THIRD FIVE-YEAR REVIEW REPORT FOR YEOMAN CREEK LANDFILL SUPERFUND SITE LAKE COUNTY, ILLINOIS

Prepared by

U.S. Environmental Protection Agency
Region 5

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August 24, 2017
Date

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Table of Contents

LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
AEVS	Air Exchange and Ventilation System
CALs	Cleanup Action Levels
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
ECs	Environmental Covenants
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FYR	Five-Year Review
GMS	Gas Management System
ICs	Institutional Controls
ICIAP	Institutional Control Implementation and Assurance Plan
IEPA	Illinois Environmental Protection Agency
IL UECA	Illinois Uniform Environmental Covenants Act
LEL	Lower Explosive Level
LFG	Landfill Gas
LTMP	Long-term Monitoring Plan
LTS	Long-term Stewardship
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
Site	Yeoman Creek Landfill Superfund Site
TBC	To be considered
UAO	Unilateral Administrative Order
UU/UE	Unlimited Use and Unrestricted Exposure
YCL	Yeoman Creek Landfill
YCRG	Yeoman Creek Remediation Group

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

This is the third FYR for the Yeoman Creek Landfill Superfund Site (YCL Site or Site). The triggering action for this **statutory** review is the February 24, 2012 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).

A Record of Decision (ROD) was signed on September 30, 1996 selecting the remedy for the Site which consists of the following:

- Yeoman Creek Landfill (both East and West portions) located north of a Commonwealth Edison (ComEd) right-of-way (marked by a series of high-voltage transmission towers)
- Edwards Field Landfill (EFL), formerly a baseball park
- North Rubloff Landfill (RFL)
- South Rubloff Landfill

The Yeoman Creek Landfill Superfund Site FYR was led by David Seely, EPA Remedial Project Manager (RPM). Participants included Syed Quadri, previous EPA RPM, Erin Rednour, the Illinois Environmental Protection Agency (IEPA) Project Manager, Heriberto Leon, EPA Community Involvement Coordinator, and Chit Christian, EPA contract support. The PRPs were notified of the initiation of the FYR. The review began on February 24, 2016.

Site Background

The Site occupies approximately 70 acres in Waukegan, Lake County, Illinois within the area depicted in Figure 1. The YCL Site operated as a landfill between 1958 and 1969, reportedly accepting both municipal and industrial wastes. The YCL Site largely was constructed within wetlands and also within the flood plain of Yeoman Creek. Leachate was observed discharging to Yeoman Creek as early as 1969. The YCL Site was placed on the National Priorities List (NPL) for site cleanup on March 31, 1989.

Interim removal actions were implemented to address imminent and substantial threats posed by the Site, including fencing, improvement of the soil cover, and construction of a building

ventilation system and a landfill gas (LFG) collection system. Long-term response actions have been implemented at the Site as required by the ROD including: (1) removal of contaminated sediment from Yeoman Creek and nearby wetlands; (2) consolidation of wastes under a flexible, dual-barrier cover; (3) continuation of measures to address LFG; (4) long-term monitoring; and (5) institutional controls (ICs).

Due to the past presence of elevated methane concentrations beyond the landfill boundary and adjacent to buildings at the Terrace Nursing Home (TNH) and Evoy properties, the previous FYR found the remedy implementation was not protective, and required additional protective measures. An investigation determined that low permeability soils appeared to be causing a buildup of methane gases under the TNH parking lot. In late 2016, these soils were excavated and replaced with high permeability materials along with the installation of a passive gas venting system. Post-construction monitoring data from November 2016 indicates the protective measures have effectively mitigated the elevated methane concentrations in the TNH parking lot. Continued monitoring is planned pursuant the approved work plan and long-term monitoring plan (LTMP).

The YCL Site is next to a large wetland and residential and commercial developments, including single-family residences, apartment buildings, a nursing home, offices, a shopping center, and restaurants. According to the United States Census Bureau, approximately 26,890 people live within a l-mile radius of the site, of which 23.2 percent are African-American and 34.9 percent are Hispanic. Waukegan, Illinois, is an environmental justice community. Homes in the area are 52.7 percent owner-occupied. The median household income of the area is $28,427.

The current land uses of the surrounding area are residential, commercial, and recreational. Nearby residents and businesses use a municipal water supply.

SITE IDENTIFICATION		
Site Name: Yeoman Creek Landfill		
EPA ID: ILD980500102		
Region: 5	**State:** IL	**City/County:** Waukegan / Lake 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", enter Agency name]*:**
Author name (Federal or State Project Manager): David Seely
Author affiliation: EPA
Review period: 2/24/2016 - 5/10/2017
Date of site inspection: 7/12/2016
Type of review: Statutory
Review number: 3
Triggering action date: 2/24/2012
Due date *(five years after triggering action date)*: 2/24/2017

II. RESPONSE ACTION SUMMARY

Prior to the Site being placed on the NPL in March 1989, the City of Waukegan added additional soil to the cover over most areas of the landfill under an agreement with IEPA in 1980 to reduce leachate production and subsequent discharges.

In 1990 pursuant to the 1989 Remedial Investigation (RI) and Feasibility Study (FS) Consent Order (AOC) with EPA, the potentially responsible parties (PRPs) installed a fence around the Site to limit site access and improve site security, and initiated the RI/FS activities. In mid-1994, the PRPs implemented an interim action installing an air exchange and ventilation system (AEVS) in a building next to the Site to mitigate exposure to LFG. The PRPs completed the RI under EPA oversight in 1995 culminating in a Record of Decision (ROD) for the Site in 1996.

On April 28, 1998, EPA issued a Unilateral Administrative Order to the PRPs requiring a time-critical removal action, including the installation of an interim LFG collection system at the perimeter of the landfill to supplement the AEVS and reduce LFG migration. The interim LFG collection system was installed, modified several times, and able to achieve compliance in the basements of nearby occupied buildings. The AEVS system was removed from service, and the interim LFG system was removed during construction of the final remedy due to off-site LFG migration being controlled by the final cover's ventilation layer and additional collection trenches outside the final cover.

EPA signed a ROD for the YCL Site on September 30, 1996. The ROD specifies the following remedy:

1. Excavation and on-site containment of contaminated soils and sediment from Yeoman Creek and nearby wetlands to meet site-specific cleanup action levels (CAL);
2. Consolidation and containment of landfilled wastes under a flexible, dual-barrier cover;
3. Collection and treatment of leachate entering Yeoman Creek, if determined necessary by exceedance of action levels during monitoring after construction of the landfill cover;
4. Replacement of interim LFG measures with a system collecting LFG under and adjacent to the landfills;
5. Attenuation of contaminants in groundwater to meet state and federal drinking water standards;
6. Long-term monitoring;
7. Enclosing the Site with fencing;
8. ICs; and
9. Additional groundwater investigation.

Figure 2 shows the Site boundary and Figure 3 shows the long-term monitoring locations. The required ROD investigations of sediments, soils, and groundwater to determine the extent of contamination were completed during 1999 and 2000. The final remedy selected in the ROD is a source-control remedy to contain or control the landfill waste materials, contaminated soils and sediments in the landfill, and releases of leachate and LFG from the landfill. The remedy addresses all media and migration pathways considered to present an unacceptable risk, including landfilled wastes; contaminated soil and sediment; and releases to surface water, ambient air, air within adjacent buildings, groundwater, surface sediments, and wetlands. The ROD specifies the performance standards and the RA is expected to achieve them.

As stated in the ROD, the remedial action objectives (RAO) include addressing the following risks:

- Human health risks in case of future development of the YCL Site;
- Human health risks from off-site LFG migration;
- Human health and ecological risks from the continuing release of hazardous substances to wetlands, Yeoman Creek, and groundwater (including meeting drinking water standards in aquifers at the YCL Site);
- Human health risks from off-site soil contamination; and
- Ecological risks from the contamination of sediments and limited wetland areas.

On April 7, 1999, the court entered a Consent Decree (CD) for remedial design (RD) and RA. The Yeoman Creek Remediation Group (YCRG) includes the following major settling work defendants:

1. Browning Ferris Industries of Illinois, Inc.
2. City of Waukegan, Illinois
3. Outboard Marine Corporation (OMC)
4. Waukegan Community School District No. 60
5. Goodyear Tire & Rubber Company
6. Dexter Corporation

In December 2000, OMC filed for bankruptcy protection under Chapter 13, leaving a letter of credit to fund a portion of its share of the work. These proceeds were placed into an escrow account, known as the OMC Trust account, which was established to hold and disburse financial assurance funds provided on behalf of OMC. These funds were later released to YCRG in 2015 to assist in funding remedy implementation.

EPA approved the RD in October 2001. In February 2002, EPA documented three minor remedy changes to the 1996 ROD remedy in a memorandum to the project file. These changes were implemented during the RA and are summarized below.

1. The remedy selected in the 1996 ROD included an active gas collection system for the Yeoman Creek Landfill and Edwards Field Landfill. Based on available data, the YCRG showed that due to the age of the Edwards Field and North and South Rubloff Landfills, an active system was not necessary to evacuate gas generated by these landfills. The YCRG further provided calculations to demonstrate that passive venting would control any LFG produced by the landfills. EPA allowed construction of the wind-assisted ventilator system proposed in the final design at the Edwards Field and Rubloff Landfills. The system was designed to be easily converted to an active system, with minimal additional construction. Monitoring of the system began in Spring 2007 to ensure achievement of all performance standards and other requirements listed in the CD and ROD. If the system fails to meet performance standards at any time, the YCRG will submit to EPA within 30 days an addendum to the RA work plan providing for conversion of the system to an active gas collection system.

2. The ROD requires the final cover to minimize infiltration of precipitation through the landfill. The cover consists of the following components:

   - A 3-foot-thick frost protection layer, including a top vegetated layer
   - Geosynthetic drainage layer overlain by protective geonet providing a hydraulic conductivity of 28 centimeters per second
   - Barrier layer consisting of a 3-foot-thick compacted clay liner that meets Illinois Solid Waste Landfill closure standards or an equivalent primary barrier layer (such as a barrier consisting of a 40- mil very low-density polyethylene or equivalent)
   - Secondary barrier layer consisting of a geosynthetic clay liner or a compacted clay liner that meets Illinois Solid Waste Landfill closure regulations
   - Gas ventilation layer
   - Grading layer to provide a minimum 2 percent slope after settlement.

   The CD clarified that YCRG may propose alternative materials provided they achieve equivalent performance. YCRG used tire chips instead of gravel for the ventilation and drainage layers. EPA allowed use of the alternative materials and is monitoring the performance of the materials against performance standards.

3. The ROD required enclosing a portion of Yeoman Creek in a steel pipe during construction. YCRG used alternatives to the steel pipe, including earthen berms that protected the creek during excavation of contaminated sediments and construction activities. As detailed in the final design and approved RA work plan, EPA allowed YCRG to use these alternatives to the extent they provided an adequate level of protection and reliability.

Remedy Implementation

YCRG initiated cleanup activities in March 2002. To minimize the cost of importing fill materials, YCRG's design required significant excavation and regrading of waste. In late 2002, hundreds of drums were discovered, causing the contractor to halt intrusive activities due to health and safety concerns. YCRG's contractor removed, over-packed, and properly disposed of the drums off-site.

In May 2003, at the request of YCRG and the United States Army Corps of Engineers, major activities at the YCL Site were halted through a stop-work order to allow time to negotiate the possible placement of dredged material from Waukegan Harbor to enhance the remedy. After long negotiations, the City of Waukegan confirmed in early April 2004 that it would not allow the placement of dredged material at the YCL Site despite the many related benefits. YCRG signed contracts with Heritage Industrial Services on April 16, 2004, providing for construction of the final remedy at the YCL Site without placement of harbor sediment. In late 2005, major construction activities were completed and documented in a Preliminary Closeout Report dated September 2005.

The remedy for YCL consisted of grading the landfill to achieve desired slopes, installing an active gas-collection and final cover system, constructing a creek isolation system, and excavating waste or soils/sediments outside the limits of the final cover system which exceed CALs.

The remedy for EFL and North RLF consisted of grading the landfills to achieve desired slopes, installing a gas-collection/ventilation system and final cover system, and excavating waste or soils/sediments outside the limits of the final cover systems which exceed CALs. As approved by EPA, wind-activated turbines were designed and connected to the vertical gas vents (passive vents) as an alternative to construction and operation of active perimeter landfill gas collection and treatment system(s) at EFL and North RLF.

In July and August 2006, various repairs and improvements were made at the Site that included the following components:

- Northern drainage system
- Condensate trap CT-14
- Installation of five vertical gas collection wells at the far north end of the East Yeoman Creek Landfill
- Headers connecting the vertical gas collection wells to CT-11 and CT-12.

In addition, other above-ground LFG collection lines were removed.

Institutional Controls

ICs are non-engineered instruments, such as administrative or legal controls, that help minimize the potential for exposure to contamination and protect the integrity of the remedy. Compliance with ICs is required to ensure long-term protectiveness for areas that do not allow for UU/UE. Table 1 identifies the areas that do not support UU/UE and the restrictions (activity and use limitations) associated with these areas.

A map which depicts the current conditions of the Site and areas which do not allow for UU/UE will be developed in the IC follow up actions discussed below.

Table 1: 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)
Yeoman Creek Landfill Site: **Yeoman Creek Landfill (East and West Components)** Soil/Landfill (Dual-barrier cover) LFG collection system Other remedy components	Yes	Yes	Lovinger Properties: PIN 08-08-403-012 & 08-08-403-013 Waukegan School District PIN 0808403028 & 0808400022 City of Waukegan PIN: 0808400021 Ms. Ruth Jacobs Beneficiary of Cosmopolitan National Bank Trust #26660 PIN 080840012 Terrace Nursing Home Beneficiary of Trust Agreement dated March 11, 1988, known as Trust No. 25-9142: PIN 0808403011 Evoy Properties PIN; 08-08-403-031 PIN; 08-08-403-016	Allow Access and No Interference with Remedy Prohibit residential use or other land uses incompatible with Site remedy Prohibit activities that may disturb the integrity of the engineered components Allow Access and No Interference with Remedy Allow Access and No Interference with Remedy Allow Access and No Interference with Remedy	Agreement Executed (May 26, 1998) Environmental covenants pursuant to IL UECA*(under review) Agreement Executed (November 11, 1999) Agreement Executed (June 25, 2002) Agreement Executed (August 20, 1995) Recorded on August 15, 2008 Agreement Executed (August 13, 1998)
Groundwater			Beneath Landfills and adjacent groundwater which exceeds cleanup standards due to contaminant releases from the Site	Prohibit groundwater use	City of Waukegan Municipal Ordinance 10-0-58 September 7, 2011 (under review)

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)
Edwards Field Landfill: Soil/Landfill (Dual-barrier cover); LFG collection system; Other remedy components Groundwater	Yes	Yes	Waukegan Park District; PIN: 08-08-400-014 PIN: 08-17-200-009 PIN: 08-17-200-024 PIN: 08-17-200-026 PIN: 08-17-200-002 Beneath landfills and adjacent groundwater where cleanup standards are exceeded due to contaminant releases from the Site	Prohibit residential use or other land uses incompatible with Site remedy Prohibit activities that may disturb the integrity of the engineered components Allow Access and No Interference with Remedy Prohibit groundwater use	Environmental covenants pursuant to IL UECA* (under review) Agreement Executed (July 28, 1999) City of Waukegan Municipal Ordinance 10-0-58 September 7, 2011 (under review)
Yeoman Creek Landfill Site Property: North and South Rubloff Landfills Soil/Landfill (Dual-barrier cover); LFG collection system; Other remedy components Groundwater	Yes	Yes	Bank of Waukegan, solely as Trustee under Trust Agreement dated October 1, 1993, and known as Trust No. 230944; PIN: 08-17-200-052 Beneath landfills and adjacent groundwater where cleanup standards are exceeded due to contaminant releases from the Site	Allow Access and No Interference with Remedy Prohibit groundwater use	Agreement Executed (February 25, 2002) City of Waukegan Municipal Ordinance 10-0-58 September 7, 2011 (under review)

*IL UECA: Illinois Uniform Environmental Covenants Act, 765 Illinois Compiled Statues 122

Status of Access Restrictions and ICs: On January 6, 2012, the YCRG submitted the proposed Environmental Covenants for parcels owned by the YCRG parties and negotiated access agreements. EPA is continuing discussions of these documents.

On September 7, 2011, the City of Waukegan approved a municipal ordinance prohibiting the use of groundwater as a potable water supply within the corporate limits of the City of Waukegan.

Current Compliance: Even though all required ICs have not been implemented, there are currently no known uses of the Site which would be considered inconsistent with the objectives to be achieved by the ICs. Access to the Site is restricted by a fence, and based on inspections and interviews, EPA is not aware of any uses of the Site or contaminated media which are inconsistent with the objectives of the ICs required by the ROD. The City ordinance prohibiting groundwater use within the City remains in place and effective.

IC Follow up Actions Needed: Develop an Institutional Control Implementation and Assurance Plan (ICIAP). The purpose of the ICIAP is to:

- conduct IC evaluation activities to determine which ICs required by the decisions documents are already in place;
- ensure that any already-implemented ICs are effective;
- evaluate the specific additional ICs that are needed; and
- ensure that long-term stewardship (LTS) procedures are put in place so that all ICs, once implemented, are properly maintained, monitored, and enforced.

IC evaluation activities will include, as needed, developing maps depicting current conditions in areas that do not allow for UU/UE, reviewing current zoning and city ordinances, and reviewing recording and title work for properties impacted by the Site.

The environmental covenants prepared by YCRG should be implemented as appropriate.

Long-term Stewardship: LTS procedures are not yet in place. Since compliance with ICs is necessary to assure the protectiveness of the remedy, planning for LTS is required to ensure that the ICs are maintained, monitored and enforced so that the remedy continues to function as intended. LTS will ensure that the ICs are maintained, monitored and enforced. Plans incorporating LTS procedures (e.g., a LTS Plan or an amendment to the Operation and Maintenance (O&M) Plan) should include the mechanisms and procedures for inspecting and monitoring compliance with the ICs as well as communications procedures. YCRG should submit an annual report to EPA to demonstrate that the Site was inspected to ensure no inconsistent uses have occurred, to certify that ICs remain in place and are effective, and to document that any necessary contingency actions have been executed.

EPA, the City of Waukegan, the School District, and YCRG members have been evaluating potential future uses and their compatibility with the dual-barrier cover system. Previously, EPA also provided a grant to the City of Waukegan to explore compatible site reuses. The City, the School District, and YCRG plan to pursue the potential for installation of solar panels for power generation. If a proposal is determined to be adequate, it will be submitted for review by EPA to evaluate whether the proposed Site reuse design may be incompatible with the design of the landfill cover or other remedy components.

System Operation/Operation and Maintenance

Operation of the LFG collection system began during construction and is ongoing. The LFG collection system components include a gas collection layer (tire chip layer), perimeter collection trenches with collection pipes, condensate traps, valves, a main vacuum blower, a flare, an air compressor, condensate tanks, and an automated control system.

An ancillary underground vapor collection system, located outside the western limits of fill on the West YCL system provides protection against possible migration of gas from the YCL toward the businesses and residences along Lewis Avenue.

Past methane monitoring data from perimeter LFG probes showed methane at probes outside the landfill boundary. YCRG has taken several steps to enhance the LFG collection system around the Lovinger property north of the YCL Site. One major action taken after the first FYR was the installation (in 2009) of a secondary LFG system on the northern portion of the site, called the Lovinger Gas Management System. The Lovinger GMS consists of a slurry wall and active gas collection trenches with a collection pipe on top of the slurry wall; the collected gas is vented to the atmosphere per the approved design. Two existing trenches, one located beneath the Evoy parking lot and one located beneath the TNH parking lot, are also connected to the Lovinger GMS blowers.

The second FYR found the remedy implementation was not protective due to continued methane detections at probes in the parking lot at the TNH and Evoy property resulting in additional protective measures being implemented. Probes LFG-326R, LFG-327R, LFG-328R, and LFG-329R had methane readings above 50 percent of the LEL consistently. Other probes at the TNH and Evoy properties also exhibited periodic methane readings above 50 percent of the LEL.

An investigation determined that low permeability soils appeared to be causing a buildup of methane gases under the TNH parking lot. In late 2016, these soils were excavated and replaced with high permeability materials along with the installation of a passive gas venting system, and have enabled the Lovinger GMS to be more effective. Completion of these protective measures since the last FYR and post-implementation monitoring demonstrate very low (well below 50% of the LEL) or no methane detections at probes in the TNH parking lot and only sporadic methane detections at probes in the Evoy parking lot.

During the second FYR site inspection, it was noted that several turbines associated with the passive LFG system at the Edwards Field and Rubloff Landfills were not operational. On January 4, 2011, Aether- DBS, contractor to the YCRG submitted a letter to Tom Thomas, Project Manager for the YCRG, which documented the non-functional turbines were replaced and adjustable rubber boots were installed to level turbines. The turbines are inspected regularly in accordance with the O&M Plan, and repairs made as needed. In addition, Table 2 below has been excerpted from Aether-DBS' January 4, 2012 letter and identifies the resolution of the items noted during the 2011 FYR site inspection.

Table 2: Status of Yeoman Creek Landfill Site 2011 5-Year Review Inspection Issues (per Report provided by Aether-DBS, January 4, 2012)			
	Item	**Status**	**Comments**
1	Fence Signs - Not all are bilingual. Replace all that are not bilingual and confirm spacing is good.	Completed	Five new signs installed in September. Report attached.
2	YCL- Regrade around CT-12 to drain to swale just west of there.	Completed	Soil added and regraded for positive drainage to swale. Report attached.
3	YCL- Remove all vegetation but grass from drainage swales. Note that area just east of southern Creek exit from YCL will need extensive excavating/handwork to remove the cattails and rip rap, screen out the rip rap, and then replace the rip rap.	Completed	Swales clear of vegetation during mowing. Swale on northern west YCL had flood debris removed and vegetation cut down. Cattails in rip rap on southern perimeter of YCL near Creek have been removed. New rip-rap brought in and excavated rip-rap stockpiled onsite for future use. Report attached.
4	YCL- Fill around PV-4 to prevent ponding.	Completed	Photos in attached report.
5	YCL - Need to clear rip rap along Yeoman Creek of growth (area around CT-15 on both sides for example).	Completed	Woody growth removed by hand and by torch. Photos in attached report.
6	West YCL - Barbed wire section is cut and needs repair.	Completed	Wire repaired. Photos in attached report.
7	Edwards - Area on north end of property of poor growth needs to be topsoiled and seeded.	Completed	Additional topsoil placed and seeded; some vegetation growth this season. Report attached.
8	Edwards - Fence Repair where cottonwood fell needs to be straightened/tightened.	Completed	Fence repaired. See photos in attached report.
9	Edwards- Wind turbines should be made level. Confirm that all spin.	Completed	Adjustable rubber boots installed to level turbines. Non-spinning turbines replaced.
10	Edwards-Vegetation along eastern perimeter, inside fence line should be cut down.	Completed	Vegetation cut down by manual weed whacking. Area is too wet to use tractor. Too wet to grow grass. Will become part of the mowing scope to cut manually in late spring and late summer mowing.
11	List of Non-Routine Actions over the last 5 years.	Completed	List of non-routine actions taken.
12	Update the previous 5-year review list and actions taken and when.	Completed	Checklist Attached.

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 3: Protectiveness Determinations/Statements from the 2012 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Not Protective	The remedy is not protective because the LFG collection system is not operating as designed; i.e., LFG above 50 percent of the lower explosive limit (LEL) continues to be present beyond the landfill boundary. A study indicates presence of methane in buried debris beyond the landfill boundary. The LFG has the potential to enter into neighboring buildings and cause methane gas fire and explosion risk. To address this LFG and the potential fire and explosion risk, the following interim measures have been implemented and are currently in place: methane sensors are located within the basement of the neighboring structures (two sensors are installed at TNH, one sensor is installed at Evoy property, one sensor at 1401 W. Golf Road, and one sensor at 1451 W. Golf Road) for continuous methane monitoring. In addition, all sensors are on auto-dialers with direct connection to the fire department and the YCRG contractor. The sensors are factory calibrated for methane. Also, the detectors will detect carbon monoxide, propane, butane and other explosive hazards. The sensor/auto-dialer is set at 20% of the LEL for methane. The basements located at TNH, Evoy and 1401-1451 W. Golf Road are routinely monitored weekly and monthly. Thirty-six locations are monitored on weekly basis and 91 locations are monitored on monthly basis. In addition, sediments in Yeoman Creek have been re-contaminated, suggesting a potential leak from the landfill. Additional actions are necessary to ensure protectiveness as well as implementation and compliance with land-use restrictions that prohibit (1) interference with the dual-barrier cover and LFG collection system and (2) groundwater use. The EPA and the responsible parties are negotiating the details of additional remedial actions to effectively and efficiently remove LFG that has been detected at the neighboring properties.
Sitewide	Not Protective	The remedy is not protective because the LFG collection system is not operating as designed; i.e., LFG above 50 percent of the LEL continues to be present beyond the landfill boundary. A study indicates presence of methane in buried debris beyond the landfill boundary. The LFG migration has the potential to enter into neighboring buildings and cause methane gas fire and is also an explosion risk. To address this LFG and the potential fire and explosion risk, the following interim measures have been implemented and are currently in place: Methane sensors located within the basement of the neighboring structures for continuous methane monitoring (two sensors are installed at TNH, one sensor is installed at Evoy property, one sensor at 1401 W. Golf Road, and one sensor at 1451 W. Golf Road). In addition, all sensors are on auto-dialers with direct connection to the fire department and the YCRG contractor. The sensors are factory calibrated for methane. Also, the detectors will detect carbon monoxide, propane, butane and other explosive hazards. The sensor/auto-dialer is set at 20% of the LEL for methane. The EPA and the responsible parties are negotiating the details of additional remedial actions to effectively and efficiently remove LFG that has been detected at the neighboring properties. The basements located at TNH, Evoy and 1401-1451 W. Golf Road are routinely monitored weekly and monthly. Thirty-six locations are monitored on weekly basis and 91 locations are monitored on monthly basis. In addition, sediments in Yeoman Creek have been re-contaminated, suggesting a potential leak from the landfill. Additional actions are necessary to ensure protectiveness as well as implementation and compliance with land-use restrictions that prohibit (1) interference with the

		dual-barrier cover and LFG collection system and (2) groundwater use. EPA and the responsible parties are negotiating the details of additional remedial actions to effectively and efficiently remove LFG that has been detected at the neighboring properties. Finally, long-term protectiveness also requires compliance with effective ICs. Hence, effective ICs must be implemented, monitored, maintained and enforced along with maintaining site remedy components so that the remedy will function as intended. Long-term protectiveness will be ensured by implementing effective ICs and through long term stewardship of ICs. To that end, an ICIAP must be prepared to conduct additional IC evaluation activities, to plan for additional ICs, as needed, and ensure long-term stewardship. Finally, long-term protectiveness also requires compliance with effective ICs.

Table 4: Status of Recommendations from the 2012 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	LFG Collection System Failure.	Implement further remedial actions to address the LFG and exposure.	Completed	Low permeability soils were excavated from beneath the TNH parking lot and a passive soil gas extraction system was installed to prevent LFGs from further migrating into nearby buildings. However, monitoring of the conditions after completion is needed to ensure no additional actions are necessary. Restoration activities were completed in the Spring of 2017.	11/16/2016
1	The LFG migration presents a health risk to residents of the neighboring buildings: as the methane in LFG could potentially cause fire or explosion hazard.	Implement and operate a LFG collection system to effectively and efficiently remove LFG from migrating to the neighboring properties.	Completed	Low permeability soils were excavated from beneath the TNH parking lot and a passive soil gas extraction system was installed to prevent LFGs from further migrating into nearby buildings. However, monitoring of the conditions after completion is needed to ensure no additional actions are necessary. Restoration activities will be completed in the Spring of 2017.	11/16/2016
1	Groundwater sample results exceed MCLs and sediment samples exceed CALs.	Continue monitoring until MCLs/CALs are attained in both groundwater and sediment. Submit an evaluation report on the efficacy of natural attenuation for the remediation of groundwater contaminants of concern at the site. Monitoring of	Under Discussion	Groundwater and sediment continue to be monitored to ensure compliance with the selected remedy. EPA is evaluating the elevated sediment contaminant concentrations detected to determine if additional actions are necessary. YCRG has submitted proposed modifications to the Long-term Monitoring and O&M Plans incorporating these concerns and these plans are under review.	

		surface water, sediment and groundwater will be necessary to ensure that there is no leakage from the landfill that would affect these media.			
1	Condensate traps with high oxygen levels.	Thoroughly test condensate traps to ensure no leaks.	Under Discussion	YCRG has submitted Helium Leak Testing Protocols for the condensate traps to verify the integrity of the gas collection system allowing it to operate as designed. These protocols are currently under discussion.	
1	Drainage layer not exposed.	Remove soil covering edge of layer.	Completed	These maintenance issues were noted during the 2012 FYR site inspection. YCRG implemented corrective measures in November 2011. These types of issues will be managed by YCRG through routine maintenance as defined in the O&M plan. If these issues continue, the O&M plan may require modification as a preventative measure.	11/30/2011
1	Drummed Investigation-derived waste.	Characterize and dispose of waste at U.S EPA-compliant facility.	Completed	Investigation-derived wastes were observed during the 2012 FYR site inspection conducted in August 2011. YCRG disposed these wastes at an EPA-compliant facility on August 26, 2011.	08/26/2011
1	Long-Term Stewardship procedures are required.	Issue an Institutional Control (IC) Implementation Plan to manage site controls.	Under Discussion	YCRG has submitted information to assure compliance with required site ICs. Final procedures to manage site ICs are currently under discussion.	

Recommendations 1 and 2: The second FYR found the remedy implementation was not protective due to the continued presence of LFG adjacent to buildings at the TNH property resulting in additional protective measures being implemented. An investigation determined that low permeability soils appeared to be causing a buildup of methane gas under the TNH parking lot resulting in continued concerns relating to the migration of the LFGs. These soils were excavated and replaced with high permeability materials along with the installation of a passive gas venting system to prevent further issues.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was published in the local newspaper, Lake County News-Sun, on June 27, 2016 notifying the community that EPA was conducting a FYR and the opportunity to provide input.

Additionally, a Spanish language notice was published July 8, 2016 in the local Spanish publication Nueva Semana to reach out to Spanish-speaking individuals. The notices also informed the public that site information is available at the local repository, Waukegan Public Library, and online at EPA's YCL website at www.epa.gov/superfund/yeoman-creek-landfill.

During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. EPA's remedial team for the site consisting of RPM Syed Quadri and Community Involvement Coordinator Heriberto Leon met with several Waukegan community members and officials in July 2016. They included two business owners next to the site, two city aldermen, the Waukegan mayor and staff. The team also made a presentation at the July meeting of the Waukegan Citizens Advisory Group giving an update on the site and responded to questions and comments from concerned citizens. There were no issues raised concerning the implementation of the remedy or its protectiveness by the members of the community. The team also visited the site's information repository located in the Waukegan library located at 128 N County St, Waukegan, IL 60085, and noted that materials were clearly labeled and indexed.

Site Inspection

The inspection of the Site was conducted on Tuesday, July 12, 2016. The weather was sunny and windy with temperature ranging from 78 to 88 degrees Fahrenheit. Present at the inspection were Syed Quadri (EPA RPM), Erin Rednour (IEPA), Chit Christian (Tetra Tech Inc., EPA Oversight Contractor), Bridget Morello (Progressive Engineering and Construction, Inc., YCRG Project Manager), Kevin Kruckeberg (Waukegan Public School District 60), Bob Solak (Hard Hat Services, YCRG O&M Contractor), Ray Hladovcak (Hard Hat Services, YCRG O&M Contractor), and Beau Harp (Civil & Environmental Consultants, Inc., YCRG O&M Contractor). The purpose of the inspection was to assess the protectiveness of the remedy.

Observations made during the site inspection were:

1) An area of the East Yeoman Creek Landfill appeared to have settled causing a depressed area where water reportedly pools when it rains. Differential settlement of landfills can put stress on engineered covers designed to prevent infiltration of water.

2) The LFG extraction and treatment system is operating and its visible components appear to be in good condition. The treatment system includes a flare. A large condensate tank now requires emptying only once a year. Treatment system components are secured within a 60-foot by 30-foot fenced area that can be accessed through a locked gate. The treatment building appears to be in good condition. The landfill perimeter fence likewise appears to be in good condition. There were no obvious signs of settlement along the slurry wall (the northern perimeter of East Yeoman Creek Landfill). Systems to mitigate methane off-Site were not inspected because planned additional protective measures have not yet been implemented. Most records are maintained off-Site.

Data Review

The selected remedy includes long-term monitoring of contaminated media to ensure protectiveness. Media that are being monitored include creek sediment, wetland soil, surface water, groundwater,

leachate, and LFG. The data review generally covered the period from October 2011 through November 2015, unless otherwise noted.

The final ROD specifies corrective action levels for sediment in Yeoman Creek. There are no CALs for wetland soil. The statement of work presented in Attachment B to the Consent Decree specifies performance standards for surface water and groundwater. The action level for LFG is based on 35 Illinois Administrative Code (IAC) § 811.311, which the ROD cites as an applicable or relevant and appropriate requirement.

Creek Sediment

Creek sediment was monitored at nine locations semi-annually through 2014, and then annually starting in 2015. Creek sediment is monitored at locations D, I, U, CSD-1, CSD-2, CSD-3, CSD-4, CSD-5, and CSD-6, which are presented on Figure 3.

Lead exceeded its CAL of 180 milligrams per kilogram (mg/kg) at only one sample location (D) in creek sediment. The CAL was exceeded twice in 2013, when lead was detected both times at a concentration of 200 mg/kg, and once in 2014, when it was detected at 210 mg/kg.

Zinc exceeded its CAL of 317 mg/kg in creek sediment at sample locations CSD-1, CSD-3, CSD-4, CSD-6, D, I, and U. Concentrations ranged from slightly above the CAL to 5,100 mg/kg, approximately 16 times the CAL. The most frequent results above the CAL were at sample locations D and U. The highest concentrations were usually detected at upstream sample location U, suggesting that elevated zinc concentrations may not be site-related.

Total polynuclear aromatic hydrocarbon (PAH) concentrations exceeded the CAL of 26 mg/kg in creek sediment at sample locations CSD-1, CSD-2, CSD-3, CSD-4, D, I, and U. Concentrations ranged from slightly above the CAL to 97.9 mg/kg, approximately 4 times the CAL. The most frequent elevated results were at CSD-4 (five events) and CSD-1 (four events).

In accordance with the ROD, total polychlorinated biphenyl (PCB) concentrations were calculated as (Aroclor 1242)/2 + (Aroclor 1248) + [(Aroclor 1254) x 10]. Total PCB concentrations exceeded the CAL of 3.4 mg/kg in creek sediment at sample locations CSD-1, CSD-2, CSD-3, CSD-4, CSD-5, D and I. The most frequent elevated results occurred during most years at sample locations CSD-2, CSD-3, CSD-4, and D. These results ranged from slightly above the CAL to 55 mg/kg, approximately 16 times the CAL.

Wetland Soil

Wetland soil was monitored at eight locations semi-annually through 2014, and then annually starting in 2015. Wetland soil is monitored at locations W1, W2, WSD-1, WSD-2, WSD-3, WSD-4, WSD-5, and WSD-6, presented on Figure 3. There are no CALs for wetland soil. However, wetland soil monitoring results were compared to CALs for creek sediment because wetland soil can migrate into the creek.

Zinc was detected slightly above its CAL of 317 mg/kg only once and at only one sample location (WSD-5) in wetland soil. Zinc has not been detected above the CAL in wetland soil since 2013.

Total PAH concentrations exceeded the CAL of 26 mg/kg at only one sample location (WSD-5) in wetland soil. Total PAHs concentrations ranged from slightly above the CAL to 365.9 mg/kg, approximately 14 times the CAL.

In accordance with the ROD, total PCB concentrations were calculated as (Aroclor 1242)/2 + (Aroclor 1248) + [(Aroclor 1254) x 10]. Total PCB concentrations exceeded the CAL of 3.4 mg/kg at sample locations W-1, W-2, WSD-1, WSD-2, and WSD-4. The most frequent detections were at sample locations W-2 and WSD-4, where PCBs have been detected every year. Detections ranged from slightly above the CAL to 23.1 mg/kg, approximately 7 times the CAL.

Surface Water

Surface water was monitored at 17 locations semi-annually through 2014, and then annually starting in 2015. Surface water is monitored at the creek sediment and wetland soil sample locations presented on Figure 3.

Surface water performance standards were exceeded at the following sampling locations: CSW-1, CSW-2, CSW-3, CSW-4, CSW-5, CSW-6, D, I, U, W1, W2, WSW-4, and WSW-6. The highest number of elevated results were detected at sample location I, followed by CSW-3 and WSW-6.

Copper, iron, lead, mercury, manganese, selenium, and zinc were detected in surface water above their performance standards. Iron had the highest number of elevated results and was detected at several sampling locations. The other metals were detected only sporadically. Iron was detected at concentrations up to 35 milligrams per liter (mg/L), approximately 35 times its performance standard of 1 mg/L. The highest result was at upstream sample location U in April 2014, the only time iron exceeded its CAL at this location. The most frequent detections above the CAL were at sample location W1. The ROD did not identify iron as a contaminant of concern in surface water.

Method detection limits for some analytes exceeded their performance standards. However, the ROD did not identify any of these analytes as contaminants of concern in surface water. PCBs, which are contaminants of concern in sediment, were not detected in surface water above their method detection limit. (The method detection limit ranged from 0.095 micrograms per liter [µg/L] to 0.19 µg/L.) However, these detection limits are approximately 4,000 to 7,000 times the PCB performance standard of 0.000026 µg/L. Therefore, it is not clear whether PCBs in surface water complied with the performance standard. Standard analytical techniques can detect PCBs at concentration significantly lower than 0.095 µg/L, although not lower than the PCB performance standard.

Groundwater

The selected remedy requires the groundwater to be monitored until contaminant concentrations are in compliance with performance standards. Groundwater was monitored at 43 locations semi-annually through 2014, and then annually starting in 2015. The monitoring wells are screened in three water bearing zones as follows: 20 monitoring wells screened in the shallow zone; 22 monitoring wells screened in the lower outwash; and one monitoring well screened in bedrock. Monitoring well locations are presented on Figure 3.

It is noted that there are no figures illustrating a comprehensive overview of groundwater contaminant conditions in the different water bearing zones over time. Groundwater flow in the lower outwash is generally to the east and is presented in Figure 4. Groundwater flow direction in the shallow zone is not clear.

Organic contaminants detected in groundwater at concentrations above their performance standards include benzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene,

bis(2-ethylhexyl) phthalate, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, methylene chloride, tetrachloroethene, and vinyl chloride. Most of these analytes were detected only sporadically. Vinyl chloride exceeded its performance standard of 2 µg/L in five monitoring wells and somewhat consistently in four of these wells. The maximum concentration of vinyl chloride was 34 µg/L, 17 times its performance standard.

Metals detected in groundwater above their performance standards include antimony, arsenic, boron, cadmium, chromium, iron, lead, manganese, mercury, nickel, and vanadium. Several analytes were detected only sporadically. Iron and manganese frequently exceeded their performance standards in several wells. Arsenic frequently exceeded its performance standard in monitoring wells MW-206 and MW-208; boron frequently exceeded its performance standard in MW-206 and MW-402; and nickel frequently exceeded its performance standard in MW-405.

Groundwater performance standards were exceeded in 38 wells (MW-101, MW-102, MW-103, MW-104, MW-106, MW-107R, MW-108, MW-109, MW-111, MW-112, MW-201, MW-202, MW-205, MW-206, MW-207, MW-208, MW-209, MW-210, MW-211, MW-212, MW-213, MW-215, MW-216, MW-217, MW-301, MW-401, MW-402, MW-403, MW-405, MW-406, MW-A, MW-B, MW-C, MW-D, MW-E1, MW-E2, MW-F, and MW-G).

MW-102, MW-206, MW-208, MW-210, MW-215, MW-216, MW-217, MW-402, and MW-405 each had at least 20 results that exceeded performance standards. MW-101, MW-106, MW-107R, MW-111, MW-202, MW-209, MW-211, MW-212, MW-213, MW-A, MW-E2, and MW-F each had at least 10 results that exceeded performance standards. The other wells had less than 10 results above performance standards.

Leachate

Nine leachate monitoring wells are used only to measure leachate elevations. Leachate elevations were monitored semi-annually through 2014, and then annually starting in 2015. From April 2013 to October 2015, leachate elevations fluctuated with no obvious trend. The average leachate elevation in October 2015 was similar to the average leachate elevation in October 2013. Seasonal changes in leachate elevations at each well were generally less than 2 feet, except at LMW-2R, where they approached 5 feet. Leachate monitoring well locations are presented on Figure 3.

Landfill Gas

Seventy gas probes were used to monitor LFG at frequencies varying from quarterly to four times a week. In 2015, the monitoring frequency was reduced such that no probe would be monitored more than twice a week. The data review covered the period from June 2012 through December 2015. Gas probe locations are presented on Figure 3 and Figure 5.

Methane was detected above the action level (50 percent of the lower explosive limit [LEL]) in 10 of 70 gas probes (LFG-63R, LFG-311R, LFG-317, LFG-321, LFG-324, LFG-326R, LFG-327R, LFG-328R, LFG-329R, and LFG-330R). Methane levels in LFG-327R exceeded the action level during 97 percent of the monitoring events. The action level was exceeded during less than 50 percent of the monitoring events in other gas probes. Methane levels in gas probes LFG-63R, LFG-317, and LFG-321 exceeded the action level only once during the monitoring period. Among the gas probes showing significant methane levels, one is located on the Evoy property, and the rest are in the TNH parking lot. Phase 2 of additional protective measures for the TNH property was completed in November 2016. These

protective measures involved excavating clayey soil from the TNH parking lot and installing new gas collection piping. Gas probes affected by the excavation were replaced, and included LFG-311R, LFG-326R, LFG-327R, LFG-328R, LFG-329R, and LFG-330R, which have historically showed elevated methane levels.

Initial monitoring results after implementation of Phase 2 of the additional protective measures are encouraging. No exceedances of the methane action level were observed as of February 2017 after these measures were implemented.

Eleven continuous methane monitors are used to monitor indoor methane levels, and eight of these monitors are located in the TNH building. Indoor methane levels did not exceed the indoor action level (25 percent of the LEL) from October 2011 through December 2015.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

Overall the remedy currently appears to be functioning as intended by the decision documents due to the following:

- Landfill wastes are being contained beneath engineered landfill covers which minimizes infiltration of precipitation;
- A comprehensive, long-term monitoring system has been developed and implemented;
- Contaminated sediments and surface soils have been excavated and consolidated beneath the landfill covers;
- Construction of LFG collection systems, including systems installed during the implementation of the additional protection measures; and
- Construction of perimeter site fencing.

However, to ensure long-term protectiveness, additional actions are needed such as:

- Formal adoption of required ICs to prevent exposures and land uses inconsistent with the selected remedy;
- Continue to evaluate LFG monitoring data to verify the additional protective measures were successful in mitigating the methane levels underneath the TNH parking lot;
- Complete the evaluation to determine whether the elevated concentrations of PCBs detected in sediment are related to the site and whether additional action is necessary; and
- Continue to monitor any settling of the landfill and determine if it is potentially compromising the integrity of the engineered landfill cover.

Remedial Action Performance

- Control of LFG migration has been a long-standing concern. Multiple actions have been taken by YCRG in attempts to prevent unacceptable exposures and migration of gases away from the landfills. In some cases, modifications to the design of the gas control systems were required to control gas migration.

Since the last FYR, YCRG implemented Phase 1 and Phase 2 of additional protective measures. Phase 1 was implemented in 2013 and consisted of: sealing the basement of the TNH building, including two basement sumps, to prevent vapor intrusion; installation of six continuous methane detectors in the TNH basement, each equipped with alarm/auto-call out system for notification of emergency conditions; and installation and monitoring of pressure taps for subslab conditions.

Phase 2 was constructed by November 2016 and involved the excavation of non-permeable clay materials in the TNH parking lot which was causing an accumulation of methane which then could migrate and infiltrate the TNH building. These materials were replaced with highly permeable materials and the installation of the TNH gas system. Initial monitoring results are favorable as no exceedances of methane action levels have been detected since the completion of Phase 2. Monitoring needs to continue to ensure these efforts have mitigated the elevated methane levels detected prior to these efforts.

- Elevated concentrations of PCBs have been detected in the sediments. It is not clear if these concentrations are due from the Site or if the Site is contributing to the contaminant loading. YCRG has submitted their evaluation of PCB levels which is undergoing EPA review to determine if additional actions are required.

System Operations/O&M

- High concentrations of oxygen have been detected in some condensate traps which may indicate gas collection system developed leaks reducing its effectiveness. YCRG has proposed Helium Leak Testing Protocols to determine the extent of the problem. These protocols are being reviewed by EPA to determine if any additional actions are required to ensure the remedy is functioning as designed.

- The 2016 site inspection identified an area of the East Yeoman Creek Landfill which had settled and reportedly collected precipitation. This settlement may have threatened the integrity of the engineered landfill cover. YCRG used the clay materials excavated during the Phase 2 actions to regrade this area to prevent the collection of precipitation and adding further infiltration prevention. This settlement needs to be evaluated to determine if the integrity of the engineered landfill cover had been jeopardized and whether additional corrective actions are necessary.

Implementation of Institutional Controls and Other Measures

ICs required by the remedy have yet to be formally adopted. Site controls such as fencing and signage have been implemented to prevent unanticipated exposures from the Site. YCRG has negotiated many access agreements with surrounding land owners to ensure remedy components are not compromised. YCRG has submitted proposed IC information to EPA which is undergoing Agency review. Once agreement is reached, the ICs need to be implemented and LTS procedures established to ensure the ICs remain in place and 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?
Yes.

Question B Summary:

The exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection remain valid as described below.

Changes in Standards and TBCs

Federal Maximum Contaminant Levels (MCL) and state groundwater standards have not changed significantly since the last FYR. Federal and state standards for surface water quality and protection of aquatic life also have not changed significantly since the last FYR. Additionally, there were no significant changes that would affect the CALs for sediment.

The review identified substantive changes regarding arsenic for two ARARs that could affect the protectiveness of the remedy for human health and the environment: the federal MCL at 40 Code of Federal Regulations (C.F.R.) § 141.62(b), and the Illinois groundwater quality standards for Class I, potable resource groundwater at 35 Illinois Administrative Code (IAC) § 620.410 show a change in the federal MCL for arsenic from 50 micrograms per liter (µg/L) to 10 µg/L. However, given the State standard is not more stringent than the federal standard, this change is inconsequential.

Additionally, although not identified as an ARAR or directly affecting protectiveness of the remedy, the Illinois UECA was promulgated in 2009. This statute addresses creation of environmental covenants (ECs) that prohibit certain uses or activities at a site where contamination remains in place. Consideration should be given to ensure the ECs to be imposed for the Site will comply with this Act and the ECs should be consistent with the current model prepared by IEPA and EPA.

Changes in Toxicity and Other Contaminant Characteristics

Toxicity and other factors for contaminants of concern have not changed significantly or in a way to significantly impact the overall protectiveness of the remedy.

Changes in Risk Assessment Methods

Minor changes in risk assessment methodologies since the time of the ROD do not significantly impact the protectiveness of the remedy.

Changes in Exposure Pathways

Land uses at or near the Site have not changed significantly since the remedy was selected. Recently, there have been discussions about potential redevelopment options at the Site. YCRG, including the Waukegan School District which owns most of the Site property, are exploring the potential opportunities for solar photovoltaic (PV) energy development at the Site. EPA evaluated potential PV reuse and determined that it may be compatible with the selected remedy.

YCRG continues to pursue PV reuse options and has issued a request for proposal for implementation. If YCRG determines that PV reuse is economically feasible, YCRG will submit proposed designs of PV reuse to EPA prior to implementation to determine if it may adversely impact the protectiveness of the remedy.

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

No. There has not been any other information that has come to light that calls into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

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

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	**Issue Category: Remedy Performance**			
	Issue: The additional protective Phase 1 and Phase 2 measures addressing the migration of LFG should be monitored to ensure long-term protectiveness.			
	Recommendation: Continue to monitor LFG and evaluate LFG monitoring data to verify the additional protective measures were successful in mitigating the methane levels underneath the TNH parking lot.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	3/31/2019

OU(s): 1	**Issue Category: Remedy Performance**			
	Issue: Landfill settlement may threaten the integrity of the engineered landfill cover.			
	Recommendation: YCRG submit an evaluation of the significance of the settlement and its impact on the performance of the engineered landfill cover to determine if any additional actions, including active monitoring of landfill settlement, are required beyond the added clay material and regrading.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	4/30/2019

OU(s): 1	Issue Category: Monitoring			
	Issue: Elevated PCB concentrations have been detected during monitoring of the sediment conditions.			
	Recommendation: Complete review of YCRG submittal to determine if any additional actions are required.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	10/31/2019

OU(s): 1	Issue Category: Institutional Controls			
	Issue: The environmental covenants submitted by YCRG are not completed.			
	Recommendation: Finalize and record environmental covenants.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/31/2018

OU(s): 1	Issue Category: Institutional Controls			
	Issue: All required ICs are not yet in place.			
	Recommendation: Develop an ICIAP. The purpose of the ICIAP is to conduct IC evaluation activities to determine which ICs required by the decision documents are already in place, to ensure that any already-implemented ICs are effective, to evaluate whether specific additional ICs are needed, and to ensure that long-term stewardship procedures are put in place so that all ICs, once implemented, are properly maintained, monitored, and enforced.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/31/2019

OU(s): 1	Issue Category: Institutional Controls			
	Issue: Long-term stewardship procedures are needed to ensure that effective ICs are monitored, maintained and enforced.			
	Recommendation: Develop and implement a LTS Plan or amend the existing O&M Plan to incorporate LTS procedures.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/31/2019

OTHER FINDINGS

In addition, the following are recommendations that were identified during the FYR to improve performance of the remedy, improve management of O&M, conserve energy, and promote reuse but do not affect current nor future protectiveness:

- Due to high concentrations of oxygen detected in condensate traps, YCRG should implement procedures to test the integrity of the gas collection system if applicable, after EPA completes a review of YCRG's prior submittals and further discussions.
- It is noted that there are no figures illustrating a comprehensive overview of groundwater contaminant conditions in the different water bearing zones over time. A comprehensive groundwater summary should be developed to clarify site hydrogeology along with nature and extent of contamination over time. The summary should include geologic cross-sections showing the different water-bearing zones, landfill waste, and landfill leachate, to clarify interaction of leachate with groundwater. For each water-bearing zone, the summary should present the horizontal extent of contamination, an assessment of groundwater flow direction, and seepage velocity. This summary should be continuously updated in YCRG's annual reports.
- YCRG shall submit design plans prior to implementation for EPA review of any planned reuse of the Site to ensure compatibility with the selected remedy.

VII. PROTECTIVENESS STATEMENT

OU1 and Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedy at the Yeoman Creek Landfill Site is currently protective of human health and the environment because the remedy is functioning as intended by the decision documents and there are no complete exposure pathways. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: • develop an ICIAP and implement ICs as required; • develop and implement a LTS plan (or amend the O&M plan to incorporate LTS procedures); • conduct additional monitoring to ensure that the Phase 1 and Phase 2 additional protective measures implemented by YCRG adequately mitigated the migration of LFGs or if additional actions are required; • complete an evaluation of the significance of the settlement and its impact on the performance of the engineered landfill cover to determine if any additional actions, including active monitoring of landfill settlement, are required beyond the added clay material and regrading; and • complete review of the YCRG submittal regarding elevated PCB concentrations detected in Site sediments and determine if additional actions are necessary.

VII. NEXT REVIEW

The next FYR report for the Yeoman Creek Landfill Superfund Site is required no less than five years from EPA's signature date of this review.

APPENDIX A – REFERENCE LIST

ARCADIS. 2013. Second Five-Year Review Report Action Items Regarding PCBs, Yeoman Creek Landfill Superfund Site, Waukegan, Illinois. USEPA ID# ILD980500102. October 21.

Civil & Environmental Consultants, Inc (C&E). 2017. Summary of the Terrace Nursing Home Phase 2 Additional Protective Measures Implementation. Yeoman Creek Landfill Superfund Site, Waukegan, Illinois. January.

U.S. Environmental Protection Agency (EPA). 1996. EPA Superfund Record of Decision: Yeoman Creek Landfill, EPA ID: ILD980500102, OU 01, Waukegan, Illinois. EPA/ROD/R05-96/308. September.

EPA. 2012. Five-Year Review Report. Second Five-Year Review Report for Yeoman Creek Landfill Superfund Site, Lake County, Illinois. February 24.

Golder Associates. 1994. Remedial Investigation Report, Yeoman Creek/Edwards Field Landfills, Waukegan, Illinois. February.

Hard Hat Services. 2014. 2013 Annual Report, Yeoman Creek Landfill Superfund Site.

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Hard Hat Services. 2016. Gas Probe Monitoring Results, Yeoman Creek Landfill Superfund Site, Waukegan, Illinois. Submitted two- to four-times a week via E-mail. January 4 through December 30.

Progressive Engineering and Construction, Inc. (Progressive). 2015. Bi-Monthly Progress Reports, Yeoman Creek Landfill Superfund Site, Waukegan, Illinois. February 22 through December 17.

Progressive. 2015. Proposed Revisions to the Long-Term Monitoring Plan, Yeoman Creek Landfill Superfund Site, Waukegan, Illinois. February 16.

Progressive. 2016. Bi-Monthly Progress Reports, Yeoman Creek Landfill Superfund Site, Waukegan, Illinois. February 19 through December 21.

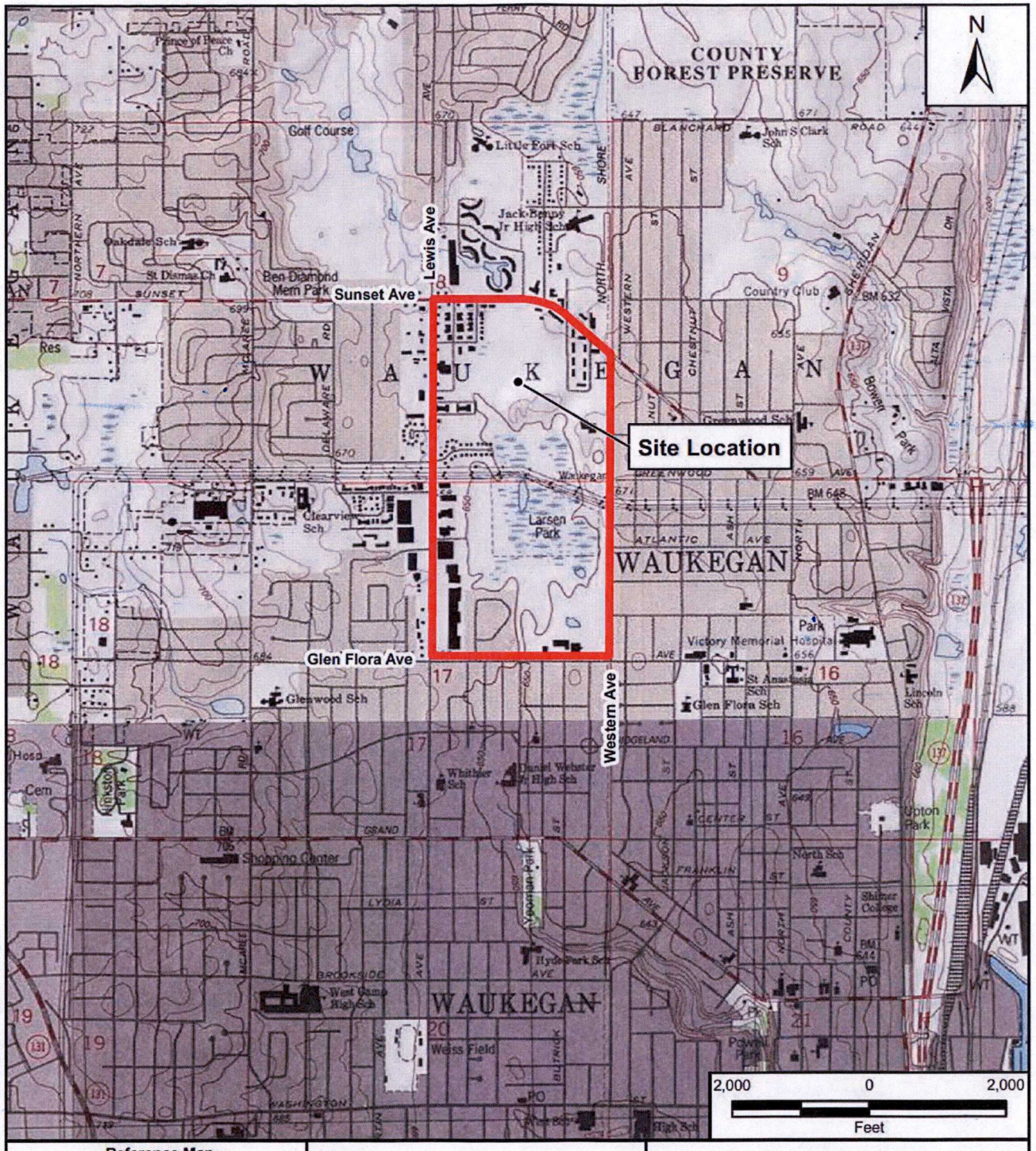
Progressive. 2016. Evaluation of PCBs in Sediment and Wetland Soil, Yeoman Creek Landfill Superfund Site, Waukegan, Illinois. October 17.

Progressive. 2016. E-mail Attachments: Gas Query2.xlsx. From Bridget Morello (progressiveec.com) to Syed Quadri (epa.gov). Subject: Yeoman - Data Query GW, SW, SD, Gas through 2015 - Email 2 of 2. May 24.

Progressive. 2016. E-mail Attachments: GW Query2.xlsx, SD Query2.xlsx, SW Query2.xlsx. From Bridget Morello (progressiveec.com) to Syed Quadri (epa.gov). Subject: Yeoman - Data Query GW, SW, SD, Gas through 2015 - Email 1 of 2. May 24.

The United States District Court for the Northern District Of Illinois Eastern Division (N.D. Ill). 1999. United States of America (Plaintiff) v. USX Corporation et al. (Defendants). Civil Action No. 98 C 6389. The Honorable Harry D. Leinenweber. Partial Consent Decree relating to Remedial Design/Remedial Action. April 7.

APPENDIX B – SITE FIGURES



Reference Map

Legend

Site Location

Source: USGS 7.5-Minute Topographic Quadrangle Map:Waukegan, IL 1998

Yeoman Creek Landfill
Waukegan, Lake County, Illinois

FIGURE 1
SITE LOCATION MAP

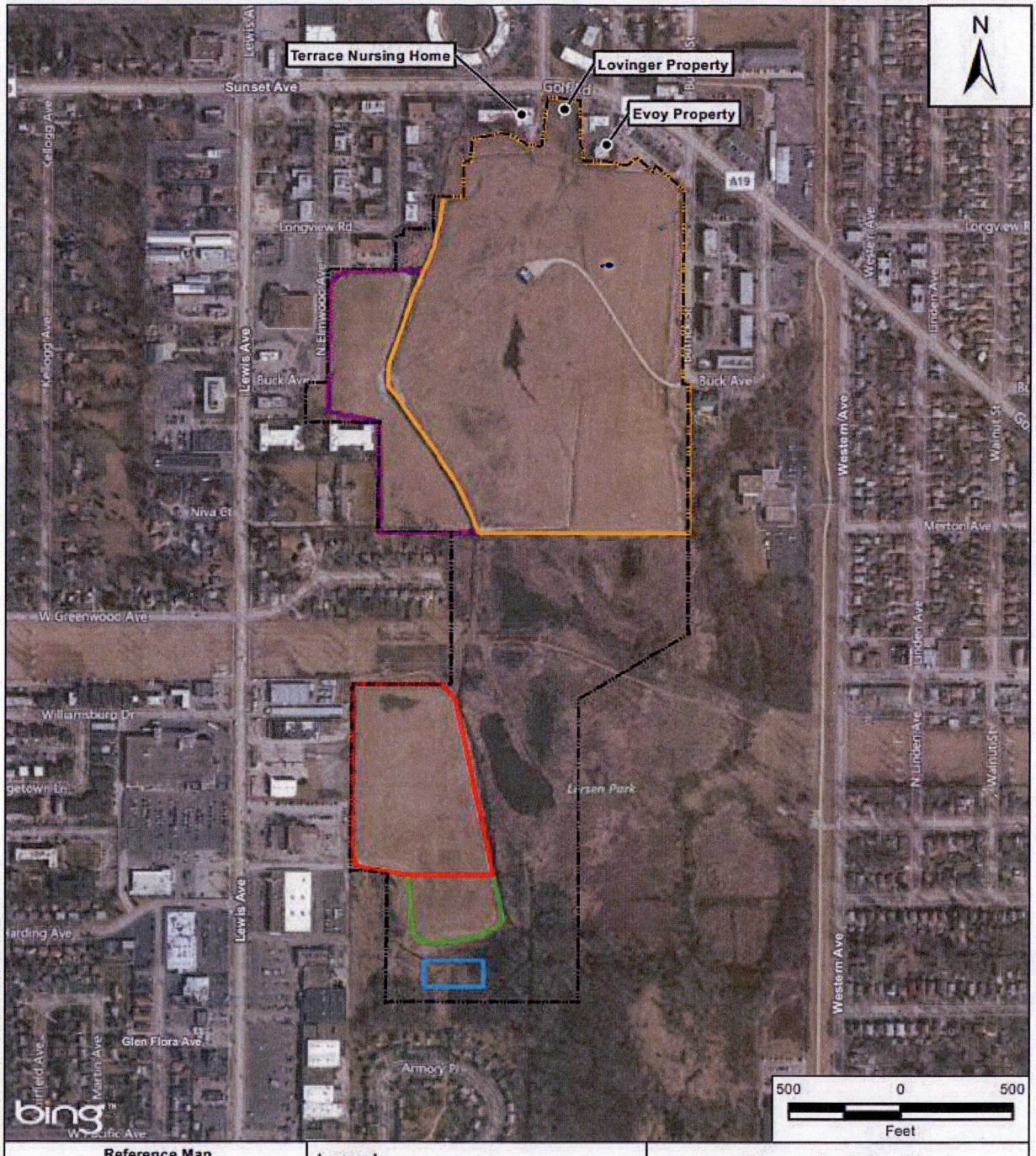
TETRA TECH

Prepared For: EPA | Prepared By: Tetra Tech Inc.

File Path: G:\G\G9026-START IV\Illinois\Yeoman Creek Landfill\mxd\Fig1-SiteLocation.mxd

Date Saved: 7/13/2016 | EPA Contract No.: EP-S5-13-01 | TDD No.: S05-0002-1409-007

Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree



Reference Map

Legend

- East Yeoman Creek Landfill
- West Yeoman Creek Landfill
- Edwards Field Landfill
- North Rubloff Landfill
- South Rubloff Landfill
- Approximate Site Boundary

Source: Bing Maps Hybrid 2013

Yeoman Creek Landfill
Waukegan, Lake County, Illinois

FIGURE 2
SITE LAYOUT MAP

TETRA TECH

Prepared For: EPA | Prepared By: Tetra Tech Inc.

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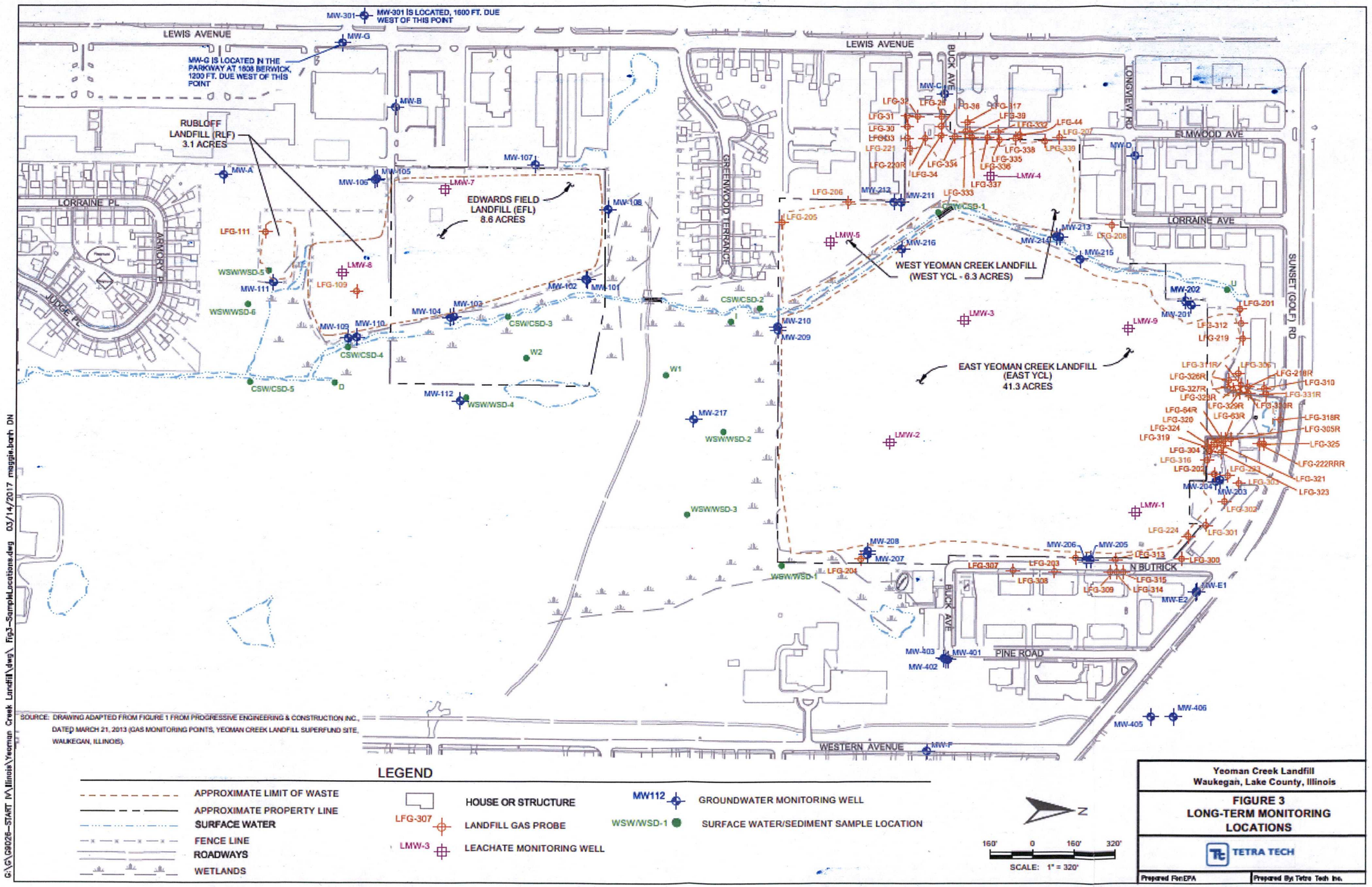
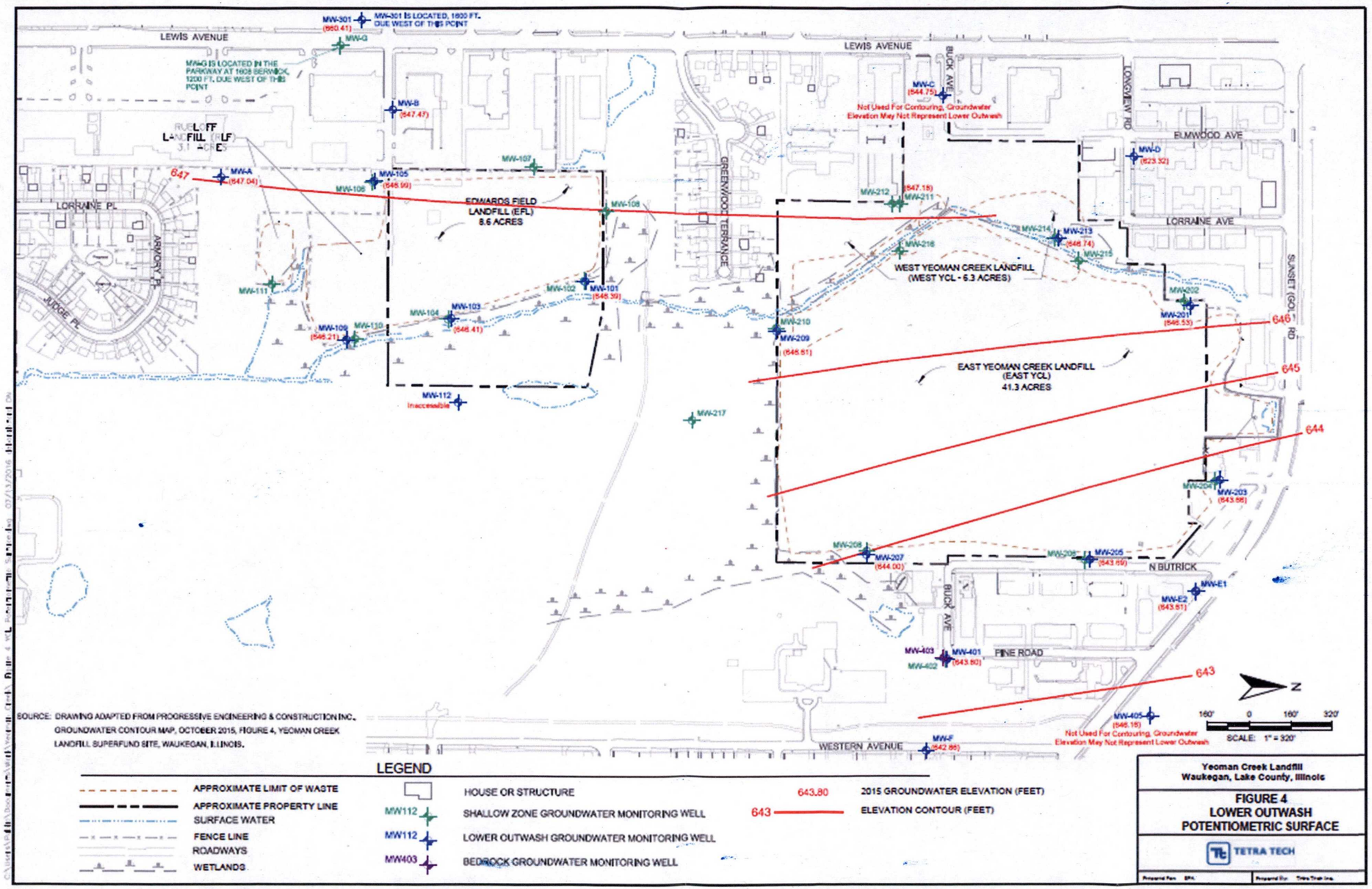
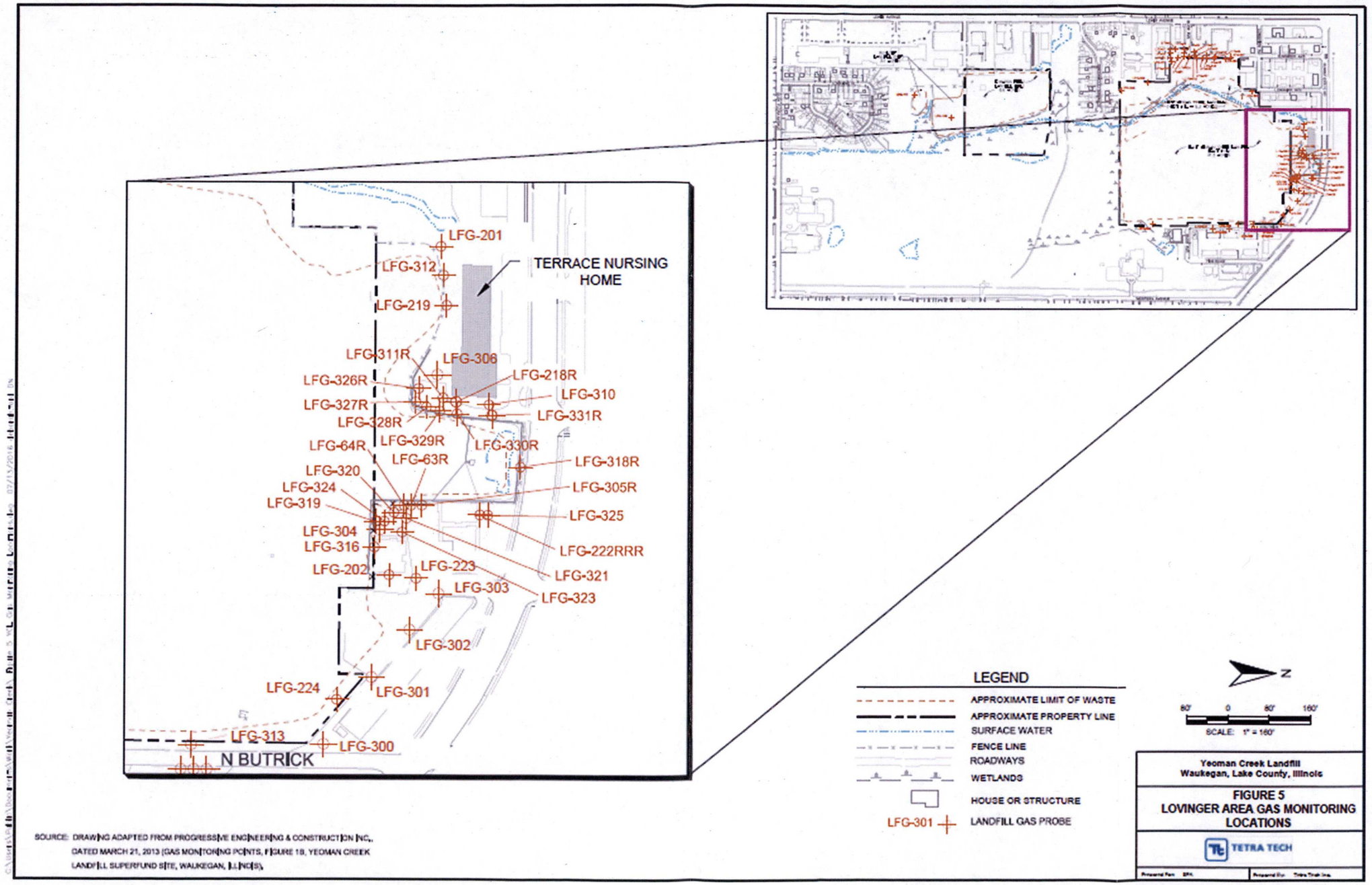
Date Saved: 3/14/2017

EPA Contract No.: EP-S5-13-01 TDD No.: S05-0002-1409-007

Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree


MW-301
MW-301 IS LOCATED, 1600 FT. DUE WEST OF THIS POINT
LEWIS AVENUE
MW-G
MW-G IS LOCATED IN THE PARKWAY AT 1608 BERWICK, 1200 FT. DUE WEST OF THIS POINT
MW-B
RUBLOFF LANDFILL (RLF) 3.1 ACRES
MW-A
MW-107
MW-105
MW-106
LMW-7
EDWARDS FIELD LANDFILL (EFL) 8.6 ACRES
MW-108
LORRAINE PL
ARMORY PL
JUDGE PL
LFG-111
WSW/WSD-5
MW-111
LMW-8
LFG-109
WSW/WSD-6
MW-104
MW-103
MW-102
MW-101
CSW/CSD-3
CSW/CSD-2
MW-109
MW-110
CSW/CSD-4
CSW/CSD-5
D
W2
W1
MW-112
WSW/WSD-4
MW-217
WSW/WSD-2
WSW/WSD-3
WSW/WSD-1
LFG-204
MW-210
MW-209
LFG-205
LFG-206
MW-212
MW-211
LFG-333
CSW/CSB-1
LMW-5
MW-216
WEST YEOMAN CREEK LANDFILL (WEST YCL - 6.3 ACRES)
MW-214
MW-213
MW-215
LFG-208
LMW-3
LMW-9
EAST YEOMAN CREEK LANDFILL (EAST YCL) 41.3 ACRES
LMW-2
MW-202
MW-201
LFG-201
LFG-312
LFG-219
LFG-218R
LFG-310
LFG-331R
LFG-316R
LFG-305R
LFG-325
LFG-222RRR
LFG-321
LFG-323
LMW-1
LFG-224
LFG-301
LFG-313
LFG-300
MW-208
MW-207
MW-206
MW-205
LFG-307
LFG-203
LFG-308
LFG-309
LFG-315
LFG-314
MW-E1
MW-E2
N BUTRICK
BUCK AVE
MW-403
MW-401
MW-402
PINE ROAD
MW-406
MW-405
WESTERN AVENUE
MW-P
LONGVIEW RD
ELMWOOD AVE
LORRAINE AVE
SUNSET (GOLF) RD
GREENWOOD TERRACE
MW-C
MW-D
LFG-32
LFG-28
LFG-38
LFG-317
LFG-31
LFG-39
LFG-30
LFG-332
LFG-44
LFG-33
LFG-207
LFG-221
LFG-220R
LFG-34
LFG-334
LFG-338
LFG-335
LFG-336
LFG-339
LFG-337
LMW-4
SOURCE: DRAWING ADAPTED FROM FIGURE 1 FROM PROGRESSIVE ENGINEERING & CONSTRUCTION INC., DATED MARCH 21, 2013 (GAS MONITORING POINTS, YEOMAN CREEK LANDFILL SUPERFUND SITE, WAUKEGAN, ILLINOIS).
LEGEND
APPROXIMATE LIMIT OF WASTE
APPROXIMATE PROPERTY LINE
SURFACE WATER
FENCE LINE
ROADWAYS
WETLANDS
HOUSE OR STRUCTURE
LFG-307 LANDFILL GAS PROBE
LMW-3 LEACHATE MONITORING WELL
MW112 GROUNDWATER MONITORING WELL
WSW/WSD-1 SURFACE WATER/SEDIMENT SAMPLE LOCATION
N
160' 0 160' 320'
SCALE: 1" = 320'
Yeoman Creek Landfill
Waukegan, Lake County, Illinois
FIGURE 3
LONG-TERM MONITORING LOCATIONS
TETRA TECH
Prepared For:EPA
Prepared By: Tetra Tech Inc.
G:\GIS\08026-START IV\Illinois\Yeoman Creek Landfill\dwg\ Fig3--SampleLocations.dwg 03/14/2017 maggie.barh DN


LEWIS AVENUE
MW-301 (960.41)
MW-301 IS LOCATED, 1600 FT. DUE WEST OF THIS POINT
MW-G
MW-G IS LOCATED IN THE PARKWAY AT 1608 BERWICK, 1200 FT. DUE WEST OF THIS POINT
MW-B (647.47)
RUBLOFF LANDFILL (RLF) 3.1 ACRES
MW-A (647.04)
MW-105 (646.99)
MW-106
MW-107
EDWARDS FIELD LANDFILL (EFL) 8.6 ACRES
MW-108
LORRAINE PL
ARMORY PL
JUDGE PL
MW-111
MW-102
MW-101 (646.39)
MW-103
MW-104 (646.41)
MW-109 (646.21)
MW-110
MW-112 Inaccessible
MW-217
LEWIS AVENUE
BUCK AVE
MW-C (644.75)
Not Used For Contouring, Groundwater Elevation May Not Represent Lower Outwash
GREENWOOD TERRANCE
MW-212
MW-211 (647.18)
MW-214
MW-213 (646.74)
MW-215
MW-216
WEST YEOMAN CREEK LANDFILL (WEST YCL - 6.3 ACRES)
LONGVIEW RD
ELMWOOD AVE
MW-D (623.32)
LORRAINE AVE
SUNSET (GOLF) RD
MW-202
MW-201 (646.53)
MW-210
MW-209 (646.51)
EAST YEOMAN CREEK LANDFILL (EAST YCL) 41.3 ACRES
MW-204
MW-203 (643.86)
MW-208
MW-207 (644.00)
MW-206
MW-205 (643.69)
N BUTRICK
MW-E1
MW-E2 (643.61)
BUCK AVE
MW-403
MW-402
MW-401 (643.80)
PINE ROAD
MW-405 (646.18)
Not Used For Contouring, Groundwater Elevation May Not Represent Lower Outwash
WESTERN AVENUE
MW-F (642.86)
647
646
645
644
643
N
160' 0 160' 320'
SCALE: 1" = 320'
SOURCE: DRAWING ADAPTED FROM PROGRESSIVE ENGINEERING & CONSTRUCTION INC., GROUNDWATER CONTOUR MAP, OCTOBER 2015, FIGURE 4, YEOMAN CREEK LANDFILL SUPERFUND SITE, WAUKEGAN, ILLINOIS.
LEGEND
APPROXIMATE LIMIT OF WASTE
APPROXIMATE PROPERTY LINE
SURFACE WATER
FENCE LINE
ROADWAYS
WETLANDS
HOUSE OR STRUCTURE
MW112 SHALLOW ZONE GROUNDWATER MONITORING WELL
MW112 LOWER OUTWASH GROUNDWATER MONITORING WELL
MW403 BEDROCK GROUNDWATER MONITORING WELL
643.80 2015 GROUNDWATER ELEVATION (FEET)
643 ELEVATION CONTOUR (FEET)
Yeoman Creek Landfill
Waukegan, Lake County, Illinois
FIGURE 4
LOWER OUTWASH
POTENTIOMETRIC SURFACE
TETRA TECH


LFG-201
LFG-312
TERRACE NURSING HOME
LFG-219
LFG-311R
LFG-306
LFG-326R
LFG-218R
LFG-310
LFG-327R
LFG-331R
LFG-328R
LFG-329R
LFG-330R
LFG-64R
LFG-63R
LFG-318R
LFG-320
LFG-324
LFG-305R
LFG-319
LFG-325
LFG-304
LFG-316
LFG-222RRR
LFG-202
LFG-223
LFG-321
LFG-303
LFG-323
LFG-302
LFG-224
LFG-301
LFG-313
LFG-300
N BUTRICK
LEGEND
APPROXIMATE LIMIT OF WASTE
APPROXIMATE PROPERTY LINE
SURFACE WATER
FENCE LINE
ROADWAYS
WETLANDS
HOUSE OR STRUCTURE
LFG-301
LANDFILL GAS PROBE
N
80' 0 80' 160'
SCALE: 1" = 160'
Yeoman Creek Landfill
Waukegan, Lake County, Illinois
FIGURE 5
LOVINGER AREA GAS MONITORING LOCATIONS
TETRA TECH
SOURCE: DRAWING ADAPTED FROM PROGRESSIVE ENGINEERING & CONSTRUCTION INC., DATED MARCH 21, 2013 (GAS MONITORING POINTS, FIGURE 19, YEOMAN CREEK LANDFILL SUPERFUND SITE, WAUKEGAN, ILLINOIS).

APPENDIX C – SITE CHRONOLOGY

Site Chronolgy

Event	Date
Initial discovery of problem or contamination	1969
NPL Listing	March 31, 1989
Interim actions and RAs, including installation of a fence around the site, construction of a building ventilation system, and construction of an LFG system	1990-1998
RI/FS complete	1995
ROD signed	September 30, 1996
UAO issued to PRPs for LFG building ventilation system	April 28,1996
CD for RD/RA	April 7, 1999
Pre-design investigation	1999-2000
RD approved	July 2001
Memorandum documenting minor changes to the remedy	February 2002
On-site RA construction begins	February 28, 2002
RA completed	September 2005
PCOR	September 23, 2005
First Five-Year Review	February 28, 2007
Flare system blower overhaul	March 2008
Changes to long-term monitoring plan (addition of sediment/surface water sampling)	Mid-2008
Design of the Lovinger Gas System	September 2008
Installation of sump pump lift station to discharge water collecting atop the landfill liner to the Evoy sewer	August 2009
Installation of Evoy sewer to drain surface water – (completion)	October 2009
Completion of slurry wall and LFG collection trench on north side of the site – (system activated)	October 2009
Large blower and additional carbon vessel installed for Lovinger Gas System	June 2010
Connection of Evoy parking lot gas collection trench to Lovinger Gas System	September 2010
Additional Terrace Nursing Home subsurface investigation/pilot test design work	May 2011
Direct Connection of Evoy parking lot collection trench to Lovinger Gas System blower through aboveground HDPE piping	June 2011
Second Five-Year Review	February 2012
Installation of six water level (depth to groundwater) monitoring points in the TNH back yard and one monitoring point within the landfill boundary	March 2012

Event	Date
Gas header repair near condensate trap #15 and piping improvements	June 2012
Connection of TNH parking lot 311R gas collection trench to Lovinger Gas System	June 2012
Conceptual plan for TNH Phase 2 additional protective measures	July 2013
Statistical evaluation of PCBs in sediment and wetland soil	October 2013
Completion of TNH Phase 1 additional protective measures (basement sealing and six monitoring taps)	December 2013
TNH Phase 2 additional protective measures design plans and specifications	August 2014
Removal of carbon vessels from landfill gas management system after annual VOC emissions estimated at less than 1 pound	December 2014
Withdrawal of TNH Phase 2 additional protective measures work plan	March 2015
Installation of three new gas monitoring probes in TNH back yard	August 2015
Reduction in monitoring frequency of select gas monitoring probes from 4 days per week to 2 days per week	August 2015
Plugging and abandonment of vertical gas wells GW-1, GW-2, GW-3, GW-4, and GW-5 in the Lovinger area	September 2015
Reduction of sediment, surface water, and groundwater monitoring frequency from semi-annual to annual, along with changes to sampling locations and analytical parameters	September 2015
Replacement of one of two Lovinger Gas System blowers	November 2015
TNH Phase 2 additional protective measures final work plan	June 2016
Evaluation of PCBs in sediment and wetland soil (response to comments on statistical evaluation of PCBs in sediment and wetland soil)	October 2016
TNH Phase 2 additional protective measures (parking lot clay fill excavation, granular material backfilling, 311R extraction trench removal, new gas extraction piping installation, and affected gas probes replacement)	November 2016

Notes:

CD	Consent Decree
FS	Feasibility study
HDPE	High density polyethylene
LFG	Landfill gas
NPL	National Priorities List
PCB	Polychlorinated biphenyl
PCOR	Preliminary close-out report
PRP	Potentially responsible party
RA	Removal action
RD	Remedial design
RI	Remedial investigation
ROD	Record of Decision
TNH	Terrace Nursing Home
UAO	Unilateral Administrative Order
VOC	Volatile organic compound

APPENDIX D – SITE INSPECTION DOCUMENTATION

July 12, 2016 Site Inspection Summary

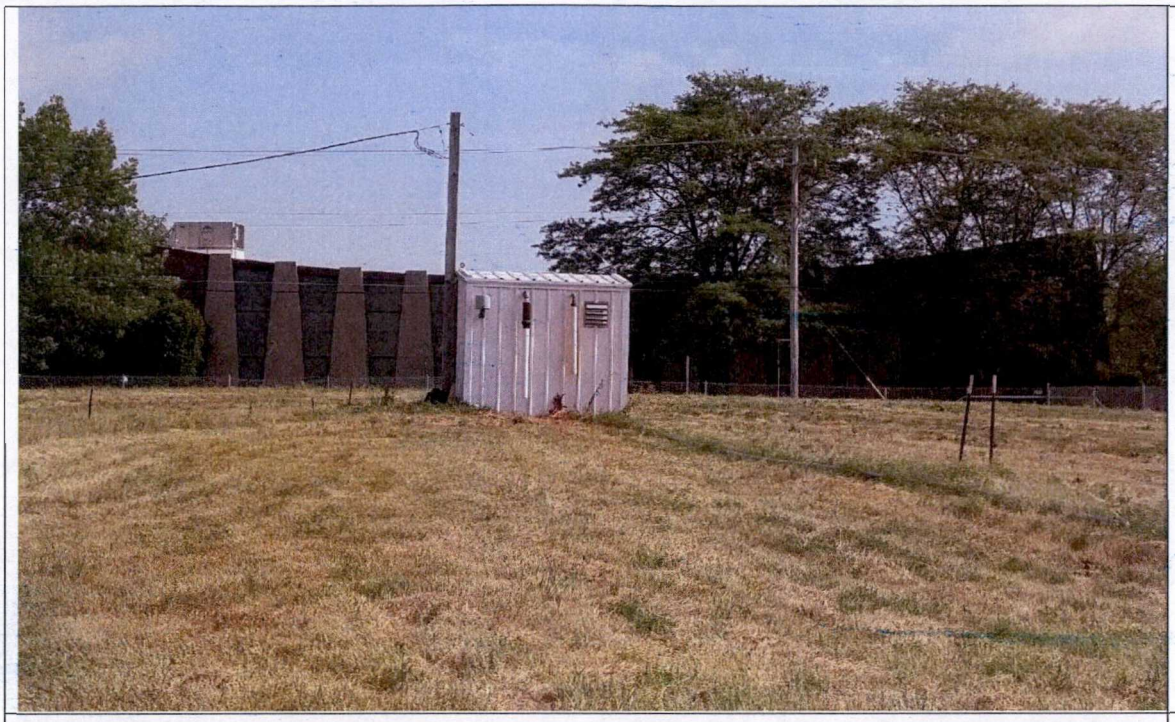
A site inspection was conducted on Tuesday, July 12, 2016. The weather was sunny and windy with temperature ranging from 78 to 88 degrees Fahrenheit. Present at the inspection were Syed Quadri (EPA Remedial Project Manager), Erin Rednour (IEPA), Chit Christian (Tetra Tech Inc., EPA Oversight Contractor), Bridget Morello (Progressive Engineering and Construction, Inc., YCRG Project Manager), Kevin Kruckeberg (Waukegan Public School District 60), Bob Solak (Hard Hat Services, YCRG O&M Contractor), Ray Hladovcak (Hard Hat Services, YCRG O&M Contractor), and Beau Harp (Civil & Environmental Consultants, Inc., YCRG O&M Contractor).

The landfill gas (LFG) extraction and treatment system is operating and its visible components appear to be in good condition. The treatment system includes a flare. A large condensate tank now requires emptying only once a year. Treatment system components are secured within a 60-foot by 30-foot fenced area that can be accessed through a locked gate. The treatment building appears to be in good condition. The landfill perimeter fence likewise appears to be in good condition. There were no obvious signs of settlement along the slurry wall (the northern perimeter of East Yeoman Creek Landfill). Systems to mitigate methane off site were not inspected because planned additional protective measures have not yet been implemented. Most records are maintained off site.

Issues noted during the inspection are summarized below.

1. An area of distressed vegetation was observed in the northern portion of East Yeoman Creek Landfill, approximately 200 feet south of the LFG treatment system, at latitude 42.388753 degrees and longitude -87.850898 degrees. It is an approximately 200-foot by 75-foot triangular area. This area is visibly lower than the surrounding land and reportedly ponds when it rains, indicating that the area has settled in the last few years. It is likely that the buried geomembrane has also settled and collects water. Therefore, in addition to backfilling and grading the depression, the corrective measure should include means to keep percolated water from pooling on top of the buried geomembrane. This measure may require installation of a second geomembrane with a geosynthetic drainage layer. The new geomembrane and drainage layer must be integrated into the cover system in a manner that will drain percolated water away from the repaired section. The old geomembrane that has been compromised by settlement should either be removed or punctured at several locations. Erosion ruts draining this area should also be graded to prevent concentrated stormwater flow. The corrective measure should be designed after a pre-construction survey. The design should include drawings and specifications and must be approved by EPA. At a minimum, the design drawings should include a plan view, cross sections, and cover integration details. Record surveys should be performed during implementation of the corrective measure to document the horizontal and vertical limits of each layer of the landfill cover.
2. Settlement is not measured. The landfill cover has an undulating surface, and settlement is likely partly responsible. It cannot be ascertained through visual observation alone whether all areas of the cover drain freely. Therefore, the landfill cover should be periodically surveyed to generate a topographic map. Drone surveys may be considered if they prove cost-effective. The first survey should be completed within 6 months after the corrective measure for cover settlement has been implemented. The result of that survey should then be compared to the original topography of the landfill cover when it was newly constructed. The second topographic survey should be completed within 2 years of the first survey (but no later than February 2021) and compared with

the first survey. After that, EPA will establish the appropriate frequency of future surveys. All topographic surveys should be performed soon after the vegetative cover has been mowed.



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