LANDFILL GAS MIGRATION ANALYSIS

OLD WILLIAMSPORT LANDFILL REDEVELOPMENT

OLD WILLIAMSPORT
LANDFILL
EFACTS FACILITY ID 1322111

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WILLIAMSPORT BALLPARK, INC.
OLD WILLIAMSPORT LANDFILL REDEVELOPMENT

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1.0 INTRODUCTION

The Old Williamsport Landfill is located at 2 Rose Street in the City of Williamsport, Lycoming County, Pennsylvania (Site). From approximately 1960 to 1978, the Site was utilized for unregulated landfill operations. Wastes that were disposed include: incineration residue, commercial waste, construction and demolition waste, domestic/household waste, industrial waste, park and beach waste, patient care institution waste, septic tank waste, street and alley waste, tree and landscaping waste, and hazardous wastes including paint thinner, organic chemicals, and pathological and biological wastes (Converse, 2005). During its use as a landfill, and for a period of time after, waste oils were used for dust control. After the landfill operations concluded, the site was subsequently used for the minor disposal of tree and roadway wastes through the 1980s, and for the storage of road salt and cinders until the early 2000s. Since that time, the northern portion of the property comprising the Site has become vacant and is currently vegetated. The southern portion of the Site was most recently utilized by Susquehanna Supply Company, a construction services company specializing in bridge and road construction. However, many of the previous property buildings have been razed and only concrete slabs and a single building remain on the property.

The current owner of the Site, Williamsport Ballpark Inc. (WBI), is in the process of redeveloping the Site to construct a series of Little League and college baseball fields and supporting infrastructure. To that end, the Site has been enrolled in the Pennsylvania Department of Environmental Protection's (PADEP) Voluntary Cleanup Program (or Act 2) to facilitate redevelopment efforts.

The Act 2 program typically involves characterization of soil, groundwater, and soil vapor conditions to determine a remedial approach for attaining one of the cleanup standards established under PA Code Title 25 Chapter 250. In the case of the Old Williamsport Landfill, WBI intends to remediate the Site to the Site Specific Standard under Act 2 using a combination of methodologies to eliminate exposure pathways to chemicals in soil and groundwater beneath the Site. However, since contamination of the Site is associated with historical waste disposal activities, namely the remaining waste material and potential landfill gas (LFG) generated by the waste mass, the Act 2 program has engaged PADEP's Waste Management Program for technical assistance. WBI is therefore coordinating with PADEP's Waste Management Program to assure that the remaining waste mass and associated landfill gas will not adversely affect the proposed redevelopment conditions.

2.0 HISTORICAL ENVIRONMENTAL INVESTIGATIONS

Several inspections and investigations have occurred at the Site subsequent to the closure of the landfill. These investigations were related to either the landfill itself or due to impacts from underground storage tanks (USTs) that were located on the southern portion of the property.

The first investigation on the northern portion of the Site occurred in September 1998 and was conducted by the NUS Corporation on behalf of the Environmental Protection Agency (EPA). This report identified low levels of organic and inorganic contaminants at the landfill but indicated that they were not present at concentrations constituting "a hazard to human health". However, the EPA indicated that this conclusion was partly the result of the limited sampling that was done

during the investigation. Additionally, the EPA did not investigate groundwater conditions at the Site.

In 2005, a broader scale investigation of the northern portion of the Site was undertaken by Converse Consultants of State College, Pennsylvania as part of a Phase II Environmental Site Assessment. This investigation assessed not only the subsurface conditions at the landfill, but also investigated potential impacts associated with the use of waste oils for dust suppression at the Site. The conclusions of the report, completed October 20, 2005, indicated that several organic and inorganic constituent concentrations were present at concentrations exceeding the Pennsylvania Statewide Health Standards (SHS) in both unsaturated soil and groundwater. In soils, antimony, lead, naphthalene, and benzo(a)anthracene exceeded Act 2 residential SHS. In groundwater, antimony, arsenic, beryllium, chromium, lead, mercury, nickel, selenium, thallium, and zinc concentrations exceeded the Act 2 SHS in groundwater from multiple wells, and methyl tert-butyl-ether (MTBE) exceeded SHS in groundwater from one well. The Phase II report also indicated that impacted groundwater may extend beyond the property boundary of the Site, and that landfill refuse material was generating landfill gas at the time of the assessment.

`On January 8, 1997, four underground storage tanks (USTs) were closed by removal by West Branch Petroleum Equipment Company, on the southern portion of the Site. The USTs included a 4,000-gallon unleaded gasoline UST, a 6,000-gallon diesel fuel UST, a 3,000-gallon diesel fuel (off-road) UST, and a 6,000-gallon UST previously containing on-road diesel. It was noted during the removal that possible soil and groundwater impacts were noticed but the contractor could not determine if the impacts were from the USTs or from existing conditions at the Site. The closure report apparently indicated samples contained “high levels” of naphthalene but did not indicate actual concentrations or whether these samples were of soil or groundwater.

In March 1998, Nittany Geoscience, Inc. of State College, Pennsylvania began an Underground Storage Tank Site Characterization Report to fully assess and delineate the extent of impacts resulting from the USTs that were located at the Site. Seven groundwater monitoring wells were installed, and samples were obtained in April 1988. Additionally, soil samples were collected and analyzed. The groundwater results indicated the presence of several petroleum constituents above non-residential Act 2 SHS (used aquifer conditions); however, these concentrations were below non-use aquifer standards. The soil samples collected indicated that no non-residential Act 2 SHS MSCs were exceeded. However, a final site/tank closure report was not prepared at the time.

USFilter Operating Services, Inc. (USFilter) took over the completion of the Underground Storage Tank Site Characterization Report in March 1999. USFilter summarized the results of previous site investigation activities to meet the requirements of an Act 2 Remedial Investigation Report/Final Report. USFilter reported that an Act 2 Site Specific Standard (SSS) was attained, which allowed for a release of liability protection associated with impacts resulting from former UST operations. USFilter also concluded that groundwater modeling demonstrated that existing groundwater impacts would not leave the property now or in the future, that there were no exposure pathways at the property, and that there was no significant ecological risk. On April 28, 1999, PA DEP indicated in a letter that the USFilter report adequately demonstrated attainment of Act 2 SSS, that no further action for the cleanup was required, and granted SSC liability protection for soil and groundwater impacts associated with the historical UST operations.

3.0 RECENT SITE CHARACTERIZATION ACTIVITIES

As part of the recent Act 2 site characterization process, a subsurface investigation of the Site was completed to examine the conditions of historic waste on the Site (depth to top and bottom of waste), determine vertical and lateral extent of chemicals of concern beneath the Site, provide geotechnical engineering parameters for site construction activities, and determine appropriate remedial approaches consistent with the proposed end use of the Site as a baseball facility.

The subsurface investigation was conducted from August 8, 2020 through October 7, 2020 and included completion of fifty-four boreholes via split-spoon and auger boring activities. Soil samples were collected from both above and below waste and later analyzed by a certified laboratory for a variety of chemical compounds. Four of the boreholes were converted to groundwater monitoring wells, while the remaining boreholes were later grouted shut with PennDOT Class B Flowable Fill with a shrinkage reducing admixture.

Due to the potential presence of LFG generated by the historic mass of waste, gas monitoring of methane was conducted during and after the drilling process. Additionally, gas concentrations were measured in the boreholes, in material samples, and at various times across the Site for methane data collection purposes. A Bascom-Turner Gas Explorer, Model #EGI-201, Methane Detector was used to measure gas concentrations across the Site. The Gas Explorer detector was utilized at the Site for the measurement of methane concentrations. The detector can be used in a roaming mode with a range of 0-40,000 ppm and a resolution of 20 ppm. In monitoring mode (stationary location) the detector has range of 0-100% gas volume. The resolution for this setting was 0.05% at a range of 0-5% gas volume; and 1.0% gas volume at a range between 5-100% gas volume.

4.0 METHANE MONITORING METHODOLOGY AND RESULTS

Methane concentrations were monitored during site characterization activities under a variety of conditions. Specifically, methane was measured within the drill casing during boring advancement, within soil and waste samples removed from the borehole, within each borehole following removal of drill casing but prior to grouting, within each borehole following grouting, and general surface readings across the Site throughout site characterization activities. As discussed in the following sections, methane concentrations as measured during site characterization activities are summarized in Tables 1, 2, and 3, and boring locations and surface monitoring locations are illustrated in Figures 1 and 2.

Concurrent Drilling/Monitoring

During the drilling process, the methane detector was used to continuously monitor the concentrations of methane within the advancing boreholes. Drilling typically occurred in two- to three-foot runs depending on the sampling needs and the addition of drilling rods. During these times, the drilling rod and split spoon would be removed, and a methane reading would be taken within the drill casing. In the few instances where methane was detected within the drill casing, drilling would cease, gas would be allowed to vacate the casing, and the gas reading in the casing would be re-checked to ensure safe conditions prior to resuming drilling activities.

Methane was infrequently detected within the drill casing during borehole advancement. In fact, as Table 1: Recorded Methane Concentrations Within Drill Casing

illustrates, only 24 out of the 853 measurements collected resulted in measurable concentrations of methane. When present, the methane concentrations ranged between 180 ppm and 670,000 ppm. The highest concentrations were observed in boreholes BH13 and BH21 with concentrations of 660,000 ppm (between 8 and 10 feet below ground surface (bgs)) and 670,000 ppm (between 24 and 26 feet bgs), respectively. Two detections of 34,000 ppm (8 to 12 feet bgs) and one detection of 31,000 (6 to 8 feet bgs) were observed at BH18. BH14 had one detection of 20,500 ppm (between 10 to 12 feet) and BH42 had a detection of 13,000 ppm between 14 and 16 feet. The remaining borehole detections were less than 1,000 ppm.

Soil and Waste Cuttings

Methane concentrations were also measured in soil and waste samples generated as cuttings during drilling activities. To measure the gasses within soil and waste samples removed from the split spoons, the material was immediately placed either into a glass jar or a zip-lock bag. These would then be tested by the gas detector after approximately five minutes of being sealed.

As Table 2: Recorded Methane Concentrations in Soil/Waste Samples illustrates, methane was only detected in soil/waste samples collected from two of the borings completed on the Site. BH38 contained methane at 180 ppm and 200 ppm at 18 to 20 feet bgs and 24 to 26 feet bgs, respectively. BH40 also contained methane at 6.8 ppm at 18 to 20 feet bgs.

Post-drilling Borehole Measurements

Methane measurements were also collected at each borehole after drill casing was removed from the boring and before boreholes were grouted, and then again following grouting of each borehole. To measure methane concentrations emanating from each borehole, the probe end was placed approximately 6 inches below the ground surface, allowed to acclimate for 30 seconds, and then the "stabilized" gas concentration was observed for 30 seconds. The average gas concentration over the final 30 second interval was then recorded. A similar protocol was used to measure methane concentration at each borehole following grouting.

Table 3: Surface/Near Surface Methane Concentrations summarizes the methane readings collected in the boreholes following removal of drill casing. A total of 126 methane readings were collected in the boreholes post-drilling but pre-grouting (as measured August 17, 2020 through August 31, 2020), with concentrations ranging from a minimum of 0 ppm (within 8 of the 54 borings) to a maximum reading of 760,000 ppm (in well B47 on 8/17/2020 and in well B11 on 8/20/2020). The average concentration of methane across all sampling events was approximately 265,000 ppm. Methane was not detected at the surface of any borehole post-grouting (as measured September 16-17, 2020 and October 2, 2020).

Surface Monitoring

Additionally, ground surface measurement of gasses was also conducted across the Site. Stationary surface gas measurements were taken at approximate grid points between the borehole locations. Measurements were made during periods of both warm (75-90º) and cool temperature (45-60º) to account for atmospheric effects on the release

of subsurface gasses. The detector was placed on the ground with the probe end just above the ground surface. As with the borehole measurements, the detectors acclimated for 30 seconds and then measurements were observed during the next thirty seconds. The average concentration during the final 30 seconds was then recorded.

Finally, roaming gas measurement of the ground surface was conducted using the detector both before and after grouting of the boreholes. Measurement was conducted by slowly walking a grid pattern of the Site while the meter constantly measured concentrations. The probe end was maintained at 1 to 2 inches above the ground surface, and the detector screens were constantly observed to note any detections.

Figure 1 illustrates the discrete measurement locations collected during site characterization activities and includes a total of 127 discrete surface/near surface methane measurement locations. Each of these locations was sampled in two separate events. Methane was not detected at the surface while collecting either the surface grid point or roaming surface gas measurements.

5.0 REMEDIAL APPROACH AND CONSTRUCTION CONSIDERATIONS

Based on the results of the site characterization activities regarding landfill gas, methane is still present within the waste mass. However, methane was not detected in several areas of the Site subsurface, and concentrations varied greatly across the Site subsurface both laterally and temporally. Therefore, it is likely that pockets of remnant landfill gas remain scattered across the Site. As the post-grouting and surface methane monitoring activities reveal, the existing soil and concrete "cap" placed on top of the historic waste mass are effective in preventing migration of methane to the atmosphere above the waste mass. It also suggests that landfill gas production rate is very low.

The proposed redevelopment of the Site will entail regrading of the existing surface to create level baseball fields, concession area, utility corridors and lighting, and stormwater control facilities. The attached Figure 2 illustrates the existing grade, proposed grading for athletic facilities, and top of waste grades. The general design approach for the facility is to maintain a minimum 3 ft. cap of soil materials in place over the surface of the waste. In general, the vast majority of the proposed site maintains 4 or more ft. of soil cap. However, in certain situations the soil cap will be less than 3 ft. Examples are areas for stormwater basins, light pole foundations, field underdrains, and stormwater piping will be much closer to or into the waste mass and are therefore more likely locations for LFG migration. For these areas, additional measures are proposed.

Stormwater basins will be lined with a geosynthetic liner system to minimize infiltration of stormwater into the waste and exfiltration of landfill gas through the basin floor. Additionally, gas mitigation trenches will be installed beneath the liner system to prevent uplift of the liner if landfill gas were to collect beneath it. Passive gas vents will also be installed adjacent to each stormwater basin to vent any LFG collected in the mitigation trenches.

Light pole foundations may encounter the waste mass and could present a potential gas mitigation pathway absent control measures. Light pole foundations will be overexcavated to a depth of 6'6" below grade and 3' laterally beyond the edge of footings in all directions, which will involve excavation into waste. The design details call for these areas to have a minimum of three-

foot thickness of soil and/or concrete covering the excavated waste, pier, and backfilled excavation area. The combined soil/concrete covering should be sufficient to minimize migration of methane to the surface in these areas.

Finally, utility trenches, stormwater piping and field underdrains will likely be completed near or within the waste mass in areas. All piping and utility trenches will be covered by at least three feet of soil or covered with an asphalt or concrete surface to inhibit gas migration to the surface. Field underdrains will be lined with an impermeable liner to minimize LFG migration.

6.0 MONITORING

WBI proposes to conduct methane monitoring during construction and for a period of time following completion of construction to ensure that methane migration does not pose a threat to construction workers or users of the athletic fields and facilities during or after construction.

Methane concentrations will be monitored throughout construction with similar equipment used during site characterization activities, particularly where construction activities encounter waste. This construction monitoring will be conducted for environmental monitoring purposes only. In addition to this environmental monitoring during construction activities, contractors will be required to implement their own personal Health and Safety Plan related to exposure to landfill gas. Surface readings will be measured and recorded by BAI at least three times weekly as additional areas are disturbed. If methane is detected above National Institute for Occupational Safety and Health (NIOSH) standards and/or between the lower and upper flammability ranges (5-17% methane, particularly in enclosed structures) during construction, the immediate area will be evacuated and allowed to stabilize prior to resuming construction activities in the area. Any such occurrences will be documented by construction oversight.

Following completion of construction, surface methane readings will also be measured to ensure that the remaining "cap" and gas control design measures continue to prevent methane migration through the surface. This will also ensure that landfill gas within the waste mass has stabilized following earth disturbance activities. Surface monitoring will be conducted in the following locations:

- Gas migration trenches daylighting around stormwater basins.
- Stormwater control inlets and outlets.
- Around permanent building foundations (bathrooms or concessions).
- Around dugout structures.
- Selected light standards where waste is closest to the surface.
- Grid pattern/random spots on surface.

Post-construction gas monitoring will be conducted according to the following schedule:

- Weekly for the first month following construction completion.
- Monthly for the following five (5) months.
- Assuming that landfill gas is not consistently detected during the monthly sampling events, during the 9th and 12th months following completion of construction activities.

If methane concentrations are consistently measured during the post-construction monitoring period, the Department will be contacted to establish acceptable methane concentrations and to determine next steps.

7.0 REFERENCES

Converse Consultants. (October 20, 2005). *Phase II Environmental Site Assessment – Williamsport Landfill.*

NUS Corporation Superfund Division (on behalf of the US Environmental Protection Agency (EPA)). (September 29, 1988). *R-585-2-8-51, Site Inspection of Williamsport Landfill Prepared Under TDD No. F3-8710-02 EPA No. PA-1106 Contract No. 68-01-7346.*

TABLES

Williamsport Ballpark, Inc.
Former Williamsport Landfill Act 2

Table 1: Recorded Methane Concentrations Within Drill Casing

	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH9	BH10	BH11	BH12	BH13	BH14
Date	**9/16/2020**	**8/24/2020**	**8/20/2020**	**8/19/2020**	**9/16/2020**	**8/17/2020**	**8/17/2020**	**8/11-8/12/2020**	**9/17/2020**	**8/24/2020**	**8/20/2020**	**8/20/2020**	**8/19/2020**	**8/17/2020**
Depth														
0-2'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-6'	0	**500**	0	0	0	0	0	0	0	0	0	0	0	0
6-8'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-10'	0	**500**	0	0	0	0	0	0	0	0	0	0	**660,000**	0
10-12'	0	0	0	0	0		0	0	0	0	0	0	0	**20,500**
12-14'	0	0	0	0	0		0	0	0	0	0	0	0	0
14-16'	0	0	0	0	0		0	0	0	**500**	0	0	0	0
16-18'	0	0	0	0	0		0	0	0	**500**	0	0	0	0
18-20'	0	0	0	0	0		0	0	0	0	0	0	0	0
20-22'	0	0	0	0	0		0	0	0	0	0	0	0	0
22-24'	0	0	0	0	0		0	0	0	0	0	0	0	0
24-26'	0	0	0	0	0		0	0	0	0	0	0	0	0
26-28'	0	0	0	0	0		0	0	0	0	0	0	0	0
28-30'	0	0	0	0	0		0	0	0	0	0	0	0	0
30-32'		0	0	0	0		0	0	0	0	0	0	0	0
32-34'		0		0			0	0	0		0		0	**500**
34-36'		0		0			0	0	0		0		0	**500**
36-38'				0			0						0	**500**
38-40'				0									0	
40-42'														

Notes:
1. Methane concentrations were measured at the time of drilling within the drill casing using a Bascom-Turner Gas Explorer, Model #EGI-201.
2. Results reported in parts per million methane.
3. Detections noted in bold font.
4. Depths measured feet below ground surface (bgs).

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Former Williamsport Landfill Act 2

Table 1: Recorded Methane Concentrations Within Drill Casing

	BH15	BH16	BH17	BH18	BH19	BH20	BH21	BH22	BH23	BH24	BH25	BH26	BH27	BH28
Date	8/15/2020	8/2/2020	8/12/2020	8/25/2020	8/20/2020	8/19/2020	8/18/2020	8/14/2020	8/2-8/3/2020	8/10/2020	8/12/2020	8/26/2020	8/26/2020	8/27/2020
Depth														
0-2'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-6'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-8'	0	0	0	**31,000**	0	0	0	0	0	0	0	0	0	0
8-10'	0	0	0	**34,000**	0	0	0	0	0	0	0	0	0	0
10-12'	0	0	0	**34,000**	0	0	0	0	0		0	0	0	0
12-14'	0	0	0	0	0	0	0	0	0			0	0	0
14-16'	0	0	0	**500**	0	0	0	0	0			0	0	0
16-18'	0	0	0	0	0	0	0	0	0			0	0	0
18-20'	0	0	0	0	0	0	0	0	0			0	0	0
20-22'	0	0	0	0	0	0	0	0	0			0	0	0
22-24'	0	0	0	0	0	0	0	0	0			0	0	0
24-26'	0	0	0	0	0	0	**670,000**	0	0			0	0	0
26-28'	0	0		0	0	0	0	0	0			0	0	0
28-30'	0	0		0	0	0	0	0	0			0	0	0
30-32'	0	0		0			0	0	0			0	0	0
32-34'	0	0					0	0	0				0	
34-36'	0	0					0		0				0	
36-38'	0	0							0					
38-40'	0	0							0					
40-42'		0												

Notes:
1. Methane concentrations were measured at the time of drilling within the drill casing using a Bascom-Turner Gas Explorer, Model #EGI-201.
2. Results reported in parts per million methane.
3. Detections noted in bold font.
4. Depths measured feet below ground surface (bgs).

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Table 1: Recorded Methane Concentrations Within Drill Casing

	BH29	BH30	BH31	BH32	BH33	BH34	BH35	BH36	BH37	BH38	BH39	BH40	BH41	BH42
Date	8/18/2020	8/18/2020	8/13/2020	8/13/2020	8/12/2020	8/25/2020	8/26/2020	8/27/2020	8/29/2020	8/31/2020	8/14/2020	8/11/2020	8/10/2020	8/25/2020
Depth														
0-2'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-6'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-8'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-10'	**500**	0	0	0	0	0	0	0	0	0	0	0	0	0
10-12'	0	0	0	0		0	0	0	0	0	0	0	0	0
12-14'	0	0	0	0		0	0	0	0	0	0	0	0	0
14-16'	0	0	0	0		0	0	0	0	**40**	0	0	0	**13,000**
16-18'	0	0	0	0		0	0	0	0	**40**	0	0	0	**1,000**
18-20'	0	**500**	0	0			0	0	0	**180**	0	**7**	0	0
20-22'	0	0	0	0			0	0	0	**180**	0	0	0	0
22-24'	0	0	0	0			0	0	0	**200**	0	0	0	0
24-26'	0	0	0	0			0	0	0	0	0	0	0	0
26-28'	0	0	0	0			0	0	0	0	0		0	0
28-30'	0	0	0				0	0	0	0	0		0	0
30-32'	0								0	0			0	
32-34'	0								0	0			0	
34-36'										0			0	
36-38'													0	
38-40'													0	
40-42'														

Notes:

1. Methane concentrations were measured at the time of drilling within the drill casing using a Bascom-Turner Gas Explorer, Model #EGI-201.
2. Results reported in parts per million methane.
3. Detections noted in bold font.
4. Depths measured feet below ground surface (bgs).

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Table 1: Recorded Methane Concentrations Within Drill Casing

	BH43	BH44	BH45	BH46	BH47	BH48	BH49	BH50	BH51	BH52	BH53	BH54	BH55
Date	8/26/2020	8/29/2020	8/29/2020	8/31/2020	8/14/2020	8/11/2020	8/10/2020	8/24/2020	8/25/2020	8/26/2020	8/27/2020	8/31/2020	9/17/2020
Depth													
0-2'	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4'	0	0	0	0	0	0	0	0	0	0	0	0	0
4-6'	0	0	0	0	0	0	0	0	0	0	0	0	0
6-8'	0	0	0	0	0	0	0	0	0	0	0	0	0
8-10'	0	0	0	0	0	0	0	0	0	0	0	0	0
10-12'	0	0	0	0	0	0	0	0	0	0	0	0	0
12-14'	0	0	0	0	0	0	0	0	0	0	0	0	0
14-16'	0	0	0	0	0	0	0	0	0	0	0	0	0
16-18'	0	0	0	0	0	0	0	0	0	0	0	0	0
18-20'	0	0	0	0	0	0	0	0	0	0	0	0	0
20-22'	0	0	0	0	0	0	0		0	0	0	0	0
22-24'	0	0	0	0	0	0	0		0	0	0	0	0
24-26'	0	0	0	0	0	0	0		0	0	0	0	0
26-28'	0	0	0	0	0		0		0	0	0	0	0
28-30'	0	0	0	0			0		0	0	0	0	0
30-32'		0	0								0	0	0
32-34'		0	0								0		0
34-36'													0
36-38'													0
38-40'													0
40-42'													0

Notes:
1. Methane concentrations were measured at the time of drilling within the drill casing using a Bascom-Turner Gas Explorer, Model #EGI-201.
2. Results reported in parts per million methane.
3. Detections noted in bold font.
4. Depths measured feet below ground surface (bgs).

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Table 2: Recorded Methane Concentrations in Soil/Waste Samples

	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH9	BH10	BH11	BH12	BH13	BH14
Date	9/16/2020	8/24/2020	8/20/2020	8/19/2020	9/16/2020	8/17/2020	8/17/2020	8/11-8/12/2020	9/17/2020	8/24/2020	8/20/2020	8/20/2020	8/19/2020	8/17/2020
Depth														
0-2'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-6'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-8'	0	0	0	0	0	0	0	0	-	0	0	0	0	0
8-10'	0	0	0	0	0	0	0	0	-	0	0	0	0	0
10-12'	-	-	-	-	-		-	-	-	-	-	-	-	-
12-14'	-	-	-	0	-		-	-	-	-	-	-	-	-
14-16'	0	0	0	0	0		0	0	-	0	0	0	0	0
16-18'	-	-	-	-	-		-	-	-	-	-	-	0	-
18-20'	0	0	0	0	0		0	0	-	0	0	0	0	0
20-22'	-	-	-	-	-		-	-	-	-	-	-	-	-
22-24'	-	-	-	-	-		-	-	-	-	-	-	-	-
24-26'	0	0	0	0	0		0	0	-	0	0	0	0	0
26-28'	-	-	-	-	-		-	-	-	-	-	-	-	-
28-30'	0	0	0	0	0		0	0	0	0	0	0	0	0
30-32'		0	0	-	0		0	-	-	0	-	0	0	0
32-34'		0		-			0	-	-		-		0	-
34-36'		0		0			0	0	0		0		0	0
36-38'				0			0						0	0
38-40'				0									0	
40-42'														

Notes:

1. Methane concentrations were measured at the time of drilling from soil and waste drill cuttings using a Bascom-Turner Gas Explorer, Model #EGI-201.
2. Results reported in parts per million methane.
3. Detections noted in bold font.
4. Depths measured feet below ground surface (bgs).
5. "-" indicates no cuttings were collected from these intervals. These intervals were completed by spinning casing rather than driving split-spoons.

Williamsport Ballpark, Inc.
Former Williamsport Landfill Act 2

Table 2: Recorded Methane Concentrations in Soil/Waste Samples

	BH15	BH16	BH17	BH18	BH19	BH20	BH21	BH22	BH23	BH24	BH25	BH26	BH27	BH28
Date	8/15/2020	8/2/2020	8/12/2020	8/25/2020	8/20/2020	8/19/2020	8/18/2020	8/14/2020	8/2-8/3/2020	8/10/2020	8/12/2020	8/26/2020	8/26/2020	8/27/2020
Depth														
0-2'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-6'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-8'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-10'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-12'	-	0	-	-	-	-	-	-	-		0	-	-	-
12-14'	-	0	-	-	-	-	-	-	-			-	-	-
14-16'	0	0	0	0	0	0	0	0	0			0	0	0
16-18'	-	0	-	-	0	-	-	-	-			-	-	-
18-20'	0	0	0	0	0	0	0	0	0			0	0	0
20-22'	-	0	-	-	-	-	-	-	-			-	-	-
22-24'	0	0	0	-	-	-	0	-	-			-	-	-
24-26'	0	0	0	0	0	0	-	0	0			0	0	0
26-28'	-	0		-	-	-	-	-	-			-	-	-
28-30'	0	0		0	0	0	0	0	0			0	0	0
30-32'	0	0		0			0	0	-			0	0	0
32-34'	-	0					-	0	-				0	
34-36'	0	0					0		0				0	
36-38'	0	0							0					
38-40'	0	0												
40-42'		0												

Notes:

1. Methane concentrations were measured at the time of drilling from soil and waste drill cuttings using a Bascom-Turner Gas Explorer, Model #EGI-201.
2. Results reported in parts per million methane.
3. Detections noted in bold font.
4. Depths measured feet below ground surface (bgs).
5. "-" indicates no cuttings were collected from these intervals. These intervals were completed by spinning casing rather than driving split-spoons.

Williamsport Ballpark, Inc.
Former Williamsport Landfill Act 2

Table 2: Recorded Methane Concentrations in Soil/Waste Samples

	BH29	BH30	BH31	BH32	BH33	BH34	BH35	BH36	BH37	BH38	BH39	BH40	BH41	BH42
Date	8/18/2020	8/18/2020	8/13/2020	8/13/2020	8/12/2020	8/25/2020	8/26/2020	8/27/2020	8/29/2020	8/31/2020	8/14/2020	8/11/2020	8/10/2020	8/25/2020
Depth														
0-2'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2-4'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-6'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-8'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-10'	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-12'	-	-	-	-		-	-	-	-	-	-	-	-	-
12-14'	-	-	-	-		0	-	-	-	-	-	-	-	-
14-16'	0	0	0	0		-	0	0	0	0	0	0	0	0
16-18'	-	-	-	-		0	-	-	-	-	-	-	-	-
18-20'	0	0	0	0			0	0	0	**180**	0	**6.8**	0	0
20-22'	-	-	-	-			-	-	-	-	-	-	-	-
22-24'	-	-	-	-			-	-	-	-	-	-	-	-
24-26'	0	0	0	0			0	0	0	**200**	0	0	0	0
26-28'	-	-	0	0			-	-	-	-	-		-	-
28-30'	0	0	0				0	0	0	0	0		0	0
30-32'	0								0	0			**-**	
32-34'	0								0	0			**-**	
34-36'										0			0	
36-38'													**-**	
38-40'													0	
40-42'														

Notes:

1. Methane concentrations were measured at the time of drilling from soil and waste drill cuttings using a Bascom-Turner Gas Explorer, Model #EGI-201.
2. Results reported in parts per million methane.
3. Detections noted in bold font.
4. Depths measured feet below ground surface (bgs).
5. "-" indicates no cuttings were collected from these intervals. These intervals were completed by spinning casing rather than driving split-spoons.

Williamsport Ballpark, Inc.
Former Williamsport Landfill Act 2

Table 2: Recorded Methane Concentrations in Soil/Waste Samples

	BH43	BH44	BH45	BH46	BH47	BH48	BH49	BH50	BH51	BH52	BH53	BH54	BH55
Date	8/26/2020	8/29/2020	8/29/2020	8/31/2020	8/14/2020	8/11/2020	8/10/2020	8/24/2020	8/25/2020	8/26/2020	8/27/2020	8/31/2020	9/17/2020
Depth													
0-2'	0	0	0	0	0	0	0	0	0	0	0	0	No sampling
2-4'	0	0	0	0	0	0	0	0	0	0	0	0	
4-6'	0	0	0	0	0	0	0	0	0	0	0	0	
6-8'	0	0	0	0	0	0	0	0	0	0	0	0	
8-10'	0	0	0	0	0	0	0	0	0	0	0	0	
10-12'	-	-	-	-	-	-	0	-	-	-	-	-	
12-14'	-	-	-	-	-	-	-	-	-	-	-	-	
14-16'	0	0	0	0	0	0	0	0	0	0	0	0	
16-18'	-	-	-	-	-	-	-	-	-	-	-	-	
18-20'	0	0	0	0	0	0	0	0	0	0	0	0	
20-22'	-	-	-	-	-	-	-		-	-	-	-	
22-24'	-	-	-	-	-	-	-		-	-	-	-	
24-26'	0	0	0	0	0	0	0		0	0	0	0	
26-28'	-	-	-	-	0		0		-	-	-	-	
28-30'	0	0	0	0			0		0	0	0	0	
30-32'		0	0								0	0	
32-34'		0	0								0		
34-36'													
36-38'													
38-40'													
40-42'													

Notes:
1. Methane concentrations were measured at the time of drilling from soil and waste drill cuttings using a Bascom-Turner Gas Explorer, Model #EGI-201.
2. Results reported in parts per million methane.
3. Detections noted in bold font.
4. Depths measured feet below ground surface (bgs).
5. "-" indicates no cuttings were collected from these intervals. These intervals were completed by spinning casing rather than driving split-spoons.

Williamsport Ballpark, Inc.
Former Williamsport Landfill Act 2

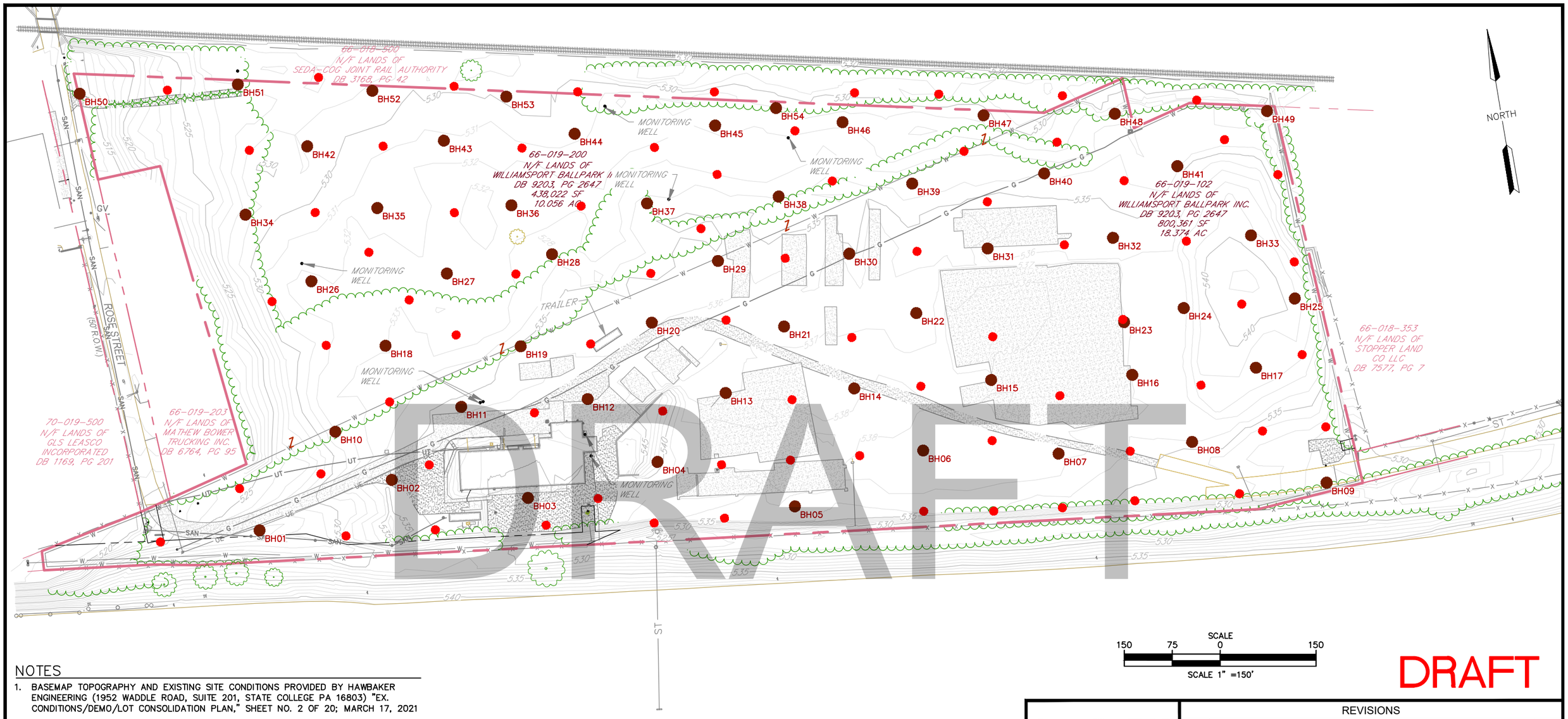
Table 3: Surface/Near-Surface Methane Concentrations

Well	8/17/2020	8/18/2020	8/20/2020	8/24/2020	8/25/2020	8/31/2020	9/16-17/2020	10/2/2020
B01							0	0
B02				**220,000**	**240,000**	**420,000**	0	0
B03			**360,000**		**180,000**	**290,000**	0	0
B04			**12,500**		0	**230,000**	0	0
B05							0	0
B06	**170,000**				**240,000**	**150,000**	0	0
B07			**510,000**		**370,000**	**260,000**	0	0
B08	**160,000**				**15,000**	**120,000**	0	0
B09							0	0
B10				**470,000**	**320,000**	**150,000**	0	0
B11			**760,000**		0	**360,000**	0	0
B12			**330,000**		**100,000**	**80,000**	0	0
B13			**410,000**		**470,000**	**540,000**	0	0
B14		**150,000**			**510,000**	**460,000**	0	0
B15	**670,000**				**580,000**	**470,000**	0	0
B16			**15,500**		**240,000**	**220,000**	0	0
B17	**50,000**		**350,000**		**380,000**	**60,000**	0	0
B18						**500**	0	0
B19					**1,000**	**290,000**	0	0
B20			**440,000**		**340,000**	**210,000**	0	0
B21		**520,000**	**470,000**		**320,000**	**400,000**	0	0
B22	**370,000**				**380,000**	**320,000**	0	0
B23	**250,000**				**90,000**	**480,000**	0	0
B24	**540,000**		**490,000**		**430,000**	**280,000**	0	0
B25	0		**6,500**		0	0	0	0
B26						**320,000**	0	0
B27						**13,500**	0	0
B28						**340,000**	0	0
B29		**320,000**	**230,000**		**350,000**	**340,000**	0	0
B30		**290,000**	**390,000**		**380,000**	**280,000**	0	0
B31					**590,000**	**390,000**	0	0
B32	**24,500**		**27,000**		**210,000**	**170,000**	0	0
B33	0		0		0	0	0	0
B34						0	0	0
B35						**120,000**	0	0
B36						**630,000**	0	0
B37						**410,000**	0	0
B38						**330,000**	0	0
B39	**29,500**		**600,000**		**530,000**	**430,000**	0	0
B40			**190,000**			**230,000**	0	0
B41	**180,000**		**160,000**		**100,000**	**24,000**	0	0
B42						**440,000**	0	0
B43						**360,000**	0	0
B44						**27,500**	0	0
B45						**610,000**	0	0
B46						**12,000**	0	0
B47	**760,000**		**240,000**		**500**	**500**	0	0
B48	**140,000**		**1,500**			0	0	0
B49	0		**290,000**		**220,000**	0	0	0
B50				0	0	0	0	0
B51						**80,000**	0	0
B52						0	0	0
B53						0	0	0
B54						**520,000**	0	0

Notes:

1. Methane concentrations were measured using a Bascom-Turner Gas Explorer, Model #EGI-201.
2. Results reported in parts per million methane.
3. Detections noted in bold font.
4. Measurements recorded 8/17-31/2020 were measured approximately 6" below ground surface in open boreholes. Measurements recorded 9/16-17 and 10/2/2020 were collected at the ground surface following grouting of borings.

FIGURES



NOTES

1. BASEMAP TOPOGRAPHY AND EXISTING SITE CONDITIONS PROVIDED BY HAWBAKER ENGINEERING (1952 WADDLE ROAD, SUITE 201, STATE COLLEGE PA 16803) "EX. CONDITIONS/DEMO/LOT CONSOLIDATION PLAN," SHEET NO. 2 OF 20; MARCH 17, 2021
2. BORING LOCATIONS SURVEYED BY HAWBAKER ENGINEERING SUMMER 2020.
3. LFG SURFACE SAMPLING LOCATIONS ARE APPROXIMATE BASED ON FIELD LOCATIONS.

LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT-OF-WAY
- EXISTING EASEMENT
- EXISTING RAILROAD
- EXISTING PAVED ROAD
- EXISTING FENCE
- EXISTING GRAVEL ROAD
- EXISTING CONCRETE AREA
- EXISTING BUILDING
- EXISTING ELECTRIC
- EXISTING UNDERGROUND ELECTRIC
- EXISTING GAS LINE
- EXISTING WATER
- EXISTING SANITARY
- EXISTING STORM SEWER
- EXISTING UNDERGROUND TELECOM
- EXISTING STORM INLET
- EXISTING SANITARY MANHOLE
- EXISTING POWER POLE
- EXISTING LIGHT POLE
- EXISTING MAJOR CONTOURS (C.I.=5')
- EXISTING MINOR CONTOURS (C.I.=1')
- EXISTING TREELINE
- EXISTING TREE
- BH26 BORING LOCATIONS
- LFG SURFACE SAMPLING LOCATIONS

BAI GROUP

REVISIONS

WILLIAMSPORT BALLPARK, INC.

FORMER WILLIAMSPORT LANDFILL PROPERTY

CITY OF WILLIAMSPORT LYCOMING COUNTY PENNSYLVANIA

LANDFILL GAS SAMPLING PLAN

DATE: 04/15/21

DRAWN BY: RHM

CHECKED: ET

BAI DRAWING NO: AUSLEY-001B003A

SHEET NO. 1 OF 2

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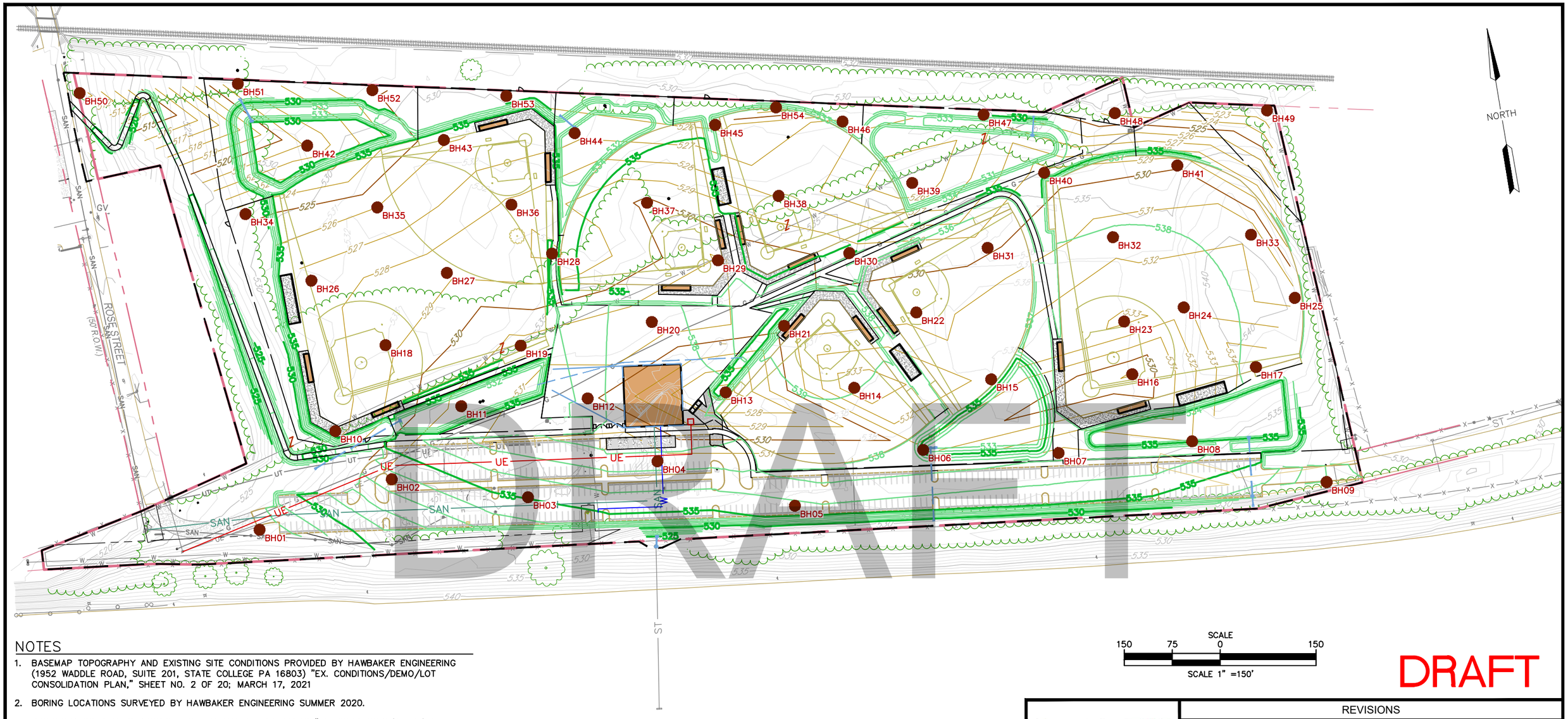

NOTES

1. BASEMAP TOPOGRAPHY AND EXISTING SITE CONDITIONS PROVIDED BY HAWBAKER ENGINEERING (1952 WADDLE ROAD, SUITE 201, STATE COLLEGE PA 16803) "EX. CONDITIONS/DEMO/LOT CONSOLIDATION PLAN," SHEET NO. 2 OF 20; MARCH 17, 2021
2. BORING LOCATIONS SURVEYED BY HAWBAKER ENGINEERING SUMMER 2020.
3. PROPOSED CONDITIONS PROVIDED BY HAWBAKER ENGINEERING "EX. CONDITIONS/DEMO/LOT CONSOLIDATION PLAN," SHEET NO. 9 OF 20, MARCH 17, 2021.
4. TOP OF WASTE CONTOURS EXTRAPOLATED FROM DEPTH-TO-WASTE CONDITIONS ENCOUNTERED IN SOIL BORINGS.

LEGEND

- EXISTING PROPERTY LINE
- EXISTING RIGHT-OF-WAY
- EXISTING EASEMENT
- EXISTING RAILROAD
- EXISTING PAVED ROAD
- EXISTING FENCE
- EXISTING GRAVEL ROAD
- EXISTING CONCRETE AREA
- EXISTING BUILDING
- EXISTING ELECTRIC
- EXISTING UNDERGROUND ELECTRIC
- EXISTING GAS LINE
- EXISTING WATER
- EXISTING SANITARY
- EXISTING STORM SEWER
- EXISTING UNDERGROUND TELECOM
- EXISTING STORM INLET
- EXISTING SANITARY MANHOLE
- EXISTING POWER POLE
- EXISTING LIGHT POLE
- EXISTING MAJOR CONTOURS (C.I.=5')
- EXISTING MINOR CONTOURS (C.I.=1')
- EXISTING TREELINE
- EXISTING TREE
- BORING LOCATIONS (BH26)
- PROPOSED PAVED ROAD
- PROPOSED GRAVEL ROAD
- PROPOSED CONCRETE AREA
- PROPOSED BUILDING
- PROPOSED UNDERGROUND ELECTRIC
- PROPOSED STORM PIPE
- PROPOSED STORM INLET
- PROPOSED MAJOR CONTOURS (C.I.=5')
- PROPOSED MINOR CONTOURS (C.I.=1')
- TOP OF WASTE MAJOR CONTOURS (C.I.=5')
- TOP OF WASTE MINOR CONTOURS (C.I.=1')

SCALE
150 75 0 150
SCALE 1" =150'

DRAFT

BAI GROUP

REVISIONS

WILLIAMSPORT BALLPARK, INC.

FORMER WILLIAMSPORT LANDFILL PROPERTY

CITY OF WILLIAMSPORT LYCOMING COUNTY PENNSYLVANIA

TOP OF WASTE ELEVATIONS AND DESIGN GRADES

DATE: 04/15/21
DRAWN BY: RHM
CHECKED: ET
BAI DRAWING NO: AUSLEY-001B003B
SHEET NO. 2 OF 2

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