**. The frequency of the screening operation is dependent upon the need for engineered aggregate destined for beneficial reuse. The screen will segregate raw bottom ash into three size fractions: > 1 1/4", 3/8" – 1 1/4", and < 3/8". The screening operation will occupy an approximate 250' x 250' area within the cell.

Raw bottom ash will be placed in the screening equipment feedhopper and processed into separate piles of the size fractions discussed above. Processing will continue until each pile is approximately 20' high as depicted on **Figure 6-2**. The material greater than 1 1/4" is unsuitable for beneficial reuse and will remain as waste in the ash cell. Depending upon the specified use, the two remaining piles (referred to as the coarse fraction and the fine fraction) will either be used "as-is" or blended together to achieve the desired gradation.

Figure 6-2
Segregated Aggregate Piles



Generalized Layout
Ash Processing Equipment

JMG ENGINEERING INC

Project Name and Address

Pasco County Class I Landfill
14230 Hays Rd
Spring Hill, FL

Project	Sheet
Date 12/18/2018	6-1
Scale 1" = 100'	

C:\Users\jason\OD\Pasco\Update Ops Plan (TO 5-18)\Generalized Equip Config2.dwg, 12/18/2018 1:50:16 PM, AutoCAD PDF (High Quality Print).pc3

7.0 Municipal Solid Waste Landfill Operations (SW1 and SW2)

The Solid Waste Landfill portion of the Class I Landfill receives municipal solid waste delivered to the Complex that is unable to be processed by the Resource Recovery Facility because the Facility is either at capacity or is unavailable during maintenance periods. The Resource Recovery Facility is the primary disposal option for all of the municipal solid waste generated within the County, however, it becomes necessary from time to time to divert MSW from the RRF. The diverted waste is directed to disposal cells SW1 and SW2. Diversion periods typically last for up to one month before all maintenance at the Resource Recovery Facility is completed and all waste once again is processed at the Resource Recovery Facility.

Following is a detailed description of the fill sequence for the Solid Waste cells (SW1 and SW2)

7.1 Valley Fill Cells SW-1 and SW-2 Fill Sequence

The Class I Landfill at the West Pasco Landfill and Resource Recovery Facility consists of two 10-acre cells – SW-1 and SW-2. Cell SW-1 is nearly at capacity and Cell SW-2 is the active cell. Cell SW-2 was designed with features and filled in such a manner to reduce leachate generation from stormwater. The filling of SW-1 and SW-2 to-date has been conducted as two separate cells, which resulted in a valley between the two cells. The general filling sequence will be accomplished by filling the valley between the cells and then area-filling SW-2 until the final build-out grades are achieved. Before valley filling begins, the temporary rain tarp will be removed, and protective cover soil will be placed in preparation for accepting waste. The filling sequence is as follows:

7.1.1 Lifts 1 and 2, Valley Fill, Part 1

The following liner preparations and valley filling may be progressed all at one time or in three or more phases depending upon site conditions and operational needs. Work will progress within the valley from west to east.

Liner Preparation

1. Remove temporary rain tarp and stormwater interceptor berm from side slope of SW-1 exposing geocomposite (geonet and geotextile), as shown in Figure 7, Stormwater Interceptor Control. Inspect geocomposite for damage. Geocomposite should not be exposed to sunlight for more than 21 days.

2. Install 2 feet of sand protective cover on the geocomposite side slope where the rain tarp has been removed. Verify sand depths on a 50-foot grid by potholing taking care not to damage the geocomposite or geomembrane.

Filling Lifts 1 and 2

3. Selected waste filling - Selected solid waste will be unloaded and spread over the two feet of protective sand cover. The waste will be inspected for large objects that shall be removed so there is no damage to the liner system. The initial selected waste lift shall be a minimum of 4 feet thick.

4. Fill Lift 1 of the Phase IV valley area between SW-1 and SW-2 from west to east. Fill the area by constructing approximately 10-foot lifts working in the general direction from south to north and west to east. Lift 1 may be progressed across the entire width of the cell or lifts may be placed in phases depending upon site conditions and operational needs. Continue the filling operation until the solid waste match waste elevation in Cell SW-2 as shown in **Figure 7-1** and **Figure 7-2**.

7.1.2 Lifts 3 and 4

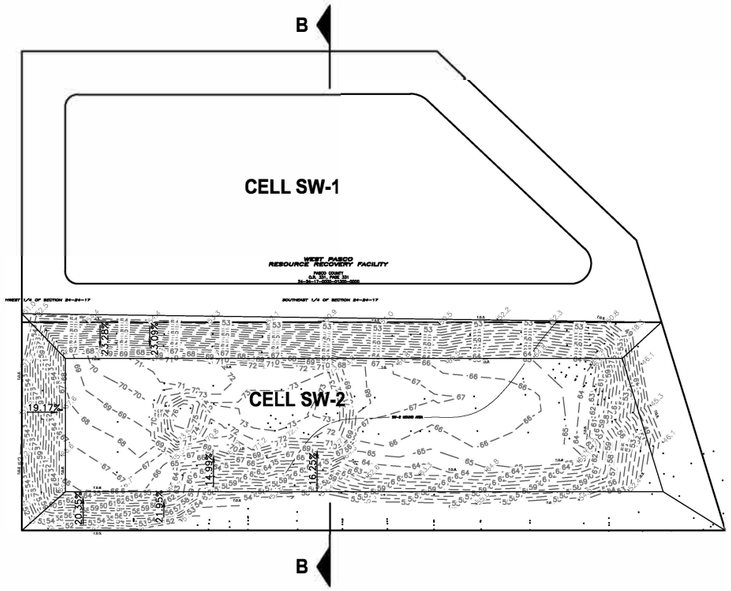
1. Lifts 3 and 4 will be area fills over the SW-2 cell and the previous valley fill. Filling will generally begin in the northwest and will proceed from north to south in rows such that the lift is filled to the outer buildout grades. Once a row is complete, additional rows will be filled moving from west to east.

2. Lifts 3 and 4 are approximately 10 feet thick and will fill up to elevation 95 feet. Slopes will be modified to meet the final build out criterial. Slopes from the base of the landfill up to elevation 77 feet will be 3H:1V. Slopes from elevation 77 feet to 95 feet will be 4H:1V. Slopes above elevation 95 feet up to 101 feet will be 5H:1V.

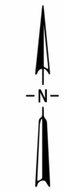
7.1.3 Lift 5

1. Lifts 5 will be an area fills over SW-1 and SW-2 cells. Lift 5 varies in thickness and may be up to 15 feet thick. Filling will generally begin in the northwest and will proceed from north to south in rows such that the lift is filled to the outer buildout grades. Once a row is complete, additional rows will be filled moving from west to east.

2. Lift 5 will be filled so that the outer slope are at build out grades. Outer slopes from the base of the landfill up to elevation 77 feet will be 3H:1V. Slopes from elevation 77 feet to 95 feet will be 4H:1V. Slopes above elevation 95 feet up to 101 feet will be 5H:1V.

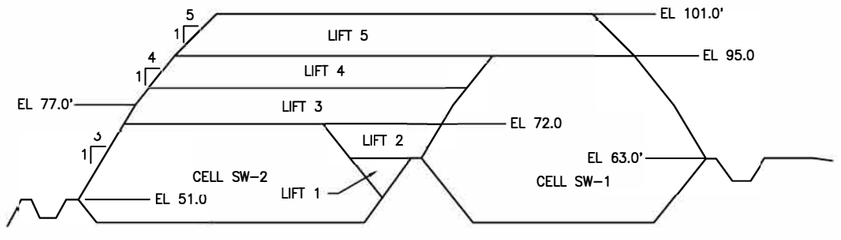


PLAN



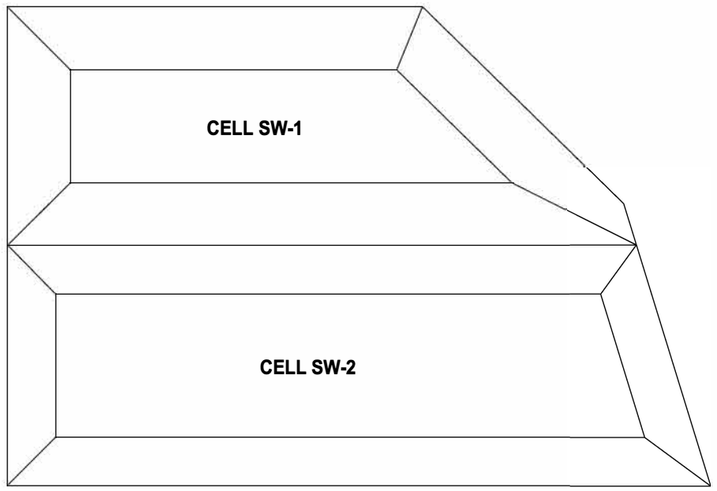
LEGEND

- PROPERTY BOUNDARY
- LIMITS OF LANDFILL CELL (APPROX)

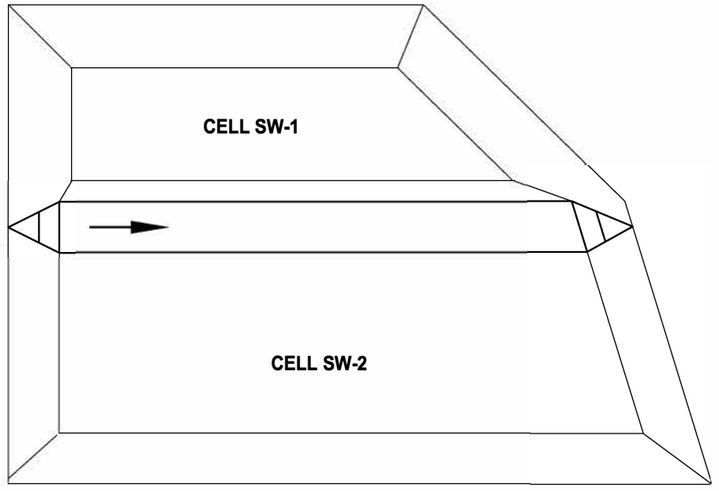


SECTION BB

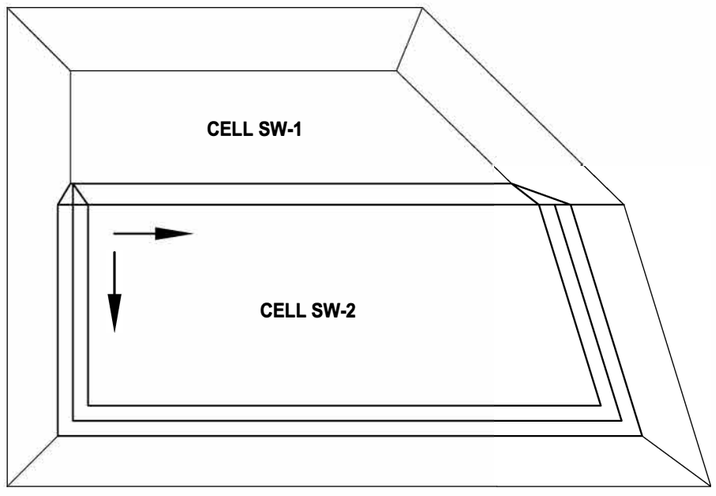
FIGURE 7-1 - PHASING PLAN
WEST PASCO LANDFILL AND
RESOURCE RECOVERY FACILITY
PASCO COUNTY, FLORIDA



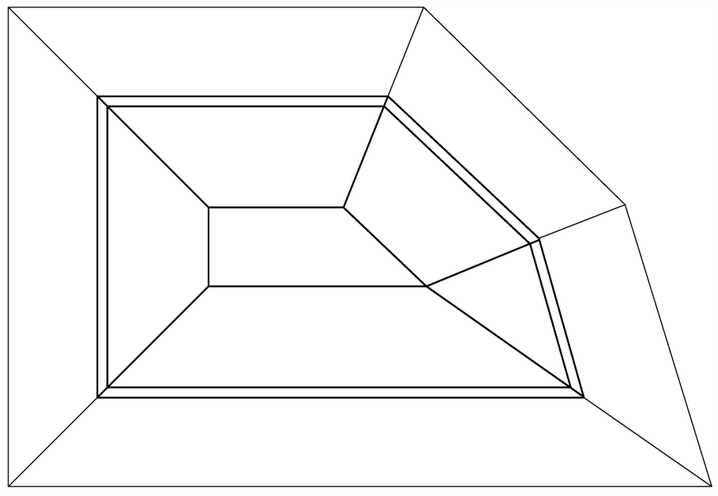
EXISTING CONDITIONS



LIFTS 1 AND 2



LIFTS 3 AND 4



LIFT 5

FIGURE 7-2
CELLS SW1 AND SW-2 FILLING SEQUENCE
WEST PASCO LANDFILL AND
RESOURCE RECOVERY FACILITY
PASCO COUNTY, FLORIDA

7.2 Solid Waste Inspection

All Operators and Spotters are trained according to the requirements of Section 5.0. Pasco County Solid Waste maintains at a minimum one trained Spotter at the active working face during waste disposal operations. The Spotter (trained) is stationed where they can inspect each shipment of waste for unauthorized/prohibited waste before being compacted. The Spotter (trained) will be located on heavy equipment spreading the waste at the working face. Although this section is written to generally address Spotters on heavy equipment, Spotters trained on the ground may be used periodically if Equipment Operators are used that are not trained Spotters. Additionally, trained Operators may also serve as Spotters. Generally, two Operators are onsite available to assist at the active working face.

A Pasco County employee will direct incoming traffic to the appropriate area at the working face. If the Equipment Operator identifies unauthorized/prohibited materials, they will do one of the following as allowed by the Florida Administrative Code:

- Move the unauthorized waste away from the active area for later removal and proper management. These wastes will be moved to temporary storage points as addressed below as soon as ground labor is available (same day).

- Stop operation and notify another person on the ground or on other equipment who will come to the active area and remove the unauthorized waste before operations are resumed.

A Spotter or Operator is inspecting waste at all times when a waste-hauling vehicle is unloading. Waste materials such as white goods, and tires are pulled from the working face and placed in pick-up trucks or to the side away from traffic if the pickup truck is not close to the Spotter. To ensure the health and safety of the spotters, if tires are observed in the waste while the waste is being pushed, the tires will be staged at the end of the slope and picked up at the end of the day. Other landfill staff have been trained to be aware of materials that are prohibited from disposal in a Class I Landfill and to help identify and remove these materials as required.

If suspicious wastes are identified, the waste load is cordoned off and the Landfill Operations Supervisor is contacted. They will examine the suspicious waste and determine whether to accept or reject the load. Loads are rejected if they contain hazardous waste or prohibited material that cannot feasibly be separated from the rest of the load or when separation would cause possible contamination such as the presence of liquids or powders that cannot be removed from the landfill once the load is dumped. If the waste material is determined to be an unacceptable waste, the hauler is contacted and asked to remove the waste themselves from the waste stream. All incidents of attempted unauthorized waste disposal will be documented and maintained in the Administration Office.

Scavenging and salvaging by the employees or the public are strictly forbidden at the landfill for the safety of everyone at the landfill. Employees have been informed of this prohibition.

7.3 Hauler Queuing

The Pasco County employees (who may be trained Spotters) at each working area shall control the number of vehicles allowed at that working face to afford comfortable maneuverability. Additional vehicles will be held at a distance from the working face to allow existing vehicles sufficient room to maneuver and unload.

Unloading vehicles should be spaced adequately to allow the crews sufficient space to work safely. For their own safety, vehicle crews are not permitted to wander from their vehicle for any reason. As vehicles leave the working face, the next vehicle is directed to a vacant unloading area. Pasco County employees move traffic into and out of the working face as quickly as possible while maintaining safe working conditions.

The trained Landfill Equipment Operators or Spotters inspect all loads discharged from the unloading vehicles, remove all unacceptable wastes, and spread the waste as soon as the vehicle moves. Another vehicle is permitted to unload its waste load in an area only after the previous waste load has been inspected, the prohibited wastes have been removed, and the load has been moved to the working face for compaction.

7.4 Waste Placement and Compaction

The active face width will be kept as small as practical to accommodate waste delivery vehicles. The actual working face width may vary depending on the daily vehicle traffic volume. The maximum width of the active face will be maintained at approximately 250 feet. Landfill Management may consider expanding the size of the working face if the backup of waste vehicles become too large.

For health and safety reasons and due to weather, fill-sequencing two working faces may be necessary to accommodate traffic in some situations. This second working face will be bermed and use the same traffic area. This area will be in the immediate vicinity of the Primary Active Area. Given the limited use of the Solid Waste cells, the use of two working faces is unlikely.

Solid waste shall be formed into horizontal lifts to construct cells. The working face of the cell and side grades above land surface shall be at a slope no greater than 3 feet horizontal to 1 foot vertical rise (3H:1V). Normal lift depths should not exceed 20 feet of compacted solid waste. However, during initial filling of the bottom lift of waste or when completing the last lifts in a phase, larger depths may be necessary.

7.5 Cover Materials and Methods

All soil used for daily, intermediate, and final cover over the required impervious cover or synthetic liner required for closure consists of material excavated from the landfill property, other County-owned lands, or purchased from offsite sources.

7.5.1 Initial Daily Cover

At the end of each working day, a compacted 6-inch layer of soil (daily cover) shall be placed over the working face to control odor, litter, fires, and vector control. Pasco County will use Alternative Daily Cover (ADC) in place of soil for daily cover, such as plastic tarps, Posi-Shell or other FDEP-approved materials, to extend the life of onsite soil sources. This includes a 50% soil and mulch mixture. Posi-Shell or mulch may also be utilized to stabilize erosion of covered side slopes as necessary.

Daily cover material is applied in a manner that prevents wasting material or exposing wastes. In areas where the initial waste layer is being installed or the lift is near the side slope, daily cover shall be applied from the top down the face of the fill cell. Inner slopes or plateaus are covered from the top or bottom depending on working conditions.

Throughout the day, cover soil and mulch may be delivered to the active area and spread when possible to reduce the area needing cover at the end of the working day. Additional landfill equipment is used to transport cover soil to the working face area. A dozer is used to spread the cover soil and compact it over the working face. Pasco County maintains excavating equipment and off-road dump trucks to perform this work.

7.5.2 Intermediate Cover/Temporary Cover

Intermediate cover consisting of 12 inches of soil will be placed on areas that are not expected to receive additional wastes within 180 days. This intermediate cover is in addition to the 6-inch initial cover required. When an ADC is used in lieu of the 6-inch initial soil cover, the intermediate cover shall be 18 inches thick. Before additional wastes are placed in areas previously covered with intermediate cover, the intermediate cover will be removed and stockpiled adjacent to the active face to use as daily cover.

7.5.3 Final Cover

Cell closure will begin immediately after final receipt of waste, when all grades have reached their final elevations. Final cover and seeding or planting of vegetative cover will be fully described in a separate Application for Landfill Closure Permit.

7.6 Special Waste Recovery

Special wastes prohibited from disposal in the Class I Landfill are addressed in Section 4.2. Small amounts of special and hazardous wastes may be contained within a load of refuse unloaded from a vehicle. While spreading the wastes onto the working face from a discharged load, the Spotters/Equipment Operators will be looking for special and hazardous wastes, which will be removed from the discharged load before being compacted into the landfilled waste. These prohibited waste materials will be placed to the side of the working face, in pick-up trucks, or 20-yard bins that are away from vehicle traffic. The materials collected in the bins and pick-up trucks will be removed from the site daily. Spotters/Equipment Operators will remove items such as white goods and tires more frequently throughout the day if a stockpile accumulates. These materials are taken to the white goods and tire storage areas within the Solid Waste Complex.

Operators are to be aware of containers that could contain prohibited hazardous wastes. These containers include the following:

- 55-gallon drums.
- 5-gallon chemical drums or paint containers.
- Marked medical wastes.
- Small containers of paints or pesticides and other HHWs.

As discussed in Section 4.2, these non-allowed wastes are isolated and the Landfill Operations Supervisor will be contacted for closer inspection. The vehicle will be detained until the material is identified for proper disposal. If the material is identified as a hazardous waste, it is loaded back into the hauler vehicle for proper disposal, if practical. Otherwise, the area should be cordoned off to prevent other loads from being dumped in the vicinity. The Solid Waste Director will contact a contracted hazardous waste hauler. The identified hazardous waste will be loaded onto this vehicle as soon as it arrives at the landfill. All identified hazardous wastes must be removed the same day they are identified

or stored in the Household Hazardous Waste Area if transportation cannot occur until the next working day.

7.7 Litter Control

Litter fences will typically be used near the active cells and working face to collect and prevent the spread of litter. Due to the shifting waste operations, fences may periodically not be in place. Litter that escapes the landfill working area shall be picked up by the end of the working day but no later than the next working day. The Landfill Operations Manager or Landfill Construction/Lead Operator inspects the normal traffic areas surrounding SW2 daily when the cell is in use. The operational boundaries of the entire Solid Waste Complex are inspected weekly.

Pasco County staff will collect litter continually on windy days. Temporary labor may be used as needed to support County staff for litter control if the volume of litter becomes too much for existing staff. The use of trustees and community service workers is also available as needed.

All open vehicles delivering waste to the Pasco County Solid Waste Complex must have a tarp or some type of enclosure to prevent litter on the site as well as all roads within the County, as required by Florida law. All open-top vehicles entering the Complex without a tarp or enclosure will be informed by the Scalehouse Attendant that a tarp or enclosure is required to transport solid waste within the County.

8.0 Special Waste Management

8.1 Household Hazardous Waste

Household hazardous waste (HHW) is accepted for disposal at the HHWCF north of the Class III Landfill (see Figure 1-1). This facility is operated for Pasco County residents Monday through Saturday, 7:00 A.M. to 5:00 P.M.

The personnel at the facility manage a diverse range of HHWs according to the characteristics of each waste. All personnel at the HHW are 40-hour HAZWOPER-certified and receive 8-hour refresher courses annually. The facility is capable of accepting and managing nearly any waste produced in a household including oils, paints, solvents, fertilizers, pesticides, herbicides, fluorescent tubes, oxidizers, and propane. However, explosive, radioactive, and bio hazardous materials like hypodermic needles, lancets, and wound dressings are not accepted for disposal at the HHHW.

At the HHW, personnel only accept materials for disposal from households within Pasco County. Wastes from Conditionally Exempt Small Quantity Generators (CESQGs) may be accepted under specific circumstances, such as a special business waste collection event. However, if a customer has an especially large amount of waste, if they have numerous containers of a particular brand of product, or if the waste they have brought for disposal is typically produced by a business, the customer will be asked additional questions. These questions may include, but are not limited to, what the product was used for.

Once collected, wastes are disposed of using a hazardous waste transporter and delivery to treatment, storage, and disposal facilities (TSDFs) operating under a permit issued pursuant to Subtitle C of the Federal Resource Conservation and Recovery Act (RCRA) and issued by the U.S. Environmental Protection Agency (USEPA) or an authorized state.

All packaged materials are shipped by a licensed hazardous waste transporter every 60 days to a fully-permitted TSDF as defined in 40 CFR 264. No waste remains at the HHWCF for more than 120 days.

8.2 Unknown and Unmarked Wastes

If containers accepted for disposal are unmarked, have illegible labels, or have contents that do not resemble their labels, the customer is questioned about the purchase and use of the material to determine its waste characteristics (i.e., flammability, reactivity [oxidizers], toxicity, or corrosivity). Many household products have uniquely shaped containers to help determine their use and waste characteristic. Materials are further grouped according to physical appearance (e.g., solid, liquid, color, viscosity etc.). The unknown material is then stored in a chemical storage lockers with blast-proof doors. Ultimately, Pasco County uses their Hazardous Waste Contractor to identify waste types before bulking or lab packing the material for disposal.

Liquids suspected of being acidic or basic are tested using pH paper. Smelling a container to determine its contents is forbidden at the HHW. However, most poisons, petroleum products, and some cleaners have strong, distinct aromas that are detectable simply by opening their container. Any HHWs that are found to be potentially reactive by these tests are stored separately from antagonistic chemicals (e.g., acids are stored in the locker marked “Corrosive”). The caustic materials are stored in the “Corrosive” locker. Flammable liquids must be kept away from oxidizers, so they are stored in the “Flammable”

locker while the oxidizers are stored in the “Corrosive” locker. Regardless of the results of these tests, all collected materials are stored at the HHW until they have been prepared for reuse or disposal. Any material determined to be reactive is stored in a locker with fire suppression and blast-proof doors. If material in unlabeled drums can be identified, it will be bulked with compatible material.

8.3 Used Oil

Used motor oils, hydraulic fluids, transmission fluids, and similar petroleum lubricants are consolidated into 55 gallon drums. The Used Oil Contractor is responsible for testing for the halogen content in these materials when they are collected. The drums are removed by a contracted Used Oil Contractor. Used oil is not permitted to be disposed of in the Class I Landfill.

8.4 Latex Paints

The HHW uses a wire rack to store 1- and 5-gallon paint cans. These racks are typically capable of holding about 60 cans of paint. Approximately two-thirds of the paint that arrives at the HHW is latex-based. Useable latex paint is opened and consolidated into 5- gallon buckets. This paint is given to citizens of Pasco County.

Paint that is not suitable for give-away is combusted at the Resource Recovery Facility.

8.5 Oil Based Paints

The HHW uses wire racks to store 1- and 5-gallon paint cans. These racks are typically capable of holding about 60 cans of paint. Approximately one-third of the paint that arrives at the HHWCF is oil-based. Useable oil-based paint is consolidated into 5-gallon buckets. This paint is given to citizens of Pasco County. Paint that is unusable is bulked into 55-gallon drums for disposal. A hazardous waste transporter moves the filled drums to a fully-permitted TSDF for proper disposal.

8.6 Poisons

Herbicides and pesticides are the largest group of poisons that are accepted at the HHW. They are prepared as “combination packages” or “lab packs” for disposal by the Hazardous Waste Contractor. Small individual containers are placed with similar wastes into a larger container (5-gallon bucket or 55-gallon drum) with Vermiculite to provide shock absorption and hold any liquids that may escape during shipment. The material is moved by a hazardous waste transporter to a fully-permitted TSDF for proper disposal. A few specialized wastes such as pentachlorophenol and arsenic compounds are packed by and managed separately by the Hazardous Waste Contractor. These specialized wastes are shipped by a hazardous waste transporter to a fully-permitted TSDF in the same way that the lab packs are. However, they are subject to different treatment standards.

8.7 Lead Acid Batteries

Lead-acid batteries are stacked on wooden pallets. The stacked batteries are then shrink wrapped onto the pallets and stored on a large containment pallet inside the HHW. The containment pallet has enough room to store three wooden pallets and have room for other products. The wooden pallets are picked up by a Lead-Acid Battery Contractor for recycling.

8.8 Electronics Recycling

Electronics waste, including televisions, VCRs, computer towers, monitors, digital cameras, and PDAs are collected and stored at the HHW for recycling. Electronics wastes are stored and managed in a manner that prevents breakage. The e-waste is stored in enclosed roll-off containers and transported to an electronics recycler.

8.9 Contaminated Soils

Pasco County will accept minor amount of contaminated soils for disposal in SW2. Soil that has been contaminated with petroleum products or any other materials that are not hazardous wastes may be disposed of in permitted Class I landfills. Petroleum-contaminated soil that has been treated pursuant to Chapter 62-713, FAC may be disposed of at permitted disposal facilities and may, if it meets the criteria of Rules 62-701.200 (53) and (55), FAC, be used as initial or intermediate cover material at solid waste disposal facilities. Contaminated soil that has the potential to leach constituents in excess of FDEP groundwater standards or criteria may be used only at Class I landfills and only in those areas of the landfill where runoff or infiltration is captured by the leachate collection system.

8.10 Biological Wastes

Bodies of captive wildlife, as well as bodies of domestic animals that have not died due to disease, may be disposed of in the SW cells of the Class I Landfill.

Disposal of bodies of domestic animals, after death due to natural or accidental causes or euthanasia, shall be accomplished according to Section 823.041(1), FS. This statute requires the disposal of the bodies of domestic animals by burning or burying at least 2 feet below the ground surface. This provision does not prohibit the disposal of such animals in Class I landfills.

Disposal of dead poultry and hatchery residue shall be accomplished according to Section 583.181(2), FS, which provides for disposal of dead poultry and hatchery residue by every poultry producer, egg producer, and poultry hatchery in Florida. The statute includes disposal of the dead poultry and hatchery residue in a sanitary landfill as an acceptable method of disposal. Furthermore, the transporter of the poultry or hatchery residue will transport the material in containers that are sufficiently sealed to prevent spillage.

Treated biomedical waste (i.e. autoclaved waste) is not accepted at the Class I landfill but is accepted at the Resource Recovery Facility. Biomedical waste that has been treated may be disposed of as solid waste that is not biomedical. Such treated waste must be in containers clearly labeled with the phrase “Treated Biomedical Waste.” The local governments that are responsible for solid waste collection and disposal shall be notified that treated biomedical waste will be disposed of in their facility before such disposal. All transport vehicles transporting treated biomedical waste to a solid waste facility for disposal shall be fully enclosed and secured when unattended. Treated biomedical waste shall be disposed of only at permitted Class I landfills or incinerators used to combust solid waste.

8.11 Tires

Segregated tires that are brought to the Facility are stored and processed in a Waste Tire Processing Area just north of the Class III Landfill. A chipping contractor is brought in approximately every six months to process the tires, which are then hauled to a permitted off-site disposal facility.

8.12 White Goods

White goods are removed from the site at least every 3 months. White goods containing chlorofluorocarbons (CFCs, such as Freon) are stored upright and managed carefully so that CFCs are not discharged to the atmosphere. White goods with the refrigerant removed are marked as such. Because Freon is extracted from all units, the compressors are not removed.Other scrap metals, such as lawnmowers, are processed (by removing tires, oil, and gasoline, as needed) and compacted with the white goods into 40-cubic-yard containers.

9.0 Leachate Management

As defined in Rule 62-701.200 (66), FAC, leachate is liquid that has passed through or emerged from solid waste and may contain dissolved, suspended, or mixed materials. Leachate must be contained and kept separate from any groundwater or surface waters. This section will provide Pasco County Solid Waste employees with a general understanding of the requirements for managing the leachate generated from the Class I (Ash and Solid Waste) Landfill operations. **Figure 9-1** identifies all locations for the leachate collection system. Rule 62-701.500(8) FAC establishes requirements for leachate management and provides the criteria for this section.

9.1 Leachate Reduction

Leachate is generated from rainfall that is absorbed into the landfill and water within the waste at the time of disposal. The leachate is collected by the Class I Landfill bottom liner system and treated as wastewater. One of the goals of the landfill design and daily operation is to minimize leachate production from the landfill to reduce the cost associated with leachate treatment and to minimize the potential environmental contamination risks. The methods described in this section can be used separately or simultaneously to achieve leachate reduction.

9.1.1 Rain Covers

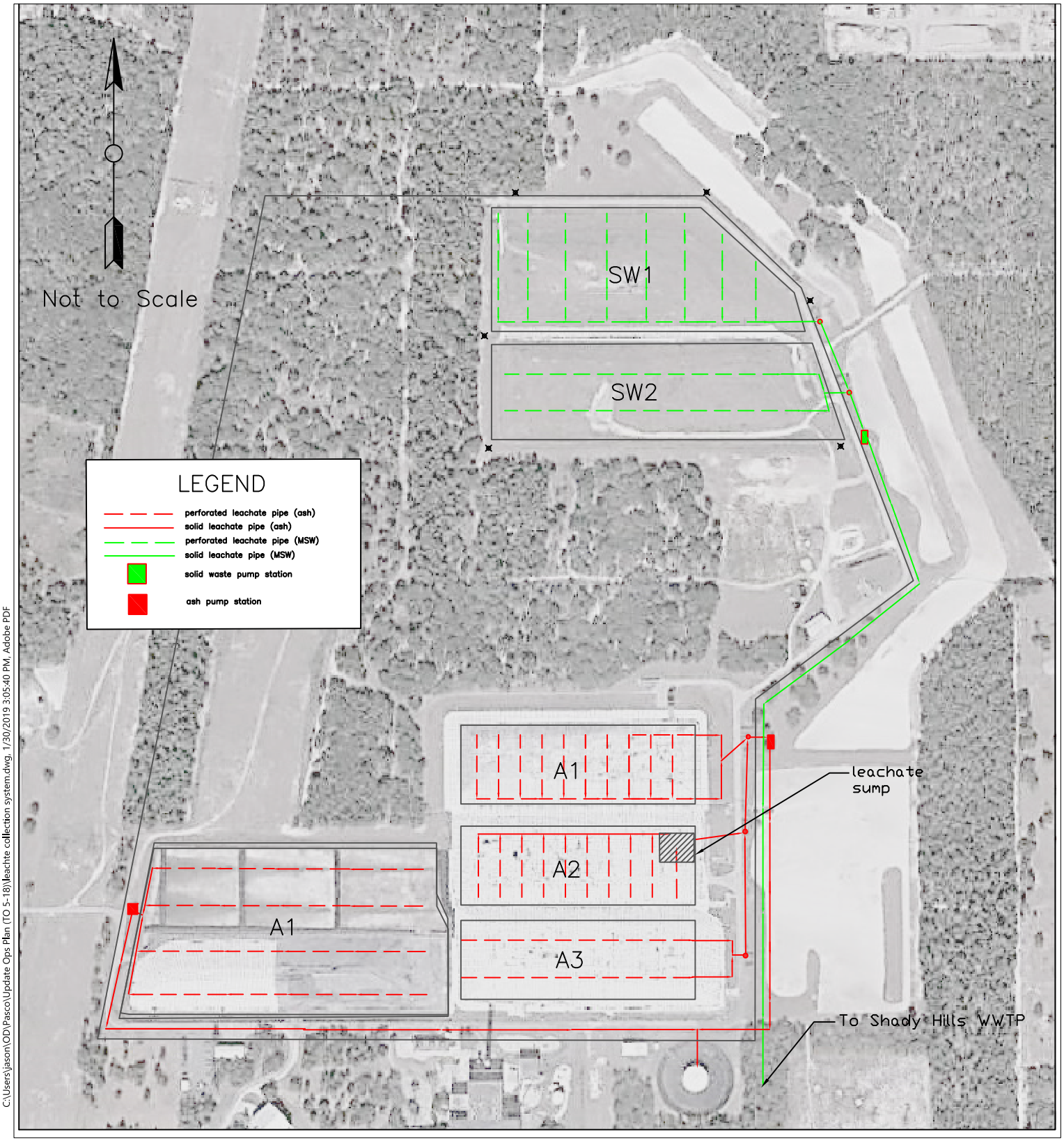
In addition to the leachate/stormwater separation intrinsic to the design of the A4 and SW2 cells, Pasco County may use rain covers (or tarpaulins) to minimize leachate generation. Areas of the landfill that will not be utilized for at least 180 days may be covered with a 20 mil geomembrane and anchored using tires. Stormwater that collects on the rain cover in areas utilizing this technique is managed as non-contact stormwater, which discharges to the perimeter stormwater ditch.

9.1.2 Stabilized Sideslopes

As filling progresses, side slopes that will not receive solid waste for 2 months or more will be stabilized with sod, seed and mulch, or rain covers. Exterior side slopes that are up to design grade and interior side slopes that will not be filled again for longer than 180 days will be covered with either intermediate cover and sod or a rain cover.

9.1.3 Closing

Pasco County Solid Waste plans to achieve an effective runoff factor of at least 30% and will work toward a goal of 50% or more upon final closure in the Class I Landfill. The methods described above represent the present plan; however, as operations continue, they may be modified if alternate



C:\Users\jason\OD\Pasco\Update Ops Plan (TO 5-18)\leachte collection system.dwg, 1/30/2019 3:05:40 PM, Adobe PDF

Note: THIS FIGURE IS NOT TO SCALE AND THE LOCATIONS OF SOME ITEMS HAVE BEEN EXAGGERATED FOR CLARITY

JMG ENGINEERING INC

LEACHATE COLLECTION SYSTEM
WEST PASCO CLASS I LANDFILL

FIGURE
9-1

methods prove more efficient or allow a higher percentage of stormwater runoff resulting in greater leachate minimization.

9.2 Leachate Collection

The leachate collection system encompasses the Ash Monfill (Cells A1, A2, A3, and A4) and the Solid Waste Landfill (Cells SW1 and SW2). Monitoring the collection, pumping and storage components occurs daily, Monday through Friday. All of these phases have been included in this Operations Plan.

9.2.1 Ash Monofill Cell A1

Cell A1 of the Ash Monofill is the original cell of the landfill constructed in 1990. It is approximately 10 acres in size and received ash between approximately 1990 and 1995. The cell was constructed with a double liner system, with intrinsic leachate removal systems for both liners (primary and secondary).

Leachate in the cell is collected by perforated laterals running north-south which drain to a 12-inch PVC leachate header pipe that runs (east to west) on the southern perimeter of the cell. The leachate collection pipes (primary and secondary) penetrate the liner(s) and discharges into one of two leachate manholes on the east side of the cell, one for the primary leachate collection system and one for the secondary leachate collection system. Leachate from the secondary liner is allowed to accumulate in the metering manhole and is periodically pumped (and metered) into the primary manhole. Leachate drains from the metering manholes by gravity to a pump station adjacent to the metering manholes. From the pump station, leachate is pumped to a 2,000,000 concrete storage tank for eventual disposal off-site.

9.2.2 Ash Monofill Cell A2

Cell A2 was constructed circa 1995 and is of a similar configuration to that of Cell A1. The leachate collection system for Cell A2 was modified circa 2000 from its original design by converting the leachate evacuation method from a pumped principle to a gravity principle. The original design and construction of the cell directed leachate from the primary liner system and the secondary liner system to headers running east-west along the northern perimeter of the cell. The headers discharged into a sump in the northeast corner of the cell, and the accumulated leachate was pumped through a side-slope riser pipe to the pump station located adjacent to cell A1. In 2000, the side slope riser pumping system was abandoned, and new gravity pipes with liner penetrations (one for leachate collected by the primary liner and one for leachate collected by the secondary liner) were installed and directed to new leachate metering manholes. As with Cell A1, leachate flows by gravity from the metering manholes to the master pump station adjacent to A1. From the pump station, leachate is combined with the leachate from Cell A1 and pumped to a 2,000,000 concrete storage tank for eventual disposal off-site.

In 2016, during a routine evaluation of the effectiveness of the landfill leachate collection and removal system, it was discovered that little to no leachate was flowing from the primary liner sump to the metering manhole. It has been determined that the most likely cause of this problem is calcification of the stone within the sump, thus preventing leachate from draining through the gravity pipes. To remedy the situation the County has been utilizing a diesel-powered pump to pump the primary leachate from the 8-inch HDPE leachate clean-out pipe stub on the east side of the cell to the primary metering manhole of Cell A-2. The County is currently in the design process of replacing the temporary diesel pump with permanent infrastructure consisting of the following:

- One submersible pump of 1.0-HP, (Grundfos Model 30 SQE 05-40 or equal) located inside the existing 8-inch HDPE primary leachate collection clean-out pipe which connects to the leachate collection sump. The submersible pump is electrically powered and sits at the bottom of the clean-out pipe to

pump out primary leachate through a half-inch or greater size discharge tubing into a new 3-inch leachate forcemain.

- 3-inch HDPE pipe connection to the existing 8-inch HDPE leachate clean-out pipe stub on the east side of Cell A-2. This new 3-inch pipe is the new leachate forcemain and is buried at least 3 feet below grade from the east side of Cell A-2 and crosses the access road and discharges into the primary wet-well of Cell A-2. The road crossing is accomplished by using a 12-inch steel casing extended beyond the paved road limits by at least 5 feet.

- A control panel integral with the submersible pump which offers controls over the submersible pump and has an emergency hand 'ON/OFF' switch. A magnetic flow meter which is strapped on the 3-inch forcemain and measures leachate flows. Instrumentation with the control panel which transmits electronic signals for recorded flow through a fiber optic cable to provide output and record flow at the leachate building.

- A 8 feet x 12 feet concrete pad on the east side of Cell A-2 to house the above grade parts of the 3-inch primary leachate forcemain, flow meter and control panel.

- A new 120v single phase electrical power connect stub-out on the concrete pad/control panel as a potential measure to power a new submersible pump for pumping secondary leachate in case the secondary leachate cannot flow by gravity in future. The existing 3-inch leachate forcemain is capable to convey the additional flow for secondary leachate.

9.2.3 Ash Monofill Cell A3

Cell A3 was constructed circa 2003 and is of a similar configuration to cell A1. It is approximately 10 acres in size and received ash between approximately 2003 and 2008. The cell was constructed with a double liner system, with intrinsic leachate removal systems for both liners (primary and secondary).

Leachate in the cell is collected by perforated 8-inch PVC leachate header pipes that run (east to west) on the interior of the cell. The leachate collection pipes (primary and secondary) penetrate the liner(s) and discharges into one of two leachate manholes on the east side of the cell, one for the primary leachate collection system and one for the secondary leachate collection system. Leachate from the secondary liner is allowed to accumulate in the metering manhole and is periodically pumped (and metered) into the primary manhole. Leachate drains from the metering manholes by gravity to a pump station adjacent to cell A1. From the pump station, leachate is combined with the leachate from Cells A1 and A2 and pumped to a 2,000,000 concrete storage tank for eventual disposal off-site.

9.2.4 Ash Monofill Cell A4

Cell A4 was constructed circa 2008 and currently serves as the active ash disposal cell for the landfill. It is approximately 20 acres in size and has been receiving ash since 2009. The cell was constructed with a double liner system, with intrinsic leachate removal systems for both liners (primary and secondary).

Leachate in the cell is collected by perforated laterals running north-south which drain to four 12-inch PVC leachate header pipes that run (east to west) on in the interior of the cell. The leachate collection pipes (primary and secondary) penetrate the liner(s) and discharges into one of two leachate holding tanks on the west side of the cell, one for the primary leachate collection system and one for the secondary leachate collection system. Leachate drains from the holding tanks by gravity to a pump station adjacent to the holding tanks. From the pump station, leachate is pumped to a 2,000,000 concrete storage tank for eventual disposal off-site.

9.2.5 Solid Waste Cell SW1

Cell SW1 of the Solid Waste Landfill is the original cell of the landfill constructed in 1990. It is approximately 10 acres in size and received waste between approximately 1990 and 1998. The cell was constructed with a double liner system, with intrinsic leachate removal systems for both liners (primary and secondary).

Leachate in the cell is collected by perforated laterals running north-south which drain to an 8-inch PVC leachate header pipe that runs (east to west) on the southern perimeter of the cell. The leachate collection pipes (primary and secondary) penetrate the liner(s) and discharges into one of two leachate manholes on the east side of the cell, one for the primary leachate collection system and one for the secondary leachate collection system. Leachate from the secondary liner is allowed to accumulate in the metering manhole and is periodically pumped (and metered) into the primary manhole. Leachate drains from the metering manholes by gravity to a pump station adjacent to the metering manholes. From the pump station, leachate is pumped directly to the adjacent Shady Hills Wastewater Treatment Facility.

9.2.6 Solid Waste Cell SW2

Cell SW2 of the Solid Waste Landfill was constructed circa 2001. It is approximately 10 acres in size and has been receiving waste since 2002. The cell was constructed with a double liner system, with intrinsic leachate removal systems for both liners (primary and secondary).

Leachate in the cell is collected by perforated laterals running north-south which drain to an 8-inch PVC leachate header pipe that runs (east to west) on the southern perimeter of the cell. The leachate collection pipes (primary and secondary) penetrate the liner(s) and discharges into one of two leachate manholes on the east side of the cell, one for the primary leachate collection system and one for the secondary leachate collection system. Leachate from the secondary liner is allowed to accumulate in the metering manhole and is periodically pumped (and metered) into the primary manhole. Leachate drains from the metering manholes by gravity to a pump station adjacent to the metering manholes. From the pump station, leachate is pumped directly to the adjacent Shady Hills Wastewater Treatment Facility.

9.3 Ash Leachate Storage Tank

As described above, leachate that is collected in the ash disposal cells is pumped to a 2 million gallon concrete storage tank located to the south of cell A3. From the pump station, the leachate flows through a 6” PVC forcemain, through a totalizing meter, and into the storage tank. The tank has a 100 foot interior diameter and is 34 feet tall (excluding the domed roof). Each foot of depth in the tank holds approximately 60,000 gallons.

9.3.1 Tank Inspections

Pasco County staff visually inspect the exterior of the tank weekly. The inspector will look for any structural damage to the tank, damage to the coating system, loose connections, visible leaks, and maintenance deficiencies. The inspector also looks for any structural damage to the secondary containment system (described below) and visible leaks.

The interior of the tank is inspected at least once every 5 years. During an interior inspection, the inspector looks for any damage to the interior two part epoxy coating system, structural damage or cracking of the tank, and/or visible leaks.

If inspections reveal any deficiencies with the interior and/or exterior of the tanks that could result in the system failing to contain leachate, Pasco County will take immediate action to remediate the situation. The tank manufacturer (Crom Corporation), coordinating with Pasco County, will handle failures or damage to the tank. Pasco County will immediately notify the manufacturer of the situation; the tank manufacturer will perform a detailed damage assessment report and remediation of the tank. FDEP will be immediately notified in writing by Pasco County of the situation and of the proposed corrective action for significant deficiencies that require more than 48 hours to repair.

9.3.2 Secondary Containment System

The secondary containment design includes a bermed area lined with 60-mil HDPE geomembrane. This area is designed to provide 2,200,000 gallons of storage capacity or 110 percent of the tank volume. Two feet of freeboard is provided at the maximum design capacity. The containment area liner material is high density polyethylene (HDPE), which is compatible with the leachate. The liner is continuous under the storage tank slab, separated by a soil drainage layer for protection of the liner.

The secondary containment area is designed with a 12-inch drain line which discharges to a stormwater swale leading to stormwater retention pond No. 1. The 12-inch discharge line is designed to discharge up to 5.4 cubic feet per second (cfs). This rate is equal to the accumulation rate of a 25-year/24-hour storm event at the point in time when 10 percent of the secondary containment volume has accumulated.

A valve is also provided on the gravity discharge line for the secondary containment system. The valve will normally remain closed. Within 24 hours of any significant rainfall accumulation, Stormwater collected in secondary containment will be visually inspected to determine if the stormwater has been contaminated. Signs of contamination include the following:

- An oily sheen on the surface of the liquid.
- A dark or nontransparent appearance of the liquid.
- An excess of suspended solids in the liquid.
- An odor coming from the liquid.

If no contamination is noted, the valve will be opened to discharge the accumulated stormwater. Once the stormwater is drained from the secondary containment area, the valve will be closed by the operator. If it is contaminated, the stormwater will be treated as leachate and pumped to the storage tank.

9.4 Ash Leachate Disposal

Once produced, leachate must be disposed of. Disposal of leachate generated by the ash disposal cells is achieved by loading leachate onto tanker trucks and hauling it to a WWTP for treatment. Leachate is normally loaded into tanker trucks from a dedicated pump station located adjacent to the 2 million gallon storage tank, but can also be loaded from different areas (such as the metering manholes or the pump station sump) as needed based on the conditions at the site. The primary disposal mechanism for leachate generated from the ash monofill is the City of Tampa's Howard F. Curren Wastewater Treatment Facility. Pasco County maintains a contract with the City of Tampa for leachate disposal rights at the wastewater treatment plant. If changes in the facility receiving leachate occur, FDEP will be notified.

9.5 Solid Waste Leachate Disposal

Leachate collected by the leachate collection systems serving Cells SW1 and SW2 is pumped directly to the adjacent Shady Hills Wastewater Treatment Plant, owned by Pasco County, for disposal. An intra-Department account has been established to charge Solid Waste for the amount of leachate delivered to the wastewater plant.

9.6 Leachate Monitoring, Data Collection, and Reporting

Rule 62-701.500(8)(f), F.A.C. requires that the quantity of leachate collected by the leachate collection and removal system be recorded in gallons per day before on-site treatment and transport off-site. To accurately record the amount of leachate collected, Pasco County utilizes in-line magnetic flow meters on the discharge side of the three pump stations (the first serving A1, A2, and A3; the second serving A4; and the third serving SW1 and SW2). Each of the flow meters totalizes the volume of leachate (in gallons) passing through the respective leachate transmission pipeline. On a daily basis (Monday through Friday), an Operator records the totalized value and the time of day that the reading was recorded. The records are compiled on monthly basis into a spreadsheet and submitted semi-annually to the FDEP.

Separate from the flow measuring requirements of 62-701.500(8)(f) is an obligation to monitor the effectiveness of the liner systems serving each of the individual cells. Pasco County accomplishes this by separately collecting leachate generated off of the secondary liner system(s). Anything but a trivial amount of leachate collected off of a secondary liner system could indicate a possible breach (or other problem) of the primary liner. On a daily basis, Pasco County operators inspect the metering manholes for all of the secondary liner systems. Anything more than a small amount of leachate collected in a secondary liner metering manhole is immediately reported to the Solid Waste Manager.

9.7 Leachate System Maintenance

Leachate flow rates from the pump stations are observed at least weekly. An extremely low (or high) flow rate, when compared to recent flow rates, may indicate a problem with the leachate-collection system. This problem could be a malfunction with pumps or its instrumentation controls. The problem could also be a blockage in or a collapse of the leachate-collection pipe. If a block is suspected, Pasco County will hire the services of a jet-cleaning and video-inspection company. An emergency purchase order for jet-cleaning and/or video-inspection of the leachate collection lines can be prepared as soon as an inspection is determined to be required. Pasco County expects that an emergency purchase order can be approved and a contractor can be hired within a maximum of 1 month. The jet-cleaning and video-inspection company will first jet-clean the pipes from the clean-outs and then video-inspect the

pipes from the same clean outs. If major problems within the system are found, Pasco County will propose a remedial action plan and submit it to FDEP for approval before beginning the remedial work.

In accordance with 62-701.500(8)(h), FAC water pressure cleaning or video recording inspection is conducted at least once every five years.

9.8 Leachate Contingency Plan

9.8.1 Leachate Pumps, Hauling, and Flow Meters

If all pumps (onboard vehicle pump, storage tank transfer pumps, and leachate wet well pumps) fail, portable pumps are available from other County Departments. In addition, a rental transfer pump can be obtained from a local rental source.

If the sewer discharge pipeline is not functioning (for the Solid Waste cells) and the existing hauling contractor is unable to transport the leachate offsite (for the Ash Cells), an emergency can be declared to select another hauler so that unnecessary delays caused by bidding and selection can be prevented.

If the primary flow meter (the compliance meter) ceases to operate for either the Solid Waste cells or the Ash cells, contracted maintenance personnel will remove the instrument and insert a spare flow meter supplied by Pasco County Water & Wastewater. The faulty instrument will be shipped to the service representative or manufacturer to repair or replace.

9.8.2 Electrical Power Failure

The leachate collection and leak detection metering manholes that receive leachate from all primary and secondary leachate collection systems are all gravity based and do not require electrical power. However, the pump stations that evacuate the manholes require electrical power. In the event of a prolonged electrical outage, back-up generators will be brought in to operate the leachate collection pump stations.

If electrical power is not available at the ash monfill tanker loadout station, leachate can be pumped from the Crom tank directly into tankers using the onboard vehicle pumps or a portable 3-inch pump or an electrical generator can be provided to supply backup power to the pump station. Backup generators are available from Pasco County Utilities.

9.8.3 Leachate Treatment Contingency

If the primary disposal facilities (City of Tampa for ash leachate and Shady Hills for solid waste leachate) are unable to accept the leachate, Pasco County will implement a contingency plan consisting of hauling the leachate to an industrial disposal facility or another treatment facility for disposal. Pasco County retains one or more vendors who can haul leachate off-site for disposal. If leachate is determined to be hazardous, it will be managed in accordance with the requirements of Rule 62-730, FAC, for hazardous waste generators and transporters.

10.0 Surface Water Management

The Class I Landfill utilizes two surface water drainage areas as shown on **Figure 10-1**. The ponds have been sized to accommodate surface water runoff from the entire landfill at buildout and are at this time largely over-sized. Surface water flowing from the landfill drains to perimeter swales that discharge to the large retention ponds east of the landfill. Stormwater modeling indicates that any runoff that will overflow the ponds will travel essentially along the natural drainage paths that existed pre-development to undeveloped depressional areas west of the power line easement. However, because the retention pond capacity is largely underutilized at this time, overflow from the ponds is not expected to occur.

Drainage ditches have been constructed adjacent to the operating landfill cells and the closed landfill areas. These drainage ditches lead to the surface water ponds described above. These ditches are designed to receive the stormwater runoff from the landfill cells, paved areas and roads for collection and infiltration (and/or evapotranspiration) in the ponds.

10.1 Stomwater System Maintenance

The following maintenance activities are performed as needed on an appropriate frequency to ensure the proper collection, conveyance, and disposition of surface waters associated with the Class I Landfill:

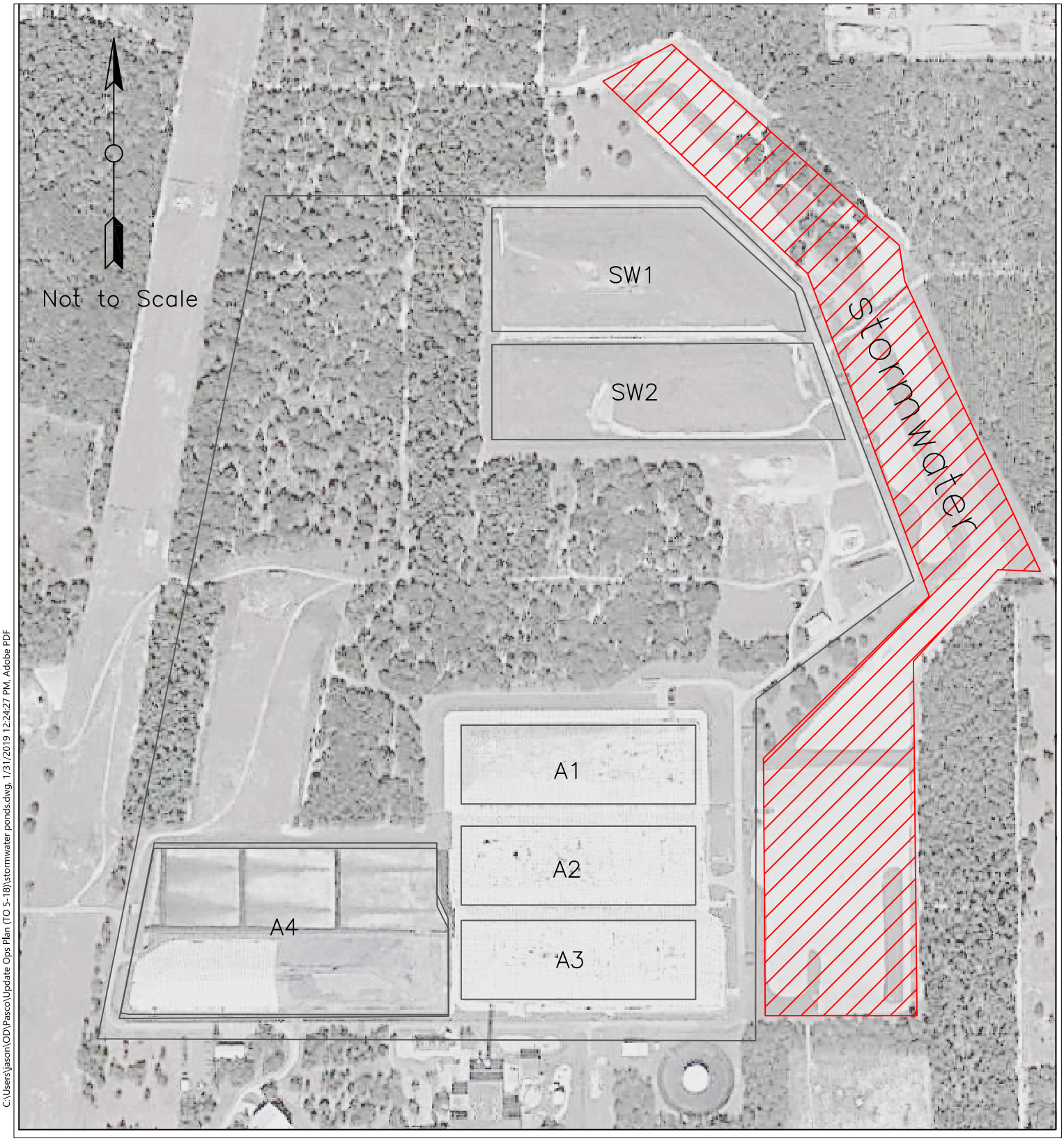
- All conveyance swales and ditches on the project site will be kept cleared of dense vegetation, debris, and trash that would impede the flow of stormwater runoff.

- All disturbed areas, swales, and basin side slopes that do not have living grass to prevent erosion will be sodded or seeded and mulched.

- All culverts that are damaged thereby inhibiting design flow rates will be cleaned, repaired, or replaced.

- The ditches, side slopes, and stormwater pond side slopes and berms will be mowed and kept clear of vegetation that would impede the discharge or receiving of stormwater.

In accordance with Rule 62-701.500(7)(k), F.A.C., the landfill will repair within 3 days erosion that causes waste to be exposed or the stormwater management system to malfunction. If the major erosion cannot be repaired within 7 days, the Pasco County will notify FDEP and propose an erosion correction schedule for the repairs.



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Note: THIS FIGURE IS NOT TO SCALE AND THE LOCATIONS OF SOME ITEMS HAVE BEEN EXAGGERATED FOR CLARITY

JMG ENGINEERING INC

STORMWATER MANAGEMENT PONDS
WEST PASCO CLASS I LANDFILL

FIGURE
10-1

11.0 Landfill Gas Management

Because the solid waste disposal cells SW1 and SW2 are relatively small and are intended to be utilized infrequently, there is no active landfill gas management associated with them. In addition to a series of passive vents, Pasco County maintains a robust landfill gas monitoring program to insure that landfill gas does not migrate laterally. The monitoring program is described below.

11.1 Landfill Gas Monitoring Program

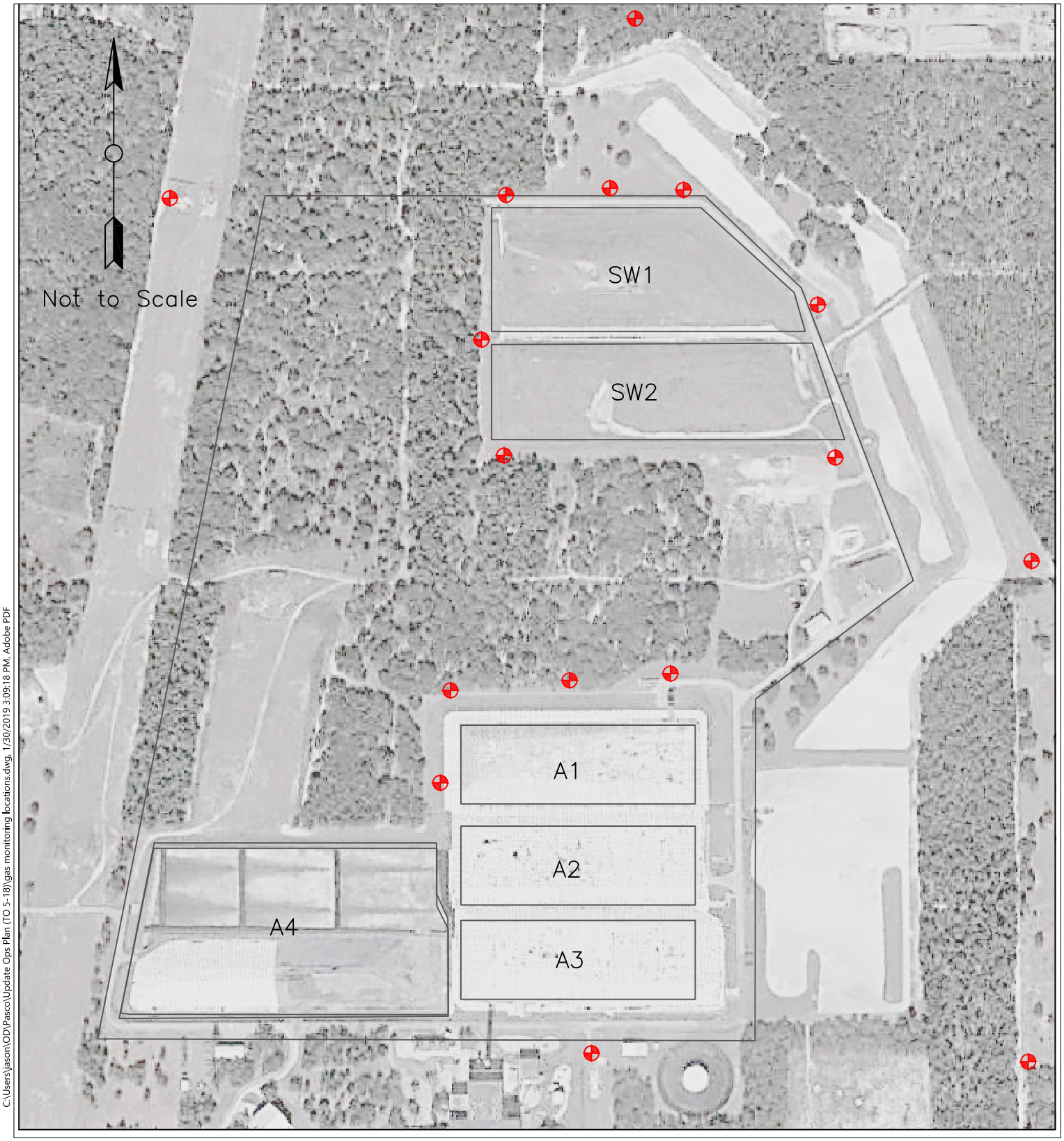
Pasco County Environmental Services is responsible for implementing the Gas Monitoring Program at the landfill. The LFG monitoring program consists of quarterly monitoring of six LFG monitoring wells, in addition to monitoring gas levels in nineteen groundwater monitoring wells. Gas monitoring is also conducted within the enclosed structures at the Class III scalehouse and the Class III Operations Building. **Figure 11-1** depicts the location of each of the gas monitoring locations. Gas monitoring is conducted in accordance with Rule 62-701.530(2)(c), F.A.C.

A portable landfill gas analyzer is used to measure the levels of combustible gases (primarily methane) at each of the monitoring locations. Part of the monitoring program is inspection of the monitoring wells for any symptoms of LFG leakage such as dead grass in the vicinity of the monitoring well or other locations. All field measurement data and observations are provided to FDEP no later than 15 days after the end of the quarter in which the monitoring occurred.

If results indicate that gas is present in excess of the 25% of the lower explosive limit (LEL) in a structure or 100% of the LEL at or beyond the landfill property boundary, a Gas Remediation Plan will be prepared in accordance with Rule 62-701.530(3)(a), F.A.C., and Pasco County Utilities will:

- Immediately take all necessary steps to ensure protection of human health and notify FDEP.

- Within 7 days of detection, submit to FDEP for approval a remediation plan for the methane gas releases. The plan shall describe the nature and extent of the problem and the proposed remedy.



C:\Users\jason\OD\Pasco\Update Ops Plan (TO 5-18)\gas monitoring locations.dwg, 1/30/2019 3:09:18 PM, Adobe PDF

Note: THIS FIGURE IS NOT TO SCALE AND THE LOCATIONS OF SOME ITEMS HAVE BEEN EXAGGERATED FOR CLARITY

JMG ENGINEERING INC

GAS MONITORING LOCATIONS
WEST PASCO CLASS I LANDFILL

FIGURE
11-1

12.0 Site Contingency Plan

Emergency conditions that may constitute a special waste-handling event at the Solid Waste Complex may be created by a natural disaster (i.e., hurricane, tornado, and/or flooding), explosion, or fire. The Landfill Operations Manager is responsible for implementing the contingency operations.

12.1 Landfill Fire

A fire extinguisher is maintained in all Pasco County landfill equipment. The quantity, type, and location of fire extinguishers located throughout the site is subject to change as conditions change on the site. Landfill fires can be very dangerous with the presence of LFG, which includes methane. Fire-fighting should only be attempted if the fire is relatively small and controllable. The area should be immediately evacuated of operating staff and outside personnel if a fire is ignited that cannot be easily and quickly controlled. The Solid Waste Manager should be contacted, and the fire should be reported to the Administration Office via field communications. The Administration office will immediately call the fire department. During a fire, incoming trucks will be prevented from using the landfill.

Once the fire is extinguished, appropriate cover will be applied to the waste and operations will continue at the original active face. If the fire is extensive and a temporary active face cannot be established, incoming trucks will be redirected to another landfill.

Landfill fires can be ignited from several sources or causes. These causes include the following:

- A gas pocket ignited from a spark generated from smoking.
- Sparks generated from pushing metal wastes.
- Chemical reactions.
- Sparks from operating equipment.
- Introduction of smoldering waste into the working face.

Onsite materials and equipment of fire protection consist of soil stockpiles near the working face, fire extinguishers carried on landfill equipment, and onsite water trucks.

The daily cover used in the landfill operation provides an effective firewall. Instructions in firefighting procedures will be routinely provided to site personnel through the prescribed TREEO training. If a fire occurs within the waste pile at the landfill, the fire department will be immediately notified, and additional soil cover will be applied to cut off the flow of oxygen to the burning area. If the fire cannot be extinguished or controlled within 1 hour, the landfill shall cease accepting waste for disposal in those areas of the facility impacted by the fire. The local fire department will again be notified via 911 of the conditions at the site and may be requested to assist site personnel and provide additional equipment, if necessary. Pasco County officials and FDEP will also be notified of conditions at the site and of the fire control plan belong implemented.

Collection vehicles entering the landfill with smoldering loads shall be directed to the Hot Load area at the Resource Recovery Facility. The truck should remain closed to minimize the amount of oxygen available to feed the fire. The local fire department shall be notified by dialing 911; Pasco County HHW staff shall be notified as well as landfill operations.

13.0 Recordkeeping

In addition to records and reporting required by other sections of this operation plan, Pasco County Solid Waste will maintain the following the following:

- Keep records of all information used to develop or support the permit applications and any supplemental information submitted to comply with FDEP requirements pertaining to the construction of the landfill throughout the design period. Records pertaining to the operation of the landfill, except for weigh tickets, shall be kept for the design period of the landfill. Weigh tickets shall be kept for a minimum of 5 years.

- Retain records of all monitoring information, including calibration and maintenance records and copies of all reports required by permit, for at least ten years. Background water quality records shall be kept for the design period of the landfill.

- Maintain an annual estimate of the remaining life and capacity in cubic yards of each active disposal facility for the Class I landfill. The annual estimate shall be based on a summary of the heights, lengths, and widths of the solid waste disposal units. The estimate shall be made and reported annually to FDEP.

All records 5 years or older may be archived offsite given that the records can be retrieved within 7 days for inspection.

14.0 Off-Site Beneficial Ash Reuse

Section 403.7045(5) of the Florida Statutes authorizes the Department to allow beneficial reuse of ash residue when an applicant demonstrates that "no significant threat to public health will result and that applicable Department standards and criteria will not be violated." Beginning in 2012, Pasco County began working with the FDEP to investigate the recycling of bottom ash for beneficial reuse as a building construction material. A series of roadway test strips and associated groundwater monitoring wells were constructed under an FDEP research and development project (Permit No. 26254-004-SO-21). Through the research and development process, the County demonstrated that the requirements of Chapter 403.7045(5), F.S. could be achieved and the Department issued a Standing Authorization specifying the conditions under which bottom ash could be beneficially utilized within the County's geographic boundaries. Subsequent modifications have been made to the original 2014 Authorization, all of which are attached as **Appendix A**.

To render the bottom ash usable for targeted recycling projects, the County follows the procedures described in Section 6.5 of the Operations Plan. Following processing, the engineered aggregate is provided to contractors under the direction of Pasco County Utilities. The engineered aggregate is provided to contractors only for construction projects that have been demonstrated to meet the criteria of the Beneficial Use Authorization (as amended).

APPENDIX A

Beneficial Ash Reuse Authorizations

Florida Department of Environmental Protection
BOB MARTINEZ CENTER
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

RICK SCOTT
GOVERNOR

CARLOS LOPEZ-CANTERA
LT. GOVERNOR

CLIFFORD D. WILSON III
INTERIM SECRETARY

December 5, 2014

via electronic mail

Michelle L. Baker, M.B.A.
County Administrator
8731 Citizens Drive
New Port Richey, Florida 34654-5598

RE: Approval of Specified Materials for
Recycling and Reuse of Treated Bottom Ash Residue from the
Pasco County Resource Recovery Facility, WACS ID No. 26254

Dear Ms. Baker

The Department has completed our review of your August 14, 2014, request for approval for recycling and reuse of the above referenced bottom ash materials under the provisions of Section 403.7045(5), Florida Statutes (F.S.). Your letter transmitted the results of use case analyses in the report, "Pasco County Use Case Scenarios to Examine the Recycling of Waste to Energy Ash in Road Construction Applications," which was prepared for the Pasco County Utilities Department by Dr. Timothy Townsend at the University of Florida.

The Department appreciates the time and care which your utilities department, and your Solid Waste Director, Mr. John Power, have taken to meet with the Department on several occasions during the preparation of the use case analyses and corresponding report that were provided with your request.

Based on our review of your August 14, 2014, application requesting the Department's authorization to utilize bottom ash from facilities owned or operated by you, Pasco County is hereby authorized and allowed to perform the proposed recycling or reuse activities in accordance with Section 403.7045(5), F.S., and the conditions of this Department Order.

Specified Materials:

The following material or materials (Specified Materials) are allowed for recycling or reuse within Pasco County by, or under the direction of, the Pasco County Utilities Department:

- Bottom Ash Residue as defined in Rule 62-701.200(7)(a), F.A.C., from the Pasco County Resource Recovery Facility (Facility), a waste-to-energy facility as defined in Section 403.7061(4), F.S. (bottom ash), and

- Any product or construction material, including asphalt or concrete, which contains bottom ash as referenced herein.

Required Treatment:

The Specified Materials for recycling and reuse shall be conditioned, by or under the direction of the Pasco County Utilities Department, in accordance with the following procedure:

Prior to recycling and reuse under this Order, bottom ash will be aged for a minimum period of 3 months. Aging will be conducted on top of or in a lined Class I landfill cell. During the entire treatment period, ash piles shall be no greater than 20 feet in height.

Specified Uses:

The recycling and reuse of the above specified materials are limited to, and only approved for, the following specified uses where the Specified Materials shall be as required herein:

1. Covered use as a road base course, where bottom ash residue from the Facility has been screened to remove large pieces of waste materials (>3/4 inch), and the road base course will be completely covered by a pavement layer;
2. Encapsulated use as a replacement for up to 50%, by weight, of the customarily used aggregate in Portland cement concrete pavement, where bottom ash residue from the Facility has been screened to remove large pieces of waste materials (>3/4 inch) and the fine fraction of the ash (<3/8 inch); and
3. Encapsulated as an aggregate in hot mix asphalt pavement, where bottom ash residue from the Facility has been screened to remove large pieces of waste materials (>3/4 inch) and the fine fraction of the ash (<3/8 inch).

Recycling and Reuse Conditions:

In accordance with the Department's approval allowing recycling and reuse of the Specified Materials, including bottom ash, as requested by the Pasco County Utilities Department (County), the County shall implement the recycling and reuse controls specified herein. The following controls and conditions are binding upon the County and are enforceable under Chapter 403, F.S:

1. Bottom ash shall be treated by conditioning, prior to recycling and reuse, in accordance with this Order.
2. The County shall not allow recycling, reuse, or disposal of the Specified Materials in any manner inconsistent with the requirements of Chapter 62-701, F.A.C., or this Order.
3. Bottom ash shall not be placed within 3 feet of groundwater, or 15 feet of wetlands or natural water bodies, or within 100 feet of a potable well that is being used or might be used for human or livestock water consumption.
4. When utilized as road base, the placement of the bottom ash shall not extend beyond the outside edge of the pavement. Bottom ash remaining outside the edge of the pavement after

construction shall be removed and recycled in a manner consistent with this Order or placed in a permitted Class I lined landfill.

5. When utilized as road base, placement of the pavement shall be completed as soon as practicable after placement of the bottom ash.
6. When bottom ash is utilized as a road base course, only dense-graded asphalt mixes shall be placed as the overlying pavement layer with a 4-inch or greater as-built thickness.
7. The roadway shall be placed and maintained following generally accepted road construction practices consistent with those utilized in Pasco County at the time of the issuance of this Order.
8. When removed from service, asphalt or concrete products containing bottom ash as aggregates shall be managed as construction and demolition debris, recycled or reused in a manner consistent with this Order, or placed in a permitted Class I lined landfill.
9. When removed from service, bottom ash that has been used as a base course shall be recycled or reused in a manner allowed under this Order, or placed in a permitted Class I lined landfill.
10. Fugitive dust emissions from the storage, processing, transport or placement of bottom ash shall be controlled by wetting.
11. Ash used as an aggregate in asphalt and concrete shall be stored on site at batch plants for a period of no more than 120 hours. Loads shall be covered with a tarp, or a similar protective cover, during transportation and ash will not be transported during periods of inclement weather. Following batching of the concrete or asphalt products, the unused ash shall be recovered and either used in a subsequent allowed construction project or placed in a Class I lined landfill.
12. The County shall comply with the following record keeping requirements:
    a. Whenever not the owner, the County shall receive written notice, from the owner or duly authorized agent of the owner (Owner) of the property where the Specified Materials are to be placed, providing the County express authorization for the placement of the Specified Materials, detailing the Owner's authorized placement dates, placement locations, and the maximum quantities of bottom ash that may be recycled or reused, or otherwise placed, on the Owner's property;
    b. The County may receive such notices from Owner's electronically;
    c. The County shall provide and maintain records detailing the actual placement dates, locations, quantities, the nature of recycling or reuse including the types of associated construction materials (i.e., road base course, concrete pavement, or asphalt pavement) where the Specified Materials were placed, and the dates and disposition whenever any Specified Materials are removed from service;
    d. Notices and records shall be maintained in a centralized record storage system accessible from the Facility, and also in association with the particular construction project records for any related road construction project that utilizes the Specified Materials; and
    e. Such notices and records shall be maintained by the County for a period of not less than 30 years after the removal of the Specified Materials from service.
13. Recycling and Reuse of the Specified Materials, and associated construction activities, shall be conducted in a manner that does not cause or contribute to violations of state water quality standards. Performance-based erosion and sediment control best management practices shall be implemented and maintained immediately prior to, during, and after construction as

needed to stabilize all disturbed areas, including material storage, staging, and processing areas, to prevent adverse impacts to the water resources and adjacent lands. Erosion and sediment control measures shall be installed and maintained in accordance with the State of Florida Erosion and Sediment Control Designer and Reviewer Manual (Florida Department of Environmental Protection and Florida Department of Transportation June 2007), available at www.dep.state.fl.us/water/wetlands/docs/erp/FLErosionSedimentManual_6_07.pdf, and the Florida Stormwater Erosion and Sedimentation Control Inspector's Manual (Florida Department of Environmental Protection, Nonpoint Source Management Section, Tallahassee, Florida, July 2008), available at www.dep.state.fl.us/water/nonpoint/docs/erosion/erosion-inspectors-manual.pdf.

14. The County shall immediately notify the Department in writing upon, or at least within 5 business days of, becoming aware of any condition, test result, or other information indicating that recycling or reuse of the Specified Materials, in accordance with this Order, may cause or contribute to violations of state water quality standards.
15. Upon reasonable notice to the County, Department staff or agents with proper identification shall have permission to enter, inspect, sample and test as the Department may claim needed to verify compliance with the requirements of Chapter 403, F.S., and this Order.

Uses other than as specified herein are not approved under this Order. Where ash from the Facility, or related materials, may be used or placed in a manner that does not comply with the Conditions of this Order, such materials shall be managed as a solid waste subject to the requirements of Chapter 62-701, F.S.

Administrative Rights

The Department's Order shall become final unless a timely petition for an administrative hearing is filed under sections 120.569 and 120.57, F.S., within **21** days of receipt of this Order. Persons who have filed such a petition may seek to mediate the dispute and choosing mediation will not adversely affect the right to a hearing if mediation does not result in a settlement. The procedures for petitioning a hearing and pursuing mediation are set forth below.

Persons affected by this Order have the following options:

A. If you choose to accept the Department's decision regarding the Order, you do not have to do anything. This Order is final and effective as of the date on the top of the first page of this Order.
B. If you choose to challenge the decision, you may do the following:
    1. File a request for an extension of time to file a petition for hearing with the Department's Agency Clerk in the Office of General Counsel within **21** days of receipt of this Order. This request should be made if you wish to meet with the Department in an attempt to resolve any disputes without first filing a petition for hearing or negotiate an agreement to mediate; or
    2. File a petition for administrative hearing with the Department's Agency Clerk in the Office of General Counsel within **21** days of receipt of this Order.

In addition to requesting an administrative hearing, any petitioner may elect to pursue mediation under Section 120.573, F.S., and must negotiate an agreement to mediate within **10** days after the deadline for filing a petition.

How to Request an Extension of Time to File a Petition for Hearing

For good cause shown, pursuant to Rule 62-110.106(4), F.A.C., the Department may grant a request for an extension of time to file a petition for hearing. Such a request must be filed (received) by the Agency Clerk in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida, 32399-3000, within **21** days of receipt of this Order. Petitioner, if different from the applicant, shall mail a copy of the request to the applicant at the time of filing. Failure to file a petition within this time period shall waive the right of anyone who may request an administrative hearing under Sections 120.569 and 120.57, F.S.

How to File a Petition for Administrative Hearing

A person whose substantial interests are affected by this Order may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, F.S. The petition must contain the information set forth below and must be filed (received) by the Agency Clerk in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, MS 35, Tallahassee, Florida, 32399-3000, within **21** days of receipt of this Order. Petitioner, if different from the applicant, shall mail a copy of the petition to the applicant at the time of filing. Failure to file a petition within this time period shall waive the right of anyone who may request an administrative hearing under Sections 120.569 and 120.57, F.S.

Pursuant to Subsection 120.569(2), F.S., and Rule 28-106.201, F.A.C., a petition for administrative hearing shall contain the following information.

a) The name, address, and telephone number of each petitioner; the name, address, and telephone number of the petitioner's representative, if any, the site owner's name and address, if different from the petitioner, the DEP facility number, and the name and address of the facility;

b) A statement of when and how the petitioner received notice of the Department's action or proposed action;

c) An explanation of how each petitioner's substantial interests are or will be affected by the Department's action or proposed action;

d) A statement of the disputed issues of material fact, or a statement that there are no disputed facts;

e) A concise statement of the ultimate facts alleged, including a statement of the specific facts the petitioner contends warrant reversal or modification of the Department's action or proposed action;

f) A statement of the specific rules or statutes the petitioner contends requires reversal or modification of the Department's action or proposed action; and

g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the Department to take with respect to the Department's action or proposed action.

How to Pursue Mediation

In addition to requesting an administrative hearing, any petitioner may elect to pursue mediation. The election may be accomplished by filing with the Department a mediation agreement with all parties to the proceeding (i.e., the applicant, the Department, and any person who has filed a timely and sufficient petition for hearing). The agreement must contain all the information required by Rule 28-106.404, F.A.C. The agreement, signed by all parties, must be received by the Agency Clerk in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida, 32399-3000 within **10** days after the deadline for filing a petition, as set forth above. Choosing mediation will not adversely affect the right to a hearing if mediation does not result in a settlement.

Pursuant to Rule 28-106.404, F.A.C., an agreement to mediate must include the following.

(i) The name, address, and telephone number of the persons who may attend the mediation, (also the DEP facility number, the name and address of the facility if applicable);
(ii) The name, address, and telephone number of the mediator agreed to by the parties;
(iii) How the costs and fees associated with the mediation will be allocated (the Department will not pay any of the costs of mediation);
(iv) The agreement of the parties regarding the confidentiality of discussions and documents introduced during mediation to the extent authorized by law;
(v) The date, time, and place of the first mediation session;
(vi) The name of the party's representative who shall have authority to settle or recommend settlement; and
(vii) The signature of the parties.

As provided in Section 120.573, F.S., the timely agreement of all parties to mediate will toll the time limitations imposed by Sections 120.569 and 120.57, F.S., for holding an administrative hearing and issuing a final order. Unless otherwise agreed by the parties, the mediation must be concluded within sixty days of the execution of the agreement. If mediation results in settlement of the administrative dispute, the Department must enter a final order incorporating the agreement of the parties. Persons seeking to protect their substantial interests that would be affected by such a modified final decision must file their petitions within **21** days of receipt of this notice, or they shall be deemed to have waived their right to a proceeding under Sections 120.569 and 120.57, F.S. If mediation terminates without settlement of the dispute, the Department shall notify all parties in writing that the administrative hearing processes under Sections 120.569 and 120.57, F.S., are resumed.

This Order is final and effective as of the date on the top of the first page of this Order. Timely filing a petition for administrative hearing postpones the date this Order takes effect until the

Department issues either a final order pursuant to an administrative hearing or mediation settlement.

Judicial Review

Any party to this Order has the right to seek judicial review of it under Section 120.68, F.S., by filing a notice of appeal under Rule 9.110 of the Florida Rules of Appellate Procedure with the Agency Clerk of the Department in the Office of General Counsel, Mail Station 35, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000, and by filing a copy of the notice of appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice of appeal must be filed within thirty days after this order is filed with the clerk of the Department (see below).

Questions

The Department appreciates your work efforts to define the conditions under which the referenced materials may be safely reused in Pasco County. Any questions regarding the Department's approval of your request should be directed to Tim Bahr at (850) 245-8790, or Richard Tedder at (850) 245-8735. Questions regarding legal issues should be referred to Brynna Ross, Office of General Counsel, at (850) 245-2242. Contact with any of the above does not constitute a petition for administrative hearing, a request for a time extension to file a petition for hearing or an agreement to mediate.

Sincerely,

 for

Jorge R. Caspary, P.G., Director
Division of Waste Management
Florida Department of Environmental Protection

FILING AND ACKNOWLEDGMENT FILED, on this date, pursuant to §120.52 Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

_____ _____

Clerk Date

Florida Department of Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Jonathan P. Steverson
Secretary

December 29, 2016

via electronic mail

Michelle L. Baker, M.B.A.
County Administrator
8731 Citizens Drive
New Port Richey, Florida 34654-5598

RE: Amendment to Approval of Standing Beneficial Use of Encapsulated Bottom Ash Generated by the Pasco County Resource Recovery Facility, Additional Uses Request. WACS ID No. 45799

Dear Ms. Baker:

The Department has completed our review of your October 6, 2016, request for approval to utilize encapsulated bottom ash generated by the Pasco County Resource Recovery Facility in two additional beneficial use applications, under the provisions of Section 403.7045(5), Florida Statutes (F.S.). Your letter transmitted the results of use case analyses in the report, "Amendment Request to Approval of Specified Materials for Recycling and Reuse of Treated Bottom Ash Residue from the Pasco County Resource Recovery Facility," which was prepared by Innovative Waste Consulting Services and JMG Engineering for the Pasco County Utilities Department.

The Department appreciates the quality and completeness of the research and document.

Based on our review of your October 6, 2016, application, Pasco County is hereby authorized and allowed to perform the proposed additional beneficial uses in accordance with Section 403.7045(5), F.S., and the conditions of this Department Order.

Specified Materials:

The following material or materials (Specified Materials) are allowed for recycling or reuse within Pasco County by, or under the direction of, the Pasco County Utilities Department:

- Bottom Ash Residue as defined in Rule 62-701.200(7)(a), F.A.C., from the Pasco County Resource Recovery Facility (Facility), a waste-to-energy facility as defined in Section 403.7061(4), F.S. (bottom ash), and
- Any product or construction material, including asphalt or concrete, which contains bottom ash as referenced herein.

Required Treatment:

The Specified Materials for recycling and reuse shall be conditioned, by or under the direction of the Pasco County Utilities Department, in accordance with the following procedure:

> Prior to recycling and reuse under this Order, bottom ash will be aged for a minimum period of 3 months. Aging will be conducted on top of or in a lined Class I landfill cell. During the entire treatment period, ash piles shall be no greater than 20 feet in height.

Specified Uses:

The recycling and reuse of the above specified materials are limited to, and only approved for, the following specified uses where the Specified Materials shall be as required herein:

1. Covered use as a road base course, where bottom ash residue from the Facility has been screened to remove large pieces of waste materials (>3/4 inch), and the road base course will be completely covered by a pavement layer;
2. Encapsulated use as a replacement for up to 50%, by weight, of the customarily used aggregate in Portland cement concrete pavement, where bottom ash residue from the Facility has been screened to remove large pieces of waste materials (>3/4 inch) and the fine fraction of the ash (<3/8 inch); and
3. Encapsulated as an aggregate in hot mix asphalt pavement, where bottom ash residue from the Facility has been screened to remove large pieces of waste materials (>3/4 inch) and the fine fraction of the ash (<3/8 inch).
4. As a partial coarse aggregate replacement in Portland cement concrete slabs beneath structures.
5. As a structural base course, underlying multi-use paths.

Recycling and Reuse Conditions:

In accordance with the Department's approval allowing recycling and reuse of the Specified Materials, including bottom ash, as requested by the Pasco County Utilities Department (County), the County shall implement the recycling and reuse controls specified herein. The following controls and conditions are binding upon the County and are enforceable under Chapter 403, F.S:

1. Bottom ash shall be treated by conditioning, prior to recycling and reuse, in accordance with this Order.
2. The County shall not allow recycling, reuse, or disposal of the Specified Materials in any manner inconsistent with the requirements of Chapter 62-701, F.A.C., or this Order.
3. Bottom ash shall not be placed within 3 feet of groundwater, or 15 feet of wetlands or natural water bodies, or within 100 feet of a potable well that is being used or might be used for human or livestock water consumption.
4. When utilized as road base, the placement of the bottom ash shall not extend beyond the outside edge of the pavement. Bottom ash remaining outside the edge of the pavement after

construction shall be removed and recycled in a manner consistent with this Order or placed in a permitted Class I lined landfill.

5. When utilized as road base, placement of the pavement shall be completed as soon as practicable after placement of the bottom ash.
6. When bottom ash is utilized as a road base course, only dense-graded asphalt mixes shall be placed as the overlying pavement layer with a 4-inch or greater as-built thickness.
7. The roadway shall be placed and maintained following generally accepted road construction practices consistent with those utilized in Pasco County at the time of the issuance of this Order.
8. When used as structural base for multi-use paths, the placement of the bottom ash shall not extend more than six inches beyond the edge of the pavement, and shall be completely covered by a compacted soil layer of a thickness of at least one inch, or equal to the thickness of the pavement, whichever is greater.
9. Bottom ash remaining outside this distance after construction shall be removed and recycled in a manner consistent with this Order, or placed in a permitted Class I lined landfill.
10. When bottom ash is utilized as a structural base layer under a multi-use path, only asphalt mixes shall be placed as the overlying pavement layer with a one-inch or greater as-built thickness.
11. When removed from service, asphalt or concrete products containing bottom ash as aggregates shall be managed as construction and demolition debris, recycled or reused in a manner consistent with this Order, or placed in a permitted Class I lined landfill.
12. When removed from service, bottom ash that has been used as a base course shall be recycled or reused in a manner allowed under this Order, or placed in a permitted Class I lined landfill.
13. Fugitive dust emissions from the storage, processing, transport or placement of bottom ash shall be controlled by wetting.
14. Ash used as an aggregate in asphalt and concrete shall be stored on site at batch plants for a period of no more than 120 hours. Loads shall be covered with a tarp, or a similar protective cover, during transportation and ash will not be transported during periods of inclement weather. Following batching of the concrete or asphalt products, the unused ash shall be recovered and either used in a subsequent allowed construction project or placed in a Class I lined landfill.
15. The County shall comply with the following record keeping requirements:
    a. Whenever not the owner, the County shall receive written notice, from the owner or duly authorized agent of the owner (Owner) of the property where the Specified Materials are to be placed, providing the County express authorization for the placement of the Specified Materials, detailing the Owner's authorized placement dates, placement locations, and the maximum quantities of bottom ash that may be recycled or reused, or otherwise placed, on the Owner's property;
    b. The County may receive such notices from Owner's electronically;
    c. The County shall provide and maintain records detailing the actual placement dates, locations, quantities, the nature of recycling or reuse including the types of associated construction materials (i.e., road base course, concrete pavement, or asphalt pavement) where the Specified Materials were placed, and the dates and disposition whenever any Specified Materials are removed from service;

d. Notices and records shall be maintained in a centralized record storage system accessible from the Facility, and also in association with the particular construction project records for any related road construction project that utilizes the Specified Materials; and
e. Such notices and records shall be maintained by the County for a period of not less than 30 years after the removal of the Specified Materials from service.

16. Recycling and Reuse of the Specified Materials, and associated construction activities, shall be conducted in a manner that does not cause or contribute to violations of state water quality standards. Performance-based erosion and sediment control best management practices shall be implemented and maintained immediately prior to, during, and after construction as needed to stabilize all disturbed areas, including material storage, staging, and processing areas, to prevent adverse impacts to the water resources and adjacent lands. Erosion and sediment control measures shall be installed and maintained in accordance with the State of Florida Erosion and Sediment Control Designer and Reviewer Manual (Florida Department of Environmental Protection and Florida Department of Transportation June 2007), available at www.dep.state.fl.us/water/wetlands/docs/erp/FLErosionSedimentManual_6_07.pdf, and the Florida Stormwater Erosion and Sedimentation Control Inspector's Manual (Florida Department of Environmental Protection, Nonpoint Source Management Section, Tallahassee, Florida, July 2008), available at www.dep.state.fl.us/water/nonpoint/docs/erosion/erosion-inspectors-manual.pdf.
17. The County shall immediately notify the Department in writing upon, or at least within 5 business days of, becoming aware of any condition, test result, or other information indicating that recycling or reuse of the Specified Materials, in accordance with this Order, may cause or contribute to violations of state water quality standards.
18. Upon reasonable notice to the County, Department staff or agents with proper identification shall have permission to enter, inspect, sample and test as the Department may claim needed to verify compliance with the requirements of Chapter 403, F.S., and this Order.

Uses other than as specified herein are not approved under this Order. Where ash from the Facility, or related materials, may be used or placed in a manner that does not comply with the Conditions of this Order, such materials shall be managed as a solid waste subject to the requirements of Chapter 62-701, F.S.

Administrative Rights

The Department's Order shall become final unless a timely petition for an administrative hearing is filed under sections 120.569 and 120.57, F.S., within **21** days of receipt of this Order. Persons who have filed such a petition may seek to mediate the dispute and choosing mediation will not adversely affect the right to a hearing if mediation does not result in a settlement. The procedures for petitioning a hearing and pursuing mediation are set forth below.

Persons affected by this Order have the following options:

A. If you choose to accept the Department's decision regarding the Order, you do not have to do anything. This Order is final and effective as of the date on the top of the first page of this Order.

B. If you choose to challenge the decision, you may do the following:
   1. File a request for an extension of time to file a petition for hearing with the Department's Agency Clerk in the Office of General Counsel within **21** days of receipt of this Order. This request should be made if you wish to meet with the Department in an attempt to resolve any disputes without first filing a petition for hearing or negotiate an agreement to mediate; or
   2. File a petition for administrative hearing with the Department's Agency Clerk in the Office of General Counsel within **21** days of receipt of this Order.

In addition to requesting an administrative hearing, any petitioner may elect to pursue mediation under Section 120.573, F.S., and must negotiate an agreement to mediate within **10** days after the deadline for filing a petition.

How to Request an Extension of Time to File a Petition for Hearing

For good cause shown, pursuant to Rule 62-110.106(4), F.A.C., the Department may grant a request for an extension of time to file a petition for hearing. Such a request must be filed (received) by the Agency Clerk in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida, 32399-3000, within **21** days of receipt of this Order. Petitioner, if different from the applicant, shall mail a copy of the request to the applicant at the time of filing. Failure to file a petition within this time period shall waive the right of anyone who may request an administrative hearing under Sections 120.569 and 120.57, F.S.

How to File a Petition for Administrative Hearing

A person whose substantial interests are affected by this Order may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, F.S. The petition must contain the information set forth below and must be filed (received) by the Agency Clerk in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, MS 35, Tallahassee, Florida, 32399-3000, within **21** days of receipt of this Order. Petitioner, if different from the applicant, shall mail a copy of the petition to the applicant at the time of filing. Failure to file a petition within this time period shall waive the right of anyone who may request an administrative hearing under Sections 120.569 and 120.57, F.S.

Pursuant to Subsection 120.569(2), F.S., and Rule 28-106.201, F.A.C., a petition for administrative hearing shall contain the following information.

a) The name, address, and telephone number of each petitioner; the name, address, and telephone number of the petitioner's representative, if any, the site owner's name and address, if different from the petitioner, the DEP facility number, and the name and address of the facility;

b) A statement of when and how the petitioner received notice of the Department's action or proposed action;

c) An explanation of how each petitioner's substantial interests are or will be affected by the Department's action or proposed action;

d) A statement of the disputed issues of material fact, or a statement that there are no disputed facts;

e) A concise statement of the ultimate facts alleged, including a statement of the specific facts the petitioner contends warrant reversal or modification of the Department's action or proposed action;

f) A statement of the specific rules or statutes the petitioner contends requires reversal or modification of the Department's action or proposed action; and

g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the Department to take with respect to the Department's action or proposed action.

How to Pursue Mediation

In addition to requesting an administrative hearing, any petitioner may elect to pursue mediation. The election may be accomplished by filing with the Department a mediation agreement with all parties to the proceeding (i.e., the applicant, the Department, and any person who has filed a timely and sufficient petition for hearing). The agreement must contain all the information required by Rule 28-106.404, F.A.C. The agreement, signed by all parties, must be received by the Agency Clerk in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida, 32399-3000 within **10** days after the deadline for filing a petition, as set forth above. Choosing mediation will not adversely affect the right to a hearing if mediation does not result in a settlement.

Pursuant to Rule 28-106.404, F.A.C., an agreement to mediate must include the following.

(i) The name, address, and telephone number of the persons who may attend the mediation, (also the DEP facility number, the name and address of the facility if applicable);
(ii) The name, address, and telephone number of the mediator agreed to by the parties;
(iii) How the costs and fees associated with the mediation will be allocated (the Department will not pay any of the costs of mediation);

(iv) The agreement of the parties regarding the confidentiality of discussions and documents introduced during mediation to the extent authorized by law;

(v) The date, time, and place of the first mediation session;

(vi) The name of the party's representative who shall have authority to settle or recommend settlement; and

(vii) The signature of the parties.

As provided in Section 120.573, F.S., the timely agreement of all parties to mediate will toll the time limitations imposed by Sections 120.569 and 120.57, F.S., for holding an administrative hearing and issuing a final order. Unless otherwise agreed by the parties, the mediation must be concluded within sixty days of the execution of the agreement. If mediation results in settlement of the administrative dispute, the Department must enter a final order incorporating the agreement of the parties. Persons seeking to protect their substantial interests that would be

affected by such a modified final decision must file their petitions within **21** days of receipt of this notice, or they shall be deemed to have waived their right to a proceeding under Sections 120.569 and 120.57, F.S. If mediation terminates without settlement of the dispute, the Department shall notify all parties in writing that the administrative hearing processes under Sections 120.569 and 120.57, F.S., are resumed.

This Order is final and effective as of the date on the top of the first page of this Order. Timely filing a petition for administrative hearing postpones the date this Order takes effect until the Department issues either a final order pursuant to an administrative hearing or mediation settlement.

Judicial Review

Any party to this Order has the right to seek judicial review of it under Section 120.68, F.S., by filing a notice of appeal under Rule 9.110 of the Florida Rules of Appellate Procedure with the Agency Clerk of the Department in the Office of General Counsel, Mail Station 35, 3900 Commonwealth Boulevard, Tallahassee, Florida 32399-3000, and by filing a copy of the notice of appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice of appeal must be filed within thirty days after this order is filed with the clerk of the Department (see below).

Questions

The Department appreciates your work efforts to define the conditions under which the referenced materials may be safely reused in Pasco County. Any questions regarding the Department's approval of your request should be directed to Kim Walker at (850) 245-8934, or Cory Dilmore at (850) 245-8712. Questions regarding legal issues should be referred to Ashanti McBride, Office of General Counsel, at (850) 245-2203. Contact with any of the above does not constitute a petition for administrative hearing, a request for a time extension to file a petition for hearing or an agreement to mediate.

Sincerely,

for

F. Joseph Ullo, Jr. P.E., Director
Division of Waste Management
Florida Department of Environmental Protection

FILING AND ACKNOWLEDGMENT FILED, on this date, pursuant to §120.52 Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Hope Thigpen
Clerk

12/29/2016
Date

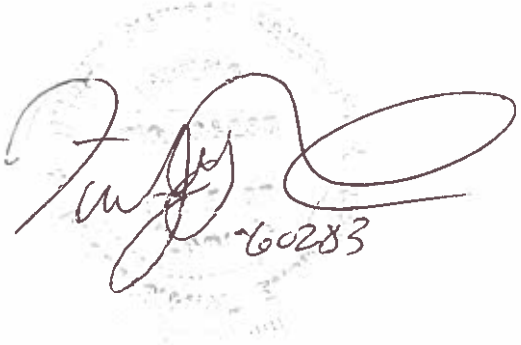
Technical Evaluation of Reduced Pavement Thickness over Road Base Course Constructed with Treated Bottom Ash

Prepared for:
Pasco County Utilities
7536 State St. Suite 213
New Port Richey, FL 34654

Prepared by

Innovative Waste Consulting Services, LLC
3720 NW 43rd St. Suite 103
Gainesville, FL 32606

Under Subcontract to:
JMG Engineering
Jason M. Gorrie, P.E., BCEE



April 16, 2018

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List of Abbreviations, Acronyms, and Initialisms

FDEP	Florida Department of Environmental Protection
GCTL	Groundwater Cleanup Target Level
HELP	Hydrologic Evaluation of Leaching Performance
IWEM	Industrial Waste Management Evaluation Model
NOAA	National Oceanic and Atmosphere Administration
PCRRF	Pasco County Resource Recovery Facility
RD&D	Research, Development, and Demonstration
US EPA	United States Environmental Protection Agency

1 Introduction

1.1 Project Background

In August 2014, Pasco County Utilities (PCU) requested the Florida Department of Environmental Protection (FDEP) for approving the recycling and reuse of treated bottom ash residue generated from the Pasco County Resource Recovery Facility (PCRRF) (hereafter referred as 'the Facility') under the provisions of Section 403.7045(5) Florida Statutes (F.S.). Along with the request, the PCU also submitted a technical report "Pasco County Use Case Scenarios to Examine the Recycling of Waste to Energy Bottom Ash in Road Construction Applications" prepared by Townsend and Roessler (2014) that provided an assessment on the suitability of utilizing waste-to-energy bottom ash as a road construction material in Pasco County (hereafter referred as 'the County'). Based on a review of the request and Townsend and Roessler (2014), in December 2014, FDEP authorized PCU to conduct the following proposed recycling and reuse of the treated bottom ash in accordance with 403.7045(5) F.S: road base course, partial aggregate replacement in Portland cement concrete (PCC) pavement, and partial aggregate replacement in hot mix asphalt (HMA) mix within Pasco County (hereafter referred as 'the County) (FDEP 2014a). In December 2016, the FDEP further granted approval to PCU for application of treated bottom ash generated from the Facility as a partial course aggregate replacement in PCC slabs beneath structures and as a structural base course underlying multi-use paths (FDEP 2016). Table 1-1 provides a brief description of specific treated bottom ash use case scenarios allowed by the FDEP (2014a; 2016).

Table 1-1. Specific Use Case Scenarios as Specified by FDEP (2014a; 2016)

Approval Date	Specific Use Case Scenario	Reference
December 5, 2014	1. "Covered use as a road base course, where bottom ash residue from the Facility has been screened to remove large pieces of waste materials (>3/4 inch), and the road base course will be completely covered by a pavement layer"; 2. "Encapsulated use as a replacement for up to 50%, by weight, of the customarily used aggregate in PCC pavement, where bottom ash residue from the Facility has been screened to remove large pieces of waste materials (>3/4 inch) and the fine fraction of the ash (<3/8 inch); and" 3. "Encapsulated use as an aggregate in HMA pavement, where bottom ash residue from the Facility has been screened to remove large pieces of waste materials (>3/4 inch) and the fine fraction of the ash (<3/8 inch)".	FDEP (2014a)
December 29, 2016	1-3 Same use case scenarios as in FDEP (2014a) 4. "As a partial coarse aggregate replacement in PCC slabs beneath structures" 5. "As a structural base course, underlying multi-use paths"	FDEP (2016)

FDEP specified controls and recycling and reuse conditions for the above mentioned use case scenarios in FDEP (2014a) and FDEP (2016). One of the recycling and reuse condition [number six in FDEP (2014a) and FDEP (2016)] states that when the bottom ash is utilized as a road base course, the overlying asphalt pavement layer (hereafter referred as pavement layer) as-built thickness shall be at least 4 inches. The PCU is considering to reduce the above-mentioned thickness of pavement layer to a minimum of 2 inches and wanted to evaluate the impact of potentially increased leaching from the application of a minimum of 2-inch thick pavement layer above the base course. The PCU contracted JMG Engineering, which subcontracted Innovative Waste Consulting Services, LLC (IWCS) to evaluate the potential infiltration rate

from the application of a 2-inch thick pavement layer above the treated bottom ash base course and its impact on human health and groundwater.

1.2 Summary of Previous Technical Evaluations

In March 2014, the FDEP granted a Research, Development, and Demonstration (RD&D) permit (Permit No. 26254-004-SO-21) to the Pasco County Solid Waste Department that allowed the Facility to construct five pavement test strips within the Facility using a combination of materials with bottom ash (FDEP 2014b). A schematic layout of pavement test strips is shown in Figure 1-1.

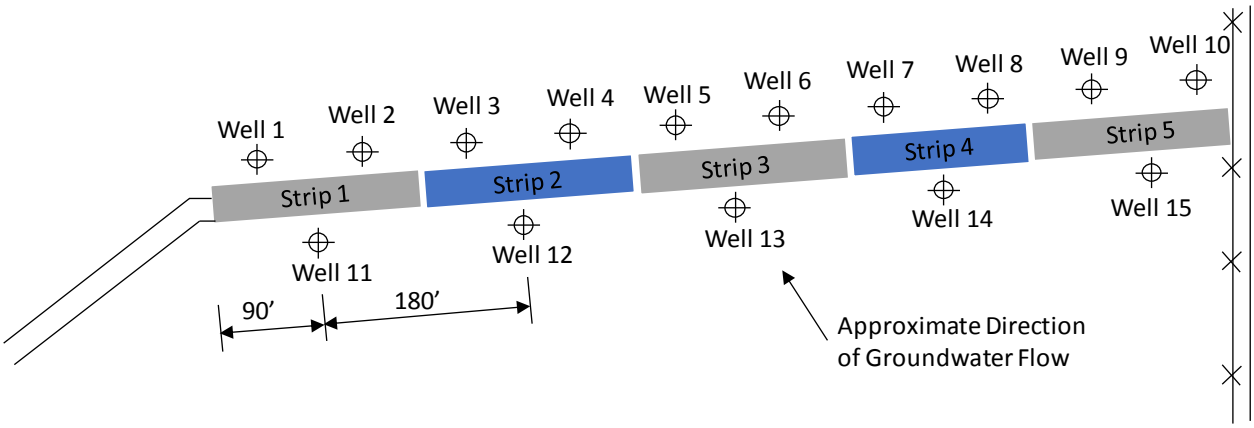

Figure 1-1. Layout of Pavement Test Strips and Surrounding Groundwater Monitoring Wells

In May 2014, the Facility constructed test strips in accordance with the RD&D permit conditions. The total length of the test strip is approximately 1,000 feet. The materials used in each test strip is listed in Table 1-2. Three of the five test strips used bottom ash as one of the material, and the remaining two test strips were constructed without using bottom ash to serve as control test strips. As shown in Figure 1-1, groundwater quality monitoring wells were installed at the groundwater upgradient and downgradient of pavement test strips. Each pavement test strip has one upgradient and two downgradient wells which are monitored quarterly.

Table 1-2. Description of Pavement Test Strips at the Facility

Strip No.	Materials used	Description
1	Bottom ash base	Bottom ash as a base course overlaid by asphalt concrete
2	Asphalt	Limerock base covered with asphalt concrete
3	Bottom ash and asphalt	Limerock base overlaid by bottom ash amended asphalt
4	PCC	Limerock base covered with PCC
5	Bottom ash and concrete	Limerock base overlaid by bottom ash amended PCC

Townsend and Roessler (2014), the report submitted by the PCU to the FDEP in August 2014, provided an evaluation of the different use case scenarios of treated bottom ash generated from the Facility. They observed that the reuse of treated bottom ash as: (1) a road base course, (2) an aggregate in PCC pavement, and (3) an aggregate in HMA pavement would not pose a significant threat to human health and the environment, when bottom ash is recycled according to procedures and constraints identified in the report. For utilizing bottom ash in a road base course, Townsend and Roessler (2014) observed that when bottom ash is covered with the pavement layer, direct human exposure of bottom ash should not be a concern. They observed leaching potential for several elements (aluminum, molybdenum, and antimony) above the health-based threshold from treated bottom ash; however, they estimated that these elements would be diluted and attenuated to safe concentrations at 100-ft or less distance from

the roadway. Townsend and Roessler (2014) also estimated infiltration of rainwater from a 4-inch thick pavement layer that would potentially leach through the base course and observed that less than 5% of annual rainwater would infiltrate through a well-constructed 4-inch thick pavement layer. For a conservative analysis, they selected a 10% infiltration rate from the overlying pavement material and observed that leachate generated from the base of the roadway would be diluted to six or more times under the surficial aquifer condition of the County. Townsend and Roessler (2014) estimated that at this infiltration rate, the leachate generated from the road base would not pose a significant threat to human health and the environment when bottom ash is recycled consistent with the procedure identified in their report.

1.3 Scope and Objectives

The primary objective of the current study was to evaluate the technical feasibility of using a minimum of 2-inch thick pavement layer above the base course in contrast to a 4-inch pavement layer as previously approved by FDEP (2014a). The level of risk associated with direct human exposure from the treated bottom ash covered with a 2-inch pavement would be expected to be the same as that of with a 4-inch pavement layer. However, a reduced pavement thickness may cause greater rainfall infiltration and groundwater impacts than a 4-inch pavement layer. Therefore, rainwater infiltration rates associated with a 2-inch thick pavement layer were estimated using HELP modeling and were compared with the modeled infiltration rates estimated for a 4-inch thick pavement layer.

Second, the impact on groundwater due to a potential increase in leachate generation from the use of treated bottom ash as road base course underlaid by a 2-inch pavement layer was evaluated by analyzing the groundwater quality monitoring data at the test strips in the recent monitoring event (November 2017). The test strips have a different combination of materials with varying thickness (2 to 8 inches); however, as presented in a later section, the model results do not show a significant variation in infiltration rate with a change in pavement layer thickness. Therefore, it was assumed that the impact on groundwater by a 2-inch thick pavement layer would be similar to the impact caused by the test strip.

1.4 Report Organization

This report has five sections and an appendix. Section One describes the project background and scope of the project, which is to estimate the infiltration rate from a 2-inch thick pavement surface. Section Two provides discussion about the infiltration rate analysis using the Hydrologic Evaluation of Leaching Performance (HELP) model. Section Three discusses the groundwater quality at the pavement test strips. Section Four provides summary and conclusion of the analysis. Section Five lists references used in the report. Appendix -A contains all the HELP model outputs.

2 Infiltration Rate Analysis

2.1 Approach

As discussed by Townsend and Roessler (2014), the asphalt pavement surface is generally low in permeability and typically constructed such that rainwater runs off as stormwater; however, a small amount of rainwater may still remain on the top of the road surface. Most of that remaining water typically evaporates, and the remaining small amount may infiltrate through the pavement material. The infiltrated water merges with the subsurface environment. There are no established models to estimate the moisture infiltration rate through pavements under varying climatic conditions; therefore, the HELP model, version 3.07 (hereafter referred as 'HELP Model'), as used by Townsend and Roessler (2014) was used to estimate the infiltration rate through the pavement layer. The HELP model is a water balance model, developed for landfill applications by the US Army Corps of Engineers in 1997. The HELP model is used to estimate the amounts of runoffs, evapotranspiration, drainage, leachate collection, and liner leakage expected from a landfill but can also be used for other systems consisting of horizontal layers subjected to rainfall.

2.2 HELP Model Input

HELP model uses climatic and design parameters to model rainfall infiltration through porous media layers. Climatic data include precipitation, temperature, humidity, wind speed, and solar radiation). Design data include information on layer arrangement and properties (e.g., saturated hydraulic conductivity, layer thickness, initial moisture content, etc.). The layers are classified into four types: vertical percolation layer, lateral drainage layer, barrier soil layer, and geomembrane liners. The HELP model provides default properties for these layers but allows the user to modify these properties.

2.2.1 Climate Data Used or HELP Model Runs

Weather stations near the Facility were identified using the National Oceanic and Atmosphere Administration (NOAA) National Centers for Environmental Information Climate Data Online tool (NOAA 2018) to obtain climatic data representative of the site. The weather station located closest to the site is in Saint Leo, Florida (latitude and longitude of 28.33° and -82.25°, respectively). Records of the past ten years (2008 to 2017) monthly total precipitation and average monthly temperature data recorded at the station were downloaded. A monthly average of the ten years of precipitation and temperature data was then used as HELP model inputs to synthetically generate precipitation and temperature data based on the HELP model default values of Tampa, Florida. The evapotranspiration latitude value was adjusted from the default HELP model default value for Tampa (27.58° to 28.47°).

2.2.2 Design Data and Layers Arrangement in HELP Model Run

Figure 2-1 schematically illustrates the layer arrangement used in the HELP model to evaluate infiltration rates from pavement layer. The same layer arrangement and design properties were used as Townsend and Roessler (2014), except that pavement layer thicknesses of 4 inchs and 2 inchs were used. In Figure 2-1, Layer 3, represents the pavement layer. Other layers are imaginary layers placed above and below the pavement layer to estimate the infiltration rate from the pavement layer.

As discussed in Townsend and Roessler (2014), the HELP model uses the SCS runoff curve method to estimate the surface runoff from a rainfall event and assumes the remaining rainfall infiltrates the topmost layer. The model does not account for the depth of water buildup on the top of the surface, which is the driving force for infiltration into the pavement material. Therefore, to better estimate the infiltration from the pavement layer, an imaginary 4-inch thick layer of high hydraulic conductivity (1,000

cm/sec) with a 2% slope (slope of the proposed road) was placed as a lateral drainage layer (layer 2) over the pavement layer (Layer 3). The drainage collected was considered as runoff from the pavement layer, and the water depth on the imaginary layer provide the subsequent infiltration into the pavement layer. An imaginary vertical percolation layer (Layer 1) with high hydraulic conductivity (1,000 cm/sec) was placed over the imaginary lateral drainage layer (Layer 2) as used by Townsend and Roessler (2014). The high hydraulic conductivity of the layers was selected to provide unrestricted flow of water. Below Layer 2, the pavement layer was placed as a barrier layer (Layer 3). The thickness of the pavement layer was provided set to 2 inches or 4 inches. The hydraulic conductivity of the pavement layer was modeled for different values ranging from $1x10^{-7}$ cm/sec to $1x10^{-3}$ cm/sec as suggested by Townsend and Roessler (2014). To collect the water infiltrated through the pavement layer, an imaginary lateral drainage layer followed by a geomembrane was placed below the pavement layer. The other HELP model input details such as porosity, field capacity, wilting point, and initial soil water content of each layer can be found in the HELP model run outputs attached in Appendix A.

A total of 11 HELP model runs were performed for each selected thickness (2 inches and 4 inches) of pavement layer by varying pavement layer hydraulic conductivity in the range of $1x10^{-7}$ cm/sec to $1x10^{-3}$ cm/sec as used by Townsend and Roessler (2014). To perform a conservative HELP model run such that all the water infiltrates through the topmost imaginary layer, an SCS runoff curve number of zero and fraction of the area allowing runoff of zero was provided. HELP model runs were performed for ten years durations and an average annual total of lateral drainage collected from Layer 4 for years 1 through 10 was used as the infiltration rate from the pavement layer.

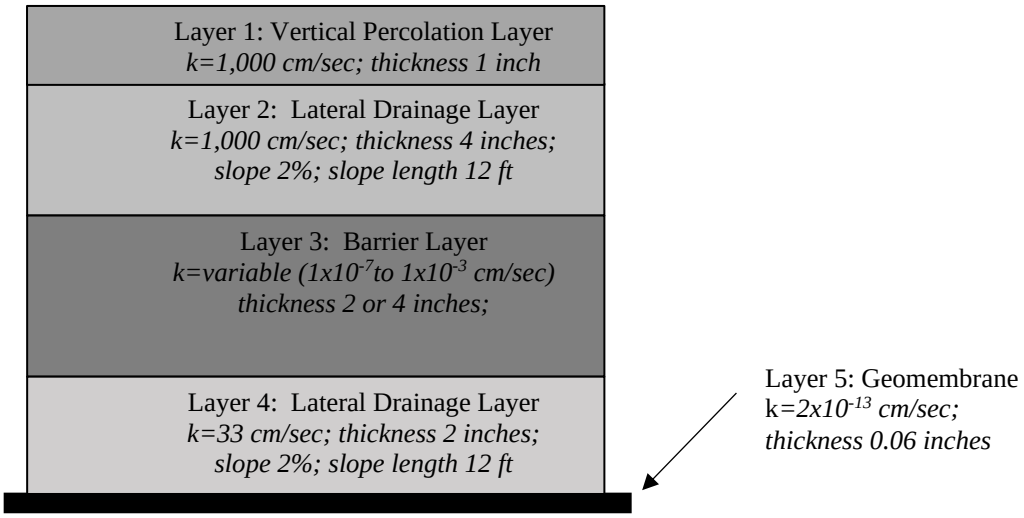

Figure 2-1. Layer Arrangement for HELP Modeling

2.3 Results and Discussion

Table 2-1 shows the infiltration rate from a 4-inch and 2-inch thick pavement surface at different hydraulic conductivities as estimated by the HELP model. The HELP model estimated an average annual precipitation of 46.31 inches.

Table 2-1. Average Annual Infiltration Rate through Paved Surfaces at Different Hydraulic Conductivities and Thickness of 4-inch and 2-inch as Estimated using HELP Model

Hydraulic Conductivity (cm/sec)	4-inch Pavement		2-inch Pavement	
	Infiltration (inches/year)	% Infiltration*	Infiltration (inches/year)	% Infiltration*
1.00E-03	10.745	21.0%	10.779	21.0%
5.00E-04	9.468	18.5%	9.487	18.5%
1.00E-04	8.059	15.7%	8.063	15.7%
5.00E-05	6.986	13.6%	6.988	13.6%
2.50E-05	5.166	10.1%	5.167	10.1%
1.00E-05	3.453	6.7%	3.454	6.7%
5.00E-06	1.991	3.9%	1.990	3.9%
2.50E-06	1.246	2.4%	1.248	2.4%
1.00E-06	0.535	1.0%	0.535	1.0%
5.00E-07	0.266	0.5%	0.266	0.5%
1.00E-07	0.066	0.1%	0.066	0.1%

* % infiltration= $\frac{Infiltration\ Rate\ (inch/year)\times 100}{Average\ Annual\ Precipitation\ (inch/year)}$

Average Annual Precipitation = 51.27 inch/year

As expected; the infiltration rate increased with the increase in hydraulic conductivity of the paved surface. The estimated infiltration ranged from 0.1% of average annual precipitation at a hydraulic conductivity $1.0x10^{-7}$ cm/sec to 21% at a hydraulic conductivity $1.0x10^{-3}$ cm/sec at 4-inch and 2-inch pavement thickness, respectively. Townsend and Roessler (2014) observed similar results for a 4-inch thick paved surface. At hydraulic conductivities less than or equal to $1.0x10^{-5}$ cm/sec, the estimated infiltration rate was the same between a 4-inch and a 2-inch thick pavement layer. At hydraulic conductivities in the range of $1.0x10^{-4}$ cm/sec to $1.0x10^{-3}$ cm/sec the difference in infiltration rate between the 4-inch and 2-inch thick pavement layer varied from 0.004 inches/year to 0.03 inch/year.

The HELP model estimates evapotranspiration, which is the sum of evaporation and transpiration (water loss from plant leaves). Since there will not be any transpiration from the pavement layer, the HELP model evapotranspiration estimate can be considered an estimate of evaporation. As discussed by Townsend and Roessler (2014), the HELP model estimates evapotranspiration only from the top layer and the estimated infiltration rate in these HELP model runs did not account for any evaporation from the top of the pavement layer, which would cause the actual infiltration through the pavement layer to be smaller. Townsend and Roessler (2014) estimated that the percentage of evaporation (using evapotranspiration estimates) relative to the sum of evaporation and infiltration ranges between 76% to 98% from a 4-inch pavement layer with hydraulic conductivities ranging between $1.0x10^{-3}$ cm/sec and $5.0x10^{-5}$ cm/sec. Considering infiltration rates from 4-inch and 2-inch thick pavement layers are similar, the evaporation from a 2-inch thick pavement layer can also be considered to vary in a similar range of 76% to 98% for the same climatic conditions.

For a well-constructed asphalt pavement road, the hydraulic conductivity can be expected to be less than $1.0x10^{-4}$ cm/sec (Townsend and Roessler, 2014). Considering pavement layer hydraulic conductivity as $1.0x10^{-4}$ cm/sec and a conservative evaporation rate of 75%, the estimated amount of infiltration from a 2-inch thick pavement layer is estimated to be 3.9% of total annual precipitation.

Townsend and Roessler (2014) selected a 10% infiltration rate from the pavement layer as a conservative infiltration rate to determine the impact of infiltrated water on human health and the environment. Based on US EPA's Industrial Waste Management Evaluation Model (IWEM) with extensive information on geological and hydrological data for various US cities, a 10% infiltration rate would be a very high infiltration rate from the pavement layer. IWEM has a default aquifer recharge rate for coarse-grained soil condition in Tampa (the closest default city in IWEM to the County) as 4.1 inches per year whereas the selected 10% infiltration rate corresponds to approximately 5.1 inches of infiltration per year. This implies the pavement infiltration rate is 1 inch per year greater than the IWEM default aquifer recharge rate for nearby unpaved areas.

Townsend and Roessler (2014) estimated that leachate generated from the road base at a 10% infiltration rate of annual precipitation should be diluted by a factor of six or more under most of the surficial aquifer conditions applicable to the County and would not pose a significant threat to human health and the environment. At a conservative estimate of 75% evaporation rate, the infiltration rate from a well-constructed 2-inch thick pavement layer is approximately 2 inches per year, which is less than half of the 10% infiltration rate. Therefore, it can be safely assumed that the leachate emanated from a road base overlaid by 2-inch thick pavement layer would also not pose a significant threat to human health and the environment in similar environmental conditions.

3 Groundwater Quality at Pavement Test Strips

3.1 Overview

This section provides an evaluation of the potential impact on groundwater quality due to rainwater infiltration through the pavement and base course materials. As presented in Section 2, the change in pavement layer thickness from 4-inch to 2 inch did not show significant variation in the infiltration rates; therefore, it was assumed that a 2-inch thick pavement layer would show a similar groundwater impact as the test strip constructed at the Facility. As discussed previously, the Facility has a total of five pavement test strips with variable thickness (2 to 8 inches) and configuration of material. The test strip has five upgradient, and ten downgradient groundwater monitoring wells and groundwater quality is monitored quarterly. This section discusses the groundwater quality of these monitoring wells based on a recent groundwater quality monitoring event.

3.2 Sample Collection and Analysis

IWCS reviewed the data for the samples collected from each well and analyzed by the Pasco County Environmental Laboratory, New Port Richey, Florida and the Pace Analytical Services, LLC, Ormond Beach, Florida. One sample was collected from each well between November 8, 2017 to November 16, 2017 and analyzed between November 8, 2017 and December 1, 2017. The samples were analyzed for a maximum of 76 parameters including field parameters (e.g., pH, conductivity, turbidity, etc.), anions (nitrate and chloride), ammonia, total dissolved solids (TDS), metals, and volatile organic carbon (VOC). IWCS did not collect or analyze the samples discussed herein.

3.3 Groundwater Monitoring Results and Discussion

Table 3-1 summarizes all the field parameter results for upgradient and downgradient wells. As shown in Figure 1-1 and Table 1-2, Wells 1, 2, 5, 6, 9, and 10 are at groundwater downgradient of the test strips that have bottom ash as one of the component material and Wells 3, 4, 7, and 8 are downgradient of the control test strips. The average pH and conductivity of wells downgradient to the test strips with or without bottom ash as a component were observed to be slightly higher than those of the upgradient wells. The average turbidity in the upgradient wells was 2.89 NTU, which was 0.92 NTU lower than the average turbidity of wells downgradient to the test strips with bottom ash as a component and 1.14 NTU higher than the wells downgradient to the control test strips. The average dissolved oxygen concentration in upgradient wells was slightly higher than the wells downgradient to the test strips with or without bottom ash.

Table 3-2 summarizes results of all the parameters that were observed above the respective method detection limit (MDL) in at least one of the wells. Table 3-2 also provides a total number of parameters analyzed in each well along with the percent of parameters that were observed below their respective MDLs. Ammonia and nitrate were below their respective MDL in all the upgradient wells. Ammonia was measured above its MDL in three of the six downgradient wells that have bottom ash as one of the components and three of the four wells downgradient to control strips. Similarly, nitrate was measured above its MDL in four downgradient wells that have bottom ash as one of the components and in all wells downgradient to control strips. The observed nitrate concentrations were below Florida's risk-based groundwater cleanup target levels (GCTLs) as established by the FDEP in Chapters 62-320 and 62-777, FAC.

The measured concentration of chloride and sodium were above their MDL in all the wells. The upgradient wells observed an average chloride concentration of 7.38 mg/L, which was 0.17 mg/L more than the

average chloride concentration in wells downgradient to the test strips that have bottom ash as one of the components. The observed average chloride concentration in wells downgradient to control test strips was 3.33 mg/L less than the average chloride concentration in upgradient wells. Similar to chloride, average sodium was also slightly higher in wells downgradient to the test strips that have bottom ash as one of the components and lower in wells downgradient to the control test strips than upgradient wells. The total dissolved solids concentration was above its MDL in all the wells except two downgradient wells. Barium, copper, iron, zinc, and chloroform were detected above their respective MDL in at least one upgradient or downgradient well. Regardless of the measured concentrations that were above their respective MDL, all the observed concentrations in all the wells were below their respective GCTL.

Based on the bottom ash leaching test, Townsend and Roessler (2014) observed aluminum (Al), antimony (Sb), and molybdenum (Mo) as a constituent of concern (COCs) that exceeded their respective GCTL. During November 2017 sampling event, the groundwater samples were analyzed only for Sb among the COCs, and all the samples had Sb concentrations below its MDL of 0.50 µg/L. Concentration of Al and Mo were not measured in this monitoring event.

Based on the November 2017 sampling event, there is no significant impact on groundwater quality from the test strips constructed using various combination of materials with or without bottom ash was observed. The application of a 2-inch thick pavement layer over treated bottom ash base course should show a similar impact on the groundwater quality.

Table 3-1. Results of Field Parameters for Upgradient and Downgradient Wells

Well #	Groundwater Gradient	pH	Conductivity	Dissolved Oxygen	Temperature	Turbidity	Color by Observation	Water Level
Unit		SU	µmhos/cm	mg/L	°C	NTU		ft
GCTL		6.5-8.5	-	-	-	-	-	-
Detection Limit		0.1	1	0.01	0	0.11	-	-
Well 11	UG	4.07	82.9	5.74	24.40	0.09	Clear	26.74
Well 12	UG	4.55	56.1	5.20	24.20	0.79	Clear	24.75
Well 13	UG	4.56	44.4	5.56	24.50	0.08	Clear	24.18
Well 14	UG	4.72	42	4.88	23.47	1.20	Clear	21.29
Well 15	UG	6.39	82	5.56	23.73	12.3	Clear	22.73
Average Concentration in UG		**4.89**	**61.48**	**5.39**	**24.06**	**2.89**	-	**23.94**
Well 1	DG	6.86	140	6.54	25.59	18.1	Gray	22.85
Well 2	DG	5.01	23	5.41	25.8	0.3	Clear	23.95
Well 5	DG	6.48	87.8	5.02	24.89	0.36	Clear	24.13
Well 6	DG	6.15	91.1	4.88	25.23	3.9	Clear	24.58
Well 9	DG	4.16	70.32	4.18	24.70	0.12	Clear	25.64
Well 10	DG	4.58	80.5	5.38	25.00	0.09	Clear	26.71
Average Concentration in DG to Test Strips 1, 3, and 5		**5.54**	**82.1**	**5.24**	**25.20**	**3.81**		**24.64**
Well 3	DG	4.95	37	4.96	26.16	3.1	Clear	21.80
Well 4	DG	4.76	42	4.14	25.12	0.90	Clear	23.86
Well 7	DG	6.01	142	5.39	25.41	1.2	Clear	20.26
Well 8	DG	5.82	68.4	4.68	25.22	1.8	Clear	21.50
***Average Concentration in DG to Test Strips 2, and 4**		**5.39**	**72.4**	**4.79**	**25.48**	**1.75**	-	**21.86**

UG - Upgradient wells; DG - Downgradient wells; GCTL - Groundwater Cleanup Target Level; Test Strips 1, 3, and 5 has bottom ash as one of the component; Test Strips 2 and 4 are control strips without any bottom ash

Table 3-2. Results of Laboratory Parameters Observed Above Method Detection Limit in at least One Well

Well #	Groundwater Gradient Direction	Number of Parameters Analyzed	Parameters below MDL (%)	Ammonia (as N)	Nitrate (as N)	Chloride	Sodium	Total Dissolved Solids	Barium	Copper	Iron	Zinc	Chloroform
Unit				mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
GCTL				-	10	250	160	500	2000	1000	300	5000	70
Method Detection Limit				0.05	0.04	0.1	0.5	10	5	2.5	20	10	0.5
Well 11	UG	69	93%	U	U	13.6	6.8	45	9.7	3.2	U	U	U
Well 12	UG	69	94%	U	U	7.99	3.2	34	U	U	U	21.7	U
Well 13	UG	69	96%	U	U	6.04	3.9	26	U	U	U	U	U
Well 14	UG	69	94%	U	U	8.4	3.9	29	7.5	U	U	U	U
Well 15	UG	69	96%	U	U	0.85	1.2	56	U	U	U	U	U
***Average Concentration in UG Well**				**-**	**-**	**7.38**	**3.8**	**38**	**8.6**	**3.2**		**21.7**	**-**
Well 1	DG to Strip 1	67	88%	0.16	0.25	6.64	5.1	68	6.9	U	191	U	1.1
Well 2	DG to Strip 1	67	96%	U	0.17	2.46	1.8	U	U	U	U	U	U
Well 5	DG to Strip 3	69	93%	0.07	0.19	7.78	4.9	48	U	U	U	U	U
Well 6	DG to Strip 3	69	91%	0.13	0.26	6.78	4.5	62	5.1	U	U	U	U
Well 9	DG to Strip 5	69	94%	U	U	8.86	7.2	37	U	U	U	U	0.63
Well 10	DG to Strip 5	69	94%	U	U	12.8	7.3	43	7.1	U	U	U	U
***Average Concentration in DG to Test Strips 1, 3, and 5**				**0.12**	**0.22**	**7.55**	**5.1**	**51.6**	**6.37**	**-**	**191**		**0.87**
Well 3	DG to Strip 2	67	93%	0.18	0.69	2.39	2.3	U	5.8	U	U	U	U
Well 4	DG to Strip 2	69	93%	1.39	0.59	4.47	4.2	24.47	U	U	U	U	U
Well 7	DG to Strip 4	69	93%	0.13	0.27	4.5	4.3	52	U	U	U	U	U
Well 8	DG to Strip 4	69	94%	U	0.04	4.82	3.9	38	U	U	U	U	U
***Average Concentration in DG to Test Strips 2, and 4**				**0.57**	**0.40**	**4.05**	**3.68**	**38.16**	**5.80**	-	**-**	-	**-**

*Average of the detected concentration

UG - Upgradient wells; DG - Downgradient wells; GCTL - Groundwater Cleanup Target Level; U-Measured concentration below method detection limit; MDL-Method Detection Limit; Test Strips 1, 3, and 5 has bottom ash as one of the component; Test Strips 2 and 4 are control strips without any bottom ash

4 Summary and Conclusions

The PCU has been granted an approval from the FDEP to reuse the bottom ash generated at the Facility in several road base and structural base applications under a series of prescribed conditions. One of the approved reuses of bottom ash is in road base course with an overlying asphalt pavement layer with a thickness of 4-inch or more. The PCU is reconsidering this thickness of pavement layer and wanted to evaluate the technical feasibility of applying a minimum of 2-inch thick pavement layer above the base course. This report provides a technical evaluation for the suitability of the application of a 2-inch thick pavement layer above the base course such that it does not pose any significant threat to human health and the environment as compared a 4-inch thick pavement layer above the base course. The technical evaluation was performed based on infiltration rates generated from a 2-inch thick pavement layer as compared to a 4-inch thick pavement layer. The potential impact on groundwater quality was also analyzed based on the samples collected at monitoring wells located at the Facilities pavement test strips.

No significant difference in infiltration rate between a 4-inch and 2-inch thick pavement layer was observed. Considering the hydraulic conductivity of a well-conditioned pavement layer is less than $1x10^{-4}$ cm/sec, a 2-inch thick paved surface should have approximately 15.7% infiltration of rainwater which is similar to a 4-inch thick paved surface. At a conservative estimate of evaporation rate (75%), the infiltration rate from a well-constructed 2-inch thick pavement layer would be approximately 3.9% of total annual precipitation. The leached material from the base course is also expected to naturally dilute to a minimum of six times based on surficial aquifer conditions applicable to the County. Additionally, based on the groundwater quality analyzed at the monitoring wells installed at the test strips for the samples collected in November 2017, none of the analyzed parameters exceeded their respective GCTL. The concentration of Sb, which was a COC observed by Townsend and Roessler (2014), was below its MDL in all the wells. Therefore, considering the rainwater infiltration rate, evaporation rate, natural dilution of leached material, and no observed significant impact on groundwater quality at the test strips, the leachate emanated from the road base overlaid by a 2-inch thick asphalt pavement layer should have a similar human health and environmental impact as that of with a 4-inch thick pavement surface above base course.

5 References

FDEP (2014a). Approval of Specified Materials for Recycling and Reuse of Treated Bottom Ash Residue from the Pasco County Resource Recovery Facility, WACS ID No. 26254

FDEP (2014b). Permit Number 26254-004-SO-21, issued to Pasco County Resource Recovery Facility (Facility WACS ID 45799) by Florida Department of Environmental Protection, March 5, 2014

FDEP (2016). Amendment to Approval of Standing Beneficial Use of Encapsulated Bottom Ash Generated by the Pasco County Resource Recovery Facility, Additional Uses Request. WACS ID No. 45799

NOAA (2018). National Weather Service Forecast Office. http://w2.weather.gov/climate/xmacis.php?wfo=tbw. Data Accessed on December 18, 2017.

Townsend, T.G., and Roessler, J. (2014). Pasco County Use Case Scenarios to Examine the Recycling of Waste to Energy Bottom Ash in Road Construction Applications. A Reported Prepared for Pasco County Utilities, Florida.

Appendix -A

HELP Model Outputs

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD16.D10

OUTPUT DATA FILE: \PASCOP16.OUT

TIME: 15:39 DATE: 4/ 2/2018

****

TITLE: PASCO ROAD INFILTRATION

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.100000001000E-06 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.147 INCHES

TOTAL INITIAL WATER = 0.147 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35

STD. DEVIATIONS 2.13 0.95 2.36 2.46 2.61 4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.2547 1.8476 3.2860 2.3468 3.0728 6.7512

8.8620 9.4376 5.4122 4.1639 1.3763 1.3374

STD. DEVIATIONS 2.1385 0.9441 2.3328 2.4520 2.5974 4.9095

3.4838 3.2023 3.1099 2.1644 0.9599 0.6708

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.0046 0.0051 0.0036 0.0024 0.0036 0.0067

0.0098 0.0094 0.0069 0.0067 0.0028 0.0040

STD. DEVIATIONS 0.0025 0.0024 0.0015 0.0021 0.0024 0.0035

0.0024 0.0031 0.0022 0.0035 0.0017 0.0024

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.0046 0.0051 0.0036 0.0024 0.0036 0.0067

0.0098 0.0094 0.0069 0.0067 0.0028 0.0040

STD. DEVIATIONS 0.0025 0.0024 0.0015 0.0021 0.0024 0.0035

0.0024 0.0031 0.0022 0.0035 0.0017 0.0024

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

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DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0057 0.0035 0.0058 0.0043 0.0054 0.0119

0.0156 0.0167 0.0099 0.0073 0.0025 0.0024

STD. DEVIATIONS 0.0038 0.0018 0.0041 0.0045 0.0046 0.0082

0.0061 0.0057 0.0056 0.0037 0.0017 0.0012

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

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	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 51.14826 (6.93520)
185668.187 99.76645

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 0.06563 (0.00865)
238.252 0.12802

LAYER 3

AVERAGE HEAD ON TOP 0.008 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 0.06563 (0.00865)
238.251 0.12802

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.000 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0265)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.91735	21479.99610
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.001712	6.21396
AVERAGE HEAD ON TOP OF LAYER 3	0.211	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.2 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.00171	6.21396
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.000	
MAXIMUM HEAD ON TOP OF LAYER 5	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.1000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD15.D10

OUTPUT DATA FILE: \PASCOP15.OUT

TIME: 15:32 DATE: 4/ 2/2018

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TITLE: PASCO ROAD INFILTRATION

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.499999999000E-06 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.147 INCHES

TOTAL INITIAL WATER = 0.147 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35

STD. DEVIATIONS 2.13 0.95 2.36 2.46 2.61 4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.2428 1.8365 3.2716 2.3405 3.0624 6.7285

8.8287 9.4090 5.3922 4.1401 1.3680 1.3272

STD. DEVIATIONS 2.1376 0.9427 2.3303 2.4498 2.5927 4.9014

3.4798 3.1948 3.1070 2.1629 0.9544 0.6637

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.0165 0.0177 0.0163 0.0088 0.0139 0.0294

0.0434 0.0376 0.0306 0.0269 0.0110 0.0142

STD. DEVIATIONS 0.0080 0.0079 0.0062 0.0069 0.0084 0.0125

0.0085 0.0123 0.0088 0.0143 0.0079 0.0100

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.0165 0.0177 0.0163 0.0088 0.0139 0.0294

0.0434 0.0376 0.0306 0.0269 0.0110 0.0142

STD. DEVIATIONS 0.0080 0.0079 0.0062 0.0069 0.0084 0.0125

0.0085 0.0123 0.0088 0.0143 0.0079 0.0100

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0057 0.0035 0.0057 0.0043 0.0054 0.0118

0.0156 0.0166 0.0098 0.0073 0.0025 0.0023

STD. DEVIATIONS 0.0038 0.0017 0.0041 0.0045 0.0046 0.0082

0.0061 0.0057 0.0056 0.0038 0.0017 0.0012

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0001 0.0001 0.0001 0.0000 0.0001 0.0001

0.0002 0.0002 0.0002 0.0001 0.0001 0.0001

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0001

0.0000 0.0001 0.0000 0.0001 0.0000 0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048) 194.50 0.105

LATERAL DRAINAGE COLLECTED 50.94762 (6.92535) 184939.859 99.37509

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 0.26629 (0.02834) 966.621 0.51940

LAYER 3

AVERAGE HEAD ON TOP 0.008 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 0.26629 (0.02834) 966.621 0.51940

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000) 0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.000 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0261) 1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.91392	21467.51760
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.007711	27.99021
AVERAGE HEAD ON TOP OF LAYER 3	0.211	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.00771	27.99021
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.001	
MAXIMUM HEAD ON TOP OF LAYER 5	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.1000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD14.D10

OUTPUT DATA FILE: \PASCOP14.OUT

TIME: 15:25 DATE: 4/ 2/2018

****

TITLE: PASCO ROAD INFILTRATION

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.999999997000E-06 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.147 INCHES

TOTAL INITIAL WATER = 0.147 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.2289 1.8186 3.2605 2.3308 3.0464 6.7026

8.7915 9.3534 5.3589 4.1185 1.3546 1.3144

STD. DEVIATIONS 2.1342 0.9352 2.3247 2.4468 2.5843 4.8941

3.4753 3.1680 3.1075 2.1505 0.9469 0.6587

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.0303 0.0342 0.0289 0.0187 0.0297 0.0554

0.0857 0.0882 0.0605 0.0520 0.0243 0.0271

STD. DEVIATIONS 0.0156 0.0149 0.0125 0.0162 0.0193 0.0209

0.0171 0.0350 0.0154 0.0212 0.0190 0.0166

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.0303 0.0342 0.0289 0.0187 0.0297 0.0554

0.0857 0.0882 0.0605 0.0520 0.0243 0.0271

STD. DEVIATIONS 0.0156 0.0149 0.0125 0.0162 0.0193 0.0209

0.0171 0.0350 0.0154 0.0212 0.0190 0.0166

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

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DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0056 0.0034 0.0057 0.0043 0.0053 0.0118

0.0153 0.0164 0.0097 0.0072 0.0025 0.0023

STD. DEVIATIONS 0.0038 0.0017 0.0041 0.0044 0.0045 0.0082

0.0061 0.0056 0.0056 0.0038 0.0017 0.0012

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0001 0.0002 0.0001 0.0001 0.0001 0.0003

0.0004 0.0004 0.0003 0.0002 0.0001 0.0001

STD. DEVIATIONS 0.0001 0.0001 0.0001 0.0001 0.0001 0.0001

0.0001 0.0002 0.0001 0.0001 0.0001 0.0001

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

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	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 50.67898 (6.90445)
183964.687 98.85110

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 0.53493 (0.05930)
1941.784 1.04339

LAYER 3

AVERAGE HEAD ON TOP 0.007 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 0.53493 (0.05930)
1941.784 1.04339

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.000 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0257)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.90962	21451.91800
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.017046	61.87750
AVERAGE HEAD ON TOP OF LAYER 3	0.211	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.1 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.01705	61.87750
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.003	
MAXIMUM HEAD ON TOP OF LAYER 5	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.1000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD22.D10

OUTPUT DATA FILE: \PASCOP22.OUT

TIME: 15:17 DATE: 4/ 2/2018

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TITLE: PASCO ROAD INFILTRATION

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.249999994000E-05 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.147 INCHES

TOTAL INITIAL WATER = 0.147 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35

STD. DEVIATIONS 2.13 0.95 2.36 2.46 2.61 4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.1858 1.7748 3.2314 2.3054 3.0042 6.6112

8.6806 9.2336 5.2858 4.0389 1.3309 1.2830

STD. DEVIATIONS 2.1300 0.9095 2.3104 2.4336 2.5685 4.8827

3.4426 3.1365 3.0997 2.1298 0.9315 0.6301

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.0731 0.0778 0.0582 0.0446 0.0714 0.1471

0.1965 0.2077 0.1333 0.1318 0.0481 0.0588

STD. DEVIATIONS 0.0374 0.0438 0.0301 0.0333 0.0378 0.0652

0.0559 0.0624 0.0391 0.0494 0.0353 0.0440

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.0731 0.0778 0.0582 0.0446 0.0714 0.1471

0.1965 0.2077 0.1333 0.1318 0.0481 0.0588

STD. DEVIATIONS 0.0374 0.0438 0.0301 0.0333 0.0378 0.0652

0.0559 0.0624 0.0391 0.0494 0.0353 0.0440

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0055 0.0033 0.0057 0.0042 0.0052 0.0114

0.0151 0.0160 0.0094 0.0070 0.0024 0.0022

STD. DEVIATIONS 0.0038 0.0016 0.0040 0.0044 0.0045 0.0081

0.0059 0.0054 0.0056 0.0036 0.0017 0.0011

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0004 0.0004 0.0003 0.0002 0.0003 0.0007

0.0009 0.0010 0.0007 0.0006 0.0002 0.0003

STD. DEVIATIONS 0.0002 0.0002 0.0001 0.0002 0.0002 0.0003

0.0003 0.0003 0.0002 0.0002 0.0002 0.0002

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 49.96552 (6.87178)
181374.812 97.45947

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 1.24838 (0.16866)
4531.624 2.43501

LAYER 3

AVERAGE HEAD ON TOP 0.007 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 1.24838 (0.16866)
4531.624 2.43501

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.001 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0246)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.89673	21405.12110
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.038366	139.26851
AVERAGE HEAD ON TOP OF LAYER 3	0.211	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.3 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.03837	139.26851
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.006	
MAXIMUM HEAD ON TOP OF LAYER 5	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

****

FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.1000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD13.D10

OUTPUT DATA FILE: \PASCOP13.OUT

TIME: 15:11 DATE: 4/ 2/2018

****

TITLE: PASCO ROAD INFILTRATION

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.499999987000E-05 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.147 INCHES

TOTAL INITIAL WATER = 0.147 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.1495 1.7370 3.1827 2.2875 2.9547 6.5188

8.5666 9.1260 5.1921 3.9794 1.2939 1.2355

STD. DEVIATIONS 2.1027 0.8972 2.2954 2.4044 2.5422 4.8156

3.3880 3.0981 3.0757 2.0848 0.9065 0.5807

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.1090 0.1165 0.1060 0.0648 0.1186 0.2376

0.3129 0.3176 0.2242 0.1920 0.0844 0.1067

STD. DEVIATIONS 0.0546 0.0638 0.0447 0.0537 0.0692 0.1148

0.1172 0.1245 0.0560 0.0983 0.0598 0.0968

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.1090 0.1165 0.1060 0.0648 0.1186 0.2376

0.3129 0.3176 0.2242 0.1920 0.0844 0.1067

STD. DEVIATIONS 0.0546 0.0638 0.0447 0.0537 0.0692 0.1148

0.1172 0.1245 0.0560 0.0983 0.0598 0.0968

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0054 0.0032 0.0055 0.0041 0.0050 0.0120

0.0147 0.0156 0.0091 0.0068 0.0023 0.0021

STD. DEVIATIONS 0.0037 0.0016 0.0040 0.0043 0.0044 0.0093

0.0058 0.0053 0.0054 0.0036 0.0016 0.0009

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0005 0.0006 0.0005 0.0003 0.0006 0.0012

0.0015 0.0015 0.0011 0.0009 0.0004 0.0005

STD. DEVIATIONS 0.0003 0.0003 0.0002 0.0003 0.0003 0.0006

0.0006 0.0006 0.0003 0.0005 0.0003 0.0005

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 49.22369 (6.79300)
178682.016 96.01251

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 1.99021 (0.25351)
7224.455 3.88197

LAYER 3

AVERAGE HEAD ON TOP 0.007 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 1.99021 (0.25351)
7224.455 3.88197

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.001 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0226)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.48480	19909.80660
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.076969	279.39749
AVERAGE HEAD ON TOP OF LAYER 3	0.406	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.2 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.07697	279.39749
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.011	
MAXIMUM HEAD ON TOP OF LAYER 5	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	1.9 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.1000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD12.D10

OUTPUT DATA FILE: \PASCOP12.OUT

TIME: 15: 4 DATE: 4/ 2/2018

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TITLE: PASCO ROAD INFILTRATION

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.999999975000E-05 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.147 INCHES

TOTAL INITIAL WATER = 0.147 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.0524 1.6905 3.0703 2.2103 2.8408 6.3916

8.2952 8.8177 5.0688 3.8718 1.2446 1.2059

STD. DEVIATIONS 2.0213 0.8797 2.2305 2.4030 2.4725 4.7984

3.3190 3.0458 3.0367 2.0586 0.8682 0.5899

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.2052 0.1637 0.2211 0.1375 0.2335 0.3648

0.5850 0.6208 0.3551 0.2962 0.1337 0.1372

STD. DEVIATIONS 0.1584 0.0818 0.1227 0.1262 0.1675 0.1681

0.1853 0.2133 0.1075 0.1311 0.0992 0.0914

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.2052 0.1637 0.2211 0.1375 0.2335 0.3648

0.5850 0.6208 0.3551 0.2962 0.1337 0.1372

STD. DEVIATIONS 0.1584 0.0818 0.1227 0.1262 0.1675 0.1681

0.1853 0.2133 0.1075 0.1311 0.0992 0.0914

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0051 0.0031 0.0052 0.0039 0.0047 0.0116

0.0138 0.0147 0.0088 0.0065 0.0021 0.0020

STD. DEVIATIONS 0.0033 0.0016 0.0038 0.0043 0.0042 0.0093

0.0055 0.0052 0.0053 0.0035 0.0015 0.0009

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0010 0.0009 0.0011 0.0007 0.0011 0.0018

0.0028 0.0030 0.0018 0.0014 0.0007 0.0007

STD. DEVIATIONS 0.0008 0.0004 0.0006 0.0006 0.0008 0.0008

0.0009 0.0010 0.0005 0.0006 0.0005 0.0004

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 47.76003 (6.51081)
173368.922 93.15759

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 3.45387 (0.57683)
12537.544 6.73689

LAYER 3

AVERAGE HEAD ON TOP 0.007 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 3.45387 (0.57683)
12537.544 6.73689

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.001 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0187)
1.87 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.48379	19906.15430
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.153595	557.54938
AVERAGE HEAD ON TOP OF LAYER 3	0.406	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.15359	557.54938
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.023	
MAXIMUM HEAD ON TOP OF LAYER 5	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.1000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD20.D10

OUTPUT DATA FILE: \PASCOP20.OUT

TIME: 14:57 DATE: 4/ 2/2018

****

TITLE: PASCO ROAD INFILTRATION

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.249999994000E-04 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.147 INCHES

TOTAL INITIAL WATER = 0.147 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.0207 1.6157 2.8918 2.1506 2.7528 6.2134

7.9276 8.4808 4.9010 3.8013 1.1315 1.1597

STD. DEVIATIONS 2.0215 0.8136 2.1457 2.3520 2.5051 4.7460

3.2727 2.9422 2.9172 1.9749 0.7653 0.5657

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.2329 0.2421 0.3980 0.1998 0.3205 0.5450

0.9507 0.9609 0.5198 0.3692 0.2443 0.1839

STD. DEVIATIONS 0.1606 0.1686 0.2250 0.1836 0.3073 0.3266

0.2984 0.4398 0.2358 0.2216 0.2126 0.1331

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.2329 0.2421 0.3980 0.1998 0.3205 0.5450

0.9507 0.9609 0.5198 0.3692 0.2443 0.1839

STD. DEVIATIONS 0.1606 0.1686 0.2250 0.1836 0.3073 0.3266

0.2984 0.4398 0.2358 0.2216 0.2126 0.1331

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0052 0.0030 0.0048 0.0038 0.0048 0.0112

0.0131 0.0142 0.0085 0.0065 0.0018 0.0020

STD. DEVIATIONS 0.0035 0.0014 0.0036 0.0041 0.0043 0.0091

0.0057 0.0050 0.0049 0.0031 0.0012 0.0010

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0011 0.0013 0.0019 0.0010 0.0015 0.0027

0.0046 0.0046 0.0026 0.0018 0.0012 0.0009

STD. DEVIATIONS 0.0008 0.0009 0.0011 0.0009 0.0015 0.0016

0.0014 0.0021 0.0012 0.0011 0.0011 0.0006

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 46.04693 (6.16277)
167150.359 89.81613

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 5.16697 (0.92874)
18756.109 10.07836

LAYER 3

AVERAGE HEAD ON TOP 0.007 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 5.16697 (0.92874)
18756.109 10.07836

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.002 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0168)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.41310	19649.55860
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.780826	2834.39868
AVERAGE HEAD ON TOP OF LAYER 3	0.398	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.1 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.78083	2834.39868
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.116	
MAXIMUM HEAD ON TOP OF LAYER 5	0.005	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.1 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.1000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD11.D10

OUTPUT DATA FILE: \PASCOP11.OUT

TIME: 14:47 DATE: 4/ 2/2018

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TITLE: PASCO ROAD INFILTRATION

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.499999987000E-04 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.147 INCHES

TOTAL INITIAL WATER = 0.147 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 2.9708 1.5989 2.7873 2.0591 2.6998 5.9837

7.4767 8.0294 4.6696 3.6619 1.1388 1.1501

STD. DEVIATIONS 1.9466 0.8025 2.0677 2.2355 2.4462 4.5887

3.0268 2.7459 2.7370 1.7798 0.8150 0.5626

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.2829 0.2589 0.5067 0.2870 0.3735 0.7747

1.4078 1.4062 0.7557 0.5040 0.2370 0.1935

STD. DEVIATIONS 0.2162 0.1728 0.3269 0.2772 0.3393 0.4539

0.9097 0.7619 0.3957 0.4163 0.2036 0.1332

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.2829 0.2589 0.5067 0.2870 0.3735 0.7747

1.4078 1.4062 0.7557 0.5040 0.2370 0.1935

STD. DEVIATIONS 0.2162 0.1728 0.3269 0.2772 0.3393 0.4539

0.9097 0.7619 0.3957 0.4163 0.2036 0.1332

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0052 0.0031 0.0047 0.0036 0.0047 0.0110

0.0129 0.0136 0.0083 0.0064 0.0021 0.0020

STD. DEVIATIONS 0.0033 0.0015 0.0034 0.0038 0.0042 0.0085

0.0051 0.0044 0.0047 0.0030 0.0015 0.0010

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0009 0.0009 0.0016 0.0009 0.0012 0.0026

0.0045 0.0045 0.0025 0.0016 0.0008 0.0006

STD. DEVIATIONS 0.0007 0.0006 0.0010 0.0009 0.0011 0.0015

0.0029 0.0024 0.0013 0.0013 0.0007 0.0004

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 44.22604 (6.00765)
160540.531 86.26442

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 6.98785 (1.52138)
25365.914 13.63005

LAYER 3

AVERAGE HEAD ON TOP 0.006 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 6.98785 (1.52138)
25365.910 13.63005

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.001 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.002 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0168)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.32451	19327.98050
PERCOLATION/LEAKAGE THROUGH LAYER 3	1.648081	5982.53467
AVERAGE HEAD ON TOP OF LAYER 3	0.389	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.5 FEET	
DRAINAGE COLLECTED FROM LAYER 4	1.64808	5982.53467
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.164	
MAXIMUM HEAD ON TOP OF LAYER 5	0.010	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.2 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.1000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD10.D10

OUTPUT DATA FILE: \PASCOP10.OUT

TIME: 14:40 DATE: 4/ 2/2018

****

TITLE: PASCO ROAD INFILTRATION

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.999999975000E-04 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.147 INCHES

TOTAL INITIAL WATER = 0.147 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 2.9022 1.5739 2.6491 1.9440 2.6260 5.7899

7.1793 7.9313 4.7278 3.5627 1.1284 1.1367

STD. DEVIATIONS 1.8794 0.7989 1.9224 1.9811 2.2800 4.2966

2.6052 2.7876 2.8591 1.6292 0.8095 0.5574

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.3515 0.2839 0.6450 0.4022 0.4474 0.9684

1.7051 1.5042 0.6976 0.6032 0.2474 0.2068

STD. DEVIATIONS 0.2769 0.1857 0.5145 0.5033 0.4387 0.7443

1.1699 0.7997 0.3006 0.5814 0.2061 0.1379

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.3515 0.2839 0.6450 0.4022 0.4474 0.9684

1.7051 1.5042 0.6976 0.6032 0.2474 0.2068

STD. DEVIATIONS 0.2769 0.1857 0.5145 0.5033 0.4387 0.7443

1.1699 0.7997 0.3006 0.5814 0.2061 0.1379

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0052 0.0031 0.0047 0.0035 0.0046 0.0108

0.0126 0.0140 0.0086 0.0064 0.0021 0.0020

STD. DEVIATIONS 0.0033 0.0015 0.0034 0.0036 0.0038 0.0084

0.0044 0.0048 0.0051 0.0028 0.0015 0.0010

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0007 0.0006 0.0012 0.0008 0.0009 0.0019

0.0033 0.0029 0.0014 0.0012 0.0005 0.0004

STD. DEVIATIONS 0.0005 0.0004 0.0010 0.0010 0.0008 0.0015

0.0022 0.0015 0.0006 0.0011 0.0004 0.0003

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 43.15129 (5.32364)
156639.172 84.16808

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 8.06261 (1.78530)
29267.287 15.72641

LAYER 3

AVERAGE HEAD ON TOP 0.006 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 8.06261 (1.78529)
29267.287 15.72641

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.001 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.001 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0168)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.14923	18691.70310
PERCOLATION/LEAKAGE THROUGH LAYER 3	2.475956	8987.72168
AVERAGE HEAD ON TOP OF LAYER 3	0.370	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 4	2.47596	8987.72168
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.147	
MAXIMUM HEAD ON TOP OF LAYER 5	0.016	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.3 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.1000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCOSD9.D10

OUTPUT DATA FILE: \PASCOOP9.OUT

TIME: 14:32 DATE: 4/ 2/2018

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TITLE: PASCO ROAD INFILTRATION

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.500000024000E-03 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.147 INCHES

TOTAL INITIAL WATER = 0.147 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 2.8173 1.4795 2.5719 1.8918 2.5708 5.6440

6.8798 7.7178 4.5763 3.4355 1.0732 1.0695

STD. DEVIATIONS 1.8616 0.7716 1.8893 1.9694 2.2840 4.2435

2.4598 2.7573 2.8369 1.6045 0.7764 0.5282

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.4364 0.3783 0.7221 0.4544 0.5025 1.1144

2.0047 1.7177 0.8491 0.7304 0.3026 0.2740

STD. DEVIATIONS 0.2981 0.2048 0.5368 0.5114 0.4371 0.7425

1.1748 0.8213 0.3280 0.6090 0.2241 0.1658

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.4364 0.3783 0.7221 0.4544 0.5025 1.1144

2.0047 1.7177 0.8491 0.7304 0.3026 0.2740

STD. DEVIATIONS 0.2981 0.2048 0.5368 0.5114 0.4371 0.7425

1.1748 0.8213 0.3280 0.6090 0.2241 0.1658

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0052 0.0031 0.0047 0.0035 0.0047 0.0108

0.0125 0.0140 0.0086 0.0064 0.0021 0.0020

STD. DEVIATIONS 0.0033 0.0015 0.0034 0.0036 0.0041 0.0083

0.0043 0.0048 0.0051 0.0028 0.0015 0.0010

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0004 0.0004 0.0006 0.0004 0.0004 0.0010

0.0017 0.0015 0.0008 0.0006 0.0003 0.0002

STD. DEVIATIONS 0.0003 0.0002 0.0005 0.0005 0.0004 0.0007

0.0010 0.0007 0.0003 0.0005 0.0002 0.0001

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 41.72738 (5.23259)
151470.391 81.39069

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 9.48654 (1.78760)
34436.125 18.50382

LAYER 3

AVERAGE HEAD ON TOP 0.006 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 9.48654 (1.78760)
34436.121 18.50381

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.002 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.001 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0168)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	4.86072	17644.41990
PERCOLATION/LEAKAGE THROUGH LAYER 3	2.481353	9007.31152
AVERAGE HEAD ON TOP OF LAYER 3	0.338	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.4 FEET	
DRAINAGE COLLECTED FROM LAYER 4	2.48135	9007.31152
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.067	
MAXIMUM HEAD ON TOP OF LAYER 5	0.016	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.3 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.1000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD24.D10

OUTPUT DATA FILE: \PASCOP24.OUT

TIME: 14:24 DATE: 4/ 2/2018

****

TITLE: PASCO ROAD INFILTRATION

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.147 INCHES

TOTAL INITIAL WATER = 0.147 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 2.7380 1.3933 2.4988 1.8414 2.5017 5.5022

6.6829 7.5023 4.4279 3.3136 1.0225 1.0100

STD. DEVIATIONS 1.8393 0.7432 1.8539 1.9526 2.2497 4.1925

2.4223 2.7187 2.8105 1.5762 0.7449 0.5010

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.5157 0.4644 0.7953 0.5048 0.5716 1.2561

2.2016 1.9333 0.9975 0.8523 0.3533 0.3335

STD. DEVIATIONS 0.3246 0.2290 0.5635 0.5259 0.4706 0.7939

1.2088 0.8503 0.3596 0.6400 0.2460 0.1925

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.5157 0.4644 0.7953 0.5048 0.5716 1.2561

2.2016 1.9333 0.9975 0.8523 0.3533 0.3335

STD. DEVIATIONS 0.3246 0.2290 0.5635 0.5259 0.4706 0.7939

1.2088 0.8503 0.3596 0.6400 0.2460 0.1925

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0052 0.0031 0.0047 0.0035 0.0047 0.0108

0.0125 0.0140 0.0086 0.0064 0.0021 0.0020

STD. DEVIATIONS 0.0033 0.0015 0.0034 0.0036 0.0041 0.0083

0.0043 0.0048 0.0051 0.0028 0.0015 0.0010

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0005 0.0004 0.0007 0.0005 0.0005 0.0011

0.0019 0.0017 0.0009 0.0007 0.0003 0.0003

STD. DEVIATIONS 0.0003 0.0002 0.0005 0.0005 0.0004 0.0007

0.0011 0.0007 0.0003 0.0006 0.0002 0.0002

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 40.43444 (5.15846)
146777.016 78.86877

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 10.77947 (1.85943)
39129.492 21.02574

LAYER 3

AVERAGE HEAD ON TOP 0.006 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 10.77947 (1.85943)
39129.492 21.02574

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.002 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.001 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0168)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	4.84387	17583.25590
PERCOLATION/LEAKAGE THROUGH LAYER 3	2.487589	9029.94824
AVERAGE HEAD ON TOP OF LAYER 3	0.338	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 4	2.48759	9029.94824
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.067	
MAXIMUM HEAD ON TOP OF LAYER 5	0.016	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.3 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.1000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCOSD8.D10

OUTPUT DATA FILE: \PASC-OP8.OUT

TIME: 9:13 DATE: 4/ 3/2018

****

TITLE: PASCO ROAD INFILTRATION

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.100000001000E-06 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.247 INCHES

TOTAL INITIAL WATER = 0.247 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.2547 1.8476 3.2860 2.3468 3.0727 6.7512

8.8620 9.4376 5.4122 4.1639 1.3763 1.3374

STD. DEVIATIONS 2.1385 0.9441 2.3328 2.4520 2.5974 4.9095

3.4838 3.2023 3.1099 2.1644 0.9599 0.6708

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.0046 0.0051 0.0036 0.0024 0.0037 0.0067

0.0098 0.0094 0.0069 0.0067 0.0028 0.0040

STD. DEVIATIONS 0.0025 0.0024 0.0015 0.0021 0.0025 0.0035

0.0024 0.0031 0.0022 0.0035 0.0017 0.0024

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.0046 0.0051 0.0036 0.0024 0.0037 0.0067

0.0098 0.0094 0.0069 0.0067 0.0028 0.0040

STD. DEVIATIONS 0.0025 0.0024 0.0015 0.0021 0.0025 0.0035

0.0024 0.0031 0.0022 0.0035 0.0017 0.0024

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0057 0.0035 0.0058 0.0043 0.0054 0.0119

0.0156 0.0167 0.0099 0.0073 0.0025 0.0024

STD. DEVIATIONS 0.0038 0.0018 0.0041 0.0045 0.0046 0.0082

0.0061 0.0057 0.0056 0.0037 0.0017 0.0012

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048) 194.50 0.105

LATERAL DRAINAGE COLLECTED 51.14824 (6.93515) 185668.125 99.76641

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 0.06566 (0.00856) 238.358 0.12808

LAYER 3

AVERAGE HEAD ON TOP 0.008 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 0.06566 (0.00856) 238.358 0.12808

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000) 0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.000 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0265) 1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.91735	21479.99800
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.001712	6.21396
AVERAGE HEAD ON TOP OF LAYER 3	0.211	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.2 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.00171	6.21396
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.000	
MAXIMUM HEAD ON TOP OF LAYER 5	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.2000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

****

****

PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCOSD7.D10

OUTPUT DATA FILE: \PASC-OP7.OUT

TIME: 9: 5 DATE: 4/ 3/2018

****

TITLE: PASCO ROAD INFILTRATION

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.499999999000E-06 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.247 INCHES

TOTAL INITIAL WATER = 0.247 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.2428 1.8365 3.2716 2.3405 3.0626 6.7285

8.8287 9.4090 5.3922 4.1401 1.3682 1.3272

STD. DEVIATIONS 2.1376 0.9427 2.3303 2.4498 2.5929 4.9014

3.4798 3.1948 3.1070 2.1629 0.9545 0.6637

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.0165 0.0177 0.0163 0.0088 0.0137 0.0294

0.0434 0.0376 0.0306 0.0269 0.0109 0.0142

STD. DEVIATIONS 0.0080 0.0079 0.0062 0.0069 0.0083 0.0125

0.0085 0.0123 0.0088 0.0143 0.0080 0.0100

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.0165 0.0177 0.0163 0.0088 0.0137 0.0294

0.0434 0.0376 0.0306 0.0269 0.0109 0.0142

STD. DEVIATIONS 0.0080 0.0079 0.0062 0.0069 0.0083 0.0125

0.0085 0.0123 0.0088 0.0143 0.0080 0.0100

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

-

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

-

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0057 0.0035 0.0057 0.0043 0.0054 0.0118

0.0156 0.0166 0.0098 0.0073 0.0025 0.0023

STD. DEVIATIONS 0.0038 0.0017 0.0041 0.0045 0.0046 0.0082

0.0061 0.0057 0.0056 0.0038 0.0017 0.0012

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0001 0.0001 0.0001 0.0000 0.0001 0.0001

0.0002 0.0002 0.0002 0.0001 0.0001 0.0001

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0001

0.0000 0.0001 0.0000 0.0001 0.0000 0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

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	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048) 194.50 0.105

LATERAL DRAINAGE COLLECTED 50.94798 (6.92516) 184941.172 99.37580

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 0.26592 (0.02878) 965.303 0.51869

LAYER 3

AVERAGE HEAD ON TOP 0.008 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 0.26592 (0.02878) 965.303 0.51869

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000) 0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.000 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0261) 1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.91392	21467.52540
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.007711	27.99012
AVERAGE HEAD ON TOP OF LAYER 3	0.211	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.00771	27.99012
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.001	
MAXIMUM HEAD ON TOP OF LAYER 5	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

****

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.2000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

****

****

PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCOSD6.D10

OUTPUT DATA FILE: \PASC-OP6.OUT

TIME: 8:52 DATE: 4/ 3/2018

****

TITLE: PASCO ROAD INFILTRATION

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.999999997000E-06 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.247 INCHES

TOTAL INITIAL WATER = 0.247 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.2289 1.8186 3.2600 2.3308 3.0458 6.7027

8.7921 9.3534 5.3589 4.1185 1.3546 1.3144

STD. DEVIATIONS 2.1342 0.9352 2.3238 2.4468 2.5839 4.8941

3.4764 3.1680 3.1075 2.1505 0.9469 0.6587

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.0303 0.0342 0.0294 0.0187 0.0303 0.0554

0.0850 0.0882 0.0605 0.0520 0.0243 0.0271

STD. DEVIATIONS 0.0156 0.0149 0.0134 0.0162 0.0195 0.0209

0.0165 0.0350 0.0154 0.0212 0.0190 0.0166

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.0303 0.0342 0.0294 0.0187 0.0303 0.0554

0.0850 0.0882 0.0605 0.0520 0.0243 0.0271

STD. DEVIATIONS 0.0156 0.0149 0.0134 0.0162 0.0195 0.0209

0.0165 0.0350 0.0154 0.0212 0.0190 0.0166

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

-

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0056 0.0034 0.0057 0.0043 0.0053 0.0118

0.0153 0.0164 0.0097 0.0072 0.0025 0.0023

STD. DEVIATIONS 0.0038 0.0017 0.0041 0.0044 0.0045 0.0082

0.0061 0.0056 0.0056 0.0038 0.0017 0.0012

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0001 0.0002 0.0001 0.0001 0.0001 0.0003

0.0004 0.0004 0.0003 0.0002 0.0001 0.0001

STD. DEVIATIONS 0.0001 0.0001 0.0001 0.0001 0.0001 0.0001

0.0001 0.0002 0.0001 0.0001 0.0001 0.0001

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

-

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048) 194.50 0.105

LATERAL DRAINAGE COLLECTED 50.67859 (6.90559) 183963.266 98.85033

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 0.53532 (0.05702) 1943.207 1.04416

LAYER 3

AVERAGE HEAD ON TOP 0.007 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 0.53532 (0.05702) 1943.207 1.04416

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000) 0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.000 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0257) 1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.90962	21451.93750
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.017046	61.87672
AVERAGE HEAD ON TOP OF LAYER 3	0.211	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.1 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.01705	61.87672
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.003	
MAXIMUM HEAD ON TOP OF LAYER 5	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.2000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD21.D10

OUTPUT DATA FILE: \PASCOP21.OUT

TIME: 8:44 DATE: 4/ 3/2018

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TITLE: PASCO ROAD INFILTRATION

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.249999994000E-05 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.247 INCHES

TOTAL INITIAL WATER = 0.247 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.1858 1.7748 3.2310 2.3054 3.0067 6.6112

8.6807 9.2336 5.2862 4.0389 1.3309 1.2830

STD. DEVIATIONS 2.1300 0.9095 2.3096 2.4336 2.5694 4.8827

3.4426 3.1365 3.0994 2.1298 0.9315 0.6301

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.0731 0.0778 0.0586 0.0445 0.0689 0.1471

0.1965 0.2077 0.1328 0.1318 0.0481 0.0588

STD. DEVIATIONS 0.0374 0.0438 0.0308 0.0333 0.0371 0.0652

0.0559 0.0624 0.0388 0.0494 0.0353 0.0440

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.0731 0.0778 0.0586 0.0445 0.0689 0.1471

0.1965 0.2077 0.1328 0.1318 0.0481 0.0588

STD. DEVIATIONS 0.0374 0.0438 0.0308 0.0333 0.0371 0.0652

0.0559 0.0624 0.0388 0.0494 0.0353 0.0440

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

-

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0055 0.0033 0.0057 0.0042 0.0052 0.0114

0.0151 0.0160 0.0094 0.0070 0.0024 0.0022

STD. DEVIATIONS 0.0038 0.0016 0.0040 0.0044 0.0045 0.0081

0.0059 0.0054 0.0056 0.0036 0.0017 0.0011

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0004 0.0004 0.0003 0.0002 0.0003 0.0007

0.0009 0.0010 0.0007 0.0006 0.0002 0.0003

STD. DEVIATIONS 0.0002 0.0002 0.0001 0.0002 0.0002 0.0003

0.0003 0.0003 0.0002 0.0002 0.0002 0.0002

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

-

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 49.96818 (6.86995)
181384.500 97.46466

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 1.24572 (0.16915)
4521.956 2.42982

LAYER 3

AVERAGE HEAD ON TOP 0.007 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 1.24572 (0.16915)
4521.956 2.42982

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.001 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0246)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.89674	21405.16990
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.038365	139.26669
AVERAGE HEAD ON TOP OF LAYER 3	0.211	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.3 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.03837	139.26669
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.006	
MAXIMUM HEAD ON TOP OF LAYER 5	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

****

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.2000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCOSD5.D10

OUTPUT DATA FILE: \PASC-OP5.OUT

TIME: 8:38 DATE: 4/ 3/2018

****

TITLE: PASCO ROAD INFILTRATION

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.499999987000E-05 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.247 INCHES

TOTAL INITIAL WATER = 0.247 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.1495 1.7370 3.1827 2.2875 2.9547 6.5188

8.5666 9.1260 5.1913 3.9795 1.2939 1.2355

STD. DEVIATIONS 2.1027 0.8972 2.2954 2.4044 2.5422 4.8156

3.3880 3.0981 3.0763 2.0848 0.9065 0.5807

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.1090 0.1165 0.1060 0.0647 0.1186 0.2376

0.3128 0.3176 0.2250 0.1920 0.0844 0.1067

STD. DEVIATIONS 0.0546 0.0638 0.0447 0.0537 0.0692 0.1148

0.1172 0.1245 0.0549 0.0983 0.0598 0.0968

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.1090 0.1165 0.1060 0.0647 0.1186 0.2376

0.3128 0.3176 0.2250 0.1920 0.0844 0.1067

STD. DEVIATIONS 0.0546 0.0638 0.0447 0.0537 0.0692 0.1148

0.1172 0.1245 0.0549 0.0983 0.0598 0.0968

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0054 0.0032 0.0055 0.0041 0.0050 0.0120

0.0147 0.0156 0.0091 0.0068 0.0023 0.0021

STD. DEVIATIONS 0.0037 0.0016 0.0040 0.0043 0.0044 0.0093

0.0058 0.0053 0.0054 0.0036 0.0016 0.0009

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0005 0.0006 0.0005 0.0003 0.0006 0.0012

0.0015 0.0015 0.0011 0.0009 0.0004 0.0005

STD. DEVIATIONS 0.0003 0.0003 0.0002 0.0003 0.0003 0.0006

0.0006 0.0006 0.0003 0.0005 0.0003 0.0005

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 49.22307 (6.79262)
178679.734 96.01129

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 1.99084 (0.25430)
7226.739 3.88320

LAYER 3

AVERAGE HEAD ON TOP 0.007 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 1.99084 (0.25429)
7226.738 3.88320

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.001 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0226)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.48482	19909.89260
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.076964	279.38000
AVERAGE HEAD ON TOP OF LAYER 3	0.406	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.2 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.07696	279.38000
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.011	
MAXIMUM HEAD ON TOP OF LAYER 5	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.2000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCOSD4.D10

OUTPUT DATA FILE: \PASC-OP4.OUT

TIME: 8:31 DATE: 4/ 3/2018

****

TITLE: PASCO ROAD INFILTRATION

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.999999975000E-05 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.247 INCHES

TOTAL INITIAL WATER = 0.247 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.0525 1.6905 3.0703 2.2104 2.8408 6.3916

8.2953 8.8178 5.0689 3.8718 1.2446 1.2059

STD. DEVIATIONS 2.0213 0.8797 2.2306 2.4030 2.4726 4.7984

3.3190 3.0459 3.0367 2.0586 0.8683 0.5899

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.2052 0.1637 0.2211 0.1375 0.2335 0.3648

0.5850 0.6207 0.3551 0.2962 0.1337 0.1371

STD. DEVIATIONS 0.1584 0.0818 0.1227 0.1262 0.1675 0.1680

0.1853 0.2133 0.1075 0.1311 0.0992 0.0914

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.2052 0.1637 0.2211 0.1375 0.2335 0.3648

0.5850 0.6207 0.3551 0.2962 0.1337 0.1371

STD. DEVIATIONS 0.1584 0.0818 0.1227 0.1262 0.1675 0.1680

0.1853 0.2132 0.1075 0.1311 0.0992 0.0914

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0051 0.0031 0.0052 0.0039 0.0047 0.0116

0.0138 0.0147 0.0088 0.0065 0.0021 0.0020

STD. DEVIATIONS 0.0033 0.0016 0.0038 0.0043 0.0042 0.0093

0.0055 0.0052 0.0053 0.0035 0.0015 0.0009

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0010 0.0009 0.0011 0.0007 0.0011 0.0018

0.0028 0.0030 0.0018 0.0014 0.0007 0.0007

STD. DEVIATIONS 0.0008 0.0004 0.0006 0.0006 0.0008 0.0008

0.0009 0.0010 0.0005 0.0006 0.0005 0.0004

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 47.76047 (6.51085)
173370.500 93.15844

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 3.45344 (0.57679)
12535.988 6.73605

LAYER 3

AVERAGE HEAD ON TOP 0.007 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 3.45344 (0.57679)
12535.986 6.73605

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.001 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0187)
1.87 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.48384	19906.32810
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.153591	557.53455
AVERAGE HEAD ON TOP OF LAYER 3	0.406	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.15359	557.53455
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.023	
MAXIMUM HEAD ON TOP OF LAYER 5	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.2000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD19.D10

OUTPUT DATA FILE: \PASCOP19.OUT

TIME: 8:15 DATE: 4/ 3/2018

****

TITLE: PASCO ROAD INFILTRATION

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.249999994000E-04 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.247 INCHES

TOTAL INITIAL WATER = 0.247 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 3.0208 1.6157 2.8918 2.1506 2.7529 6.2136

7.9278 8.4810 4.9012 3.8013 1.1316 1.1597

STD. DEVIATIONS 2.0215 0.8136 2.1458 2.3520 2.5051 4.7461

3.2728 2.9423 2.9173 1.9750 0.7653 0.5657

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.2328 0.2421 0.3979 0.1998 0.3204 0.5448

0.9505 0.9607 0.5197 0.3691 0.2443 0.1838

STD. DEVIATIONS 0.1606 0.1686 0.2250 0.1836 0.3073 0.3266

0.2984 0.4398 0.2358 0.2215 0.2126 0.1331

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.2328 0.2421 0.3979 0.1998 0.3204 0.5448

0.9505 0.9607 0.5197 0.3691 0.2443 0.1838

STD. DEVIATIONS 0.1606 0.1686 0.2250 0.1836 0.3073 0.3266

0.2984 0.4398 0.2358 0.2215 0.2126 0.1331

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

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DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0052 0.0030 0.0048 0.0038 0.0048 0.0112

0.0131 0.0142 0.0085 0.0065 0.0018 0.0020

STD. DEVIATIONS 0.0035 0.0014 0.0036 0.0041 0.0043 0.0091

0.0057 0.0050 0.0049 0.0031 0.0012 0.0010

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0011 0.0013 0.0019 0.0010 0.0015 0.0027

0.0046 0.0046 0.0026 0.0018 0.0012 0.0009

STD. DEVIATIONS 0.0008 0.0009 0.0011 0.0009 0.0015 0.0016

0.0014 0.0021 0.0012 0.0011 0.0011 0.0006

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

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	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 46.04796 (6.16287)
167154.109 89.81814

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 5.16594 (0.92862)
18752.361 10.07634

LAYER 3

AVERAGE HEAD ON TOP 0.007 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 5.16594 (0.92862)
18752.359 10.07634

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.000 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.002 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0168)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.41322	19649.98830
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.780826	2834.39868
AVERAGE HEAD ON TOP OF LAYER 3	0.398	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.5 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.78083	2834.39868
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.116	
MAXIMUM HEAD ON TOP OF LAYER 5	0.005	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.1 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.2000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCOSD3.D10

OUTPUT DATA FILE: \PASC-OP3.OUT

TIME: 8: 5 DATE: 4/ 3/2018

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TITLE: PASCO ROAD INFILTRATION

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.499999987000E-04 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.247 INCHES

TOTAL INITIAL WATER = 0.247 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 2.9709 1.5989 2.7875 2.0592 2.6999 5.9840

7.4770 8.0297 4.6698 3.6620 1.1389 1.1501

STD. DEVIATIONS 1.9467 0.8025 2.0678 2.2356 2.4463 4.5889

3.0269 2.7460 2.7371 1.7798 0.8150 0.5626

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.2827 0.2588 0.5066 0.2870 0.3734 0.7744

1.4074 1.4058 0.7555 0.5039 0.2370 0.1934

STD. DEVIATIONS 0.2162 0.1727 0.3268 0.2771 0.3392 0.4538

0.9096 0.7618 0.3956 0.4162 0.2036 0.1332

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.2827 0.2588 0.5066 0.2870 0.3734 0.7744

1.4074 1.4058 0.7555 0.5039 0.2370 0.1934

STD. DEVIATIONS 0.2162 0.1727 0.3268 0.2771 0.3392 0.4538

0.9096 0.7618 0.3956 0.4162 0.2036 0.1332

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0052 0.0031 0.0047 0.0036 0.0047 0.0110

0.0129 0.0136 0.0083 0.0064 0.0021 0.0020

STD. DEVIATIONS 0.0033 0.0015 0.0034 0.0038 0.0042 0.0085

0.0051 0.0044 0.0047 0.0030 0.0015 0.0010

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0009 0.0009 0.0016 0.0009 0.0012 0.0026

0.0045 0.0045 0.0025 0.0016 0.0008 0.0006

STD. DEVIATIONS 0.0007 0.0006 0.0010 0.0009 0.0011 0.0015

0.0029 0.0024 0.0013 0.0013 0.0007 0.0004

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 44.22802 (6.00792)
160547.719 86.26829

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 6.98588 (1.52124)
25358.734 13.62619

LAYER 3

AVERAGE HEAD ON TOP 0.006 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 6.98588 (1.52124)
25358.732 13.62619

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.001 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.002 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0168)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.32475	19328.82810
PERCOLATION/LEAKAGE THROUGH LAYER 3	1.648081	5982.53467
AVERAGE HEAD ON TOP OF LAYER 3	0.389	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 4	1.64808	5982.53467
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.164	
MAXIMUM HEAD ON TOP OF LAYER 5	0.010	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.2 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

****

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.2000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCOSD2.D10

OUTPUT DATA FILE: \PASC-OP2.OUT

TIME: 16:20 DATE: 4/ 2/2018

****

TITLE: PASCO ROAD INFILTRATION

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.999999975000E-04 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.247 INCHES

TOTAL INITIAL WATER = 0.247 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 2.9024 1.5740 2.6493 1.9441 2.6262 5.7905

7.1800 7.9320 4.7282 3.5630 1.1285 1.1368

STD. DEVIATIONS 1.8795 0.7989 1.9226 1.9813 2.2802 4.2970

2.6054 2.7879 2.8594 1.6293 0.8096 0.5575

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.3512 0.2837 0.6447 0.4020 0.4471 0.9679

1.7044 1.5035 0.6972 0.6029 0.2473 0.2067

STD. DEVIATIONS 0.2768 0.1856 0.5144 0.5031 0.4386 0.7440

1.1697 0.7996 0.3004 0.5813 0.2060 0.1379

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.3512 0.2837 0.6447 0.4020 0.4471 0.9679

1.7044 1.5035 0.6972 0.6029 0.2473 0.2067

STD. DEVIATIONS 0.2768 0.1856 0.5144 0.5031 0.4386 0.7440

1.1697 0.7996 0.3004 0.5813 0.2060 0.1379

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0052 0.0031 0.0047 0.0035 0.0046 0.0108

0.0126 0.0140 0.0086 0.0064 0.0021 0.0020

STD. DEVIATIONS 0.0033 0.0015 0.0034 0.0036 0.0038 0.0084

0.0044 0.0048 0.0051 0.0028 0.0015 0.0010

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0007 0.0006 0.0012 0.0008 0.0009 0.0019

0.0033 0.0029 0.0014 0.0012 0.0005 0.0004

STD. DEVIATIONS 0.0005 0.0004 0.0010 0.0010 0.0008 0.0015

0.0022 0.0015 0.0006 0.0011 0.0004 0.0003

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 43.15513 (5.32411)
156653.109 84.17557

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 8.05877 (1.78487)
29253.340 15.71891

LAYER 3

AVERAGE HEAD ON TOP 0.006 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 8.05877 (1.78488)
29253.336 15.71891

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.001 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.001 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0168)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	5.14968	18693.34370
PERCOLATION/LEAKAGE THROUGH LAYER 3	2.475943	8987.67187
AVERAGE HEAD ON TOP OF LAYER 3	0.370	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 4	2.47594	8987.67187
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.147	
MAXIMUM HEAD ON TOP OF LAYER 5	0.016	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.3 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.2000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCOSD1.D10

OUTPUT DATA FILE: \PASC-OP1.OUT

TIME: 16: 7 DATE: 4/ 2/2018

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TITLE: PASCO ROAD INFILTRATION

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.500000024000E-03 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.247 INCHES

TOTAL INITIAL WATER = 0.247 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92

3.51 3.19 3.09 2.18 0.95 0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 2.8185 1.4801 2.5730 1.8926 2.5719 5.6465

6.8828 7.7212 4.5783 3.4370 1.0737 1.0699

STD. DEVIATIONS 1.8624 0.7719 1.8902 1.9703 2.2850 4.2454

2.4609 2.7585 2.8382 1.6052 0.7768 0.5284

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.4351 0.3777 0.7210 0.4536 0.5014 1.1119

2.0017 1.7143 0.8471 0.7289 0.3022 0.2736

STD. DEVIATIONS 0.2973 0.2046 0.5362 0.5106 0.4364 0.7408

1.1739 0.8208 0.3270 0.6084 0.2238 0.1657

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.4351 0.3777 0.7210 0.4536 0.5014 1.1119

2.0017 1.7143 0.8471 0.7289 0.3022 0.2736

STD. DEVIATIONS 0.2973 0.2046 0.5362 0.5106 0.4364 0.7408

1.1739 0.8208 0.3270 0.6084 0.2238 0.1657

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

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DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0052 0.0031 0.0047 0.0035 0.0047 0.0108

0.0125 0.0140 0.0086 0.0064 0.0021 0.0020

STD. DEVIATIONS 0.0033 0.0015 0.0034 0.0036 0.0041 0.0083

0.0043 0.0048 0.0051 0.0028 0.0015 0.0010

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0004 0.0004 0.0006 0.0004 0.0004 0.0010

0.0017 0.0015 0.0008 0.0006 0.0003 0.0002

STD. DEVIATIONS 0.0003 0.0002 0.0005 0.0005 0.0004 0.0007

0.0010 0.0007 0.0003 0.0005 0.0002 0.0001

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

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	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000

EVAPOTRANSPIRATION 0.054 (0.0048)
194.50 0.105

LATERAL DRAINAGE COLLECTED 41.74552 (5.23492)
151536.250 81.42608

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 9.46839 (1.78542)
34370.266 18.46843

LAYER 3

AVERAGE HEAD ON TOP 0.006 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 9.46839 (1.78541)
34370.266 18.46843

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.002 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.001 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0168)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	4.86285	17652.13670
PERCOLATION/LEAKAGE THROUGH LAYER 3	2.481289	9007.08008
AVERAGE HEAD ON TOP OF LAYER 3	0.338	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	
LOCATION OF MAXIMUM HEAD IN LAYER 2		
(DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 4	2.48129	9007.08008
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.067	
MAXIMUM HEAD ON TOP OF LAYER 5	0.016	
LOCATION OF MAXIMUM HEAD IN LAYER 4		
(DISTANCE FROM DRAIN)	0.3 FEET	
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.2000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE **

** HELP MODEL VERSION 3.07 (1 NOVEMBER 1997) **

** DEVELOPED BY ENVIRONMENTAL LABORATORY **

** USAE WATERWAYS EXPERIMENT STATION **

** FOR USEPA RISK REDUCTION ENGINEERING LABORATORY **

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PRECIPITATION DATA FILE: \PASCO-P1.D4

TEMPERATURE DATA FILE: \PASCO-T1.D7

SOLAR RADIATION DATA FILE: \PASCO-S1.D13

EVAPOTRANSPIRATION DATA: \PASCO-E1.D11

SOIL AND DESIGN DATA FILE: \PASCSD17.D10

OUTPUT DATA FILE: \PASCOP17.OUT

TIME: 15:58 DATE: 4/ 2/2018

****

TITLE: PASCO ROAD INFILTRATION

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE

COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 1.00 INCHES

POROSITY = 0.5000 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0186 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.4610 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0020 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 1000.00000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 4.00 INCHES

POROSITY = 0.0500 VOL/VOL

FIELD CAPACITY = 0.0020 VOL/VOL

WILTING POINT = 0.0010 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0500 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.100000005000E-02 CM/SEC

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER

MATERIAL TEXTURE NUMBER 0

THICKNESS = 2.00 INCHES

POROSITY = 0.8500 VOL/VOL

FIELD CAPACITY = 0.0100 VOL/VOL

WILTING POINT = 0.0050 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0100 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 33.0000000000 CM/SEC

SLOPE = 2.00 PERCENT

DRAINAGE LENGTH = 12.0 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER

MATERIAL TEXTURE NUMBER 35

THICKNESS = 0.06 INCHES

POROSITY = 0.0000 VOL/VOL

FIELD CAPACITY = 0.0000 VOL/VOL

WILTING POINT = 0.0000 VOL/VOL

INITIAL SOIL WATER CONTENT = 0.0000 VOL/VOL

EFFECTIVE SAT. HYD. COND. = 0.199999996000E-12 CM/SEC

FML PINHOLE DENSITY = 0.00 HOLES/ACRE

FML INSTALLATION DEFECTS = 0.00 HOLES/ACRE

FML PLACEMENT QUALITY = 4 - POOR

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER = 0.00

FRACTION OF AREA ALLOWING RUNOFF = 0.0 PERCENT

AREA PROJECTED ON HORIZONTAL PLANE = 1.000 ACRES

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

INITIAL WATER IN EVAPORATIVE ZONE = 0.000 INCHES

UPPER LIMIT OF EVAPORATIVE STORAGE = 0.001 INCHES

LOWER LIMIT OF EVAPORATIVE STORAGE = 0.000 INCHES

INITIAL SNOW WATER = 0.000 INCHES

INITIAL WATER IN LAYER MATERIALS = 0.247 INCHES

TOTAL INITIAL WATER = 0.247 INCHES

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM

PASCO COUNTY FLORIDA

STATION LATITUDE = 28.47 DEGREES

MAXIMUM LEAF AREA INDEX = 0.00

START OF GROWING SEASON (JULIAN DATE) = 0

END OF GROWING SEASON (JULIAN DATE) = 367

EVAPORATIVE ZONE DEPTH = 0.0 INCHES

AVERAGE ANNUAL WIND SPEED = 8.60 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 74.00 %

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	2.04	3.78	3.08	3.85	8.29
7.36	8.91	6.53	2.47	1.63	1.31

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.70	61.80	66.70	72.70	77.20	80.70
81.70	81.80	80.20	73.80	66.40	63.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR TAMPA FLORIDA

AND STATION LATITUDE = 28.47 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.26	1.87	3.30	2.34	3.08	6.78
	8.89	9.44	5.43	4.16	1.37	1.35
STD. DEVIATIONS	2.13	0.95	2.36	2.46	2.61	4.92
	3.51	3.19	3.09	2.18	0.95	0.67

RUNOFF

TOTALS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

STD. DEVIATIONS 0.000 0.000 0.000 0.000 0.000 0.000

0.000 0.000 0.000 0.000 0.000 0.000

EVAPOTRANSPIRATION

TOTALS 0.003 0.004 0.003 0.002 0.003 0.006

0.008 0.009 0.006 0.005 0.002 0.003

STD. DEVIATIONS 0.001 0.002 0.001 0.001 0.002 0.002

0.001 0.002 0.001 0.002 0.002 0.001

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS 2.7403 1.3944 2.5009 1.8430 2.5038 5.5070

6.6886 7.5087 4.4316 3.3164 1.0233 1.0108

STD. DEVIATIONS 1.8409 0.7438 1.8556 1.9544 2.2516 4.1962

2.4244 2.7211 2.8130 1.5775 0.7455 0.5015

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS 0.5134 0.4633 0.7932 0.5032 0.5695 1.2514

2.1959 1.9269 0.9937 0.8495 0.3525 0.3327

STD. DEVIATIONS 0.3232 0.2284 0.5622 0.5243 0.4693 0.7907

1.2070 0.8493 0.3576 0.6388 0.2455 0.1921

LATERAL DRAINAGE COLLECTED FROM LAYER 4

TOTALS 0.5134 0.4633 0.7932 0.5032 0.5695 1.2514

2.1959 1.9269 0.9937 0.8495 0.3525 0.3327

STD. DEVIATIONS 0.3232 0.2284 0.5622 0.5243 0.4693 0.7907

1.2070 0.8493 0.3576 0.6388 0.2455 0.1921

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

STD. DEVIATIONS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

0.0000 0.0000 0.0000 0.0000 0.0000 0.0000

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AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

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DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES 0.0052 0.0031 0.0047 0.0035 0.0047 0.0108

0.0125 0.0140 0.0086 0.0064 0.0021 0.0020

STD. DEVIATIONS 0.0033 0.0015 0.0034 0.0036 0.0041 0.0083

0.0043 0.0048 0.0051 0.0028 0.0015 0.0010

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES 0.0004 0.0004 0.0007 0.0005 0.0005 0.0011

0.0019 0.0017 0.0009 0.0007 0.0003 0.0003

STD. DEVIATIONS 0.0003 0.0002 0.0005 0.0005 0.0004 0.0007

0.0011 0.0007 0.0003 0.0006 0.0002 0.0002

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 10

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	INCHES	CU. FEET	PERCENT
PRECIPITATION	51.27 (6.946)	186102.8	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000
EVAPOTRANSPIRATION	0.054 (0.0048)	194.50	0.105
LATERAL DRAINAGE COLLECTED	40.46872 (5.16300)	146901.469	78.93565

FROM LAYER 2

PERCOLATION/LEAKAGE THROUGH 10.74518 (1.85516)
39005.008 20.95885

LAYER 3

AVERAGE HEAD ON TOP 0.006 (0.001)

OF LAYER 3

LATERAL DRAINAGE COLLECTED 10.74518 (1.85517)
39005.004 20.95885

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH 0.00000 (0.00000)
0.002 0.00000

LAYER 5

AVERAGE HEAD ON TOP 0.001 (0.000)

OF LAYER 5

CHANGE IN WATER STORAGE 0.001 (0.0168)
1.86 0.001

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 10

	(INCHES)	(CU. FT.)
PRECIPITATION	6.09	22106.701
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	4.84810	17598.60350
PERCOLATION/LEAKAGE THROUGH LAYER 3	2.487472	9029.52148
AVERAGE HEAD ON TOP OF LAYER 3	0.338	
MAXIMUM HEAD ON TOP OF LAYER 3	0.001	

LOCATION OF MAXIMUM HEAD IN LAYER 2

(DISTANCE FROM DRAIN) 0.2 FEET

DRAINAGE COLLECTED FROM LAYER 4	2.48747	9029.52148
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.067	
MAXIMUM HEAD ON TOP OF LAYER 5	0.016	

LOCATION OF MAXIMUM HEAD IN LAYER 4

(DISTANCE FROM DRAIN) 0.3 FEET

SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.0256	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0010	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

by Bruce M. McEnroe, University of Kansas

ASCE Journal of Environmental Engineering

Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 10

LAYER	(INCHES)	(VOL/VOL)
1	0.0237	0.0237
2	0.0080	0.0020
3	0.2000	0.0500
4	0.0200	0.0100
5	0.0000	0.0000
SNOW WATER	0.000	

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