Inspection Report

To: David Bacher, NRG

From: Richard Southorn, P.E., P.G.

Re: Indian River Landfill – Annual CCR Unit Inspection Report

Inspection Date: October 16, 2018

Memo Date: January 18, 2019

INTRODUCTION

Title 40 Code of Federal Regulations (CFR) Part 257 addresses, in part, the management of Coal Combustion Residuals (CCR) in regulated units, including landfills. Specific to §257.84(b) of the Rule, existing and new CCR landfills must be inspected on an annual basis by a qualified professional engineer. For the Indian River Generating Station (owned by Indian River Power, LLC, a subsidiary of NRG Energy, Inc. [NRG]), this inspection requirement applies to the existing Indian River Landfill (IRLF). IRLF consists of two phases. Phase I was constructed and closed prior to the implementation of the CCR Rule and is therefore exempt from these regulations. Phase II is a horizontal expansion of Phase I and has a piggyback component (vertical expansion). Phase II is currently operational and therefore falls under the CCR Rule regulations. Due to the fact that Phase II is a piggyback expansion, it is recognized that the stability of Phase I may impact Phase II. Therefore, both Phases I and II are inspected on an annual basis.

Mr. Richard Southorn (a qualified professional engineer with APTIM Environmental & Infrastructure, Inc. [Aptim]) conducted the 2018 annual on-site inspection of IRLF on October 16, 2018. The findings from this annual inspection are summarized in the remaining sections of this correspondence.

As required, this report will be placed in the Indian River facility's operating record per §257.105(g)(9), noticed to the State Director per §257.106(g)(7), and posted to the publicly accessible internet site per §257.107(g)(7). The 2017 annual inspection report was placed into the facility's operating record on January 18, 2018. Therefore, this report must be placed into the facility's operating record on January 18, 2019 to meet the annual reporting requirements of §257.84(b)(4).

BACKGROUND

The IRLF is an industrial waste landfill used solely for the disposal of CCR wastes or other industrial wastes generated at the station and is operated/maintained in accordance with the State of Delaware Department of Natural Resources and Environmental Control (DNREC) Solid Waste Permit No. 12/01. The IRLF disposal areas are located approximately one half of a mile south of the Generating Station.

The landfill consists of two major phases, Phase I and Phase II. Phase I is unlined and has a 46 acre footprint. Phase I began accepting waste in 1980 and cap construction was approved and certified closed by DNREC on October 20th, 2014. Phase II has a composite liner, and is 28 acres

in size. The Phase II expansion is comprised of two landfill cells (Cell 1 and 2) located west of Phase I and a piggyback (filling over Phase I) expansion on the western slopes of Phase I. The piggyback expansion of Phase II is separated from Phase I by a composite liner system.

The Phase II expansion began accepting waste on September 17, 2010 within Cell 1. Cell 2 received operational authorization in 2015. Cell 1 is not actively receiving CCR material and has a vegetated intermediate cover. Cell 2 is currently open and actively receiving CCR material. No additional areas have been closed. The facility is permitted to sell the CCR for beneficial reuse projects and will continue to seek opportunities to do so.

With respect to the IRLF, Aptim's evaluation has focused on the following items as outlined in §257.84(b)(1)(i-ii):

- *A review of available information regarding the status and condition of the CCR unit, including, but not limited to, files available in the operating record; and*
- *A visual inspection of the CCR unit to identify signs of distress or malfunction.*

Specific to Aptim's preparation of this annual inspection report, and per §257.84(b)(2) (i-iv), the following aspects of the CCR unit have been documented:

- *Any changes in geometry of the structure since the previous annual inspection;*
- *The approximate volume of CCR contained in the unit at the time of the inspection;*
- *Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit; and*
- *Any other change(s) which may have affected the stability or operation of the CCR unit since the previous annual inspection.*

OPERATING RECORDS REVIEW

The operating records review of the facility's operating record and verification was performed during the site inspection. Files reviewed during the on-site inspection included but were not limited to: 2011 Phase II Landfill Expansion Application, NRG Permit SW-12/01, Annual Landfill Operations Report, Weekly Inspection Reports, Leachate Collection System Daily Inspection Reports, Phase I Cap Inspection Forms, Stormwater Conveyance and Discharge System Forms, and Daily/After Storm Event Erosion Control/Emissions Inspection Forms. During the site inspection, Mr. Southorn interviewed Charlie Griggs (Landfill Manager) to verify the information contained within the operating record.

<u>Environmental Control System Overview</u>

a. Bottom Liner System - The Phase II has a composite liner system that consists of a geosynthetic clay liner (GCL) and geomembrane liner system. The composite liner system extends along the piggyback portion between Phase I and Phase II thereby creating a separate layer.

b. Leachate Collection System - Phase II has a 12-inch drainage system with a series of collection pipes that drain to two sumps located on the north perimeter of Cell 2

and the south perimeter of Cell 1. The leachate is then pumped via a below grade leachate forcemain to the existing above grade leachate storage tanks located west of the landfill. From the tanks, leachate is trucked to the Indian River Generating Station for reuse in the bottom ash system.

c. Stormwater Management - Non-contact stormwater is drained around the landfill in accordance with the current NPDES permit to stormwater detention basins/ponds located north and south of the landfill. Stormwater run-off from within the active area is collected and managed within the leachate collection system.

d. Final Cover System - Phase I has received a final cover system and is closed, Cell 1 in Phase II has a vegetated intermediate cover and is not actively accepting CCR material, and Cell 2 in Phase II is an active unit and therefore has no final cover.

Summary of Landfill Construction

As of the date of this inspection, Phase I has been capped and closed. Cell 1 in Phase II is not actively receiving CCR material. Cell 2 in Phase II is currently open and actively receiving CCR material. No additional areas have been closed since the previous annual inspection.

Review of Prior Inspections

a. Weekly inspections: A review of previous weekly inspections dating back to December 5, 2016 (the date of the previous annual inspection) was conducted to understand any deficiencies and remedial actions. Some minor corrective actions were noted for cover and erosion repairs. All deficiencies were found to be remedied in a timely manner.

b. Annual inspections: A review of the previous annual inspection has determined that there were no deficiencies or releases, actual or potential structural weaknesses, or concern to the stability of the land form. All environmental control systems were in good operating condition and functioning as intended.

Summary of CCR Volumes

Approximately 217,532 cy have been placed in Cell 2. Cell 1 has largely been filled, but NRG Energy estimates that Phase II Cell 1 has approximately 5,000 cy of emergency capacity left in case Cell 2 becomes accessible.

SITE INSPECTION

The site inspection was performed on October 16, 2018 by Mr. Southorn. Mr. Southorn focused on standard geotechnical signs of distress or malfunction such as slumping at the toe of slope, tensile cracking, abnormal or excessive erosion on the side slopes or stormwater management facilities, slope bulging, groundwater/surface water seepage or ponding, etc. These visual signs are potential indicators of structural weakness of the CCR Landfill unit.

Visual Signs of Distress or Malfunction

No visual signs of distress or malfunction were observed during the inspection. Stormwater drainage features, slope appearance and stability, leachate conveyance mechanisms, and overall

site conditions were assessed. Closed portions of Phase I and Phase II and stabilized intermediate cover areas of Phase II exhibited well established vegetative cover.

Review of Environmental Control Systems

With no evidence to the contrary, the environmental control systems at IRLF are believed to be in good operating condition and functioning as intended. At the time of the inspection, leachate and stormwater conveyance systems were operating as designed. It is noted that a significant storm at the facility shortly before the inspection. Stormwater controls appeared in good condition following this storm. Based on interviews with Charlie Griggs, some erosion channels were formed in the active face. These channels had been repaired prior to the inspection, and were therefore not observed. Additionally, the storm produced elevated leachate levels in Cell 2 of Phase II. The leachate could be seen to be safely and appropriately contained as it was being drawn down. A high-level alarm indicated the liquid level on the collection system control panel, as intended. This observation confirms the effectiveness of environmental controls.

CONCLUSIONS

Based on a review of the facility's operating record, site interviews and a site inspection, the following conclusions were developed:

Changes in Geometry

As of the date of this inspection, Cell 2 of Phase II is open and receiving CCR material. Active filling operations in Cell 2 in the approximate location shown in the attached figure at a peak elevation generally equal the surrounding perimeter road elevation.

CCR Volume

As previously stated, approximately 217,532 cy have been placed in Cell 2. Cell 1 has largely been filled, but NRG Energy estimates that Phase II Cell 1 has approximately 5,000 cy of emergency capacity left in case Cell 2 becomes accessible.

Appearances of an Actual or Potential Structural Weakness of CCR Unit

At the time of inspection, there were no signs of distress or malfunction that would indicate actual or potential structural weakness at either Phase I or II.

Changes that May Affect the Stability or Operation of the CCR Unit

There have been no changes to the Indian River Landfill area that pose a threat or concern to the stability of the land form.

RECOMMENDATIONS

Based on the on-site inspection performed on October 16, 2018, APTIM recommends the following actions:

1. Continue operation and maintenance within the active landfilling area as currently performed.

2. Maintain adequate access to the closed portions of the landfill to maintain the ability to perform weekly visual site structural inspections.

There were no deficiencies or releases identified during the 2018 annual inspection that required the owner or operator to perform corrective actions as required under §257.84(b)(5).

PROFESSIONAL ENGINEER'S CERTIFICATION

In accordance with §257.84(b) of the Rule, I hereby certify based on a review of available information within the facility's operating records and observations from my personal on-site inspection (including the photographs contained in Attachment 2), that the IRLF does not exhibit any appearances of actual/potential structural weakness that would be disruptive to the normal operations of the IRLF. The unit is being operated and maintained consistent with recognized and generally accepted good engineering standards and practices.

Certified by: Richard Southorn

Date: 1/18/19

Richard Southorn, P.E., P.G.
Professional Engineer Registration No. PE 20894
APTIM Environmental & Infrastructure, Inc.

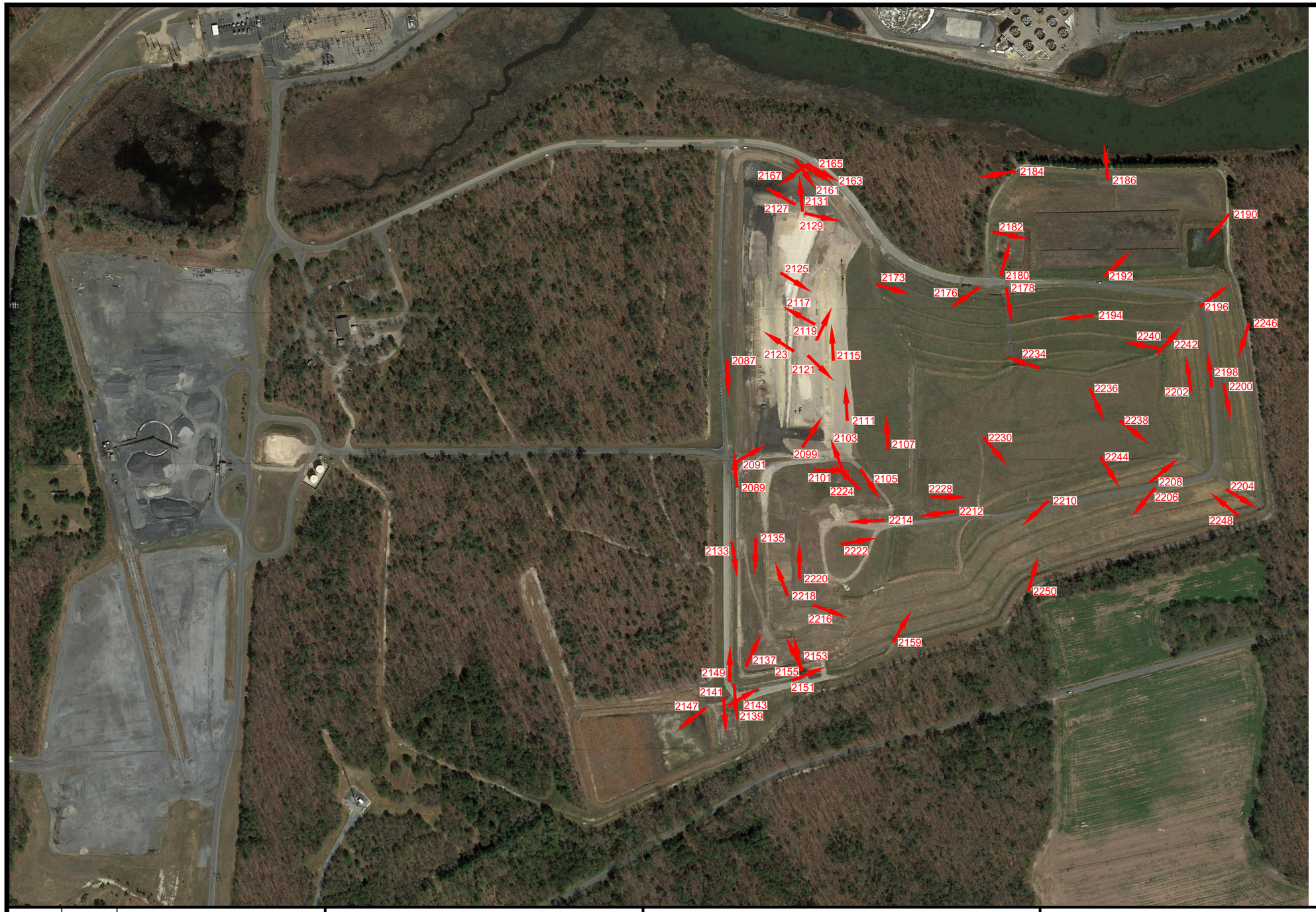
ATTACHMENTS

1. Site Map
2. Inspection Photo Log

REFERENCES

1. 2017 Landfill Periodic Inspection Report (dated January 18, 2018)
2. 2017 Annual Landfill Operations Report NRG Energy Indian River Generating Station
3. 40 Code of Federal Regulations Part 257.
4. Routine Inspection Reports.
5. DNREC Solid Waste Permit No. 12/01

Attachment 1
Site Map



0 400'

GRAPHIC SCALE

LEGEND

2018 ANNUAL INSPECTION PHOTOGRAPH (ARROW DENOTES DIRECTION OF VIEW)

REV. NO.	DATE	DESCRIPTION

nrg SM

APTIM Environmental & Infrastructure, Inc.

INDIAN RIVER LANDFILL
DAGSBORO,DELAWARE

2018 ANNUAL INSPECTION

DRAWN BY:	APPROVED BY:	PROJ. NO.:	DATE:
BWM	RDS	631224966	DECEMBER 2018

T:\AutoCAD\Projects\NRG\CCR-Annual Inspections\2018\IndianRiver-DE.dwg, 11x17, 12/12/2018 8:40:26 AM

Attachment 2
Photo Log

Project: Indian River Landfill 2018 CCR Annual Inspection
Photographer: Richard Southorn

Image: 2087 Date: 10/16/2018 Time: 7:11 AM Direction: South Description: 5 mph speed limit near active face.	

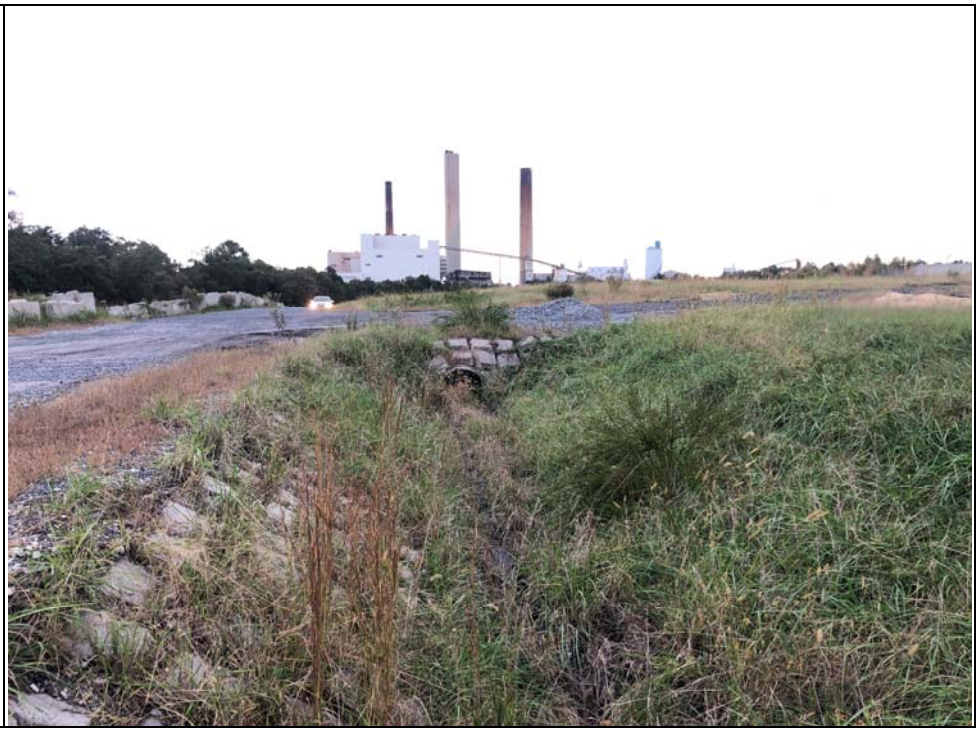
Image: 2089 Date: 10/16/2018 Time: 7:13 AM Direction: North Description: Armored perimeter stormwater channel.	

Image: 2091 Date: 10/16/2018 Time: 7:16 AM Direction: Northeast Description: Entrance to active face.	

Image: 2099 Date: 10/16/2018 Time: 7:20 AM Direction: Northeast Description: Gypsum stockpile.	

Image: 2101 Date: 10/16/2018 Time: 7:21 AM Direction: East Description: Phase 2 Cell 1/Cell 2 boundary looking towards the separation berm. Slopes are well vegetated with no sign of erosion, sloughing, or animal borrows.	

Image: 2103 Date: 10/16/2018 Time: 7:22 AM Direction: North Description: Overview of active face	

Image: 2105 Date: 10/16/2018 Time: 7:22 AM Direction: Southeast Description: Elbow of Phase 1/Phase 2 Cell 1 confluence. Erosion was experienced following a significant recent rain event. Repairs to an erosion channel that had formed are shown, looking upslope.	

Image: 2107 Date: 10/16/2018 Time: 7:23 AM Direction: North Description: Phase I intermediate cover slopes are well vegetated with no sign of erosion or sloughing.	

Image: 2111 Date: 10/16/2018 Time: 7:25 AM Direction: North Description: Active face is well maintained. Material is graded and compacted. No ponding water.	

Image: 2115 Date: 10/16/2018 Time: 7:27 AM Direction: North Description: Active face is well maintained. Material is graded and compacted. No ponding water.	

Image: 2117 Date: 10/16/2018 Time: 7:28 AM Direction: Northwest Description: Spreading bottom ash in active face.	

Image: 2119 Date: 10/16/2018 Time: 7:28 AM Direction: Northeast Description: Description: Jersey barriers that are used in concentrated flow areas of the active face to prevent erosion rills from forming.	

Image: 2121 Date: 10/16/2018 Time: 7:29 AM Direction: Southeast Active face is well maintained. Material is graded and compacted. No ponding water.	

Image: 2123 Date: 10/16/2018 Time: 7:30 AM Direction: Northwest Description: Recently spread bottom ash in active face.	

Image: 2125 Date: 10/16/2018 Time: 7:32 AM Direction: Southeast Description: Active face is well maintained. Material is graded and compacted. No ponding water.	

Image: 2127 Date: 10/16/2018 Time: 7:33 AM Direction: Northwest Description: Standing water within cell due to recent rains. The stormwater water percolates through the ash into the leachate collection layer, where it is pumped out and removed as leachate.	

Image: 2131 Date: 10/16/2018 Time: 7:36 AM Direction: North Description: Standing water within cell due to recent rains. The stormwater water percolates through the ash into the leachate collection layer, where it is pumped out and removed as leachate.	

Image: 2133 Date: 10/16/2018 Time: 7:42 AM Direction: South Description: Vegetation in perimeter channel. No signs of erosion.	

Image: 2135 Date: 10/16/2018 Time: 7:43 AM Direction: South Description: Final cover on sideslopes of Phase II Cell 1. Vegetation is healthy with full coverage. No signs of erosion stability issues observed on sideslope.	

Image: 2137 Date: 10/16/2018 Time: 7:47 AM Direction: Northeast Description: Final cover on sideslopes of Phase II Cell 1. Vegetation is healthy with full coverage. No signs of erosion stability issues observed on sideslope.	

Image: 2139 Date: 10/16/2018 Time: 7:48 AM Direction: South Description: Pipes conveying water from perimeter ditch to stormwater basin. Clear of obstruction at inlets and outlets.	

Image: 2141 Date: 10/16/2018 Time: 7:49 AM Direction: South Description: Stormwater basin forebay. In good condition.	

Image: 2143 Date: 10/16/2018 Time: 7:49 AM Direction: Northeast Description: Inlets to stormwater basin. Clear of obstruction at inlets and outlets.	

Image: 2147 Date: 10/16/2018 Time: 7:51 AM Direction: Southwest Description: Stormwater basin forebay. In good condition.	

Image: 2149 Date: 10/16/2018 Time: 7:52 AM Direction: North Description: Perimeter stormwater ditch is well maintained and in good condition.	

Image: 2151 Date: 10/16/2018 Time: 7:53 AM Direction: East Description: Phase 1, Cell 1 leachate pump house and stormwater culvert. Building is appropriately signed. Culvert is free of obstructions.	

Image: 2153 Date: 10/16/2018 Time: 7:53 AM Direction: North Description: Phase 1, Cell 1 leachate instrument panel. Good working order.	

Image: 2155 Date: 10/16/2018 Time: 7:54 AM Direction: Northwest Description: Inside Phase 1, Cell 1 Leachate Pump House. Cleanout riser and pump risers with T connection to forcemain shown. Building is well maintained.	

Image: 2159 Date: 10/16/2018 Time: 7:58 AM Direction: Northeast Description: Terrace berm. Clear of obstructions and functioning as intended. Vegetative cover is dense and healthy.	

Image: 2161 Date: 10/16/2018 Time: 8:03 AM Direction: Southeast Description: Phase 2, Cell 2 leachate pump house. Building exterior is in good condition and appropriately signed.	

Image: 2165 Date: 10/16/2018 Time: 8:05 AM Direction: Southeast Description: Leachate liquid level indicator and controls in the Phase 2, Cell 2 leachate pump house. Red light is indicating a high leachate level associated with standing water.	

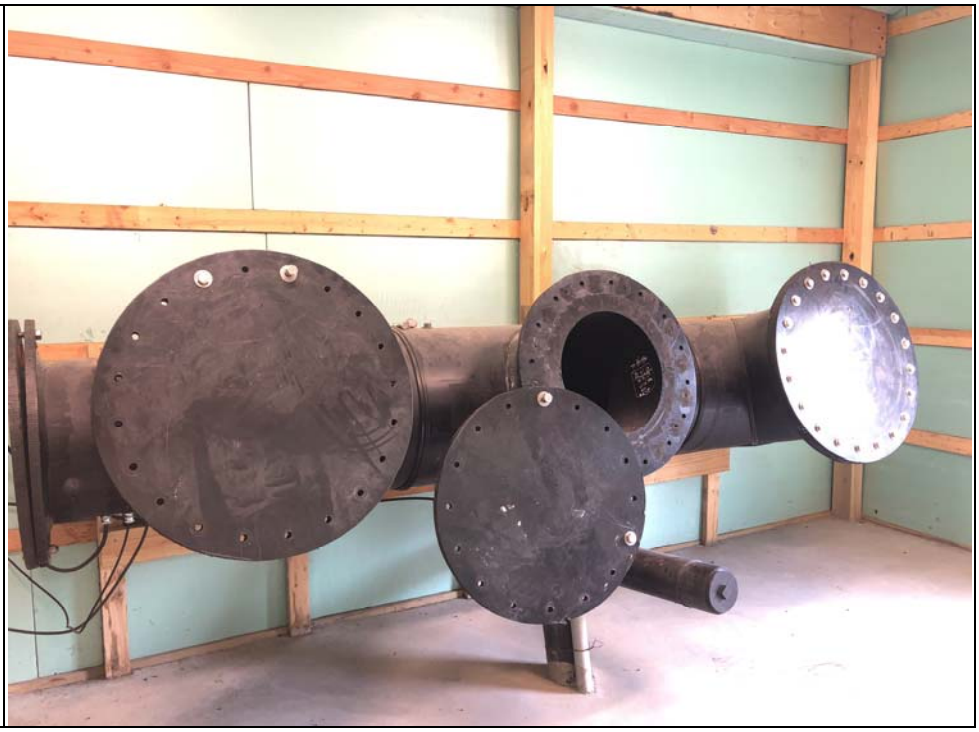
Image: 2167 Date: 10/16/2018 Time: 8:05 AM Direction: Southwest Description: Phase 1, Cell 2 leachate sump risers.	

Image: 2173 Date: 10/16/2018 Time: 8:09 AM Direction: East Description: Landfilll sideslopes and terraces are well maintained. No evidence of slope stability issues.	

Image: 2176 Date: 10/16/2018 Time: 8:12 AM Direction: Southwest Description: Final cover on sideslopes with stormwater ditch in foreground.	

Image: 2178 Date: 10/16/2018 Time: 8:13 AM Direction: South Description: Downchute near northwest basin west forebay.	

Image: 2180 Date: 10/16/2018 Time: 8:14 AM Direction: North Description: Northwest basin forebay.	

Image: 2182 Date: 10/16/2018 Time: 8:16 AM Direction: East Description: Northwest basin.	

Image: 2184 Date: 10/16/2018 Time: 8:17 AM Direction: West Description: Monitoring well cluster.	

Image: 2186 Date: 10/16/2018 Time: 8:18 AM Direction: North Description: Northeast basin outlet skimmer.	

Image: 2190 Date: 10/16/2018 Time: 8:21 AM Direction: Southwest Description: East forebay of northwest basin.	

Image: 2192 Date: 10/16/2018 Time: 8:25 AM Direction: Northeast Description: Northwest basin.	

Image: 2194 Date: 10/16/2018 Time: 8:26 AM Direction: West Description: Phase 1 terrace berm. Clear of obstructions and functioning as intended. Vegetative cover is dense and healthy.	

Image: 2196 Date: 10/16/2018 Time: 8:29 AM Direction: Northeast Description: Phase 1 corner downchute road crossing equalizing pipes. Free of obstructions.	

Image: 2198 Date: 10/16/2018 Time: 8:30 AM Direction: North Description: Phase 1 plateau access road. Well maintained. No rutting or potholes. Final cover on either side of road is well maintained with no evidence of stability issues or erosion.	

Image: 2200 Date: 10/16/2018 Time: 8:31 AM Direction: South Description: Phase 1 terrace berm. Clear of obstructions and functioning as intended. Vegetative cover is dense and healthy.	

Image: 2202 Date: 10/16/2018 Time: 8:32 AM Direction: North Description: Phase 1 terrace berm. Clear of obstructions and functioning as intended. Vegetative cover is dense and healthy.	

Image: 2204 Date: 10/16/2018 Time: 8:33 AM Direction: Southeast Description: Phase 1 corner downchute. Rock is in-place and not migrating. No evidence of washouts.	

Image: 2206 Date: 10/16/2018 Time: 8:35 AM Direction: Southwest Description: Phase 1 final cover and stormwater terraces. Well maintained and functioning as intended.	

Image: 2208 Date: 10/16/2018 Time: 8:35 AM Direction: Northeast Description: Phase 1 final cover and stormwater terraces. Well maintained and functioning as intended.	

Image: 2210 Date: 10/16/2018 Time: 8:36 AM Direction: Southwest Description: Phase 1 final cover and stormwater terraces. Well maintained and functioning as intended.	

Image: 2212 Date: 10/16/2018 Time: 8:37 AM Direction: West Description: Final cover on plateau. Vegetation is well established. No signs of animal burrows or erosion.	

Image: 2214 Date: 10/16/2018 Time: 8:37 AM Direction: West Description: Final cover on plateau. Vegetation is well established. No signs of animal burrows or erosion.	

Image: 2216 Date: 10/16/2018 Time: 8:39 AM Direction: East Description: Final cover on plateau. Vegetation is well established. No signs of animal burrows or erosion.	

Image: 2218 Date: 10/16/2018 Time: 8:40 AM Direction: North Description: Final cover on sideslopes. Vegetation is well established. No signs of animal burrows or erosion.	

Project: Indian River Landfill 2018 CCR Annual Inspection
Photographer: Richard Southorn

Image: 2220 Date: 10/16/2018 Time: 8:41 AM Direction: North Description: Final cover on plateau. Vegetation is well established. No signs of animal burrows or erosion.	

Image: 2222 Date: 10/16/2018 Time: 8:42 AM Direction: East Description: Final cover on plateau. Vegetation is well established. No signs of animal burrows or erosion.	

Image: 2224 Date: 10/16/2018 Time: 8:44 AM Direction: Northwest Description: Phase 2, Cell 2 active area.	

Image: 2228 Date: 10/16/2018 Time: 8:45 AM Direction: East Description: Final cover on plateau. Vegetation is well established. No signs of animal burrows or erosion.	

Image: 2230 Date: 10/16/2018 Time: 8:46 AM Direction: Southeast Description: Final cover on plateau. Vegetation is well established. No signs of animal burrows or erosion.	

Image: 2234 Date: 10/16/2018 Time: 8:47 AM Direction: West Description: Terraces are well maintained and drain as intended.	

Image: 2236 Date: 10/16/2018 Time: 8:48 AM Direction: Southeast Description: Final cover on plateau. Vegetation is well established. No signs of animal burrows or erosion.	

Image: 2238 Date: 10/16/2018 Time: 8:49 AM Direction: Southeast Description: Final cover on plateau. Vegetation is well established. No signs of animal burrows or erosion.	

Image: 2242 Date: 10/16/2018 Time: 8:50 AM Direction: Northeast Description: Inlet pipes on inside plateau berm to letdown channel.	

Image: 2244 Date: 10/16/2018 Time: 8:51 AM Direction: Southeast Description: Final cover on plateau. Vegetation is well established. No signs of animal burrows or erosion.	

Project: Indian River Landfill 2018 CCR Annual Inspection
Photographer: Richard Southorn

Image: 2246 Date: 10/16/2018 Time: 8:57 AM Direction: South Description: Overview of sideslopes from toe of slope. Recently mowed and in good condition.