Department of Environmental Protection

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

DEP Form #: 62-701.900(32)

Form Title: Application For a Permit to Construct and Operate a Research, Development and Demonstration Facility

Effective Date January 6, 2010

Incorporated in Rule: 62-701.310(5), F.A.C.

Received
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APPLICATION FOR A PERMIT TO CONSTRUCT AND OPERATE A RESEARCH, DEVELOPMENT AND DEMONSTRATION FACILITY

GENERAL INSTRUCTIONS: Pursuant to Section 403.70715, Florida Statutes,(FS) the Department may issue a Research, Development and Demonstration (RD&D) Permit to the owner or operator of any solid waste management facility who proposes to utilize an innovative and experimental solid waste treatment technology or process, for which permit standards have not been promulgated. The purpose of this application form is to assist the applicant in providing information to the Department for obtaining an RD&D permit. In accordance with Rule 62-701.315(9), Florida Administrative Code, (F.A.C.), a fee in the amount of $1,000 per year, but not to exceed $3,000 for three years, shall be submitted with the application by check made payable to the Department of Environmental Protection. The RD&D permit can be issued for not longer than three years and is renewable no more than three times. Complete appropriate sections for the type of facility for which application is made and include all additional information, drawings, and reports necessary to evaluate the facility.

Please Type or Print in Ink

A. GENERAL INFORMATION

1. Generally describe the type of facility to be operated under the RD&D permit:

Pavement test strips will be constructed on the property of the Pasco County Resource Recovery Facility. Asphalt and Portland cement pavement test strips will be amended with Waste to Energy bottom ash as a partial aggregate replacement bottom ash will be used as a road base course for the construction of one test strip.

2. Type of application:

Construction	[ ]	Construction/Operation	[x]
Operation	[ ]		

3. Classification of application:

New	[x]	Substantial Modification	[ ]
Renewal	[ ]	Minor Modification	[ ]

4. Facility name: Pasco County Resource Recovery Facility

5. DEP ID number: 45799 County: Pasco

6. Facility location (main entrance): 14230 Hays Road, Spring Hill, FL 34610-7630

7. Location coordinates:

Section: S24 Township: T24S Range: R17E

Latitude: 82 ° 33 ' 16.96W " Longitude: 28 ° 22 ' 44.52N "

Datum: WGS84 Coordinate Method: Google Earth

Collected by: Justin Roessler Company/Affiliation: University of Florida

8. Applicant name (operating authority): Pasco County Solid Waste Department

Mailing address: Pasco County Resource Recovery Facility (Street or P.O. Box) Spring Hill (City) Florida (State) 34610 (Zip)

Contact person: John P. Power Telephone:(727) 857-2780

Title: Solid Waste Facility Manager

9. Authorized agent/Consultant: Dr. Timothy G. Townsend P.E

Mailing address: 333 New Engineering Building P.O Box 116450 (Street or P.O. Box) Gainesville (City) Florida (State) 32611 (Zip)

Contact person: Dr. Timothy G. Townsend P.E. Telephone:(352) 392-0846

Title: Professor, University of Florida, Engineering School of Sustainable Infrastructure and the Environment

10. Landowner (if different than applicant):

Mailing address: (Street or P.O. Box) (City) (State) (Zip)

Contact person: Telephone:( )

11. Approximate land area required for operation of this facility: 30,000 Sq Ft

12. Anticipated construction starting and completion dates:

From: Jan 1, 2014 To: Feb 1, 2014

13. Anticipated operation starting and completion dates:

From: Feb 1, 2014 To: Feb 1, 2017

B. ADDITIONAL INFORMATION

1. Attach a site plan, of a scale not greater than 200 feet to the inch, which shows the project location and identifies the proposed waste storage and handling areas, general facility layout, and any other relevant features such as water bodies or wetlands on or within 200 feet of the site and potable water wells on or within 500 feet of the site.

2. Attach a facility design and operation plan which includes:

   a. A detailed description of how the wastes are to be handled or processed at the facility including any necessary testing required to properly operate the facility;

   b. If applicable, process flow diagrams for the facility operations which are signed and sealed by a professional engineer;

   c. A description of the types of equipment that will be used at the facility;

   d. A projection of the volume and weights of material intended to be processed or handled at the facility;

   e. A description of any expected air emissions and wastewater discharges from the facility which may be potential pollution sources;

   f. A ground water monitoring plan which meets the applicable requirements of Rule 62-701.510 and Chapter 62-520, F.A.C. or a description why a ground water monitoring plan is not applicable to the facility; and

   g. A description of what steps will be taken to prevent discharge of leachate and mixing of leachate with stormwater.

3. Attach a closure plan which describes how the facility will be closed upon completion of the project and how the closure activities will be funded.

C. CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

1. Applicant

The undersigned applicant or authorized representative of Pasco County Solid Waste

is aware that statements made in this form and attached information are an application for a Research, Development & Demonstration Facility Permit from the Florida Department of Environmental Protection and certifies that the information in this application is true, correct and complete to the best of his/her knowledge and belief. Further, the undersigned agrees to comply with the provisions of Chapter 403, Florida Statutes, and all rules and regulations of the Department. It is understood that the Permit is not transferable, and the Department will be notified prior to the sale or legal transfer of the permitted facility.

Signature of Applicant or Agent

John Power, Solid Waste Director
Name and Title (please type)

jpower@pascocountyfl.net
E-Mail address (if available)

14230 Hays Rd.
Mailing Address

Spring Hill, FL 34610
City, State, Zip Code

(727) 856-0119
Telephone Number

October 9, 2013
Date

Attach letter of authorization if agent is not a governmental official, owner, or corporate officer.

2. Professional Engineer registered in Florida (or Public Officer if authorized under Sections 403.707 and 403.7075, Florida Statutes):

This is to certify that the engineering features of this waste processing facility have been designed/examined by me and found to conform to engineering principles applicable to such facilities. In my professional judgment, this facility, when properly maintained and operated, will comply with all applicable statutes of the State of Florida and rules of the Department. It is agreed that the undersigned will provide the applicant with a set of instructions of proper maintenance and operation of the facility.

Signature

Timothy G Townsend, Professor
Name and Title (please type)

60283
Florida Registration Number
(please affix seal)

Box 116450, UF
Mailing Address

Gainesville, FL 32611-6450
City, State, Zip Code

ttown@ufl.edu
E-Mail address (if available)

(352) 494-8605
Telephone Number

B. Additional Information

1. Attach a site plan, of a scale not greater than 200 feet to the inch, which shows the project location and identifies the proposed waste storage and handling areas, general facility layout, and any other relevant features such as water bodies or wetlands on or within 200 feet of the site and potable water wells on or within 500 feet of the site.

1. *A site plan identifying the project location, facility layout and other relevant features is included in the attached permit application.*

2. Attach a facility design and operation plan which includes:

a. A detailed description of how the wastes are to be handled or processed at the facility including any necessary testing required to properly operate the facility;

a. A detailed description of waste handling, processing, and testing procedures is included in the attached permit application.

b. If applicable, process flow diagrams for the facility operations which are signed and sealed by a professional engineer;

b. Not applicable

c. A description of the types of equipment that will be used at the facility;

c. Standard paving and compaction equipment will be used for the construction of the roadway test strips.

d. A projection of the volume and weights of material intended to be processed or handled at the facility;

d. Approximately 350 tons of WTE bottom ash will be used in the construction of the test strips. 40 tons will be utilized as a partial aggregate replacement in the Portland cement concrete, 50 tons as a partial aggregate replacement in hot mix asphalt, and 260 tons used as a road base course.

e. A description of any expected air emissions and wastewater discharges from the facility which may be potential pollution sources;

e. Not applicable

f. A ground water monitoring plan which meets the applicable requirements of Rule 62-701.510 and Chapter 62-520, F.A.C. or a description why a ground water monitoring plan is not applicable to the facility; and

f. A groundwater-monitoring plan which meets applicable requirements of Rule 62-710.510 and Chapter 62-520 is included in the attached permit application.

g. A description of what steps will be taken to prevent discharge of leachate and mixing of leachate with stormwater.

g. Not applicable

3. Attach a closure plan which describes how the facility will be closed upon completion of the project and how the closure activities will be funded.

3. Pasco County Solid Waste Department plans to leave the test strips in place following construction and monitoring processes outlined in the attached permit application, test patches will be removed and placed in the onsite landfill. If constituents of potential concern are detected in monitoring wells above applicable regulatory thresholds and the Florida Department of Environmental Protection deem these concentrations to pose a risk to human health or the health of the environment, the test strips will be removed and the material placed in the onsite landfill.

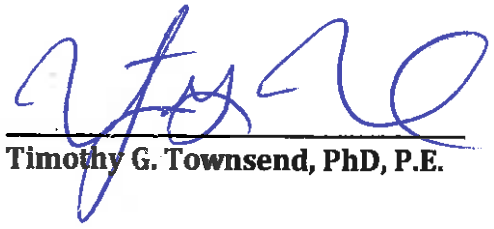
Research, Development and Demonstration Permit Application For The Pasco County Waste to Energy Ash Recycling Project

Prepared for:

Pasco County Solid Waste and Resource Recovery Department
Spring Hill, Florida

Prepared by:

Dr. Timothy Townsend, Ph.D., P.E.
Professor, University of Florida
Engineering School of Sustainable Infrastructure and the Environment
Department of Environmental Engineering Sciences



Timothy G. Townsend, PhD, P.E.

FL Reg #___60283_____

Table of Contents

Table of Figures

Table of Tables

1.0 Summary of Proposed RD&D Activity

Pasco County Solid Waste Department (under the Pasco County Board of County Commissioners) proposes to conduct a research pilot project to examine the recycling of waste-to-energy (WTE) bottom ash as a construction material in new roads. This project is being conducted with the assistance of the University of Florida (UF) Engineering School of Sustainable Infrastructure and the Environment (ESSIE). The activities are proposed as a Research, Development, and Demonstration (RD&D) Facility Permit pursuant to Rule 62-4.050(4)(j)(26), F.A.C..The RD&D activities are proposed for a three year period.

All proposed activities will be conducted on the property of the Pasco County Solid Waste Resource Recovery Facility in Spring Hill, Florida. The Pasco County Solid Waste Resource Recovery Facility is a permitted solid waste disposal facility operating under Power Plant Site Certification Order No PA87-23. WTE bottom ash from the WTE facility will be used in the construction of three roadway test strips. Following conventionally used international practices, ash will be aged in the onsite monofill to facilitate a reduction in leaching and the creation of a structurally viable product. In one test strip, WTE bottom ash will be used as a partial aggregate replacement in Portland cement concrete. In a second test strip, WTE bottom ash will be used as a partial aggregate replacement in hot mix asphalt pavement. In a third test strip, WTE bottom ash will be used as a compacted road base. In addition, appropriate control test strips without WTE bottom ash will be constructed. Two test patches will be constructed using WTE ash as a base course covered by a control asphalt layer.

The leaching properties of the WTE ash used in the construction activities will be thoroughly examined using both routinely applied leaching protocols (e.g., synthetic precipitation leaching procedure [SPLP]) and the US EPA's new suite of the leaching protocols. Similarly, leaching properties of concrete and asphalt pavement amended with WTE bottom ash will be examined. Groundwater monitoring wells will be constructed up gradient and down gradient of each test strip and will be monitored prior to and following road construction. Groundwater will be monitored for at least three years after test strip construction.

Successful completion of this project will provide Pasco County with necessary information to make decisions regarding future larger-scale WTE ash recycling efforts and will provide data needed by FDEP to assess beneficial use of WTE bottom ash in road construction. Comparison of laboratory data with results from groundwater monitoring will provide needed information on the appropriate testing methodology for similar future beneficial use projects.

This proposal includes a description of the proposed construction activities and the associated monitoring. Also included herein are the results of ash characterization

from the facility demonstrating that the WTE bottom ash is not a hazardous waste. Additional characterization data is also included to provide FDEP with a thorough understanding of the chemical constituents encountered in the facility's WTE bottom ash.

2.0 Site Description

This section contains a description Pasco County Resource Recovery Facility site, including the location of the existing landfill units, the road network, and the existing groundwater monitoring wells. Site-specific geologic and hydrologic conditions are also summarized.

2.1 Site History and Layout

The Pasco County Resource Recovery Facility is owned by the Pasco County Board of County Commissioners and is located in Spring Hill, Florida. The facility began commercial operation in May 1991, serving the residents of Pasco County. The facility, which operates as "Covanta Pasco Inc.," has been operated by Covanta Energy under contract to Pasco County since its start-up. The facility processes up to 1,050 tons per day of solid waste, generating 31.2 megawatts (gross) of renewable energy that is sold to Progress Energy. Covanta Pasco recovers and recycles approximately 4,500 tons of ferrous (steel) metal and 520 tons of non-ferrous (copper, tin, aluminum) metal each year from the WTE ash. The Pasco facility also offers a public drop-off center where local residents can bring non-hazardous household items for disposal.The facility houses a number of permitted solid waste disposal units. This includes four lined Class I landfill cells and four lined Class III landfill cells. The location of these cells relative to the overall layout of the site is presented in Figure 1. Leachate collected from the lined landfill units is collected and is currently hauled to the City of Tampa's Howard F. Curran Advanced Wastewater Treatment Facility for disposal.

2.2 Site Hydrogeology & Groundwater Monitoring Well Network

Two aquifer units are monitored as part of the groundwater-monitoring network at the Pasco County Resource Recovery Facility, a surficial aquifer unit and the Floridan aquifer. In some years, the water levels in the surficial aquifer wells are too low for samples to be collected. In general, the groundwater flows from the southeast to the northwest. A series of monitoring wells are located both up gradient and down gradient of the Class I and Class III landfill units. The typical hydraulic gradient in the Florida aquifer ranges from 0.001 to 0.005 ft/ft. Groundwater flow seepage velocity in the Florida aquifer has been estimated in the range of 0.14 ft/day (50 ft/yr).
The surficial and Floridan aquifer contour maps are presented in figures 2 and 3 respectively; locations of current monitoring wells are also included.

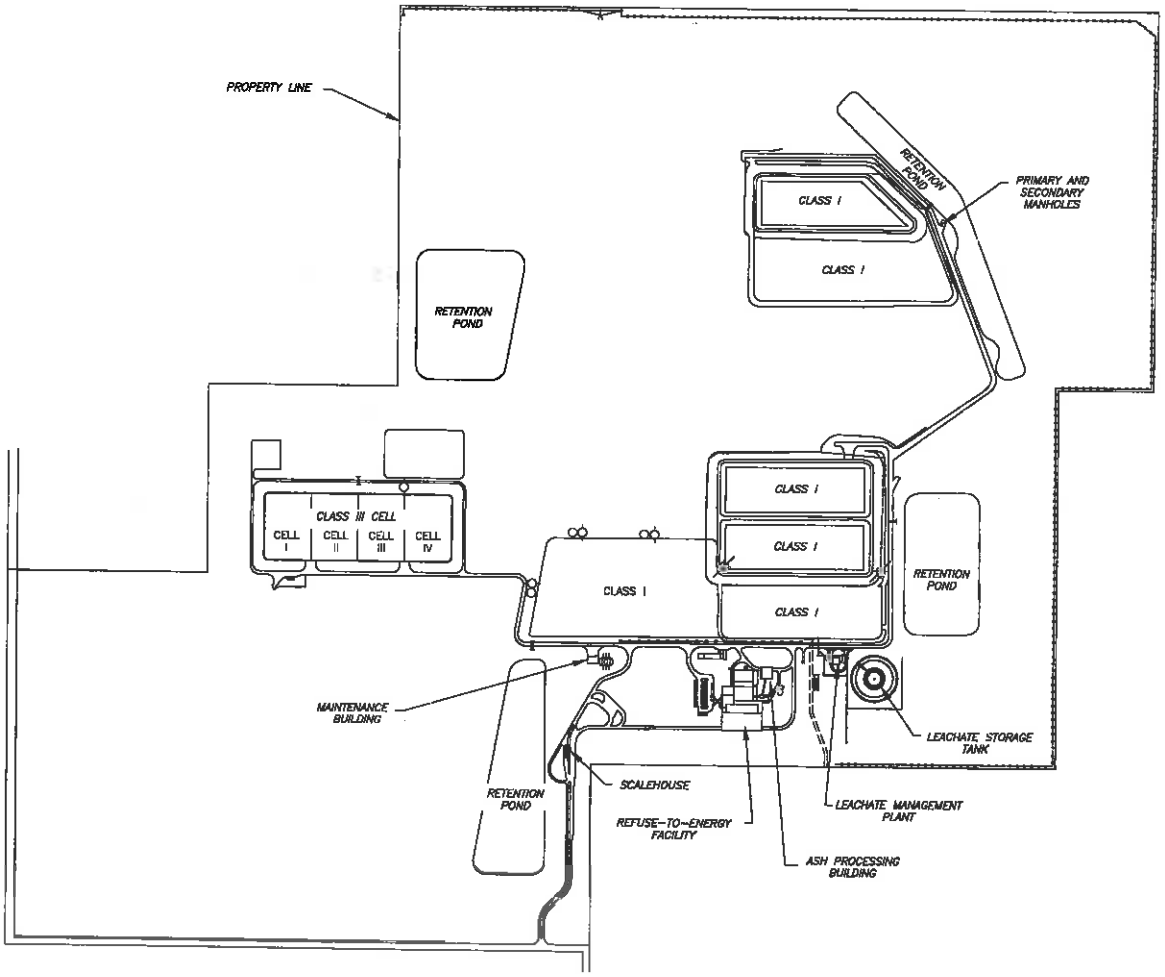
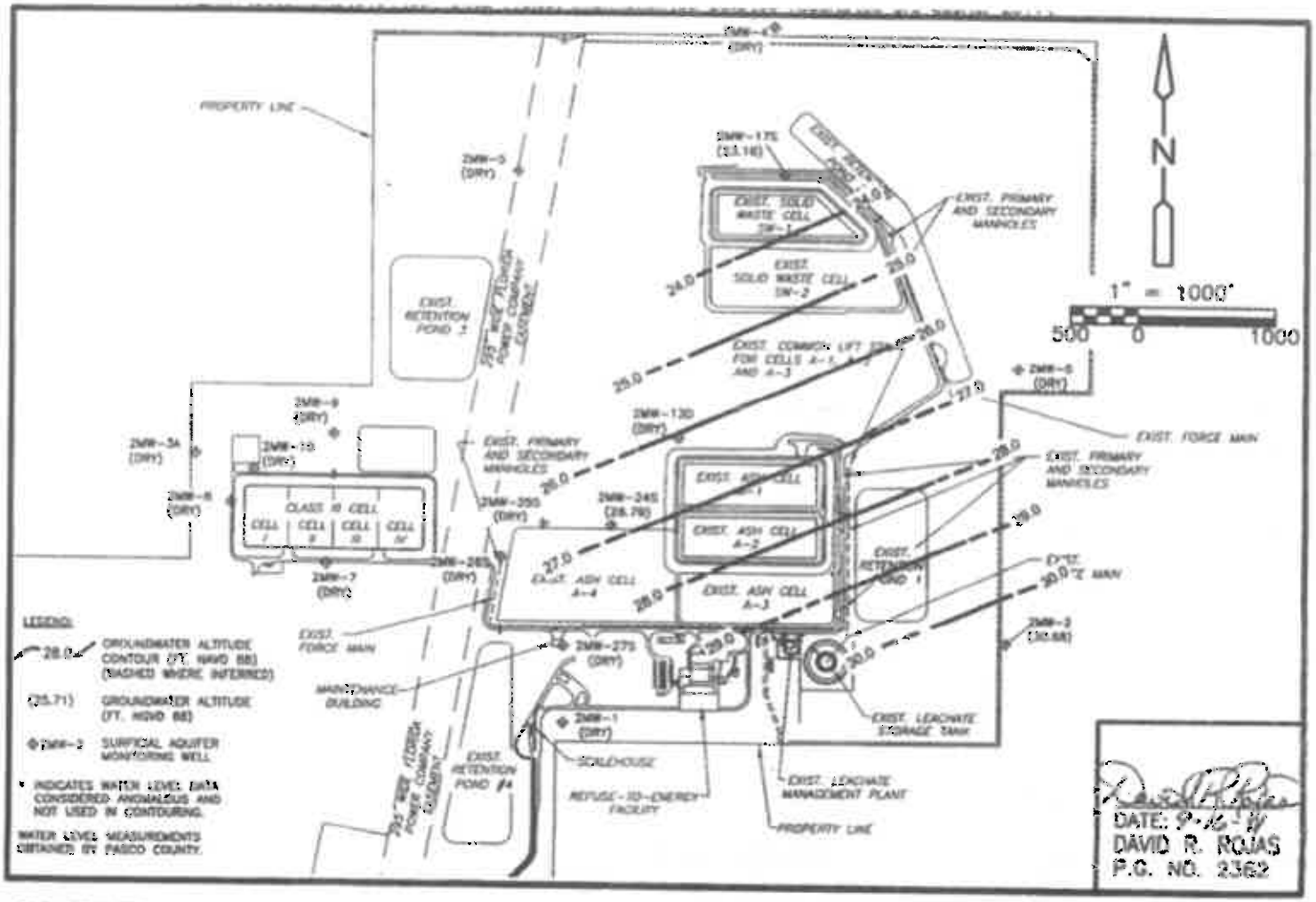


Figure 1. Layout of Pasco County Resource Recovery Facility



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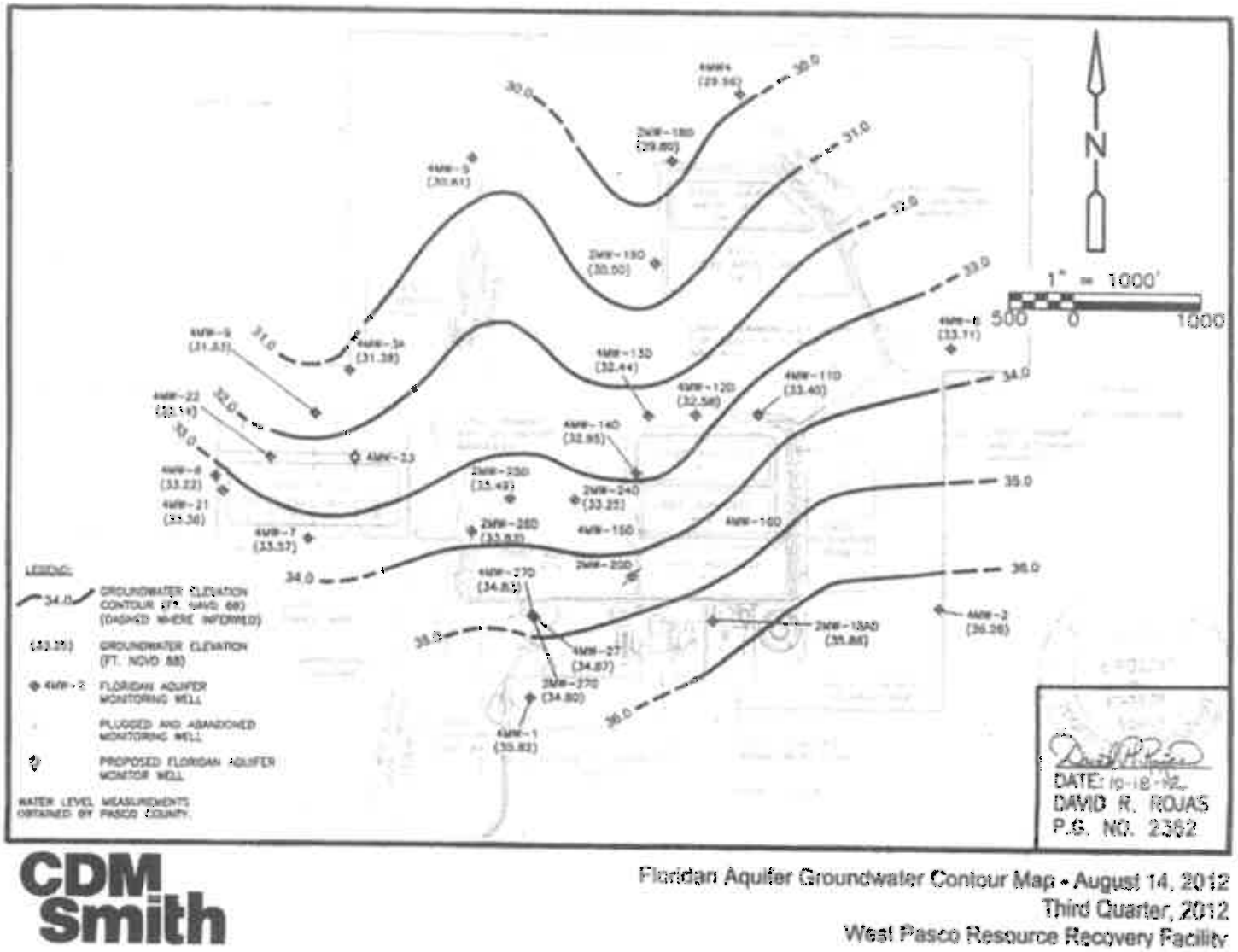
consulting • engineering • construction • operations

Surfical Aquifer Groundwater Contour Map - Reference file
Third Quarter, 2011
West Pasco Resource Recovery Facility

Figure 2. Groundwater Monitoring Well Network and Surficial Aquifer Contours (2011) at the Pasco County Resource Recovery Facility

[Taken from Groundwater Monitoring Plan Evaluation Semester 1 2011 - Semester 2 2012 West Pasco Class 1 Landfill]



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Floridan Aquifer Groundwater Contour Map - August 14, 2012
Third Quarter, 2012
West Pasco Resource Recovery Facility

Figure 3. Groundwater Monitoring Well Network and Floridan Aquifer Contours (2012) at the Pasco County Resource Recovery Facility

[Taken from Groundwater Monitoring Plan Evaluation Semester 1 2011 - Semester 2 2012 West Pasco Class 1 Landfill]

3.0 Supporting Information

3.1 Historic Ash Characterization Data

The Pasco County WTE facility produces a combined ash consisting of both bottom ash and fly ash. The ash proposed for use in the RD&D construction and monitoring activity will only be selected screenings of the facility's bottom ash, existing data on the targeted ash fraction(s) is provided in Appendix A.

3.2 Data Produced in Support of Permit Application

In support of this permit application, extensive ash characterization was conducted. The objectives of this testing included (1) demonstrating that the proposed ash fraction(s) were not toxicity characteristic hazardous waste (TCLP testing), (2) providing other data on ash chemical characteristics to aid in designing the study and to assist FDEP with their review (SPLP and total metals), and (3) determining appropriate mix designs for the constructed test strips. Only the results from the first two objectives are presented in detail here. The preliminary results of the third objective were used to develop proposed mix designs presented in the next section.

WTE bottom ash samples were collected over a seven-day sampling event (June 3, 2013- June 9,2013). The sampling plan incorporated the procedures outlined in USEPA Document No. EPA530-R-95-036 entitled "Guidance for the Sampling and Analysis of Municipal Waste Combustion Ash for the Toxicity Characteristic." Covanta personnel collected grab samples and generated half-day composite samples. Fourteen half-day samples were collected for the two size fractions of interest: a greater than 3/8 inch fraction and a less than 3/8 inch fraction. Following the metals recovery units in the facility's ash management facility, grab samples of both fractions of ash were collected every fifteen minutes in three-hour intervals. These samples were composited in twelve-hour increments to produce the half-day samples. The half-day samples were labeled with the date and time (day or night). Three five-gallon buckets of each half-day sample were generated; Covanta retained one bucket while two were taken to the University of Florida Solid and Hazardous laboratory for analysis. Mixing one 5-gallon bucket of each half-day sample thoroughly in pre-cleaned mixer created a composite sample representing the entire sampling event.

The ash samples (each size fraction) were characterized using several different testing methods. The toxicity characteristic leaching procedure (TCLP; Method 1311) was performed on the composite samples in triplicate (x3) as well as one replicate of each half-day sample. The purpose of the TCLP was to confirm that the WTE bottom ash was not a TC hazardous waste. The synthetic precipitation leaching procedure (SPLP;

Method 1312) was also performed in triplicate on the composite samples, as well as on each individual half-day sample. Total metal concentrations of the composite sample (8 replicates) and each half-day sample (2 replicates) were determined using an EPA method 3050b acid digestion. Metals analysis for digested solid and leachate (TCLP and SPLP) samples was conducted using inductively coupled plasma atomic emission spectroscopy (ICP-AES).

The results of the TCLP are presented in Table 1 (<3/8-inch samples) and Table 2 (>3/8-inch samples). All measured TCLP leachate concentrations from the composite samples were below the toxicity characteristic (TC) limits. The arithmetic mean and the 95% UCL of all elements for both size fractions were below the TC limits. The results demonstrate that both fractions of the WTE bottom ash collected during the 7-day sampling event were not hazardous wastes.

The results of the SPLP are presented in Table 3 (<3/8-inch samples) and Table 4 (>3/8-inch samples), while the results for total concentrations are presented in Table 5 (<3/8-inch samples) and Table 6 (>3/8-inch samples).

Table 1. TCLP Results for the Less than 3/8-inch WTE Bottom Ash Samples

Element	Half-Day Sample Range Min-Max (mg/L)	Half-Day Sample Arithmetic Mean (mg/L)	Half-Day Sample 95% UCL (mg/L)	Composite Mean (mg/L)
Less than 3/8"				
As	0.005-0.005	0.005	0.005	0.008
Ba	0.267-0.652	0.375	0.419	0.376
Cd	0.001-1.1	0.343	0.493	0.263
Cr	0.003-0.085	0.023	0.036	0.012
Pb	0.005-14.1	2.06	3.75	1.57
Se	0.003-0.029	0.016	0.019	0.015
Ag	0.005-0.005	0.005	0.005	0.005
Hg	0.010-0.010	0.010	0.010	0.010

*Values below the detection limit are reported at the detection limit

Table 2. TCLP Results for the Greater than 3/8-inch WTE Bottom Ash Samples

Element	Half-Day Sample Range Min-Max (mg/L)	Half-Day Sample Arithmetic Mean (mg/L)	Half-Day Sample 95% UCL (mg/L)	Composite Mean (mg/L)
Greater than 3/8"				
As	0.005-0.013	0.006	0.007	0.005
Ba	0.272-0.809	0.488	0.549	0.715
Cd	0.001-1.16	0.188	0.310	0.203
Cr	0.002-0.176	0.046	0.074	0.104
Pb	0.005-3.14	0.428	0.788	1.38
Se	0.006-0.157	0.010	0.012	0.012
Ag	0.005-0.005	0.005	0.005	0.005
Hg	0.010-0.010	0.010	0.010	0.010

*Values below the detection limit are reported at the detection limit

Table 3. SPLP Results for the Less than 3/8-inch WTE Bottom Ash Samples

Element	Half-Day Sample Range Min-Max (mg/L)	Half-Day Sample Arithmetic Mean (mg/L)	Half-Day Sample 95% UCL (mg/L)	Composite Mean (mg/L)
Less than 3/8"				
Ag	0.005-0.005	0.005	0.005	0.005
Al	0.087-7.62	0.811	1.62	1.95
As	0.005-0.005	0.005	0.005	0.005
B	0.009-0.471	0.030	0.036	0.011
Ba	0.891-1.96	1.19	1.33	1.60
Be	0.003-0.003	0.003	0.003	0.003
Ca	336-615	422	452	407
Cd	0.001-0.001	0.001	0.001	0.001
Cr	0.003-0.009	0.006	0.007	0.005
Cu	0.152-0.360	0.244	0.277	0.194
Fe	0.002-0.013	0.005	0.006	0.003
Hg	0.010-0.010	0.010	0.010	0.010
Mg	0.010-0.022	0.016	0.017	0.013
Mn	0.001-0.001	0.001	0.001	0.001
Mo	0.030-0.069	0.045	0.050	0.043
Na	62.8-129	83.8	92.5	78.2
Ni	0.002-0.049	0.007	0.012	0.002
Pb	1.04-35.2	8.80	13.9	3.03
Sb	0.003-0.008	0.004	0.005	0.004
Se	0.008-0.008	0.008	0.008	0.008
Sn	0.004-0.008	0.004	0.005	0.004
Sr	0.884-1.73	1.15	1.24	1.15
V	0.001-0.001	0.001	0.001	0.001
Zn	0.453-1.09	0.811	0.876	0.685

*Values below the detection limit are reported at the detection limit

Table 4. SPLP Results for the Greater than 3/8-inch WTE Bottom Ash Samples

Element	Half-Day Sample Range Min-Max (mg/L)	Half-Day Sample Arithmetic Mean (mg/L)	Half-Day Sample 95% UCL (mg/L)	Composite Mean (mg/L)
Ag	0.005-0.005	0.005	0.005	0.005
Al	8.27-146	63.8	82.1	56.1
As	0.005-0.005	0.005	0.005	0.005
B	0.006-0.917	0.044	0.055	0.012
Ba	0.172-1.02	0.554	0.690	0.716
Be	0.003-0.003	0.003	0.003	0.003
Ca	87.9-237	158	181	158
Cd	0.001-0.001	0.001	0.001	0.001
Cr	0.003-0.004	0.003	0.003	0.003
Cu	0.007-1.27	0.146	0.288	0.003
Fe	0.004-0.034	0.011	0.015	0.008
Hg	0.010-0.010	0.010	0.010	0.010
Mg	0.009-0.047	0.019	0.024	0.010
Mn	0.001-0.002	0.001	0.002	0.001
Mo	0.017-0.137	0.032	0.045	0.029
Na	27.8-74.2	45.2	51.5	48.8
Ni	0.002-0.009	0.002	0.003	0.005
Pb	0.005-0.364	0.083	0.135	0.137
Sb	0.006-0.174	0.047	0.069	0.026
Se	0.008-0.008	0.008	0.008	0.008
Sn	0.004-0.018	0.006	0.007	0.004
Sr	0.231-1.27	0.542	0.673	0.641
V	0.002-0.017	0.008	0.010	0.007
Zn	0.023-0.251	0.105	0.135	0.168

*Values below the detection limit are reported at the detection limit

Table 5. Total Metal Results for the Less than 3/8-inch WTE Bottom Ash Samples

Element	Half-Day Sample Range Min-Max (mg/kg)	Half-Day Sample Mean (mg/kg)	Half-Day Sample 95% UCL (mg/kg)	Composite Mean (mg/kg)
Less than 3/8"				
Ag	0.126-18.3	2.68	3.86	3.85
Al	9,780-131,000	33,300	41,900	29,500
As	4.89-12	7.61	8.19	9.43
Ba	179-988	333	379	405
Ca	49,200-88,900	73,300	76,500	84,100
Cd	1.53-48.8	9.24	12.0	12.2
Cr	29.1-188	57.7	66.7	50.5
Cu	417-5,880	1,670	2,140	5,100
Fe	13,400-47,800	28,000	30,900	25,900
Hg	.909-1.05	0.997	1.01	1.11
Mg	2,510-8,240	5,140	5,550	5,580
Mn	229-948	478	539	1,210
Mo	3.74-83.9	11.1	15.8	8.50
Na	4,090-13,600	6,700	7,260	6,950
Ni	23.3-142	52.7	62.3	65.3
Pb	214-1990	594	768	600
Sb	8.76-37.2	19.4	21.7	24.3
Se	0.545-0.631	0.598	0.606	0.668
Sn	17.4-663	65.8	104	112
Sr	108-502	194	223	209
V	6.82-27.1	14.5	16.0	15.2
Zn	1,110-17,700	2,960	4,000	3,500

*Values below the detection limit are reported at the detection limit

Table 6. Total Metal Results for the Greater than 3/8-inch WTE Bottom Ash Samples

Element	Half-Day Sample Range Min-Max (mg/kg)	Half-Day Sample Mean (mg/kg)	Half-Day Sample 95% UCL (mg/kg)	Composite Mean (mg/kg)
Greater than 3/8"				
Ag	0.402-15	2.25	3.22	2.49
Al	7,530-63,400	26,900	31,500	34,100
As	3.02-26.7	7.47	8.96	9.61
Ba	120-710	304	348	301
Ca	34,100-77,500	58,600	62,500	82,100
Cd	0.100-35.4	7.53	9.81	13.2
Cr	21.1-141	58	68	60
Cu	275-11,700	1,680	2,440	2,860
Fe	6,200-67,700	33,300	38,900	33,400
Hg	0.952-1.00	0.987	0.993	1.08
Mg	2100-5220	3,580	3,860	4,540
Mn	149-2160	507	637	486
Mo	2.94-22.4	7.15	8.53	10.9
Na	3,220-13,500	8,020	9,000	7,530
Ni	17.2-413	59.7	85.2	95.0
Pb	113-10,900	736	1,410	653
Sb	6.91-29.7	14.3	16.2	22.2
Se	0.0571-0.61	0.592	0.596	0.607
Sn	11.9-271	76.9	99.5	104
Sr	91.1-749	218	266	199
V	6.06-19.1	11.1	12.3	12.7
Zn	721-2,860	1,400	1,590	2,500

*Values below the detection limit are reported at the detection limit

4.0 Proposed RD&D Activities

4.1 Testing Location

An existing unpaved road within the property of the Pasco County Solid Waste Resource Recovery Facility will be used as the testing area, and is identified in Figure 4. The road begins at a gate on the property line bordering Shady Hills Road and connects to a paved road to the west. Approximately 1,000 feet of paved road will be integrated into to this RD&D activity (though a greater total length of road may be paved).

4.2 Test Strip Construction

Five different test strips will be constructed. A description of each of the five test strip conditions is presented in Table 7. Three of the test strips will contain WTE ash, one as a base course material, one as a partial replacement aggregate in asphalt pavement, and one as a partial aggregate replacement in concrete pavement. Two ten foot by ten foot test patches will be installed to provide data on leachate quality and generation rates, and to allow for core sampling while maintaining the integrity of the road. A geomembrane liner will be installed below the test patch to capture leachate for analysis. Following completion of the project the test patches will be removed and placed in the onsite landfill, test strips will be left in place. Detailed descriptions of each configuration are presented in Appendix B.

Table 7. Description of Test Strips

Test Strip	Description
WTE Bottom ash used a base course	One hundred eighty feet of asphalt concrete (containing no ash) above a base course consisting of compacted WTE bottom ash (a blend of both the >3/8-inch and the <3/8-inch fractions).
WTE Bottom ash used as a partial aggregate replacement for Portland cement concrete pavement	One hundred eighty feet of Portland cement concrete incorporating the >3/8-inch bottom WTE bottom as a partial aggregate replacement above a base course consisting of compacted lime rock. The WTE ash will comprise approximately 15-20% by mass of the concrete mix.
WTE Bottom ash used as a partial aggregate replacement for asphalt pavement.	One hundred eighty feet of asphalt concrete incorporating the >3/8-inch and as a partial aggregate replacement above a base course consisting of compacted lime rock. The WTE ash will comprise approximately 20-30% by mass of the asphalt mix.
Control: Portland cement concrete pavement	One hundred eighty feet of Portland cement concrete (containing no ash) above a base course consisting of compacted lime rock.
Control: Asphalt pavement	One hundred eighty feet of asphalt concrete (containing no ash) above a base course consisting of compacted lime rock.

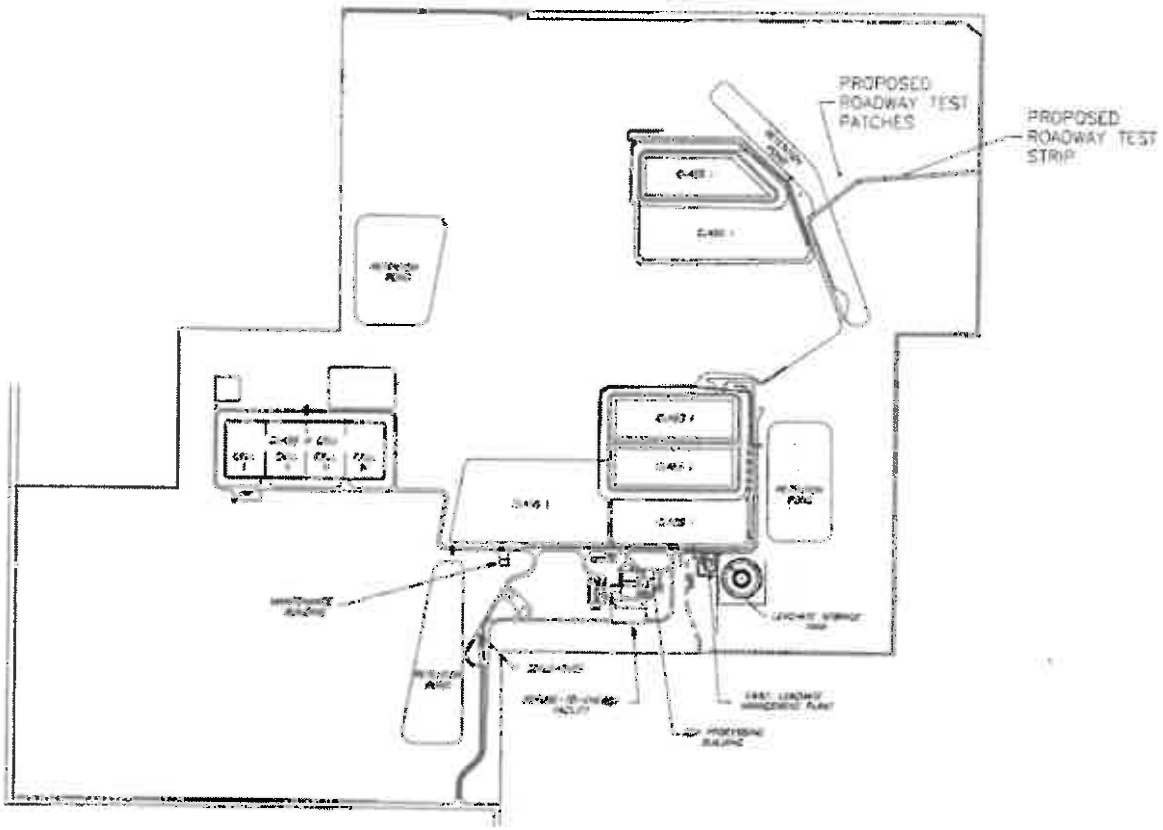


Figure 4. Location of Test Strips at the Pasco County Solid Waste Resource Recovery Facility

A state-licensed contractor using standardized construction techniques will construct the test strips. Test strip mix design will be based off of FDOT specs with modifications to account for the addition of the ash. WTE ash used as part of this project will be processed and stored within the facility's covered ash processing building. Processed ash used as an aggregate replacement will be transported to the designated concrete or asphalt batch plants in dump trucks and the loads will be tarped; ash will not be transported during periods of inclement weather. Only ash sufficient for the test strip will transported to the batch plant, and any remaining ash will be transported back to the Resource Recovery Facility for disposal in a Class I landfill unit. At the batch plant, the ash will be incorporated into a manufactured product (and transported to the test strip site for placement) within 48 hours of receipt.

4.3 Groundwater Monitoring Well Construction

Groundwater monitoring wells will be installed both up gradient and down gradient of each test strip as indicated in Figures 5, 6 and 7. Well installation will commence prior to construction of the test strips. The wells will be installed in the surficial aquifer by a licensed contractor and will be developed according to standard FDEP protocol. Well depth and screen height will be determined through dialogue with FDEP personnel. Soil samples will be taken during construction of the wells to determine site-specific soil characteristics.

4.4 Materials Sample Collection

Samples of ash, concrete, and pavement will be collected throughout test strip construction for chemical characterization in the laboratory. A composite ash sample will be collected as appropriate from each source. While, the processed ash used as an aggregate in concrete and asphalt (>3/8-inch fraction) should be the same, composite samples will be collected from each batch plant. Samples of mixed concrete and asphalt containing ash (as well as the control samples that do not contain ash) will be collected as the test strips are constructed. A composite sample of the combined bottom ash used as the base course material will be collected during test strip construction.

4.5 Materials Chemical Characterization

The ash samples and the concrete samples will be chemically characterized using a suite of different methods. The methods are identified in Table 8. The chemical analytes to be targeted (and their estimated detection limits) are presented in Appendix C.

4.6 Groundwater Monitoring

The five up gradient groundwater wells will be monitored for a period of two months prior to construction of the test strips to establish baseline groundwater quality. Post construction groundwater samples will be collected on a monthly basis following standardized FDEP sampling protocols. A list of target chemical analytes is presented in Appendix D.

4.7 Site Characterization

Prior to construction of the test strips preliminary characterization will be conducted to establish baseline soil and water quality levels. Grab soil samples will be taken between five to ten feet from each side of the test strips where WTE ash is proposed to be used as a construction material. Two discrete samples will be taken at depths of 0-0.5 ft below surface and 0.5-2 ft bls; a total of twelve samples will be taken. These samples will be analyzed for total metals (EPA Method 3050b) a list of the target chemical analytes is presented in Appendix C. Prior to construction grab samples of surfacewater will be taken if present from the retention pond west of the test strip and analyzed for the target chemical analytes listed in Appendix D. Post construction soil and surfacewater sampling will be conducted every three months in accordance with the protocols described above.

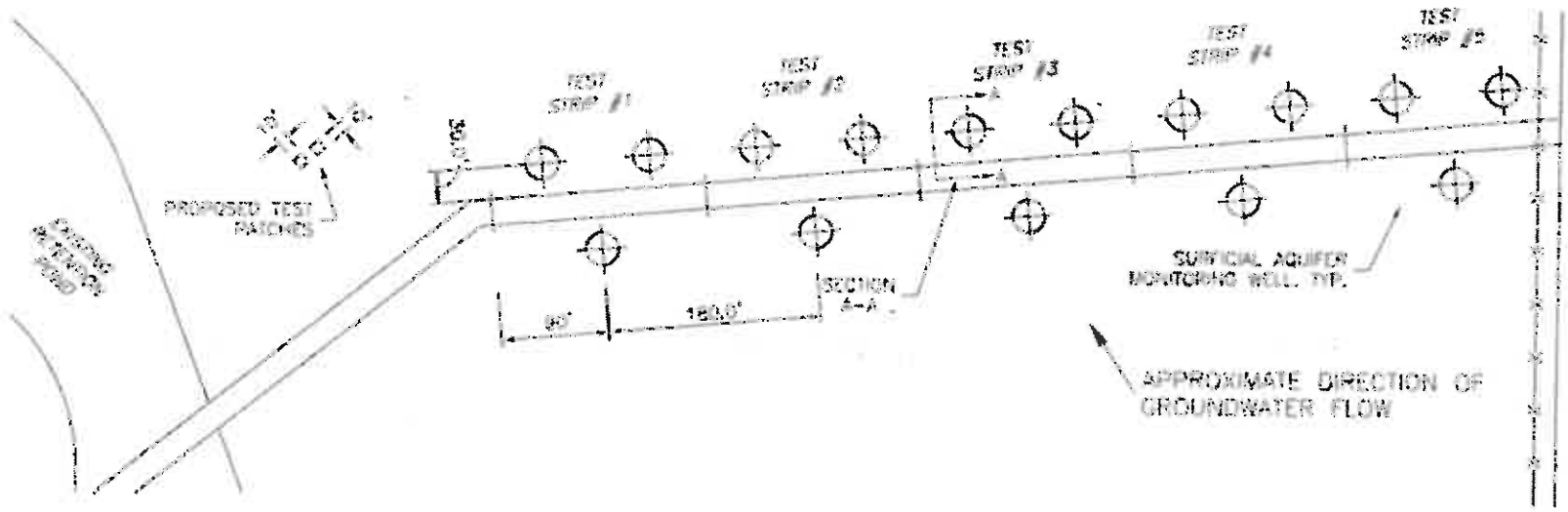


Figure 5. Well Location Detail

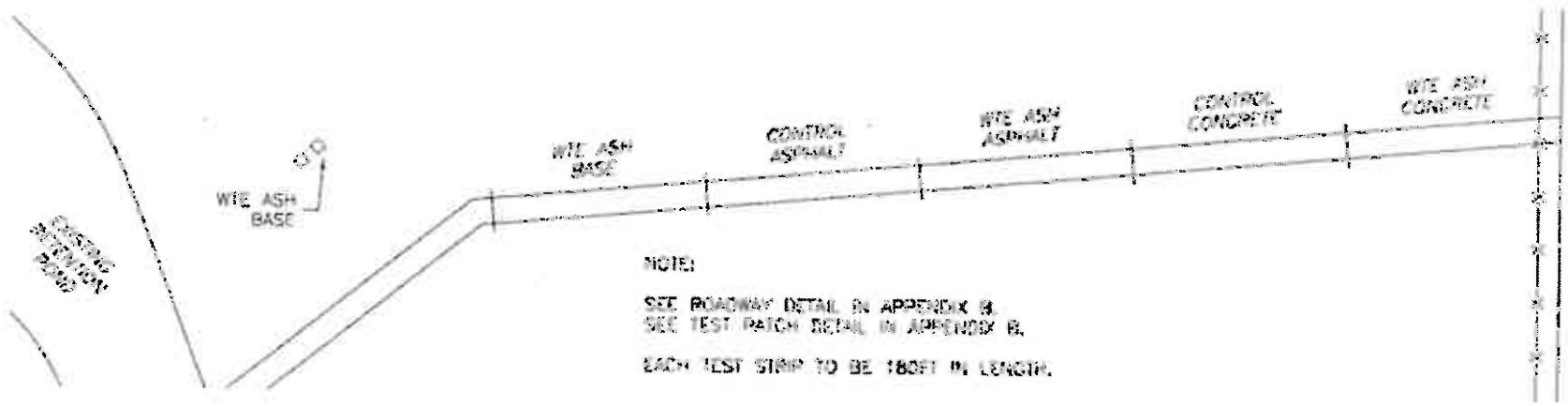


Figure 6. Test Strip Detail

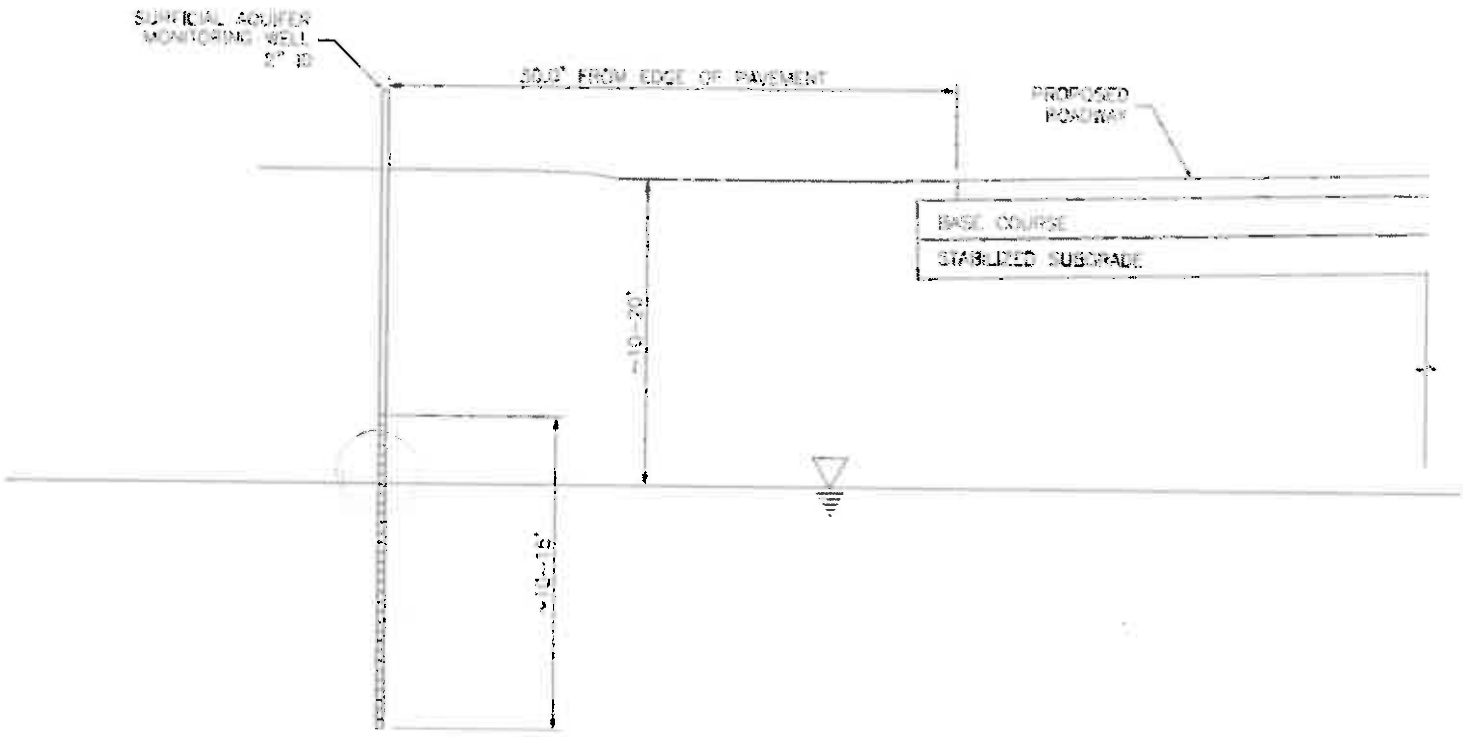


Figure 7. Section A-A: Typical Monitoring Well Cross-Section

Table 8.
Chemical Methods to be Performed on Ash, Concrete, and Asphalt Samples

Analytical Method	Composite Sample of Base Course Ash	Composite Sample of Ash from Each Batch Plant	Concrete Amended with WTE Bottom (>3/8-inch)	Asphalt Amended with WTE Bottom (>3/8-inch)	Control Samples [#]
Total Metal Concentration (EPA Method 3050B; digestion on ICP-AES)	X	X	X	X	X
TCLP (Method 1311)	X	X			
SPLP (Method 1312)	X	X	X	X	X
Leaching Method 1313	X		X	X	
Leaching Method 1314	X		X	X	
Leaching Method 1315	X		X	X	
Leaching Method 1316	X		X	X	

[#] To include aggregate used in asphalt and concrete, lime rock used as base course, un-amended Portland cement concrete, un-amended asphalt pavement

5.0 Reporting and Project Closure

Quarterly reports will be submitted to FDEP describing the research activities and providing groundwater monitoring data. Upon project completion, a final report will be prepared and submitted. The final report will present findings and conclusions on the suitability of beneficial reuse of WTE bottom ash as a road construction material.

Pasco County Solid Waste Department plans to leave the test strips in place following construction and monitoring processes outlined in the attached permit application, test patches will be removed and placed in the onsite landfill. If constituents of potential concern are detected in monitoring wells above applicable regulatory thresholds and the Florida Department of Environmental Protection deem these concentrations to pose a risk to human health or the health of the environment, the test strips will be removed and the material placed in the onsite landfill.

Appendix A

Historic Ash Chemical Characteristic Results from
Pasco County Solid Waste Resource Recovery Facility

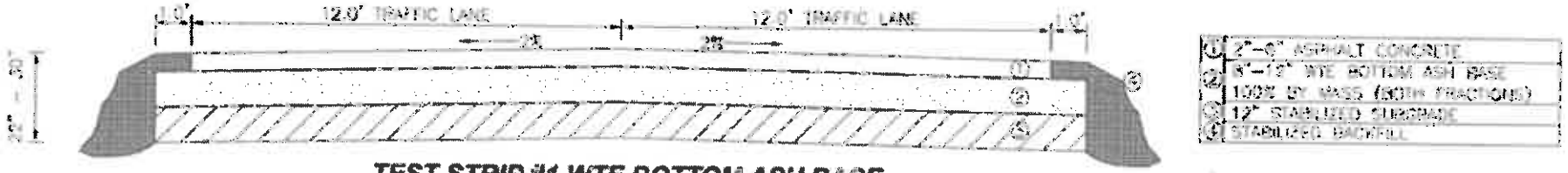
Table 9. Lead and Cadmium Total Concentration and TCLP Values from 7-Day Characterization (2012)

Less than 3/8" Bottom Ash					
TCLP (mg/L)			Total Concentration (mg/kg)		
Sample	Cd	Pb	Sample	Cd	Pb
8/4/12	0.01	0.01	8/4/12	63.2	496
8/4/12	0.01	0.01	8/4/12	14.1	1,870
8/5/12	0.01	0.01	8/5/12	8.2	436
8/5/12	0.01	0.01	8/5/12	2.1	813
8/6/12	0.01	0.01	8/6/12	9.9	414
8/6/12	0.01	0.01	8/6/12	3.5	225
8/7/12	0.01	0.01	8/7/12	4	358
8/7/21	0.01	0.01	8/7/21	2.9	2,310
8/8/12	0.01	0.01	8/8/12	4.8	428
8/8/12	0.01	0.01	8/8/12	4.1	298
8/9/12	0.01	0.01	8/9/12	7.8	218
8/9/12	0.01	0.01	8/9/12	3.6	309
8/10/12	0.01	0.01	8/10/12	2.7	288
8/10/12	0.01	0.01	8/10/12	2.1	129
Mean	0.01	0.01	Mean	9.5	614
95% UCL	0.01	0.01	95% UCL	17	922

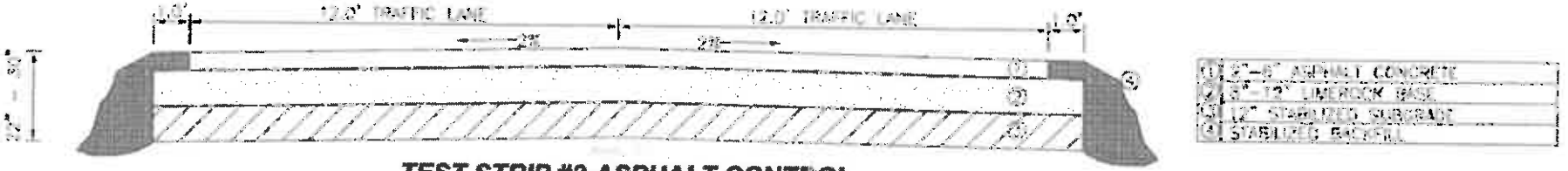
Greater than 3/8" Bottom Ash					
TCLP (mg/L)			Total Concentration (mg/kg)		
Sample	Cd	Pb	Sample	Cd	Pb
8/4/12	0.05	0.05	8/4/12	17.4	185
8/4/12	0.13	0.05	8/4/12	4.6	115
8/5/12	0.05	0.05	8/5/12	4.5	158
8/5/12	0.05	0.035	8/5/12	2.2	179
8/6/12	0.092	3.9	8/6/12	0.57	95
8/6/12	0.01	0.01	8/6/12	3.6	51,100
8/7/12	0.032	0.01	8/7/12	6.4	332
8/7/21	0.01	0.01	8/7/21	4.5	156
8/8/12	0.01	0.031	8/8/12	0.2	32.4
8/8/12	0.046	0.01	8/8/12	1.7	66.3
8/9/12	0.029	0.01	8/9/12	1.1	42.5
8/9/12	0.14	0.01	8/9/12	2.1	33.7
8/10/12	0.011	0.041	8/10/12	0.78	58.6
8/10/12	0.057	0.31	8/10/12	0.7	59.9
Mean	0.051	0.323	Mean	3.60	3,758
95% UCL	0.071	0.812	95% UCL	5.68	10,208

Appendix B

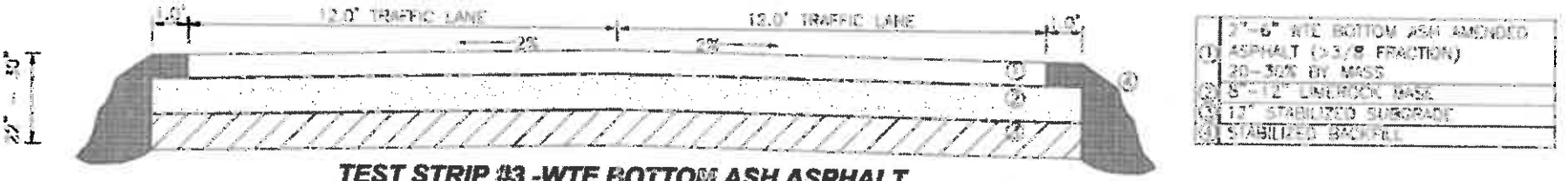
Test Section Configurations



TEST STRIP #1 WTE BOTTOM ASH BASE
Scale: 1:50

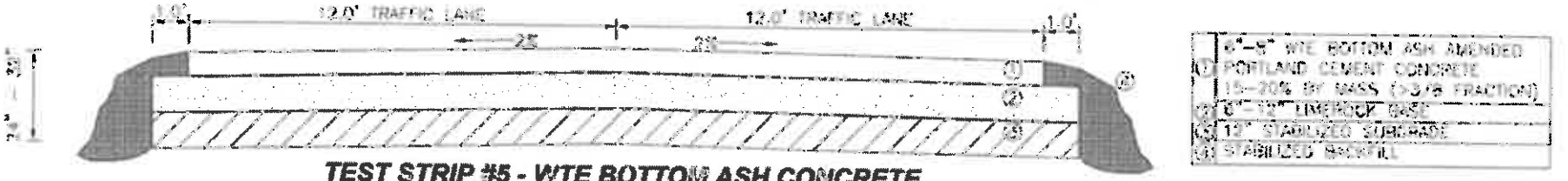


TEST STRIP #2-ASPHALT CONTROL
Scale: 1:50



TEST STRIP #3 -WTE BOTTOM ASH ASPHALT
Scale: 1:50

TEST STRIP #4 - CONTROL CONCRETE
Scale: 1:50



TEST STRIP #5 - WTE BOTTOM ASH CONCRETE
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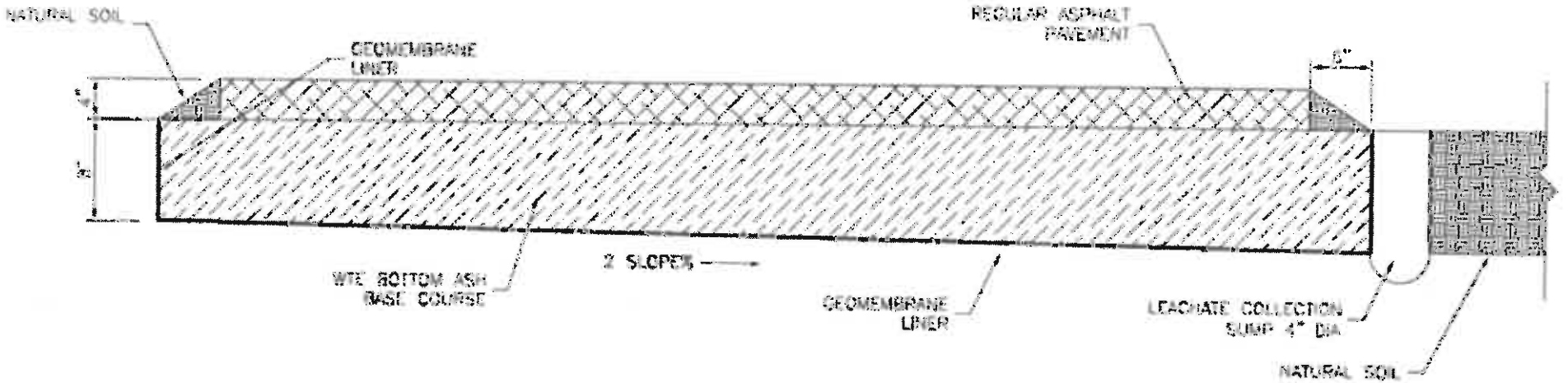

TEST PATCH DETAIL

Appendix C

Target Analytes for Leachate, Ash, and Concrete Samples

Table 10. Target Analytes and Estimated Detection Limits

Element	Estimated Detection Limit (µg/L)
Ag	5.25
Al	34.5
As	6
B	9
Ba	1.5
Be	3
Ca	13.5
Cd	1.5
Cr	3
Cu	3
Fe	3
Hg	0
Mg	3
Mn	1.5
Mo	3
Na	60
Ni	2.25
Pb	6
Sb	3.75
Se	9
Sn	4.5
Sr	4.5
V	1.5
Zn	3

Appendix D

Groundwater and Surfacewater Monitoring Target Analytes

Table 11. Target Groundwater and Surfacewater Analytes and Estimated Detection Limits

Element	Estimated Detection Limit (µg/L)
Ag	5.25
Al	34.5
As	6
B	9
Ba	1.5
Be	3
Ca	13.5
Cd	1.5
Cr	3
Cu	3
Fe	3
Hg	10
Mg	3
Mn	1.5
Mo	3
Na	60
Ni	2.25
Pb	6
Sb	3.75
Se	9
Sn	4.5
Sr	4.5
V	1.5
Zn	3
SO4-	200
NO3-	500
CL-	100
ALK	n/a
pH	n/a
Conductivity	0
Turbidity	0
Temp	n/a
DO	0
TDS	0
Static Water Level (Groundwater Only)	