FIRST FIVE-YEAR REVIEW REPORT FOR THE CINNAMINSON GROUNDWATER CONTAMINATION SITE BURLINGTON COUNTY, NEW JERSEY

Prepared by

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8/13/19

Date

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
ICs	Institutional Controls
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
ROD	Record of Decision
RPM	Remedial Project Manager
TBC	To be considereds

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the first FYR for the Cinnaminson Groundwater Contamination Site (site). The triggering action for this statutory review is the July 31, 2014 signature date of the Operable Unit 2 (OU2) Record of Decision (OU2 ROD) for the site. The FYR has been prepared due to the fact that hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The site consists of four OUs, two of which will be addressed in this FYR.

- OU1 addresses the contaminated groundwater at the site associated with the Sanitary Landfill Inc. (SLI), operations.

- OU2 addresses the SLI Landfill (SLI LF) caps, and the SLI LF surface water runoff and gas mitigation systems.

The two OUs that are not addressed in this FYR are OU3 and OU4 due to the fact that remedial actions have not yet been selected:

- OU3 addresses contaminated soil and groundwater associated with the former BOC Gas facility, now the responsibility of Linde, LLC, and currently named Messer LLC. Linde/Messer LLC is currently performing a remedial investigation/feasibility study (OU3 RI/FS) and removal action under a 2008 Administrative Order on Consent (2008 AOC), with EPA oversight. In addition, under OU3, vapor intrusion from contaminated soil and groundwater into buildings is being investigated and mitigated when necessary under an EPA removal action.

- OU4, addresses site-wide groundwater contamination not covered by OU1. EPA is conducting the OU4 RI/FS to identify and address data gaps in the delineation of site-wide groundwater contamination not already part of OU1 and OU3.

OU 3 and OU 4 reviews will be included in subsequent FYRs following completion of the RI/FS's for OU3 and OU4, RODs and remedy implementation begins.

The site FYR was led by Alida Karas, EPA Region 2 RPM. Participants included Jeff Josephson (EPA Section Chief), , Chuck Nace (EPA Ecological Risk Assessor), Sharissa Singh (EPA hydrogeologist), Ula Kinahan (EPA Human Health Risk Assessor) and Natalie Loney (EPA Community Involvement Coordinator). The responsible party, SC Holdings (SCH), was notified of the initiation of the FYR. The review began on October 11, 2018.

Site Background

The site covers approximately 400 acres. It is located in the townships of Cinnaminson and Delran, Burlington County, New Jersey, and includes properties bounded by Union Landing Road, Route 130, River Road and Taylors Lane. The site area includes two closed landfills known as the northwest and southeast, along with residential and light to heavy industrial properties. The Delaware River is located northwest of the site and U.S. Route 130 passes southeast of the site. Two small streams, Pompeston Creek and Swede Run, provide run-off from the site into the Delaware River.

Originally, the Cinnaminson landfill property was owned by Lockhart Construction Company and was operated as a sand and gravel mining pit. During the late 1950s, municipal solid waste was deposited into the completed mining pits while sand and gravel mining continued on other parts of the property. When mining operations ceased in the late 1960s, larger amounts of refuse and solid wastes were deposited into the abandoned pits. Two landfills areas resulted from the historical practice of waste disposal in areas of the site occuring as sand and gravel mining operations came to an end. SLI, a Waste Management subsidiary, purchased the property in 1970 and was permitted by the New Jersey Department of Environmental Protection (NJDEP) to continue landfilling operations. Approximately 240,000 tons of wastes per year were deposited, including municipal and institutional wastes, bulky wastes, dry and liquid sewage sludge, construction and demolition wastes, vegetable and food processing wastes, and industrial wastes, including hazardous substances. In 1993, SCH became the site owner through a purchase from SLI.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Cinnaminson Groundwater Contamination Site OU1 and OU2		
EPA ID: NJD980785638		
Region: 2	**State:** NJ	**City/County:** Cinnaminson/Burlington County
SITE STATUS		
NPL Status: Final		
Multiple OUs?	**Has the site achieved construction completion?**	

Yes	No

REVIEW STATUS
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**
Author name (Federal or State Project Manager): Alida Karas
Author affiliation: EPA Region 2
Review period: 7/31/2014 - 7/31/2019
Date of site inspection: 11/19/2018
Type of review: Statutory
Review number: 1
Triggering action date: 7/31/2014
Due date *(five years after triggering action date)*: 7/31/2019

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

On September 27, 1980, NJDEP issued an Administrative Consent Order (1980 ACO) to SLI to close the landfills. In 1981, SLI submitted a closure plan to NJDEP and it was approved. The closure plan required that the landfills be capped with 18 inches of clay and a landfill gas collection and venting systems be installed, as well as the initiation of a groundwater monitoring program. Landfill cap and gas mitigation systems construction, pursuant to a 1984 NJDEP ACO, began in 1985 and was completed in 1987. In April 1989, NJDEP accepted the final caps construction. While not part of the Superfund action, EPA and NJDEP conferred on NJDEP's requirements. Groundwater contamination, primarily volatile organic compounds (VOCs), was detected near the landfills during the closure activities.

From 1985 to 1989, EPA conducted an OU1 Remedial Investigation (OU1 RI) to determine the sources, and nature and extent of groundwater contamination. The OU1 RI activities included field surveys, hydrogeologic investigations, groundwater sampling, surface water/sediment sampling and potable well sampling. The OU1 RI identified the presence of VOCs in two aquifers, using data from 87 monitoring wells. VOCs detected in the groundwater included vinyl chloride, 1,2-dichloroethane, trichloroethene (TCE), tetrachloroethene (PCE), trichloroethane, and benzene. EPA conducted an endangerment assessment to evaluate the potential risks to human health and the environment associated with the site. The endangerment assessment was the study that existed at that time in place of what is now known as a risk assessment. The endangerment assessment concluded that contaminated groundwater is the medium of greatest concern for exposure to humans. It did not identify risks to ecological receptors. Additionally, the Sceening Level Ecological Risk Assessment (SLERA) done for OU2 did not identify ecological risks.

Response Actions

Initial Response – In October 1984, EPA proposed the site to the National Priorities List (NPL) and it became final on the NPL in June 1986. In 1985, EPA began the OU1 RI to investigate the nature and extent of contamination. In 1989, the OU1 Feasibility Study (OU1 FS) was prepared and completed by EPA.

OU1 ROD - Contaminated groundwater associated with SLI LFs - On September 28, 1990, the OU1 ROD was issued by EPA. The OU1 ROD contains the following Remedial Action Objectives (RAOs):

- To satisfy applicable or relevant and appropriate local, state and federal requirements (ARARs);
- To reduce continued degradation of the groundwater; and,
- To prevent contaminants from migrating toward existing municipal drinking water wells.

The OU1 ROD established the following actions to address contaminated groundwater:

- Extraction and treatment of contaminated groundwater from both the shallow and deep aquifers;
- Reinjection of treated water into the deep aquifer; and
- Installation and monitoring of additional wells to ensure the effectiveness of the remedy.

OU 2 ROD – No further action for the SLI LF caps– OU 2 addresses the two unlined SLI LFs. - The July 2014 OU2 ROD concluded that no OU2 remedial action is necessary to ensure protection of human health and the environment. The SLI LF caps completed in 1987, as well as the landfill gas mitigation and surface water runoff controls and enhancements completed during the OU1 remedial action (OU1RA), in 1995 and 1996, met all state and federal requirements.

Status of Implementation

OU1 - In June 1991, EPA issued a Unilateral Administrative Order (1991 UAO) to SLI, the predecessor to SCH, that required implementation of the groundwater remedy described in the OU1 ROD. Pre-design investigatory work provided new information on groundwater flow rates and the extent of contamination. This new information suggested that the OU1 ROD may have overestimated the size and scope of groundwater extraction and treatment system that was required to achieve all the RAOs. The conceptual design developed from the pre-RD investigation determined that shallow “perched” zones and the deep regional aquifer were not separated by a continuous geologic barrier, as previously believed. A revised groundwater extraction and treatment system concept that included five groundwater extraction wells near the SLI LF areas (now known as EW-1, EW-2, EW-4A, EW-5 and EW-6), a treatment system with a capacity of approximately 200 gallons per minute and three reinjection wells on SLI property (now known as RW-1, RW-2 and RW-3) was developed. In response to this new concept, the original scope of the OU1 remedial design (OU1 RD) was revised. The revised OU1 RD

involved a reduction in the number and location of groundwater extraction wells that focused on the remediation of specific groundwater releases that emanate from the SLI LFs and the properties immediately adjacent and upgradient (north) of the SLI property that were identified during the pre-design investigatory work.

It should be noted that the OU1 RD also included, at SLI's request, a design for an enhanced gas management system at the SLI LFs. The enhancements included expanding the existing gas management system so that landfill gas was collected more aggressively. Two phases of enhancing the gas management system were implemented and completed between September 1995 and December 1996. In conjunction with SLI's gas management system enhancements, certain drainage improvements were performed that facilitated drainage of stormwater runoff from the surface of the landfills as well as increased the caps' resistance to rainfall infiltration.

The final OU1 RD was approved by EPA in January 1999. Construction of the OU1 groundwater remedial action (OU1 RA) began in January 1999 and was completed in April 2000. Full operation of the groundwater remediation system began in May 2000.

The groundwater remediation system has captured and treated contaminated groundwater and prevented contaminants from migrating toward existing municipal drinking water wells, which are two of the OU1 RAOs. SCH operated and monitored performance of the OU1 RA since 2000, with EPA oversight. After approximately ten years of operation, SCH indicated that the effectiveness of the groundwater extraction and treatment system to further improve groundwater conditions in the area downgradient of the SLI LFs had decreased, primarily because the VOC concentrations had been reduced in the extraction zone.

In May 2013, SCH submitted a request to perform a groundwater extraction and treatment system monitoring assessment/shutdown test. The purpose of the groundwater extraction and treatment system monitoring/shutdown test was to enable EPA to make a determination regarding the efficacy of continued operation of the groundwater remediation system to address the OU1 groundwater plume. The work plan for the shutdown test was approved by EPA and initiated by SCH in July 2013. The treatment plant was turned off on July 19, 2013. The results of subsequent monitoring and evaluation are presented below in the Data Review section of this report.

Following the two-year shutdown test of the groundwater extraction and treatment system, EPA agreed that the shutdown could continue, but required SCH to develop and implement a long-term monitoring plan (LTMP). On August 1, 2018, EPA approved the LTMP, and the monitoring program began in October of 2018. The LTMP includes the following:

- Groundwater sampling will be conducted every two years at 49 monitoring locations. This sampling includes analysis for VOCs, manganese, arsenic, and field parameters. Every five years an additional set of monitored natural attenuation (MNA) parameters is included, and the next event with MNA parameters will be in 2019.
- Groundwater sampling will also be conducted annually at the 5 previous groundwater extraction wells, to evaluate possible changes in water quality in this critical area, which

is between the landfills and other monitoring wells further downgradient.

- If the previous sampling result for a well exceeds a specific trigger (detailed in the LTMP workplan), a discussion between SCH and EPA will occur to determine if a temporary increase in sampling frequency is warranted.
- Groundwater levels will be measured annually at a larger set of wells to assess possible changes in groundwater elevation and flow directions.

Oversight of this monitoring plan by EPA will continue, and if contaminant levels begin to increase again or if new or different OU1 source areas are discovered to be impacting the aquifer, remediation measures will have to be established, perhaps including re-establishing the groundwater extraction and treatment system.

OU2 - The OU2 no-action ROD did not require any further implementation. The groundwater remediation has been in operation since 2000, the cap system has been in place since 1987 and the SLI gas management enhancement system has been in operation since 1996. Together with the OU1 RA, these remedial activities with respect to the landfills have reduced the continuation of degradation of groundwater. After the July 2014 OU2 ROD was issued by EPA, all of the SLI LFs required monitoring is conducted by NJDEP.

Institutional Controls

The OU1 and OU2 RODs do not require institutional controls in the form of deed notices, however the NJDEP requires deed notices for the SLI LFs and a Classification Exception Area (CEA) for the contaminated groundwater. The deed notice for the landfill property was placed on April 30, 2015, and the CEA was put in place on March 15, 2007. The deed notice provides that any future disruption of the closed landfills shall require prior approval from the NJDEP in accordance with N.J.A.C. 7:26-2A.8(j) and requires biennial monitoring to ensure the cap remains protective. A re-evaluation of the need for institutional controls will be made during the OU3 and OU4 RI/FS process and if required, be incorporated into the OU3 and/or OU4 ROD as needed.

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater	Yes	No	OU1 – contaminated groundwater	A Classification Exception Area or CEA serves as an institutional control by providing notice that there is ground water pollution in a localized area caused by a discharge at a contaminated site.	CEA – Cinnaminson Groundwater Contamination Site OU1 March 15, 2007

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Deed notice	Yes	No	OU2 landfills	Deed Notice/ Restriction: A notification added to the title of a property when contamination will remain above NJDEP's residential/ unrestricted soil remediation standards, N.J.A.C. 7:26D. A Deed Notice requires a property owner's concurrence and specifies the location and concentration of all contaminants and how they must be controlled, maintained or monitored.	Deed Notice Block 702 Lot 34 Cinnaminson, NJ May 15, 2015

System Operations/Operation and Maintenance

A System Operation and Maintenance Plan was approved by EPA in June 2000. Since the groundwater extraction and treatment system is not currently operated, no actions are taken except to ensure that the groundwater treatment plant can be readily operated if EPA determines that this is necessary.

Climate Change - Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate changes in the region and near the site.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification,

On October 1, 2018, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 42 Superfund sites in New York and New Jersey, including the Cinnaminson Groundwater Contamination site. The announcement can be found at the following web address: https://www.epa.gov/aboutepa/fiscal-year-2019-five-year-reviews. In addition to this notification, a public notice was made available via e-mail to the Township of Cinnaminson on 8/13/2019, with a request that a notice be posted to the town's website. The purpose of the public notice is to inform the community that there is a FYR and inviting the public to submit any comments to the EPA. The notice also includes the RPM and the CIC address and telephone numbers for questions or comments related to the five-year review process or the site. Once the FYR is completed, the results of the review and the report will be made available at the site information repositories located at: U.S. EPA Records Center, 290 Broadway, 18th floor, New York, NY 10007 and Cinnaminson Public Library, 1619 Riverton Road, Cinnaminson, NJ 08077, as well as the site's website: https://www.epa.gov/superfund/cinnaminson.

Data Review

OU 1 - A conceptual site model completed by TetraTech GEO on behalf of SCH in 2012 indicated that: 1)VOC concentration trends suggested that the source of SLI LFs contamination was controlled or remediated by activities conducted prior to groundwater extraction and treatment system operation. 2) The largest groundwater contaminant concentration decreases occurred prior to the start of groundwater extraction and treatment system operation in May 2000 and coincided with OU2 activities in 1995 and 1996, including the installation of gas extraction wells that may have removed mass from a likely vadose zone source. 3) Further decreases occurred during the first several years of groundwater extraction and treatment system operation. 4) Although concentrations for several VOCs upgradient of the groundwater extraction system are slightly above ARARs, all detections are within one order of magnitude of the ARARs. 5) Substantial decreases in contaminant concentrations downgradient of pumping wells EW-1 and EW-2 suggest that contamination was reduced, and that groundwater in this area of the site is now replaced by cleaner water.

Groundwater Extraction and Treatment Plant Shutdown Test Shutdown Program Results-
In May 2013, SCH submitted a request to perform a groundwater extraction and treatment system monitoring assessment/shutdown test. The purpose of the groundwater extraction and treatment system monitoring/shutdown test was to enable EPA to make a determination regarding the efficacy of continued operation of the groundwater remediation system to address the OU1 groundwater plume. The work plan for the shutdown test was approved by EPA and initiated by SCH in July 2013. The treatment plant was turned off on July 19, 2013.

The approved 2013 Shutdown Test Work Plan identified a revised groundwater monitoring program for a two-year shutdown test that would indicate if the site conceptual model provided an accurate representation of contaminated groundwater flow and transport. EPA determined the groundwater extraction and treatment system could be discontinued if the analysis of the two-year test data indicates that the groundwater quality from the OU1 source areas continued to decline or remained stable at low concentrations.

The revised two-year shutdown groundwater monitoring plan called for:

- Evaluation of TCE concentration trends at groundwater extraction well 6 (EW-6) to determine if TCE concentrations at EW-6 decrease after the well is shutdown as indicated in the site conceptual model. Therefore, pre-shutdown test sampling occurred at EW-6 in July/August 2013 (baseline), followed by sampling at EW-6 in September 2013, October 2013, November 2013, January 2014, March 2014, June 2014, September 2014, December 2014, March 2015, and June 2015;
- Obtaining two-year test monitoring well data to determine if the shutdown of the groundwater extraction and treatment system results in contaminant increases in downgradient monitoring wells, and sampling of the remaining groundwater extraction wells (other than EW-6) EW-1, EW-2, EW-4A, and EW-5 in order to determine if any measurable increase in VOC concentration occurs in the absence of pumping;
- Collection of VOC, manganese, and arsenic concentration data and groundwater elevation data from monitoring wells (consistent with the previous semi-annual

groundwater monitoring program) to continue evaluating groundwater quality and flow within the existing monitoring network to ensure that the groundwater quality measured in monitoring wells improved or was stable.

The results from the two-year shutdown monitoring test data indicated that:

- Decreasing TCE concentration at EW-6 did occur. The analysis of the declining TCE concentration results indicated that as described in the site conceptual model, EW-6 was likely capturing TCE from an upgradient source different from the SLI LFs although there are probably some low TCE levels also captured from the SLI LFs source;
- OU1 ROD parameters above site criteria in groundwater extraction wells include 1,2-dichloroethane, tetrachloroethene, TCE, and benzene. The concentrations of these parameters in downgradient wells remained very low, with exceedances just above site criteria for a small number of parameters;
- Contaminant concentrations at the previous semi-annual groundwater monitoring program wells remained consistent with historic monitoring results at these locations and did not demonstrate a significant change with respect to the baseline sampling event results.

Based on the shutdown test results, EPA has allowed the groundwater extraction and treatment system to remain out of operation although it is maintained in the event groundwater extraction and treatment is required in the future. Instead EPA required that the LTMP be developed and implemented.

LTMP Data – The LTMP groundwater sampling was initiated in October 2018 as described above.
The groundwater sampling results are compared to current site criteria, which are either the current NJGWQS or MCLs.

The sampling results of the October 2018 sampling, as well as all groundwater sampling results since 2013, may be found at: *Cinnaminson Groundwater Contamination Site Groundwater Results Since Baseline Sampling Event* at: https://semspub.epa.gov/src/document/02/562819.

All but one of the VOC detections in the October 2018 sampling event indicated:

- A decrease from the most recent previous data from 2017 and/or
- All levels of each VOC was below 5 micrograms/liter (µg/L)

One exception to the findings above was that chlorobenzene was detected at pumping well EW-2 at 12 µg/L compared to 9.9 µg/L in September 2017. Per the LTMP plan, the current detected concentration was compared to the average concentration from previous monitoring events collected from the start of the shutdown (July 2013) through the most recent previous data (September 2017). The average chlorobenzene concentration for EW-2 for that time period is 7.9 µg/L. Per the LTMP trigger, the current detection of chlorbenzene at EW-2 is less than twice the average of previous data (i.e., 15.8 µg/L), and therefore no plan for an increase in the sampling frequency is necessary at this time.

In addition, groundwater elevation levels were measured in 116 monitoring wells and piezometers at and adjacent to the site on October 19, 2018. Results found that compared to the previous groundwater level event in 2017, water elevation levels were higher in the current event by approximately 2.5 feet near the former landfills, and approximately 1.5 feet in the downgradient part of the site near monitoring well CEA-1. The overall pattern of groundwater flow direction in the current monitoring event is similar to the 2017 event and consistent with observations from previous events during the shutdown test.

Under the ongoing OU4 RI/FS, EPA has analyzed area-wide groundwater monitoring wells that monitor groundwater contamination from numerous sources for 1,4- dioxane and 1,2,3 trichloropropane (1,2,3-TCP). 1,4,-dioxane has been detected in groundwater monitoring wells at levels above the NJGWQCS (0.4 μg/L) at concentrations ranging from non-detect to 120 μg/L. Of the 64 samples analyzed, there were 35 non-detects and 29 samples had detections of 1,4-dioxane. Eight samples had concentrations from 0.4 μg/L to 1 μg/L, seven samples had concentrations between 1.1 μg/L and 10 μg/L, and the remaining 14 samples had concentrations from 11 μg/L to 120 μg/L. The source areas for the 1,4 -dioxane will be established in the OU4 RI/FS. Monitoring wells were also recently analyzed for 1,2,3-TCP during the OU4 RI, but the results are not yet available from the laboratory.

In summary, the 2018 monitoring results, when compared with data since 2013, indicate that OU1 groundwater conditions have generally been stable since the shutdown test was implemented in 2013. Concentrations of OU1 COCs at most wells have either decreased or not changed to a significant degree. Between 2013 and 2018, TCE concentrations in EW-1 averaged 1.1 μg/L, and at EW2 TCE concentration averaged 1.4 μg/L. TCE was non-detect in EW-4 and EW-5 between 2013 and 2018. Between 2013 and 2018, the TCE concentration at EW-6 ranged from 8.2 μg/L in 2018 down from 24 μg/L measured in 2014 and averaged 15.3 μg/L since 2013. The groundwater flow is similar to previous events subsequent to the implementation of the shutdown test. Therefore, implementation of the LTMP will continue.

Site Inspection

An inspection of the site was conducted on November 19, 2018. In attendance were Alida Karas, Remedial Project Manager, U.S. EPA Region 2, Chuck Nace, Ecological Risk Assessor, U.S. EPA Region 2, Ula Kinahan, Human Health Risk Assessor, U.S. EPA Region 2, Natalie Loney, Community Relations, U.S. EPA Region 2, Daniel St. Germain, HDR, Mayble Abraham, HDR, and Lisa Voyce, HDR. The purpose of the inspection was to assess the site. Overall, the site fence was in good condition, there were no obvious breaches or erosion at the capped areas and the site area are being well-maintained.

V. TECHNICAL ASSESSMENT QUESTIONS

QUESTION A: Is the remedy functioning as intended by the decision documents?

The site contains four OUs. Two OUs have selected and implemented remedies (OU1 and OU2), and two OUs are in the remedial investigation (RI) stage (OU3 and OU4). The remedy for OU1

consisted of groundwater extraction and treatment (preferably by chemical precipitation and biological/granular activated carbon) of contaminated groundwater from both the shallow and deep aquifers, reinjection of the treated water into the deep aquifer, and installation and monitoring of additional wells to ensure the effectiveness of the remedy, while the OU2 ROD remedy is a no action remedy for the landfills as the construction of the existing landfill caps and surface water and landfill gas mitigation systems were determined to be protective.

The RAOs in the OU1 ROD include: reduce continued degradation of the groundwater and prevent contaminants from migrating towards the existing municipal drinking water wells. Under direction of EPA, the OU1 groundwater extraction and treatment system was taken off-line in 2013, and a long-term monitoring plan was implemented to evaluate levels of contamination in the aquifer over time. The trend analysis of TCE, PCE and vinyl chloride in groundwater extraction wells EW-1, EW-6 and EW-2 indicates that levels have been stable and/or decreasing. Site-related VOC concentrations in the impacted wells located in the downgradient portion of the plume also are mostly decreasing except for CEA-2, which showed an increase in TCE from 7.5 μg/L in 2015 to 11 μg/L in 2017. The other sources of the contamination in the aquifer (other than the landfills) are currently being evaluated as part of the remedial investigations associated with OU3 and OU4 and will be addressed in future decision documents (e.g., additional RODs and/or ROD amendment).

There is a potential for vapor intrusion in off-site properties which is being investigated and mitigated as part of an OU3 EPA-removal action. Vapor intrusion investigations have been on-going since 2009, with sampling events carried out in 2009, 2017 and 2018. Treatment systems are installed in the homes at no cost to the homeowner, if warranted. Approximately eight homes have received treatment systems so far. Additional investigation/mitigation is planned for 2019.

Although the groundwater extraction and treatment system is not currently operating, the remedy is protective from a human health exposure perspective as the groundwater ingestion pathway is not complete due to municipal water being provided to the community. In addition, from an ecological perspective, based on the information provided during the site visit, the remedies implemented for OU1 and OU2 are functioning as intended to protect ecological receptors.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Human Health: An endangerment assessment was completed for OU1, and was also used for OU2, which evaluated residential exposure of groundwater through ingestion and inhalation of ambient air, worker exposure to inhalation of site-related VOCs, and exposure to soil and surface water. There were no completed pathways identified for soil and surface water, and the inhalation of ambient air for workers and nearby residents was determined to be below or within acceptable EPA risk values. Ingestion of groundwater from the perched groundwater aquifer and the regional aquifer by nearby residents was determined to be associated with unacceptable cancer risk and noncancer hazards. The pathways and exposure assumptions that were included in the endangerment assessment are still valid; however, the vapor intrusion pathway into

residential and commercial structures was subsequently identified during OU3 and is under investigation/mitigation pursuant to an OU3 removal action.

The toxicity values that were used in the endangerment assessment were valid at the time the investigation was conducted. Given that over 20 years has passed since the initial endangerment assessment was conducted, many of the toxicity values have changed. The results of the previous assessment remain valid, as the risks and hazards calculated exceeded EPA acceptable values and would still exceed acceptable values using current toxicity values. Current toxicity values are being used in the human health risk assessments being conducted for OU3 and OU4, which are examining additional potential sources to the overall regional groundwater contamination.

The cleanup values that were selected for groundwater were state and federal drinking water standards that were applicable at the time the OU1 ROD was signed. Some of the drinking water standards have changed, with several becoming more stringent and several becoming less stringent . Although some of the values have changed, the cleanup values listed in the OU1 ROD are still valid. At this time, the remedy is protective of human health as the drinking water pathway is not complete due to municipal water being supplied to the community.

The remedial action objectives (RAOs) identified in the OU 1 ROD were to: meet established ARARs, reduce continued degradation of groundwater and prevent migration of groundwater to the public well field. These RAOs remain valid.

Ecological: An ecological risk assessment was not conducted for OU1; however, the OU1 ROD indicated that "there were no endangered species or critical habitats located in the Study area" and "it was determined that environmental risks were not significant at the Cinnaminson site." A Screening Level Ecological Risk Assessment (SLERA) was conducted as part of the OU2 investigation. The results of the SLERA also indicated that "there were no endangered species or critical habitats located in the Study area" and "it was determined that environmental risks were not significant." Based upon review of the current site data and the site visit, there are no completed ecological pathways associated with the OU1 or OU2 properties due to no groundwater discharge on site and waste being under a protective cap. Therefore, the conclusion that there is no significant ecological risk is still valid. Additional ecological risk assessment evaluation is being conducted for the OU3 and OU4 remedial investigations to examine potential exposure to ecological receptors due to potential discharge of groundwater to surface water bodies.

QUESTION C: Has any **other** information come to light that could call into question the protectiveness of the remedy?

There were no issues that were identified during the review of the documents that would call into question the protectiveness of the remedies that have been implemented. Additional investigations of migration of the plume is being conducted as part of the OU3 and OU4 remedial investigation.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

OTHER FINDINGS

In March 2019, PSE&G, under a lease agreement with SCH, completed construction of a solar panel array on the landfills. EPA, NJDEP, and the Corps of Engineers approved of the plans for the construction of this solar array. The solar array was energized the first week of August 2019. Details of the solar array include:

- 32,490 solar panels.
- The array occupies 25 acres on the plateau of the landfills.
- It is anticipated that the site will generate approximately 13 Megawatts of power.
- The project will supply power to 1,300 – 2,600 homes.

The solar panel array will not interfere with the landfill caps. The landfill caps and gas mitigation systems will continue to be monitored.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
Operable Unit:1	*Protectiveness Determination:* Protective	*Planned Addendum Completion Date:* Click here to enter a date
Protectiveness Statement: **The OU1 remedy is protective of human health and the environment.**		

Protectiveness Statement(s)		
Operable Unit:2	*Protectiveness Determination:* Protective	*Planned Addendum Completion Date:* Click here to enter a date
Protectiveness Statement: **The OU2 remedy is protective of human health and the environment.**		

VIII. NEXT REVIEW

The next FYR report for the Cinnaminson Groundwater Contamination site is required five years from the completion date of this review.

APPENDIX A: REFERENCE LIST

1) Groundwater Monitoring Report: October 2018 Sampling Event – Cinnaminson Groundwater Contamination Site, February, 2019.

2) Cinnaminson Groundwater Contamination Site Groundwater Results Since Baseline Sampling Event, Operable Unit 1, 2013-2018. https://semspub.epa.gov/src/document/02/562819

3) Long-term Monitoring Plan, revised proposal, Cinnaminson Groundwater Contamination Site, Operable Unit 1, March, 2018 .

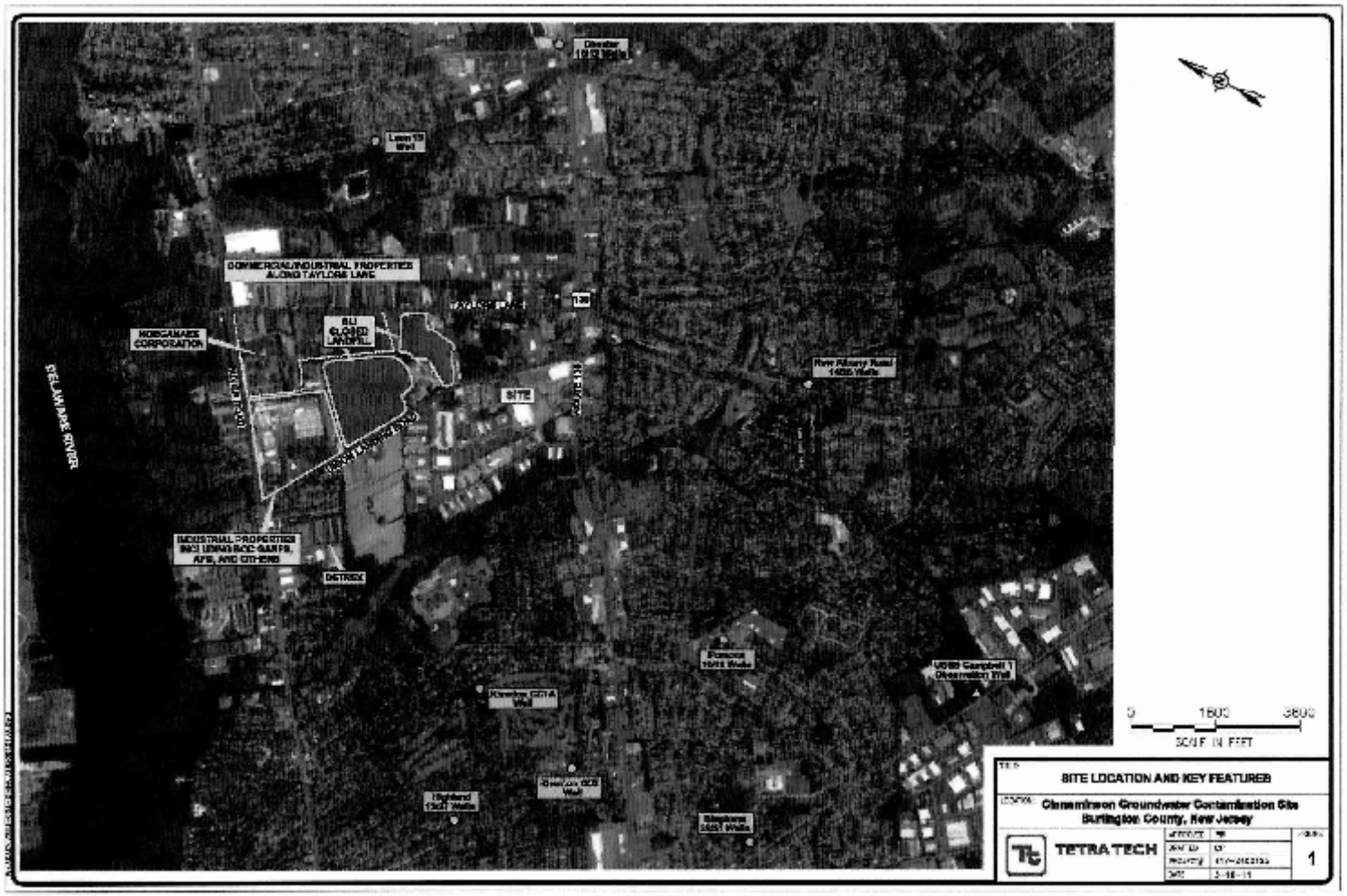
4) Request to Permanently Discontinue the P&T System
Cinnaminson Groundwater Contamination Site , September, 2015.

5) Deed Notice, Block 702, Lot 34, Cinnaminson Groundwater Contamination Site, June, 2015.

6) Record of Decision – Cinnaminson Groundwater Contamination Superfund Site, Operable Unit 2, July, 2014. https://semspub.epa.gov/work/02/260279.pdf

7) *Final Pump & Treat System Monitoring/Assessment Shutdown Test Work Plan*, July, 2013, Cinnaminson Groundwater Contamination Site.

8) Conceptual Site Model, Cinnaminson Groundwater Contamination Site, October, 2012.

9) Record of Decision – Cinnaminson Groundwater Contamination Site, Operable Unit 1, September, 1990. https://semspub.epa.gov/work/02/109766.pdf

APPENDIX B SITE LOCATION MAP WITH KEY FEATURES