FOURTH FIVE-YEAR REVIEW REPORT FOR JIS LANDFILL SUPERFUND SITE MIDDLESEX COUNTY, NEW JERSEY

Prepared by

U.S. Environmental Protection Agency
Region 2
New York , New York

Pat Evangelista, Acting Director
Superfund and Emergency Management Division

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Date

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LIST OF ABBREVIATIONS & ACRONYMS

AO	Administrative Order
ARAR	Applicable or Relevant and Appropriate Requirement
BEE	Baseline Ecological Evaluation
CEA	Classification Exemption Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
ICs	Institutional Controls
MNA	Monitored Natural Attenuation
MW	Monitoring Well
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
OU	Operable unit
PRP	Potentially Responsible Party
RAWP	Remedial Action Work Plan
RAO	Remedial Action Objectives
ROD	Record of Decision
RPM	Remedial Project Manager
SLERA	Screening Level Ecological Risk Assessment
TBC	To be considered
TCE	Tricholoethylene
UU/UE	Unlimited Use and Unrestricted Exposure
VI	Vapor Intrusion
WRA	Well Restriction Area

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 fourth FYR for the JIS Landfill Superfund Site (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 one operable unit (OU) which will be addressed in this FYR. OU1 addresses groundwater contamination through the capping of the landfill and an active groundwater remedy.

The Site FYR was led by EPA: Ashley Similo (remedial project manager), Rachel Griffiths (hydrogeologist), Abbey States (risk assessor), Michael Clemetson (ecological risk assessor), and Lindsay Carrera (community involvement coordinator). The JIS Performing Parties Group (the JIS Group) was notified of the initiation of the FYR. The review began on June 13, 2019.

Site Background

The Site covers approximately 24 acres, which includes a 7.8 acre landfill and the former JIS facility and waste transfer operation and a downgradient plume located on Cranbury South River Road (Route 535) in South Brunswick Township, Middlesex County, New Jersey (Figure 1). The Site includes a landfill immediately east of the New Jersey Turnpike, an inactive borrow pit and a solid waste recycling facility. The north side and south side of the Site adjoin newly constructed commercial warehouses. Additional agricultural fields, a proposed warehouse, as well as residential areas of Monroe Township and the Borough of Jamesburg, are located downgradient and east of the Site.

Landfilling at the Site began in 1955. The JIS facility accepted a wide variety of chemical, municipal and industrial wastes which allegedly contained hazardous substances. According to the NJDEP, these wastes included broken battery casings, paint sludges, solvents, pesticide impregnated plastics, oil sludges, and 55-gallon drums. This activity continued until 1976, at which point the disposal of additional chemical or hazardous wastes was prohibited. Disposal of other materials continued until 1985, when the landfill was closed.

The Site is situated in the northeastern part of the New Jersey Coastal Plain. Two major aquifers underlie the Site: the Old Bridge Sand Aquifer and the underlying Farrington Sand Aquifer, which are the major sources of potable water in Middlesex County. In the area of the Site, they are separated by the Woodbridge Clay formation, which serves to limit contamination to the Old Bridge Sand Aquifer. Groundwater flows in an east-southeasterly direction. Manalapan Brook is a discharge point for shallow groundwater, while the majority of the groundwater continues to flow to the east beneath the Brook.

The Site (including the JIS property and those properties above the primary and secondary plumes) is mostly commercial and agricultural in nature, with some sparse residential population associated mostly with the secondary plume. The underlying Old Bridge Aquifer is a Class II, or potable water, aquifer. Groundwater is currently not a source of potable water in the area of the Site, as a municipal water supply is available. A commercial warehouse and a residential development have been approved for development immediately downgradient of the JIS property. The JIS property itself is currently used for operation of a biosparge treatment system that is part of the selected remedy, as discussed below. Recently, there has been some interest in developing the property for commercial use, including the construction and operation of a warehouse. Water usage for any new construction within the area above the primary and secondary plumes will be controlled through the New Jersey Department of Environmental Protection's (NJDEP's) Classification Exemption Area (CEA), which is part of the selected remedy of the 2009 Record of Decision (ROD) Amendment and was approved in May 2013.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: JIS Landfill Site		
EPA ID: NJD97400998		
Region: 2	**State:** NJ	**City/County:** South Brunswick/Middlesex County
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA ***If "Other Federal Agency" was selected above, enter Agency name*:** Click here to enter text.		
Author name (Federal or State Project Manager): Ashley Similo		
Author affiliation: EPA		
Review period: 01/12/2015-11/14/2019		
Date of site inspection: 10/24/2019		
Type of review: Statutory		
Review number: 4		
Triggering action date: 01/12/2015		
Due date *(five years after triggering action date)*: 01/12/2020		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Groundwater contamination related to the Site was first detected in 1975. Contaminants of concern (COCs) are migrating away from the JIS Landfill in a "primary" plume and a "secondary" plume. COC concentrations have historically been much higher in the primary plume. The primary plume includes contaminated groundwater which originates beneath the landfill and extends in an easterly direction approximately 5,000 feet to monitoring well MW-20. The secondary plume extends beyond MW-20. The COCs exist in a relatively narrow band of contaminated groundwater no wider than 1,000 feet in both plumes.

The following Site COCs for groundwater include antimony, benzene, chromium, 1,2-dichloroethylene, ethylbenzene, lead, methylene chloride, toluene, trichloroethylene (TCE), vinyl chloride and xylenes. The COCs for soils include arsenic, chromium, lead, 1,1,1-trichloroethane, di-n-butylphthalate, phenanthrene, pyrene, bis-2-ethylhexylphthalate, aroclor 1260, 4,4-DDE and 4,4-DDT.

The RI/FS evaluated human health and ecological risks. A human health risk assessment was conducted and evaluated the following groundwater exposure pathway: ingestion of groundwater by residents and inhalation of volatiles in the groundwater by residents using tapwater. The risk analysis indicated that the combined cancer risk for adults and children is 6.9×10^{-3}, which is above the EPA acceptable risk range. The risk was primarily driven by exposure to benzene.

A Baseline Ecological Evaluation (BEE) and a Screening Level Ecological Risk Assessment (SLERA) were performed at the Site. Both evaluations focused on the downgradient surface water discharge areas associated with the secondary plume. These evaluations concluded that there were no significant ecological effects caused by the plume's discharge to the surface water or wetland areas.

As a result of monitoring performed since the ROD, several of the contaminants identified as COCs in groundwater during the RI/FS were determined to no longer pose a concern, while additional COCs were identified and added to the list. The present accounting of COCs for groundwater for the Site is included in Table 4 of the ROD Amendment and Appendix B of this document.

Response Actions

From 1980 to 1985, JIS installed a solid waste cap over portions of the landfill. Installation of this cap did not satisfy NJDEP's requirements for Site closure, as the cap did not comply with the conditions specified in a State court order.

EPA used its removal action authority to provide bottled water to homes with impacted groundwater wells from June 1989 until February 1992, when connections to a municipal water system were completed. Since that time, the JIS Group , has connected additional homes to the municipal water supply system to prevent ingestion of contaminated groundwater from private wells.

EPA issued the ROD for the JIS Landfill on August 15, 1995. The following remedial action objectives (RAOs) were established and identified in the ROD:

Source Control

- Prevent or reduce further migration of contaminants from the landfill into the groundwater.

Groundwater

- Prevent human exposure to contaminated groundwater;
- Prevent further migration of contaminated groundwater off-Site;
- Prevent the migration of contaminated groundwater into the underlying aquifers; and
- Reduce contaminant concentrations in the Old Bridge Aquifer to levels which do not exceed applicable Federal and State water quality standards.

To address these RAOs, the ROD called for a number of remedial actions to mitigate exposures and restore the environment. The major elements of the 1995 remedy are presented below:

- provide an alternative water supply for residents with contaminated drinking water wells
- upgrade the existing landfill cap to consist of:
    - 24 inches vegetated topsoil
    - 12 inches soil drainage layer
    - 30-mil textured synthetic material layer
    - 12 inches clay with maximum 1 x 10-7 cm/sec permeability
- extract contaminated ground water from the primary plume underlying the site
- treat the contaminated ground water in a facility to be constructed on site
- dispose the treated ground water on the site by a recharge trench
- implement a ground-water monitoring program to monitor the primary and secondary plumes, and to ensure the effectiveness and protectiveness of the remedy

Additionally, the 1995 ROD stated NJDEP will place well-use restrictions on well permits to prevent the installation of new wells in the contaminated portion of the Old Bridge Aquifer and appropriate land-use restrictions will be required for the landfill.

Several of the components of the 1995-selected remedy were implemented, such as the installation of the upgraded cap in 2000, the provision of alternative water supply to affected residents, and the monitoring program for the primary and secondary plumes. As discussed in more detail below, EPA permitted the PRPs to test an alternative technology to the extraction and treatment system selected. Also, a full scale in-situ biosparge treatment system has been operating for the treatment of the primary plume since 2005. In September 2009, a ROD Amendment was signed which formally replaced the extraction and treatment system selected in the 1995 ROD with the operational biosparge system.

The 1995 ROD's RAOs were updated to specifically address the primary plume in the 2009 ROD Amendment, as follows:

- Prevent unacceptable exposure of human receptors to COCs through ingestion, direct contact or inhalation of COCs in the primary plume of groundwater; and
- Restore the Old Bridge Aquifer to groundwater conditions that are consistent with the contemplated use of the Aquifer within a reasonable period of time.

COCs and Remediation Goals can be found in Appendix B.

The 2009 ROD Amendment changed the major elements of the remedy for the primary plume. The extraction and treatment system selected in the 1995 ROD has been superseded by the following remedial actions:

- Continued operation of the biosparge treatment system, consisting of the injection of oxygen/air directly into the groundwater allowing natural microorganisms to biodegrade the COCs by creating an aerobic treatment zone in the near-field portion of the primary plume;
- Monitored natural attenuation (MNA) of the far-field portion of the primary plume;
- A long-term groundwater monitoring program, with both hydraulic and water quality monitoring, to continue to evaluate the effectiveness of remedial actions in restoring groundwater quality;
- Institutional Controls to restrict contaminated groundwater usage, as well as a recommended strategy for addressing the potential for soil vapor intrusion in new construction.

Based upon the monitoring data collected for the secondary plume, the ROD Amendment made no changes to this part of the 1995 ROD.

Status of Implementation

As noted above, connection to the municipal water supply was provided to affected/potentially affected residences. This work was initially performed between 1989 and 1992, before the ROD was signed, although, in 2003/2004, a few other homes further downgradient of the Site that were threatened by the groundwater contamination were connected to the water supply after the ROD was signed. From August 1999 to June 2000, the JIS Group performed a small-scale biosparging pilot study at the Site to evaluate its potential effectiveness for remediating groundwater contamination at the Site. Design of the 1995 ROD's extraction and treatment remedy moved forward at the same time and was completed in March 2002.

Design of the cap augmentation was completed in early 2000 to upgrade the existing cap to meet New Jersey standards. The main construction effort, including the installation of the perimeter fence, was completed in the fall of 2000. However, the surface water control aspects of the design, including surface water collection and discharge systems, were not fully implemented until late in 2004. In January 2005, the construction effort was certified as complete.

At the request of the JIS Group, implementation of the extraction and treatment design was then delayed to allow for a full-scale biosparge pilot study, as directed in the 2004 AO. The full-scale pilot began operation in April 2005. Subsequent monitoring studies showed that COC concentrations in the near-field primary plume were decreasing, and, as a result, the extraction and treatment remedy was changed to the application of full-scale biosparge technology in the 2009 ROD Amendment.

The ROD also indicated that the far-field portion of the primary plume, as well as the secondary plume, would be monitored to determine the effectiveness of natural attenuation processes. Since 1998, regular groundwater monitoring events have been performed which provide water quality data on and around the Site, including throughout the primary and secondary plumes. Additional monitoring wells were installed to determine the limits of the secondary plume. Existing data from this monitoring well network suggests that, as a whole, concentrations of the most significant COCs have declined in both the far-field portion of the primary plume as well as the secondary plume.

In September 2010, EPA approved the JIS Group's Remedial Action Work Plan (RAWP) for continued O&M of the Site remedies. The RAWP addresses all remaining remedial activities, including O&M of the biosparge treatment facility, groundwater monitoring, and the institutional control measures that were discussed in the ROD and ROD Amendment.

All of the remedial actions for the Site have been constructed and implemented in compliance with the 1995 ROD and the 2009 ROD Amendment. EPA has determined that no further remedial action is necessary other than long-term operation of the biosparge treatment system and monitoring of natural attenuation in groundwater. The JIS Group continues to perform operation and maintenance of the biosparge treatment plant and to conduct groundwater monitoring.

IC Summary Table

Table 2: 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	Yes	JIS Landfill Property and downgradient plume	Restrict contaminated groundwater usage	- Deed Notice for JIS Property (July 2012, rev. June 2017) - Classification Exemption Area and Well Restriction Area (May 2013, updated biennially)
Soil Vapor	Yes	Yes	JIS Property and downgradient plume	A strategy for addressing the potential for soil vapor intrusion in new construction	- Vapor Intrusion Sampling Plan (August 2011) - Letter to local officials (2011, 2017)
Land Use	Yes	Yes	JIS Property	Restrict land use on the property to remain non-residential	- Deed Notice for JIS Property (July 2012, rev. June 2017)

Systems Operations/Operation & Maintenance

The primary activities described in the RAWP include: continued operation of the in-situ biosparge treatment system; monitoring the effectiveness of the biosparge treatment system; monitoring the effectiveness of natural attenuation in the far-field primary and secondary plume areas downgradient of the biosparge system; inspection and maintenance of the landfill cap and other on-Site control measures, including deed restrictions; and development of institutional controls to protect property owners on and adjacent to the Site and the Site's groundwater plume until such time as they are no longer needed. A VI Sampling Plan was also developed and is included in the O&M of the remedy.

Based on the analytical data collected in recent years, the JIS Group prepared a Work Plan proposing some modifications to the groundwater monitoring program in 2014 (August 5 and September 16). The USEPA approved the Work Plan on October 30, 2014. To the extent possible, the modifications were completed in 2015. The modifications are summarized as follows:

- Closure of the following 50 wells:
  - MW-1 S&D MW-6 S&D MW-9
  - MW-14 S&D MW-19 S&I MW-24 S,I&D
  - MW-26 S,I&D MW-28 S,I&D MW-29
  - MW-33 S,I&D MW-35 MW-36
  - MW-39 S MW-40 S&D MW-53 S, I&D
  - MW-56 S,I-1,I-2&D MW-62 S&D MW-64 S&D
  - MP-1 MP-2 MP-3
  - MP-4 RT-3 B-3
  - B-4 PZ-1 PZ-2
  - PZ-3 PZ-4 OIW-5D
- Wells B-3, B-4, PZ-1, PZ-2, PZ-3, and PZ-4 were not listed for closure in the original Work Plan but were encountered during the field work for the closure of the listed wells. These wells were installed in 2000 as part of the pump & treat remedy evaluation and no longer serve any function and therefore were closed. Similarly wells MP-1, MP-2, MP-3, MP-4, and OIW-5D were initially installed as part of the biosparge pilot study but are no longer in use. Therefore, they were also closed. It was planned to close wells MW-37, MW-38, and MW-39 D but these three wells could not be located in the field and therefore were not closed.
- Installation of a replacement well nest at the location of MW-53. The existing wells at MW-53 had blockages that prevented monitoring devices from being installed into the wells. So the original wells were closed and a replacement set was installed.

The biosparge groundwater monitoring program consists of the collection and analysis of groundwater samples from 45 monitoring wells (MW-42 through MW-55 and MP-6) that were installed along the alignment of the biosparge system. The wells are grouped into fifteen well nests with each well nest including a shallow, intermediate, and deep screened interval. The wells in the core of the JIS plume (located between wells MW-53 and MP-6) are now sampled semi-annually, whereas the remainder of the wells in the biosparge monitoring network are sampled annually. The samples from the wells that are on the annual cycle are collected in March/April of each year to coincide with the timing of the biennial sampling of the downgradient plume that is used for the CEA certification. All of the wells in the biosparge monitoring program are sampled for VOCs (including 1,4-dichlorobenzene and 1,2,4-trichlorobenzene), arsenic, and manganese.

In 2015, the following program changes were implemented to expand the monitoring network for the biosparge injection system:

- The installation of three new sentry wells located approximately 100 feet upgradient of the injection system; and
- The conversion of the two large diameter pumping wells (PW-1 and PW-2) each into two specific wells monitoring different zones within the aquifer.

The three new sentry well clusters (shallow, intermediate, and deep) (MW-68, MW-69, and MW-70) were intended to straddle the path of the known central axis of the plume emanating from the landfill, as previously defined by wells MW-5 and MP-6, and were to be sampled semi-annually for two years to provide insight into the concentration of chemicals approaching the biosparge injection system. The groundwater samples collected from these wells confirm that the primary flow path of the plume follows from the shallow well at MW-5, through the shallow zone at the location of MW-69 and the intermediate zone at MW-70 and then continues downgradient toward MP-6. Consistent with recommendations set forth in the 2012/2013 Annual Report, samples were also collected from wells MW 21I & D and MW 61D in 2015 to monitor water quality in these areas. The data from these additional wells were used to determine the extent of chemical presence to recertify the CEA in 2015.

In 2015, two modifications were initiated to the groundwater monitoring program and were subsequently implemented in 2016. In accordance with the September 16, 2014 letter specifying the details of the groundwater monitoring program and approval by the USEPA on November 17, 2015 , the frequency of groundwater monitoring was reduced as follows:

- The groundwater monitoring wells along the central axis (MP-6, MW-53, MW-44, MW-49, MW-50) of the primary flow path of the plume emanating from the landfill have had their sampling frequency reduced from quarterly to semi-annually. All other groundwater monitoring wells in the biosparge monitoring well network, outside of the primary flow path of the plume have had their sampling frequency reduced from semi-annually to annually.
- The wells monitoring the downgradient portion of the plume beyond the Site property boundary areas have had their sampling frequency changed from annually to biennially beginning in 2015.
- Three sentry wells (MW-68, MW-69, and MW-70) were installed in 2015 and two former pump test wells were also converted into monitoring wells (PW-1 and PW-2). These wells were sampled semi-annually in 2016, completing the second of the two year program of semi-annual sampling for these wells previously agreed to with the USEPA.

Further proposed changes to the groundwater monitoring program for the Site are pending. These include the following:

- The JIS Group has been in communication with Lennar regarding the development of the former Dallenbach property on the east side of Cranbury South River Road in Monroe Township. Several wells have already been abandoned on this property in accordance with prior discussions with EPA, and as set forth in prior Annual Reports. The developer has requested that additional wells be abandoned/relocated based on the planned development.
- The JIS Group is aware of a plan to develop another property located to the east of the JIS Site, immediately east of Cranbury South River Road in Monroe Township. The property was recently purchased by a developer, the KRE Group. KRE Group has obtained site plan approval from the Township for the development of a warehouse that will be built in an area where some groundwater monitoring wells are currently located. The need to abandon and re-locate some of the wells on this property was previously communicated to EPA. The development plans have been updated and the JIS Group has discussed with KRE, the potential closure, replacement, or re-location of some of these wells.
- On January 31, 2019, the JIS Group submitted a Well Abandonment Relocation Plan for approval to the USEPA. This plan covers monitoring wells for the properties noted above, as well as additional wells that may need to be abandoned and re-located due to the widening of Cranbury South River Road. The road widening potentially impacts the KRE property and the

property currently owned by Next Generation TS FBO Robert H. Goodman. The wells impacted by the development will be decommissioned in accordance with NJDEP regulations and the replacement or relocation of these wells will be performed after the development implementation. Well abandonments/relocations began in early 2019.

Annual assessments for the potential for vapor intrusion in accordance with the 2011 "Vapor Intrusion Sampling Plan" at any nearby structures has been conducted at the Site. Sampling was conducted at a nearby residence until 2012, when the structure was demolished; sampling was also conducted at the JIS office building. Sampling has not shown elevated indoor air concentrations at the JIS office building on the JIS Property. Sampling of the sub-slab conditions at the residence/autobody shop located at the intersection of Cranbury South River Road and Docks Corner Road has been requested annually, however, access was not, and has not been granted to this facility. No new homes have been constructed in the area of the plume during the reporting period. The potential for vapor intrusion at existing and any newly constructed structures in the future will be continue to be evaluated annually. Also, development plans for two properties in the vicinity of the remaining shallow groundwater plume will incorporate passive vapor systems and vapor barriers.

Other Site changes include transfer of ownership of the Property. In 2014, the JIS Group filed suit against JIS Co. and its principals to enforce a judicially approved settlement agreement requiring JIS Co. to transfer ownership of the JIS property to the JIS Group's designee, *de maximis, inc*. In 2016, the Court ordered that title in the property be transferred to *de maximis, inc*. Title to the property is now in *de maximis'* name, and JIS Co. is no longer in possession of the property. The trial court's judgment requiring that the property be transferred to *de maximis, inc.* was recently affirmed by the Appellate Division of the Superior Court of New Jersey on February 1, 2018. Additionally, on June 12, 2017, the JIS Group recorded a revised Deed Notice with the Clerk's Office which restricts development of the entire Site, rather than just the western landfill portion of the Site.

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 change in the region and near the Site.

III. PROGRESS SINCE THE LAST REVIEW

Table 3: Protectiveness Determinations/Statements from the 2015 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The remedy at OU1 is protective of human health and the environment.
Sitewide	Protective	The remedy at OU1 is protective of human health and the environment.

There were no issues that required recommendations and follow-up actions identified during the previous FYR.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On October 1, 2019, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 43 Superfund sites in New York, New Jersey and Puerto Rico, including the JIS Landfill site. The announcement can be found at the following web address: https://www.epa.gov/aboutepa/fiscal-year-2020-five-year-reviews. In addition to this notification, a public notice was made available by a posting to the township website, https://www.southbrunswicknj.gov, on 11/1/19 stating that there was a FYR and inviting the public to submit any comments to the U.S. EPA. The township also posted the public notice on the bulletin board in the Municipal Building. The results of the review and the report will be made available at the Site information repository located at the U.S. EPA Records Center, 290 Broadway, 18th floor, New York, New York and at https://www.epa.gov/superfund/jis-landfill.

No interviews were conducted during the FYR process.

Data Review

Figure 1 shows the location of the JIS landfill, monitoring wells, and an aerial view of the contaminant plume based on most recent sampling events in all three aquifer intervals. The contaminant plume from the JIS Landfill is primarily composed of benzene and is limited to a relatively narrow band emanating in the area of MW-5 and moving downgradient between on-Site wells MW-53 and MP-6. The biosparge injection system is located immediately downgradient of MW-53 and MP-6 and it provides treatment of the groundwater before it migrates downgradient of the property boundary.

Contaminant concentrations in groundwater have been regularly monitored since the ROD was issued in 1995. In general, both contaminant concentrations and extent have continued to decrease during the past five years, as they have since the closure of the landfill and installation of the modified RCRA cap in 2000. In accordance with a 2009 ROD Amendment and 2010 approved RAWP, a biosparging system and biosparge monitoring program was implemented. In addition, there is a biennial groundwater monitoring program that consists of the collection and analysis of groundwater samples from wells in the JIS plume downgradient of the Site to delineate the extent of the plume and to inform the extent of the CEA. The groundwater samples collected for the biennial plume program are analyzed for VOCs, arsenic, and manganese. Arsenic levels in the shallow, intermediate and deep groundwater samples have occasional detections exceeding MCLs/NJGWQSs; however, there is some uncertainty as to whether the source is Site-related or due to the natural occurrence of this mineral in the soils in the region. The biosparging (oxygen enhancement) treatment of groundwater from the JIS Landfill Site also reduces the arsenic levels. Manganese concentrations in groundwater also exceed MCLs/NJGWQSs, but are at levels that do not present a risk to human health. Sampling of wells for both arsenic and manganese will continue in accordance with the monitoring plan.

As of the October 2018 sampling event, benzene in excess of its NJGWQS of 1 microgram per liter (ug/L) in the shallow aquifer was limited to the JIS landfill source area and primary plume. The highest benzene concentrations of 810 ug/L was detected at MW-5 and rapidly decreased to 2.5 ug/L at MW-7 approximately 200 feet downgradient of the property boundary and biosparge system as shown on Figure 1. As the JIS plume migrates downgradient from the landfill, it also attenuates and migrates vertically toward the bottom of the aquifer which is on the order of 100 feet below the ground surface.

Both the intermediate and deep aquifer zones have a primary plume of VOCs above NJGWQS on the JIS property, and two secondary plumes beginning 2,500 ft downgradient as shown on Figure 1. The highest benzene concentrations in both zones as of October 2018 are located on the JIS property at MP-9 in the intermediate zone (180 ug/L) and MW-70 in the deep zone (22 ug/L). Downgradient of the property, concentrations of VOCs in both zones include TCE (maximum concentration of 7 ug/L at intermediate well MW-21 in March 2017) and benzene (maximum concentration of 2 ug/L at deep well MW-30 in March 2017) which marginally exceed their NJGWQS of 1 ug/L each. With few exceptions, the biosparge system has been effectively treating the contaminant plume emanating from the landfill and preventing further migration offsite, while the downgradient plume extent continues to decrease in both size and concentration as shown on the biosparge trends in Figure 2. Expectations are that the concentrations of VOCs will continue to decline as a result of continued operation of the biosparging system and will continue to be monitored.

1,4-dioxane is not considered a COC at the Site but it has been sampled for in a limited number of vapor points most recently in 2017 and 2018. The only detection in the vapor was in MW-65V at 37J µg/L in 2017. Additionally, in 2000, 1,4-dioxane was sampled for in four soil samples on the property, all of which were non-detect.

An investigation was performed in 2018 after the observation of sporadic increases in benzene concentrations at MW-5. Though the groundwater migrating from MW-5 is being treated by the biosparge system, the location itself is outside of the landfill cap and the focus of the effort was to determine if additional source material was present outside the cap. Soil borings and temporary monitoring wells were installed in the vicinity of MW-5 and several soil and groundwater samples were collected and analyzed. The results of the investigation indicate that there is not additional source material near MW-5, but rather the sporadic spikes of contamination could be attributed to variable groundwater flow paths from the upgradient landfill source. Benzene concentrations at MW-5 continue to be monitored on a semi-annual basis, and groundwater migrating downgradient from the area is being treated as intended by the biosparge system.

Another investigation was performed in 2017 and 2018 in response to elevated concentrations of TCE on the JIS property. Historically, TCE concentrations remained below 5 ug/L but the October 2015 sampling event included results of 43 ug/L in MW-5, 160 ug/L in MP-6D, and 210 ug/L in MW-69I. The results of additional sampling and investigation yielded concentrations that were orders of magnitude lower by 2017 (maximum TCE concentration of 4 ug/L at MP-6I) and continued to decrease in the 2018 sampling event. The conclusion was that a slug of TCE migrated and attenuated along the downgradient plume axis. However, during the August 2018 MW-5 investigation, TCE was detected outside of the capped landfill at TWSP-3 at a concentration of 14,000 ug/L which represents possible DNAPL concentrations. Therefore, this area should be further investigated. Meanwhile, TCE concentrations continue to be monitored and contaminated groundwater migrating downgradient from the landfill area is being treated by the biosparge system.

Site Inspection

The inspection of the Site was conducted on 10/24/2019. In attendance were Ashley Similo and Abbey States (EPA), Erica Bergman, David Morrow and Aysia Gandy (NJDEP), Irv Freilich (PRP Group Counsel) and John Garges and Brian Faulke (GHD). The purpose of the inspection was to assess the protectiveness of the remedy.

No issues were observed during the site inspection. The site's engineering control, a chain link fence, protects the property and is in apparent good repair. The landfill cap was observed to be in good condition. The biosparge treatment facility appeared to be well maintained, in sound structural condition, and operational. The materials handling operations previously occurring at the property have ceased. A large commercial warehouse is under construction on the property adjacent to the site, in the area of the downgradient plume. The RP Group noted that there has been interest in the JIS Property for sale and future development. Prospective purchasers should be aware of the restrictions set forward in the Deed Notice.

V. TECHNICAL ASSESSMENT

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

The remedy is functioning as intended by the ROD and ROD amendment. The source control remedy selected in the 1995 ROD consisted of upgrading the existing landfill cap, an extraction and treatment system to remediate the portion of the groundwater plume closer to the landfill, and monitored natural attenuation for the secondary plume. The 2009 ROD amendment formally replaced the extraction and treatment system selected in the 1995 ROD with the in-situ biosparge system operating at the Site.

The biosparge treatment system, in combination with monitoring and natural attenuation, is expected to restore the groundwater to federal and state standards. The remedy continues to prevent direct contact with the contaminated groundwater and soils and inhibit the spread of contamination throughout the groundwater. All groundwater sampling points downgradient of the biosparge injection points with COCs above MCLs display a general decreasing trend during the FYR period. All samples containing the maximum COCs measured during the FYR period were collected upgradient of the treatment system. The contaminants of concern in groundwater and respective cleanup goals are shown in Table 1.

Based on the review of the recent groundwater monitoring data, the only exceedances in the shallow groundwater are within 200 feet of the Site. The shallow groundwater discharges into the Manalapan Brook which is approximately two miles east of the Site. Therefore, the remedy is functioning as intended for ecological purposes.

Institutional controls restricting future use of the Site were implemented in 2013 in the form of a CEA/Well Restriction Area (WRA) filed with the Middlesex County Registry which will be biannually certified by NJDEP. The September 2010 RAWP outlines institutional controls in place to ensure sufficient notification of future property owners within the shallow groundwater plume to address the potential for vapors to impact new homes constructed over the plume. Follwing the Site's Vapor Intrusion Sampling Plan, the potential for vapor intrusion at structures located within 100 ft of shallow groundwater contamination exceeding NJGSWLs is assessed annually. Also, in letters dated May 22, 2017 and June 8, 2017, EPA notified the township of potential vapor intrusion concerns for any structures to be built above or near the plume. The letter recommended that future structures located in the area of groundwater contamination be built with a vapor barrier or vapor intrusion mitigation system. Additionally, a revised site-wide Deed Notice was placed on the entire JIS Landfill Property in 2017.

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?

There are no changes in the physical conditions of the site or site uses that would affect the protectiveness of the selected remedy. The land use considerations and potential exposure pathways considered in the baseline human health risk assessment are still valid. The exposure assumptions and the toxicity values that were used during the risk assessments to support the 1995 ROD and 2009 ROD Amendment followed EPA guidance at the time and are still valid. Although specific parameters and toxicity values may have changed since that time, the risk assessment process that was used is still consistent with current practice and the need to implement a remedial action remains valid. Toxicity data for methylene chloride, TCE, and tetrachloroethylene have been updated since the time of remedy selection. The new RfDs and associated screening values do not impact the remedy selection or cleanup levels, and the process that was used in the human health risk assessment for the site is still valid.

Remedial action objectives of preventing human exposure to contaminated groundwater, preventing contaminant migration, and reducing contaminant concentrations in the Old Bridge Aquifer to below applicable federal and state standards remain valid. Several VOCs in groundwater, as well as arsenic and manganese, exceed NJGWQS both in the source area and downgradient of the treatment system. Since there are no wells in the contaminated area, there is no human exposure through the direct contact pathway. A Deed Notice and CEA/WRA are currently in place to restrict future use of site groundwater; therefore, the remedy is protective even though groundwater continues to exceed drinking water standards.

The indirect exposure pathway for groundwater was evaluated through indoor air sampling of the JIS building and screening of shallow groundwater results. Access was requested for the adjacent residence/autobody shop south of the JIS property during the review period, but, the property owner was not responsive to the JIS Group's request. However, indoor air and ambient samples were collected annually at the JIS property. Indoor air results for site COCs did not exceed EPA's residential vapor intrusion screening levels (VISLs) set at a cancer risk of 10^{-6} and a hazard of 1. The JIS building was demolished following the 2018 sampling event. Access should continue to be attempted for the neighboring property during the next FYR period. Shallow groundwater samples taken from the JIS property during this FYR period continue to exceed residential VISLs set at a cancer risk of 10^{-4} and hazard of 1 for benzene, 1,4-dichlorobenzene, TCE, chlorobenzene, ethylbenzene, xylenes, and vinyl chloride. VOC exceedances were also detected in shallow groundwater immediately downgradient of the JIS property and source area, with a maximum total VOC concentration of 181 µg/L at MW-7S.

As noted in previous FYRs, contamination gets deeper as it travels further downgradient, therefore vapor intrusion is not a concern over the secondary plume as vapors are not expected to migrate through clean water and into nearby homes. However, there is residential development planned adjacent to the lateral area of the plume. As noted above, in 2017, EPA sent letters to the mayor of the township expressing concerns for the potential for vapor intrusion at any structures to be built above or near the plume. The letter recommended that future structures located in the area of groundwater contamination be built with a vapor barrier or vapor intrusion mitigation system. Current development plans for properties in the vicinity of the remaining shallow groundwater plume incorporate passive vapor systems and vapor barriers. Additionally, as stated in the VI sampling plan, groundwater, particularly the shallow interval near the landfill source area, must continue to be carefully monitored to ensure that contamination in the shallow groundwater is not posing a vapor intrusion concern.

Although the ecological risk assessment screening and toxicity values used to support the 1995 ROD may not necessarily reflect the current values, the landfill cap eliminates any potential risk from surface soil contaminants to terrestrial receptors. As noted in the ROD and ROD Amendment, sediment and surface water samples collected from the Manalapan Brook did not contain any measurable contamination. Additionally, a Screening Level Ecological Risk Assessment (SLERA) was conducted in 2009 for downgradient surface water discharge areas associated with the secondary plume. The SLERA concluded that there are no significant ecological effects in these discharge areas. Consequently, the exposure assumptions remain appropriate and thus the remedy remains protective of ecological resources.

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

Based on the evaluation of the potential human exposures at the site there is no new information that could call into question the protectiveness of this remedy.

VI. ISSUES/RECOMMENDATIONS

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

OTHER FINDINGS

In addition, the following recommendation was identified during the FYR and may improve performance of the remedy and accelerate site close out but does not affect current and/or future protectiveness:

- Concentrations of TCE (14,000 ug/L) identified in August 2018 at TWSP-3 outside the capped landfill represent DNAPL concentrations and a potential source area. Although contaminated groundwater is being addressed by the downgradient biosparge treatment system, it is recommended that the JIS Group further investigate this area to determine if possible alternative active remedies (i.e., in-situ) to augment groundwater remediation in this localized area is warranted.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
Operable Unit: 1	*Protectiveness Determination:* Protective	*Planned Addendum Completion Date:* N/A
Protectiveness Statement: The remedy at OU1 is protective of human health and the environment.		

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

VIII. NEXT REVIEW

The next FYR report for the JIS Landfill Superfund site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Administrative Consent Order with NJDEP	June 1987
Administrative Order of Consent addenda	December 1989, October 1991, June 1997
Remedial Investigation / Risk Assessment for the JIS Landfill	July 1992
Record of Decision for the JIS Landfill	August 1995
Landfill Cap Design and the Operation and Maintenance Plan	September 1999
Detailed Report	November 2000
Administrative Consent Order	August 2004
Chemical Concentration Trends Report	May 2005
Remedial Investigation Addendum, Secondary Plume Area	July 2009
Record of Decision Amendment	September 2009
Preliminary Close Out Report	September 2009
Remedial Action Work Plan	September 2010
Unilateral Administrative Order	September 2010
Annual reports from GHD	2014-2019
Annual Vapor Intrusion Reports	2014-2019
Results of Landfill Liner and MW-5 Soil Boring Investigations Memo	October 2018

Appendix B: COC's and Remediation Goals

Parameter	Groundwater Criteria[1] (ppb)
Volatile Organic Compounds	
1,3-dichlorobenzene	600
1,1-dichloroethane	50
1,2-dichlorobenzene	600
1,1,1-trichloroethane	30
4-methyl-2-pentanone	100
1,1-dichloroethene	1
Ethylbenzene	700
Acetone	6,000
1,4-dichlorobenzene	75
Vinyl chloride	1
Trans-1,2-dichloroethene	100
Chloroform	70
1,2-dichloroethane	2
Xylene (total)	1,000
1,1,2,2-tetrachloroethane	1
Cis-1,2-dichloroethene	70
1,2-dichloropropane	1
Tetrachloroethene	1
Methylene chloride	3
Toluene	600
Chlorobenzene	50
Trichloroethene	1
Benzene	1
Semi-Volatile Organic Compounds	
Nitrobenzene	6
1,2,4-trichlorobenzene	9
Metals	
Barium	2,000
Barium, dissolved	200
Chromium, dissolved	70
Copper	1,300
Copper, dissolved	1,300
Nickel	100
Nickel, dissolved	100
Zinc	2,000
Zinc, dissolved	2,000
Antimony, dissolved	6
Chromium (total)	70

Lead, dissolved	5
Antimony	6
Cadmium, dissolved	4
Cadmium	4
Lead	5
Arsenic, dissolved	3
Arsenic	3
Manganese, dissolved	50
Manganese	50

[1] Groundwater cleanup criteria is the lower value of the NJGWQS or USEPA MCL.

Figure 1

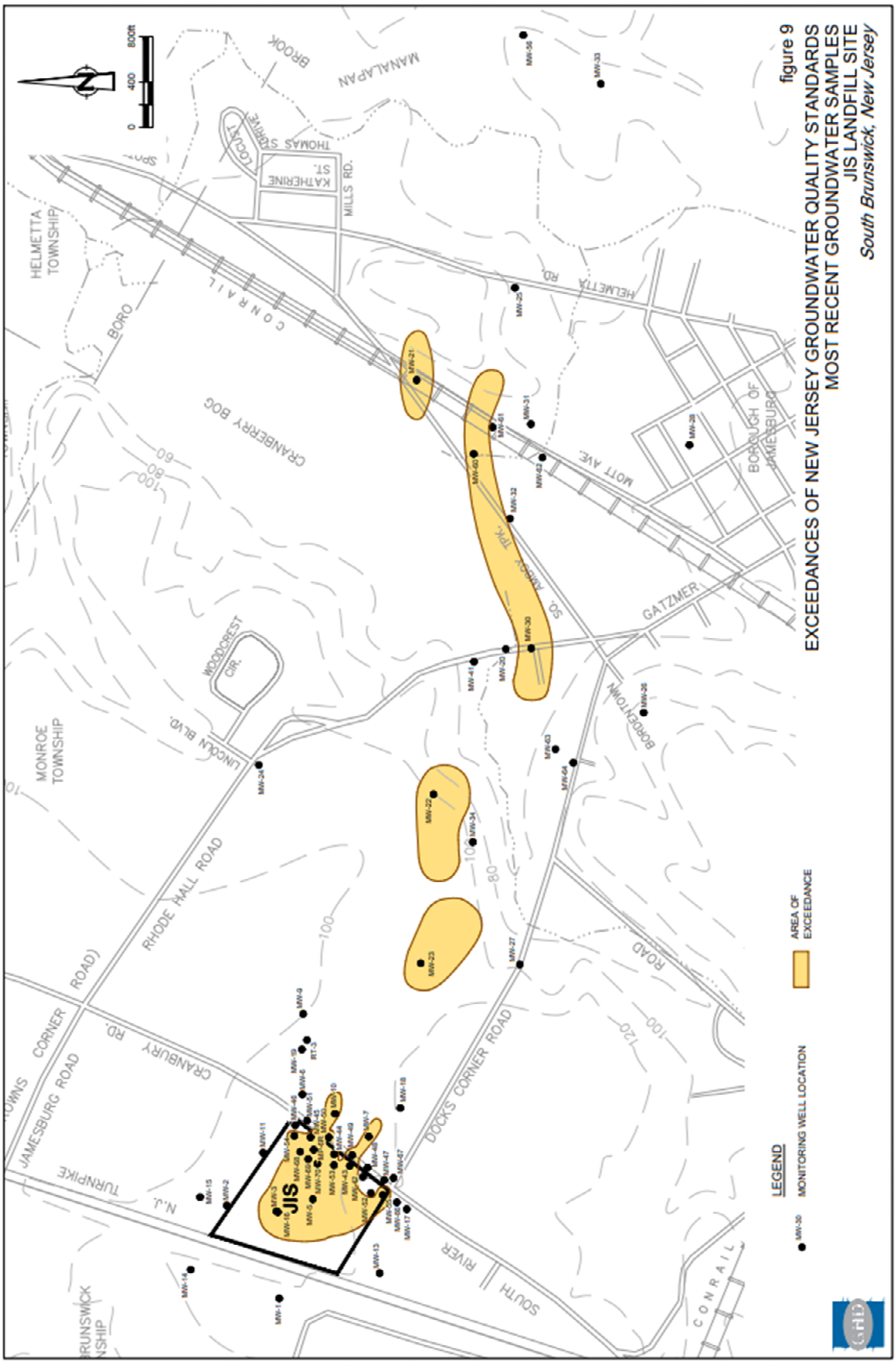
figure 9
EXCEEDANCES OF NEW JERSEY GROUNDWATER QUALITY STANDARDS
MOST RECENT GROUNDWATER SAMPLES
JIS LANDFILL SITE
South Brunswick, New Jersey
LEGEND
MONITORING WELL LOCATION
AREA OF EXCEEDANCE
JIS
N
0
400
800ft
HELMETTA TOWNSHIP
MONROE TOWNSHIP
BOROUGH OF JAMESBURG
RHODE HALL ROAD
JAMESBURG ROAD
DOCKS CORNER ROAD
GATZMER ROAD
MOTT AVE.
HELMETTA RD.
MILLS RD.
CRANBERRY BOG
CONRAIL
SOUTH RIVER
N.J. TURNPIKE
LINCOLN BLVD.
WOODCREST CIR.
THOMAS STREAM
KATHERINE ST.
BROOK
MANALAPAN

Figure 2

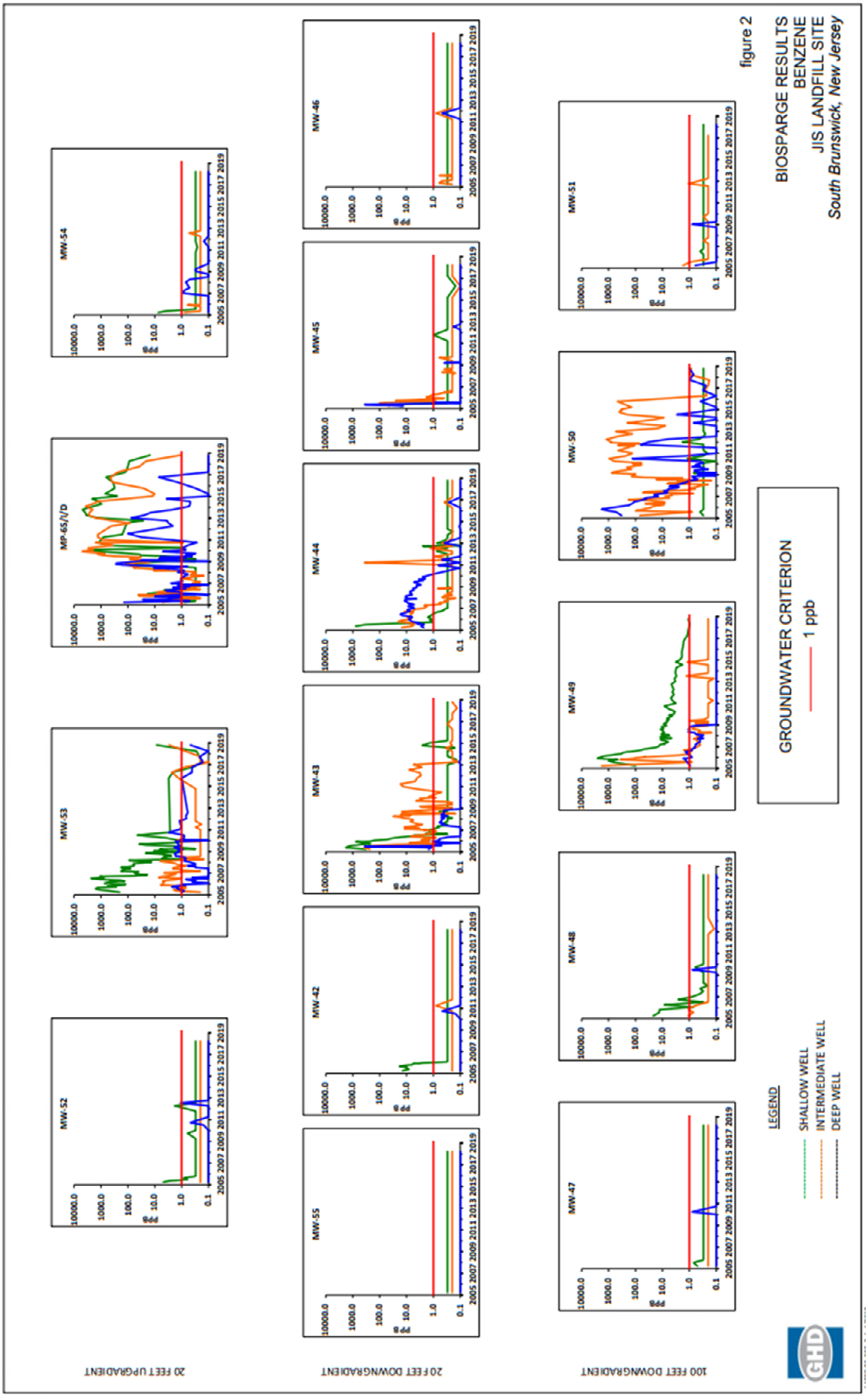
figure 2
BIOSPARGE RESULTS
BENZENE
JIS LANDFILL SITE
South Brunswick, New Jersey
GROUNDWATER CRITERION
1 ppb
LEGEND
SHALLOW WELL
INTERMEDIATE WELL
DEEP WELL
20 FEET UPGRADIENT
20 FEET DOWNGRADIENT
100 FEET DOWNGRADIENT
MW-52
MW-53
MW-54
MP-6S/I/D
MW-55
MW-42
MW-43
MW-44
MW-45
MW-46
MW-47
MW-48
MW-49
MW-50
MW-51
ppb
2005 2007 2009 2011 2013 2015 2017 2019