

2018 Annual Groundwater Monitoring and Corrective Action Report: OUC Stanton Energy Center CCR

PREPARED FOR: OUC
PREPARED BY: CH2M HILL Engineers, Inc.
DATE: January 30, 2019
PROJECT NUMBER: D3134200.1A.CS.AU.01

Mitchell Lee Griffin, P.E.
Florida P.E. No. 40772

CH2M HILL
225 East Robinson Street,
Suite 505
Orlando, Florida 32801
(352) 384-7078
Mitch.Griffin@CH2M.com



This report has been digitally sealed by Mitchell L. Griffin, P.E. on the date adjacent to the seal.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copy.

Mitchell Lee
Griffin

Digitally signed by Mitchell Lee
Griffin
Date: 2019.01.30 16:08:14 -05'00'

Purpose

On April 17, 2015, the United States Environmental Protection Agency (EPA) published the final rule for the Coal Combustion Residuals (CCR) Rule, Subtitle D of 40 Code of Federal Regulations 257. The CCR Rule established national minimum criteria for CCR disposal and became effective October 19, 2015. The CCR Rule applies to Orlando Utilities Commission (OUC) Stanton Energy Center (SEC) because of the disposal of CCR material generated from the combustion of coal at this facility. This technical memorandum fulfills the reporting requirements associated with the annual groundwater monitoring and corrective action report, §257.90 (2)(e).

The CCR Rule includes deadlines for the establishment of a groundwater monitoring system, the sampling and analysis of groundwater samples, the statistical analysis of the groundwater quality data, and corrective actions (if necessary) for facilities disposing of CCR. The CCR Groundwater Monitoring and Corrective Action program is described in Sections 257.90 through 257.98 of the CCR Rule:

- Applicability (§257.90)
- Groundwater Monitoring Systems (§257.91)
- Groundwater Sampling and Analysis Requirements (§257.93)
- Detection Monitoring Program (§257.94)
- Assessment Monitoring Program (§257.95)
- Assessment of Corrective Measures (§257.96)
- Selection of Remedy (§257.97)
- Implementation of Corrective Action Program (§257.98)

Monitoring requirements for compliance are included in §257 sub-sections. How OUC met the requirements of the CCR program is described in the 2017 annual report (CH2M, 2018). The first annual report contained the results of the Groundwater Monitoring and Corrective Action program from July 2015 through December 2017. Subsequent OUC SEC annual reports were intended to only describe the status of the program for those given years in accordance with §257.90(e) (Table 1). This technical memorandum provides the required documentation to demonstrate the OUC SEC's compliance with the CCR Rule annual groundwater monitoring and corrective action report.

Table 1. Annual Groundwater Monitoring and Corrective Action Report (§257.90(e))

2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

Requirement	Response
A map, aerial image, or diagram showing the CCR unit and the background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit.	These are shown in Figures 1 and 2 in the background section
Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken.	No changes to the wells during this period
In addition to the monitoring data obtained under §§257.90 through §257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs.	See results section
A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels).	See discussion section
Other information required to be included in the annual report as specified in §257.90 through §257.98.	Part of discussion and conclusions

Background and Setting

SEC is located 12 miles southeast of Orlando, Florida. OUC has been operating SEC since 1987 and dry-managing CCRs in landfills on the west side of the property. The original, now closed, landfill received CCR from July 1987 through August 28, 2015. From the period of May 28 through August 15, 2015, the CCR directed to the closed landfill was used to form part of the landfill cap. The cap was completed with 2 feet of soil and then sodded to stabilize the soil. The old landfill is exempt from the CCR Rule because it ceased operations prior to implementation. The old landfill has been closed (hereinafter “closed landfill”), is undergoing post-closure monitoring under OUC's Conditions of Certification with the Florida Department of Environmental Protection (FDEP). The closed landfill has a 6.42-megawatt solar power generation farm installed over its top.

The new landfill (hereinafter “active landfill”) began receiving CCR in May 28, 2015 as a monofill that receives CCR produced by the SEC coal-fired power generating process. The new landfill is positioned immediately west of and adjacent to the closed landfill and immediately east of the SEC western property boundary, Figures 1 and 2. The design standards for the active landfill were compliant with Florida's municipal solid waste landfill requirements under Chapter 62-701, Florida Administrative Code. The active landfill is fully lined and does not discharge into the surficial groundwater.

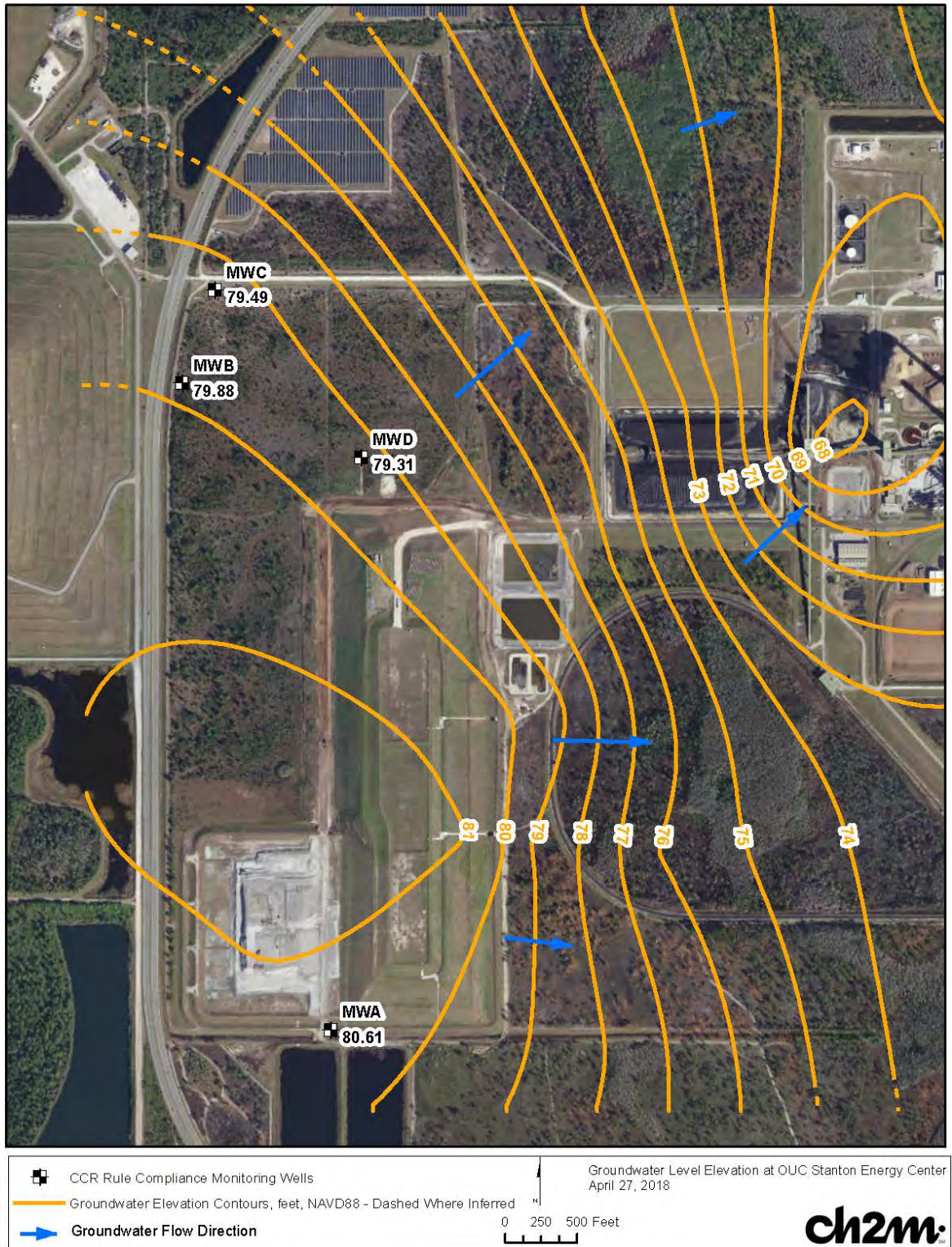


Figure 1. 2018 First Semi-Annual Event Groundwater Levels
 2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

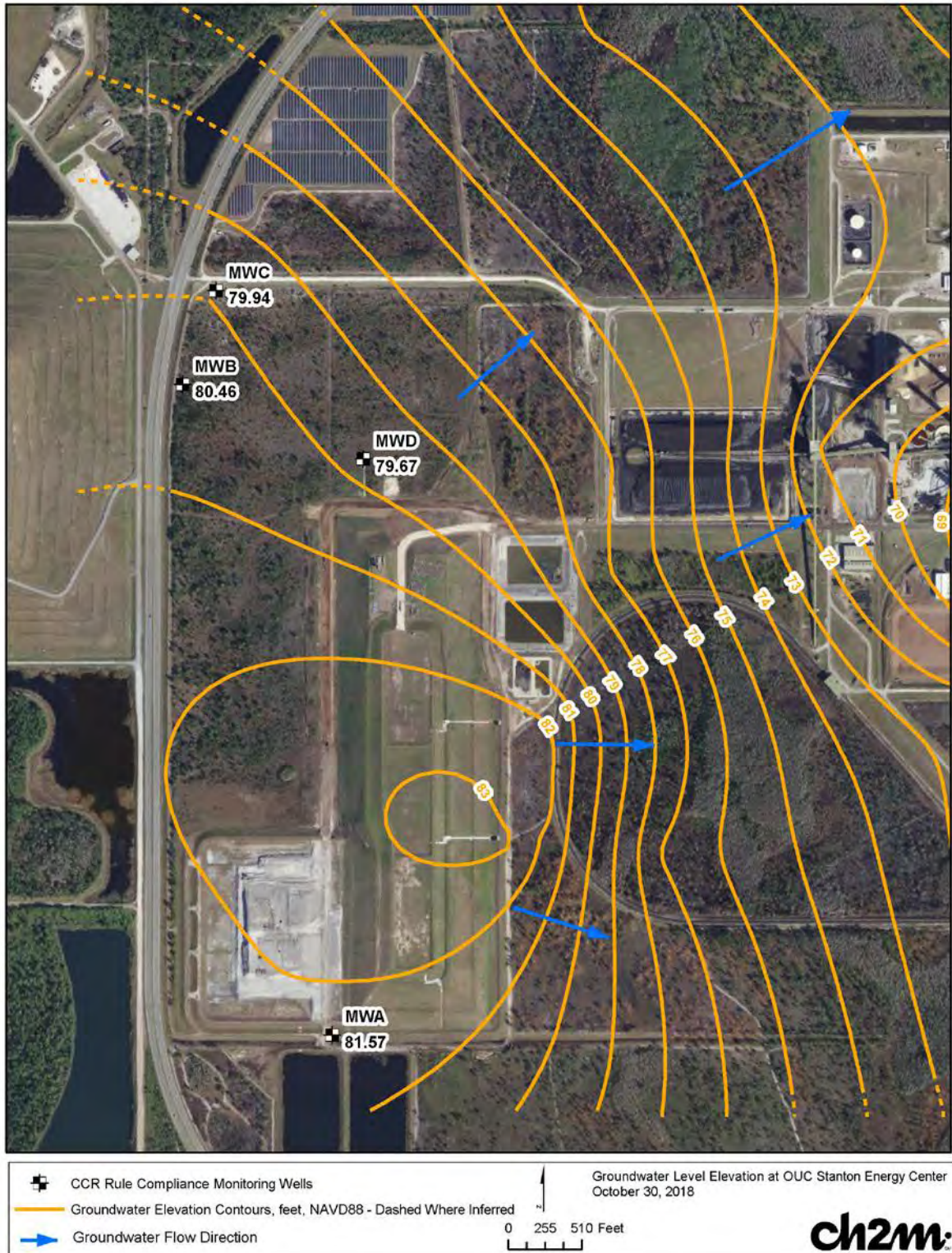


Figure 2. 2018 Second Semi-Annual Event Groundwater Levels
2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

Groundwater conditions at SEC are regulated under two separate programs: the FDEP Power Plant Siting Act and the U.S. Environmental Protection Agency (EPA) CCR Rule. The FDEP monitoring program has been active since August 1986, while the CCR monitoring program began in October 2015. OUC has made a conscious effort to keep these programs separate because different regulatory requirements, different groundwater quality standards, and different monitored constituents. However, the groundwater conditions at the two adjacent landfills are common.

Monitoring well locations were selected based on the groundwater gradient characteristics and the positions of the active and closed landfills, but were also constrained by the western site boundary. The Orange County municipal solid waste landfill is immediately west of SEC. The physical constraints, the history of FDEP's groundwater monitoring and other investigation results were used to locate the monitoring wells for the CCR program. The western property boundary is the regional groundwater upgradient edge of the SEC site. The surficial aquifer groundwater near the active SEC CCR landfill is generally flowing outward from an apparent local groundwater level high under the closed coal residual landfill (especially evident at the end of the wet season in Figure 2). The active SEC CCR landfill is located adjacent to the closed one, and the surficial groundwater gradient is toward the southwest initially, but the overall site gradient is still toward the northeast. Thus, the groundwater quality conditions near the active landfill and monitored under the CCR program do not represent unaffected background conditions; they represent baseline conditions from the beginning of the CCR groundwater monitoring program.

No problems were encountered in the CCR monitoring program from July 2015 through 2017. Key program activities for 2018 were to prepare an annual report and upload the document to the OUC CCR website by January 30, 2018, and continue with CCR detection monitoring.

CCR Groundwater Data Screening and Decision Process through the Assessment Monitoring Program

The groundwater data and screening and decision process was derived from §257.90 through §257.98 of the CCR Rule. A summary of the monitoring process is:

1. Collect CCR period background water quality data, Appendix III and IV constituents. This step occurred between September 9, 2015 and July 20, 2017 at SEC and is completed.
2. Identify method(s) to evaluate the data for statistically significant trend changes for each well and constituent for Appendix III and IV constituents by well. This step was completed and documented in an October 2017 report.
3. Quantify criteria that define the limits for statistically significant change from background for each Appendix III and IV constituent by well. This was completed and documented in the 2017 annual report.
4. Establish a groundwater protection standard for each Appendix IV constituent [§257.95(h)]. Note that the CCR Rule does not list Appendix III constituents to establish groundwater protection standards. This was completed and documented in the 2017 annual report.
5. Collect detection program water quality data, Appendix III constituents (§257.94). The single detection monitoring program sampling results are presented in the 2017 annual report.
6. Assess groundwater flow direction and rate. The single detection monitoring program sampling results are presented in the 2017 annual report.
7. Compare detection program water quality data to the statistical trend criteria to evaluate for no significant trend change, or a significant trend change, from the background water quality data.
 - a. If the result is no significant trend change then continue with detection program monitoring

- b. If the result is a significant trend change may be indicated, then resample within 90 days
 - i. Compare data to the statistical criteria for no significant trend change or significant trend change
 - 1. If the result is no significant trend change then continue with detection program monitoring
 - 2. If the result is significant trend change of one or more constituents at the waste boundary [§257.94(e)]
 - a. Establish an assessment monitoring program and post a notification on the CCR Web site that an assessment monitoring program has been established, or
 - b. Demonstrate that a source other than the CCR unit caused the significant increase within 90 days. Continue with the detection monitoring program.
 - c. After approximately 3 years of detection program monitoring reassess the statistical analyses of the groundwater water quality trends against the background data to identify if changes are needed.
- 8. Assessment monitoring program (§257.95)
 - a. Within 90 days of establishing an assessment monitoring program sample the groundwater for Appendix IV constituents, and then sample annually thereafter.
 - b. The number of samples, N, needs to be sufficient to support the statistical evaluation of the data [§257.93(e)]. The owner may demonstrate that an alternative sampling frequency is necessary during the active life and post-closure of the CCR unit based on site conditions; however, sample no less frequently than annually.
 - c. After obtaining the results from the above, within 90 days sample all wells for Appendix III and IV constituents, at least semi-annually. The number of samples, N, needs to be sufficient to support the statistical evaluation of the data [§257.93(e)].
 - i. Establish groundwater protection standards consistent with [§257.95(h)] as described in Item 4, above.
 - ii. If the sampling results for the Appendix III and IV constituents are below the established groundwater protection standards for two consecutive sampling events, the monitoring program may return to detection monitoring (Appendix III constituents). Notification that the detection monitoring program is resuming must be posted on the CCR Web site.
 - iii. If concentrations of one or more constituents are above background but below the groundwater protection standard continue with the assessment monitoring program.
 - iv. If concentrations of one or more constituents are statistically significant concentrations above the groundwater protection standard, post a notification on the CCR Web site [§257.95(g)] and characterize the nature of the release [§257.95(g)(1)].

The 2017 results and analysis indicated that calcium, chloride, pH (low) and total dissolved solids (TDS) from MW-B, and calcium and chloride from MW-D fell outside the statistical confidence intervals. This does not mean that there is a problem, but continued scrutiny is needed to assess site conditions. Continued detection monitoring was conducted in 2018.

Results of the Detection Monitoring Program – 2018

Monitoring Wells

The SEC CCR active landfill groundwater monitoring system consists of 4 surficial aquifer monitoring wells. These wells are named MW-A, MW-B, MW-C, and MW-D. The monitoring wells are about 20 to 25 feet deep into the surficial aquifer. MW-A has an approximate 10-foot deeper installation depth because the land surface elevation at its location is approximately 10 feet higher than the other wells. The horizon for the monitoring interval for MW-A is the same as the interval for MW-B, MW-C, and MW-D. MW-A is the upgradient well and the other wells are downgradient based on local groundwater levels.

Groundwater Levels and Flow

Groundwater levels in the monitoring wells were collected with each sampling event and groundwater level elevation maps were prepared. Table 2 presents the well location and water level data. Figure 3 shows a chart of the quarterly groundwater elevations. The quarterly groundwater level maps are provided in Figures 1 and 2. In general, there are no major changes in groundwater levels across the site since 2015. The 2018 values were like those measured in 2016, while 2017 showed some larger variations.

Table 2. Background and First Operations Period Groundwater Levels – MW-A, MW-B, MW-C, and MW-D, OUC Stanton Energy Center

2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

DATE	Well	Florida State Plane East Zone (901)		Elevation TOC (feet, NAVD 88)	Depth to Water (feet)	Water Level Elevation (feet, NAVD 88)
		Northing (feet)	Easting (feet)			
10/30/2015	MW-A	1504260	597643.8	95.77	13.60	82.17
4/29/2016					13.96	81.81
10/31/2016					13.53	82.24
4/25/2017					15.64	80.13
10/31/2017					13.31	82.46
4/27/2018					15.16	80.61
10/30/2018					14.20	81.57
10/30/2015	MW-B	1508750	596609.8	86.05	4.86	81.19
4/29/2016					5.20	80.85
10/31/2016					4.90	81.15
4/25/2017					7.25	78.80
10/31/2017					4.41	81.64
4/27/2018					6.17	79.88
10/30/2018					5.59	80.46
10/30/2015	MW-C	1509398	596841.6	86.84	6.22	80.62
4/29/2016					6.56	80.28
10/31/2016					6.14	80.70
4/25/2017					8.36	78.48
10/31/2017					5.67	81.17

Table 2. Background and First Operations Period Groundwater Levels – MW-A, MW-B, MW-C, and MW-D, OUC Stanton Energy Center

2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

DATE	Well	Florida State Plane East Zone (901)		Elevation TOC (feet, NAVD 88)	Depth to Water (feet)	Water Level Elevation (feet, NAVD 88)
		Northing (feet)	Easting (feet)			
4/27/2018	MW-D	1508237	597858.3	85.1	7.35	79.49
10/30/2018					6.90	79.94
10/30/2015					4.89	80.21
4/29/2016					5.58	79.52
10/31/2016					5.14	79.96
4/25/2017					7.44	77.66
10/31/2017					3.96	81.14
4/27/2018					5.79	79.31
10/30/2018					5.43	79.67

TOC – Top of casing

NAVD 88 – North American Vertical Datum of 1988

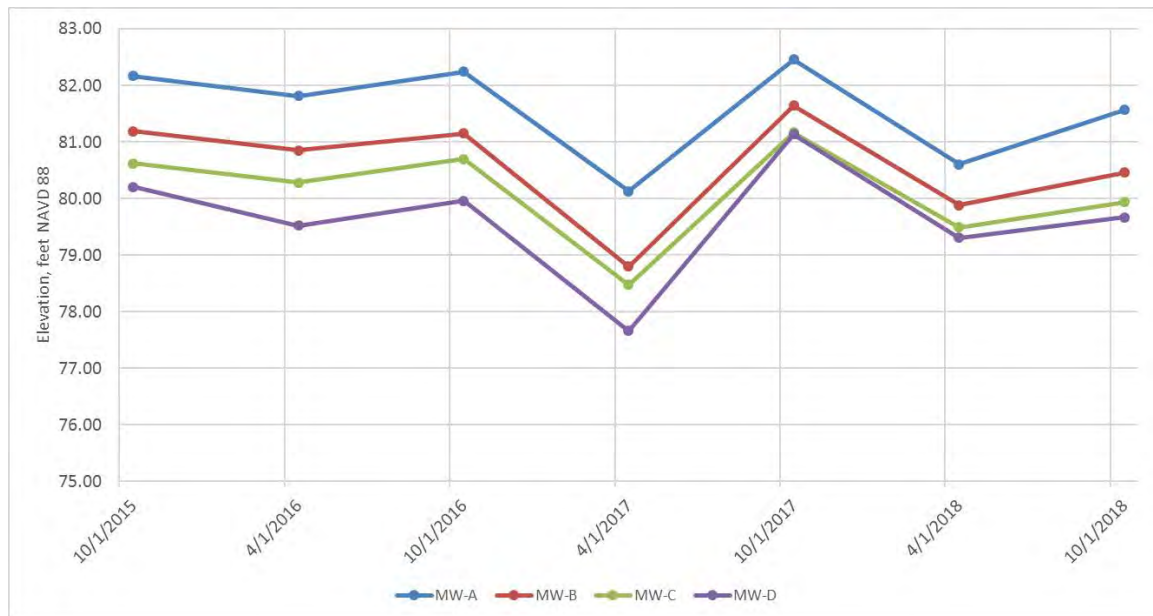


Figure 3. Quarterly Groundwater Levels

2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

Groundwater Sampling and Laboratory Analysis

The detection monitoring program began with establishing background groundwater quality conditions that consisted of collecting and analyzing quarterly samples between September 2015 and July 2017 for Appendix III and IV constituents. Sampling events to establish background water quality conditions were completed by October 17, 2017 in accordance with §257.94(b). MW-A is the background well and MW-B, MW-C, and MW-D are the three wells to monitor for compliance with the CCR.

Based on the October 2017 results, OUC resampled MW-B for calcium, chloride, pH (low), and TDS; and MW-D for calcium and chloride on January 25, 2018. The resampled data were evaluated against the October 30, 2017 background sample results to determine the next action. Two parameters were confirmed to be potential statistical significant increase (SSI), pH and total dissolved solids (TDS) in MW-B. The apparently confirmed well-constituent pairs identified for a SSI at well MW-B may not be a SSI due to lack of a sufficient quantity of background data. Until more data are collected a reliable test to detect the existence of a trend cannot be made and there are higher chances of making a false positive error.

The 2018 semi-annual sampling results are shown in Table 3 (and Appendix A). The following results are noted:

- Based on the March 22, 2018 compliance monitoring sampling event, initial SSIs were identified at all 3 wells for 5 well-constituent pairs:
 - o Well MW-B for pH and TDS
 - o Well MW-C for chloride and TDS
 - o Well MW-D for TDS
- Based on the September 19, 2018 compliance monitoring sampling event, initial SSIs were identified at all 3 wells for 10 well-constituent pairs:
 - o Well MW-B for calcium, chloride, pH, and TDS
 - o Well MW-C for TDS
 - o Well MW-D for calcium, chloride, pH, sulfate, and TDS

Again, pH and TDS were shown to be potential SSI in MW-B in March. Based on the analysis conducted based on the 2017 results, no retesting was conducted in the spring of 2018; these March data are assumed confirmed. For the September 19, 2018 sampling event, calcium and chloride were potential SSI in addition to pH and TDS at MW-B. TDS was also consistently higher than the SSI limits in MW-C for both sampling events. The potentially high chloride reading in MW-C was not duplicated later. MW-D had a potential SSI for pH in March; but calcium, chloride, pH, sulfate, and TDS were outside the statistical limits in September. Because of the increase in the number of parameters with potential SSIs, retesting for the September 2018 event was conducted January 14, 2019; the results are not available for this report.

Table 3. Summary of 2018 Annual Data Detection Monitoring Results

2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

Well	Constituents	Units	First Semi-Annual Sampling Event on 3/22/2018				Second Semi-Annual Sampling Event on 9/19/2018			
			LPL	UPL	Observed Values	Statistically Significant Increase	LPL	UPL	Observed Values	Statistically Significant Increase
MW-B	Boron	µg/L		140	107	No		159	95.2	No
	Calcium	µg/L		5270	879	No		5270	13600	Yes
	Chloride	µg/L		24300	19000	No		24300	60200	Yes
	Fluoride	µg/L		230	100U	No		230	140	No
	pH	pH Units	4.7	5.38	4.45	Yes	4.86	5.54	4.31	Yes
	Sulfate	µg/L		61300	40300	No		61300	52300	No
	TDS	µg/L		111000	123000	Yes		75600	210000	Yes
MW-C	Boron	µg/L		31.1	20U	No		31.1	20U	No
	Calcium	µg/L		8370	7380	No		8370	8050	No
	Chloride	µg/L		20100	21800	Yes		22400	17700	No
	Fluoride	µg/L		DQR	100U	No		DQR	100U	No
	pH	pH Units	4.62	5.33	4.95	No	4.55	5.25	5.01	No
	Sulfate	µg/L		2370	1970	No		2370	530	No
	TDS	µg/L		70800	77000	Yes		70800	73000	Yes
MW-D	Boron	µg/L		32.6	20U	No		32.6	29.6	No
	Calcium	µg/L		2780	1790	No		2380	11400	Yes
	Chloride	µg/L		28500	10800	No		30500	41300	Yes
	Fluoride	µg/L		120	100U	No		120	100U	No
	pH	pH Units	3.04	4.36	4.57	Yes	2.68	3.99	4.55	Yes
	Sulfate	µg/L		330	250U	No		330	13100	Yes
	TDS	µg/L		114000	43000	No		114000	118000	Yes

UPL and LPL mean upper and lower prediction limits based on baseline, respectively.

µg/L is micrograms per liter

Data Discussion

Based on the October 2017 results, OUC resampled MW-B for calcium, chloride, pH (low), and TDS; and MW-D for calcium and chloride in January 2018. The apparently confirmed well-constituent pairs identified for a SSI at well MW-B may not be a SSI due to lack of sufficient background data. Until more data are collected a reliable test to detect the existence of a trend cannot be made and there are higher chances of making a false positive error. Once, the background data set contains about 20 samples, the trend analysis should be reconducted and, if found significant, it should be considered while determining the background levels.

During the 2018 routine detection monitoring, the pH was low and the TDS was high again in March at MW-B. Based on the resampling analysis, other than selective confirmatory resampling for the October event, no action was warranted. A relative high value of chloride was also measured at MW-C. No resampling was done for this one apparent reading because there is was not enough reason to remobilize a sampling for this one value that was close to the SSI upper limit and TDS not being very high above the upper limit, and well below the Florida standard. For example, in October, the chloride level was below the upper limit again. However, in October there were more parameters with potential SSI in all three wells.

- MW-B: Calcium, chloride, pH (low), and TDS where all very high when compared to the probability limits, between 2 to 3 times higher for the dissolved solid components.
- MW-C: TDS exceed the upper probability limit by 1.2 mg/L (73 milligrams per liter [mg/L] versus 70.8 mg/L).
- MW-D: Calcium, chloride, pH (low), sulfate, and TDS where high (or low) when compared to the probability limits. While calcium was high, like at MW-B, the TDS was not as great of an exceedance. There is no Florida groundwater standard for calcium because it is considered an essential element for health. Sulfate was higher than previously monitored and higher compared to the probability limit; but below the Florida groundwater standard.
- TDS and sulfate have Florida secondary groundwater standards of 500 mg/L and 250 mg/L, respectively, and none of the monitoring results to date exceeded those levels.

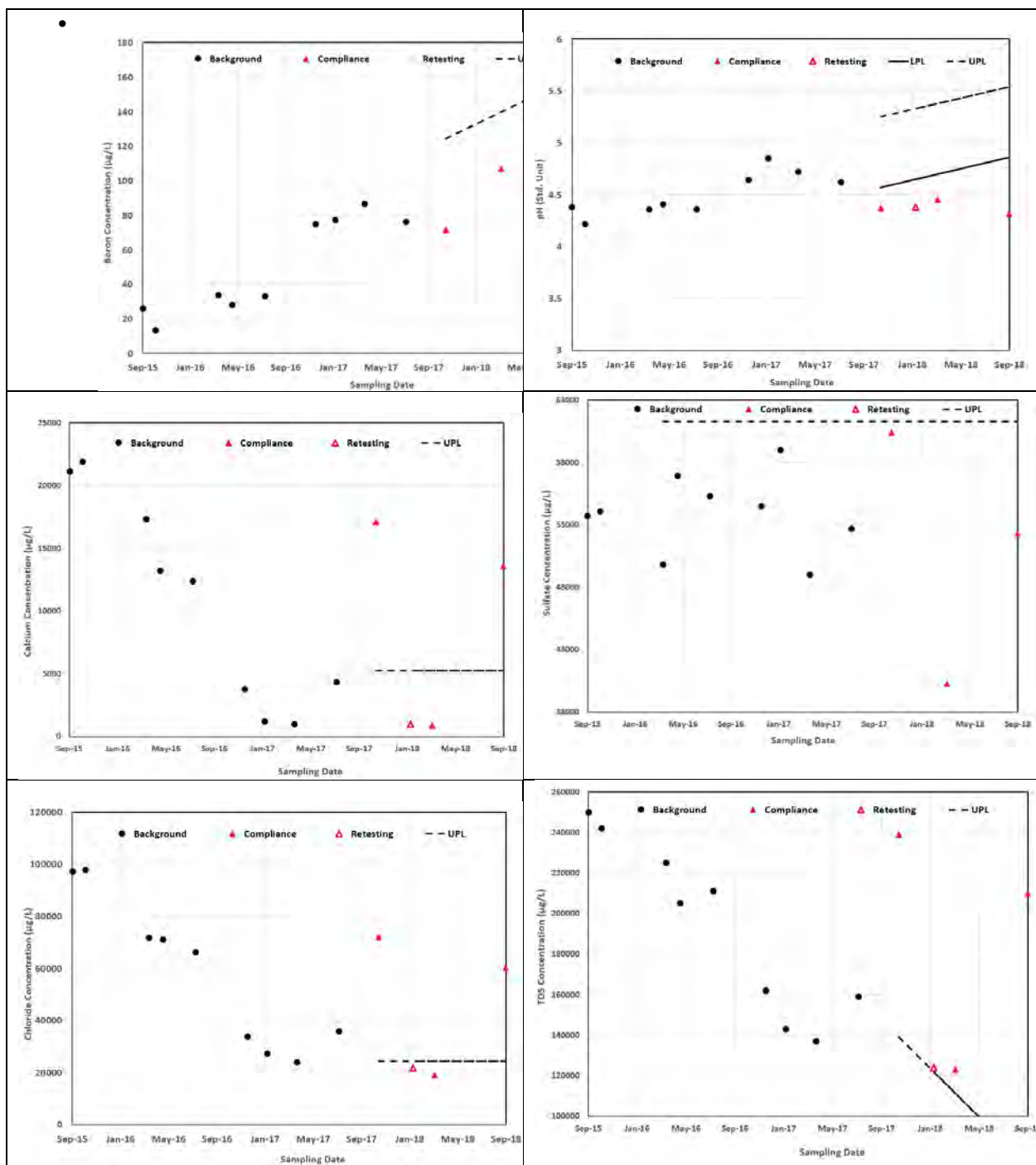
As described by §257.94(e), OUC must establish an assessment monitoring program meeting the requirements of by §257.95 or may demonstrate that a source other than the CCR unit caused the SSI over background concentrations.

To understand whether resampled and confirmed SSIs are release from the landfill, it is important to understand how the background limits (probability limits) were established statistically and the uncertainty associated with them. The background data were collected within a compressed schedule comprising of 23 months which may not be sufficient to capture the actual natural variability and inherent trend, if there is any. Because of insufficient number of background data over a long duration, the following statistical elements may not be accurately determined:

- Outliers may not be correctly identified and removed. Decisions about keeping or removal of abnormal observations may impact data characteristics (e.g., the mean and standard deviation) which are used to establish the background limits.
- Trends may not be correctly characterized. In general, an insufficient record of background data makes it challenging to conduct a reliable test to detect the existence of a trend. This is particularly true if the background data set contains fewer than approximately 20 samples (EPA, 2009).
 - In the present case, there were 9 background samples available to identify a trend. It appears that for both pH and TDS, trends may be of limited duration, indicating that the

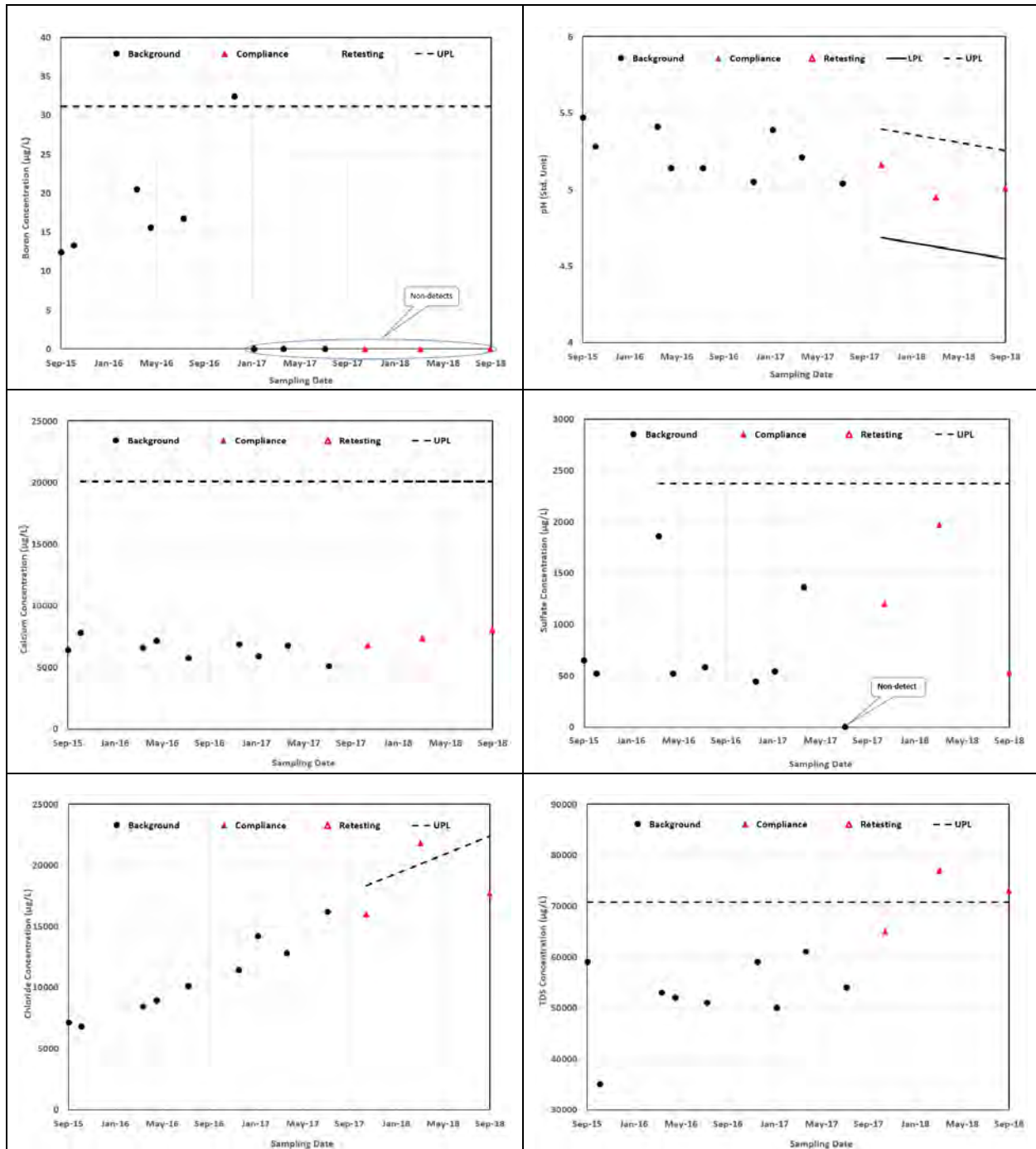
assumption of a consistent trend during future sampling events may not be reasonable and could potentially result in identifying a background exceedance when it does not exist, that is, causing a false positive situation.

- o While establishing background limits, the background data for those well-constituent pairs where a significant trend component was statistically justified was detrended. The Mann-Kendall test was used for identifying the presence of a trend and the Theil-Sen method was used to determine the relevant parameters using the 9 rounds of background data. After calculating the trend, it was removed from the background data and trend-free residuals were used to establish the background levels. To compare an observed sampling result for a well-constituent pair collected either during a compliance or retest monitoring event, the sample result is compared against the sum of the predicted trend components and the established background probability limit. In cases, when a trend analysis predicted future mean values would be negative, the future trend mean value was set to a value of zero. If the trend analysis predicted future mean value is incorrect due to uncertainty associated with trend parameters or due to identification of a false trend, it may result into a false SSI.
- Figures 4, 5, and 6 present time series plots showing both the background data and compliance monitoring data along with their respective established background levels. From several of these plots, the trend components identified based on the background data have not been continued into the compliance phase. For example, at the most downgradient well MW-B, pH, calcium, and TDS do not appear to follow their respective trends. Similarly, for well MW-D, pH does not follow a decreasing trend.
- Figure 7 presents pair plots with correlations for the various detection monitoring constituents, including the combined data set of background, compliance and retesting. These plots show three statistical characteristics: correlations, scatterplots, and their histograms. In reviewing these plots, the following features are noted:
 - o Several of these scatterplots indicate that bivariate relationships between constituent pairs do not remain consistent, instead they are dynamic in nature.
 - o TDS show strong positive correlations with calcium, chloride, and sulfate. Sulfate has a strong positive correlation with chloride, and calcium and chloride. This correlation would be expected with TDS since salts would be included in the TDS values.
 - o pH is negatively correlated with all other detection monitoring constituents.



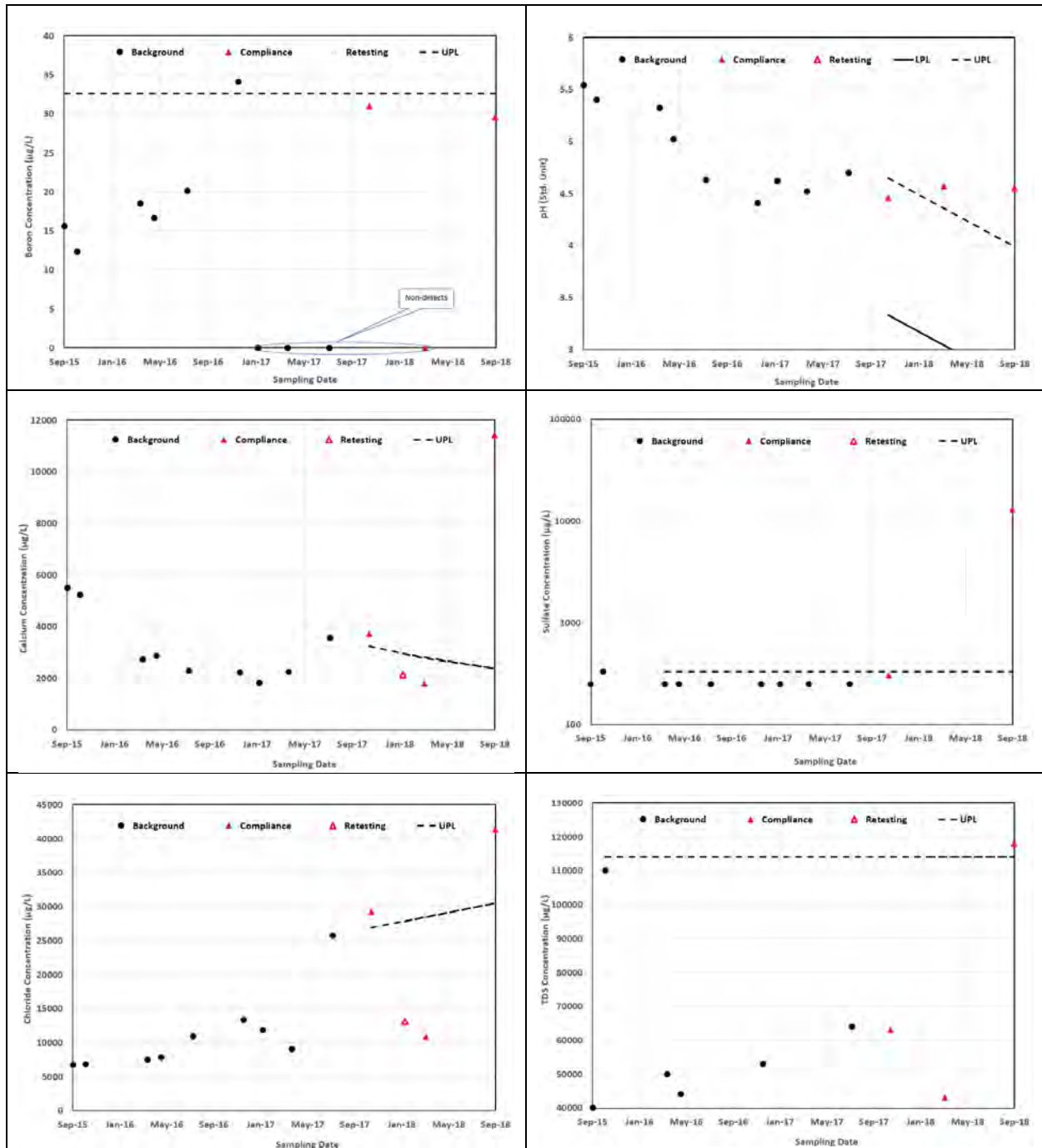
Notes: Time series plot for Fluoride is not shown due to 100% non-detects.

Figure 4. Time Series Plots for Downgradient Well MW-B for various Detection Monitoring Constituents
2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report



Notes: Time series plot for Fluoride is not shown due to 100% non-detects.

Figure 5. Time Series Plots for Downgradient Well MW-C for various Detection Monitoring Constituents
2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report



Notes: Time series plot for Fluoride is not shown due to 100% non-detects.

Figure 6. Time Series Plots for Downgradient Well MW-D for various Detection Monitoring Constituents
2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

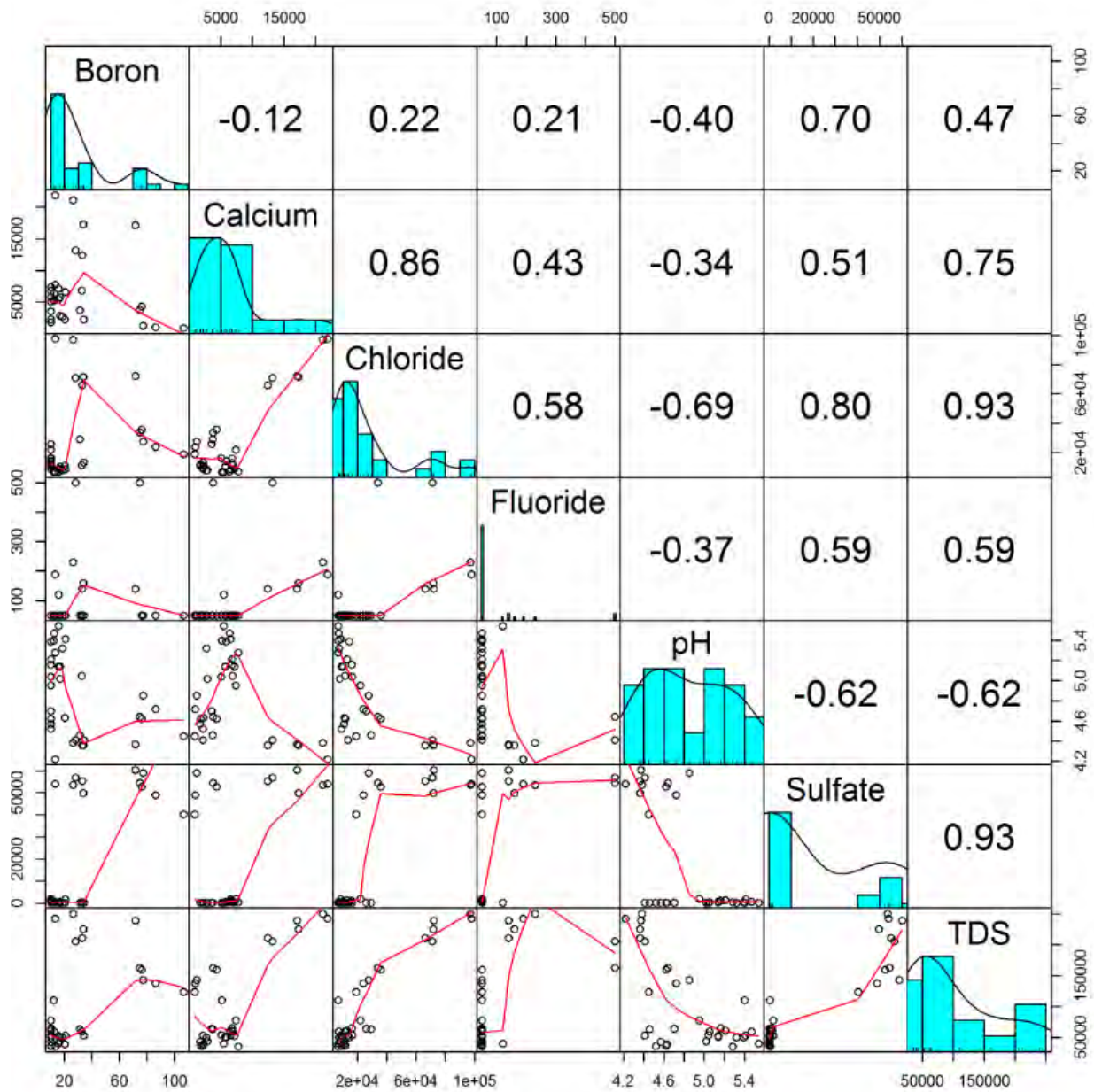


Figure 7. Pairs Plot, Histogram, and Correlation Matrix for CCR Appendix III Constituents
 2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

Potential Alternative Sources Review

Given the high values at MW-B, it is possible there is something migrating from offsite near that location. A review of the SEC site indicated that OUC began storing limerock near MW-D during 2015 (Figure 8), which could potentially impact TDS and calcium. The limerock stockpile was placed shortly after the monitoring wells were established in 2015. However, the location is a little east of MW-D and MW-B is much further west of MW-D and the limerock. MW-D is not directly downgradient of MW-B. MW-C is much closer to MW-B and is downgradient. MW-C and MW-D are more similar in results than MW-B. Stormwater runoff from the stockpile could contribute to the groundwater quality monitored through MW-D, but any potential impact is not evident in MW-D's data. Furthermore, this alternative potential source of calcium and TDS does not represent the potential effects of CCR management.



Figure 8. Location of Limerock Stockpile Relative to MW-D
2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

Regardless, MW-B, MW-C, and MW-D are shallow (about 20 to 30 feet below ground surface are the open well screen interval, about 15 feet below the water table). 2018 was a wet year in Florida. Figure 9 shows rainfall data collected near SEC. Rainfall was frequent between June and October, this is common in Central Florida. The annual rainfall measured onsite at the landfill, which is common, as well. Consequently, no obvious alternative source of potential contamination has been identified to date, other than the limerock stockpile.

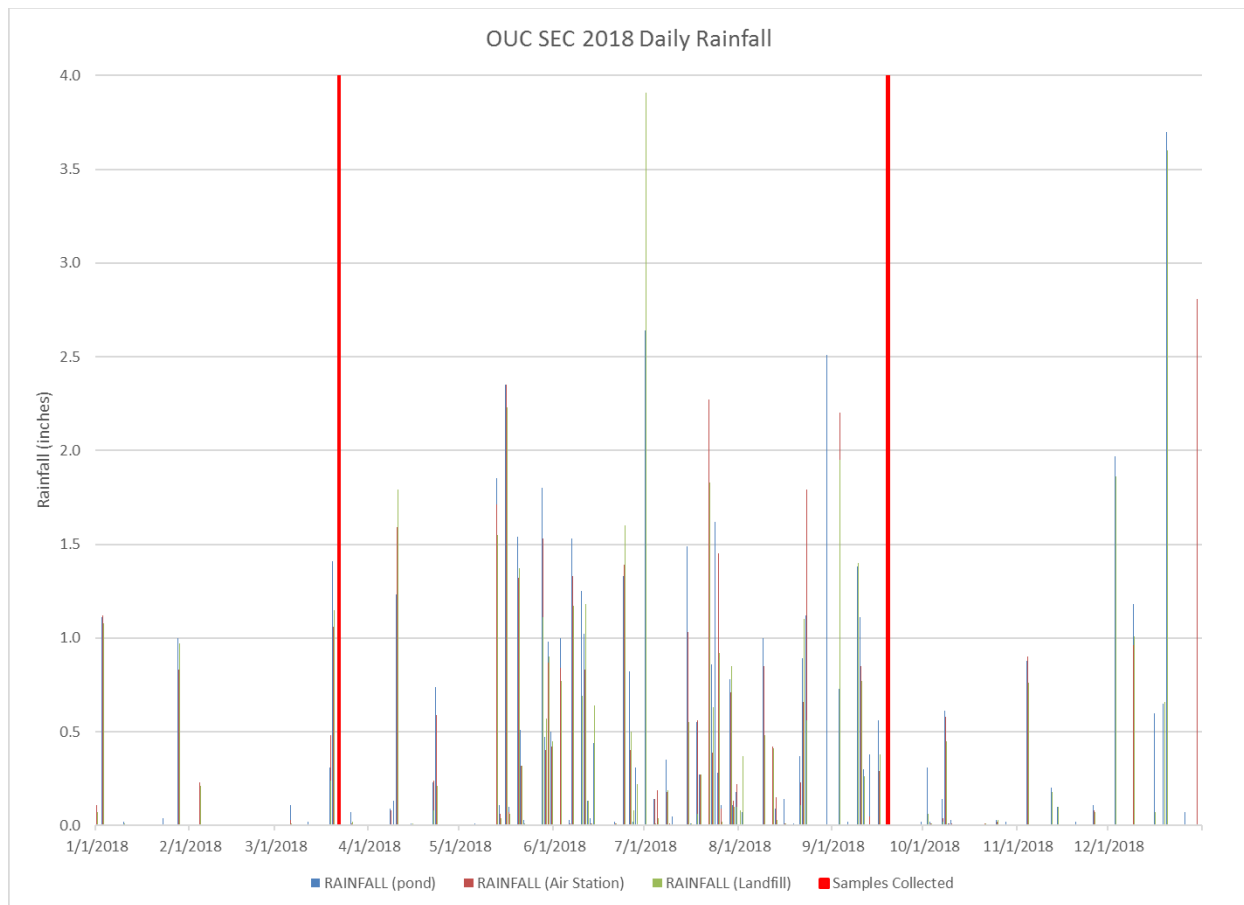


Figure 9. 2018 Rainfall in at SEC
2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

Identifying Patterns of Similarity/Abnormality among Sampling Observations using Principal Component Analysis

Multivariate analysis using principal component analysis (PCA) was conducted to identify whether samples from the OUC SEC active landfill that were confirmed for SSIs exhibit different statistical characteristics than the characteristics exhibited by the remaining sample population (that is, background samples and compliance samples with no exceedances). PCA is commonly used to effectively identify anomalies and patterns potentially present in multidimensional data sets. PCA is a multivariate statistical method that can be used to provide added insights into the patterns present in a data set which is not possible to identify and comprehend based upon information provided by univariate statistics. Multivariate methods are evaluations of multiple variables simultaneously in comparison with univariate methods which are evaluations one-variable at a time. Univariate methods do not consider correlations between variables, while multivariate methods do incorporate correlations between variables.

In general, PCA is an effective method for analyzing data sets consisting of correlated variables, such as hydrogeochemical data from groundwater detection monitoring. As demonstrated above, there are significant correlations between the parameters with potential SSIs (Figure 7). PCA is used to reduce the dimensionality of a data set with correlated variables by creating new uncorrelated variables (the principal components [PCs]) that are linear combinations of the data (Jolliffe, 1986). The PCs are ordered such that the first few account for most of the variation present in the original variables. The factor loadings within the method are responsible for the correlations between PCs and selected variables (i.e.,

constituents), and those with the greatest positive and negative loadings make the largest contribution. As a result, PC loadings can offer information on the sources that are responsible for similarities of collected samples in groundwater quality.

PCA has also been used as a robust outlier identification method, especially when dealing with multivariate data sets consisting of observations for several constituents and monitoring locations (Singh 1993; Jackson and Chen, 2004; EPA, 2009a). PCA has been widely used to investigate the proportional composition of environmental samples to determine potential sources of contamination (Mudge, 2015). Multivariate analysis using PCA can be used to determine characteristic components of natural groundwater background levels, thus enabling identification of groundwater quality influences resulting from other sources; such as leaching of solid waste (such as the limerock stockpile near MW-D), leakage from holding ponds, improper irrigation, and geological and hydrogeological conditions” (Dong et al., 2007; DOE, 2012).

For the SEC active landfill, the data set used to conduct PCA consisted of 33 samples. These data from the 3 SEC Landfill CCR monitoring wells are the 9 rounds of background samples collected from September 2015 through July 2017 and two rounds of compliance samples collected in March and September 2018. The variables selected for analysis consisted of the CCR Appendix III constituents: boron, calcium, chloride, fluoride, pH, sulfate, and TDS. PCA requires that input variables have similar scales of measurement when comparing variables having different units of measurement and different degree of variability. The active landfill data were standardized by mean-centering and scaling to unit variance prior to analysis.

A biplot showing the correlations between the constituents and the PCs, combined with the positioning of the data from the 33 samples is provided in Figure 10. In the biplot, the samples are points (represented by sample numbers ranging from 1 to 33) and the constituents are the vectors. The positioning of the sample points is determined based on the factor scores of observations for each retained PC. The factor scores quantify the relationships between the samples and the PCs based on their combined chemical signatures. In Figure 10, background samples (BKGD) are shown as red symbols and samples collected during compliance sampling (COMP) are shown as blue symbols. As indicated in the axis titles, the first two components (PC1 and PC2) explain 63.7 percent and 18.5 percent of the total variability contained in the original variables, respectively. Figure 11 shows the same biplot but the data are color-coded by well. Biplots also highlight relationships among observations collected over various sampling events and can be used to help identify anomalous sample(s), if present in the data set. From these 2 biplots, MW-B data are separated from MW-C and MW-D results. MW-B data are also scattered from each other showing high variability is present.

Figures 12 and 13 show biplots of the PCA with 95 percent bivariate confidence ellipses for the entire data set (33 samples) and for well-specific data sets, respectively. A confidence ellipse is a region that contains a specific percentage of the population under the assumption that the population is bivariate normal. For example, a 95 percent confidence ellipse indicates a region that contains 95 percent of samples drawn from a bivariate normal population with mean and covariance matrices that are equal to the sample estimates. A confidence ellipse is helpful for detecting deviation from normality, outlier(s), or anomalous sample(s). Because the center of the ellipse is the sample mean, a confidence ellipse can give a visual indication of skewness and outliers in the data. Thus, the ellipse shown on Figure 12 indicates that the component scores for the March 2018 compliance monitoring event collected from the downgradient wells MW-C and MW-D fall within the 95-percent bivariate confidence ellipse and well MW-B falls outside of the collective downgradient 95-percent bivariate confidence ellipse. Figure 12 indicates that the March 2018 compliance monitoring result at well MW-B does not appear to belong to the normal region for the downgradient data, and can be called as an anomaly. However, Figure 13 illustrates that the component score for the March 2018 compliance monitoring event at all downgradient wells fall within their well-specific 95-percent bivariate confidence ellipses. Figure 13 also supports that the 95-percent confidence ellipse areas for well MW-B is significantly large in comparison

of other two wells indicating highly variable water quality. Based on the Figure 13 plot results, the March 2018 compliance monitoring result from well MW-B appears to be normal for that well as most data appear to have similar signatures.

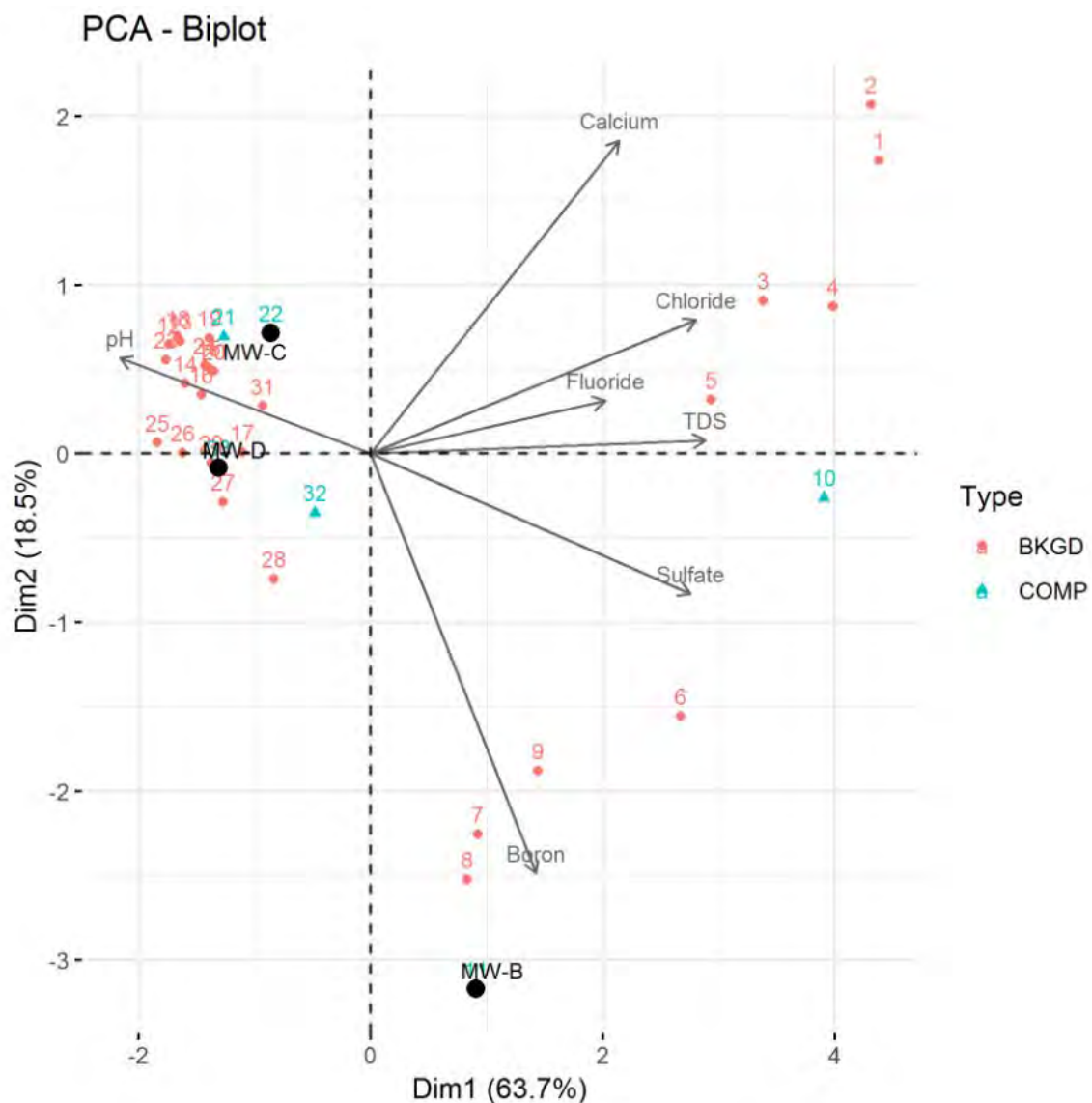


Figure 10. PCA Biplot for CCR Appendix III Constituents Color-Coded by Sample Period (Samples with background exceedance shown as black symbol; labels correspond to the sample number)
 2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

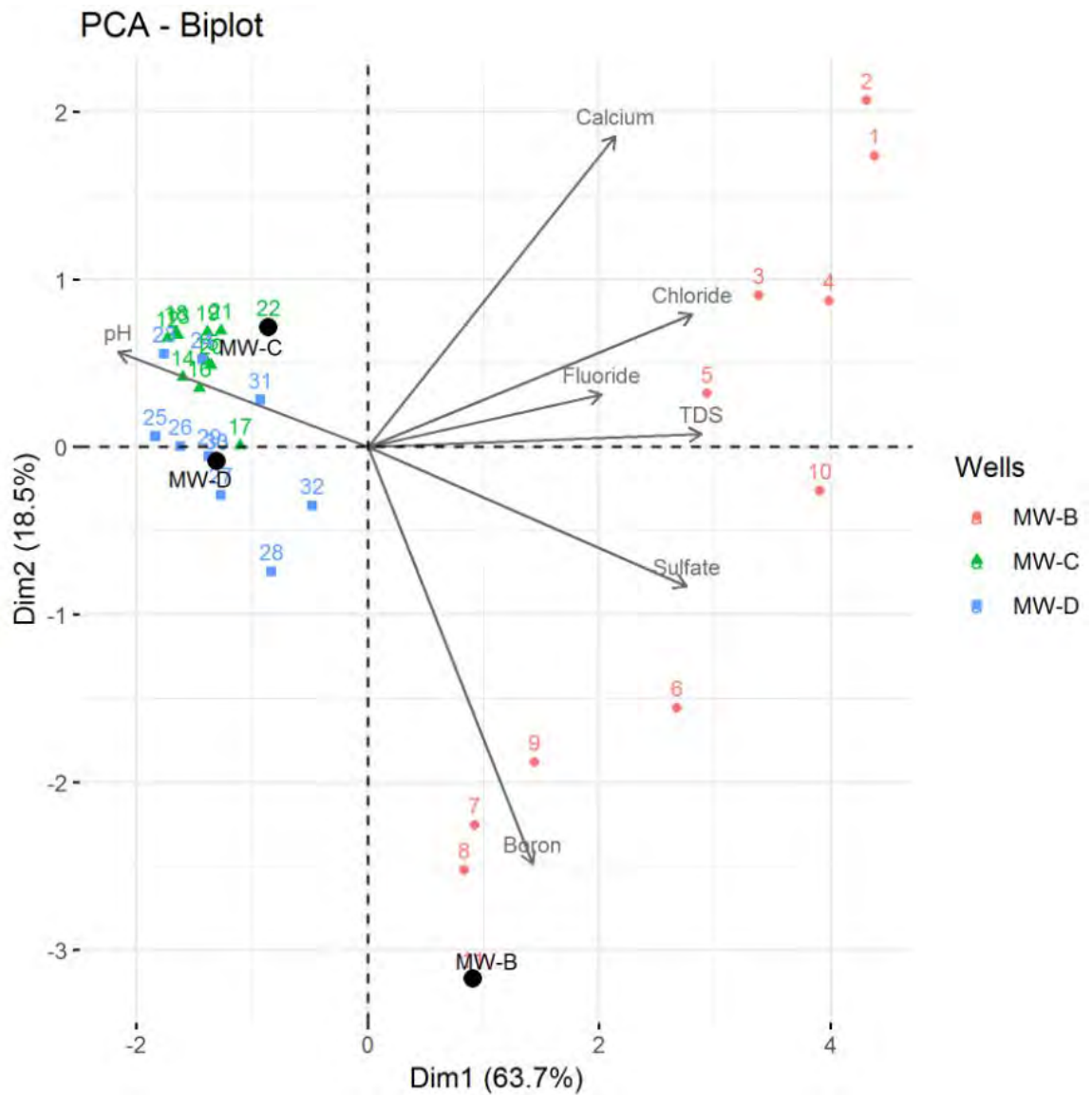


Figure 11. PCA Biplot for CCR Appendix III Constituents Color-Coded by Well (Samples with background exceedance shown as black symbol; labels correspond to the sample number)
 2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

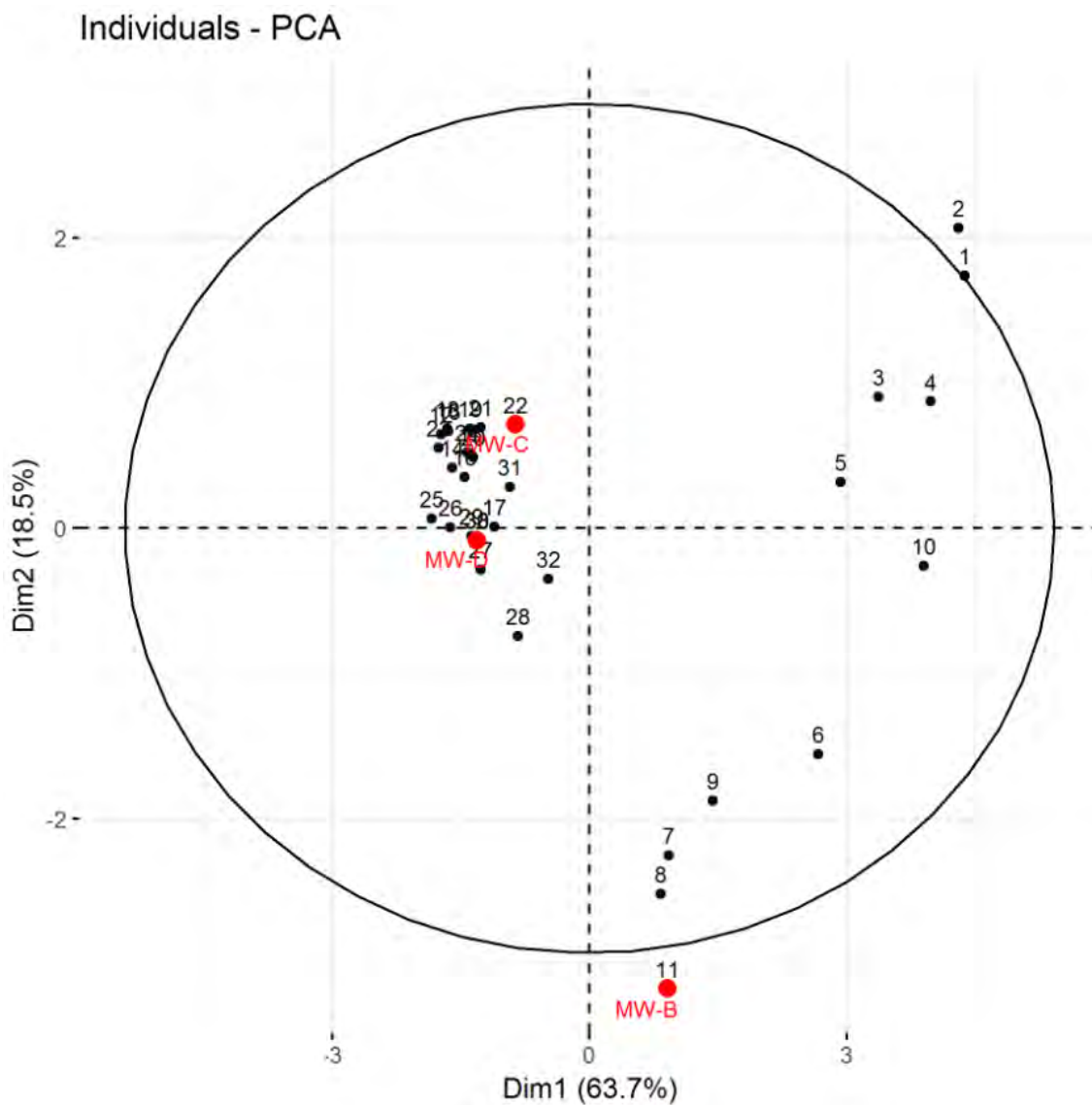


Figure 12. PCA Individuals Plot for CCR Appendix III Constituents with Area-Specific 95 Percent Bivariate Confidence Ellipse (Samples with background exceedance shown as red symbol; labels correspond to the sample number)
 2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

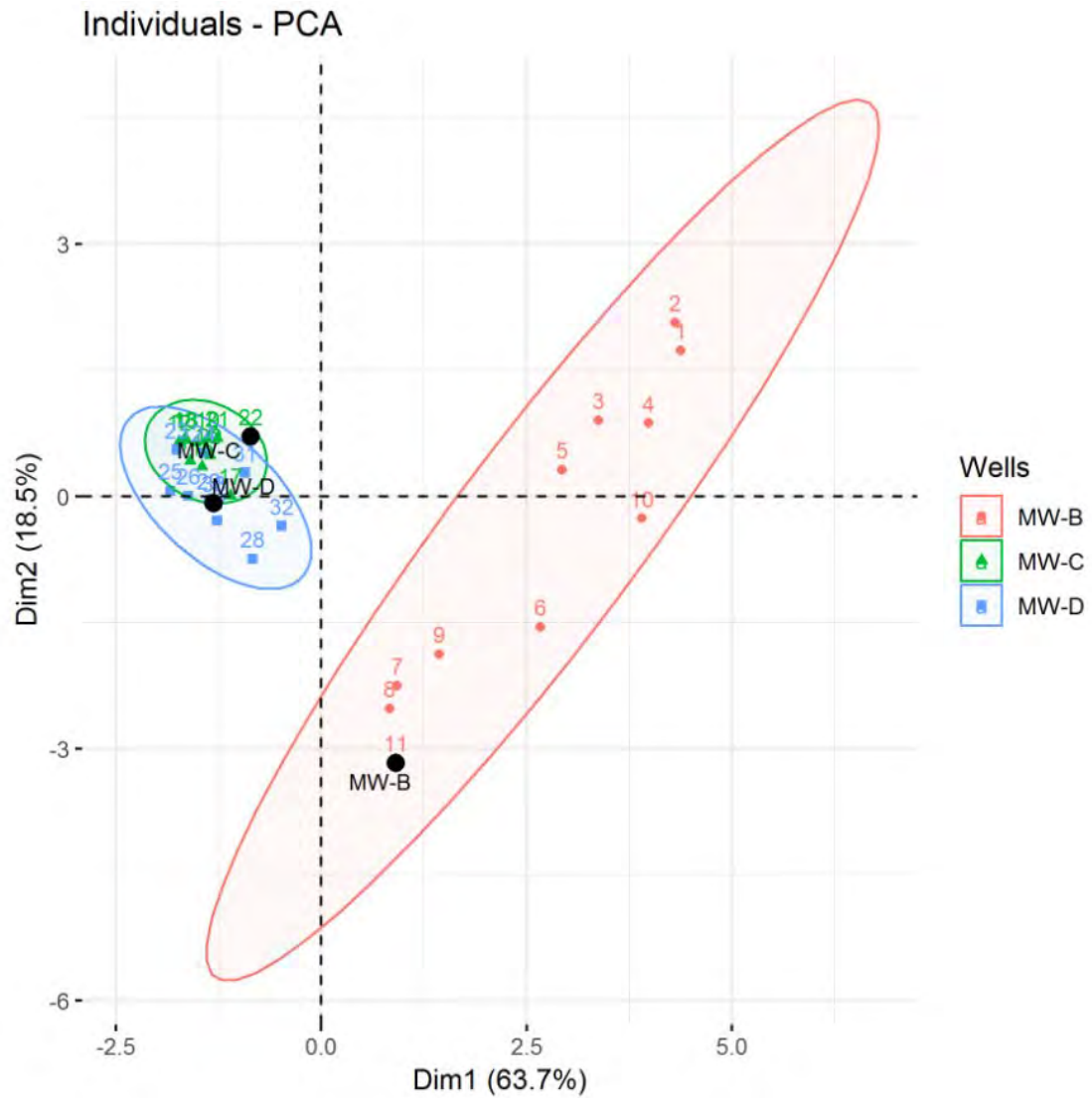


Figure 13. PCA Individuals Plot for CCR Appendix III Constituents with Well-Specific 95-Percent Bivariate Confidence Ellipses (Samples with background exceedance shown as black symbol; labels correspond to the sample number)
 2018 Coal Combustion Residuals Annual Groundwater Monitoring and Corrective Action Report

Conclusion

The general purpose of the 2018 annual report is to document the results of the detection monitoring OUC SEC. The results indicated that analyses of several parameter fell outside the expected statistical confidence interval based on the original background analysis of the CCR data. None of these values exceed or constitute a violation of groundwater standards levels. These exceedances are derived from a comparison of the results to a statistical analysis of a limited number of background readings.

If an SSI is verified using the detection monitoring program, the site assessment monitoring program must be initiated for all monitoring wells within 90 days and continuing at semiannual frequency. CCR assessment monitoring continues until such time that the monitoring program can be returned to the CCR detection monitoring or the program can proceed to a CCR corrective action program, as appropriate. After the first assessment monitoring sampling round, subsequent semiannual sampling at all monitoring wells must include all Appendix III constituents, and any Appendix IV constituent detected in the in the first round of assessment monitoring sampling. Based on the review of the data against projected trends, potential sources of constituents from surrounding land uses, and PCA analysis, it is concluded that SSIs of any constituent are not verified and it is not appropriate to proceed to assessment monitoring. MW-B sampling has indicated some unusual responses to TDS and other constituent parameters, that contain high variability. Within its own set of constituent pairs (Figure 13), the monitored data fell within a 95 percent bivariate confidence interval ellipse.

Results from evaluating the March and September 2018 CCR detection monitoring results did verify the presence of SSI within the data set; therefore, continuation of the detection monitoring program is appropriate.

References

For detailed discussions of multivariate statistical methods and underlying mathematical theory, the reader is referred to the books by Jolliffe (1986) and Johnson and Wichern (2007).

CH2M HILL Engineers, Inc. (CH2M). 2018. Annual Groundwater Monitoring and Corrective Action Report: OUC Stanton Energy Center CCR. Prepared for Orlando Utilities Commission, Orlando, Florida. January.

Dong, D., Q. Wi, R. Zhang, Y. Song, S. Chen, P. Li, S. Liu, C. Bi, Z. LV, and S. Hunag. 2007. Environmental Characteristics of Groundwater: An Application of PCA to Water Chemistry Analysis in Yulin. *Journal of China University of Mining and Technology*. 17:1, March, Pages 73-77.

Jackson, D.A. and Y. Chen. 2004. Robust Principal Component Analysis and Outlier Detection with Ecological Data. *Environmetrics*. 15: 129–139.

Johnson, R.A. and D. Wichern. 2007. *Applied Multivariate Statistical Analysis*. 6th Edition. Prentice Hall.

Jolliffe, I.T. 1986. *Principal Component Analysis*. Springer-Verlag, New York, New York.

Mudge, S. (2015). *Multivariate Statistical Methods and Source Identification in Environmental Forensics*. In *Introduction to Environmental Forensics*. 3rd Edition, editors Brian Murphy and Robert Morrison. pp 655-675. Elsevier Science Publishers.

Singh, A. 1993. *Omnibus Robust Procedures for Assessment of Multivariate Normality and Detection of Multivariate Outliers*. In *Multivariate Environmental Statistics*, Patil G. P. and Rao, C.R., Editors, pp. 445-488. Elsevier Science Publishers.

U.S. Code of Federal Regulations (CFR). 2015. Title 40: Protection of Environment. Subtitle D of 40 Code of Federal Regulations, Part 257 - Criteria for Classification of Solid Waste Disposal Facilities and Practices. April 17, 2015

U.S. Department of Energy (DOE). 2012. Multivariate Statistical Analysis of Water Chemistry in Evaluating the Origin of Contamination in Many Devils Wash, Shiprock, New Mexico. LMS/SHP/S09257. December.

U.S. Environmental Protection Agency (EPA). 2009a. Scout 2008 – A Robust Statistical Package. Office of Research and Development, February.

U.S. Environmental Protection Agency (EPA). 2009. U.S. Environmental Protection Agencyb. EPA's Unified Guidance, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities. EPA 530/R-09-007. March 2009.

Appendix A

Laboratory Analysis Results

OUC Stanton CCR Monitoring Well Results, 2018							
Location ID	Sample Date	Parameter Name	MCL	Final Result Text	Final Result Units	Final Reporting Limit	Final Detection Limit
MW-B	3/22/2018 10:17	Boron	none	107	µg/L	400	400
MW-B	9/19/2018 10:50	Boron	none	95.2	µg/L	20	20
MW-B	3/22/2018 10:17	Calcium	none	879	µg/L	39	39
MW-B	9/19/2018 10:50	Calcium	none	13600	µg/L	39	39
MW-B	3/22/2018 10:17	Chloride	250000	19000	µg/L	1000	1000
MW-B	9/19/2018 10:50	Chloride	250000	60200	µg/L	10000	10000
MW-B	3/22/2018 10:17	Field pH	6.5 to 8.5	4.45	pH Units		
MW-B	9/19/2018 10:50	Field pH	6.5 to 8.5	4.31	pH Units		
MW-B	3/22/2018 10:17	Fluoride	4000	100 U	µg/L	100	100
MW-B	9/19/2018 10:50	Fluoride	4000	140	µg/L	100	100
MW-B	3/22/2018 10:17	Sulfate	250000	40300	µg/L	2500	2500
MW-B	9/19/2018 10:50	Sulfate	250000	52300	µg/L	2500	2500
MW-B	3/22/2018 10:17	Total Dissolved Solids	500000	123000	µg/L	5000	5000
MW-B	9/19/2018 10:50	Total Dissolved Solids	500000	210000	µg/L	5000	5000
MW-C	3/22/2018 9:48	Boron	none	20 U	µg/L	20	20
MW-C	9/19/2018 10:24	Boron	none	20 U	µg/L	20	20
MW-C	3/22/2018 9:48	Calcium	none	7380	µg/L	39	39
MW-C	9/19/2018 10:24	Calcium	none	8050	µg/L	39	39
MW-C	3/22/2018 9:48	Chloride	250000	21800	µg/L	1000	1000

OUC Stanton CCR Monitoring Well Results, 2018							
Location ID	Sample Date	Parameter Name	MCL	Final Result Text	Final Result Units	Final Reporting Limit	Final Detection Limit
MW-C	9/19/2018 10:24	Chloride	250000	17700	µg/L	1000	1000
MW-C	3/22/2018 9:48	Field pH	6.5 to 8.5	4.95	pH Units		
MW-C	9/19/2018 10:24	Field pH	6.5 to 8.5	5.01	pH Units		
MW-C	3/22/2018 9:48	Fluoride	4000	100 U	µg/L	100	100
MW-C	9/19/2018 10:24	Fluoride	4000	100 U	µg/L	100	100
MW-C	3/22/2018 9:48	Sulfate	250000	1970	µg/L	250	250
MW-C	9/19/2018 10:24	Sulfate	250000	530	µg/L	250	250
MW-C	3/22/2018 9:48	Total Dissolved Solids	500000	77000	µg/L	5000	5000
MW-C	9/19/2018 10:24	Total Dissolved Solids	500000	73000	µg/L	5000	5000
MW-D	3/22/2018 11:40	Boron	none	20.0 U	µg/L	20	20
MW-D	9/19/2018 12:13	Boron	none	29.6	µg/L	20	20
MW-D	3/22/2018 11:40	Calcium	none	1790	µg/L	39	39
MW-D	9/19/2018 12:13	Calcium	none	11400	µg/L	39	39
MW-D	3/22/2018 11:40	Chloride	250000	10800	µg/L	1000	1000
MW-D	9/19/2018 12:13	Chloride	250000	41300	µg/L	2000	2000
MW-D	3/22/2018 11:40	Field pH	6.5 to 8.5	4.57	pH Units		
MW-D	9/19/2018 12:13	Field pH	6.5 to 8.5	4.55	pH Units		
MW-D	3/22/2018 11:40	Fluoride	4000	100 U	µg/L	100	100
MW-D	9/19/2018 12:13	Fluoride	4000	100 U	µg/L	100	100
MW-D	3/22/2018 11:40	Sulfate	250000	250 U	µg/L	250	250

OUC Stanton CCR Monitoring Well Results, 2018							
Location ID	Sample Date	Parameter Name	MCL	Final Result Text	Final Result Units	Final Reporting Limit	Final Detection Limit
MW-D	9/19/2018 12:13	Sulfate	250000	13100	µg/L	500	500
MW-D	3/22/2018 11:40	Total Dissolved Solids	500000	43000	µg/L	5000	5000
MW-D	9/19/2018 12:13	Total Dissolved Solids	500000	118000	µg/L	5000	5000



WATER QUALITY LABORATORY

Technical Report for:

OUC-Environmental Division

WQLAB Job Number:

1803072

Report to:

**Mark Corbett
OUC-Environmental Division
PO Box 3193
Orlando, FL 32808-3193**

Total Number of Pages 19 (Including Cover Page)

Estimates of uncertainty of analysis are available on request.
These results relate only to the samples tested.



Test results contained in this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs, as applicable.

Donna McCue
Laboratory Supervisor

Certification: FLDOH Certification Number E53566

April 02, 2018

OUC-Environmental Division
PO Box 3193
Orlando, FL 32808-3193

RE: WQLAB Project Number: **1803072**
Client Project Description: **Combustion Waste Landfill Monitoring**

Enclosed is the report of laboratory analysis for the following samples:

Sample Number	Sample Description	Date Collected
1803072-01	SEC Monitoring Well C	03/22/2018
1803072-02	SEC Monitoring Well C, FD	03/22/2018
1803072-03	SEC Monitoring Well B	03/22/2018
1803072-04	SEC Monitoring Well A	03/22/2018
1803072-05	SEC Monitoring Well D	03/22/2018
1803072-06	Field/Equipment Blank	03/22/2018

Footnotes are given at the end of the report, when applicable.

If you have any questions or comments concerning this report, please do not hesitate to contact us.

Sincerely,



Donna McCue
Laboratory Supervisor

Enclosures

Laboratory Report ENCO Jacksonville FLDOH# E82277

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well C
Matrix Water
WQLAB Sample Number 1803072-01RE1
Date/Time Collected 03/22/2018 09:48
Date/Time Received 03/22/2018 14:15

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Boron (Reshot)	20.0 <i>u</i>	ug/L	EPA 200.7	1	20.0	50.0	03/26/18 12:30	03/28/18 10:31	8C26003	ACV
Calcium (Reshot)	7380	ug/L	EPA 200.7	1	39.0	500	03/26/18 12:30	03/28/18 10:31	8C26003	ACV

Laboratory Report ENCO Jacksonville FLDOH# E82277
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well C, FD
Matrix Water
WQLAB Sample Number 1803072-02RE1
Date/Time Collected 03/22/2018 09:58
Date/Time Received 03/22/2018 14:15

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Boron (Reshot)	20.0	ug/L	EPA 200.7	1	20.0	50.0	03/26/18 12:30	03/28/18 10:32	8C26003	ACV
Calcium (Reshot)	7730	ug/L	EPA 200.7	1	39.0	500	03/26/18 12:30	03/28/18 10:32	8C26003	ACV

Laboratory Report ENCO Jacksonville FLDOH# E82277
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well B
Matrix Water
WQLAB Sample Number 1803072-03RE1
Date/Time Collected 03/22/2018 10:17
Date/Time Received 03/22/2018 14:15

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Boron (Reshot)	107	ug/L	EPA 200.7	1	20.0	50.0	03/26/18 12:30	03/28/18 10:34	8C26003	ACV
Calcium (Reshot)	879	ug/L	EPA 200.7	1	39.0	500	03/26/18 12:30	03/28/18 10:34	8C26003	ACV

Laboratory Report ENCO Jacksonville FLDOH# E82277
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well A
Matrix Water
WQLAB Sample Number 1803072-04
Date/Time Collected 03/22/2018 10:44
Date/Time Received 03/22/2018 14:15

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Boron	400	ug/L	EPA 200.7	20	400	1000	03/26/18 12:30	03/27/18 12:21	8C26003	ACV
Calcium	3870000	ug/L	EPA 200.7	20	780	10000	03/26/18 12:30	03/27/18 12:21	8C26003	ACV

Laboratory Report ENCO Jacksonville FLDOH# E82277
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well D
Matrix Water
WQLAB Sample Number 1803072-05RE1
Date/Time Collected 03/22/2018 11:40
Date/Time Received 03/22/2018 14:15

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Boron (Reshot)	20.0	ug/L	EPA 200.7	1	20.0	50.0	03/26/18 12:30	03/28/18 10:35	8C26003	ACV
Calcium (Reshot)	1790	ug/L	EPA 200.7	1	39.0	500	03/26/18 12:30	03/28/18 10:35	8C26003	ACV

Laboratory Report ENCO Jacksonville FLDOH# E82277
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation Field/Equipment Blank
Matrix Water
WQLAB Sample Number 1803072-06RE1
Date/Time Collected 03/22/2018 11:47
Date/Time Received 03/22/2018 14:15

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Boron (Reshot)	20.0 <i>u</i>	ug/L	EPA 200.7	1	20.0	50.0	03/26/18 12:30	03/28/18 10:37	8C26003	ACV
Calcium (Reshot)	39.0 <i>u</i>	ug/L	EPA 200.7	1	39.0	500	03/26/18 12:30	03/28/18 10:37	8C26003	ACV

Laboratory Report Orlando Utilities Commission FLDOH# E53566

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well C
Matrix Water
WQLAB Sample Number 1803072-01
Date/Time Collected 03/22/2018 09:48
Date/Time Received 03/22/2018 14:15

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Field pH	4.95	SU	FT 1100	1			03/22/18 09:48	03/22/18 09:48	B18C117	CRW
Chloride	21.8	mg/L	EPA 300.0	1	1.00	1.00	03/29/18 19:25	03/29/18 19:25	B18C142	JLK
Fluoride	0.10 <i>u</i>	mg/L	EPA 300.0	1	0.10	0.10	03/29/18 19:25	03/29/18 19:25	B18C142	JLK
Sulfate	1.97	mg/L	EPA 300.0	1	0.25	0.25	03/29/18 19:25	03/29/18 19:25	B18C142	JLK
Total Dissolved Solids	77.0	mg/L	SM 2540 C	1	5.00	5.00	03/26/18 11:50	03/26/18 11:50	B18C122	CRW

Laboratory Report Orlando Utilities Commission FLDOH# E53566
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well C, FD
Matrix Water
WQLAB Sample Number 1803072-02
Date/Time Collected 03/22/2018 09:58
Date/Time Received 03/22/2018 14:15

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Field pH	4.94	SU	FT 1100	1			03/22/18 09:58	03/22/18 09:58	B18C117	CRW
Chloride	21.3	mg/L	EPA 300.0	1	1.00	1.00	03/29/18 20:57	03/29/18 20:57	B18C142	JLK
Fluoride	0.10 <i>u</i>	mg/L	EPA 300.0	1	0.10	0.10	03/29/18 20:57	03/29/18 20:57	B18C142	JLK
Sulfate	1.96	mg/L	EPA 300.0	1	0.25	0.25	03/29/18 20:57	03/29/18 20:57	B18C142	JLK
Total Dissolved Solids	80.0	mg/L	SM 2540 C	1	5.00	5.00	03/26/18 11:50	03/26/18 11:50	B18C122	CRW

Laboratory Report Orlando Utilities Commission FLDOH# E53566
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well B
Matrix Water
WQLAB Sample Number 1803072-03
Date/Time Collected 03/22/2018 10:17
Date/Time Received 03/22/2018 14:15

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Field pH	4.45	SU	FT 1100	1			03/22/18 10:17	03/22/18 10:17	B18C117	CRW
Chloride	19.0	mg/L	EPA 300.0	1	1.00	1.00	03/29/18 21:27	03/29/18 21:27	B18C142	JLK
Fluoride	0.10 <i>u</i>	mg/L	EPA 300.0	1	0.10	0.10	03/29/18 21:27	03/29/18 21:27	B18C142	JLK
Sulfate	40.3	mg/L	EPA 300.0	10	2.50	2.50	03/29/18 21:58	03/29/18 21:58	B18C142	JLK
Total Dissolved Solids	123	mg/L	SM 2540 C	1	5.00	5.00	03/26/18 11:50	03/26/18 11:50	B18C122	CRW

Laboratory Report Orlando Utilities Commission FLDOH# E53566
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well A
Matrix Water
WQLAB Sample Number 1803072-04
Date/Time Collected 03/22/2018 10:44
Date/Time Received 03/22/2018 14:15

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Field pH	3.90	SU	FT 1100	1			03/22/18 10:44	03/22/18 10:44	B18C117	CRW
Chloride	14700	mg/L	EPA 300.0	1000	1000	1000	03/29/18 23:29	03/29/18 23:29	B18C142	JLK
Fluoride	100 <i>u</i>	mg/L	EPA 300.0	1000	100	100	03/29/18 23:29	03/29/18 23:29	B18C142	JLK
Sulfate	1550	mg/L	EPA 300.0	1000	250	250	03/29/18 23:29	03/29/18 23:29	B18C142	JLK
Total Dissolved Solids	29000	mg/L	SM 2540 C	1	5.00	5.00	03/26/18 11:50	03/26/18 11:50	B18C122	CRW

Laboratory Report Orlando Utilities Commission FLDOH# E53566

(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well D
Matrix Water
WQLAB Sample Number 1803072-05
Date/Time Collected 03/22/2018 11:40
Date/Time Received 03/22/2018 14:15

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Field pH	4.57	SU	FT 1100	1			03/22/18 11:40	03/22/18 11:40	B18C117	CRW
Chloride	10.8	mg/L	EPA 300.0	1	1.00	1.00	03/29/18 22:28	03/29/18 22:28	B18C142	JLK
Fluoride	0.10 <i>u</i>	mg/L	EPA 300.0	1	0.10	0.10	03/29/18 22:28	03/29/18 22:28	B18C142	JLK
Sulfate	0.25 <i>u</i>	mg/L	EPA 300.0	1	0.25	0.25	03/29/18 22:28	03/29/18 22:28	B18C142	JLK
Total Dissolved Solids	43.0	mg/L	SM 2540 C	1	5.00	5.00	03/26/18 11:50	03/26/18 11:50	B18C122	CRW

Laboratory Report Orlando Utilities Commission FLDOH# E53566
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation Field/Equipment Blank
Matrix Water
WQLAB Sample Number 1803072-06
Date/Time Collected 03/22/2018 11:47
Date/Time Received 03/22/2018 14:15

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Chloride	1.00 <i>u</i>	mg/L	EPA 300.0	1	1.00	1.00	03/29/18 18:54	03/29/18 18:54	B18C142	JLK
Fluoride	0.10 <i>u</i>	mg/L	EPA 300.0	1	0.10	0.10	03/29/18 18:54	03/29/18 18:54	B18C142	JLK
Sulfate	0.25 <i>u</i>	mg/L	EPA 300.0	1	0.25	0.25	03/29/18 18:54	03/29/18 18:54	B18C142	JLK
Total Dissolved Solids	5.00 <i>u</i>	mg/L	SM 2540 C	1	5.00	5.00	03/26/18 11:50	03/26/18 11:50	B18C122	CRW

Quality Control Orlando Utilities Commission FLDOH# E53566

Anions by EPA Method 300.0

Analyte	ResultQual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
---------	------------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------

Batch: B18C142

Blank (B18C142-BLK1)

Prepared & Analyzed: 29-Mar-18

Fluoride	0.10 U	0.10	mg/L		0.10				
Chloride	1.00 U	1.00	mg/L		1.00				
Sulfate	0.25 U	0.25	mg/L		0.25				

LCS (B18C142-BS1)

Prepared & Analyzed: 29-Mar-18

Fluoride	0.99		mg/L	1.00		98.6	90-110		
Chloride	9.71		mg/L	10.0		97.1	90-110		
Sulfate	3.90		mg/L	4.00		97.5	90-110		

Duplicate (B18C142-DUP1)

Source: 1803072-01

Prepared & Analyzed: 29-Mar-18

Fluoride	0.10 U	0.10	mg/L		0.10				10
Chloride	21.8	1.00	mg/L		21.8			0.0918	10
Sulfate	1.97	0.25	mg/L		1.97			0.254	10

Matrix Spike (B18C142-MS1)

Source: 1803072-01

Prepared & Analyzed: 29-Mar-18

Fluoride	2.2	0.10	mg/L	2.00	ND	108	80-120		
Chloride	29.6	1.00	mg/L	8.00	21.8	98.1	80-120		
Sulfate	5.36	0.25	mg/L	4.00	1.97	84.8	80-120		

Quality Control Orlando Utilities Commission FLDOH# E53566

Conventional Chemistry Parameters

Analyte	ResultQual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
---------	------------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------

Batch: B18C122

Blank (B18C122-BLK1)

Prepared & Analyzed: 26-Mar-18

Total Dissolved Solids	5.00 U	5.00	mg/L		5.00				
------------------------	--------	------	------	--	------	--	--	--	--

LCS (B18C122-BS1)

Prepared & Analyzed: 26-Mar-18

Total Dissolved Solids	502	5.00	mg/L	501		100	80-120		
------------------------	-----	------	------	-----	--	-----	--------	--	--

Duplicate (B18C122-DUP1)

Source: 1803072-03

Prepared & Analyzed: 26-Mar-18

Total Dissolved Solids	123	5.00	mg/L		123			0.00	10
------------------------	-----	------	------	--	-----	--	--	------	----

Quality Control ENCO Jacksonville FLDOH# E82277

Metals by EPA 200 Series Methods

Analyte	ResultQual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
---------	------------	-----------------	-------	-------------	---------------	------	-------------	-----	-----------

Batch: 8C26003

Blank (8C26003-BLK1)

Prepared: 26-Mar-18 Analyzed: 27-Mar-18

Boron	20.0 U	50.0	ug/L		20.0				
Calcium	39.0 U	500	ug/L		39.0				

LCS (8C26003-BS1)

Prepared: 26-Mar-18 Analyzed: 27-Mar-18

Boron	2580	50.0	ug/L	2500		103	85-115		
-------	------	------	------	------	--	-----	--------	--	--

Quality Control ENCO Jacksonville FLDOH# E82277

Metals by EPA 200 Series Methods (Continued)

Analyte	Result Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: 8C26003 (Continued)									
LCS (8C26003-BS1)									
Calcium	5070	500	ug/L	5000		101	85-115		
Matrix Spike (8C26003-MS1)									
		Source: BB01278-04		Prepared: 26-Mar-18 Analyzed: 27-Mar-18					
Boron	2650	50.0	ug/L	2500	86.9	102	70-130		
Calcium	8370	500	ug/L	5000	3290	102	70-130		
Matrix Spike Dup (8C26003-MSD1)									
		Source: BB01278-04		Prepared: 26-Mar-18 Analyzed: 27-Mar-18					
Boron	2660	50.0	ug/L	2500	86.9	103	70-130	0.4	25
Calcium	8400	500	ug/L	5000	3290	102	70-130	0.3	25

Project Name: Combustion Waste Landfill Monitoring

Footnotes

- Qualifiers:
- U Compound was analyzed for but not detected
 - I The reported value is between the laboratory method detection limit and the practical quantitation limit
 - V Analyte was detected in both the sample and the associated method blank
 - L Off-scale high. Actual value is known to be greater than the value given

- Acronyms:
- Dil Dilution Factor
 - LCS Laboratory Control Sample
 - LCSD Laboratory Control Sample Duplicate
 - MDL Method detection limit.
 - MS Matrix Spike
 - MSD Matrix Spike Duplicate
 - NC Laboratory lacks NELAC certification for this analyte.
 - NS Not Screened
 - PQL Practical Quantitation Limit: the lowest result that can be routinely quantified and reported.
 - RPD Relative Percent Difference

Approved by:

Donna McCue
Laboratory Supervisor



ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

10775 Central Port Dr.
Orlando, FL 32824
(407) 826-5314 Fax (407) 850-6945

4810 Executive Park Court, Suite 211
Jacksonville, FL 32216-6069
(904) 296-3007 Fax (904) 296-8210

102-A Woodwinds Industrial Ct.
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515

www.encolabs.com

Page ____ of ____

Client Name

OUC

Project Number

Address

3500 Citrus Ave

Project Name/Desc

SEC Landfill Monitoring Wells

PO # / Billing Info

City/ST/Zip

Orlando, FL 32839

Reporting Contact

Jim Sheemaker ouc.com

Tel

407-934-2549

Billing Contact

Sampler(s) Name, Affiliation (Print)

Chas Wright OUC WGL

Site Location / Time Zone

Preservation (See Codes) (Combine as necessary)

Lab Workorder

Requested Turnaround Times

Note: Rush requests subject to acceptance by the facility

Standard

Expedited

Due ____/____/____

Sample Comments

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		</
--------	----------------------------------	-----------------	-----------------	-------------	--------------------	-----------------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----

OUC GROUNDWATER SAMPLING LOG

Site Name: <u>SEC Lettered Wells</u>	Site Location: <u>MW - C</u>
Well No. _____	Sample ID: _____
Date: <u>03/22/18</u>	

PURGING DATA

Well Diameter: 2"	Tubing Diameter: 1/4"	Well Screen Depth Interval: 20-30'	Static Depth to Water: 6.98	Sampling Device: PP #2
Well Volume Purge: 1 Well Volume = (Total Well Depth - Static Depth to Water) X Well Capacity = (<u>31.5</u> feet - <u>6.98</u> feet) X <u>0.16</u> gallons/foot = <u>3.92</u> gallons				
Equipment Volume Purge: 1 Equipment Vol. = Pump Volume + (Tubing Capacity X Tubing Length) + Flow Cell Volume = <u>0</u> gallons + (0.0026 gallons / foot X 30 feet) + 0.12 gallons = 0.2 gallons				
Initial Tubing Depth in Well (Feet): <u>22</u>		Final Pump or Tubing Depth in Well: (feet): <u>22</u>		Purging Initiated at: <u>0944</u>
				Purging ended at: <u>1001</u>
				Total Volume Purged (gallons): _____

Time	Volume Purged (gallons)	Cumul. Volume Purged (gallons)	Purge Rate (gpm)	Depth to Water (feet)	pH (Standard units)	Temp (°C)	Cond. µS/cm	Dissolved Oxygen (mg/L)	Turbidity (NTUs)	Color (Describe)	Odor (Describe)
0942			0.25	7.12	4.95	23.46	97	0.32	5.20	Clear	H ₂ S
0945			0.25	7.12	4.95	23.54	96	0.31	4.21		
0948			0.25	7.12	4.95	23.44	96	0.30	3.89		
0952			0.25	7.12	4.95	23.33	95	0.31	4.19		
0955			0.25	7.12	4.98	23.52	94	0.30	4.70		
0958			0.25	7.12	4.94	23.43	95	0.29	3.47		

Field Duplicate

Well Capacity (Gallons Per Foot): 0.75"=0.02; 1"=0.04; 1.25"=0.06; 2"=0.16; 3"=0.37; 4"=0.65; 5"=1.02; 6"=1.47; 12"=5.88
Tubing inside diameter capacity (Gallons Per Foot): 1/8"=0.0006; 3/16"=0.0014; 1/4"=0.0026; 5/16"=0.004; 3/8"=0.006; 1/2"=0.010; 5/8"=0.016
Purging Equipment Codes: B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

Sampled By (Print) / Affiliation: <u>C. Wright, J. Shumaker / OUC well</u>				Sampler(s) Signature(s): <u>[Signature]</u>			Sampling initiated at: <u>0948, 0958</u>		Sampling ended at: <u>0951, 1001</u>	
Pump or tubing depth in well (feet): <u>22</u>				Tubing Material Code: <u>PE</u>		Field-filtered: Y ☒ N ☐		Filter Size: _____ µm		
Field Decontamination: Pump Y ☒ N ☐				Tubing Y ☒ N ☐ (replaced)		Duplicate: Y ☒ N ☐				

Sample Container Specification				Sample Preservation			Intended Analysis and/or Method	Sampling Equipment Code	Sample Pump Flow Rate (mL per minute)
Sample ID Code	# Containers	Material Code	Volume	Preservative Used	Total Vol Added in Field (mL)	Final pH			

Remarks: _____ (Sulfite: NA mg/L)

Material codes: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; S = Silicone; T=Teflon; O = Other
Sampling Equipment Codes: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
 2. Stabilization criteria for range of variation of the last three consecutive readings (see FS 2212, Section 3)
 pH: ± 0.2 units Temperature: ± 0.2°C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2); optionally, 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

OUC GROUNDWATER SAMPLING LOG

Site Name:		Site Location: MW-B
Well No.	Sample ID:	Date: 03/22/18

PURGING DATA

[illegible]

SAMPLING DATA

[illegible]

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. Stabilization criteria for range of variation of the last three consecutive readings (see FS 2212, Section 3)
pH: + 0.2 units Temperature: + 0.2°C Specific Conductance: + 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2);
optionally, 0.2 mg/L or + 10% (whichever is greater) Turbidity: all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

OUC GROUNDWATER SAMPLING LOG

Site Name:		Site Location: MW-A
Well No.	Sample ID:	Date: 03/22/18

PURGING DATA

[illegible]

SAMPLING DATA

Sampled By (Print) / Affiliation: C Wright, J Shaeffer / OUC WAL				Sampler(s) Signature(s): <i>C Wright</i>			Sampling initiated at: 10/4/11		Sampling ended at:	
Pump or tubing depth in well (feet): 33				Tubing Material Code: PE			Field-filtered: Y (☒ N)		Filter Size: ____ µm	
Field Decontamination: Pump Y (☒ N) Tubing Y (☒ N (replaced))						Duplicate: Y (☒ N)				
Sample Container Specification				Sample Preservation			Intended Analysis and/or Method	Sampling Equipment Code	Sample Pump Flow Rate (mL per minute)	
Sample ID Code	# Containers	Material Code	Volume	Preservative Used	Total Vol Added in Field (mL)	Final pH				
Remarks:										
								(Sulfite: NA mg/L)		
Material codes: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; S = Silicone; T=Teflon; O = Other Sampling Equipment Codes: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other										

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. Stabilization criteria for range of variation of the last three consecutive readings (see FS 2212, Section 3)
pH: ± 0.2 units Temperature: $\pm 0.2^{\circ}\text{C}$ Specific Conductance: $\pm 5\%$ Dissolved Oxygen: all readings $\leq 20\%$ saturation (see Table FS 2200-2); optionally, 0.2 mg/L or $\pm 10\%$ (whichever is greater) Turbidity: all readings $< 20 \text{ NTU}$; optionally $+ 5 \text{ NTU}$ or $\pm 10\%$ (whichever is greater)

OUC GROUNDWATER SAMPLING LOG

Site Name: SEC Lettered Wells		Site Location: MW-1D
Well No.	Sample ID:	Date: 03/22/18

PURGING DATA

[illegible]

SAMPLING DATA

Sampled By (Print) / Affiliation:				Sampler(s) Signature(s):			Sampling initiated at: 1140		Sampling ended at: 1144	
Pump or tubing depth in well (feet):				Tubing Material Code:			Field-filtered: Y N Filter Size: _____ µm			
Field Decontamination: Pump Y N Tubing Y N (replaced)							Duplicate: Y N			
Sample Container Specification				Sample Preservation			Intended Analysis and/or Method	Sampling Equipment Code	Sample Pump Flow Rate (mL per minute)	
Sample ID Code	# Containers	Material Code	Volume	Preservative Used	Total Vol Added in Field (mL)	Final pH				
Remarks:										
								(Sulfite: mg/L)		
Material codes: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; S = Silicone; T=Teflon; O = Other										
Sampling Equipment Codes: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other										

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.

2. Stabilization criteria for range of variation of the last three consecutive readings (see FS 2212, Section 3)

pH: ± 0.2 units **Temperature:** $\pm 0.2^{\circ}\text{C}$ **Specific Conductance:** $\pm 5\%$ **Dissolved Oxygen:** all readings $< 20\%$ saturation (see Table FS 2200-2); optionally, 0.2 mg/L or $\pm 10\%$ (whichever is greater) **Turbidity:** all readings $< 20\text{ NTU}$; optionally $+5\text{ NTU}$ or $\pm 10\%$ (whichever is greater)

I:\WQLAB\LAB\Sampling\SEC Monitoring Wells\OUC Groundwater Sampling Log.doc

Build the "Y" this way if there is qualified data on this page.

Form FD9000-8 CALIBRATION LOG (FDEP SOP FT 1000-FT 1500, FD 1000-FD 4000) 11-10-05

Project/Site: SEC Lettered Wells

Date: 03/22/18

Meter # YSI 556 MPS

Temperature (Quarterly) For Date of Last Temperature Verification see 07/10/17 in log book Micro Temp

09F100824
N-064777-AB
SRW 3/22/18

Dissolved Oxygen	DEP SOP FT 1500	Initials	Date	Time	Probe Charge	Probe Gain	mg/L	Temp °C	% DO	Saturation mg/L (from chart)	Pass or Fail
------------------	-----------------	----------	------	------	--------------	------------	------	---------	------	------------------------------	--------------

CAL	ICV	CCV	CRW	03/22/18	0740		9.165	19.60	99.0	9.09	P
CAL	ICV	CCV	↓	↓	↓		9.147	19.68	97.1	8.58	P
CAL	ICV	CCV	CRW	03/22/18	1435		8.829	21.54	98.7	8.67	P
CAL	ICV	CCV									P
CAL	ICV	CCV									P
CAL	ICV	CCV									P
CAL	ICV	CCV									P

Specific Conductance	DEP SOP FT 1200	Initials	Date	Time	Standard $\mu\text{mhos/cm}$	Exp. Date	Lot #	Bottle #	Cell Constant	Reading $\mu\text{mhos/cm}$	Pass or Fail
----------------------	-----------------	----------	------	------	------------------------------	-----------	-------	----------	---------------	-----------------------------	--------------

CAL	ICV	CCV	CRW	03/22/18	0745	100	2712916	Q3-67		100	P
CAL	ICV	CCV	↓	↓	↓	10000	2609627	Q2-145		9791	P
CAL	ICV	CCV									P
CAL	ICV	CCV									P
CAL	ICV	CCV									P
CAL	ICV	CCV									P
CAL	ICV	CCV									P

pH	DEP SOP FT 1100	Initials	Date	Time	Standard SU	Exp. Date	Lot #	Bottle #	Slope	Reading SU	Pass or Fail
----	-----------------	----------	------	------	-------------	-----------	-------	----------	-------	------------	--------------

CAL	ICV	CCV	CRW	03/22/18	0747	7.00		Q2-151			P
CAL	ICV	CCV	↓	↓	↓	4.00		Q3-50			P
CAL	ICV	CCV	↓	↓	↓	4.63	164677	Q3-29		4.53	P
CAL	ICV	CCV	CRW	03/22/18	1440	7.00		Q2-151		7.05	P
CAL	ICV	CCV									P
CAL	ICV	CCV									P
CAL	ICV	CCV									P
CAL	ICV	CCV									P

Maintenance: Weekly pH Slope: _____ Specific Conductance Probe Cleaned? Yes No Dissolved Oxygen Membrane Changed: Yes No

Notes:

Perform only in Calibrate Mode:
Perform only in Run Mode:
Perform only in Run Mode:

CAL - Calibrate -
ICV - Initial Calibration Verification
CCV - Continuing Calibration Verification

Project/Site: SEC Lettered WellsDate: 03/22/18

Turbidity Meter#	DEP SOP	Initials	Date	Time	Standard NTU	Exp. Date	Lot #	Bottle #	Range	Reading NTU	Pass or Fail
Acceptance Criteria: +/- 10%											
N10010C039215	FT 1600										
CAL ICV CCV		CPW	03/22/18	0800	0.1	12/2018	A7333	Q3-56		0.06	P F
CAL ICV CCV		↓	↓	↓	20	↓	↓	↓		20.1	P F
CAL ICV CCV		CPW	03/22/18	1445	20	12/2018	A7333	Q3-56		20.3	P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
Acceptance Criteria: +/- 10%											
Residual Cl2 Meter #	DEP SOP	Initials	Date	Time	Standard mg/L	Exp. Date	Lot #	Bottle #	Slope	Reading mg/L	Pass or Fail
Acceptance Criteria: +/- 10%											
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
Acceptance Criteria:											
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F

Perform only in Calibrate Mode:
 Perform only in Run Mode:
 Perform only in Run Mode:

CAL - Calibrate -
 ICV - Initial Calibration Verification
 CCV - Continuing Calibration Verification



WATER QUALITY LABORATORY

Technical Report for:

OUC-Environmental Division

WQLAB Job Number:

1809051

Report to:

**Mark Corbett
OUC-Environmental Division
PO Box 3193
Orlando, FL 32808-3193**

Total Number of Pages 19 (Including Cover Page)

Estimates of uncertainty of analysis are available on request.
These results relate only to the samples tested.



Test results contained in this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs, as applicable.

Donna McCue
Laboratory Supervisor

Certification: FLDOH Certification Number E53566

October 26, 2018

OUC-Environmental Division
PO Box 3193
Orlando, FL 32808-3193

RE: WQLAB Project Number: **1809051**
Client Project Description: **Combustion Waste Landfill Monitoring**

Enclosed is the report of laboratory analysis for the following samples:

Sample Number	Sample Description	Date Collected
1809051-01	SEC Monitoring Well C	09/19/2018
1809051-02	SEC Monitoring Well C, FD	09/19/2018
1809051-03	SEC Monitoring Well B	09/19/2018
1809051-04	SEC Monitoring Well A	09/19/2018
1809051-05	Field/Equipment Blank	09/19/2018
1809051-06	SEC Monitoring Well D	09/19/2018

Footnotes are given at the end of the report, when applicable.

If you have any questions or comments concerning this report, please do not hesitate to contact us.

Sincerely,



Donna McCue
Laboratory Supervisor

Enclosures

Laboratory Report ENCO Jacksonville FLDOH# E82277

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well C
Matrix Water
WQLAB Sample Number 1809051-01RE1
Date/Time Collected 09/19/2018 10:24
Date/Time Received 09/19/2018 14:50

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Boron (Reshot)	20.0 <i>u</i>	ug/L	EPA 200.7	1	20.0	50.0	09/24/18 09:02	09/25/18 13:06	8I24003	ACV
Calcium (Reshot)	8050	ug/L	EPA 200.7	1	39.0	500	09/24/18 09:02	09/25/18 13:06	8I24003	ACV

Laboratory Report ENCO Jacksonville FLDOH# E82277
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well C, FD
Matrix Water
WQLAB Sample Number 1809051-02RE1
Date/Time Collected 09/19/2018 10:34
Date/Time Received 09/19/2018 14:50

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Boron (Reshot)	20.0	ug/L	EPA 200.7	1	20.0	50.0	09/24/18 09:02	09/25/18 13:08	8I24003	ACV
Calcium (Reshot)	7920	ug/L	EPA 200.7	1	39.0	500	09/24/18 09:02	09/25/18 13:08	8I24003	ACV

Laboratory Report ENCO Jacksonville FLDOH# E82277
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well B
Matrix Water
WQLAB Sample Number 1809051-03RE1
Date/Time Collected 09/19/2018 10:50
Date/Time Received 09/19/2018 14:50

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Boron (Reshot)	95.2	ug/L	EPA 200.7	1	20.0	50.0	09/24/18 09:02	09/25/18 13:09	8I24003	ACV
Calcium (Reshot)	13600	ug/L	EPA 200.7	1	39.0	500	09/24/18 09:02	09/25/18 13:09	8I24003	ACV

Laboratory Report ENCO Jacksonville FLDOH# E82277
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well A
Matrix Water
WQLAB Sample Number 1809051-04
Date/Time Collected 09/19/2018 11:20
Date/Time Received 09/19/2018 14:50

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Boron	400	ug/L	EPA 200.7	20	400	1000	09/24/18 09:02	09/25/18 10:48	8I24003	ACV
Calcium	4050000	ug/L	EPA 200.7	20	780	10000	09/24/18 09:02	09/25/18 10:48	8I24003	ACV

Laboratory Report ENCO Jacksonville FLDOH# E82277
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation Field/Equipment Blank
Matrix Water
WQLAB Sample Number 1809051-05RE1
Date/Time Collected 09/19/2018 11:41
Date/Time Received 09/19/2018 14:50

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Boron (Reshot)	20.0 U	ug/L	EPA 200.7	1	20.0	50.0	09/24/18 09:02	09/25/18 13:11	8I24003	ACV
Calcium (Reshot)	51.4 I	ug/L	EPA 200.7	1	39.0	500	09/24/18 09:02	09/25/18 13:11	8I24003	ACV

Laboratory Report ENCO Jacksonville FLDOH# E82277
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well D
Matrix Water
WQLAB Sample Number 1809051-06RE1
Date/Time Collected 09/19/2018 12:13
Date/Time Received 09/19/2018 14:50

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Boron (Reshot)	29.6 I	ug/L	EPA 200.7	1	20.0	50.0	09/26/18 09:02	09/27/18 13:10	8I26003	ACV
Calcium (Reshot)	11400	ug/L	EPA 200.7	1	39.0	500	09/26/18 09:02	09/27/18 13:10	8I26003	ACV

Laboratory Report Orlando Utilities Commission FLDOH# E53566

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well C
Matrix Water
WQLAB Sample Number 1809051-01
Date/Time Collected 09/19/2018 10:24
Date/Time Received 09/19/2018 14:50

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Field pH	5.01	SU	FT 1100	1			09/19/18 10:24	09/19/18 10:24	B18I072	JLK
Chloride	17.7	mg/L	EPA 300.0	1	1.00	1.00	09/20/18 20:43	09/20/18 20:43	B18I081	JLK
Fluoride	0.10 <i>u</i>	mg/L	EPA 300.0	1	0.10	0.10	09/20/18 20:43	09/20/18 20:43	B18I081	JLK
Sulfate	0.53	mg/L	EPA 300.0	1	0.25	0.25	09/20/18 20:43	09/20/18 20:43	B18I081	JLK
Total Dissolved Solids	73.0	mg/L	SM 2540 C	1	5.00	5.00	09/20/18 12:45	09/20/18 12:45	B18I074	CRW

Laboratory Report Orlando Utilities Commission FLDOH# E53566
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well C, FD
Matrix Water
WQLAB Sample Number 1809051-02
Date/Time Collected 09/19/2018 10:34
Date/Time Received 09/19/2018 14:50

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Field pH	5.00	SU	FT 1100	1			09/19/18 10:34	09/19/18 10:34	B18I072	JLK
Chloride	18.5	mg/L	EPA 300.0	1	1.00	1.00	09/20/18 22:26	09/20/18 22:26	B18I081	JLK
Fluoride	0.10 <i>u</i>	mg/L	EPA 300.0	1	0.10	0.10	09/20/18 22:26	09/20/18 22:26	B18I081	JLK
Sulfate	0.47	mg/L	EPA 300.0	1	0.25	0.25	09/20/18 22:26	09/20/18 22:26	B18I081	JLK
Total Dissolved Solids	75.0	mg/L	SM 2540 C	1	5.00	5.00	09/20/18 12:45	09/20/18 12:45	B18I074	CRW

Laboratory Report Orlando Utilities Commission FLDOH# E53566
(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well B
Matrix Water
WQLAB Sample Number 1809051-03
Date/Time Collected 09/19/2018 10:50
Date/Time Received 09/19/2018 14:50

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Field pH	4.31	SU	FT 1100	1			09/19/18 10:50	09/19/18 10:50	B18I072	JLK
Chloride	60.2	mg/L	EPA 300.0	10	10.0	10.0	09/20/18 23:35	09/20/18 23:35	B18I081	JLK
Fluoride	0.14	mg/L	EPA 300.0	1	0.10	0.10	09/20/18 23:01	09/20/18 23:01	B18I081	JLK
Sulfate	52.3	mg/L	EPA 300.0	10	2.50	2.50	09/20/18 23:35	09/20/18 23:35	B18I081	JLK
Total Dissolved Solids	210	mg/L	SM 2540 C	1	5.00	5.00	09/20/18 12:45	09/20/18 12:45	B18I074	CRW

Laboratory Report Orlando Utilities Commission FLDOH# E53566

(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation SEC Monitoring Well A
Matrix Water
WQLAB Sample Number 1809051-04
Date/Time Collected 09/19/2018 11:20
Date/Time Received 09/19/2018 14:50

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Field pH	4.01	SU	FT 1100	1			09/19/18 11:20	09/19/18 11:20	B18I072	JLK
Chloride	14800	mg/L	EPA 300.0	1000	1000	1000	09/21/18 00:10	09/21/18 00:10	B18I081	JLK
Fluoride	1.0 <i>u</i>	mg/L	EPA 300.0	10	1.0	1.0	09/21/18 00:44	09/21/18 00:44	B18I081	JLK
Sulfate	1280	mg/L	EPA 300.0	1000	250	250	09/21/18 00:10	09/21/18 00:10	B18I081	JLK
Total Dissolved Solids	26900	mg/L	SM 2540 C	1	5.00	5.00	09/20/18 12:45	09/20/18 12:45	B18I074	CRW

Laboratory Report Orlando Utilities Commission FLDOH# E53566

(Continued)

Project Name Combustion Waste Landfill Monitoring
Sample Designation Field/Equipment Blank
Matrix Water
WQLAB Sample Number 1809051-05
Date/Time Collected 09/19/2018 11:41
Date/Time Received 09/19/2018 14:50

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Chloride	1.00 <i>u</i>	mg/L	EPA 300.0	1	1.00	1.00	09/20/18 19:34	09/20/18 19:34	B18I081	JLK
Fluoride	0.10 <i>u</i>	mg/L	EPA 300.0	1	0.10	0.10	09/20/18 19:34	09/20/18 19:34	B18I081	JLK
Sulfate	0.25 <i>u</i>	mg/L	EPA 300.0	1	0.25	0.25	09/20/18 19:34	09/20/18 19:34	B18I081	JLK
Total Dissolved Solids	5.00 <i>u</i>	mg/L	SM 2540 C	1	5.00	5.00	09/20/18 12:45	09/20/18 12:45	B18I074	CRW

Laboratory Report Orlando Utilities Commission FLDOH# E53566

(Continued)

Project NameCombustion Waste Landfill Monitoring

Sample DesignationSEC Monitoring Well D

MatrixWater

WQLAB Sample Number1809051-06

Date/Time Collected09/19/2018 12:13

Date/Time Received09/19/2018 14:50

Parameters	Results	Units	Method	Dil	MDL	PQL	Date/Time Prepared	Date/Time Analyzed	Batch	Analyst
Field pH	4.55	SU	FT 1100	1			09/19/18 12:13	09/19/18 12:13	B18I072	JLK
Chloride	41.3	mg/L	EPA 300.0	2	2.00	2.00	09/21/18 10:42	09/21/18 10:42	B18I081	JLK
Fluoride	0.10 <i>u</i>	mg/L	EPA 300.0	1	0.10	0.10	09/21/18 01:19	09/21/18 01:19	B18I081	JLK
Sulfate	13.1	mg/L	EPA 300.0	2	0.50	0.50	09/21/18 10:42	09/21/18 10:42	B18I081	JLK
Total Dissolved Solids	118	mg/L	SM 2540 C	1	5.00	5.00	09/20/18 12:45	09/20/18 12:45	B18I074	CRW

Quality Control Orlando Utilities Commission FLDOH# E53566

Anions by EPA Method 300.0

Analyte	ResultQual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B18I081									
Blank (B18I081-BLK1)				Prepared & Analyzed: 20-Sep-18					
Fluoride	0.10 U	0.10	mg/L		0.10				
Chloride	1.00 U	1.00	mg/L		1.00				
Sulfate	0.25 U	0.25	mg/L		0.25				
LCS (B18I081-BS1)				Prepared & Analyzed: 20-Sep-18					
Fluoride	2.0		mg/L	2.00		100	90-110		
Chloride	7.96		mg/L	8.00		99.5	90-110		
Sulfate	1.86		mg/L	2.00		93.0	90-110		
Duplicate (B18I081-DUP1)				Source: 1809051-01 Prepared & Analyzed: 20-Sep-18					
Fluoride	0.10 U	0.10	mg/L		0.10				10
Chloride	17.7	1.00	mg/L		17.7			0.135	10
Sulfate	0.52	0.25	mg/L		0.53			1.70	10
Matrix Spike (B18I081-MS1)				Source: 1809051-01 Prepared & Analyzed: 20-Sep-18					
Chloride	25.8	1.00	mg/L	8.00	17.7	101	80-120		
Sulfate	4.37	0.25	mg/L	4.00	0.53	96.0	80-120		

Quality Control Orlando Utilities Commission FLDOH# E53566

Conventional Chemistry Parameters

Analyte	ResultQual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: B18I074									
Blank (B18I074-BLK1)				Prepared & Analyzed: 20-Sep-18					
Total Dissolved Solids	5.00 U	5.00	mg/L		5.00				
LCS (B18I074-BS1)				Prepared & Analyzed: 20-Sep-18					
Total Dissolved Solids	296	5.00	mg/L	294		101	80-120		
Duplicate (B18I074-DUP1)				Source: 1809051-03 Prepared & Analyzed: 20-Sep-18					
Total Dissolved Solids	202	5.00	mg/L		210			3.88	10

Quality Control ENCO Jacksonville FLDOH# E82277

Metals by EPA 200 Series Methods

Analyte	ResultQual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: 8I24003									
Blank (8I24003-BLK1)				Prepared: 24-Sep-18 Analyzed: 25-Sep-18					
Boron	20.0 U	50.0	ug/L		20.0				
Calcium	39.0 U	500	ug/L		39.0				
LCS (8I24003-BS1)				Prepared: 24-Sep-18 Analyzed: 25-Sep-18					
Boron	2430	50.0	ug/L	2500		97	85-115		
Calcium	4920	500	ug/L	5000		98	85-115		

Quality Control ENCO Jacksonville FLDOH# E82277

Metals by EPA 200 Series Methods (Continued)

Analyte	Result Qual	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch: 8I24003 (Continued)									
Matrix Spike (8I24003-MS1)		Source: BB04129-03		Prepared: 24-Sep-18 Analyzed: 25-Sep-18					
Boron	2560	50.0	ug/L	2500	139	97	70-130		
Calcium	122000	500	ug/L	5000	116000	117	70-130		
Matrix Spike Dup (8I24003-MSD1)		Source: BB04129-03		Prepared: 24-Sep-18 Analyzed: 25-Sep-18					
Boron	2590	50.0	ug/L	2500	139	98	70-130	1	25
Calcium	121000	500	ug/L	5000	116000	95	70-130	0.9	25
Batch: 8I26003									
Blank (8I26003-BLK1)		Prepared: 26-Sep-18 Analyzed: 27-Sep-18							
Boron	20.0 U	50.0	ug/L		20.0				
Calcium	39.0 U	500	ug/L		39.0				
LCS (8I26003-BS1)		Prepared: 26-Sep-18 Analyzed: 27-Sep-18							
Boron	2380	50.0	ug/L	2500		95	85-115		
Calcium	4790	500	ug/L	5000		96	85-115		
Matrix Spike (8I26003-MS1)		Source: BB04159-01		Prepared: 26-Sep-18 Analyzed: 27-Sep-18					
Boron	2490	50.0	ug/L	2500	67.9	97	70-130		
Calcium	22400	500	ug/L	5000	17600	95	70-130		
Matrix Spike Dup (8I26003-MSD1)		Source: BB04159-01		Prepared: 26-Sep-18 Analyzed: 27-Sep-18					
Boron	2480	50.0	ug/L	2500	67.9	96	70-130	0.6	25
Calcium	22900	500	ug/L	5000	17600	107	70-130	2	25

Project Name: Combustion Waste Landfill Monitoring

Footnotes

Qualifiers:

U	Compound was analyzed for but not detected
I	The reported value is between the laboratory method detection limit and the practical quantitation limit
V	Analyte was detected in both the sample and the associated method blank
L	Off-scale high. Actual value is known to be greater than the value given

Acronyms:

Dil	Dilution Factor
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MDL	Method detection limit.
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NC	Laboratory lacks NELAC certification for this analyte.
NS	Not Screened
PQL	Practical Quantitation Limit: the lowest result that can be routinely quantified and reported.
RPD	Relative Percent Difference

Approved by:

Donna McCue
Laboratory Supervisor



Phone: 407-434-2549 Fax: 407-434-2619 WQLAB@ouc.com

Work Order #: 1809051

PAGE 1 of 2

Enco Kit
for Ca & B

Kit
SK-137

Container Type Codes	
P = Plastic 125mL	Lot: _____
P = Plastic 250mL	Lot: _____
P = Plastic 500mL	Lot: _____
P = Plastic 1L	Lot: _____
AG= AmberGlass125mL	Lot: _____
AG= AmberGlass250mL	Lot: _____
AG= AmberGlass500mL	Lot: _____
AG= AmberGlass1L	Lot: _____

Sampling Kit #	Lot:
Matrix Codes*	
GW = Ground Wtr	DW = Drinking Wtr
WW = Waste Wtr	SW = Surface Wtr
O = Other (specify):	

Pres. Codes		
A. None	B. HNO ₃	C. H ₂ SO ₄
D. NH ₄ Cl	E. HCl	F. EDA
G. Na ₂ S ₂ O ₃	H. H ₃ PO ₄	I. Ascorbic Acid
Code: _____	Lot: _____	
Code: _____	Lot: _____	
Code: _____	Lot: _____	

[illegible]

OUC GROUNDWATER SAMPLING LOG

Site Name:	Site Location: <u>SEC</u>
Well No. <u>C</u>	Sample ID: <u>1809051-01</u> Date: <u>09-19-18</u>

1809051 -02 = Field Duplicate

PURGING DATA

Well Diameter: 2"	Tubing Diameter: 1/4"	Well Screen Depth Interval: 20-30'	Static Depth to Water: 5.34	Sampling Device: RP
Well Volume Purge: 1 Well Volume = (Total Well Depth - Static Depth to Water) X Well Capacity <u>26.16</u> x <u>0.16</u> = (<u>31.5</u> feet - <u>5.34</u> feet) X <u>0.16</u> gallons/foot = <u>4.17</u> gallons <i>~85% 31m</i>				
Equipment Volume Purge: 1 Equipment Vol. = Pump Volume + (Tubing Capacity X Tubing Length) + Flow Cell Volume = 0 gallons + (0.0026 gallons / foot X 30 feet) + 0.12 gallons = 0.2 gallons				
Initial Tubing Depth in Well (Feet): <u>16.5</u>	Final Pump or Tubing Depth in Well: (feet): <u>16.5</u>	Purging Initiated at: <u>0944</u>	Purging ended at:	Total Volume Purged (gallons):

Time	Volume Purged (gallons)	Cumul. Volume Purged (gallons)	Purge Rate (gpm)	Depth to Water (feet)	pH (Standard units)	Temp (°C)	Cond. µS/cm	Dissolved Oxygen (mg/L)	Turbidity (NTUs)	Color (Describe)	Odor (Describe)
1018	8.50	8.50	0.25	5.52	5.00	25.12	98	0.27	3.69	Clear	Sulfide
1021	0.75	9.25	↓	5.52	5.00	25.09	98	0.27	3.71	↓	↓
1024	0.75	10.00	↓	5.52	5.01	25.13	97	0.26	3.86	↓	↓
1028	11.00	11.00	0.25	5.52	5.01	25.07	98	0.37	3.53	Clear	Sulfide
1031	0.75	11.75	↓	5.52	5.00	25.04	98	0.39	3.24	↓	↓
1034	0.75	12.50	↓	5.52	5.00	25.02	97	0.37	2.85	↓	↓

Well Capacity (Gallons Per Foot): 0.75"=0.02; 1"=0.04; 1.25"=0.06; 2"=0.16; 3"=0.37; 4"=0.65; 5"=1.02; 6"=1.47; 12"=5.88
Tubing inside diameter capacity (Gallons Per Foot): 1/8"=0.0006; 3/16"=0.0014; 1/4"=0.0026; 5/16"=0.004; 3/8"=0.006; 1/2"=0.010; 5/8"=0.016
Purging Equipment Codes: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

Sampled By (Print) / Affiliation: <u>OUC J. Shoemaker, J. Koschwa WGL</u>				Sampler(s) Signature(s): <u>[Signature]</u>			Sampling initiated at: <u>1024, 1034</u>		Sampling ended at: <u>1026, 1036</u>	
Pump or tubing depth in well (feet): <u>16.5</u>				Tubing Material Code: <u>HOPE</u>		Field-filtered: <u>Y</u> <u>N</u> Filter Size: <u> </u> µm		Filtration Equipment Type: <u> </u>		
Field Decontamination: Pump <u>Y</u> (<u>N</u>) Tubing <u>Y</u> (<u>N</u>) (replaced)				Duplicate: <u>(Y) (N) App</u>						

Sample Container Specification				Sample Preservation			Intended Analysis and/or Method	Sampling Equipment Code	Sample Pump Flow Rate (mL per minute)
Sample ID Code	# Containers	Material Code	Volume	Preservative Used	Total Vol Added in Field (mL)	Final pH			

Remarks: (Sulfite: mg/L)

Material codes: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; S = Silicone; T=Teflon; O = Other
Sampling Equipment Codes: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
 2. Stabilization criteria for range of variation of the last three consecutive readings (see FS 2212, Section 3)
 pH: ± 0.2 units Temperature: ± 0.2°C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2); optionally, 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

OUC GROUNDWATER SAMPLING LOG

Site Name:		Site Location: SEC	
Well No. B	Sample ID: 1809051-03	Date: 09-19-18	

PURGING DATA

[illegible]

SAMPLING DATA

Sampled By (Print) / Affiliation: J Shoemaker, J Koschewa OVC WQL				Sampler(s) Signature(s): <i>[Signature]</i>			Sampling initiated at: 1050		Sampling ended at: 1052	
Pump or tubing depth in well (feet): 22				Tubing Material Code: HDPE			Field-filtered: Y N		Filter Size: _____ µm	
Field Decontamination:				Pump	Y N	Tubing	Y N (replaced)	Duplicate:	Y N	
Sample Container Specification				Sample Preservation			Intended Analysis and/or Method	Sampling Equipment Code	Sample Pump Flow Rate (mL per minute)	
Sample ID Code	# Containers	Material Code	Volume	Preservative Used	Total Vol Added in Field (mL)	Final pH				
Remarks:										
								(Sulfite:	mg/L)	
Material codes: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; S = Silicone; T=Teflon; O = Other										
Sampling Equipment Codes: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other										

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.

2. Stabilization criteria for range of variation of the last three consecutive readings (see FS 2212, Section 3)

pH: ± 0.2 units **Temperature:** $\pm 0.2^{\circ}\text{C}$ **Specific Conductance:** $\pm 5\%$ **Dissolved Oxygen:** all readings $\leq 20\%$ saturation (see Table FS 2200-2); optionally, 0.2 mg/L or $\pm 10\%$ (whichever is greater) **Turbidity:** all readings $\leq 20\text{ NTU}$; optionally $+5\text{ NTU}$ or $\pm 10\%$ (whichever is greater)

OUC GROUNDWATER SAMPLING LOG

Site Name:		Site Location: SEC
Well No. A	Sample ID: 1809051-04	Date: 9-19-2018

PURGING DATA

Well Diameter: 2"	Tubing Diameter: ¼"	Well Screen Depth Interval: 20-30'	Static Depth to Water:	Sampling Device:							
Well Volume Purge: 1 Well Volume = (Total Well Depth - Static Depth to Water) X Well Capacity $= (45 \text{ feet} - 12.5 \text{ feet}) \times 0.16 \text{ gallons/foot}$ ≈ 5.2 gallons											
Equipment Volume Purge: 1 Equipment Vol. = Pump Volume + (Tubing Capacity X Tubing Length) + Flow Cell Volume $= 0 \text{ gallons} + (0.0026 \text{ gallons / foot} \times 30 \text{ feet}) + 0.12 \text{ gallons} = 0.2 \text{ gallons}$											
Initial Tubing Depth in Well (Feet): 33	Final Pump or Tubing Depth in Well: (feet):		Purging Initiated at: 1005	Purging ended at:	Total Volume Purged (gallons):						
Time	Volume Purged (gallons)	Cumul. Volume Purged (gallons)	Purge Rate (gpm)	Depth to Water (feet)	pH (Standard units)	Temp (°C)	Cond. µS/cm	Dissolved Oxygen (mg/L)	Turbidity (NTUs)	Color (Describe)	Odor (Describe)
1114	17.25	17.25	0.25	12.70	4.01	25.06	39891	0.19	1.68	Clear	Brimy/H₂S
1117	0.75	18.00	f	12.70	4.01	25.07	39655	0.20	1.68	f	f
1120	0.75	18.75	f	12.70	4.01	25.08	39545	0.21	1.15	f	f
Well Capacity (Gallons Per Foot): 0.75"=0.02; 1"=0.04; 1.25"=0.06; 2"=0.16; 3"=0.37; 4"=0.65; 5"=1.02; 6"=1.47; 12"=5.88											
Tubing inside diameter capacity (Gallons Per Foot): 1/8"=0.0006; 3/16"=0.0014; ¼"=0.0026; 5/16"=0.004; 3/8"=0.006; ½"=0.010; 5/8"=0.016											
Purging Equipment Codes: B = Bailar; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)											

SAMPLING DATA

Sampled By (Print) / Affiliation: J. Shoemaker, J. Kusckewa WGL				Sampler(s) Signature(s): [Signature]			Sampling initiated at: 1120		Sampling ended at: 1122	
Pump or tubing depth in well (feet): 33				Tubing Material Code: HDPE			Field-filtered: Y (N)		Filter Size: _____ µm	
Field Decontamination: Pump Y (N)				Tubing Y (N (replaced))			Duplicate: Y (N)			
Sample Container Specification				Sample Preservation			Intended Analysis and/or Method	Sampling Equipment Code	Sample Pump Flow Rate (mL per minute)	
Sample ID Code	# Containers	Material Code	Volume	Preservative Used	Total Vol Added in Field (mL)	Final pH				
Remarks:										
(Sulfite: _____ mg/L)										
Material codes: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; S = Silicone; T=Teflon; O = Other										
Sampling Equipment Codes: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other										

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.

2. Stabilization criteria for range of variation of the last three consecutive readings (see FS 2212, Section 3)

pH: ± 0.2 units **Temperature:** $\pm 0.2^{\circ}\text{C}$ **Specific Conductance:** $\pm 5\%$ **Dissolved Oxygen:** all readings $\leq 20\%$ saturation (see Table FS 2200-2); optionally, 0.2 mg/L or $\pm 10\%$ (whichever is greater) **Turbidity:** all readings < 20 NTU; optionally $+ 5$ NTU or $\pm 10\%$ (whichever is greater)

OUC GROUNDWATER SAMPLING LOG

Site Name:		Site Location: SEC
Well No. D	Sample ID: 1809051-06	Date: 09-19-2018

PURGING DATA

[illegible]

SAMPLING DATA

Sampled By (Print) / Affiliation: J. Shoemaker, J. Kaschewa				Sampler(s) Signature(s): <i>[Signature]</i>			Sampling initiated at: 1213		Sampling ended at: 1215	
Pump or tubing depth in well (feet): 22				Tubing Material Code: HDPE			Field-filtered: Y ☒ N		Filter Size: _____ µm	
Field Decontamination: Pump Y ☒ N				Tubing Y ☒ N (replaced)			Duplicate: Y ☒ N			
Sample Container Specification				Sample Preservation			Intended Analysis and/or Method	Sampling Equipment Code	Sample Pump Flow Rate (mL per minute)	
Sample ID Code	# Containers	Material Code	Volume	Preservative Used	Total Vol Added in Field (mL)	Final pH				
Remarks:										
										(Sulfite: _____ mg/L)
Material codes: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; S = Silicone; T=Teflon; O = Other										
Sampling Equipment Codes: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other										

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.

2. Stabilization criteria for range of variation of the last three consecutive readings (see FS 2212, Section 3)

pH: ± 0.2 units **Temperature:** ± 0.2°C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, 0.2 mg/L or + 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

Form FD9000-8 **CALIBRATION LOG (FDEP SOP FT 1000-FT 1500, FD 1000-FD 4000)** 11-10-05

Boldly "X" this box
if there is qualified
data on this page.

Project/Site: Lettered Wells/ SECDate: 9-19-2018Meter # YSI 556 MPS 06H1774AB

Temperature (Quarterly) For Date of Last Temperature Verification see in log book

Dissolved Oxygen	DEP SOP FT 1500	Initials	Date	Time	Probe Charge	Probe Gain	mg/L	Temp °C	% DO	Saturation mg/L (from chart)	Pass or Fail
Acceptance Criteria: ± 0.3 mg/l											
CAL	ICV	CCV	<u>9-19-2018</u>	<u>0839</u>			<u>8.91</u>	<u>21.10</u>	<u>100.1</u>	<u>8.878</u>	<u>(P) F</u>
CAL	ICV	CCV	<u>9-19-2018</u>	<u>1545</u>			<u>2.05</u>	<u>21.20</u>	<u>101.9</u>	<u>8.880</u>	<u>(P) F</u>
CAL	ICV	CCV									<u>P F</u>
CAL	ICV	CCV									<u>P F</u>
CAL	ICV	CCV									<u>P F</u>
CAL	ICV	CCV									<u>P F</u>
CAL	ICV	CCV									<u>P F</u>
CAL	ICV	CCV									<u>P F</u>

Specific Conductance	DEP SOP FT 1200	Initials	Date	Time	Standard μ mhos/cm	Exp. Date	Lot #	Bottle #	Cell Constant	Reading μ mhos/cm	Pass or Fail
Acceptance Criteria: $\pm 5\%$											
CAL	ICV	CCV	<u>9-19-2018</u>	<u>0837</u>	<u>500</u>	<u>7/2019</u>	<u>1708C49</u>	<u>Q3-90</u>		<u>497</u>	<u>(P) F</u>
CAL	ICV	CCV	<u>9-19-2018</u>	<u>1540</u>	<u>50,000</u>	<u>5/2020</u>	<u>7805060</u>	<u>Q3-91</u>		<u>50301</u>	<u>(P) F</u>
CAL	ICV	CCV									<u>P F</u>
CAL	ICV	CCV									<u>P F</u>
CAL	ICV	CCV									<u>P F</u>
CAL	ICV	CCV									<u>P F</u>
CAL	ICV	CCV									<u>P F</u>

pH	DEP SOP FT 1100	Initials	Date	Time	Standard SU	Exp. Date	Lot #	Bottle #	Slope	Reading SU	Pass or Fail
Acceptance Criteria: ± 0.2 SU											
CAL	ICV	CCV	<u>9-19-2018</u>	<u>0830</u>	<u>7.00</u>	<u>8/2019</u>	<u>175677</u>	<u>Q3-76</u>		<u>6.98</u>	<u>(P) F</u>
CAL	ICV	CCV	<u>9-19-2018</u>	<u>0834</u>	<u>4.00</u>	<u>7/2019</u>	<u>174298</u>	<u>Q3-50</u>		<u>4.08</u>	<u>(P) F</u>
CAL	ICV	CCV		<u>1533</u>	<u>7.00</u>	<u>As Above</u>				<u>6.96</u>	<u>(P) F</u>
CAL	ICV	CCV	<u>9-19-2018</u>	<u>1537</u>	<u>4.00</u>	<u>As Above</u>				<u>4.01</u>	<u>(P) F</u>
CAL	ICV	CCV									<u>P F</u>
CAL	ICV	CCV									<u>P F</u>
CAL	ICV	CCV									<u>P F</u>
CAL	ICV	CCV									<u>P F</u>

Maintenance: Weekly pH Slope: _____ Specific Conductance Probe Cleaned? Yes No Dissolved Oxygen Membrane Changed: Yes No

Notes:

Perform only in Calibrate Mode:
Perform only in Run Mode:
Perform only in Run Mode:

CAL - Calibrate -
ICV - Initial Calibration Verification
CCV - Continuing Calibration Verification

Project/Site: _____

Date: _____

Turbidity Meter#	DEP SOP FT 1600	Initials	Date	Time	Standard NTU	Exp. Date	Lot #	Bottle #	Range	Reading NTU	Pass or Fail
Acceptance Criteria: +/- 10%											
10010C037215											
CAL ICV CCV		JL	09-19-18	0840	20	Exp 19	Q356			20.3	P F
CAL ICV CCV		JL	09-19-18	0840	20.1	Dec 18	Q356			20.1	P F
CAL ICV CCV		JL		1440	20	Feb 19	Q356			20.2	P F
CAL ICV CCV		JL		1440	20.1	Dec 18				0.1	P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F

Residual C12 Meter #	DEP SOP FT 2000	Initials	Date	Time	Standard mg/L	Exp. Date	Lot #	Bottle #	Slope	Reading mg/L	Pass or Fail
Acceptance Criteria: +/- 10%											
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F

	DEP SOP	Initials	Date	Time	Standard SU	Exp. Date	Lot #	Bottle #	Slope	Reading	Pass or Fail
Acceptance Criteria:											
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F
CAL ICV CCV											P F

Perform only in Calibrate Mode:
 Perform only in Run Mode:
 Perform only in Run Mode:

CAL - Calibrate -
 ICV - Initial Calibration Verification
 CCV - Continuing Calibration Verification