EXHIBIT SEVEN

ESTABLISHMENT OF BACKGROUND VALUES FOR

PERCHLORATE, 1,4-DIOXANE AND MECOPROP

CLOSED COLLINSVILLE LANDFILL

COLLINSVILLE, ILLINOIS

EXHIBIT 7-1

Groundwater Results, Background Statistical Calculations and Background Values (Section 5.0), Assessment of Detection, Sources, Extent and Applicability of Background Values (Section 6.0), Summary of Conclusions (Section 7.0), References (Section 8.0) and Tables 7-1.1 and 7-1.2 Submitted to IEPA October 24, 2014

NOTE: This copy excludes background information Sections 1-4), figures and comparison of all data to Class I, background, and PQL criteria as well as Appendix B, Chain of Custodies and Analytical Results and Appendix C, Statistical Data Sheets of the above report.

ESTABLISHMENT OF BACKGROUND VALUES FOR PERCHLORATE, 1,4-DIOXANE AND MECOPROP 4TH QUARTER 2013 THROUGH 3RD QUARTER 2014 CLOSED COLLINSVILLE LANDFILL COLLINSVILLE, ILLINOIS

OCTOBER 2014

Prepared for:

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APPENDICES

ACRONYMS

2 x PQL	two (2) times practical quantitation limit
COC	chain of custody
IAC	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency
MCPP	Mecoprop
MDEP	Massachusetts Department of Environmental Protection
mg/L	milligrams per liter
PQL	practical quantitation limit
TDS	total dissolved solids
Tetra Tech, Inc.	Tetra Tech
TOC	total organic carbon
TOX	total organic halogens
UCL	upper confidence limit
ug/L	micrograms per liter

5.0 GROUNDWATER RESULTS, BACKGROUND STATISTICAL CALCULATIONS AND BACKGROUND VALUES

This section summarizes the analytical results collected between November 25, 2013 and July 30, 2014, describes the statistical methods used to calculate background UCLs for perchlorate, 1,4-dioxane, and MCPP, and presents the results of the statistical calculations.

5.1 Summary of Analytical Results

Analytical results for List 1, List 2, List 3 parameters and the new parameters for the groundwater samples collected at the Closed Collinsville Landfill from November 2013 through July 2014 are summarized in Appendix A, Tables 1 through 3. The results were compared to Class 1 Groundwater Standards (Table 1), the 99% UCL (Table 2 for those parameters with established UCLs), and two times the PQL (Table 3). Two times the PQL is identified in Appendix A, Table 3 as 2 X PQL.

5.2 Calculation of Background Concentrations for Perchlorate, 1,4-Dioxane, and MCPP

MW-6, the IEPA approved background well for the Closed Collinsville Landfill, was installed in 2006 after borings confirmed the location was outside of the landfill perimeters. Background values for the List 1, List 2 and List 3 parameters were established in 2006 (assessment monitoring parameters) and 2010 (remaining parameters).

The methods used to calculate background values in 2006 and 2010 are identical as those specified in Supplemental Permit No. 2014-234-SP, Attachment B and used to calculate background values for perchlorate, 1,4-dioxane, and MCPP. Statistical data calculation sheets are provided in Appendix C. Prior to calculation of UCLs, the Shapiro-Wilk Test of Normality was used to evaluate the distribution of the data as follows:

The analytical results for each quarter and parameter were sorted in ascending order and a *W* statistic was calculated for each parameter using the following formula:

$$W = \frac{\left(\sum_{i=1}^{n} a_i x_{(i)}\right)}{\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

Where:

n = number of samples
i = *i* th order statistic
x = individual sample
$\bar{x}$ = average
a = a derived constant

The calculated W statistic was then compared to a table of W statistics. If the calculated value was greater than the table value, the data was considered normally distributed. If the data was not normally distributed, then the W statistic was re-calculated using the natural log of the data points. This result is compared to the W statistic table a second time. If the calculated W value using the natural log of the data is larger than the table value, then the data is considered lognormally distributed. The data distribution for perchlorate and 1,4-dioxane was lognormally distributed. MCPP was not detected in the background well; therefore, data distribution was not applicable and not calculated.

The UCL for each parameter was calculated in accordance with Supplemental Permit No. 2014-234-SP, Attachment B. The mean, variance, standard deviation and upper confidence limit were calculated first using the formulas below. The statistical calculations sheets are presented in Appendix C and summarized in Appendix A, Table 4.

Arithmetic mean: $\overline{X_b}$

$$\overline{X_b} = [X_1 + X_2 + \ldots + X_n]/n$$

Where:
n = the number of background samples
X_n= background values for MW-6

Background variance: S_b^2

$$S_b^2 = [(X_1 - \overline{X_b})^2 + (X_2 - \overline{X_b})^2 + \ldots + (X_n - \overline{X_b})^2]/n - 1$$

deviation: S_b

$$S_b = \sqrt{S_b^2}$$

Formula 4: UCL: CL

$$CL = \overline{X_b} + (t\sqrt{1 + 1/n})(S_b)$$

Where:

t = t value in standard T lookup table at the required significance (T table provided in Supplemental Permit No. 2014-234-SP, Attachment B)

For MCPP, a UCL could not be calculated because the compound was not detected in the background well during the four quarters samples were collected. According to the permit requirements, if a compound is not detected in the background well, the PQL becomes the background value.

5.3 Analytical Results for Perchlorate, 1,4-Dioxane, and MCPP

The focus of this report is the three new compounds – their source, background values, applicability of their background values, and detection above Class I Standards, background

values and two times the PQL. The analytical results are summarized in Appendix A, Table 5 and the laboratory analytical report is presented in Appendix B. Results for the three parameters exceeding Class I Groundwater Standards, the 99% UCL and two times the PQL are summarized below.

According to Supplemental Permit No. 2014-234-SP, if concentrations exceed Class I Groundwater Quality Standards, background values, or two times the PQL, a significant change in groundwater quality is said to have occurred. However, based on the February 2014 evaluation of the source or sources of perchlorate, dioxane and MCPP (summarized in Section 6), the landfill is not the source of the three new parameters. The source of the perchlorate is the use of blasting agents and associated poor housekeeping and storage during coal mining at the site that predates the landfill. The source of the dioxane is the recent, post-closure use of herbicides around structures and roads at the landfill. Herbicides were applied in accordance with state regulations. The source of MCPP may be post-closure use of herbicides on residential property adjacent to the landfill. However, the detection of MCPP in MW-1DUP (9.72 µg/L) was the sole detection during the November 2013 through July 2014 monitoring period. Most likely the detection represents a field or laboratory anomaly rather than an actual detection. The validity of the detection is further discussed in Section 6.1. Adjusted standards have been developed in accordance with 35 IAC 620.440(c) based upon the previous historical impact of coal mining at the site and the recent, post-closure use of herbicides following the construction of roads and structures (leachate recovery buildings) at the landfill.

5.3.1 New Parameters Exceeding Class I Groundwater Quality Standards.

The full list of routine parameters compared to Class I Groundwater Standards is presented in Appendix A, Table 1. The analytical results for perchlorate, 1,4-dioxane and MCPP for the four quarters of monitoring from November 2013 through July 2014 are discussed below and summarized in Appendix A, Table 5.

5.3.1.1 Fourth Quarter 2013

The Fourth Quarter 2013 sampling results for the three parameters above Class 1 Standard are:

- **Perchlorate** – Concentrations exceeded the Class I Groundwater Standard of 4.90 µg/L in MW-1 (40 µg/L), MW-1DUP (36 µg/L), MW-4 (51 µg/L), and the background well MW-6 (7.8 µg/L);
- **1,4-Dioxane** – 1,4-Dioxane was detected in MW-1, MW-1DUP, and MW-4, but concentrations did not exceed the Class I Groundwater Standard of 7.0 µg/L; and
- **MCPP** - Concentrations exceeded the Class I Groundwater Standard of 7.70 µg/L in MW-1DUP (9.72 µg/L).

5.3.1.2 First Quarter 2014

First Quarter 2014 sampling results for the three parameters above Class 1 Standards are:

- **Perchlorate** – Concentrations exceeded the Class I Groundwater Standard of 4.90 µg/L in MW-4 (11.0 µg/L) and the background MW-6 (15 µg/L);

- **1,4-Dioxane** – Concentrations exceeded the Class I Groundwater Standard of 7.0 µg/L in MW-1 (10.4 µg/L) and MW-1DUP (11.3 µg/L); and
- **MCPP** – MCPP was not detected in the samples during the First Quarter 2014 and concentrations did not exceed the Class I Groundwater Standard of 7.70 µg/L.

5.3.1.3 Second Quarter 2014

Second Quarter 2014 sampling results for the three parameters above Class 1 Standards are:

- **Perchlorate** – Perchlorate was not detected in the samples during the Second Quarter 2014 and concentrations did not exceed the Class I Groundwater Standard of 4.90 µg/L;
- **1,4-Dioxane** – Concentrations exceeded the Class I Groundwater Standard of 7.0 µg/L in MW-1 (12.9 µg/L), MW-1DUP (10.4 µg/L), and MW-4 (11.8 µg/L); and
- **MCPP** – MCPP was not detected in the samples during the Second Quarter 2014 and concentrations did not exceed the Class I Groundwater Standard of 7.70 µg/L.

5.3.1.4 Third Quarter 2014

Third Quarter 2014 sampling results for the three parameters above Class 1 Standards are:

- **Perchlorate** – Perchlorate was not detected in the samples during the Third Quarter 2014 and concentrations did not exceed the Class I Groundwater Standard of 4.90 µg/L;
- **1,4-Dioxane** – Concentrations exceeded the Class I Groundwater Standard of 7.0 µg/L in MW-1 (11.9 µg/L), MW-1DUP (12.3 µg/L), and MW-4 (11.5 µg/L); and
- **MCPP** – MCPP was not detected in the samples during the Third Quarter 2014 and concentrations did not exceed the Class I Groundwater Standard of 7.70 µg/L.

5.3.2 Parameters Exceeding Background Concentrations in the Groundwater

Background concentrations for perchlorate, MCPP and 1,4-Dioxane were calculated as described in Section 5.2 and summarized in Appendix A, Table 4. The validity and source of the detections and applicability of background values are discussed in Section 6.

The full list of the routine and annual parameters compared to background concentrations is presented in Appendix A, Table 2. The analytical results for perchlorate, 1,4-dioxane and MCPP for the four quarters of monitoring from November 2013 through July 2014 are discussed below and summarized in Appendix A, Table 5.

5.3.2.1 Fourth Quarter 2013

The Fourth Quarter 2013 sampling results for the three parameters above Class 1 Standard are:

- **Perchlorate** – Concentrations exceeded the 99% UCL of 38.04 µg/L in MW-1 (40 µg/L) and MW-4 (51 µg/L);
- **1,4-Dioxane** – Concentrations exceeded the 99% UCL of 4.11 µg/L in MW-1 (5.15 µg/L), MW-1DUP (4.30 µg/L), and MW-4 (6.12 µg/L); and
- **MCPP** -. No UCL calculated.

5.3.2.2 First Quarter 2014

First Quarter 2014 sampling results for the three parameters above background values are:

- **Perchlorate** – Perchlorate concentrations were detected but did not exceed the 99% UCL of 38.04 µg/L;
- **1,4-Dioxane** – Concentrations exceeded the 99% UCL of 4.11 µg/L in MW-1 (10.4 µg/L) and MW-1DUP (11.3 µg/L); and
- **MCPP** – MCPP was not detected in the samples during the First Quarter 2014.

5.3.2.3 Second Quarter 2014

Second Quarter 2014 sampling results for the three parameters above background values are:

- **Perchlorate** – Perchlorate was not detected in the samples during the Second Quarter 2014 and concentrations did not exceed the 99% UCL of 38.04 µg/L;
- **1,4-Dioxane** – Concentrations exceeded the 99% UCL of 4.11 µg/L in MW-1 (12.9 µg/L), MW-1DUP (10.4 µg/L), and MW-4 (11.8 µg/L); and
- **MCPP** – MCPP was not detected in the samples during the Second Quarter 2014.

5.3.2.4 Third Quarter 2014

Third Quarter 2014 sampling results for the three parameters above Class 1 Standards are:

- **Perchlorate** – Perchlorate was not detected in the samples during the Third Quarter 2014 and concentrations did not exceed the 99% UCL of 38.04 µg/L;
- **1,4-Dioxane** – Concentrations exceeded the 99% UCL of 4.11 µg/L in MW-1 (11.9 µg/L), MW-1DUP (12.3 µg/L), and MW-4 (11.5 µg/L); and
- **MCPP** – MCPP was not detected in the samples during the Third Quarter 2014.

5.3.3 Parameters Exceeding Organic Parameters Two Times the Practical Quantitation Limit

The full list of routine annual parameters compared to two times the PQL is presented in Appendix A, Table 3. The analytical results for the organic parameters, 1,4-dioxane and MCPP, for four quarters of monitoring from November 2013 through July 2014 are discussed below and summarized in Appendix A, Table 5. Two times the PQL is identified in Appendix A, Table 5 as 2 X PQL. Perchlorate is not considered an organic parameter.

5.3.3.1 Fourth Quarter 2013

The Fourth Quarter 2013 sampling results for1,4-dioxane and MCPP that exceed two times the PQL are:

- **1,4-Dioxane** – Concentrations exceeded two times the PQL of 2.00 µg/L in MW-1 (5.15 µg/L), MW-1DUP (4.30 µg/L), and MW-4 (6.12 µg/L); and
- **MCPP** – MCPP was detected in MW-1DUP (9.72 µg/L), but the concentration did not exceed two times the PQL of 14.00 µg/L.

5.3.3.2 First Quarter 2014

First Quarter 2014 sampling results for1,4-dioxane and MCPP that exceed two times the PQL are:

- **1,4-Dioxane** – Concentrations exceeded two times the PQL of 2.00 µg/L in MW-1 (10.4 µg/L), MW-1DUP (11.3 µg/L) and MW-4 (3.7 µg/L); and
- **MCPP** – MCPP was not detected in the samples during the First Quarter 2014.

5.3.3.3 Second Quarter 2014

Second Quarter 2014 sampling results for 1,4-dioxane and MCPP that exceed two times the PQL are:

- **1,4-Dioxane** – Concentrations exceeded two times the PQL of 2.00 µg/L in MW-1 (12.9 µg/L), MW-1DUP (10.4 µg/L), and MW-4 (11.8 µg/L); and
- **MCPP** – MCPP was not detected in the samples during the Second Quarter 2014.

5.3.3.4 Third Quarter 2014

Third Quarter 2014 sampling results for 1,4-dioxane and MCPP that exceed two times the PQL are:

- **1,4-Dioxane** – Concentrations exceeded two times the PQL of 2.00 of 14.0 µg/L in MW-1 (11.9 µg/L), MW-1DUP (12.3 µg/L), and MW-4 (11.5 µg/L); and
- **MCPP** – MCPP was not detected in the samples during the Third Quarter 2014.

6.0 ASSESSMENT OF THE DETECTION, SOURCES, EXTENT AND APPLICABILITY OF BACKGROUND VALUES

Background values for perchlorate, 1,4-dioxane and MCPP monitored from November 2013 through July 2014 were established as described in Section 5. Perchlorate, 1,4-dioxane, and MCPP exceeded the background values, Class I and Groundwater Standards. Additionally, 1,4-dioxane, and MCPP exceeded two times the PQLs. The validity of the detections, the source and extent and the applicability of background values for perchlorate, 1,4-dioxane, and MCPP are discussed below.

6.1 Validity of the Detections of Perchlorate, 1,4-Dioxane, and MCPP

Perchlorate and 1,4-dioxane were detected multiple times and when detected in MW-1, the two compounds were also found in the duplicate sample (MW-1DUP) at similar concentrations. The multiple detections and the reproducibility of the detections in the duplicate sample imply that the detections of perchlorate and dioxane are valid.

MCPP was detected one-time only in MW-1DUP but was not detected in the corresponding field sample MW-1. The lack of reproducibility or multiple detections implies that the detection of MCPP is most likely not valid. The detection of MCPP is believed to be an artifact of field sampling, sample shipment, laboratory analysis, or instrument performance. MCPP will not be further evaluated.

6.2 Sources of Perchlorate and 1,4-Dioxane

The information provided below is a summary of the report submitted to the IEPA in February 2014 and approved on May 29, 2014 as Supplemental Permit No. 2014-077-SP.

The Lumaghi Coal Company owned the project site and surrounding land and mined coal on their property from approximately 1900 until the 1950s (Canteen Mine #2). The 3,500 acre underground mine covered the project site and a large portion of the surrounding property. During operation of the mines, activities that took place on the surface and in the subsurface included movement of coal, coal stripping and washing, equipment refueling, air venting, water pumping, blasting, milling, and maintenance of mine equipment and machinery. Each of these activities or a combination of these activities can result in contamination (Teaf, Mulisch, Kuperberg and Wcislo, 2006).

Based on the 2008 assessment monitoring results, a large volume of raw coal and acidic gob were stored north and south of Canteen Creek for a long period of time. After the property was transferred to the City of Collinsville, the coal and gob were incorporated into the landfill. The primary source of the high concentrations of the assessment monitoring parameters is the historic presence of coal mining waste on the property prior to the opening of the landfill. Adjusted standards have been developed in accordance with 35 IAC 620.440(c) based upon the historical impact of gob storage at the site that predates the landfill (Tetra Tech, 2008).

6.2.1 Perchlorate

The presence of perchlorate in the groundwater is associated with coal mining activities – namely the use of perchlorate-containing explosives during underground blasting activities. The dominant commercial explosives used during early coal mining activities until approximately 1945 included explosives containing perchlorate-containing Chilean nitrate (black powder), AN dynamite (ammonium nitrate dynamite containing perchlorate), and perchlorate-containing detonators (Interstate Technology and Regulatory Council, 2005). Perchlorate is persistent in the groundwater and not easily degraded [Massachusetts Department of Environmental Protection (MDEP), 2006]. While most of the perchlorate present in explosives and detonators is expected to be consumed upon detonation, poor housekeeping, spillage, improper use or misfires could leave residues of perchlorate in the soil or mine. Nitrate and perchlorate residues that remain in the soil or mines after blasting would have dissolved on contact with groundwater and would remain in the groundwater (GeoSyntec Consultants, 2005 and MDEP, 2006).

Since early operation of the landfill to the present time, no sources of military propellants or munitions, commercial explosives or blasting agents (other than those described), fireworks, or flares have been identified that would have resulted in disposal of a significant source of perchlorate contamination at the landfill. The landfill closed prior to common use of perchlorates with industrial applications (GeoSyntec Consultants, 2005 and MDEP, 2006).

Based on the widespread prevalence of perchlorates at the landfill (MW-1, MW-4 and MW-6), the upward vertical gradient of the deeper mine water (artesian well MW-7), the length of time explosives and blasting agents were used (life of the mine), and the lack of other sources of perchlorates, the operation of the mine is the most likely source of perchlorates at the Closed Collinsville Landfill

6.2.2 1,4-Dioxane

1,4-Dioxane was found during each of the four quarters in MW-1 and MW-4. Lower concentrations were detected in the background well MW-6 on two occasions. Additionally, the organic compound was found in a leachate sample collected in February 2014, but the leachate concentration (2.09 µg/L) was half the concentration found in the downgradient wells.

The compound 1,4-dioxane, is currently widely used in industrial and commercial products from paints and degreasers to food additives and cosmetics. However, the compound is frequently an impurity in surfactants used in pesticides and herbicides including the widely used products, Roundup® and Roundup® Pro. Concentrations of 1,4-dioxane as high as 350 ppm may be present in each of these products (http://www.naturescountrystore.com/roundup/page2.html, 2014). According to the Director of the City's Street Department, Polaris/liberate lecitech /Roundup® Pro are herbicides applied to targeted locations (the area surrounding the four leachate collection buildings) and spot applied to the gravel road that traverses the landfill. The herbicides are applied during the growing season and are applied in accordance with manufacturer's specifications. The applications have occurred for a number of years (Cheatham 2014). 1,4-Dioxane was present in MW-1, MW-4 and MW-6.

Though there are many possible sources of 1,4-dioxane that might have been disposed at the landfill, no chlorinated solvents or chemicals associated with varnishes, paint, paint thinners, or antifreeze have been detected in landfill leachate. The organic chemicals previously detected in leachate samples include low levels of phenols, pentachlorophenol, benzene, monochlorobenzene, paradicholorobenzene, and Picloram. Most of the organic compounds found in the leachate have not been detected outside the landfill. Phenols and picloram have each been found on one time only on separate occasions in background well MW-6. 1,4-Dioxane was detected in the leachate at concentrations lower than found in MW-1 and MW-4.

MW-1 and MW-4 are located downgradient and in close proximity of a leachate recovery building. The building was sprayed with Roundup® Pro for as long as the herbicide was in use. The background well MW-6 is 175 feet from Leachate Recovery Building 03 that has also been sprayed with the herbicide since the inception of the weed control program. The leachate sample was collected from the newest structure (Leachate Recovery Building 0$) that was installed in early 2013 and the area was sprayed once with Roundup® Pro. Based on the proximity of the wells from the landfill road and structures and the period of time the herbicide was applied near the wells, the most likely source of the herbicides is the routine application of herbicides. Applications of Roundup® Pro ceased when the herbicide was identified as the most likely source of the 1,4-dioxane.

6.2.3 MCPP

The lack of reproducibility or multiple detections of MCPP indicated that its detection was most likely an anomaly – an artifact of field, sample shipment, or laboratory activities.

6.3 Extent of the Compounds

6.3.1 Perchlorate

Perchlorate was detected in MW-1, MW-4, and MW-6 and concentrations of ranged from 7.8 µg/L (MW-6) to 51 µg/L (MW-4). Concentrations were highest in the northern third of the landfill where raw coal and gob were stored. The extent is similar to the assessment monitoring parameters whose source is associated with the pre-landfill storage of acidic mine waste. Additionally, the extent of the perchlorate suggests that the coal and gob stored on the surface of the landfill may have originally contained perchlorate residue that later percolated into the groundwater.

6.3.2 1,4-Dioxane

1,4-Dioxane was detected in MW-1, MW-4 and MW-6 and concentrations ranged from 1.09 µg/L (MW-6) to 12.9 µg/L (MW-1). Concentrations were highest in the vicinity of structures where Roundup® Pro had been applied for the longest period of time. Concentrations decreased with decreased duration of seasonal application or increased distance from the road and structures.

6.3.3 MCPP

The lack of reproducibility or multiple detections of MCPP indicated that its detection was most likely an anomaly – an artifact of field, sample shipment, or laboratory activities.

6.4 Applicability of Background Values

The pre-landfill use of perchlorate during mine blasting and the post-landfill discharge of 1,4-dioxane during application of Roundup® Pro to specific locations at the landfill do not have a definable point source for either compound. As such, background concentrations are not applicable to these compounds due to their widespread use.

6.4.1 Perchlorate

The majority of Madison County from Edwardsville to Belleville was mined-out prior to 1960. Blasting activities were an integral part of coal mining. Prior to 1945, the majority of the explosives and blasting agents contained perchlorate in the form of Chilean nitrate, ammonium nitrate dynamite or perchlorate-containing detonators. This type of widespread regional blasting for more than 50 years over a large area, results is what is a nonpoint source of contamination, and background values are not applicable to nonpoint sources. According to IEPA:

> *The name "nonpoint source pollution" is derived from the concept that there is no single point from which the pollution comes; it comes from everyone and everywhere (source:* http://www.epa.state.il.us/water/watershed/publications/nps-pollution/nonpoint-source-pollution.html, 2014).

6.4.2 1,4-Dioxane

Roundup® Pro was applied after the landfill was closed in accordance with state regulations at multiple points on the surface of the landfill. The surface application resulted in impact to the background well as well as points within the landfill. The herbicide is extensively used throughout the region and is, most likely pervasive along most roadways. The application impacted the entire landfill and some areas along the eastern, southern and western perimeter of the landfill. The northern perimeter may be impacted from use of Roundup® Pro along Lebanon Road. Therefore, there is no definable source of the 1,4-dioxane and background concentrations are not applicable.

7.0 SUMMARY AND CONCLUSIONS

The background values were calculated for perchlorate, 1,4-dioxane and MCPP and an evaluation of the applicability of those values, and validity of their detection, as well as a discussion of their source(s) and extent was performed as a requirement of Supplemental Permit 2014-324-SP.

Background values were established for each parameter (Appendix C) in accordance with permit requirements. The validity of the detections of each parameter was assessed based on multiple detections and reproducibility. The detection of perchlorate and 1,4-dioxane were assessed as valid. However, the lack of reproducibility or multiple detections of MCPP indicated that its detection was most likely an anomaly – an artifact of field, sample shipment, or laboratory activities.

The sources of perchlorate and 1,4-dioxane were not associated with operation of the landfill. The sources either predated (perchlorate) or post-dated (1,4-dioxane) operation of the landfill. Based on the occurrence and historic use of the compounds, perchlorate is most likely associated with use of perchlorate containing explosives and blasting agents during the 50 year operation of the Lumaghi Canteen Mine #2. The most likely source of the 1,4-dioxane is the use of common herbicides that contain surfactants with 1,4-dioxane as an impurity.

The extent of perchlorate and 1,4-dioxane includes the entire landfill and the impact of the two compounds extends to the background well as a result of widespread pre- and post-landfill use, respectively. The regional use of perchlorate during mining activities in the area has resulted in an undefinable nonpoint source. Additionally, the commonly used herbicide Roundup® Pro containing1,4-dioxane was spot applied, post-landfill operation, to specific but disparate locations within the landfill. Due to the proximity of the upgradient background well to one or more of the areas applied, the upgradient location was impacted. For both compounds, the source area is not a well-defined point source and background values associated an impacted upgradient location are not applicable.

Adjusted standards have been developed in accordance with 35 IAC 620.440(c) based upon the historical impact of gob storage and mine blasting at the site that predates the landfill and post-landfill use of herbicides in accordance with U.S and Illinois regulations.

8.0 REFERENCES

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Appendix A Table 4
Summary of Quarterly Sample Results and Statistics for Perchlorate, 1,4-Dioxane, MCPP
in Background Well MW-6
November 2013-July 2014

Monitoring Location MW6: Sampling Results, Statistics and Comparison to Class I Standards, Background Values, and 2xPQL										
	25-Jan-13	**26-Feb-14**	**21-May-14**	**31-Jul-14**	**Mean**	**Variance**	**Standard Deviation**	**Class I**	**99%UCL**	**2xPQL**
New List 3 Detected Inorganic and Organic Parameters Detected in November 2013 through July 2014										
Perchlorate (ug/L)	**7.80**	**15.0**	<4.00	<4.00	6.70	38.09	6.17	**4.90**	38.04	NA
MCPP (ug/L)	<7.0	<7.0	<7.0	<7.00	7.00	NA	0.00	**7.0**	*7.0	14.0
1,4-Dioxane (ug/L	<1.0	1.8	<1.0	1.09	0.97	0.3817	0.62	**7.70**	4.11	2.00

Notes:

respective Reporting Limit.

Bolded indicates result exceeds Class I Groundwater Quality Standard

Italicized indicates result exceeds 99% CL

Indicates result exceeds two times Practical Quantitation Limit

NA - Not applicable to inoroganics

*Compound not detected and the PQL becomes the background value

Table 7-1.2
Comparison of Quarterly Sample Results for To Class I Standards, Background Values and 2xPQL
for Perchlorate, 1,4-Dioxane, and MCPP
November 2013-July 2014

	Nov-13	Feb-14	May-14	Jul-14	Class I	99%UCL	2xPQL
Monitoring Location MW-1							
Perchlorate (ug/L)	***40.0***	<4.0	<4.0	<4.0	**4.90**	*38.04*	NA
MCPP (ug/L)	<7.0	<7.0	<7.0	<7.00	**7.0**	*7.00*	14.0
1,4-Dioxane (ug/L)	5.15	***10.4***	***12.9***	***11.90***	**7.70**	*4.11*	2.00
Monitoring Location MW-1 DUP							
Perchlorate (ug/L)	***36.00***	<4.0	<4.0	<4.0	**4.90**	*38.04*	NA
MCPP (ug/L)	***9.72***	<7.0	<7.0	<7.00	**7.0**	*7.00*	14.0
1,4-Dioxane (ug/L)	4.30	**11.3**	**10.4**	**12.30**	**7.70**	*4.11*	2.00
Monitoring Location MW-2							
Perchlorate (ug/L)	<4.0	<4.0	<4.0	<4.00	**4.90**	*38.04*	NA
MCPP (ug/L)	<7.0	<7.0	<7.0	<7.00	**7.0**	*7.00*	14.0
1,4-Dioxane (ug/L)	<1.0	<1.0	<1.0	<1.00	**7.70**	*4.11*	2.00
Monitoring Location MW-4							
Perchlorate (ug/L)	***51.0***	**11.0**	<4.0	<4.00	**4.90**	*38.04*	NA
MCPP (ug/L)	<7.0	<7.0	<7.0	<7.00	**7.0**	*7.00*	14.0
1,4-Dioxane (ug/L)	6.12	3.7	**11.8**	**11.50**	**7.70**	*4.11*	2.00
Monitoring Location MW-6							
Perchlorate (ug/L)	**7.80**	**15.0**	<4.00	<4.00	**4.90**	*38.04*	NA
MCPP (ug/L)	<7.0	<7.0	<7.0	<7.00	**7.0**	*7.00*	14.0
1,4-Dioxane (ug/L)	<1.0	1.8	<1.0	1.09	**7.70**	*4.11*	2.00

Notes:

Reporting Limit.

Bolded indicates result exceeds Class I Groundwater Quality Standard

Italicized results with red font exceeds 99% CL

Indicates result exceeds two times Practical Quantitation Limit

NA - Not applicable to inoroganics