Stock Island Landfill
Gas and Water Sampling Brief

Upon request, the Utilities Department looked at the gas and water sampling activities at or around the Stock Island Landfill. We were also asked to provide any first-hand knowledge of other landfill mining or reuse projects that might give insight to the project.

1) Landfill Gas Review

What is Landfill Gas?

- **Landfill gas is composed of a mixture of hundreds of different gases.** By volume, landfill gas typically contains ***45% to 60% methane*** and ***40% to 60% carbon dioxide***. Landfill gas also includes small amounts of nitrogen, oxygen, ammonia, sulfides, hydrogen, carbon monoxide, and ***nonmethane organic compounds (NMOCs)*** such as trichloroethylene, benzene, and vinyl chloride.
- **How is landfill gas formed? Decomposition, Volatilization and Chemical Reactions**

- **Bacterial decomposition.** Most landfill gas is produced by bacterial decomposition, which occurs when organic waste is broken down by bacteria naturally present in the waste and in the soil used to cover the landfill. Organic wastes include food, garden waste, street sweepings, textiles, and wood and paper products.
- **Volatilization**. Landfill gases can be created when certain wastes, particularly organic compounds, change from a liquid or a solid into a vapor. This process is known as volatilization***. NMOCs*** in landfill gas may be the result of volatilization of certain chemicals disposed of in the landfill.
- **Chemical reactions.** Landfill gas, including ***NMOCs,*** can be created by the reactions of certain chemicals present in waste. For example, if chlorine bleach and ammonia come in contact with each other within the landfill, a harmful gas is produced.

How long will the landfill produce gas?

- Gas starts producing in the first few years after it is buried.
- Peak production is 5-7 years after buried.
- Almost all gas is produced within 20 years of being buried.
- Small quantities of gas may continue to be emitted for 40-50 years. We are close to 30 years since the last waste was added to the Stock Island Landfill.
- The amount of organic material in the waste is an important factor in how long gas production lasts. The more organic waste, the longer the landfill produces gas.

Hydrogen Sulfide (H2S) Facts

What is hydrogen sulfide?

- Hydrogen sulfide is a heavier-than-air, flammable gas with a characteristic rotten egg odor. Individuals can detect this odor when hydrogen sulfide gas is present at very low levels. Each individual has a different sensitivity to the odor.

Hydrogen Sulfide (H2S) Facts

- Hydrogen sulfide occurs both naturally and from industrial processes. Natural sources include crude oil, natural gas, salt marshes, sulfur springs, and swamps. Industrial sources include manure handling operations, oil refineries, pulp and paper mills, tanneries, wastewater treatment plants, and solid waste landfills.
- Hydrogen sulfide may account for up to 1 percent by volume of landfill gas emissions, although typically the percentage is much less. The formation of hydrogen sulfide within a landfill depends on certain conditions including moisture content, temperature, and pH; anaerobic conditions (lacking oxygen); and a sulfate source.

Hydrogen Sulfide (H2S) Facts

What types of wastes contribute to hydrogen sulfide formation in landfills?

- Gypsum wallboard, a component of Construction and Demolition Debris (CDD), is a major contributor to hydrogen sulfide formation in landfills.
- CDD and crushed CDD (fines), containing gypsum, are a significant source of sulfate. Other types of waste streams that may contain sulfate include wastes from pulp and paper mill bleaching and coating operations and sludges from wastewater treatment plants.

Hydrogen Sulfide (H2S) Facts

How do landfills check for hydrogen sulfide?

- Different methods can be used to check for hydrogen sulfide and are selected based on site-specific needs. Hydrogen sulfide can be detected and measured with portable or stationary continuous air monitors. Air sampling and subsequent laboratory analysis can also be conducted.

Hydrogen Sulfide (H2S) Facts

How can hydrogen sulfide be controlled in the landfill environment?

- Hydrogen sulfide and other landfill gases can be controlled by installing an active gas management system that pulls out and burns the landfill gas. Also, hydrogen sulfide emissions can be reduced by decreasing the amount of sulfate containing wastes entering the landfill, and by applying certain cover materials such as soil amended with lime and fine concrete.

Hydrogen Sulfide (H2S) Facts

Are there Federal Standards and/or Exposure Limits?

- OSHA and NIOSH have established workplace limits for hydrogen sulfide. OSHA established an eight-hour permissible exposure limit-time weighted average (PEL-TWA) of 10 ppm and a 15-minute short-term exposure limit (PEL-STEL) of 15 ppm for exposed workers. NIOSH established a limit of 300 ppm as the immediately dangerous to life and health concentration.
- EPA health scientists unanimously recommend a weighted average of no more than 15 ppb at the residence or 70 ppb at the property line. EPA set the safe exposure level at 0.00014 ppm to protect sensitive people such as children and the elderly.

2) Review of complaints about Stock Island Landfill

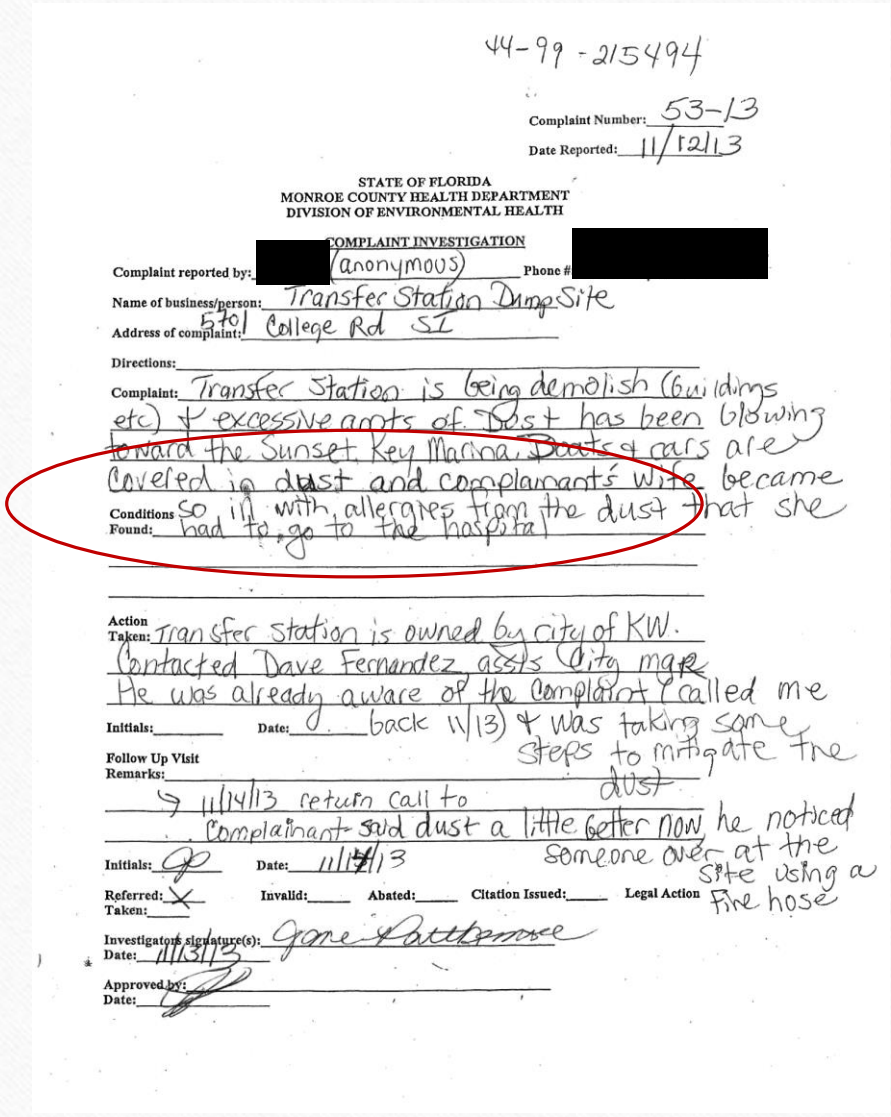
The City requested information about any complaints or investigations of the City of Key West Stock Island Landfill from the Florida Department of Health in Key West. Below is the email response and the complaint received:

From: Floyd, Caitlin M
Sent: Tuesday, February 5, 2019 8:53 AM
To: Kerr, Alison M <Alison.Kerr@flhealth.gov>; Rachal, James M <James.Rachal@flhealth.gov>
Cc: Stayton, Donna N <Donna.Stayton@flhealth.gov>
Subject: RE: Sanitary Nuisance Records - Mt. Trashmore

Alison,
I have attached the only complaint we had on file.
The only other thing I know about the landfill is that the schools had monitors in them to detect landfill gasses. It was regulated by either the DEP or EPA but this past year I know the County was trying to stop being required to monitor at both Poinciana and Gerald Adams because there hadn't been any detections in a few years. I'm not sure what ended up happening with that. I can try to find the lady's contact information who was monitoring that if you need it.

This is the only complaint filed with the FDOH that we could find.

Next we followed up with FDEP about the schools that were being monitored were actually Poinciana and HOB, but we were informed due to the construction of a new Gerald Adams school buildings on the site adjacent to the Stock Island Landfill there had been environmental sampling, including gases, of the site.



44-99-215494

Complaint Number: 53-13
Date Reported: 11/12/13

STATE OF FLORIDA
MONROE COUNTY HEALTH DEPARTMENT
DIVISION OF ENVIRONMENTAL HEALTH

COMPLAINT INVESTIGATION

Complaint reported by: [redacted] (anonymous) Phone # [redacted]
Name of business/person: Transfer Station Dump Site
Address of complaint: 5701 College Rd SI
Directions:
Complaint: Transfer Station is being demolish (buildings etc) & excessive amts of dust has been blowing toward the Sunset Key Marina. Boats & cars are covered in dust and complainants wife became
Conditions Found: so ill with allergies from the dust that she had to go to the hospital

Action Taken: Transfer Station is owned by city of KW. Contacted Dave Fernandez asst City mgr. He was already aware of the complaint & called me back 11/13) & was taking some steps to mitigate the dust
Initials: Date:
Follow Up Visit Remarks: 11/14/13 return call to complainant- said dust a little better now he noticed someone over at the site using a fire hose
Initials: Date: 11/14/13
Referred: X Invalid: Abated: Citation Issued: Legal Action Taken:
Investigators signature(s): Jane Patterson
Date: 11/13/13
Approved by:
Date:

3) Review of gas sampling and possibility of VOC vapors

SITE ASSESSMENT REPORT FOR
GERALD ADAMS ELEMENTARY SCHOOL
5855 COLLEGE ROAD
STOCK ISLAND, MONROE COUNTY, FLORIDA 33040

EE&G Environmental Services, LLC
5751 Miami Lakes Drive
Miami Lakes, Florida 33014
(305) 374-8300
June 9, 2017
EE&G Project No.: 2017 – 3071

FDEP Oculus database Waste Cleanup
ID No. COM_355111

On April 25, 2017, EE&G installed four temporary vapor wells around the site (Gerald Adams Elementary School next to the Stock Island Landfill) via the direct-push drill rig, which were designated VP-1 thru VP-4.

On April 26 and May 12, 2017, EE&G conducted vapor screening events for the 4 vapor wells, which included measuring the wells with a 4-gas meter and an OVA/FID.

<u>April 26, 2017</u>

- High tides 10:18am and 11:27pm
- Low tides 3:49am and 4:39pm

<u>May 12, 2017</u>

- High tide 11:09am
- Low tides 4:46am and 5:55pm

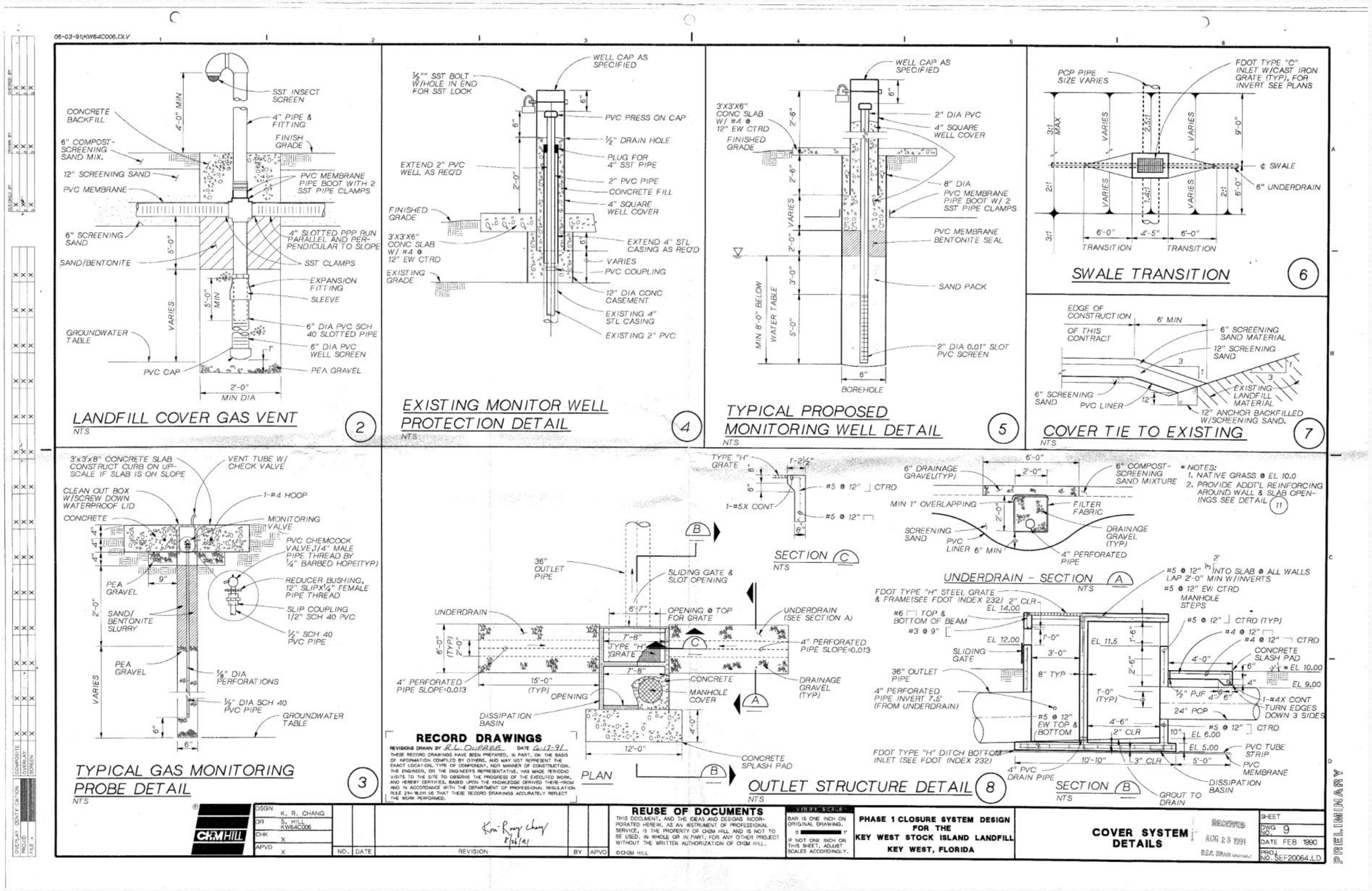

06-03-91;KW64C006.DLV
LANDFILL COVER GAS VENT
NTS
2
SST INSECT SCREEN
4" PIPE & FITTING
FINISH GRADE
CONCRETE BACKFILL
6" COMPOST-SCREENING SAND MIX.
12" SCREENING SAND
PVC MEMBRANE
PVC MEMBRANE PIPE BOOT WITH 2 SST PIPE CLAMPS
6" SCREENING SAND
4" SLOTTED PPP RUN PARALLEL AND PER-PENDICULAR TO SLOPE
SAND/BENTONITE
SST CLAMPS
EXPANSION FITTING
SLEEVE
6" DIA PVC SCH 40 SLOTTED PIPE
6" DIA PVC WELL SCREEN
GROUNDWATER TABLE
PVC CAP
PEA GRAVEL
2'-0" MIN DIA
EXISTING MONITOR WELL PROTECTION DETAIL
NTS
4
WELL CAP AS SPECIFIED
½" SST BOLT W/HOLE IN END FOR SST LOCK
PVC PRESS ON CAP
½" DRAIN HOLE
PLUG FOR 4" SST PIPE
EXTEND 2" PVC WELL AS REQ'D
2" PVC PIPE
CONCRETE FILL
4" SQUARE WELL COVER
FINISHED GRADE
3'X3'X6" CONC SLAB W/ #4 @ 12" EW CTRD
EXTEND 4" STL CASING AS REQ'D
VARIES
PVC COUPLING
EXISTING GRADE
12" DIA CONC CASEMENT
EXISTING 4" STL CASING
EXISTING 2" PVC
TYPICAL PROPOSED MONITORING WELL DETAIL
NTS
5
WELL CAP AS SPECIFIED
3'X3'X6" CONC SLAB W/ #4 @ 12" EW CTRD
FINISHED GRADE
2" DIA PVC
4" SQUARE WELL COVER
8" DIA
PVC MEMBRANE PIPE BOOT W/ 2 SST PIPE CLAMPS
PVC MEMBRANE BENTONITE SEAL
SAND PACK
MIN 8'-0" BELOW WATER TABLE
2" DIA 0.01" SLOT PVC SCREEN
BOREHOLE
SWALE TRANSITION
6
PCP PIPE SIZE VARIES
FDOT TYPE "C" INLET W/CAST IRON GRATE (TYP), FOR INVERT SEE PLANS
¢ SWALE
6" UNDERDRAIN
TRANSITION
COVER TIE TO EXISTING
NTS
7
EDGE OF CONSTRUCTION OF THIS CONTRACT
6' MIN
6" SCREENING SAND MATERIAL
12" SCREENING SAND
6" SCREENING SAND
PVC LINER
EXISTING LANDFILL MATERIAL
12" ANCHOR BACKFILLED W/SCREENING SAND.
TYPICAL GAS MONITORING PROBE DETAIL
NTS
3
3'x3'x8" CONCRETE SLAB CONSTRUCT CURB ON UP-SCALE IF SLAB IS ON SLOPE
VENT TUBE W/ CHECK VALVE
CLEAN OUT BOX W/SCREW DOWN WATERPROOF LID
1-#4 HOOP
CONCRETE
MONITORING VALVE
PVC CHEMCOCK VALVE,1/4" MALE PIPE THREAD BY ¼" BARBED HOPE(TYP)
PEA GRAVEL
REDUCER BUSHING, 12" SLIPX¼" FEMALE PIPE THREAD
SAND/ BENTONITE SLURRY
SLIP COUPLING 1/2" SCH 40 PVC
½" SCH 40 PVC PIPE
PEA GRAVEL
⅛" DIA PERFORATIONS
½" DIA SCH 40 PVC PIPE
GROUNDWATER TABLE
OUTLET STRUCTURE DETAIL
NTS
8
PLAN
36" OUTLET PIPE
SLIDING GATE & SLOT OPENING
UNDERDRAIN
OPENING @ TOP FOR GRATE
UNDERDRAIN (SEE SECTION A)
TYPE "H" GRATE
4" PERFORATED PIPE SLOPE=0.013
CONCRETE
MANHOLE COVER
DRAINAGE GRAVEL (TYP)
OPENING
DISSIPATION BASIN
CONCRETE SPLASH PAD
SECTION C
NTS
1-#5X CONT
#5 @ 12" CTRD
UNDERDRAIN - SECTION A
NTS
6" DRAINAGE GRAVEL(TYP)
MIN 1" OVERLAPPING
SCREENING SAND
PVC LINER 6" MIN
6" COMPOST-SCREENING SAND MIXTURE
FILTER FABRIC
DRAINAGE GRAVEL (TYP)
4" PERFORATED PIPE
* NOTES:
1. NATIVE GRASS @ EL 10.0
2. PROVIDE ADDT'L REINFORCING AROUND WALL & SLAB OPEN-INGS SEE DETAIL 11
SECTION B
NTS
FDOT TYPE "H" STEEL GRATE & FRAME(SEE FDOT INDEX 232)
#5 @ 12" INTO SLAB @ ALL WALLS LAP 2'-0" MIN W/INVERTS
#5 @ 12" EW CTRD
MANHOLE STEPS
SLIDING GATE
36" OUTLET PIPE
4" PERFORATED PIPE INVERT 7.5' (FROM UNDERDRAIN)
CONCRETE SLASH PAD
24" PCP
1-#4X CONT TURN EDGES DOWN 3 SIDES
FDOT TYPE "H" DITCH BOTTOM INLET (SEE FDOT INDEX 232)
4" PVC DRAIN PIPE
PVC TUBE STRIP
PVC MEMBRANE
DISSIPATION BASIN
GROUT TO DRAIN
RECORD DRAWINGS
REVISIONS DRAWN BY R.L. DUPREE DATE 6-17-91
THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS, AND MAY NOT REPRESENT THE EXACT LOCATION, TYPE OF COMPONENT, NOR MANNER OF CONSTRUCTION. THE ENGINEER, OR THE ENGINEER'S REPRESENTATIVE, HAS MADE PERIODIC VISITS TO THE SITE TO OBSERVE THE PROGRESS OF THE EXECUTED WORK, AND HEREBY CERTIFIES, BASED UPON THE KNOWLEDGE DERIVED THERE-FROM AND IN ACCORDANCE WITH THE DEPARTMENT OF PROFESSIONAL REGULATION RULE 21H-19.011 (4) THAT THESE RECORD DRAWINGS ACCURATELY REFLECT THE WORK PERFORMED.
CH2M HILL
DSGN K. R. CHANG
DR S. HILL KW64C006
CHK
APVD
NO. DATE REVISION BY APVD
REUSE OF DOCUMENTS
THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF CH2M HILL AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CH2M HILL.
©CH2M HILL
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.
PHASE 1 CLOSURE SYSTEM DESIGN FOR THE KEY WEST STOCK ISLAND LANDFILL KEY WEST, FLORIDA
COVER SYSTEM DETAILS
RECEIVED AUG 23 1991
SHEET
DWG NO. 9
DATE FEB 1990
PROJ NO. SEF20064.LD
PRELIMINARY

TABLE 2
VAPOR WELL RESULTS
GERALD ADAMS ELEMENTARY SCHOOL
5855 COLLEGE ROAD
STOCK ISLAND, MONROE COUNTY, FLORIDA 33040
PROJECT NO.: 2017 - 3071

ID	Date	OVA/FID (ppm)			4-GAS METER			
		Unfiltered	Filtered	Net OVA	CO %	H2S (ppm)	LEL %	Oxygen %
VP-1	4/26/17	< 1	NF	< 1	2	0	0	18.3
	5/12/17	< 1	NF	< 1	0	0	0	14.1
VP-2	4/26/17	32	30	2	2	0	0	18.3
	5/12/17	< 1	NF	< 1	0	0	0	17.5
VP-3	4/26/17	120	7	113	0	0	0	18.3
	5/12/17	186	< 1	186	0	0	0	19.1
VP-4	4/26/17	< 1	NF	< 1	0	0	0	20.2
	5/12/17	< 1	NF	< 1	0	0	0	20.1

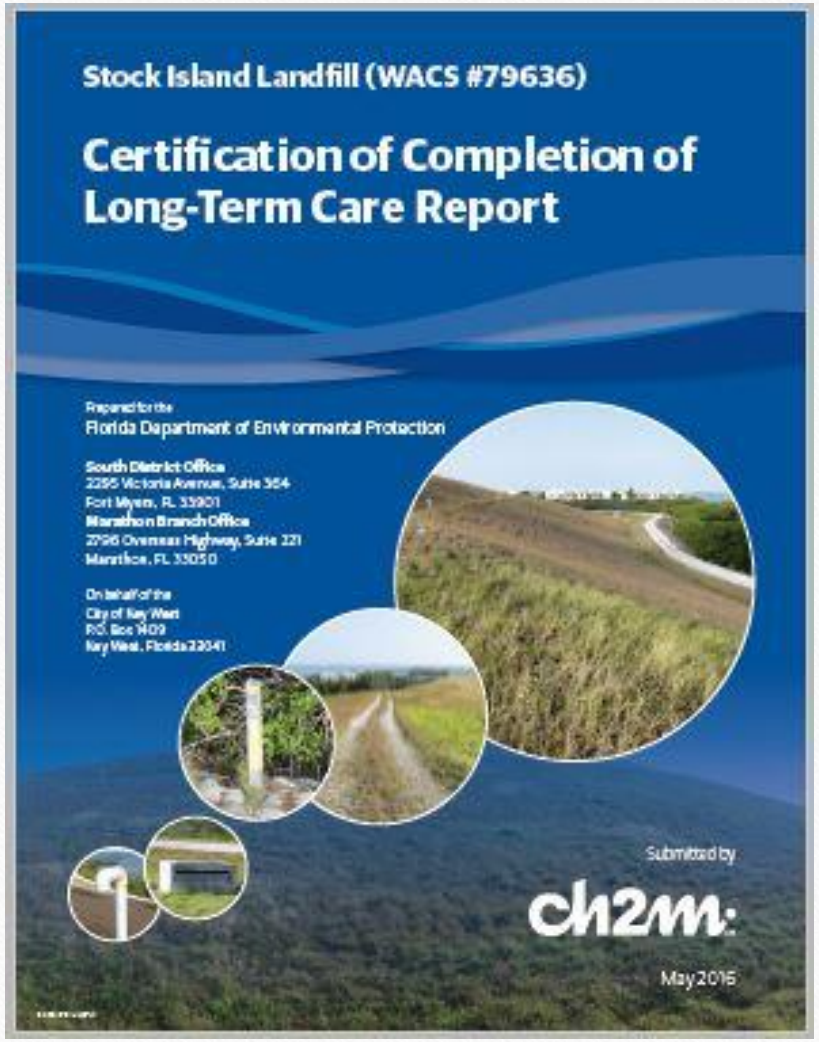
Notes:
ppm = parts per million
N/A = Not lab analyzed
CO = carbon monoxide
VP= vapor point
H2S = hydrogen sulfide
LEL = lower explositivity limit
OVA/FID = organic vapor analyzer equipped with a flame ionization device

FDEP Oculus database Waste Cleanup
ID No. is COM_355111

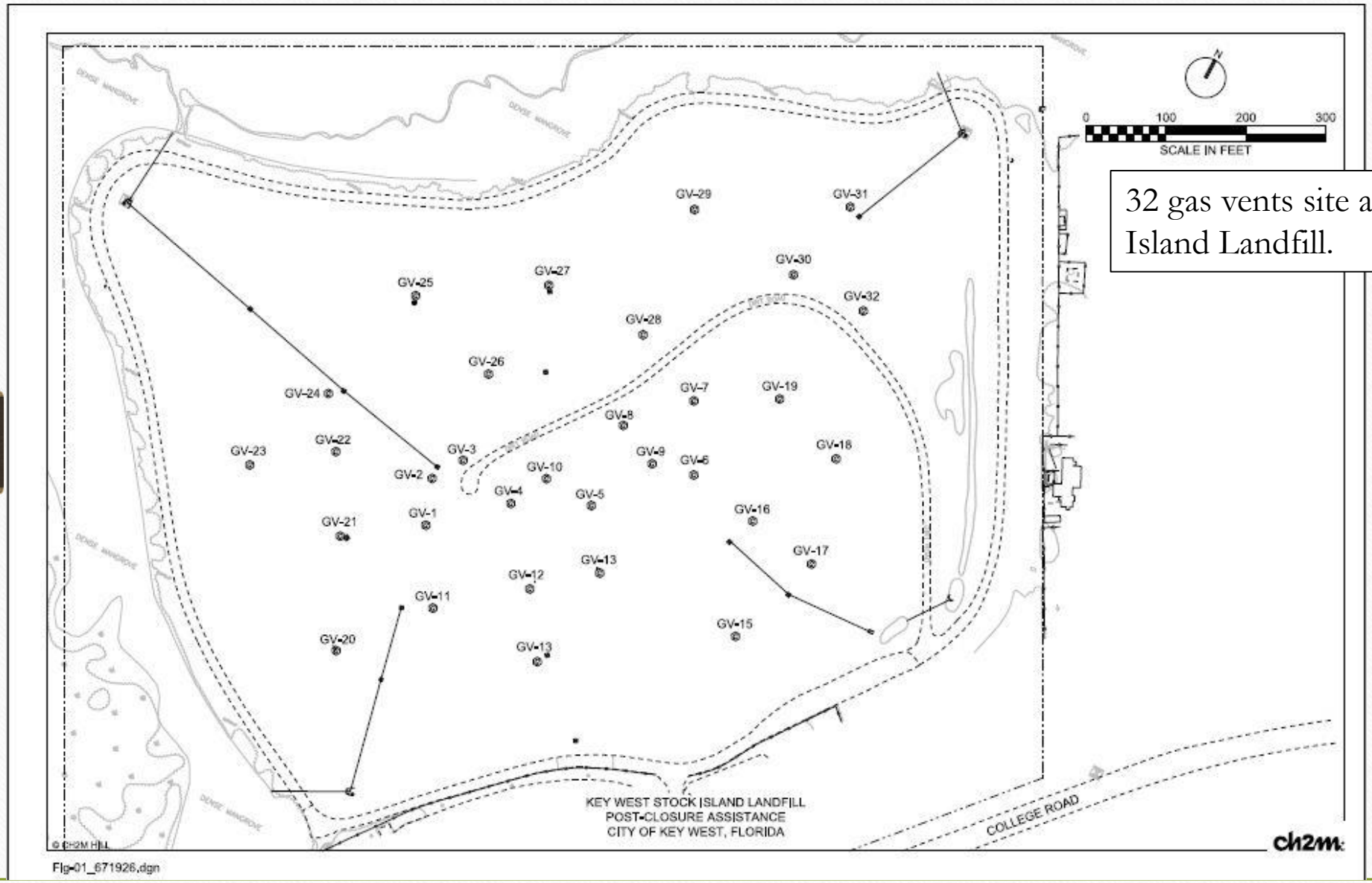
Gerald Adams Elementary School - Public Notification November 2017

"The buried debris and adjoining landfill have resulted in the accumulation of vapors containing low concentrations of petroleum constituents and methane. However, confirmation sampling did not detect Volatile Organic Compounds (VOC's) above the USEPA Vapor Intrusion Screening Levels (VISL's), and methane readings were below the lower explosive limit (LEL)."

Results of gas vent sampling in May 2016 by City of Key West contractors CH2M for Closure Report.



CH2M Certification of Completion Long –Term Care Report



32 gas vents site at Stock Island Landfill.

May 4, 2016
Low tide 1:26am
High tide 7:43am
Sampling began 11:00am
Low tide 2:10pm
Sampling ended 2:30pm
High tide 8:34pm

Gas vents 1-7 were first sampled starting at 11:00am

Landfill Gas Vents GV-1 through GV-7, all located on the landfill peak, showed methane readings of > 100% LEL (% of the lower explosive limit for methane), when sampled directly from the vent. GV-1 through GV-7 were also the only vents to produce hydrogen sulfide readings, ranging from 1.3 to 6.9 ppm. GV-22, GV-26, and GV-29 yielded % LEL readings 30%, 4%, and 25% respectively.

Returned to vents 1-7 before 2:30pm, sampled a second time, yielding results of between 0 and 5 % LEL, significantly lower than initial sampling results.

It was hypothesized that the apparent decrease in venting could be associated with local tidal fluctuations, as the site is bordered by seawater on two sides and in close proximity on a third side. Initial comparisons of field measurements with NOAA tidal charts (Exhibit 5) supported this hypothesis and prompted development of a secondary testing plan.

*CH2M Certification of Completion Long –Term Care Report.

May 11, 2016
High tide1:49 am
Low tide 6:48am
High tide 1:01pm
Sampling started 2:43pm
Low tide 8:21pm

May 12, 2016
High tide 2:48am
Low tide 7:52am
High tide 2:01pm
Low tide 9:21pm

May 13, 2016
Sampling ended 1:06am
High tide 3:52am
Low tide 9:08am
High tide 3:11pm
Low tide 10:20pm

- Follow-up gas monitoring was completed from 2:43 p.m. on May 11, 2016 through 1:06 a.m. on May 13, 2016.
- The MultiRAE unit was installed at one of the more productive gas vents, GV-3, sampling every 120 seconds.
- Results indicate minor correlations between gas venting and tidal fluctuation as gas vent off-gassing concentrations fluctuate throughout the day.
- Tidal influence does not appear to be the sole source of off-gas fluctuations.
- Rate of off-gassing and gas concentrations are likely influenced by a variety of factors such as tidal and atmospheric pressure fluctuation.

4) Review of water sampling and possibility of water contamination

Review of semi-annual water quality sampling for Stock Island Landfill groundwater monitoring wells

(June 2011 - December 2015)

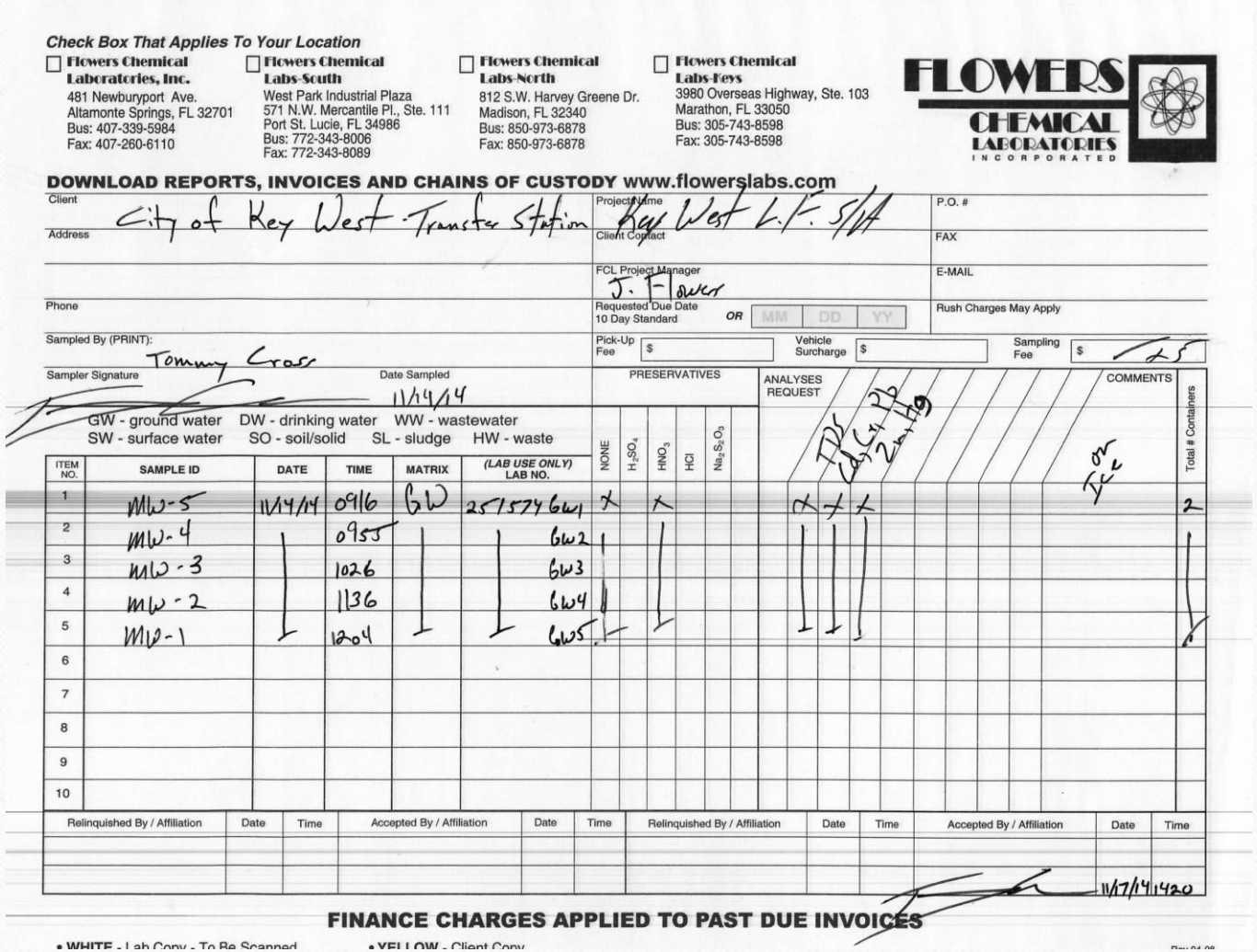
- Only one groundwater parameter was found to occasionally exceed the Groundwater Cleanup Target Levels (GCTLs) set forth in Chapter 62-777, F.A.C. = Total Dissolved Solids (TDS) at Well #2 and Well #3. Both of these wells are between the landfill and the Gulf of Mexico.

- The TDS exceedance should not be seen as a potential concern for leachate leaks. The background water condition ***is*** the Gulf of Mexico due to the tidal influence the groundwater incurs through the highly permeable formations. All other monitored parameters have not shown any exceedance or concerning data trends.

- The data analyzed during the reporting period indicated the landfill does not impact groundwater at concentrations that may be expected to result in violations of Department water quality standards or criteria.

The following are examples of the times of water samples and the tides of the day.

Two different labs were contracted in the following samples:
Flowers Chemical Laboratories Inc.
Jupiter Environmental Laboratories, Inc.



Check Box That Applies To Your Location

☐ Flowers Chemical Laboratories, Inc.
481 Newburyport Ave.
Altamonte Springs, FL 32701
Bus: 407-339-5984
Fax: 407-260-6110

☐ Flowers Chemical Labs-South
West Park Industrial Plaza
571 N.W. Mercantile Pl., Ste. 111
Port St. Lucie, FL 34986
Bus: 772-343-8006
Fax: 772-343-8089

☐ Flowers Chemical Labs-North
812 S.W. Harvey Greene Dr.
Madison, FL 32340
Bus: 850-973-6878
Fax: 850-973-6878

☐ Flowers Chemical Labs-Keys
3980 Overseas Highway, Ste. 103
Marathon, FL 33050
Bus: 305-743-8598
Fax: 305-743-8598

FLOWERS CHEMICAL LABORATORIES INCORPORATED

DOWNLOAD REPORTS, INVOICES AND CHAINS OF CUSTODY www.flowerslabs.com

Client: City of Key West Transfer Station
Project Name: Key West L.F. 5/14
P.O. #
Address
Client Contact
FAX
FCL Project Manager: J. Flowers
E-MAIL
Phone
Requested Due Date 10 Day Standard OR MM DD YY
Rush Charges May Apply
Sampled By (PRINT): Tommy Cross
Pick-Up Fee $
Vehicle Surcharge $
Sampling Fee $ 45
Sampler Signature
Date Sampled 11/14/14

GW - ground water DW - drinking water WW - wastewater
SW - surface water SO - soil/solid SL - sludge HW - waste

ITEM NO.	SAMPLE ID	DATE	TIME	MATRIX	(LAB USE ONLY) LAB NO.	PRESERVATIVES: NONE	H_2SO_4	HNO_3	HCl	$Na_2S_2O_3$	ANALYSES REQUEST	COMMENTS	Total # Containers
1	MW-5	11/14/14	0916	GW	251574 GW1	X		X			X X X		2
2	MW-4		0955		GW2								
3	MW-3		1026		GW3								
4	MW-2		1136		GW4								
5	MW-1		1204		GW5								
6													
7													
8													
9													
10													

TDS Ca Cl Pb Zn Hg

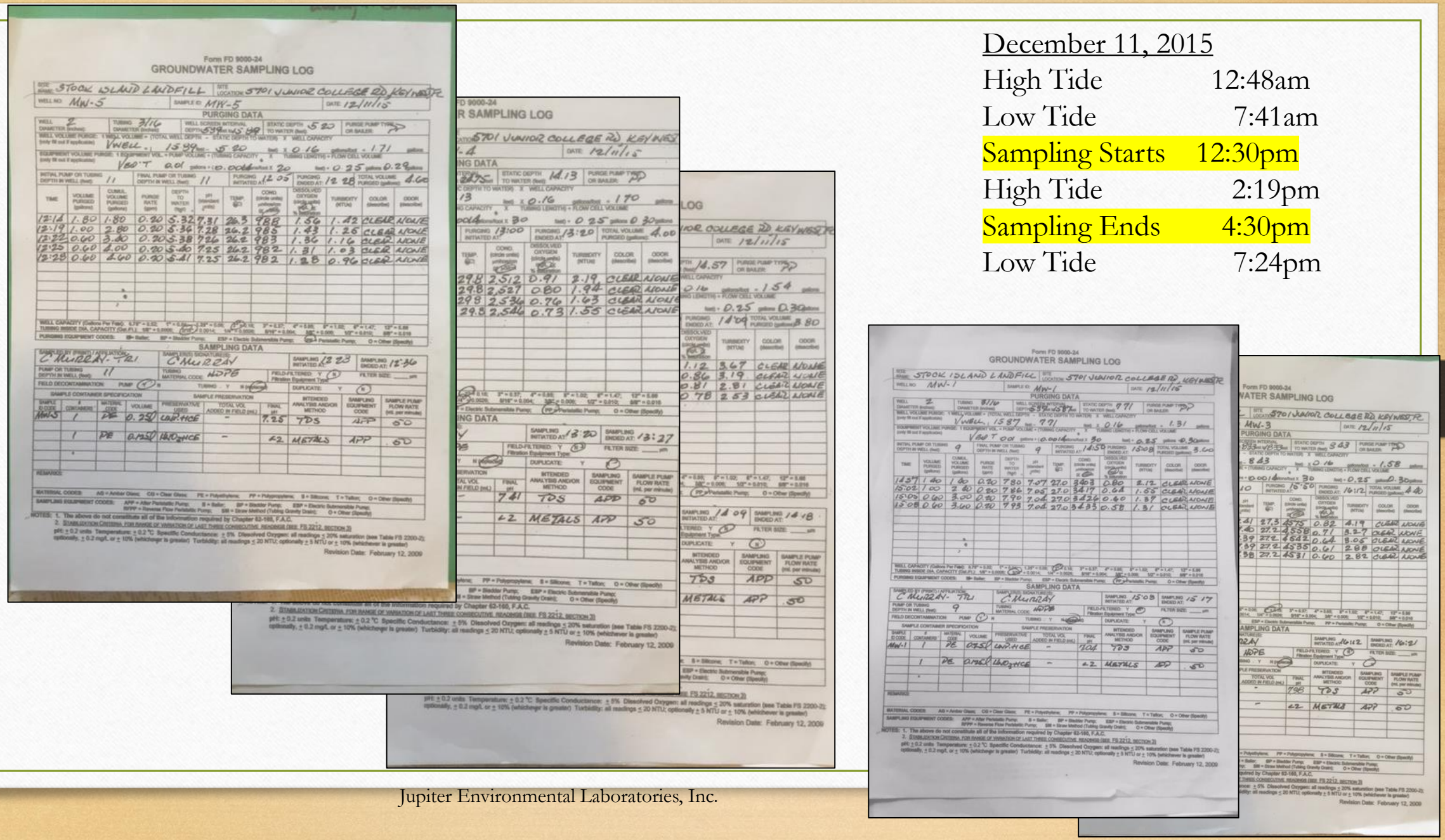
Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
										11/17/14	1420

FINANCE CHARGES APPLIED TO PAST DUE INVOICES

• WHITE - Lab Copy - To Be Scanned • YELLOW - Client Copy

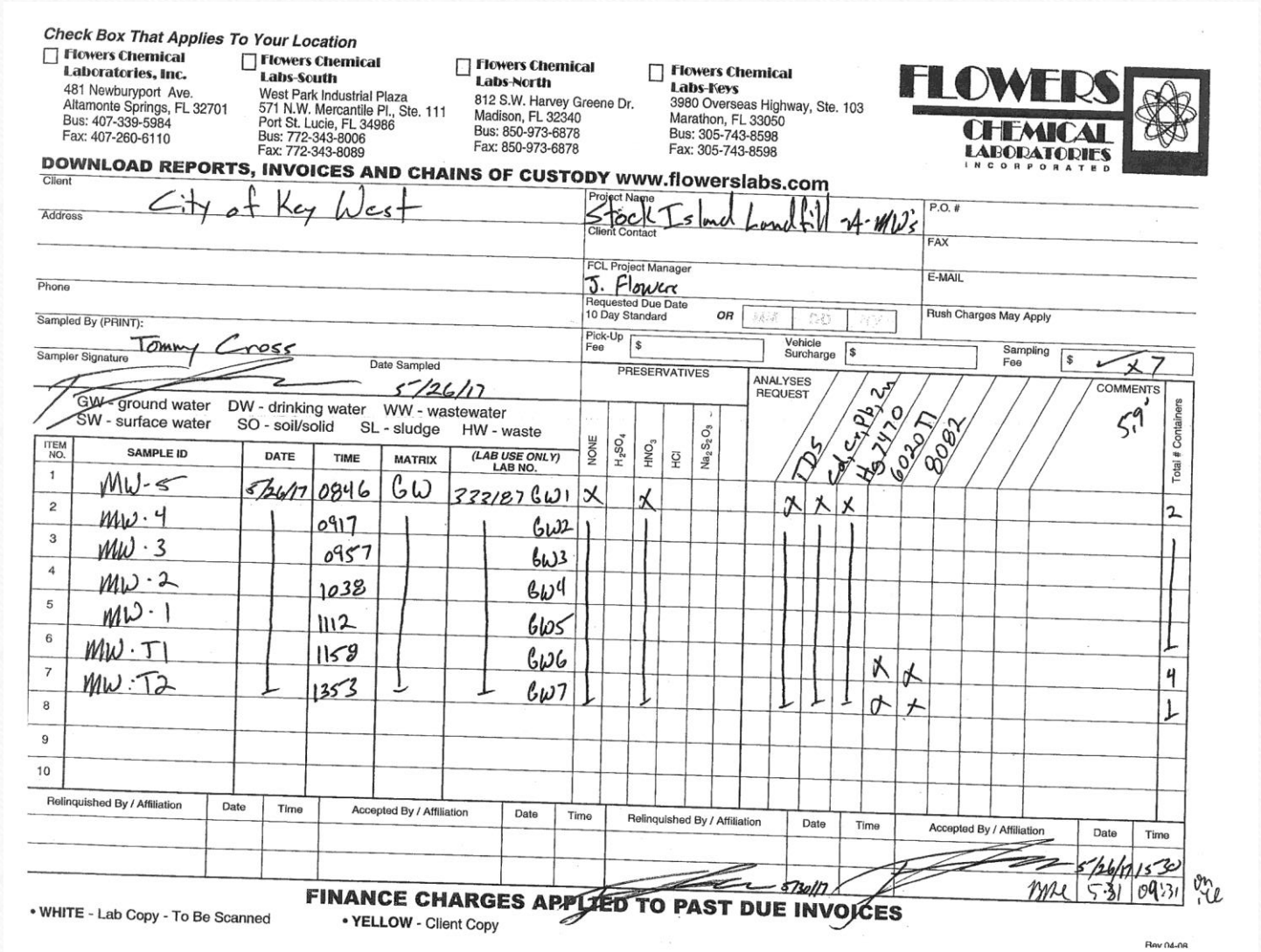
November 14, 2015

High Tide	2:18am
Sampling Starts	9:16am
Low Tide	9:23am
Sampling Ends	12:04pm
High Tide	3:48pm
Low Tide	7:24pm



December 11, 2015

High Tide	12:48am
Low Tide	7:41am
Sampling Starts	12:30pm
High Tide	2:19pm
Sampling Ends	4:30pm
Low Tide	7:24pm



Check Box That Applies To Your Location

☐ Flowers Chemical Laboratories, Inc.
481 Newburyport Ave.
Altamonte Springs, FL 32701
Bus: 407-339-5984
Fax: 407-260-6110

☐ Flowers Chemical Labs-South
West Park Industrial Plaza
571 N.W. Mercantile Pl., Ste. 111
Port St. Lucie, FL 34986
Bus: 772-343-8006
Fax: 772-343-8089

☐ Flowers Chemical Labs-North
812 S.W. Harvey Greene Dr.
Madison, FL 32340
Bus: 850-973-6878
Fax: 850-973-6878

☐ Flowers Chemical Labs-Keys
3980 Overseas Highway, Ste. 103
Marathon, FL 33050
Bus: 305-743-8598
Fax: 305-743-8598

FLOWERS CHEMICAL LABORATORIES INCORPORATED

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Client: City of Key West
Project Name: Stock Island Landfill 4 MW's
P.O. #
Address
Client Contact
FAX
Phone
FCL Project Manager: J. Flowers
E-MAIL
Sampled By (PRINT):
Requested Due Date 10 Day Standard OR
Rush Charges May Apply
Sampler Signature: Tommy Cross
Pick-Up Fee $
Vehicle Surcharge $
Sampling Fee $ x7
Date Sampled: 5/26/17

GW - ground water DW - drinking water WW - wastewater
SW - surface water SO - soil/solid SL - sludge HW - waste

ITEM NO.	SAMPLE ID	DATE	TIME	MATRIX	(LAB USE ONLY) LAB NO.	PRESERVATIVES: NONE	H_2SO_4	HNO_3	HCl	$Na_2S_2O_3$	ANALYSES REQUEST: TDS	Cd Cr Pb Zn Hg 7470	6020 TT	8082	COMMENTS	Total # Containers
1	MW-5	5/26/17	0846	GW	333187 GW1	X		X			X	X	X		5.9'	2
2	MW-4		0917		GW2											
3	MW-3		0957		GW3											
4	MW-2		1038		GW4											
5	MW-1		1112		GW5											
6	MW-T1		1158		GW6								X	X		4
7	MW-T2		1353		GW7								X	X		1
8																
9																
10																

Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
				5/26/17	1530
				5.31	0931

FINANCE CHARGES APPLIED TO PAST DUE INVOICES

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Rev 04-08

May 26, 2017

Low Tide	3:57am
Sampling Starts	8:46am
High Tide	10:34am
Sampling Ends	1:53pm
Low Tide	5:17pm

...ck Box That Applies To Your Location

☐ Flowers Chemical Laboratories, Inc.
481 Newburyport Ave.
Altamonte Springs, FL 32701
Bus: 407-339-5984
Fax: 407-260-6110

☐ Flowers Chemical Labs-South
West Park Industrial Plaza
571 N.W. Mercantile Pl., Ste. 111
Port St. Lucie, FL 34986
Bus: 772-343-8006
Fax: 772-343-8089

☐ Flowers Chemical Labs-North
812 S.W. Harvey Greene Dr.
Madison, FL 32340
Bus: 850-973-6878
Fax: 850-973-6878

☐ Flowers Chemical Labs-Keys
3980 Overseas Highway, Ste. 103
Marathon, FL 33050
Bus: 305-743-8598
Fax: 305-743-8598

FLOWERS CHEMICAL LABORATORIES INCORPORATED

DOWNLOAD REPORTS, INVOICES AND CHAINS OF CUSTODY www.flowerslabs.com

Client: City of Key West-Transfer Station
Address:
Phone:
Sampled By (PRINT): Tommy Cross
Sampler Signature: [signature]
Date Sampled: 5/17/18 - 5/18/18

Project Name: SILF - A - MW's
Client Contact:
FCL Project Manager: J. Flowers
Requested Due Date: 10 Day Standard OR
Pick-Up Fee $
Vehicle Surcharge $
Sampling Fee $ x 7
P.O. #
FAX
E-MAIL
Rush Charges May Apply

GW - ground water DW - drinking water WW - wastewater
SW - surface water SO - soil/solid SL - sludge HW - waste

ITEM NO.	SAMPLE ID	DATE	TIME	MATRIX	(LAB USE ONLY) LAB NO.	NONE	H_2SO_4	HNO_3	HCl	$Na_2S_2O_3$	Cd, Cr, Pb, Zn, Hg	Tl	TDS	PCB (8082)	COMMENTS	Total # Containers
1	T-2	5/17/18	1044	GW	366367 GW1	x		x			X	X	X	X	5.9°	4
2	T-1		1138		GW2							x		x		
3	MW-5	5/18/18	1019		GW3											2
4	MW-4		0946		GW4											
5	MW-3	5/17/18	1324		GW5											
6	MW-2		1424		GW6											
	MW-1		1223		GW7											

Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time	Relinquished By / Affiliation	Date	Time	Accepted By / Affiliation	Date	Time
						[signature]			[signature]	5/18/18	1245
										5/22	10:30

on ice

E - Lab Copy - To Be Scanned

FINANCE CHARGES APPLIED TO PAST DUE INVOICES

• YELLOW - Client Copy

May 26, 2017

High Tide	12:26 am
Low Tide	4:59am
Sampling Starts	10:44am
High Tide	11:33am
Sampling Ends	14:24pm
Low Tide	6:24pm

5) Review of Landfill Mining

The article below mentions 3 landfill reclamation (mining) projects. I was involved in the first one, Perdido Landfill, in the grant writing, observations, and educational tours and presentations of the project. I've also attached an article from the EPA about landfill reclamation, what's involved and some case studies. Both of these are available to you.

I also went to observe a landfill mining project at New River Landfill. Where Perdido Landfill used contractors, New River used staff.

https://foresternetwork.com/msw-management-magazine/ms-waste/ms-landfill-management/landfill-mining-current-trends/

- Perdido Landfill opened in 1980.
- Liners were not required until the early 1990's. Before that trenches were used to deposit trash.
- Now Perdido digs up the old trash and screens it into two separate materials: dirt and trash at a 70/30 ratio.
- Removes a possible source of groundwater contamination
- Provides 40+ years of solid waste disposal capacity within existing permitted footprint.
- Processed excavated waste is reused on site for daily and intermediate cover, reducing the need for new borrow pits.

Challenges and Processes

- Bore samples before the project
- Spent 1 year experimenting different screens and processes
- Soil contents and sampling
- Keeping exposed garbage covered
- Different options
- Dust


CAT

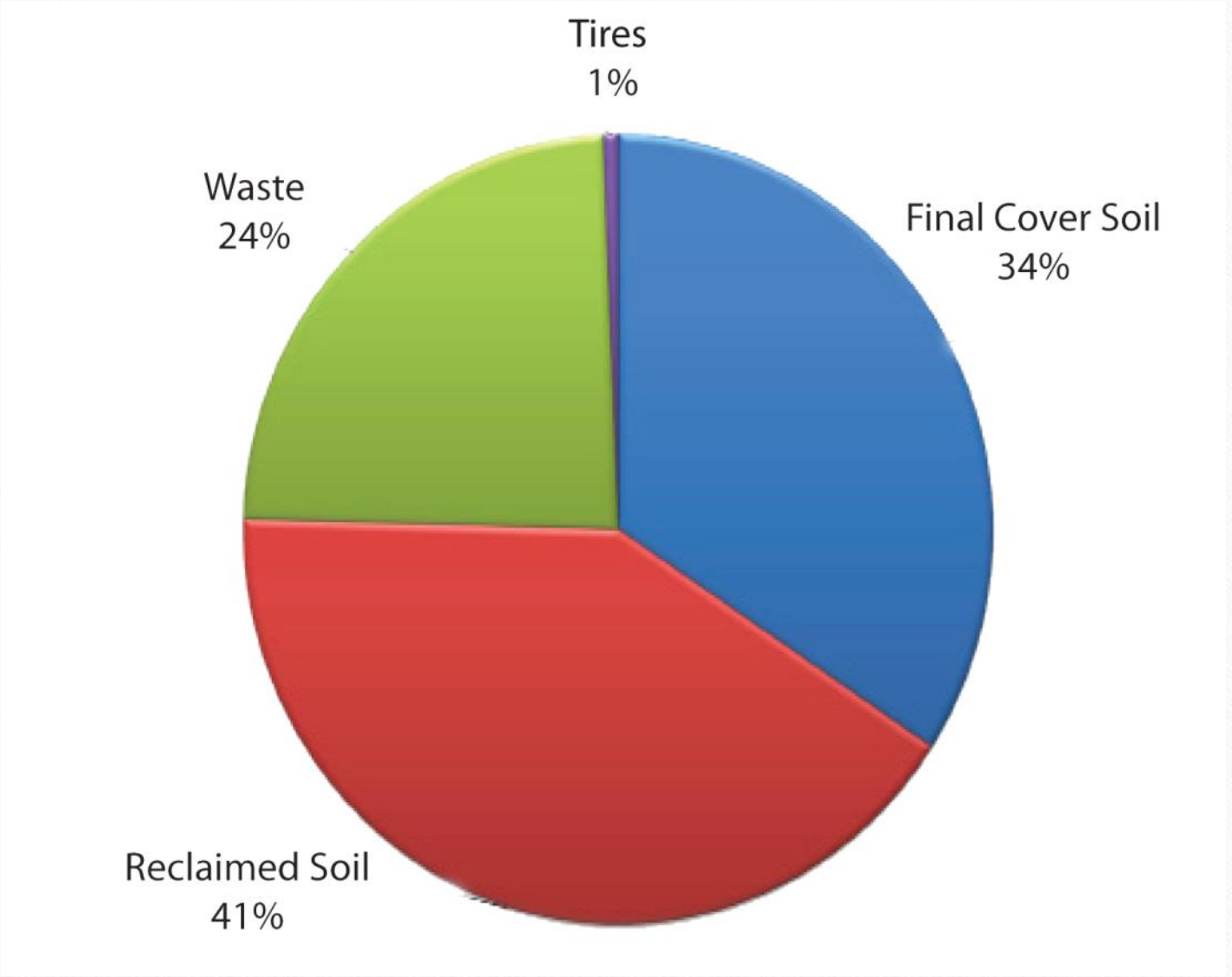

CAT


CAT
TROMMEL SCRE
CBP


CBP


CBP

What Was Perdido Landfill Made Of?



Closed Landfills

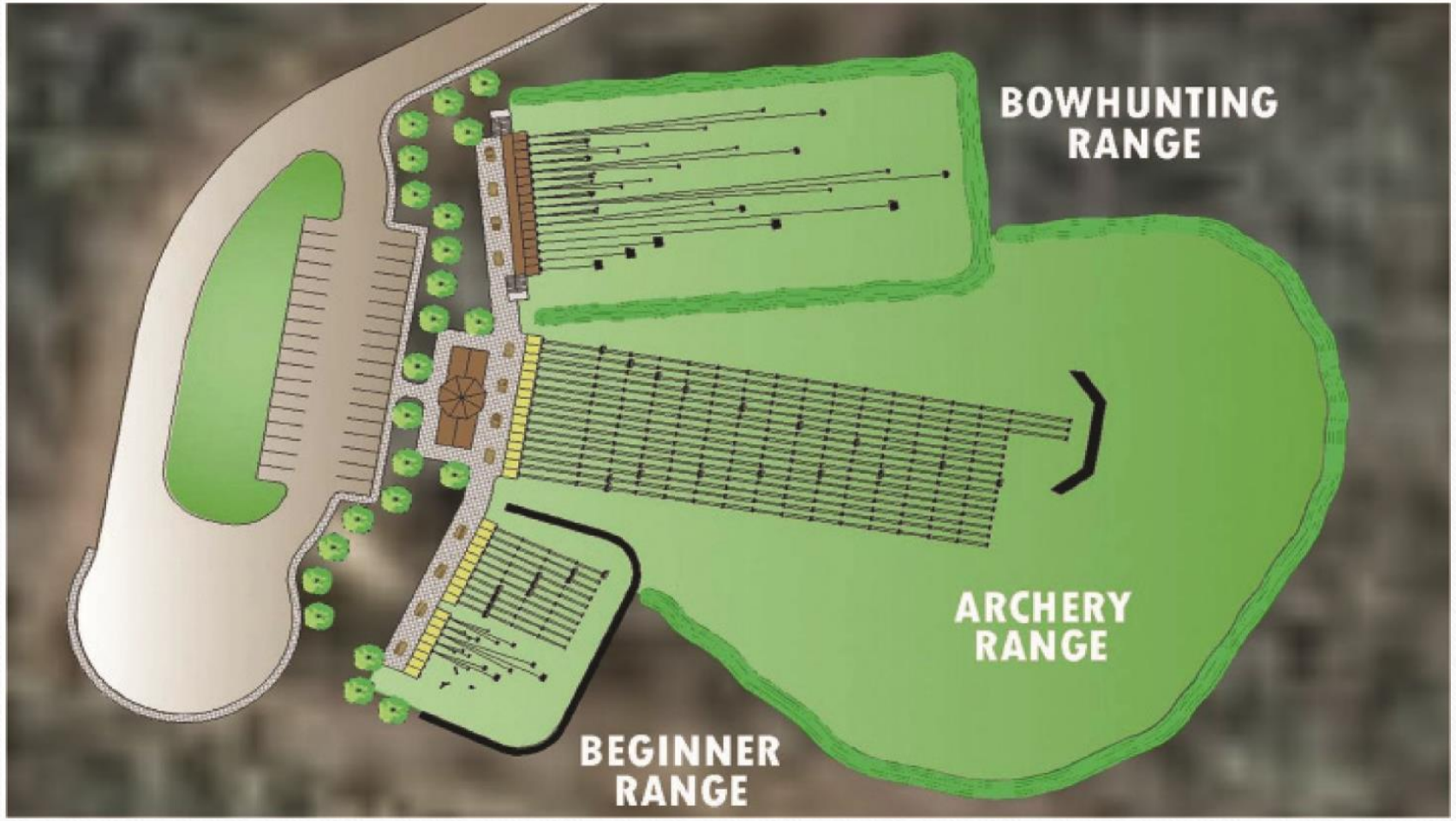
Some landfill reuse projects

Landfill space turned into solar farm.

Closed Landfills

Saufley Field Landfill, Escambia County

Partnership with the FWC and Florida Dept. of Education



Closed Landfills

Beulah Landfill, Escambia County

Northwest Florida Modelers, Inc. (www.nfmi.org) enjoy Fritz Field.

Resources for information noted in presentation

- Tides: https://tidesandcurrents.noaa.gov/noaatideannual.html?id=8724580
- Pre-2017 Tides: https://tides4fishing.com/us/florida-florida-keys/key-west-south-side-white-street-pier
- Patricia Goense, FDEP Environmental Specialist II, Drinking Water Patricia.Goense@FloridaDEP.gov
- Waste Cleanup records for Gerald Adams Elementary School (ID No. COM_355111): https://depedms.dep.state.fl.us:443/Oculus/servlet/shell?command=hitlist&[freeText=]&[folderName=]&[profile=Administrative%2BCleanup_Remediation%2BDiscovery_Compliance%2BDocument_Review%2BEligibility%2BEnforcement_Legal]&[creator=]&[entityType=any]&[createdDateTo=]&[catalog=5]&[searchBy=Profile]&[sortBy=Received+Date]&[createdDate=]&{County=_EQ_MONROE}&{District=_EQ_N%2FA}&{Facility-Site+ID=_EQ_COM_355111}
- Perdido Landfill: www.myescambia.com
- City Website: https://www.cityofkeywest-fl.gov/department/division.php?structureid=314
  - CH2M Certification of Completion Long –Term Care Report
  - CH2M. 2012. "Data Analysis for the Closed Stock Island Landfill, Key West, Florida".
- Florida Department of Environment Protection (FDEP). 2004. "Ground Water Standards and Guidance Concentrations used in Watershed Assessments". Division of Waters Resource Management. Bureau of Watershed Management. https://floridadep.gov/dear
- Landfill Gas Basics: https://www.atsdr.cdc.gov/hac/landfill/html/ch2.html