Attachment 15

Groundwater Assessment Plan

Closed Collinsville Landfill, Collinsville, IL

Tetra Tech, January 2000

Attachment 15-1

Text and Tables, Groundwater Assessment Plan

Closed Collinsville Landfill, Collinsville, IL

Tetra Tech, January 2000

GROUNDWATER ASSESSMENT PLAN
CLOSED COLLINSVILLE LANDFILL
COLLINSVILLE, ILLINOIS

SEPTEMBER 2000

Prepared for:

CITY OF COLLINSVILLE
COLLINSVILLE, ILLINOIS 62234

PROJECT NUMBER: 10463

PREPARED BY:

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EXECUTIVE SUMMARY

Tetra Tech, Inc. was retained by the City of Collinsville, Illinois (the City) to prepare this Groundwater Assessment Plan for Illinois Environmental Protection Agency (the Agency) review and approval.

This investigation was prompted based on a Violation Notice M-1998-00195, issued by the Agency on 6 October 1998. This violation notice was a result of the Agency's inspection of the landfill completed on 22 April 1998 that identified levels of Chlorides and Total Dissolved Solids (TDS) had exceeded the Class II Groundwater Standards of 200 mg/L and 1,200 mg/L respectively (35 Ill. Adm. Code 620.420(a), except as provided in Section 620.450 or subsection (a)(3) or (d)).

As a result of the limited investigation performed by Tetra Tech, Inc. in March 1999, it appears that the landfill is contributing to the elevated concentrations of Chlorides and TDS found in the groundwater monitoring well. Specifically, based on the upgradient piezometer, upgradient groundwater concentrations of Chlorides and TDS (11 mg/L and 776 mg/L, respectively) were well below those concentrations found in the monitoring well located downgradient (251 mg/L and 1,490 mg/L, respectively). The historical data suggests that both Chlorides and TDS in the groundwater have fluctuated and generally risen over the 1987 to 1994 time period, have remained nearly steady since 1994, and increased again in 1998. Chloride concentrations in the leachate water have consistently ranged from 189 to 585 mg/L since the leachate system has been in place, while concentrations of TDS in the leachate have decreased over the same period. Concentrations of Chlorides and TDS in all surface water samples collected were found to be well below the surface water standards of 500 mg/L and 1,000 mg/L, respectively (Illinois Water Pollution Regulations).

The objective of this Groundwater Assessment Plan is to present a technical approach for further investigation of groundwater at the site in an effort to establish an accurate assessment of the risk to human health and the environment resulting from potential groundwater contamination attributable to the facility. The Groundwater Assessment Plan proposes to establish the direction of groundwater flow, extent of groundwater impact, and the rate of migration in an effort to meet the objective of this investigation.

1.0 INTRODUCTION

This Groundwater Assessment Plan has been prepared by Tetra Tech, Inc. on behalf of the City of Collinsville (the City) for submittal to the Illinois Environmental Protection Agency (the Agency) for review and approval.

1.1 PURPOSE AND OBJECTIVE

This Groundwater Assessment Plan presents a technical approach to further investigate groundwater at the site and describe the proposed field activities, sampling methodologies and analytical procedures. The results of this investigation are expected to identify potential Chloride, TSD and other constituent concentrations.

In March 1999, Tetra Tech, Inc. was contracted by the City to perform a limited surface water and groundwater investigation. This investigation was prompted based on Violation Notice M-1998-00195, issued by the Agency on 6 October 1998. The investigation concluded that the landfill is potentially impacting the downgradient monitoring well, exceeding the Class II Groundwater Standard for Chlorides and TDS.

The limited surface water and groundwater investigation performed in March of 1999 by Tetra Tech will serve as the technical basis for this plan. A complete copy of the investigation report has been previously submitted.

1.2 STATUTORY AUTHORITY

Authority to responding to releases or threats of release from a landfill affecting groundwater quality is addressed in Title 35, Subtitle F, Chapter 1, Part 620 of the Illinois Environmental Protection Pollution Control Board. Under this act, the City of Collinsville (The City) or landfill owner is required to investigate, survey, test or gather other pertinent data to assess the existence, extent and nature of specified contaminants of groundwater. In addition, the City of Collinsville is authorized to undertake planning, engineering and other studies or investigations to prevent, limit or mitigate the risk to human health or welfare and the environment.

2.0 SITE CHARACTERIZATION

The site is described as a closed sanitary landfill located along Lebanon Road due east and outside the city limits of Collinsville, Illinois.

2.1 SITE DESCRIPTION AND HISTORY

The closed Collinsville landfill is located in the northwest half of Section 36, Township 3 North, Range 8 West, Madison County, Illinois. The approximate location of the landfill is shown on the U.S.G.S. 7.5 Minute Topographic Collinsville Quadrangle Map (Figure 1). It is approximately 22 acres in area and was in operation under the 807 regulations from the early 1970's through 1984 under permit number 1972-71. The site was certified closed in October 1986. A partial leachate collection system has been installed at various sections of the site since its closure. Collected leachate is transferred to the Collinsville Waste Water Treatment Plant (EPA, LPC 1194280002).

2.2 SITE GEOLOGY

Madison County is regionally in the Central Lowland Province and locally in the Springfield Plain (Wilman, 17). Elevation is generally between 600 and 800 feet above ground (Wilman, 18). Due to the advance and retreat of the ice in the Quaternary age, the sand and gravel deposits dominate the subsurface of Madison County. Underlying the Quaternary gravel deposits are the sandstone, limestone, and dolomite marine sediments of the Paleozoic age (UG-1).

The closed Collinsville Landfill is located in the south central section of Madison County. The bedrock consist of sandstone, limestone, shale and coal from the Pennsylvanian Carbondale and Modesto Formations of the Paleozoic age with a thickness of approximately 200 feet (Wilman, 21). Below the Pennsylvania Formations, much of the Mississippi Formations are eroded except for a thin layer of sandstone known as the Cypress Sandstone which is approximately 40 feet thick (Wilman, 155). The Devonian, Silurian, Ordovician, and Cambrian represent limestone, dolomite, sandstones, shales, and siltstone formations (Wilman, 10). Finally, the Precambrian basement igneous rocks are approximately 4,000 feet below the surface.

2.3 HYDROLOGIC CHARACTERISTICS

Based on a previous study, groundwater is believed to be flowing in a northwesterly direction (Mathes, 1991). There are two small creeks in the immediate vicinity; one flows west along the northern edge of the landfill (between the landfill and Lebanon Road) and the other flows north along the western edge. The creeks merge northwest of the landfill.

A successful aquifer requires permeable sand, gravel or rock, and a rock bearing unit that conducts water (*The Changing Illinois Environment: Critical Trends*, 1). According to the Illinois Department of Natural Resources, most of the aquifers in Illinois are located in the northern one fourth of the state and along the

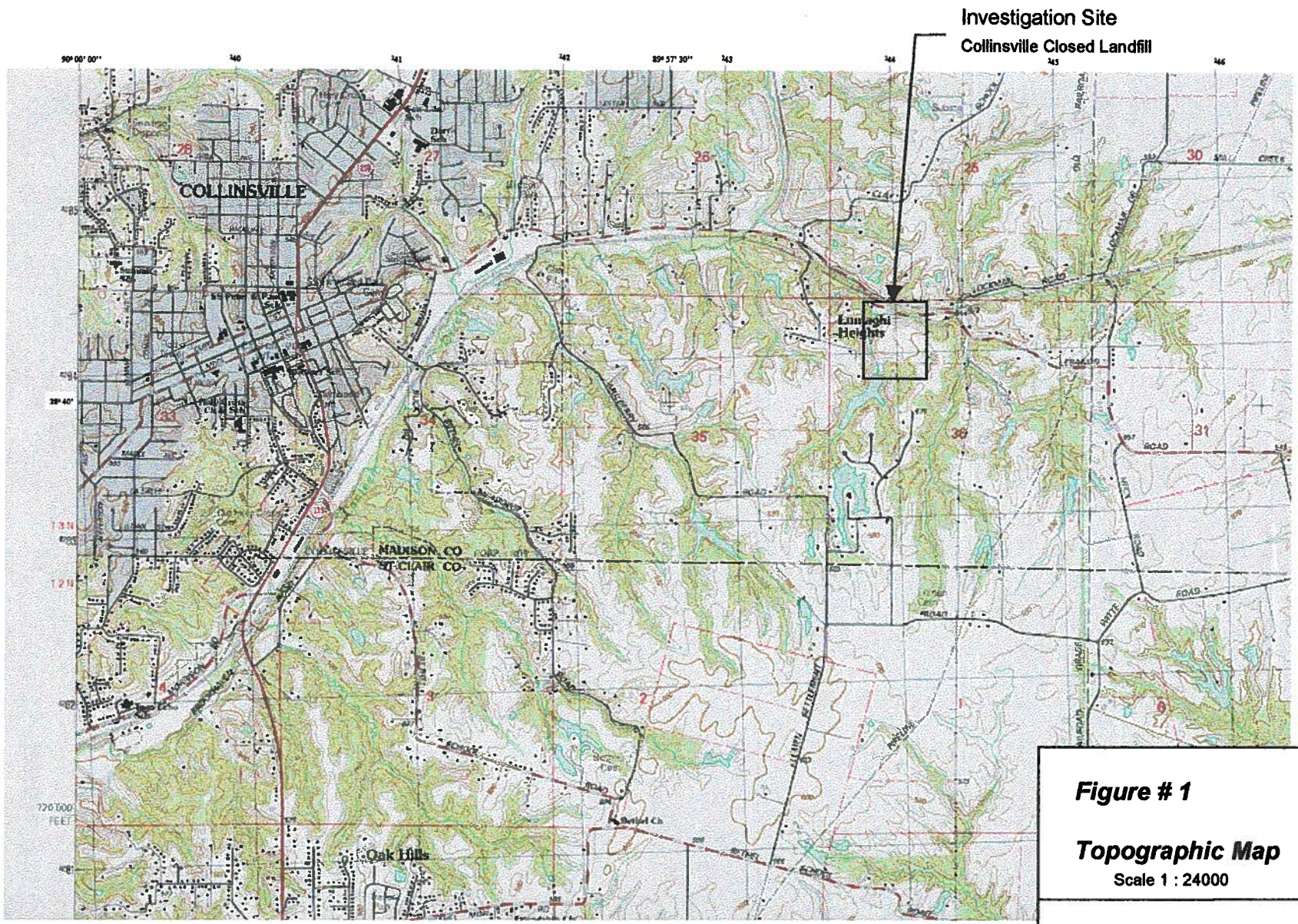

Figure # 1

Topographic Map

Scale 1 : 24000 North

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western edge following the Mississippi River. These major bedrock aquifers are less than 300 feet below the surface (*Illinois Major Bedrock Aquifer within 300 Feet Below Ground Surface,* 1).

In Central Illinois, which includes Madison County and the closed Collinsville Landfill, the major bedrock aquifers exist greater than 500 feet below the ground surface (*Illinois Major Bedrock Aquifer within 500 Feet Below Ground Surface* 1). The permeable sand and gravel deposits of Quaternary glacial advances and retreats are known as the surficial deposits and play a crucial part in producing a successful aquifer. The thickness of the surficial deposits in the Collinsville Landfill area extends less than 100 feet thick. With such a thin layer of bedrock, an aquifer is difficult to locate if present at all (*Groundwater Atlas of United States,* 11).

2.4 WETLANDS, ECOLOGICAL HABITATS AND ENDANGERED SPECIES

Tetra Tech, Inc. personnel performed a survey in accordance with the Quality of Wetlands, Natural Areas, and the Life contained therein, including endangered or threatened species of plant, fish or wildlife listed pursuant to the Endangered Species Act, 16 U.S.C. 1531 et seq., or the Illinois Endangered Species Protection Act (Ill. Rev. Stat. 1991, ch. 8, par. 331 et seq.) [415 ILCS 10].

References include the "Endangered and Threatened Species of Illinois: Status and Distribution Volume 2-Animals".

Review of the "Endangered and Threatened Species of Illinois: Status and Distribution Volume 1 – Flora" and the "ILLINOIS LIST OF ENDANGERED AND THREATENED FLORA-1998 Revision" the following species were noted to be either endangered or threatened to date:

- *Astragalus crassicarpus var. trichocalyx* Large Ground Plum
- *Draba cuneifolia* Whitlow Grass
- *Platanthera leucophea* Eastern Prairie Fringed Orchid
- *Silene ovata* Ovate Catchfly
- *Spiranthes vernalis* Spring Ladies' Tresses

Review of the References include the "Endangered and Threatened Species of Illinois: Status and Distribution Volume 3 - 1994 revisions" and the "ILLINOIS LIST OF ENDANGERED AND THREATENED FAUNA - 1998 Revision" the following species were noted to be either endangered or threatened to date:

- *Crotalus horridus* Timber Rattlesnake
- *Ellipsaria lineolata* Butterfly
- *Fusconaia ebena* Ebonyshell

- *Macrhybopsis gelida* Sturgeon Chub
- *Rallus elegans* King Rail
- *Sistrurus catenatus* Eastern Massauga

Because the landfill has been closed for over 13 years and has restricted public access, ecological habitats have been primarily left undisturbed.

3.0 GROUNDWATER INVESTIGATIONS

In March 1999, Tetra Tech, Inc. was contracted by the City to perform a limited surface water and groundwater investigation. This investigation was prompted based on Violation Notice M-1998-00195, issued by the Agency on 6 October 1998. The investigation concluded that the landfill is potentially impacting the downgradient monitoring well, exceeding the Class II Groundwater Standard for Chlorides and TDS.

This Groundwater Assessment Plan presents a technical approach to further investigate groundwater at the site and describe the proposed field activities and sampling and analysis procedures. Based on this data, an assessment regarding the extent of Chloride and TDS concentrations can be developed.

3.1 PREVIOUS INVESTIGATIONS

To date, the rate of groundwater flow has not been determined. However, the groundwater appears to flow towards the creeks on the north and west boundaries of the landfill as indicated in Figure 2.

3.2 GROUNDWATER QUALITY

On 22 April 1998, the Agency sampled the monitoring well for inorganics, VOCs, Semi-VOCs, pesticides, herbicides, and PCBs. A complete parameter list and analytical results generated from the Agency's sampling event of April, 1998, as part of the March, 1999 Investigation Report. According to the Agency's Violation Notice M-1998-00195, the groundwater in the area is classified as Class II – General Resource Groundwater by default. Exceedences of the Class II Groundwater Standard identified by the agency were Chlorides of 265 mg/L and TDS of 1,450 mg/L. The concentrations of Chlorides and TDS identified during the March, 1999 investigation were found to be 251 mg/L and 1,490 mg/L, consistent with the Agency's findings of April, 1998. Review of the historical data is consistent with these findings. The following table presents the Chlorides and TDS historical data from the monitoring well.

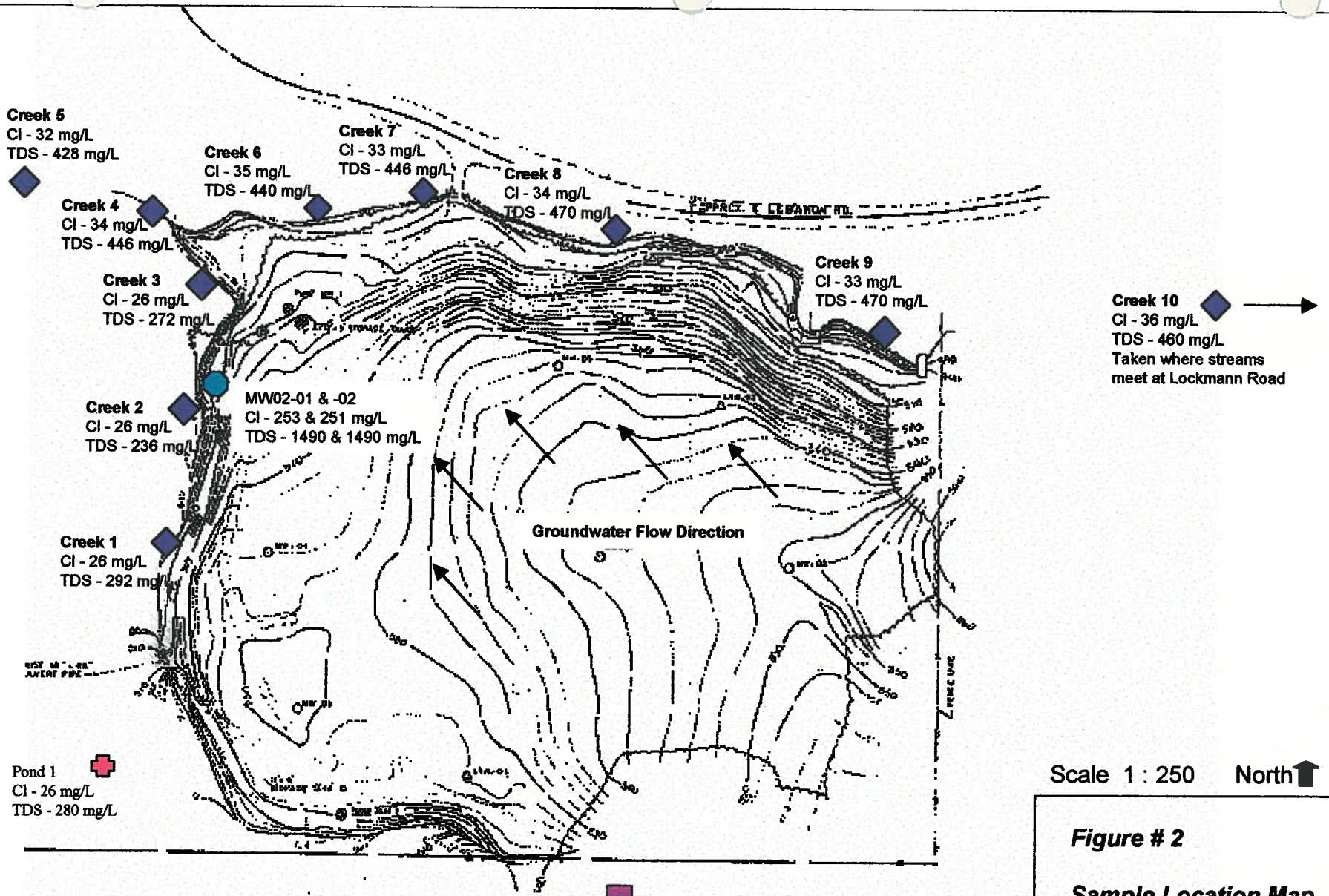

Figure # 2

Sample Location Map

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TABLE 1

**GROUNDWATER QUALITY TESTING RESULTS (mg/L)
CLOSED COLLINSVILLE LANDFILL**

Date	Chlorides	Total Dissolved Solids (TSD)
10/22/87	180	671
10/12/88	95	798
10/27/89	118	1,052
7/31/90	56	498
7/31/91	206	1,382
7/23/92	132	1,052
4/9/93	218	1,480
4/8/94	238	1,460
4/25/95	238	1,462
4/9/93	218	1,480
4/8/94	238	1,460
4/25/97	233	1,424
4/22/98	265	1,450
IL STANDARD	**200**	**1,200**

As demonstrated in the previous table, both Chlorides and TDS in the groundwater had fluctuated and generally risen over the 1987 to 1994 time period, remained nearly steady since 1994, and increased again in 1998.

3.3 EXISTING AND ANTICIPATED CONTAMINATION, IF ANY, OF THE SPECIFIC GROUNDWATER

The data on the monitoring well was reviewed for the period from 1987 through 1998. Excluding Chloride and TDS constituents, it is not anticipated that the specific groundwater will experience other parameter exceedences. Concentrations of Chlorides in the monitoring well are expected to range between 200-300 mg/L and TDS concentrations are expected to range between 1,400-1,600 mg/L. It is also difficult to ascertain the anticipated time period that elevated concentrations of Chlorides and TDS will continue to exist in the specific groundwater. Implementation of this Groundwater Assessment Plan is expected to provide the data necessary to determine the extent of the Chloride and TDS concentrations downgradient.

3.4 SURFACE WATER QUALITY

During the 12-26 March 1999 investigation, Tetra Tech, Inc. collected multiple surface water samples from nearby ponds and creeks. The surface water was tested for elevated concentrations of Chlorides and/or TDS found in potable water sources. The results are shown on the following table.

TABLE 2

SURFACE WATER TESTING RESULTS (mg/L)
CLOSED COLLINSVILLE LANDFILL

Location	Chlorides	Total Dissolved Solids (TDS)
POND – 01	26	280
POND – 02	7	186
CREEK – 01	26	292
CREEK – 02	26	236
CREEK – 03	26	272
CREEK – 04	34	446
CREEK – 05	32	428
CREEK – 06	35	440
CREEK – 07	33	446
CREEK – 08	34	470
CREEK – 09	33	470
CREEK – 10	36	470
IL STANDARD	**500**	**1,000**

These results are also depicted on (Figure 2). As shown by this figure, both Chlorides and TDS concentrations are higher in the creek running parallel with Lebanon Road in comparison to the creek running along the western edge of the landfill. Sample number CREEK-10 was collected well up-stream from the landfill at Lockman Road. The levels of Chlorides and TDS found in this sample are consistent with those found in the creek adjacent to the landfill. However, all results obtained are below Illinois Standard for Chloride and TDS in surface waters. Based on the analytical data, the landfill is not causing the Chloride and TDS levels found in the surface waters to exceed Illinois Surface Water Standards.

3.5 EXISTING AND ANTICIPATED IMPACT ON ANY POTABLE WATER SUPPLIES DUE TO CONTAMINATION

A review of the Illinois Water Well Survey of the nearby residents, was performed to assess the number of wells present within a 1,300-foot distance from the outer edge of the closed landfill. Based on the review of plat maps, 7.5 minute quadrangle (topographic) maps and water well construction records, Tetra Tech conducted a preliminary survey of identified property owners within 1,300 feet downgradient of the closed landfill and their sources of potable water.

Approximately 11 residential wells are located at/or within a 1,300-foot distance from the landfill (See Table 3). One residential well is located within 300 feet of the closed landfill. It is located west and adjacent to the closed landfill on private property (Kenneth and Susan Kitson). The residential water well is located in the NW NE NW quarter of Section 36. According to well construction reports, the water well was constructed in April 1980 for use as potable water. Another water well on private property (Robert Lockman) located in the SW SW SW quarter of Section 25 exists within 1,000-feet of the closed landfill. According to well construction report, the water well was constructed in March1989 for use as potable water supply. Review of plat maps, recorder of deed records and construction well reports, indicate approximately nine (9) water wells between 1,000 to 1,300 feet from the closed landfill. These water wells are located in Sections 25, 26 and 35. These water wells were constructed from mid 1970's to late 1980's at depths from 30 to 45 feet below ground surface (bgs).

TABLE 3

SPECIFIC RESIDENTIAL WATER WELLS LOCATED ON PRIVATE PROPERTY

Property Owner	Water Well Location	Water Well Depth (Feet)	Year Constructed	Distance From Closed Landfill
Kenneth & Susan Kitson	NW NE NW Section 36	29.0	4/22/80	<300 feet
Robert Lockman	NW NW NW Section 25	42.0	3/24/89	<1,000 feet
Otto Jardan	SW SE SE Section 26	29.0	3/13/74	<1,300 feet
Ronald Strong	NE NE NE Section 35	40.0	8/14/92	<1,300 feet
Cletus Karman	NE NE NE Section 35	30.0	1/13/86	<1,300 feet
Dave Gannen	SW SW SW Section 25	45.0	5/1/90	<1,300 feet
Herman Lilley	SW SW SW Section 25	36.0	1/1/75	<1,300 feet
Ray Rackley	SW SW SW Section 25	43.0	3/1/76	<1,300 feet
Dale Huff	SW SW SW Section 25	44.0	6/17/88	<1,300 feet
Louis Pruiett	SW SW SW Section 25	39.0	3/25/89	<1,300 feet
Tammy Wilde	SW SW SW Section 25	45.0	4/10/89	<1,300 feet

The preliminary survey revealed that property owners immediately adjacent to and within 300 feet downgradient of the closed landfill no longer use their water wells and have been connected to city water or have always been connected to city water (no water well construction record or registration).

The survey also appeared to show that the majority of property owners within 300 to 1,300 feet downgradient of the closed landfill use city water. A few property owners (Lilley, Moore and Wilde) were identified as using well water for human consumption. However, these properties appear to be located north of Lebanon Road and north, northeast of the closed landfill on higher ground

(upgradient). Groundwater appears to flow to the south and west toward a tributary of Canteen Creek. The creek tributary flows from east to west and appears to be the source of groundwater recharge. It is unlikely that these wells would be affected due to the apparent groundwater flow and physical location with respect to the closed landfill and the creek tributary (the properties are located on the north side of the creek tributary).

3.6 TRIGGERING MECHANISM

In response to the requirements of the Violation Notice M-1998-00195, issued by the Agency on 6 October 1998, an appropriate triggering mechanism for the permitted monitoring parameters was analyzed to evaluate if the increasing trends are due to the landfill.

A temporary piezometer, identified as PIEZOMETER-02, was installed on 26 March 1999 upgradient to the landfill (Figure 2) located on the northwest portion of the private property immediately northwest of a pond. Groundwater was encountered at a depth of 3.5' – 4.0' bgs, however drilling continued to a depth of approximately 11' bgs. Groundwater was purged from this location for approximately one (1) hour prior to collection of the sample according to the Limited Surface and Groundwater Investigation Report – Closed Collinsville Landfill dated March 1999.

The groundwater from the upgradient location, PIEZOMETER-02, was found to contain concentrations at 11 mg/L Chlorides and 776 mg/L TDS. The concentrations were considerably lower at the upgradient location as compared to results from in the downgradient well (Table 1). Due to the lower concentrations of Chlorides and TDS at the upgradient location, it appears that the elevated levels of Chlorides and TDS in the downgradient well may have been potentially impacted by the landfill.

4.0 SUBSURFACE INVESTIGATION DRILLING

A Tetra Tech Geologist and Registered Professional Civil Engineer performed a visual survey of the immediate area surrounding the landfill to identify locations for the installation of a permanent monitoring well upgradient and temporary piezometers downgradient from the closed landfill. The purpose of the subsurface investigation is to assess the specific groundwater movement, concentrations of contaminants and to accurately assess the groundwater quality through installation and sampling of a monitoring well and temporary piezometers. The subsurface investigative drilling will be performed by an experienced driller and logged by an on-site geologist.

A total of five soil borings will be advanced using a direct-push hydraulic (Geoprobe)

unit to an anticipated depth of 30' below ground surface (bgs). Monitoring Well 01 is located approximately 35 feet outside of the waste boundary as indicated on Figures 2 and 3. To satisfy the objective of defining the extent of Chloride and TDS impact, the proposed five piezometers are located approximately 100 feet outside the waste boundary. Since, in some locations, the waste boundary extends to near the property line of the City of Collinsville, some piezometers will be located on neighboring properties. One monitoring well will be installed approximately 300 feet from the facility boundary in the down gradient direction. The exact location of this monitoring well will be determined through field activities and water level measurements. Additional monitoring locations may be installed, if necessary to determine the extent of contamination. (See Figure 3).

Two piezometers identified as piezometer (P-3) and piezometer (P-4) are anticipated to be placed on private property (Kitson), pending access, located immediately north and west of the closed landfill. Piezometer (P-4) will be installed on the western portion of the private property immediately south of Lebanon Road. Piezometer (P-3) will be installed a short distance due east from the first piezometer nearest to the closed landfill (See Figure 3). The proposed location of the piezometers was determined due to the presumed groundwater gradient and immediate vicinity of the closed landfill. These locations should provide reliable information indicating any off-site Chlorides and/or TDS groundwater concentrations and effects of natural attenuation from groundwater recharge, if any.

Two piezometers (P-5 and P-6) will be installed on another piece of private property (Bruhn), pending access, located adjacent to Kitson's private property and west of the closed landfill. Piezometer (P-5) will be installed further north of piezometer (P-6) and along the private property boundary fence line. This piezometer location is south of Lebanon Road and is also located in dense vegetation. Piezometer (P-6) will be installed in an area of dense vegetation near the southeast portion of the subject property. The peizometer is immediately west of the creek flowing north and borders the western boundary line of the closed landfill. The locations of these piezometers are apparently downgradient based upon local topography, previous groundwater investigations, on-site reconnaissance and location of the creeks. The piezometer locations are expected to assess potentially elevated Chloride and TDS groundwater concentration levels.

Another piezometer (piezometer (P-7)) is anticipated to be installed east of the creek flowing north and long the western boundary line of the closed landfill. On-site reconnaissance revealed areas near the proposed piezometer location that appeared to be areas of groundwater recharge (as evidence of surface water, saturated or wet soils and vegetation). The piezometer location should provide reliable groundwater concentration levels of Chlorides and TDS prior to leaving the property boundary.

It is anticipated that a skid mounted Geoprobe drill rig will be used. The drill rig will require tow by either a bobcat or tractor. The skid mounted Geoprobe unit is

approximately 4 feet wide by 5 feet high allowing relatively easy access to desired drilling locations through the dense vegetation. The hydraulic unit will first bore out the soil in 4-foot sections with a macro-core sampler (1.5" inside diameter (ID)) which has been fitted with plastic sleeve inserts. Once the core sampler has been driven or pushed through the 4-foot interval, the sampler will be retrieved. The geoprobe unit will also be equipped with a percussion hammer mounted to the hydraulic ram to assist, if necessary, in pushing the sampler to greater depths. The plastic sleeve will then be removed from the sampler and logged by the on-site geologist. The 4-foot soil core collected by the sampler is undisturbed, allowing detailed description of the lithology and soil structure.

Table 4

PIEZOMETER LOCATION DESCRIPTIONS

Piezometer ID	Property Owner	Approximate Location
Piezometer (P-3)	Kenneth & Susan Kitson	South of Lebanon Road and North of closed landfill, east portion of property.
Piezometer (P-4)	Kenneth & Susan Kitson	South of Lebanon Road and northwest of closed landfill, west portion of property.
Piezometer (P-5)	Darnell & Rebecca Bruhn	West of Canteen Creek tributary, southwest of Lebanon Road, northeast portion of property (dense vegetation).
Piezometer (P-6)	Darnell & Rebecca Bruhn	West of Canteen Creek tributary, west of closed landfill, southeast portion of property (dense vegetation).
Piezometer (P-7)	City of Collinsville	West of Canteen Creek Tributary near western boundary of property (dense vegetation).

One two-inch diameter monitoring well identified as monitoring well (MW-3) is proposed to be placed on private property, pending access, located immediately south, southwest of the closed landfill. Monitoring well (MW-3) will be installed to 30' bgs on the northwest portion of the private property immediately northwest of a pond and near the location of PIEZOMETER-02 installed 26

March 1999 (See Figure 3). The proposed location for the upgradient monitoring well was determined due to the presumed groundwater gradient and immediate vicinity of the closed landfill. This location should provide reliable information identifying the triggering mechanism of off-site Chlorides and/or TDS groundwater concentrations.

4.1 PIEZOMETER INSTALLATION

The piezometers will be constructed utilizing schedule 40 Polyvinyl Chloride (PVC) casing conforming to ASTM Standard F-480-88A or the National Foundation Standard 14 (Plastic Piping System). The PVC piping will be one (1) inch in diameter (ID) and all sections will be flush mounted.

4.2 MONITORING WELL INSTALLATION

The monitoring well will be installed to a depth of 30' bgs and constructed utilizing schedule 40 Polyvinyl Chloride (PVC) casing conforming to ASTM Standard F-480-88A or the National Foundation Standard 14 (Plastic Piping System) plus a slotted screen. Ten-foot long machine slotted screens will be attached to the PVC. The screens will consist of 0.01-inch slots surrounded by a #16/30 filter pack sand or equivalent. The position of the screen will depend on the location of the water table. The well riser will be flush threaded.

4.3 SOIL BORING/LITHOLOGIC LOGGING

The recovered soil samples from all soil borings will be lithologically logged from the continuous sample recovery in accordance with the Uniform Soil Classification System (USCS) (ASTM D-2487-92) and the Visual-Manual Procedure detailed in ASTM D-2488-93. Lithologic boring logs (Figure 4) will be completed by the on-site geologist for all borings. These logs will include, but are not limited to, the site name and location, boring number and location, start and finish dates, advanced/recovered intervals, lithologic descriptions (soil constituents, soil consistency, color, density, moisture, and nature and extent of gravel or sand lenses/seams), thickness of each stratum, depth to groundwater, name of driller, name of geologist, and other note worthy remarks.

4.4 PIEZOMETER CONSTRUCTION

Once the locations have been bored to the desired depth, 1-inch threaded Polyvinyl Chloride (PVC) pipe in 3 foot sections are assembled as they are lowered into each bore hole. Each piezometer will be screened with 0.01" factory slotted screens from 5 feet bgs to 30 feet bgs to allow for maximum recharge. Prior to groundwater sample collection, the static water level will be measured in each piezometer and recorded.

FIGURE #4

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SOIL BORING LOG

Boring No.	Project No.	Project:	Sheet of

Depth to Water Table:

Depth (feet)	Sample ID Number	Advanced	Recovered	Description	Observations	Graphic Log
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

Geologist Name: _____ Signature: _____

4.5 MONITORING WELL CONSTRUCTION

A borehole will be drilled to the desired depth. It will be at a minimum of 8 inches in diameter to allow for a 2-inch annular space between the borehole sidewall and well casing. The well casing consist of10-foot screen and riser, which will be lowered into the borehole. The well casing will be sealed with threaded PVC. It will extend approximately two to three feet above the ground surface with lockable vented steel well cap or lid. Then, the well will be plumbed and centered in the boring to ensure it is straight. The well casing and wall of the borehole will be filled with #16/30 filter pack silica sand or equivalent. The filter pack will extend from the bottom of the well to at least 2-feet above the top of the well screen. Pure sodium bentonite pellets will be placed above the filter pack to create a seal. Finally, the remaining annulus will be grouted using a Portland Type I (ASTM C150) cement slurry.

After construction, the monitoring well must be developed. First, the fine-grained materials that commonly accumulate in the monitoring well will be bailed until the bottom of the monitoring well can be probed. Water levels, temperature, pH, specific conductance, and turbidity are recorded prior and during sampling. Next, the well is surged using a surge block to flush fine-grained materials from the filter pack. A bailer will be used to extrapolate the needed discharge volume of water. These steps are repeated several times. The well will be allowed to recharge before collection of the groundwater sample.

Groundwater characteristics help determine the ratio of water available compared to the volume of water stored in the rock. To help evaluate the groundwater characteristics, field hydraulic conductivity values are determined by varying pumping rates and the rate of recharge. Field hydraulic conductivity values are ascertained by a step test. A step test will be performed during the development of the monitoring well which monitors water levels and field parameters prior, during and after the development. Water levels will be compared to the reaction time required for the groundwater to recover back to the level observed prior to pumping and development.

4.6 DECONTAMINATION PROCEDURES

All hydraulic sampling equipment will be decontaminated between boring locations and will consist of the following sequential steps:

- Disassemble equipment, as required;
- Laboratory grade glassware detergent (Alconox or equivalent) and tap water;
- Thorough tap water scrub to remove visual contamination;

- Generous rinse with tap water; and
- Final rinse with distilled or deionized (DI) water.

Since dedicated mini-bailers will be used for groundwater sampling, decontamination of groundwater sampling equipment will not be required. The water level indicator will be rinsed with DI water between uses.

4.7 INVESTIGATIVE DERIVED WASTE (IDW) MANAGEMENT

Investigative Derived Waste (IDW) will consist of soil cores and drill cuttings not used for analytical purposes, fluids from monitoring well development and purging activities, decontamination water, and discarded expendables. Decontamination water will be placed in DOT approved 55-gallon closed-top metal drum(s) and unused soil cores and drill cuttings will be placed into an DOT approved 55-gallon metal open-top drum(s). Each drum will be clearly labeled as to their contents, filled/closing date and project number. With the exception of one soil boring located near the western boundary of the closed landfill and the monitoring well, the remaining soil borings collected for the proposed piezometer locations are outside the property boundary of the closed landfill. It is anticipated that the remaining drilling locations will be in non-impacted soils in undisturbed clean areas.

Once the groundwater-sampling event is complete, one (1) composite groundwater sample will be collected from the water IDW drum. Based on the analytical results, a determination will be made as to whether the wastewater meets the City of Collinsville WasteWater Treatment Plant (WWTP) analytical parameters or treated/disposed of at an off-site facility. Tetra Tech personnel will prepare any permitting documents required and/or notifications for the City of Collinsville to submit to the Illinois Environmental protection Agency (IEPA) for approval of discharge to sanitary sewer.

The soil and water drums will be stored on-site until results of the analysis are received. Discarded materials, including personnel protective equipment (PPE), towels and plastic bags, will be disposed in accordance with applicable regulations at the end of each day or work shift.

5.0 GROUNDWATER MONITORING

Once the target depth of 30 feet bgs has been reached and the soil sampler has been removed for the piezometers, 30 feet of 1 inch ID schedule 40 PVC pipe will be placed in the open borehole. The 10 to 30 feet bgs interval will be screened with 0.010-inch slotted screen sections to allow for the maximum groundwater recharge. It is expected that placing the PVC into the borehole will allow for the collection of

groundwater samples at the end of the day. The limited capacity of 1 inch PVC piping may result in the collection of a groundwater sample over two days.

After the installation of the proposed upgradient monitoring well, groundwater samples will be taken following well development. The monitoring well will be purged prior to sampling because standing water may yield a non-representative sample. The groundwater sample will be collected using a PVC bailer following purging and well recharged.

At the completion of the installation and development of the piezometers and monitoring well, Tetra Tech personnel will record the static water level with a water level meter. The static water levels will be recorded and shown on a potentiometeric map. Also, measurements for immiscible layers and the total depth of the monitoring well will be taken after completion of the installation and development of the monitoring well. Finally, water level measurements from piezometers and monitoring wells will be collected on a bi-monthly basis for a period of one year to assess temporal variability in groundwater flow.

5.1 SAMPLING FREQUENCY AND ANALYSIS

Five groundwater samples from the piezometers and one groundwater sample from the proposed upgradient monitoring well will be collected. The piezometers will be sampled using disposable "mini-bailers". Each "mini-bailer" is 3/4" diameter x 36" in length. The monitoring well will be sampled using a disposable Teflon bailer. Groundwater samples removed with the disposable bailer will be placed in the appropriate sample containers, labeled, and stored on ice in a thermally insulated shipping container. Each groundwater sample will be sent to an accredited environmental laboratory.

All 35 IAC Part 620.220 constituents will be analyzed at two down gradient locations nearest the waste boundary. 35 IAC Part 620.220 constituents include inorganics, VOC's, semi-VOC's, pesticides, herbicides, and PCB's for Class II groundwater. If analytical data from these locations exceed any of the thresholds for Class II constituents other than Chloride and TSD, Tetra Tech, Inc. will extend monitoring of the additional elevated constituents to all monitoring locations. If the two down gradient locations do not exceed the thresholds for Class II constituents, then only Chloride and TDS levels will be analyzed at all monitoring locations.

If the Geoprobe method fails during investigation to adequately provide sufficient groundwater samples within a 24-hour sampling period, then standard 2" id groundwater monitoring wells will be installed in place of the temporary piezometers.

5.2 SAMPLE HANDLING, PRESERVATION, CHAIN OF CUSTODY AND SHIPPING

Field personnel will be donning chemical resistant gloves while logging the soil and collecting groundwater samples. A clean pair of gloves will be used for each sampling event. Approved EPA sample containers will be used throughout the project. Each groundwater sample will be given a unique number. A "Chain-of-Custody Record" will maintain sample custody (Figure 5). The chain-of-custody (COC) record will be completed at the site by the individual designated by the Project Manager as responsible for sample shipment. It will contain the following information: project name, sampler signatures, sample identification number, sample matrix (i.e., water), requested analysis and method number, and sample preservation.

A sample will be considered to be under custody if:

- Sample is in the possession of the responsible person;
- Sample is in view of the responsible person;
- Sample is locked or sealed by the responsible person to prevent tampering; or
- If sample is in a designated secure area.

Each sample within the shipping container will be listed on the COC for that container. Original COCs, signed by both field samplers and laboratory personnel, will be returned to Tetra Tech with the analytical results and included with the Investigation Report.

Duplicates

Duplicate samples are quality control samples designed to evaluate the laboratories ability to reproduce analytical results. They are defined as 2 water samples collected independently at a single sampling location during a single act of sampling. The duplicate sample will be submitted "blind" to the laboratory and given a fictitious sample number and collection time. The total number of duplicates will be 10 percent of the total groundwater samples collected.

Trip Blanks

The trip blank is a quality control sample designed to evaluate cross contamination in the field. A trip blank is a sample filed at the laboratory with reagent grade type II water spare. The trip blank is transported to the site, handled as a regular sample, and returned to the laboratory with the groundwater samples for analysis.

FIGURE #5

Chain of Custody Record

TETRA TECH, INC.
333 Salem Place, Suite 145
Fairview Heights, IL 62208
Telephone (618) 632-5801
Telefax (618) 632-2751

SHIPPED TO: _____

DATE _____ PAGE 1 OF 1

CLIENT:	ANALYSIS PARAMETERS	TURN AROUND TIME:
PROJECT NAME:		TOTAL NO. OF CONTAINERS SHIPPED:
		METHOD OF SHIPMENT/SHIPMENT NO.:
PROJECT MGR.:		
TC#:		
SAMPLERS (SIGNATURES)		SPECIAL REQUIREMENTS:

	SAMPLE NO.	DATE	TIME	OBSERVATIONS/COMMENTS
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				

RELINQUISHED BY	SIGNATURE	COMPANY	DATE	TIME
		TETRA TECH, INC.		
RECEIVED BY	SIGNATURE	COMPANY	DATE	TIME
RELINQUISHED BY	SIGNATURE	COMPANY	DATE	TIME
RECEIVED BY	SIGNATURE	COMPANY	DATE	TIME
RELINQUISHED BY	SIGNATURE	COMPANY	DATE	TIME
RECEIVED BY	SIGNATURE	COMPANY	DATE	TIME

Temperature Blank

All samples including the temperature blank will be placed in an ice-filled cooler and will be chilled to 4 degrees Fahrenheit. The temperature blanks will be filled with deionized water and will be free of contaminants. The laboratory will use the temperature blank to assess the temperature of the samples inside the cooler. Laboratory personnel will record the receiving temperature.

6.0 DOCUMENTATION AND REPORT SUBMITTAL TO REGULATORY AGENCY

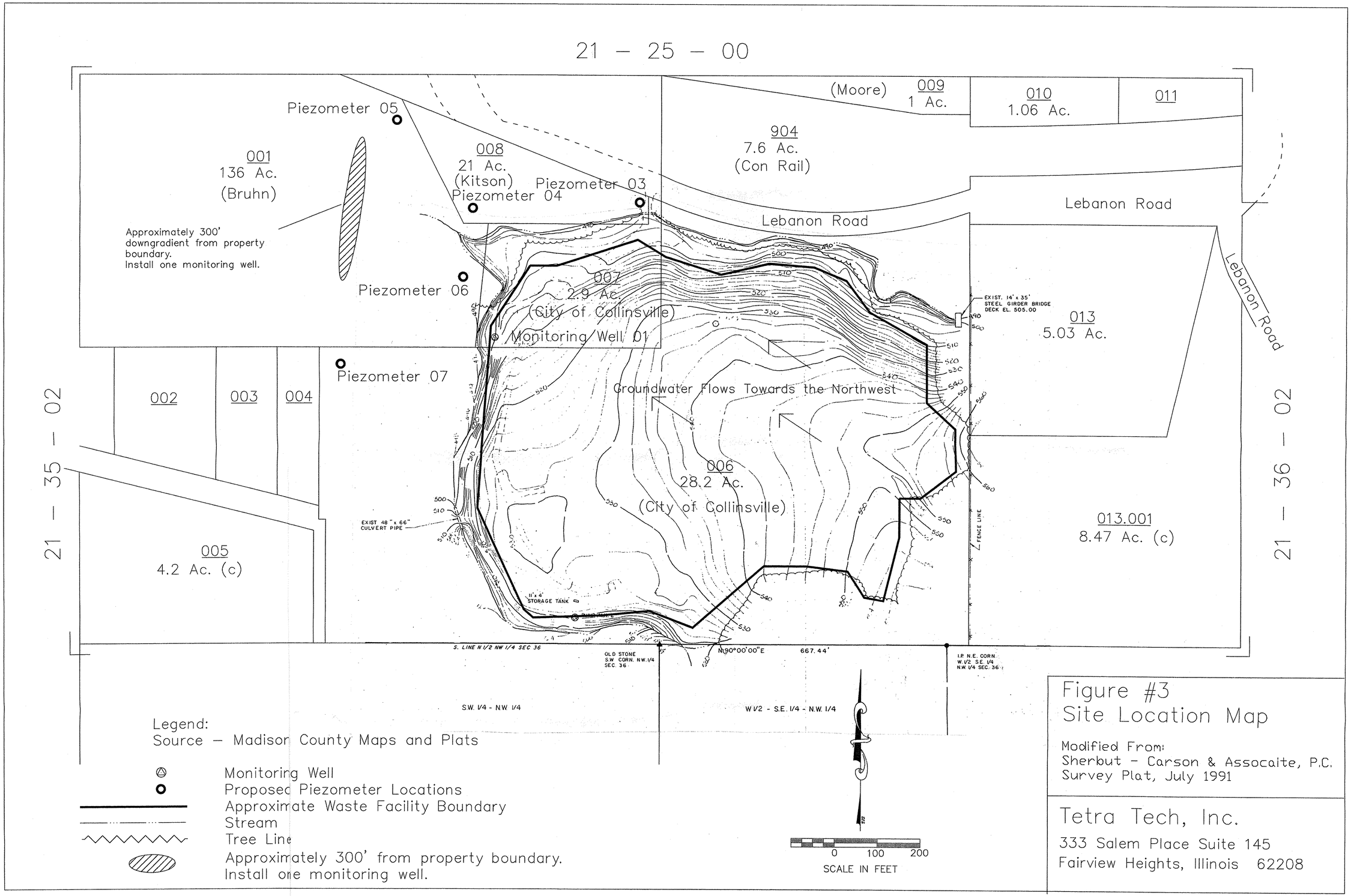
A site investigation report will be prepared and submitted to the Agency within 80 days after the completion of fieldwork. The site investigation report will document field activities, sampling methodologies, analysis procedures and results of the investigation. The report will include boring logs, groundwater sampling sheets, IDW disposition and surveyed locations. Summary tables of analytical results will be provided for comparison to 35 IAC Part 620 constituents for Class II regulatory limit standards. An isopleth contamination map will be included as part of the investigation report to illustrate the extent and concentrations of parameters exceeding standards. The report will also assess the potential rate and extent of contamination from the facility by determining the groundwater flow, establishing the extent and concentrations of parameters, and defining the rate of migration.

Attachment 15-2

Plate 1, Groundwater Assessment Plan

Closed Collinsville Landfill, Collinsville, IL

Tetra Tech, January 2000



Legend:
Source – Madison County Maps and Plats

- Monitoring Well
- Proposed Piezometer Locations
- Approximate Waste Facility Boundary
- Stream
- Tree Line
- Approximately 300' from property boundary. Install one monitoring well.

Figure #3
Site Location Map

Modified From:
Sherbut - Carson & Associate, P.C.
Survey Plat, July 1991

Tetra Tech, Inc.
333 Salem Place Suite 145
Fairview Heights, Illinois 62208