APTIM

Inspection Report

To:	**Mark Jacklin (Keystone Generating Station)**
From:	**Richard Southorn, P.E., P.G.**
Re:	**Keystone Ash Disposal Site – Annual CCR Unit Inspection Report**
Inspection Date:	**October 22, 2018**
Report Date:	**January 16, 2019**

INTRODUCTION

Title 40 Code of Federal Regulations (CFR) Part 257 addresses, in part, the management of Coal Combustion Residuals (CCR Rule, or Rule) 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 Keystone Generating Station (operated by GenOn Northeast Management Company), this inspection requirement applies to the existing Ash Disposal Site. In support of this obligation, Mr. Richard Southorn (a qualified professional engineer with Aptim Environmental & Infrastructure, Inc. [APTIM]) conducted an on-site inspection of the Ash Disposal Site on October 22, 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 Keystone 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). Placement of the prior annual inspection report into the facility's operating record was accomplished on January 18, 2018. Per §257.84(b)(4), the current report will be entered into the facility's operating record no later than January 18, 2019.

BACKGROUND

The collective Ash Disposal Site consists of the contiguous East Valley and West Valley components and is operated/maintained in accordance with Pennsylvania Department of Environmental Protection (PADEP) Solid Waste Permit No. 300837. Stage I of East Valley was constructed first and became operational in 1985. Stage I was initially constructed in the northern part of East Valley, with Stage II being later constructed in the southern half of East Valley and piggy-backed over the Stage I area. West Valley comprises Stage III of the disposal site, and it along with Stage II of East Valley, are the currently active portions. Disposal of CCR materials in West Valley began in 2002. When completed, West Valley will piggy-back over the western part of the East Valley Disposal Site. Stage IV of the disposal site (West Valley Expansion) is permitted and currently under construction. It is situated in the southern part of West Valley and represents a horizontal and vertical expansion of the Stage III area. When ultimate development conditions are reached, Stage IV will piggy-back over Stage III as well as the western limits of East Valley (Stage I and Stage II). At such time when the permitted disposal capacity has been

fully expended and final grades attained, any uncapped areas of the disposal site will be capped and closed in accordance with the approved Closure Plan.

As of the October 22, 2018 inspection, CCR materials were being placed in the active face of Stage III (West Valley). Additionally, composite liner installation was being completed in the West Valley Stage IV Expansion Area.

With respect to the Ash Disposal Site, 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 the annual inspection report, and per §257.84(b)(2) (i-iv), the following aspects have been addressed:

- *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

Principal items reviewed as part of this year's inspection included, but were not limited to: Design Drawings, 2017/2018 Weekly and Periodic Landfill Inspection Reports that have been completed since the 2017 Inspection, 2017 Annual Landfill Operations Report, and Solid Waste Permit No. 300837. During the site inspection, Mr. Southorn interviewed facility personnel (Mr. Mark Jacklin) to verify the information contained within the operating record.

Environmental Control System Overview

i. Bottom Liner System

   a. East Valley is underlain by a single synthetic liner system.

   b. West Valley has a double-liner system with one component being a geosynthetic clay liner.

ii. Leachate Collection System

a. The East Valley and West Valley leachate collection systems are represented by piping networks located above the liner system. East Valley leachate is routed to the existing Pump Station and then pumped to the station's Industrial Wastewater Treatment (IWT) plant. West Valley leachate flows by gravity directly to the IWT. Following processing at the IWT and eventually at the Final Wastewater Treatment (FWT) plant, the treated effluent is discharged in accordance with the station's National Pollutant Discharge Elimination System (NPDES) Permit.

iii. Stormwater Management

a. "Contact" stormwater at both East Valley and West Valley is collected in the West Valley Equalization Pond to allow for solids settling and is then routed to the IWT for treatment.

b. Non-contact stormwater at both East Valley and West Valley is routed to dedicated NPDES-permitted outfalls for direct discharge to surface water.

Summary of Landfill Construction

Composite liner installation was being completed in the West Valley Stage IV Expansion Area at the time of inspection. CCR disposal was occurring in the remaining active areas of West Valley Stage III. CCR disposal will move to the West Valley Stage IV Expansion Area once construction is complete and the area is certified for use.

Review of Prior Inspections

Weekly inspections: A review of weekly inspections has concluded that no significant deficiencies occurred at the facility that required remedial actions.

Annual inspections: A review of the previous annual inspection report 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.

CCR Disposal

Based on information provided by Station personnel, the total in-place disposal quantity of CCR materials as of December 2017 was estimated at approximately 28,601,150 cubic yards (cy). At the end of December 2018, approximately 739,186 cy of additional materials have been disposed. Therefore, the approximate total CCR disposal quantity at the end of 2018 is 29,340,336 cy.

SITE INSPECTION

The site inspection was performed on October 22, 2018 by Mr. Southorn. The inspection focused on identification of standard geotechnical signs of distress or malfunction. Specific aspects such as slumping at the toe of slope, tensile cracking, abnormal or excessive erosion on the side slopes, slope bulging, and groundwater/surface water seepage or ponding were assessed. If

present, these readily visible 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 and intermediate cover areas of the East Valley exhibited well established vegetation.

Review of Environmental Control Systems

With no evidence to the contrary, the bottom liner systems at East Valley and West Valley are believed to be in good operating condition and functioning as intended. At the time of the inspection, conveyance systems to the IWT were operating as designed.

Review of Previously Recommended Actions

No corrective actions were required based on the findings of the 2017 Annual Inspection. Recommendations were limited to the continued operation and maintenance of the facility and maintaining access to closed portions of the landfill for inspection purposes. These recommendations were found to have been followed, based on site conditions and the review of weekly inspection logs.

CONCLUSIONS

Changes in Geometry

CCR material placement has progressed in the active disposal area of the West Valley throughout this year. As of the date of this inspection, peak fill elevations in the active disposal area were at approximately 1,400 feet mean sea level.

In-Place CCR Disposal Quantities

The total permitted disposal capacity for the combined East Valley and West Valley areas is 49,926,600 cy. The approximate total CCR disposal quantity at the end of 2018 is 29,340,336 cy.

Appearance of an Actual or Potential Structural Weakness of the CCR Unit

At the time of inspection, there were no signs of distress or malfunction that would indicate actual or potential structural weakness at East Valley or West Valley.

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

There have been no changes to the East Valley or West Valley areas that pose a threat or concern to the stability of the land form.

RECOMMENDATIONS

1. Continue operation and maintenance in the active areas as currently performed.

2. Ensure 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 Keystone Ash Disposal Site does not exhibit any appearances of actual/potential structural weakness that would be disruptive to the normal operations of the East Valley and West Valley CCR Units. Both units are being operated and maintained consistent with recognized and generally accepted good engineering standards and practices.

Certified by: RICHARD SOUTHORN

Date: JAN 16, 2019

1/16/19

LICENSE EXPIRES
9/30/19

Richard Southorn, P.E., P.G.

Professional Engineer Registration No. PE085411

Aptim Environmental & Infrastructure, Inc.

ATTACHMENTS

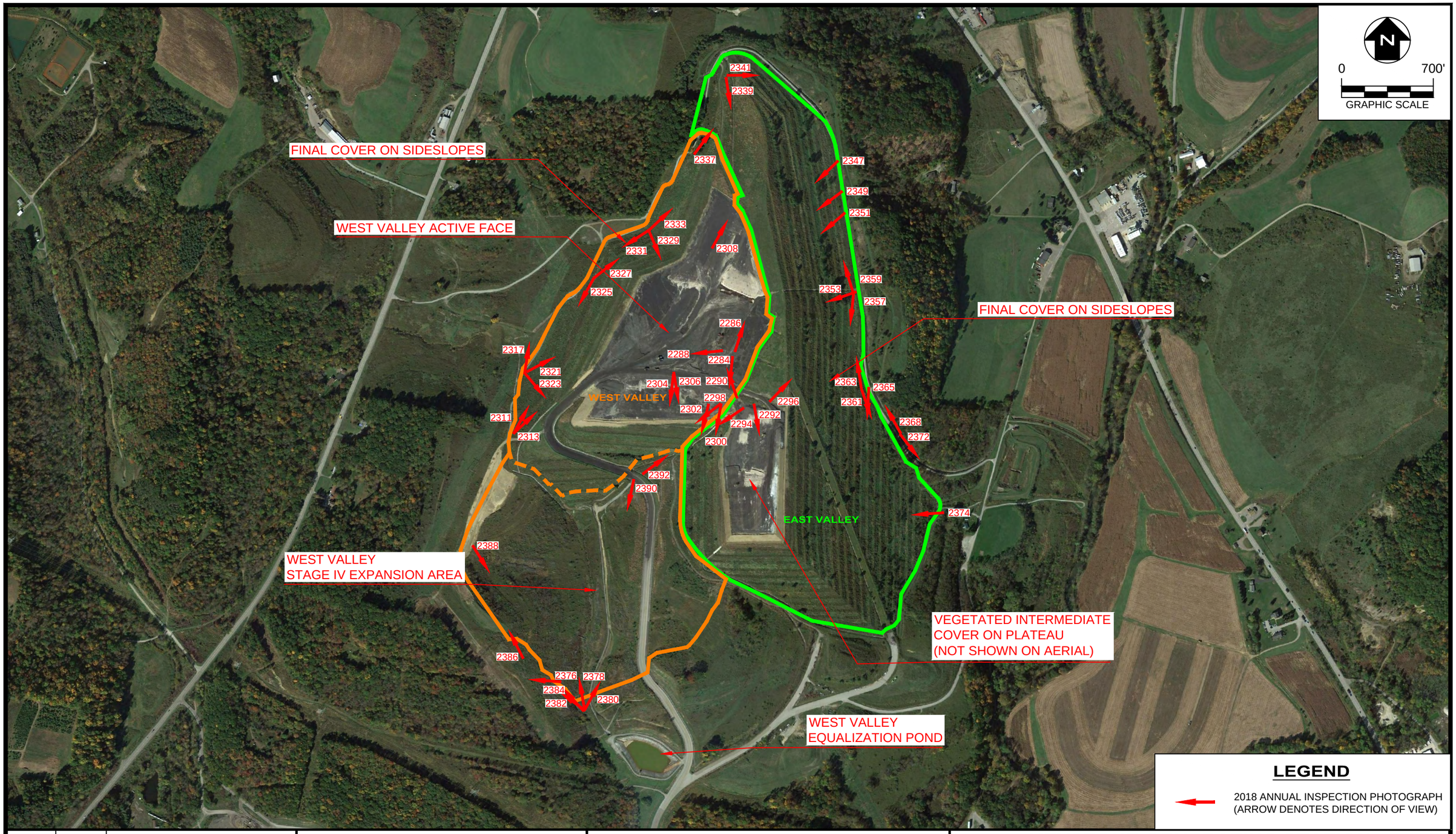
1. Site Map
2. Inspection Photo Log

REFERENCES

1. Residual Waste Major Permit Modification, Keystone Station Disposal Site, July 1996.
2. 2017 Keystone Generating Station Annual Landfill Operations Report.
3. Weekly and Periodic Landfill Inspection Reports Nov 2017 – Oct 2018.
4. 40 Code of Federal Regulations, Part 257.

Attachment 1

Site Map



LEGEND

2018 ANNUAL INSPECTION PHOTOGRAPH
(ARROW DENOTES DIRECTION OF VIEW)

REV. NO.	DATE	DESCRIPTION

APTIM Environmental & Infrastructure, Inc.

KEYSTONE GENERATING STATION
SHELOCTA, PENNSYLVANIA

PHOTOGRAPH LOCATION MAP

DRAWN BY:	APPROVED BY:	PROJ. NO.:	DATE:
BWM	RDS	1009174011	DECEMBER 2018

T:\AutoCAD\Projects\NRG\CCR-Annual Inspections\2018\Keystone-PA.dwg, 11x17, 12/11/2018 2:50:51 PM

Attachment 2

Photo Log

Project: Keystone Annual Inspection
Photographer: Richard Southorn

Image: 2284 Date: 10/22/2018 Time: 7:45 AM Direction: South Description: Gypsum in West Valley active area that has been recently spread prior to compaction.	

Image: 2286 Date: 10/22/2018 Time: 7:45 AM Direction: North Description: Gypsum in West Valley active area.	

Project: Keystone Annual Inspection
Photographer: Richard Southorn

Image: 2288 Date: 10/22/2018 Time: 7:46 AM Direction: West Description: West Valley active area. Compacted and graded to prevent ponding water.	

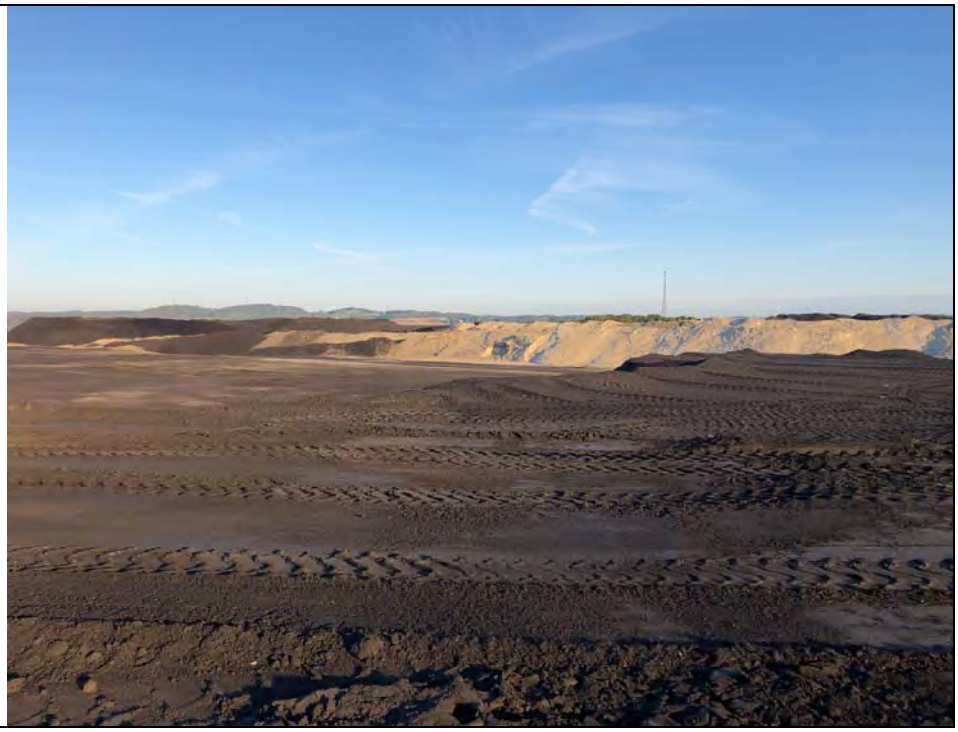
Image: 2290 Date: 10/22/2018 Time: 7:48 AM Direction: North Description: West Valley active area after being sprayed by water truck to prevent fugitive dust.	

Image: 2292 Date: 10/22/2018 Time: 7:49 AM Direction: South Description: Final cover placed on East Valley. Vegetation is well established with uniform coverage. No observed erosion, animal burrows, or visual indications of instability.	

Image: 2294 Date: 10/22/2018 Time: 7:49 AM Direction: Southwest Description: A non-contact stormwater channel that is lined with revetment mat. The channel is free of obstructions and appears in good condition.	

Image: 2296 Date: 10/22/2018 Time: 7:51 AM Direction: Northeast Description: Final cover on sideslopes of East Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2298 Date: 10/22/2018 Time: 7:53 AM Direction: Southwest Description: Recently installed geomembrane in West Valley Expansion Area.	

Image: 2300 Date: 10/22/2018 Time: 7:53 AM Direction: South Description: Final cover on sideslopes of East Valley. The vegetation is dense and healthy. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2302 Date: 10/22/2018 Time: 7:53 AM Direction: South Description: Southern view between East and West Valley Expansion Area from active area.	

Project: Keystone Annual Inspection
Photographer: Richard Southorn

Image: 2304 Date: 10/22/2018 Time: 7:56 AM Direction: South Description: Filter press material stockpile in West Valley active area.	

Image: 2306 Date: 10/22/2018 Time: 7:56 AM Direction: South Description: Filter press material stockpile in West Valley active area.	

Project: Keystone Annual Inspection
Photographer: Richard Southorn

Image: 2311 Date: 10/22/2018 Time: 8:02 AM Direction: Northeast Description: Perimeter road on western side of West Valley. Revetment lined run-off ditch on interior side of road (right, in photograph).	

Image: 2313 Date: 10/22/2018 Time: 8:02 AM Direction: Northeast Description: A non-contact stormwater channel that is lined with revetment mat. The channel is free of obstructions and appears in good condition.	

Image: 2317 Date: 10/22/2018 Time: 8:03 AM Direction: North Description: Cleanout access point for new pump station.	

Image: 2321 Date: 10/22/2018 Time: 8:04 AM Direction: Northeast Description: Final cover on sideslopes of West Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2323 Date: 10/22/2018 Time: 8:04 AM Direction: Southeast Description: A leachate cleanout present within the West Valley final cover.	

Image: 2325 Date: 10/22/2018 Time: 8:07 AM Direction: Southwest Description: Final cover on sideslopes of West Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Project: Keystone Annual Inspection
Photographer: Richard Southorn

Image: 2327 Date: 10/22/2018 Time: 8:08 AM Direction: Northeast Description: Final cover on sideslopes of West Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2329 Date: 10/22/2018 Time: 8:09 AM Direction: Southeast Description: West Valley edge-of-Liner marker in foreground and leachate cleanout riser in background.	

Image: 2331 Date: 10/22/2018 Time: 8:09 AM Direction: Southwest Description: Final cover on sideslopes of West Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2333 Date: 10/22/2018 Time: 8:09 AM Direction: Northeast Description: Final cover on sideslopes of West Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2337 Date: 10/22/2018 Time: 8:11 AM Direction: Northeast Description: Final cover on sideslopes of West Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2339 Date: 10/22/2018 Time: 8:14 AM Direction: South Description: Final cover on topslopes of West Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Project: Keystone Annual Inspection
Photographer: Richard Southorn

Image: 2341 Date: 10/22/2018 Time: 8:14 AM Direction: East Description: Final cover on sideslopes of East Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2347 Date: 10/22/2018 Time: 8:17 AM Direction: Southwest Description: Final cover on sideslopes of East Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2349 Date: 10/22/2018 Time: 8:17 AM Direction: Southwest Description: Final cover on sideslopes of East Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2351 Date: 10/22/2018 Time: 8:17 AM Direction: Southwest Description: Final cover on sideslopes of East Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Project: Keystone Annual Inspection
Photographer: Richard Southorn

Image: 2353 Date: 10/22/2018 Time: 8:19 AM Direction: West Description: Downchute on final cover at East Valley. The downchute is armored and free of obstruction. Functioning as intended.	

Image: 2357 Date: 10/22/2018 Time: 8:19 AM Direction: South Description: Final cover on sideslopes of East Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2359 Date: 10/22/2018 Time: 8:19 AM Direction: North Description: Final cover on sideslopes of East Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2361 Date: 10/22/2018 Time: 8:22 AM Direction: South Description: Final cover terrace on sideslopes of East Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2363 Date: 10/22/2018 Time: 8:22 AM Direction: North Description: Final cover terrace on sideslopes of East Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Image: 2365 Date: 10/22/2018 Time: 8:23 AM Direction: South Description: Final cover terrace on sideslopes of East Valley. The vegetation is dense, healthy, and uniformly distributed. The final cover slopes show no evidence of erosion, animal burrows, or failure (e.g. sloughing or sliding).	

Project: Keystone Annual Inspection
Photographer: Richard Southorn

Image: 2368 Date: 10/22/2018 Time: 8:25 AM Direction: Northwest Description: Non-contact stormwater channel looking upslope at East Valley. Armored and functioning as intended.	

Image: 2372 Date: 10/22/2018 Time: 8:25 AM Direction: Southeast Description: Non-contact stormwater channel looking downslope at East Valley. Armored and functioning as intended.	

Image: 2374 Date: 10/22/2018 Time: 8:29 AM Direction: West Description: East Valley leachate collection structure (routes to Pump Station and then to IWT facility).	

Image: 2376 Date: 10/22/2018 Time: 8:35 AM Direction: Northwest Description: Liner construction to support filling between valleys. Geomembrane is being installed over compacted clay liner. Panel seaming actively being completed.	

Image: 2378 Date: 10/22/2018 Time: 8:36 AM Direction: North Description: Liner construction to support filling between valleys. Geomembrane is being installed over compacted clay liner. Panel seaming actively being completed.	

Image: 2382 Date: 10/22/2018 Time: 8:36 AM Direction: Northwest Description: Geomembrane is being installed over compacted clay liner in West Valley Expansion Area.	

Project: Keystone Annual Inspection
Photographer: Richard Southorn

Image: 2384 Date: 10/22/2018 Time: 8:37 AM Direction: West Description: Stormwater run-on control ditch near limits of construction in West Valley Expansion Area.	

Image: 2386 Date: 10/22/2018 Time: 8:37 AM Direction: Northwest Description: Geomembrane installation in West Valley Expansion Area.	

Image: 2388 Date: 10/22/2018 Time: 8:39 AM Direction: Southeast Description: Geomembrane installation in West Valley Expansion Area.	

Image: 2390 Date: 10/22/2018 Time: 8:42 AM Direction: South Description: Geomembrane installation in West Valley Expansion Area.	

Project: Keystone Annual Inspection
Photographer: Richard Southorn

Image: 2392 Date: 10/22/2018 Time: 8:42 AM Direction: Northeast Description: Contact stormwater ditches that flow to the West Valley Equalization Pond.