FIFTH FIVE-YEAR REVIEW REPORT FOR KIN-BUC LANDFILL SUPERFUND SITE MIDDLESEX COUNTY, NEW JERSEY

Prepared by

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Date

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LIST OF ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
BMP	Biota Monitoring Plan
BNAs	Base-Neutral/Acid Extractable Compounds
CEA	Classification Exception Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
ECMA	Edmonds Creek Marshland Area
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
GPD	Gallons Per Day
HDPE	High-Density Polyethylene
ICs	Institutional Controls
ILR	Industrial Land Reclaiming
MCUA	Middlesex County Utilities Authority
NAPs	Natural Attenuation Parameters
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NJDEP	New Jersey Department of Environmental Protection
NJGWQS	New Jersey Groundwater Quality Standards
NPL	National Priorities List
O&M	Operation and Maintenance
OUs	Operable Units
PAHs	Polyaromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
POTW	Publicly Owned Treatment Works
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SWQS	Surface Water Quality Standards
UAO	Unilateral Administrative Order
UU/UE	Unlimited Use/Unrestricted Exposure
VOCs	Volatile Organic Compounds

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 review 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 fifth FYR for the Kin-Buc Landfill Superfund Site. The triggering action for this statutory review is the completion date of the previous FYR. 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 two operable units (OUs), and two operable units will be addressed in this FYR. OU1 addresses the landfill wastes. OU2 addresses contamination outside of the landfill, including sediment, groundwater, and surface water.

The Kin-Buc Landfill Superfund Site FYR was led by Brittany Hotzler, EPA Remedial Project Manager. Participants included EPA Section Chief Rich Puvogel, EPA Hydrogeologist Kathryn Flynn, EPA Human Health Risk Assessor Lora Smith-Staines, EPA Ecological Risk Assessor Michael Clemetson, and EPA Community Involvement Coordinator Pat Seppi. The PRP was notified of the initiation of the FYR. The review began on 5/2/2018.

Site Background

Physical Characteristics

The Kin-Buc Landfill Superfund Site (Site) is located at 383 Meadow Road, Edison Township, Middlesex County, New Jersey (Figure 1). The Site is bordered by the Edison Township Landfill, approximately 600 feet to the south, wetlands and the inactive Industrial Land Reclaiming (ILR) Landfill to the east, the Raritan River to the west, and the Edison Salvage Yard, the Edison Township boat launch, and a chemical manufacturing plant to the northwest. The Heller Industrial Park, a light-industrial and commercial complex, is located northeast of the Site. The Edgeboro Landfill is located across the river, approximately a ½ mile southwest of the Kin-Buc and Edison landfills.

The Site includes three landfill mounds, the Low-Lying Area (situated in between Kin-Buc I and the Edison Township Landfill), and the Edmonds Creek Marsh Area (ECMA). Kin-Buc I is the largest of the landfill mounds, covering 30 acres, with a maximum elevation of 93 feet. Kin-Buc II, immediately north of Kin-Buc I, covers 12 acres, with a maximum elevation of 51 feet. Mound B is located west of Kin-Buc I, along the shoreline of the Raritan River, and covers approximately 9 acres, at an average elevation of 15 feet. The 14-acre Low-Lying Area in between Kin-Buc I and the Edison Landfill has an elevation ranging between 10 and 25 feet, of which approximately 10 feet is fill material and refuse. Portions of the Site, including the Edmonds Creek Wetlands, the Pool C area, the eastern end of the

Low-Lying Area, the mouth of Millbrook/Martins Creek, and the southern end of Mound B, all fall within the 100- or 500-year floodplain.

The Edmonds Creek wetlands consist of approximately 50 acres of tidal wetlands, which border the Landfill mounds to the east. The wetlands are drained by Edmonds Creek, which discharges to the Raritan River southeast of the Edison Landfill. Edmonds Creek and the associated wetlands are tidally influenced, with a maximum elevation of 4 feet above mean sea level, and sediments are regularly redistributed in response to tidal fluctuations and storm events. Edmonds Creek also receives drainage from the ditch between the Low-Lying area and the Edison Landfill. Millbrook/Martins Creek flows past the Site to the northwest of Kin-Buc I and II, and discharges to the Raritan River at Mound B. This stream system receives runoff from the Kin-Buc mounds, as well as upgradient sources, and is tidally influenced in the vicinity of Mound B.

The Site is located within an industrial and commercial area of Edison Township, which is zoned for light industry. Upstream of the site, the City of New Brunswick withdraws water from two surface supplies, the Delaware and Raritan Canal and Weston's Mill Pond, and a dammed section of the Lawrence Brook, a tributary of the Raritan River which enters the river from the west.

The closest residences are approximately 1½ to 2 miles to the north of the Site, and no municipal or private drinking water supply wells are located within a two-mile radius of the Site. The OU2 Record of Decision (ROD) concluded that local land use factors would prevent the use of the groundwater, and the conditions identified at the time of the ROD are still valid.

Site Geology/Hydrogeology

There are four stratigraphic units present at the Site (top to bottom): refuse fill, meadow mat, sand-and-gravel, and bedrock.

The Site is underlain by sedimentary rocks of Triassic Age, including the Brunswick Formation and the Lockatong formation, which consist chiefly of siltstone, mudstone, and shale, and occur at depths ranging between 25 and 46 feet below ground surface. A sand-and-gravel unit, representing recent Raritan River channel fill, overlies the bedrock locally at an average thickness of 16 feet. Within Mound B and the Low-Lying Area, a layer of organic-rich clay and silt known as "meadow mat" overlies the sand-and-gravel deposit, with an average thickness of seven feet. A refuse layer of varying thickness, between seven and 24 feet outside of the landfill mounds, overlies the meadow mat deposit. The refuse contains relatively old waste materials, such as household and municipal solid waste, debris, household appliances, industrial wastes, and fill materials. The refuse layer is overlain by clay and a layer of cover soil on Mound B, and a layer of cover soil over the Low-Lying Area.

All four stratigraphic units are water bearing, although only the bedrock unit is regionally extensive and used as a water supply. In the refuse layer, the groundwater flows radially from the Kin-Buc I mound toward Pool C, the Edison Landfill, and the Raritan River, and is not tidally influenced by the river. The underlying meadow mat layer acts as a semi-confining layer, as its fine-grained organic-rich matrix exhibits very low permeability, indicating that groundwater does not readily flow vertically or horizontally in this unit. The sand-and-gravel unit is in direct hydraulic contact with the river and is therefore affected by tidal influence. At low tide, the groundwater in this unit flows across the Site from southeast to northwest. At high tide, this flow is reversed, and groundwater flows from Mound B towards the Low-Lying Area. However, net flow is west, towards the river. Regional flow in the

bedrock unit is towards the south. Vertical gradients within the four units indicate the net discharge from these units is either directly or indirectly to the Raritan River. The refuse and sand-and-gravel units discharge directly into the Raritan River at high and low tides, while the bedrock unit discharges upward into the sand-and-gravel unit, from which groundwater then discharges into the river.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Kin-Buc Landfill Superfund Site		
EPA ID: NJD049860836		
Region: 2	**State:** NJ	**City/County:** Edison Township/Middlesex

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**
Author name (Federal or State Project Manager): Brittany Hotzler
Author affiliation: United States Environmental Protection Agency
Review period: 5/2/2018 - 2/19/2019
Date of site inspection: 11/7/2018
Type of review: Statutory
Review number: 5
Triggering action date: 7/2/2014
Due date *(five years after triggering action date)*: 7/2/2019

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Landfilling at the Site began around 1947, with private operators accepting municipal, industrial, and hazardous waste. Kin-Buc, Inc., began operating the Site in 1968. Between 1971 and 1976, Kin-Buc, Inc., operated the Site as a state-approved landfill for solid and liquid industrial wastes and municipal wastes. EPA estimates, on the basis of owner-operator records, that approximately 70 million gallons of liquid waste, and at least one million tons of solid waste, were disposed at Kin-Buc between 1973 and 1976. Hazardous wastes were disposed in the main landfill mound, Kin-Buc I, as well as in Kin-Buc II.

Little is known about the waste disposal history of Mound B, other than it was primarily used for municipal wastes.

In 1976, the New Jersey Department of Environmental Protection (NJDEP) revoked Kin-Buc's permit to operate due to violations of both state and federal environmental statutes. EPA's involvement with the Site began that same year during an investigation of an oil spill at the Site, which revealed that hazardous substances had been discharged from the facility. In 1979, EPA filed initial charges against the owners/operators under the Water Pollution Control Act and the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA). Under a partial settlement in 1980, the owners/operators, Kin-Buc, Inc., agreed to install a landfill cap and initiate a long-term monitoring program at the Site, but not to remediate the Site, or control further migration of contaminants in the area. Therefore, that same year, EPA began collecting aqueous and oily leachate from the Pool C area for treatment and disposal as part of an emergency response action, with funds provided initially under Section 311(k) of the Clean Water Act (and later under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)). In 1982, as part of the settlement negotiations, the owners/operators assumed responsibility for all cleanup activities.

In September 1983, the Site was added to the National Priorities List (NPL). That same year, failed negotiations with a small group of owner/operator potentially responsible parties (PRPs) led to the issuance of the first of several unilateral administrative orders (UAOs) for the Site. The first UAO directed the PRPs to assume ongoing maintenance of EPA's emergency response actions around Pool C and performance of a remedial investigation and feasibility study (RI/FS) for the Site. From 1983 to 1988, EPA directed and provided oversight for the PRP OU1 RI/FS activities at the Site. As part of the initial actions in 1984, 4,000 drums containing oily and aqueous phases of leachate and contaminated solids were shipped off-site for incineration. From 1984 to 1994, approximately 5,000,000 gallons of aqueous phase leachate were shipped off-site for treatment and disposal. The RI indicated high levels of Polychlorinated Biphenyls (PCBs), volatile and semi-volatile organic compounds, and inorganic contaminants in soils, groundwater, and surface water. The RI also identified the portions of the waste disposal areas, in particular the Kin-Buc I and Kin-Buc II mounds, and the Pool C area, as continuing sources of discharge of contaminants into the environment.

Contaminants were found in the refuse unit leachate, as well as in groundwater from the sand-and-gravel unit, and at very low levels in the bedrock aquifer. Leachate in the refuse unit contained volatile organic compounds (VOCs), base-neutral/acid extractable compounds (BNAs), metals, pesticides, and PCBs. Contamination originated within the Kin-Buc I and II mounds and migrated towards Mound B and the Raritan River to the west, and towards the ECMA to the east. The sand-and-gravel unit contained VOCs and BNAs similar to those found in the refuse unit, although at lower concentrations. The bedrock unit contained very low levels of VOCs. In evaluating the potential risk to human health and the environment associated with the Site, EPA performed a risk assessment. The risk assessment identified eight indicator contaminants from over 100 contaminants identified in various media at the Site, including benzene, chloroform, 1,1-dichloroethylene, PCBs, vinyl chloride, arsenic, cadmium and lead. The risks associated with exposure scenarios identified in the risk assessment included: potential future ingestion of groundwater; potential exposure of on-site workers to volatilization of PCBs from Pool C; direct contact of on-site workers to oily-phase(non-aqueous phase liquid) leachate; consumption of aquatic life with elevated PCB levels; exposure of aquatic populations adjacent to the Site to elevated PCB and heavy metal concentrations; and, exposure of terrestrial populations (especially birds) to direct contact with oily-phase leachate.

From 1989 to 1992, EPA directed a group of PRPs to perform an RI/FS at the Site for OU2, which involved evaluating migration pathways of contaminants into groundwater, surface water, and sediments. The PRPs also conducted a supplemental sediment sampling program which further refined the extent of PCB contamination in the Edmonds Creek wetland sediment. The report confirmed the findings of the RI – that sediments in the ECMA contained PCBs, polyaromatic hydrocarbons (PAHs) and metals. PCBs were found at concentrations less than 10 parts per million (ppm) in most parts of the marsh, although portions of the Edmonds Creek channel contained concentrations which ranged up to 81 ppm. Areas immediately adjacent to Pool C exhibited concentrations between 100 and 290 ppm. PCBs identified were predominantly Aroclors 1248 and 1254. Distribution of these contaminants indicted that PCBs were attributable to Pool C via the connecting channel to Edmonds Creek. PAHs and metals were found throughout the marsh. Distribution patterns were less clear regarding PAHs and metals in the sediments; other man-made sources of PAHs and metals in the vicinity of the Site have most likely contributed to the distribution of these constituents in the study area. However, certain metals and PAHs were highest in areas also characterized by high levels of PCBs.

The OU2 RI identified elevated levels of PCBs in Edmonds Creek, a tidal tributary to the Raritan River, as posing unacceptable risks to human health and the environment. EPA estimated that total risks for both carcinogens and noncarcinogens were derived primarily from ingestion of fish exposed to Site contaminants and secondarily to the ingestion of contaminated groundwater by potential future residents. The OU2 ROD concluded that the locations and characteristics of the Site preclude any current exposure to contaminated groundwater, and future residential use was not plausible based upon historic and current land use. Surface waters in Edmonds Creek did not appear to be affected by Site-derived contamination; thus, in OU2, only ingestion of fish exposed to sediment contaminants constituted a risk to human health.

Response Actions

OU1

EPA issued the first of two RODs for the Site on September 30, 1988. The first ROD divided the Site into two operable units: OU1, which consisted of the Kin-Buc I and II mounds, as well as portions of the Low-Lying Area (between Kin-Buc I and the Edison Landfill) and Pool C, and OU2, which addressed the other off-site areas of contamination. The selected remedy for OU1, intended to provide source control for the landfill mounds, consisted of the following components:

- installation of a circumferential slurry wall to bedrock on all sides of the Site;
- maintenance, and upgrading if necessary, of the Kin-Buc I cap and installation of a cap in accordance with RCRA Subtitle C and state requirements on Kin-Buc II, portions of the Low-Lying area between Kin-Buc I and the Edison Landfill and Pool C;
- collection and off-site incineration of oily phase leachate;
- collection and on-site treatment of aqueous phase leachate and contaminated groundwater with disposal via direct surface water discharge;
- periodic monitoring; and,
- operation and maintenance.

These remedial activities were necessary in order to attain the remedial action objectives (RAOs) of controlling the lateral movement of contaminants within the refuse layer, controlling subsurface flow manifesting as surface seeps, controlling surface contamination, and controlling the migration of contaminants into the underlying aquifers with evaluation of the effectiveness of natural barriers. EPA did not develop remedial action objectives for groundwater or surface water in the OU1 ROD because the implementation of source control provided for in the OU1 remedial action, including a slurry wall and cap, was expected to be sufficient to prevent further migration of contaminants.

OU2

The OU1 ROD required that an RI/FS be conducted for adjacent areas affected by contaminant migration from the landfill. The OU2 RI/FS focused on evaluation of the nature and extent of groundwater contamination in the Low-Lying Area and Mound B, wetland area contamination in Edmonds Creek and the neighboring marsh system, and surface water contamination in Edmonds Creek and Mill Brook/Martins Creek.

On September 28, 1992, EPA issued the ROD for OU2. The major components of the remedy selected under the 1992 ROD for OU2 were:

- the excavation of an estimated 2,200 cubic yards of sediment containing PCBs at levels greater than 5 ppm from within the Edmonds Creek channel;
- consolidation of the excavated sediments within the OU1 containment system;
- restoration of wetland areas affected by the excavation of contaminated sediments; and,
- long-term monitoring of groundwater and surface water to ensure the effectiveness of the remedy.

These remedial activities were necessary in order to attain the RAOs of removing sediments containing PCBs at concentrations greater than 5 ppm, by consolidating them within the OU1 containment system and restoring wetland areas impacted by the excavation of contaminated sediments.

Status of Implementation

Construction for OU1 was initiated in June 1993. The slurry wall and landfill cap, as well as the leachate collection and groundwater treatment system, were completed in May 1995. During the construction of the OU1 remedy, buried drums were detected in Mound B, an area not previously thought to be used for hazardous waste disposal. EPA conducted further investigations in the form of geophysical testing and dug a series of test pits in Mound B. Investigations led to the excavation and removal of drums containing suspected hazardous materials. The details of this investigation and subsequent response action are memorialized in an Explanation of Significant Differences (ESD), issued in 2001.

A group of PRPs commenced work on the remedial design for OU2 in 1992, and the remedial action for OU2 was initiated in June 1994. PCB-contaminated sediments were excavated from five separate zones located within Edmonds Creek and the neighboring marsh system, where PCB concentrations exceeded the cleanup goal of 5 ppm. While the OU2 ROD estimated that approximately 2,200 cubic yards of sediments exceeded the remediation goal, confirmatory sampling conducted during the remedial action led to the expansion of the excavation area, with a final volume totaling 9,400 cubic yards. The excavated sediments were placed within the OU1 slurry wall, and the wetland areas were restored.

Groundwater Collection and Treatment

As of May 2015, groundwater and leachate at the Site are extracted from four deep sand-and-gravel unit pumping wells and four shallow pumping wells, at an average rate of 18,480 gallons per day (gpd) for deep wells, and 1,456 gpd for shallow wells. Approximately 7.3 million gallons of groundwater were collected by the system in 2017. Collected groundwater is discharged to the Middlesex County Utilities Authority (MCUA) Millbrook Siphon chamber on the northern bank of the Raritan River for treatment at the MCUA publicly owned treatment works (POTW). A double containment (four-inch inner diameter, eight-inch outer diameter), double-wall high-density polyethylene (HDPE) pipe conveys fluids from the Kin-Buc site to the metering station, and from the metering station to the Millbrook Siphon. Previously, groundwater and leachate were collected and treated on site, and discharged to surface water in the nearby Raritan River.

Groundwater Sampling Plan

In July 2012, EPA approved a groundwater sampling program modification that included large-scope years (sampling for VOCs, PCBs, specific metals, specific natural attenuation parameters (NAPs)) and small-scope years (PCB sampling only). The approved plan allowed for three large-scope years and two small-scope years within a FYR period. Further modifications to the sampling program were approved by EPA in July 2013, which included the elimination of PCB sampling from monitoring wells screened in the bedrock unit and reduced the sampling frequency for PCBs to every other year.

Biota Monitoring Plan

After completion of the OU2 sediment removal in 1996, a Biota Monitoring Plan (BMP) was developed to evaluate post-remedial conditions in Edmonds Creek. The assessment goals of the BMP included:

- an evaluation of the recolonizing of invertebrates and fish to the remediated areas;
- measurement of downward PCB concentration trends in the tissues of targeted species;
- long-term assessment of achieving the remediation goal of 5 ppm in sediment; and,
- commensurate reductions in biological uptake in targeted species.

The initial post-remedial conditions in Edmonds Creek were generally encouraging, with a mean PCB concentration (based upon post-excavation sampling) of less than 1 ppm, and rapid repopulation of the remediated areas with invertebrates and fish. Due to a continuous interchange of sediments with the Raritan River through tidal action, the BMP assessed trends in the creek over a longer time period than the initially expected five years. During the initial five-year sampling period, the results from the BMP sampling were generally favorable, though there was some variability in the results, and some evidence of bio-uptake of PCBs. Since several elevated detections of PCBs in sediments were found above the cleanup level of 5 ppm, EPA directed the PRPs to extend the monitoring under a slightly reduced program, beginning in 2002. The subsequent six years of this extended monitoring provided results similar to the first five years of sampling – biota tissue data indicated some favorable trends, but also showed evidence of PCB uptake relative to the reference areas sampled. PCB sediment concentrations in a vast majority of the samples across all the sample zones over the 11-year period were an order of magnitude lower than the pre-remedial levels; however, sporadic sediment detections greater than 5 ppm appeared in each of the annual BMP reports. Elevated PCB levels appeared in different sample zones,

varied in concentration, location, and time frame (not found in the same location from one year to the next), and did not suggest an obvious distribution pattern.

The results of the BMP led to further investigations to determine if there was an unidentified continuing source of PCBs in or around Edmonds Creek. In April 2004, EPA, in coordination with NJDEP conducted a site inspection of the ECMA and adjacent areas. The objective of this inspection was to locate potential source areas. The inspection identified seeps in the north and southeast toe of the Edison Township Landfill. These seeps were re-inspected in August 2004. The BMP assessments, OU1 monitoring results, and the visual site inspections, indicated that there were no continuing Kin-Buc-derived sources of PCBs discharging to Edmonds Creek. Therefore, in October 2008, EPA suspended data collection under the BMP. To further investigate the presence of continuing PCB source areas, including potential sources not associated with Kin-Buc, additional investigations were initiated in the surrounding areas of Edmonds Creek in June 2009. As part of this effort, an initial sampling event took place around the north and southeast toe of the Edison Township Landfill where seeps were previously located. Thirteen sediment and surface water samples were collected from two transects along the toe of the Landfill. These seeps generally aligned with the seeps identified in the earlier 2004 visual inspections. Samples from seep locations were analyzed for PCBs, and all samples were found to be less than 1.0 ppm.

In 2010, EPA began another investigation to assist in the characterization of PCBs present in the soil/sediment in and around Edmonds Creek. The overall investigation objectives were to examine observable trends from the soil/sediment data and determine if there were any PCB source areas. The investigation was conducted in four phases from October 2011 to June 2012. Due to a laboratory error, EPA resampled 17 acres of marshland in 2015. Extensive post-remediation sampling was followed by analyses to evaluate the potential impacts of the implemented remedy on the study area. The results of the investigation are discussed below in the Data Review section.

IC Summary Table: Summary of Planned and/or Implemented ICs

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	Sitewide	Restrict groundwater use in the vicinity of the Site.	Classification Exception Area (CEA) 2006

Institutional Controls Verification

In 2006, the NJDEP approved a Classification Exception Area (CEA) for a portion of the Site. The CEA was established by NJDEP in accordance with N.J.A.C. 7:9-1.6, because groundwater quality standards are not being met at this Site due to pollution caused by human activity.

Systems Operations/Operation & Maintenance

Under an existing UAO, Waste Management, a PRP for the Site, continues to operate the groundwater and leachate collection system, manages the appropriate disposal of landfill gas, performs maintenance

of the cap and other aspects of the remedy, and conducts groundwater and surface water monitoring, all in accordance with an approved Operations and Maintenance plan for the Site.

Landfill Gas Migration System and Flare

A gas extraction system monitors the combustible gas levels in the landfill to ensure they remain at acceptable levels, and no off-site gas migration occurs. Combustible and lower explosive limit measurements are obtained from six gas migration monitoring wells located outside the slurry wall, along the northern edge of the landfill boundary. In December 2017, flare upgrades were conducted at the Site, due to the decreasing gas quality and difficulty of keeping the gas flare operational 24 hours a day. The upgrades were made to operate the flare on an intermittent basis – four days on, and three days off. The O&M plan does not stipulate how often the gas flare must operate, provided that gas migration through the subsurface does not occur, as measured by the gas migration monitoring probes.

Groundwater and Surface Water Monitoring

The OU1 hydraulic monitoring network is composed of 29 monitoring wells located along the slurry wall, including 11 wells screened in the bedrock, most of which are located in five clusters or transects (Figure 2). Monitoring wells at each transect were installed in pairs, within the same hydrogeologic unit, with one well located inside the slurry wall, and the other well located outside the slurry wall. Groundwater elevation data is collected on both sides of the slurry wall to assess the performance of the slurry wall as a hydraulic barrier and containment system.

The OU2 monitoring network is composed of 16 wells, including one background bedrock monitoring well, located in the Low-Lying area and Mound B. Groundwater and surface water monitoring are conducted as part of the OU2 remedy to ensure that the OU1 remedy is functioning as anticipated.

All monitoring wells are tested for contamination, as well as for water quality parameters to assess the natural attenuation potential within the various water-bearing units.

Surface water samples are obtained from four locations in the Raritan River, and are tested to ensure that contaminants in groundwater from the Site are not impacting the River.

Climate Change

Potential site impacts from climate change have been assessed, and the performance of the remedy may be impacted by the following expected effects of climate change in the region and near the site: remedy impairment due to water level rise, flooding, storms and/or winds; sea level rise; increasing frequency of heavy precipitation events; increasing intensity of storms (winds/precipitation/storm surge); and increasing risk of floods. However, the O&M Plan addresses these impacts through inspection and maintenance of the landfill cap, vegetated areas, the surface water drainage system, and the treatment plant, following heavy rains or flooding.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the **last** FYR as well as the recommendations from the **last** FYR and the current status of those recommendations.

Table 1: Protectiveness Determinations/Statements from the 2014 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The OU1 remedy is protective of human health and the environment.
2	Short-term Protective	The OU2 remedy currently protects human health and the environment because the long-term monitoring of groundwater and surface water component of the remedy has demonstrated effectiveness in preventing further migration of contaminants into the environment. However, in order for the remedy to be protective in the long-term, the following action needs to be taken: complete the ongoing study to determine the source of elevated PCB concentrations in Edmonds Creek, as prescribed in the previous Five-Year Review, to evaluate protectiveness of the remedy.
Sitewide	Short-term Protective	The remedies currently protect human health and the environment because the landfill cap prevents exposure to contaminants and the slurry wall effectively prevents migration of contaminants from the landfill. In addition, the long-term monitoring of groundwater and surface water component of the remedy has demonstrated effectiveness in preventing further migration of contaminants into the environment. However, in order for the remedy to be protective in the long-term, the following action needs to be taken: complete the ongoing study to determine the source of elevated PCB concentrations in Edmonds Creek, as prescribed in the previous Five-Year Review, to evaluate protectiveness of the remedy.

Table 2: Status of Recommendations from the 2014 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	As a result of heavy rain and minor flooding caused by Hurricane Sandy, the vegetation in a drainage area outside of the slurry wall has been eroded; this area is adjacent to Well Transect #5 by the power line tower, on the eastern side of Kin-Buc.	Repair eroded area and vegetate it. To control erosion by future heavy rain and flooding, drainage channels are to be kept clear of debris to properly direct surface run off, and the protective vegetative cover is to be maintained.	Completed	Multiple attempts to vegetate this area have been made. Erosion controls are in place, and drainage channels are kept clear of debris to properly direct surface run off.	November 2017
2	Laboratory reporting limits for several surface water contaminants exceeded the NJDEP SWQS.	With regard to surface water data, for many of the contaminants of concern, laboratory detection limits are not low enough to compare against current screening criteria. Detection limits that are greater than the screening criteria results in an incomplete interpretation of the data. Future laboratory sampling events need to be amended to allow for lower detection limits.	Completed	Future surface water monitoring results will be compared to the NJDEP SWQS for screening purposes only.	March 2018
2	While the remedy overall continues to be protective in the short-term, periodic sediment concentrations greater than the remediation goal of 5 parts per million (5 ppm) of polychlorinated biphenyls (PCBs) continue to be found in portions of Edmonds Creek.	Complete the ongoing study to determine the source of elevated PCB concentrations in Edmond's Creek, as prescribed in the previous Five-year Review.	Completed	The ongoing study of elevated PCB concentrations in Edmonds Creek and the Edmonds Creek Marshland Area was completed in August 2018. The study determined that the Kin-Buc Landfill site is not a continuing source of PCBs to Edmonds Creek or the associated marshland area.	August 2018

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

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 Kin-Buc Landfill 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 provided to Edison Township for posting on the Township's website on 2/19/2019, stating that there was an ongoing FYR and inviting the public to submit any comments to the U.S. EPA. The results of the review and the report will be made available at: https://www.epa.gov/superfund/kin-buc and at the Site information repositories located at EPA Region 2, 290 Broadway, 18th Floor, New York, New York, 10007, and at the Edison Township Public Library, 340 Plainfield Avenue, Edison, New Jersey, 08817.

Data Review

The data assessed in this review period includes the annual monitoring reports from 2014 – 2017.

Hydraulic Monitoring

The groundwater elevation data is collected from 35 monitoring wells to assess the performance of the slurry wall in isolating the landfill wastes from the groundwater. Annual elevation data from 2014 to 2017 shows most of the Site has an inward gradient sufficient to prevent off-site migration of contaminated groundwater within the landfill. Although there are some occurrences where a vertical gradient is shown between the sand-and-gravel layer to the bedrock, the horizontal gradient at these bedrock locations is directed inward and toward the landfill, which reflects a typical scenario with a higher water table outside the slurry wall compared to the slurry wall interior (Figure 3).

Groundwater Sampling and Analysis

Groundwater samples are collected biannually from 20 wells in OU1 and 15 wells in OU2. Monitoring wells are located within the slurry wall, just outside the slurry wall, in Mound B, in the Low-Lying Area south-southeast of Kin-Buc I and II, and upgradient of the landfill (Table 3 and Table 4). All monitoring wells are tested for VOCS, SVOCs, PCBS, and metals.

The groundwater and leachate Contaminants of Concern (COCs) identified in the ROD include: 1,1-dichloroethene, benzene, chlorobenzene, vinyl chloride, toluene, chloroform, phenol, arsenic, cadmium, lead, zinc, and PCBs. The predominant COCs that remain in the groundwater above the NJDEP Ground Water Quality Standards (GWQS) are benzene, chlorobenzene, PCBs, and arsenic. There are few SVOC detections, some of which were not originally identified as COCs in the ROD.

VOCs

Refuse Layer

During this review period, benzene concentrations in the refuse wells inside and outside the slurry wall exceeded the NJGWQS of 1 µg/L, with concentrations ranging from 120 to 160 µg/L inside the slurry wall, and concentrations ranging from 0.12 µg/L to 280 µg/L outside the slurry wall. The wells yielding the highest benzene concentrations are GEI-5G, W-13G, and W-4G, which are one or two orders of magnitude greater than the concentration ranges depicted for W-6G, GEI-6G, GEI-3G, and GEI-10G. The overall maximum concentrations are found in GEI-5G, which is in Mound B and shows a range from 560 to 610 µg/L. W-4G and W-13G also indicate some of the highest benzene concentrations, of 150 to 190 µg/L, respectively. W-4G is part of Transect #2 and upgradient of Mound B.

The monitoring well showing the lowest benzene concentrations in the refuse is W-6G, situated just outside the slurry wall in Transect #3, with a range of 1.7 to 1.9 µg/L over the review period.

Maximum chlorobenzene concentrations outside the slurry wall are found at W-4G and W-13G, with ranges of 300 to 330 and 230 to 400 µg/L, and inside the slurry wall at W-15G, from 730 to 1000 µg/L, respectively. With the exception of GEI-5G, this is also where maximum benzene concentrations have been detected.

Sand-and-Gravel Layer

The only sand-and-gravel well that is currently monitored and situated within the slurry wall is W3-S. This well has some of the highest benzene concentrations found in this layer with a range of 350-430 µg/L. The other well showing a similar range is WE-5S, which is situated in Mound B and in close proximity to GEI-5G, where the maximum concentrations of benzene were detected in the refuse. It is likely that the benzene found in the refuse is providing a source of contamination to the sand-and-gravel layer, but it can be deduced that the bedrock is not being severely impacted in this area since bedrock well WE-5R benzene ranges from 0.29-0.31 µg/L. The remaining wells screened in the sand-and-gravel unit have benzene ranges from below 1 µg/L to 54 µg/L.

Maximum chlorobenzene concentrations were found within the slurry wall in monitoring well W-3S, with a range of 2,800-3,600 µg/L. Elevated concentrations were also found in W-4S and W-6S, at 420 µg/L and between 110-380 µg/L, respectively. W-3S and W-4S are part of Transect #1, while W-6S is part of Transect #3. The lowest chlorobenzene ranges are evident in WE-10S (0.11 µg/L – 0.24 µg/L) and W-13S (0.11 µg/L – 0.24 µg/L). Similar to benzene concentrations during this review period, no discernable trend is evident in these wells.

Bedrock

VOC contamination in bedrock wells is lower than the wells screened in the refuse and sand-and-gravel units. The exception to this is bedrock well, W-1R which shows maximum benzene concentrations ranging from 310 µg/L – 420 µg/L, and chlorobenzene ranging from 480 µg/L – 3,500 µg/L over this review period. This well is located in Transect #1 and is situated within the slurry wall. The corresponding monitoring well outside the slurry wall, W-2R, shows dramatically reduced benzene concentrations ranging from 42-49 µg/L. W-3RR, located in Transect #2 and

inside the slurry wall, was non-detect for benzene during this review period, while adjacent well W-4R, situated outside the slurry wall, ranged from non-detect to 0.2 µg/L. The only other bedrock well of concern is W-6R, which ranged from 43 – 45 µg/L of benzene for this review period. With the exception of W-1R, chlorobenzene has been below the NJGWQS in all other bedrock wells over this review period.

SVOCs

In general, SVOCs have not been detected in OU1 or OU2, although there are a few exceptions over the review period. Phenol has consistently been detected above the NJGWQS of 2,000 µg/L in W-1R (63,000 – 80,000), with an increasing concentration from 2014 – 2016. However, phenol has not been detected in the corresponding well outside the slurry wall, W-2R. Another compound is Bis(2-ethylhexyl) phthalate, which was detected in W-2G at 6.5 µg/L in 2014, above the NJGWQS of 3 µg/L, but was non-detect in 2016.

PCBs

PCB detections are generally limited to the refuse and sand-and-gravel unit in Transect #1, Transect #2, and Mound B. The maximum PCB concentration found during this FYR period was 12 µg/L of Aroclor1232, found in W-15G in 2014.

Metals

Arsenic and manganese are two metals that are commonly detected in groundwater at the site above NJGWQS. In 2016, arsenic was above the NJGWQS at 25 locations, with the highest detected arsenic concentration located at WE-10R (230 µg/L). Manganese was detected above the NJGWQS of 50 µg/L in 33 locations, with the highest detected manganese concentrations located in W-1R and W-2R in Transect Location #1, at 70,500 µg/L and 6,300 µg/L, respectively.

Overall, groundwater concentrations of contaminants have remained relatively static during this review period, and elevation data collected from inside and outside the slurry wall indicates that hydraulic source control is being maintained and functioning as intended. Although there are some occurrences where a vertical gradient is shown inside the slurry wall, between the sand-and-gravel layer to the bedrock layer, the horizontal gradient at these bedrock locations is directed inward and toward the landfill. Concentrations of contaminants in groundwater outside of the slurry wall are an order of magnitude less than they were during the RI sampling, demonstrating that groundwater concentrations have improved, and current concentrations are more reflective of remnant contamination that existed prior to the installation of the slurry wall. The Meadow Mat layer that overlies the sand-and-gravel layer at Mound B and the Low-Lying Area also restricts movement of the contaminated groundwater that is present outside the slurry wall by acting as a semi-confining layer. The fine-grained, organic-rich matrix of the Meadow Mat layer exhibits very low permeability, indicating that groundwater does not readily flow vertically or horizontally in this unit.

Surface Water

Surface water quality samples are collected annually from four locations in the Raritan River near Mound B, based upon the predominant direction of groundwater flow away from the Site. These surface water samples are collected downstream, upstream, and adjacent to the Site during an outgoing tide, from

downstream sampling locations to upstream sampling locations. The levels detected over the past five years are consistent with previous surface water analyses, and do not suggest new sources to the river, or a problem with implemented remedies. The surface water analytes are VOCs, SVOCs, PCBs, pesticides, and metals. PCBs were not detected in any of the surface water samples in 2015 or 2017. VOC detections have been demonstrating a decreasing trend in recent years, with the exception of Acrylonitrile, and SVOC results are consistent with historic results. Surface water sampling also showed a decreased but continued presence of metals, specifically arsenic.

Laboratory detection limits for PCBs and some pesticides exceeded NJDEP Surface Water Quality Standards (SWQS), however, the OU2 ROD did not develop RAOs or chemical-specific ARARs for surface water, and there is currently no exposure scenario for surface water that would adversely affect human health. Future surface water monitoring results will be compared to the NJDEP SWQS for screening purposes only, as the surface water monitoring program was implemented to evaluate migration of contaminants from Kin-Buc into the Raritan River.

Sediment and Biota Monitoring

In 2015, due to a laboratory error, EPA resampled 17 acres of marshland sediment to assist in the characterization of PCBs present in the soil/sediment in and around Edmonds Creek. The overall investigation objectives were to examine observable trends from the soil/sediment data and determine if there were any PCB source areas. The results of the investigation showed that 412 out of 414 samples had concentrations below the 5 ppm remediation goal, with a mean detected PCB concentration of 0.553 ppm for all samples collected in the ECMA – an order of magnitude below the Site cleanup value – indicating that Kin-Buc Landfill is not a continuing source of PCBs to Edmonds Creek and the associated marshland. Since the ECMA is influenced by tidal effects and flooding events imposed by the Raritan River, the fine-grained sediments are susceptible to re-suspension and re-deposition on the marsh flood. The sporadic sediment PCB concentrations greater than the remediation goal of 5 ppm are likely related to a re-deposition of sediment that is already present in the marshland, rather than a contribution from a continuing source of PCB material.

Biota monitoring data collection under the BMP was suspended in October 2008, pending further PCB sediment investigations. In 2018, based on the results of the extensive post-remedial sampling and eleven years of biota monitoring, EPA determined that no additional sampling of sediment or biota in Edmonds Creek or the ECMA was necessary.

Site Inspection

The inspection of the Site was conducted on 11/7/2018. In attendance were EPA Remedial Project Manager Brittany Hotzler, EPA Section Chief Rich Puvogel, EPA Hydrogeologist Kathryn Flynn, EPA Human Health Risk Assessor Lora Smith-Staines, EPA Ecological Risk Assessor Michael Clemetson, and representatives for the PRPs. The purpose of the inspection was to assess the protectiveness of the remedy. The landfill caps on Kin-Buc I and II and Mound B were well maintained and in good condition, with clear access roads on top and around the landfill mounds. Wells at the Site were also found to be in good condition and were locked and labeled.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

Groundwater elevation data indicates that the implementation of hydraulic source control in OU1 is being maintained and functioning as intended. Overall, an inward gradient has been established and where there are vertical gradients from the sand-and-gravel layer to the bedrock, the horizontal gradient at the bedrock locations is directed inward and toward the landfill.

Monitoring of the groundwater and surface water ensures the protectiveness of the OU1 remedy. There has been no indication of increasing contamination or sudden concentration spikes which supports the determination that the hydraulic control system is functioning as intended. At the time of the OU2 ROD, OU1 was considered sufficient to address groundwater and potential surface water contamination from the Site, since the source of groundwater contamination was considered to be contained within the slurry wall, and long-term monitoring of groundwater and surface water provided data to evaluate the remedy effectiveness. The sediment data collected from 2010 – 2015 indicated that PCBs found in the sediments do not exceed established criteria and therefore the OU2 remedy is effective.

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

Question B Summary:

Changes in Risk Assessment Methods

The OU1 and OU2 RODs were signed prior to the implementation of a majority of the Risk Assessment Guidance for Superfund used currently by EPA. However, the process that was used remains valid.

Changes in Exposure Pathways

The exposed populations and exposure pathways evaluated as part of the 1988 OU1 and 1992 OU2 RODs for the Site remain appropriate currently and for the next five years. These include: landfill worker dermal contact with groundwater and/or leachate, and dermal contact with/inhalation of vapors from Pool C, recreational contact via consumption of fish and/or dermal contact with/ingestion of surface water and sediment, dermal contact with/ingestion of surface water and sediment while swimming, and residential consumption of/dermal contact with groundwater for potable purposes. These pathways were evaluated separately for children and adults, when appropriate.

Since the landfill was capped, the dermal contact with leachate and the dermal contact with/inhalation of vapors from Pool C pathways have been interrupted. Residential dermal contact and inhalation of vapors from contaminated groundwater are not currently a concern since groundwater is not used for potable purposes below or downgradient of the landfill, and the slurry wall provides a steady inward gradient. While there remain some exceedances of NJDEP GWQS inside the slurry wall (predominantly benzene, chlorobenzene, PCBs, and arsenic), landfill worker contact with groundwater is not a concern since the area inside the slurry wall is capped. Furthermore, the inward gradient prevents groundwater outside the slurry wall from posing an unacceptable risk, and extracted groundwater is discharged directly to the

MCUA. Continued groundwater and surface water monitoring will ensure that contamination remains within the slurry wall. No additional sources of contamination or COCs have been identified since the last FYR.

Though the ROD for OU2 did not develop RAOs or chemical-specific ARARs for groundwater and surface water, it stated that "implementation of source control provided in the OU1 remedial action will be sufficient to prevent further migration of contaminants in to the environment." For data evaluation purposes, OU2 groundwater and surface water sampling results are compared to the current federal and state groundwater quality standards and surface water quality standards. While detection limits for several surface water contaminants remain above their respective NJDEP SWQS, concentrations appear to be consistent with previous sampling rounds. Further, the OU2 ROD determined the following regarding contact with surface water in the Raritan River: No current or plausible future exposure scenarios for surface water would pose a risk to human health.

A remediation goal of 5 ppm for PCBs was selected for total PCBs in sediments in the OU2 ROD. Pockets of residual PCB contamination exist in Edmonds Creek marshland sediments, as indicated in the previous FYR. EPA performed an internal statistical review of data to determine whether an upper estimate of the average (95% UCL) concentration of the PCBs present is above the cleanup goal. EPA is confident that the reasonable maximum PCB concentration which any human could be exposed in the Edmunds Creek wetlands is below the OU2 ROD cleanup goal of 5 ppm. In fact, none of the individual 2015 data points were above the 5-ppm cleanup goal.

EPA developed this cleanup goal for PCBs primarily to reduce risks to human health via ingestion of contaminated fish and to the environment via bioaccumulation of contaminants in aquatic species. Application of the 5-ppm cleanup goal to the sediments in the Edmonds Creek marsh provided for removal of PCBs that exceed the level EPA had determined to be adequately protective of resident wildlife. Removal of sediments and the natural recovery of the wetland system has resulted in the mean detected PCB sediment concentration in Edmonds Creek and the adjacent marsh, based on EPA sampling of 0.553 ppm, well below the RAO of 5 ppm. As a result, the fish ingestion pathway based on site-related contamination is no longer a concern.

Soil vapor intrusion (SVI) is evaluated when soils and/or groundwater are known or suspected to contain VOCs. One or more exceedances of benzene, chlorobenzene, chloroform, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, methylene chloride, tetrachloroethene, toluene, trichloroethene, and vinyl chloride have been reported in groundwater in the last five years; however, Kin-Buc is located in an industrial/commercial area bordered by a number of landfills, wetlands, and the Raritan River, and the nearest residences are between one and a half and two miles north of the Site. It is unlikely that the Site will be re-developed in the next five years, and the current potential for the vapor intrusion pathway remains incomplete.

Contaminants of Concern

In the OU1 ROD, eight indicator contaminants were chosen from over one hundred contaminants identified in the various media at the Site (groundwater, surface water, sediment and air). These included: benzene, chloroform, 1,1-dichloroethene, PCBs, vinyl chloride, arsenic, cadmium, and lead.

In the OU2 ROD, PCBs were identified as the primary contaminant of concern.

Additional buried drums were discovered in Mound B that were a potential source of groundwater contamination. Removal of these drums was memorialized in the 2001 ESD.

PCBs are present in the Edmonds Creek marshland sediments adjacent to the Site. The landfill appears to maintain an inward gradient (except during strong storm events); therefore, the contamination present is either residual, as a result of the Site, or originating from another source outside of the Site. Additional sediment sampling conducted from 2010-2015 showed that the Kin-Buc Landfill site is not a continuing source of PCBs to Edmonds Creek or the associated wetland area.

The predominant COCs that remain in groundwater above the NJGWQS are benzene, chlorobenzene, PCBs, and arsenic. There are few SVOC detections, some of which were not originally identified as COCs in the ROD. No additional sources of contamination or COCs have been identified since the last FYR.

Validity of the RAOs

The OU1 RAOs included controlling the lateral movement of contaminants within the refuse layer, controlling subsurface flow manifesting as surface seeps, controlling surface contamination, and controlling the migration of contaminants into the underlying aquifers with evaluation of the effectiveness of natural barriers. EPA did not develop remedial action objectives for groundwater or surface water in the OU1 ROD because the implementation of source control provided for in the OU1 remedial action, including a slurry wall and cap, was expected to be sufficient to prevent further migration of contaminants. The RAOs selected remain valid and the remedial actions outlined in the OU1 ROD have been effective at achieving them.

The 1992 OU2 ROD addressed Mound B, the Low-lying area, Edmonds Creek, Mill Brook/Martins Creek, and associated wetland portions of the Kin-Buc Landfill, and called for the excavation of approximately 2,200 cubic yards of sediments with total PCB levels above 5 ppm, disposal and containment of excavated sediment within the OU1 slurry wall and cap, active restoration of wetlands affected by the excavation of contaminated sediments, long-term monitoring of groundwater and surface water, and maintenance of the Mound B cover. These remedial activities were necessary in order to attain the remedial action objectives (RAOs) of removing sediments containing PCBs at concentrations greater than 5 ppm, by consolidating them within the OU1 containment system and restoring wetland areas impacted by the excavation of contaminated sediments.

The OU2 RAO of 5 ppm from the 1992 ROD was based on several different factors; bioavailability, biological effects data from literature, PCBs in sediment remediation goals at other Superfund sites, and minimizing wetland impacts associated with remedial activities. Although the ecological risk assessment and toxicity values used to support the 1992 ROD may not necessarily reflect the current values, the remedy prevents the landfill from being a continuing source of contamination to the Edmonds Creek. Further, the mean detected PCB concentration in sediment from the Edmonds Creek and the adjacent marsh, based on EPA sampling is 0.553 ppm, well below the RAO of 5 ppm.

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

No.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU1, OU2

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
Operable Unit: OU1	*Protectiveness Determination:* Protective	*Planned Addendum Completion Date:* N/A
Protectiveness Statement: The OU1 remedy is protective of human health and the environment.		

Protectiveness Statement(s)		
Operable Unit: OU2	*Protectiveness Determination:* Protective	*Planned Addendum Completion Date:* N/A
Protectiveness Statement: The OU2 remedy is protective of human health and the environment.		

Sitewide Protectiveness Statement	
Protectiveness Determination: Protective	*Planned Addendum Completion Date:* N/A
Protectiveness Statement: The sitewide remedies are protective of human health and the environment.	

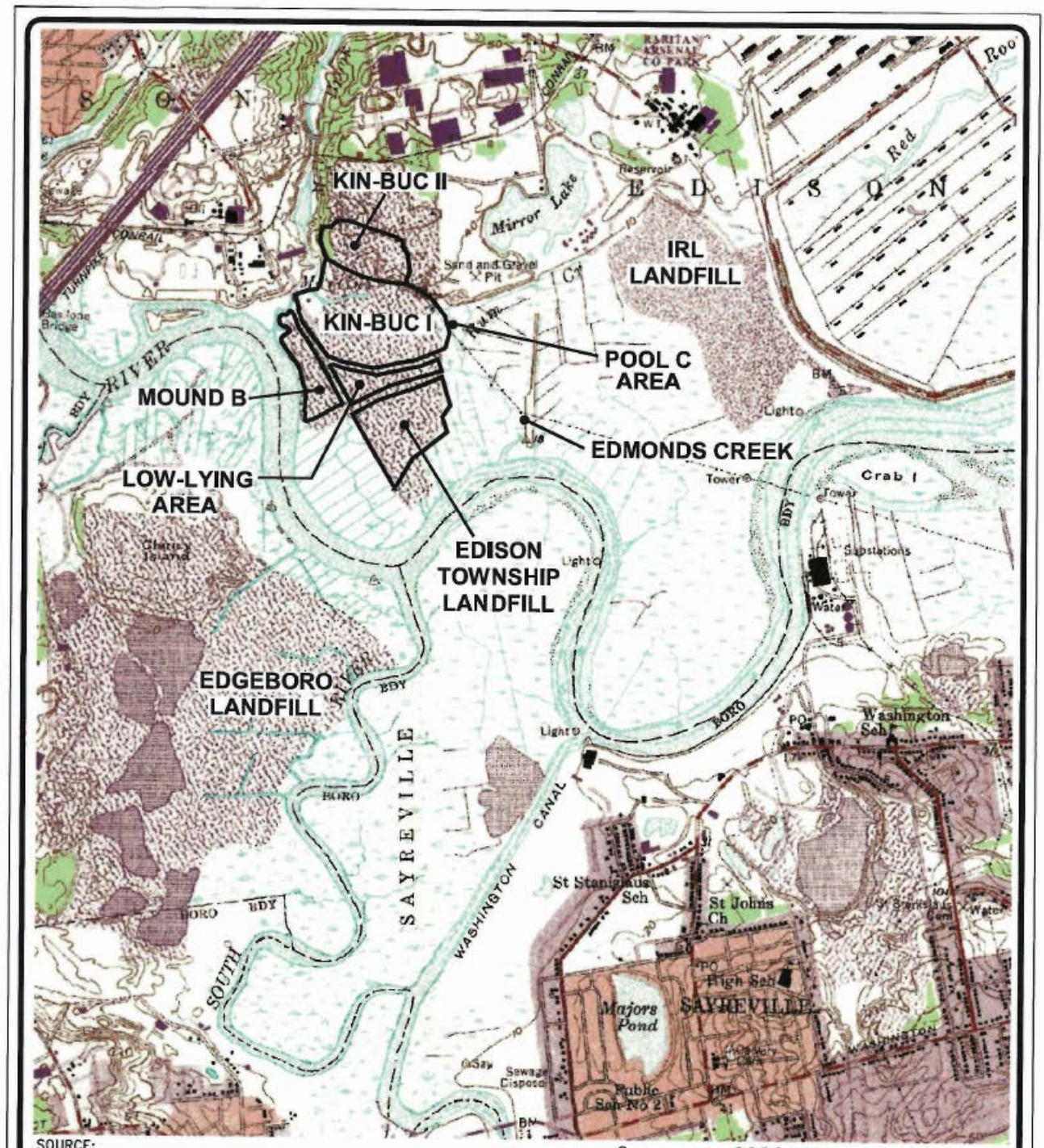
VIII. NEXT REVIEW

The next FYR report for the Kin-Buc Landfill Superfund Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Document Title, Author	Date
Five-Year Review Report, EPA	February 1999
Explanation of Significant Differences, EPA	August 2001
Five-Year Review Report, EPA	September 2004
Five-Year Review Report, EPA	September 2009
Five-Year Review Report, EPA	July 2014
Record of Decision, EPA	September 1988
Record of Decision, EPA	September 1992
2014 Annual Monitoring Report, Waste Management	March 2015
2015 Annual Monitoring Report, Waste Management	March 2016
2016 Annual Monitoring Report, Waste Management	March 2017
2017 Annual Monitoring Report, Waste Management	March 2018
Sampling Report for Kin-Buc Landfill Superfund Site, Soil/Sediment Re-Sampling Event, EPA Superfund Support Team	May 2015
Post-Remedial Sediment Conditions in the Edmonds Creek Marshland Area Report, EPA	August 2018

APPENDIX B – FIGURES



SOURCE:
SOUTH AMBOY AND SOUTH BRUNSWICK, NEW JERSEY
7.5 MINUTE QUADRANGLES (CONTOUR INTERVAL = 10 FEET)

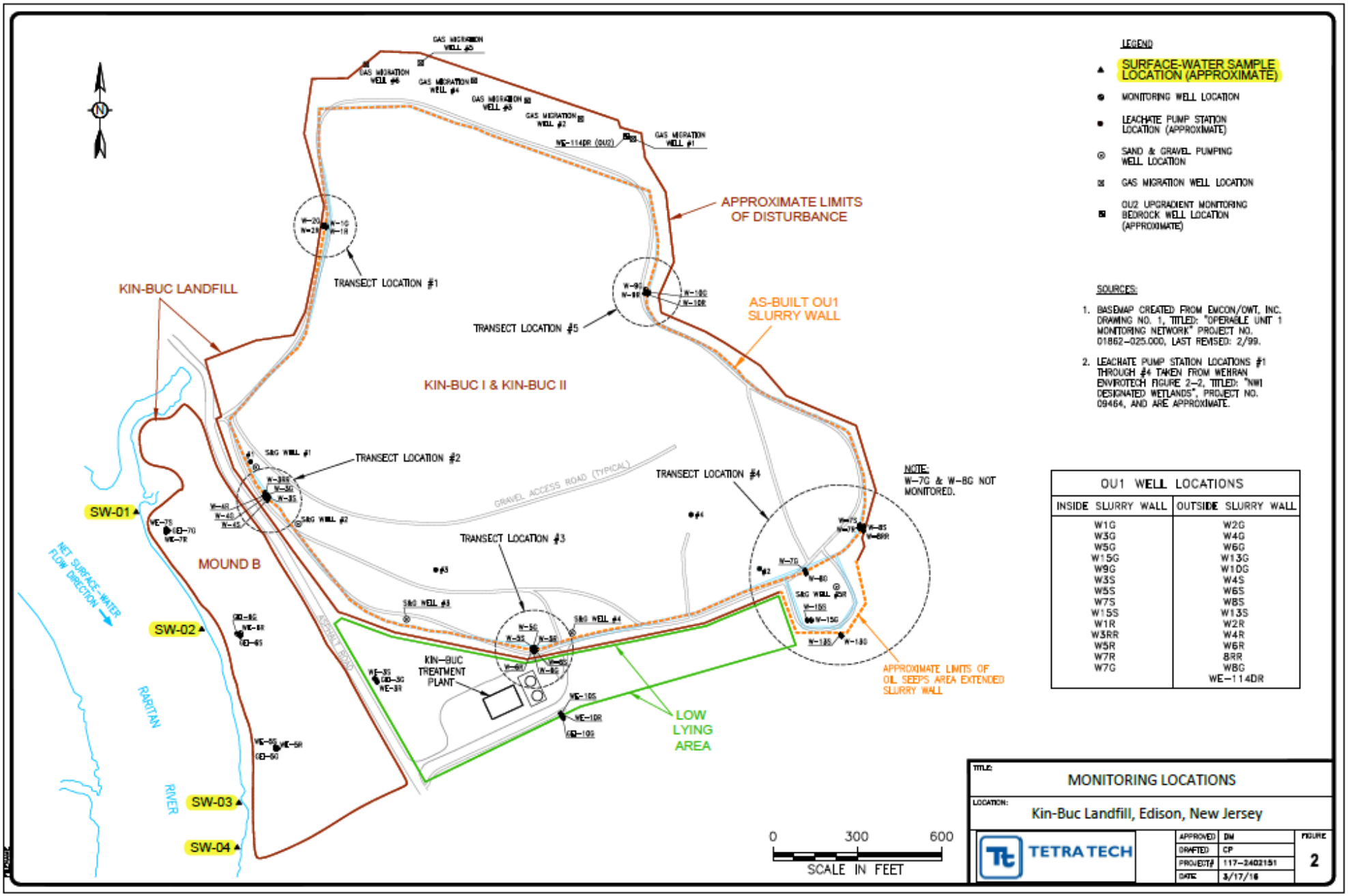
QUADRANGLE LOCATIONS

P:\AGADX 7407-061-KINBK 2402061006A.DWG

TITLE:	SITE LOCATION AND SURROUNDING AREA
LOCATION:	SC Holdings, Inc. - KIN-BUC Landfill Site Edison, New Jersey

TETRA TECH

APPROVED	DS	FIGURE
DRAFTED	CP	1
PROJECT#	117-2402061	
DATE	3-28-11	



LEGEND

- SURFACE-WATER SAMPLE LOCATION (APPROXIMATE)
- MONITORING WELL LOCATION
- LEACHATE PUMP STATION LOCATION (APPROXIMATE)
- SAND & GRAVEL PUMPING WELL LOCATION
- GAS MIGRATION WELL LOCATION
- OU2 UPGRADIENT MONITORING BEDROCK WELL LOCATION (APPROXIMATE)

SOURCES:

1. BASEMAP CREATED FROM EMCON/OWT, INC. DRAWING NO. 1, TITLED: "OPERABLE UNIT 1 MONITORING NETWORK" PROJECT NO. 01862-025.000, LAST REVISED: 2/99.
2. LEACHATE PUMP STATION LOCATIONS #1 THROUGH #4 TAKEN FROM WEHRAN ENVIROTECH FIGURE 2-2, TITLED: "NWI DESIGNATED WETLANDS", PROJECT NO. 09464, AND ARE APPROXIMATE.

NOTE:
W-7G & W-8G NOT MONITORED.

OU1 WELL LOCATIONS	
INSIDE SLURRY WALL	OUTSIDE SLURRY WALL
W1G	W2G
W3G	W4G
W5G	W6G
W15G	W13G
W9G	W10G
W3S	W4S
W5S	W6S
W7S	W8S
W15S	W13S
W1R	W2R
W3RR	W4R
W5R	W6R
W7R	8RR
W7G	W8G
	WE-114DR

TITLE: MONITORING LOCATIONS

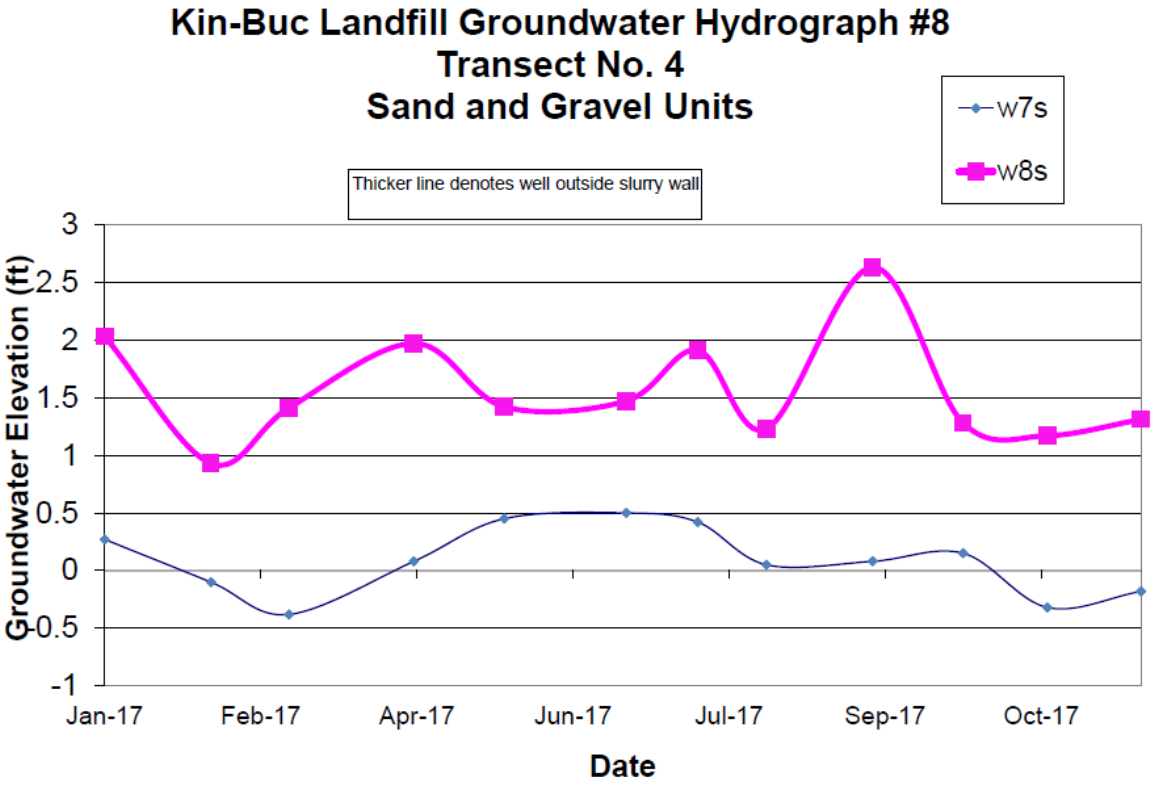
LOCATION: Kin-Buc Landfill, Edison, New Jersey

TETRA TECH

APPROVED	DM
DRAFTED	CP
PROJECT#	117-2402151
DATE	3/17/16

FIGURE 2

Figure 3
Hydrograph depicting a typical scenario where the water table outside the slurry wall is higher than the water table within the slurry wall, indicating an inward hydraulic gradient



APPENDIX C – TABLES

Table 3: Distribution of OU1 Wells Across the Site

Transect Location No.	Screened Hydrogeologic Unit	Well ID Inside Slurry Wall	Well ID Outside Slurry Wall
1	Refuse/Fill		W-2G
	Bedrock	W-1R	W-2R
2	Refuse/Fill		W-4G
	Sand and Gravel	W-3S	W-4S
	Bedrock	W-3RR	W-4R
3	Refuse/Fill		W-6G
	Sand and Gravel		W-6S
	Bedrock	W-5R	W-6R
4	Refuse/Fill	W-15G	W-13G
	Sand and Gravel		W-13S
			W-8S
	Bedrock	W-7R	W-8RR
5	Refuse/Fill		W-10G
	Bedrock	W-9R	W-10R

Table 4: Distribution of OU2 Wells Across the Site

Well ID	Screened Hydrogeologic Unit
Low-Lying Area	
GEI-3G	Refuse/Fill
WE-3S	Sand and Gravel
WE-3R	Bedrock
GEI-10G	Refuse/Fill
WE-10S	Sand and Gravel
WE-10R	Bedrock
Mound B	
GEI-5G	Refuse/Fill
WE-5S	Sand and Gravel
WE-5R	Bedrock
GEI-6G	Refuse/Fill
GEI-6S	Sand and Gravel
WE-6R	Bedrock
GEI-7G	Refuse/Fill
WE-7S	Sand and Gravel
WE-7R	Bedrock
Upgradient	
WE-114DR	Bedrock
Surface Water	
SW-01	Raritan River
SW-02	Raritan River
SW-03	Raritan River
SW-04	Raritan River