UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

OCT 01 2015

REPLY TO THE ATTENTION OF:

LU-9J

Jason Smith
Corporate Environmental Director
Tecumseh Products Company
2700 West Wood Street
Paris, Tennessee 38242

Re: Notice of Violation
3008(h) Administrative Order on Consent RCRA-05-2010-0012
Tecumseh Products Company, 100 East Patterson, Tecumseh, Michigan 49286
EPA ID#: MID005049440

Dear Mr. Smith:

By this letter, EPA is notifying Tecumseh Products Company (TPC) that it is not in compliance with Paragraphs 13.a. and 13.b. of the Administrative Order on Consent (AOC RCRA-05-2010-0012), which became effective March 29, 2010. Paragraph 13.a. of the AOC requires TPC to submit an Environmental Indicators Report demonstrating that all current human exposures to contamination at or from the facility are under control within 18 months of the effective date of the AOC. The original deadline date for meeting this requirement was extended to September 30, 2013. As EPA stated in its January 31, 2014 correspondence, TPC has not adequately demonstrated that human exposures are under control. Paragraph 13.b. of the AOC requires TPC to submit an Environmental Indicators Report demonstrating that the migration of contaminated groundwater at or from the facility had stabilized within 30 months of the effective date of the AOC. The original deadline date for meeting this requirement was September 29, 2012; the deadline date was extended to July 31, 2015. As discussed below, TPC has not adequately demonstrated that the migration of contaminated groundwater has stabilized.

In evaluating your *Supplement to Remedial Investigation and Environmental Indicator Report (Migration of Contaminated Groundwater Under Control)* (EI Supplemental Report) dated July 31, 2015, EPA performed a statistical analysis of the groundwater data TPC collected and, based on our analysis (Attachment 1 to this letter), EPA concludes that TPC has failed to demonstrate that the migration of contaminated groundwater has stabilized and the migration of contaminated groundwater has not been controlled and, therefore, is in violation of Paragraph 13.b. of the AOC RCRA-05-2010-0012. Attachment 2 provides specific comments related to TPC's EI Supplemental Report, and Attachment 3 provides a chronology of events at the TPC site leading to EPA's conclusions herein.

Specifically, we find that Tecumseh Products Company is in violation of the 2010 RCRA 3008(h) Consent Order's (Docket Number RCRA-05-2010-0012) following requirements:

Violation 1: Failure to Demonstrate that Migration of Contaminated Groundwater is Stable.

> Paragraph 13.b. of the AOC provides that "Tecumseh Products shall submit an Environmental Indicators Report and perform any other necessary activities, consistent with this Section, demonstrating that: Migration of contaminated groundwater at or from the facility is stabilized. That is, the migration of all groundwater known or reasonably suspected to be contaminated with hazardous wastes or hazardous constituents above acceptable levels is stabilized to remain within any existing areas of contamination as defined by monitoring locations designated at the time of the demonstration..."

Tecumseh Products has not installed monitoring wells in the locations needed to demonstrate that groundwater contaminated with hazardous constituents has stabilized, as required under paragraph 14.e. In downgradient areas at wells MW-21 and MW-23, data demonstrate increases in contaminant concentrations, indicating that the plume is expanding (see Attachment 1). In addition, recent data collected from temporary borings demonstrates that the area of contaminated groundwater has expanded beyond the perimeter of contaminated groundwater shown in TPC's September 2012 Groundwater EI report. Additionally, TPC has not implemented the corrective actions necessary to stabilize the migration of contaminated groundwater, as required under Paragraph 14.d. Therefore, TPC has failed to demonstrate that the migration of contaminated groundwater at or from the facility has stabilized, in violation of paragraph 13.b. of the Order.

Violation 2: Failure to Demonstrate that Human Exposures are Under Control.

> Paragraph 13.a. of the AOC provides that "Tecumseh Products shall submit an Environmental Indicators Report and perform any other necessary activities, consistent with this Section, demonstrating that: All current human exposures to contamination at or from the facility are under control. That is, significant or unacceptable exposures do not exist for all media known or reasonably suspected to be contaminated with hazardous wastes or hazardous constituents above risk-based levels, for which there are complete pathways between contamination and human receptors."

The expansion of the area of groundwater contamination at levels above the residential screening criteria for vapor intrusion in off-site areas prevents EPA from determining that human exposures are under control, as explained in our January 31, 2014 correspondence regarding TPC's Human Health Environmental Indicator Report. Groundwater contamination above screening criteria for residential vapor intrusion north, east, and southeast of the site has not been delineated as required under Paragraph 11. of the AOC. TPC has confirmed that contamination above the screening criteria exists off-site to the north, near residences that do not currently have mitigation systems installed, and the sources of contamination near MW-4S to the north and B-100 to the southeast have not been controlled. Additionally, TPC has not implemented the

corrective actions necessary to demonstrate that human exposures are under control, as required under Paragraph 14.c. Therefore, TPC has failed to demonstrate that the human exposures to contamination at or from the facility are under control, in violation of Paragraph 13.a. of the Order.

Violation 3: Failure to Identify and Define the Nature and Extent of Releases of Hazardous Waste and Hazardous Constituents at or from the Facility.

> Paragraph 11. of the Consent Order for the Facility states "Tecumseh Products shall identify and define the nature and extent of releases of hazardous waste and hazardous constituents at or from the facility...which may [or do not] pose an unacceptable risk to human health and the environment and ...provide the basis for those conclusions, including an evaluation of the risks"

TPC has not demonstrated that the human exposures to contamination at or from the facility are under control, in violation of Paragraph 13.a. of the Order, and TPC has not demonstrated that the migration of contaminated groundwater at or from the facility has stabilized, in violation of Paragraph 13.b. of the Order. Therefore, TPC has not identified the nature and extent of contamination that poses acceptable/unacceptable risks to human health and the environment and is in violation of Paragraph 11. of the AOC.

Paragraph 31.d. of the order subjects the facility to stipulated penalties for failure to adequately demonstrate through the Environmental Indicators Report (required in Paragraph 13.b.) that groundwater migration is stabilized, and Paragraph 31.c. of the order subjects the facility to stipulated penalties for failure to adequately demonstrate through the Environmental Indicators Report (required in Paragraph 13.a.) that human exposure to contamination is under control. This notice of violation is not a demand letter seeking stipulated penalties.

EPA requests that TPC respond to this letter within 30 days explaining how it plans to control the migration of contaminated groundwater and demonstrate human exposures are under control per the order's requirements, and where TPC plans to establish a monitoring network to monitor the migration of contamination, now and in the future, to verify the progress of Interim and Corrective Measures and to evaluate contaminant migration and human exposures.

EPA may determine that your failure to perform the required activities constitutes a continuing event of non-compliance and may subject TPC to the assessment of penalties by EPA under the terms of the AOC RCRA-05-2010-0012 following TPC's receipt of this letter.

If you have any questions concerning this matter, please contact Joseph Kelly of my staff at 312-353-2111.

Sincerely,

Jose G. Cisneros
Chief
Remediation and Reuse Branch

cc: Graham Crockford, TRC Environmental Corporation (TPC Project Manager)
Douglas McClure, Conlin, McKenney & Philbrick, PC
Stacy Metz, TRC Environmental Corporation
Tecumseh District Library – Public Repository
Dale Bridgford, MDEQ

Attachments

Attachment 1 – *Trend Analysis: Tecumseh Products*, USEPA FIELDS Group.

30 September 2015

Trend Analysis: Tecumseh Products

USEPA FIELDS Group
John Canar, Environmental Scientist
Charles Roth, Life Scientist

Introduction

Nine groundwater wells selected by the USEPA LCD project manager, Joe Kelly, were used for trend analysis for two VOCs: TCE and VC. Two software packages were used for these analyses: ProUCL and VSP. Both softwares were funded, in part, by the USEPA and other Federal agencies.

Methods

Data sets

The USEPA FIELDS Group received an MS Access database via TRC Solutions. That file was named "DB_Tecumseh_v2.accdb". That file was queried and exported as an Excel file. This Excel file, with minor modifications (e.g., days since first sampling event, seasons), was used for trend analysis.

Seasons were defined as "Winter" (December, January, and February); "Spring" (March, April, and May); "Summer" (June, July, and August); and "Fall" (September, October, and November). (These seasonal distinctions were used for the Seasonal-Kendall statistical trend test.)

All of the groundwater concentration values for the nine wells of interest were detected values.

The nine wells selected for analyses and the chemicals of concern were:

MW-21 (TCE)
MW23 (VC)
MW-31 (TCE)

MW-35I (TCE)

MW22 (VC)
MW-36S (TCE)
MW-37S (TCE)
MW-38S (TCE)
MW-39S (TCE)

Where TCE stands for trichloroethene and VC stands for vinyl chloride. The first four wells were considered of primary importance; the last five of secondary importance.

The location of these wells relative to MIP sample locations and boundaries is provided in Figure 1. As can be seen in the figure, four of the wells tested for trend are within the site boundaries. These wells are: MW-35I (TCE), MW-36S (TCE), MW-37S (TCE), and MW-39S (TCE). The remaining five wells are downgradient. One in the northern plume, MW23 (VC), one in between the northern and southern plumes, MW22 (VC), and three in the southern plume: MW-21 (TCE), MW-31 (TCE), and MW-38S (TCE).

Figure 2 shows the locations of permanent wells relative to source areas. This figure was created from TRC Solutions reports. It provides an additional understanding of the plumes, in two-dimensions, and their relationship to the wells selected for trend analysis in this report.

Trend Analysis

ProUCL version 5.0 was used to perform two statistical tests of trend: Mann-Kendall and Theil-Sen. Both are nonparametric tests with the Theil-Sen also providing an estimate of the equation of the line (ProUCL, 2013). In addition, Visual Sample Plan (VSP) version 7.4 was used to perform the Mann-Kendall trend test and the Season-Kendall trend test. The Seasonal-Kendall is "an extension of the Mann-Kendall" test when "the data collected over time are expected to change in the same direction (up or down) for one or more seasons" (VSP, 2015).

Results and Conclusions

Trend Analysis

The Mann-Kendall analysis showed that five of the nine wells exhibited a significant upward trend at a 5% significance level (alpha) (see Table 1). Of the remaining four wells, three exhibited a significant upward trend but at higher alpha levels. Well MW-37S (TCE) was significant at an alpha of 10%; Well-39S (TCE) at 25%; and Well-38S (TCE) at 30% (using the ProUCL software) and 35% (using the VSP software). Only well MW-35I (TCE) did not exhibit

an upward trend at an alpha value less than 40%. If anything, there appears to be a downward trend.

Figure 3 shows a representative output from ProUCL software's Mann-Kendall trend analysis for well MW-21 (TCE). And Figure 4 shows the same well's output from VSP software's Mann-Kendall trend analysis.

The Theil-Sen analysis showed that five of the nine wells exhibited a significant upward trend at a 5% significance level (alpha) (see Table 1). These wells were: MW-21 (TCE), MW23 (VC), MW-31 (TCE), MW22 (VC), and MW-36S (TCE). Figure 5 shows a representative output from ProUCL software's Theil-Sen trend analysis for well MW-23 (VC). Well MW-37S (TCE) exhibited a significant upward trend at a 15% significance level. The three remaining wells did not exhibit a statistically significant upward trend at an alpha level less than 40%. Two of the remaining wells, MW-38S (TCE) and MW-39S (TCE) exhibit an upward trend. (See Figure 6 for an example.)

The Seasonal-Kendal analysis showed that four of the nine wells exhibited a significant upward trend at a 5% significance level (see Table 1). These wells were MW-21 (TCE), MW23 (VC), MW-31 (TCE), and MW22 (VC). Two other wells had a significant upward trend at a 15% alpha level, wells MW-36S (TCE) and MW-37S (TCE). An additional two wells, MW-35I (TCE) and MW-39S (TCE), did not have a significant upward trend at the 45% alpha level. The remaining well, MW-38S (TCE), had too few observations, by season, for the statistical analysis to be performed.

Figure 7 shows a representative output from VSP software's Seasonal-Kendall trend analysis output for well MW-31 (TCE).

Summary

Mann-Kendall

Of the nine wells tested, eight had statistically significant upward trends using significance levels (alpha) of 30% or less using the Mann-Kendall test in the ProUCL software. Six of these wells had alpha levels of 10% or less. (In the VSP software, the alpha is 35% or less for these eight wells.) The remaining well did not exhibit a statistical trend and exhibited more of a downward trend.

Theil-Sen

Six of the nine wells tested had statistically significant upward trends using significance levels (alpha) of 15% or less using the Theil-Sen test. The remaining three wells were not significant at an alpha level of 40%.

Seasonal-Kendall

Six of the nine wells tested had statistically significant upward trends using significance levels (alpha) of 15% or less using the Seasonal-Kendall test. Wells MW-35I (TCE) and MW-39S (TCE) were not significant at an alpha level of 45%. The remaining well, MW-38S (TCE) had too few observations (by season and year) for analysis.

Number of observations

Five of the nine wells had 10 observations or less. Two of these wells, MW-38S (TCE) and MW-39S (TCE), exhibited higher alpha levels associated with an upward trend than wells with larger numbers of observations. Additional observations will likely improve confidence in the trend analysis results.

Perhaps most interestingly, all five of the "off site" wells, wells MW-21 (TCE), MW22 (VC), MW23 (VC), MW-31 (TCE), and MW-38S (TCE), had statistically significant upward trends for the Mann-Kendall test. (Four of the five, were significant for the Theil-Sen statistical test.) Four of these five wells also had significant upward trends accounting for seasons (the Seasonal-Kendall test). The fifth well, MW-38S (TCE), had too few observations for the Seasonal-Kendall test.

References

Maichle, Robert, Singh, Anita, and Singh, Ashok. ProcUCL 5.0.00. Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. http:// http://www.epa.gov/OSP/hstl/tsc/software.htm

ProUCL Version 5.0.00 User Guide, Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations, EPA/600/R-07/041, September 2013.

VSP Development Team (2015). Visual Sample Plan: A Tool for Design and Analysis of Environmental Sampling. Versionn 7.4. Pacific Northwest National Laboratory. Richland, WA. http://vsp.pnnl.gov

Contact

Please contact the FIELDS Group via John Canar (canar.john@epa.gov) about this document.

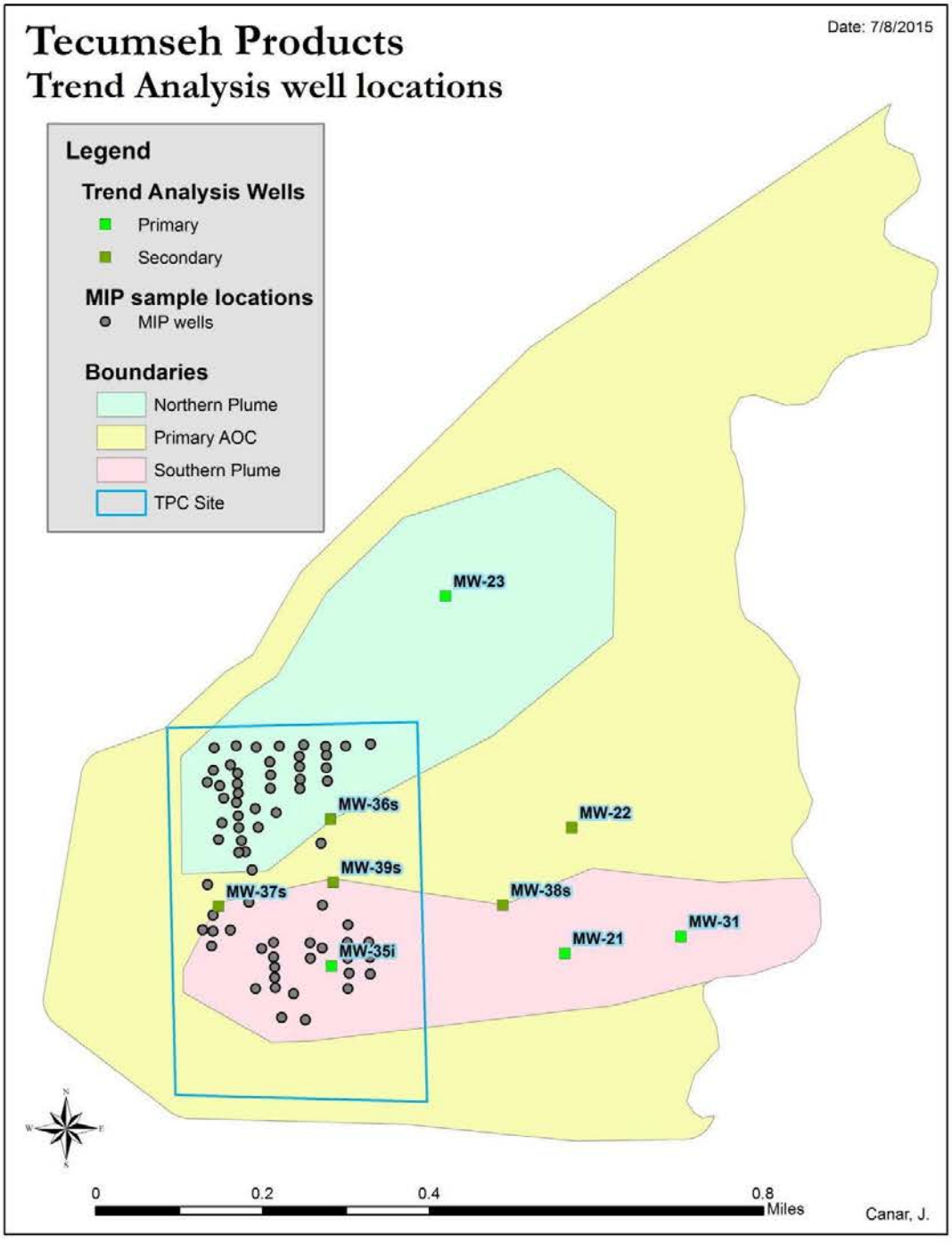


Figure 1: Trend analysis wells, MIP sample locations, and boundaries.

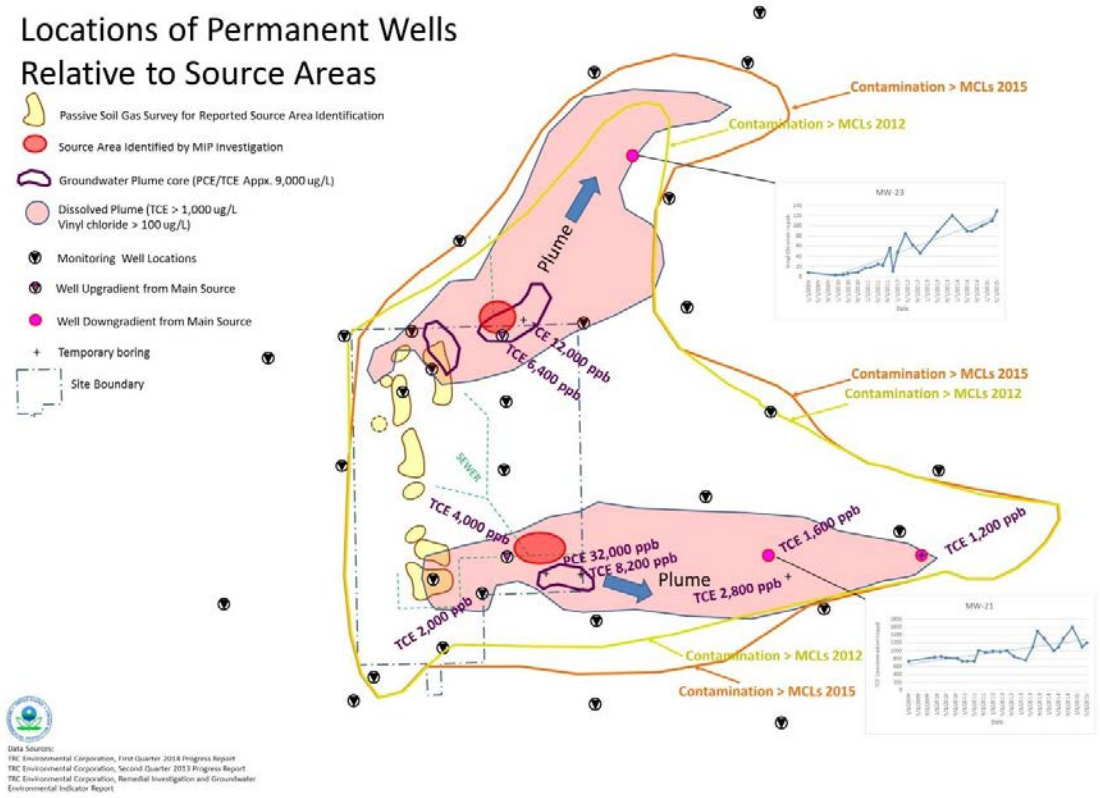


Figure 2: Locations of permanent wells relative to source areas.

			ProUCL		VSP	
Well ID	Significance	Observations	Mann-Kendall	Theil-Sen	Mann-Kendall	Seasonal-Kendall
MW-21 (TCE)	Primary	24	upward	upward	upward	upward
MW23 (VC)	Primary	22	upward	upward	upward	upward
MW-31 (TCE)	Primary	20	upward	upward	upward	upward
MW-35I (TCE)	Primary	10	no upward	no upward	no upward	no upward
MW22 (VC)	Secondary	19	upward	upward	upward	upward
MW-36S (TCE)	Secondary	10	upward	upward	upward	upward
MW-37S (TCE)	Secondary	10	upward	upward	upward	upward
MW-38S (TCE)	Secondary	8	upward	no upward	upward	too few observations
MW-39S (TCE)	Secondary	10	upward	no upward	upward	no upward

upward at 5% alpha
upward at 10% alpha
upward at 15% alpha
upward at 25% alpha
upward at 30% alpha
upward at 35% alpha
not significant at 40% alpha

Table 1: Summary of Trend Analysis results.

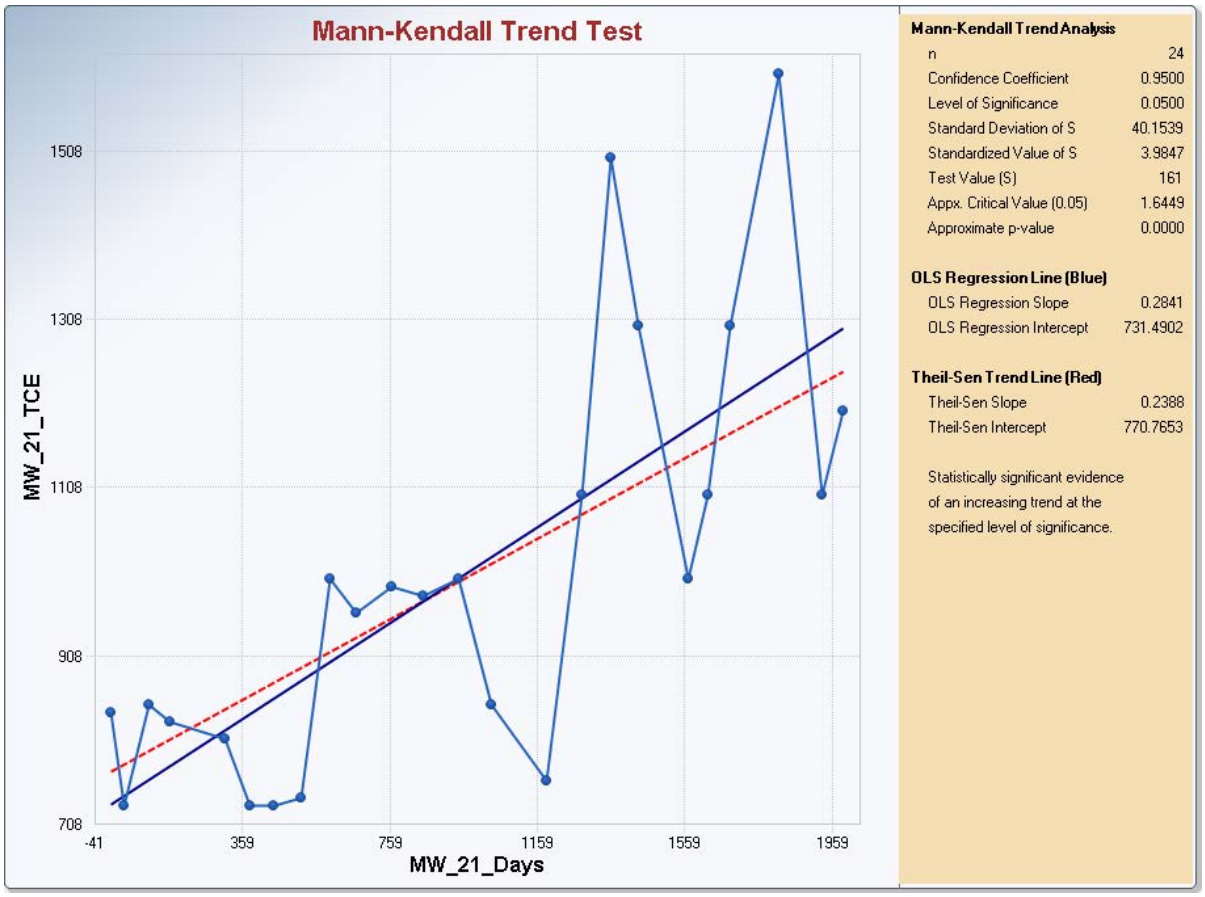


Figure 3: ProUCL software's Mann-Kendall trend analysis output for well MW-21 (TCE)

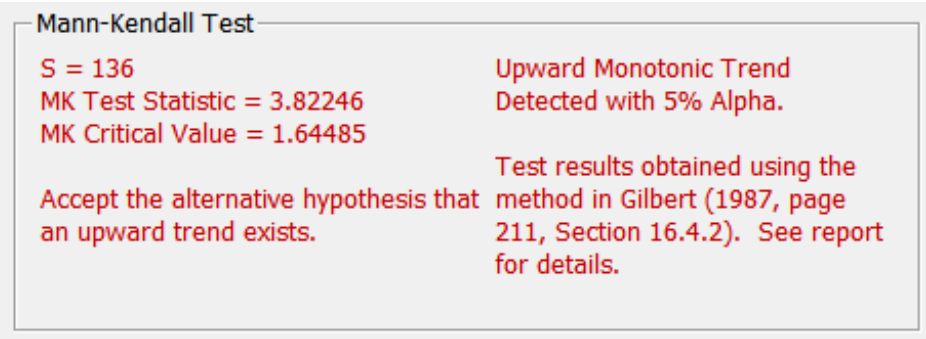


Figure 4: VSP software's Mann-Kendall trend analysis output for well MW-21 (TCE)

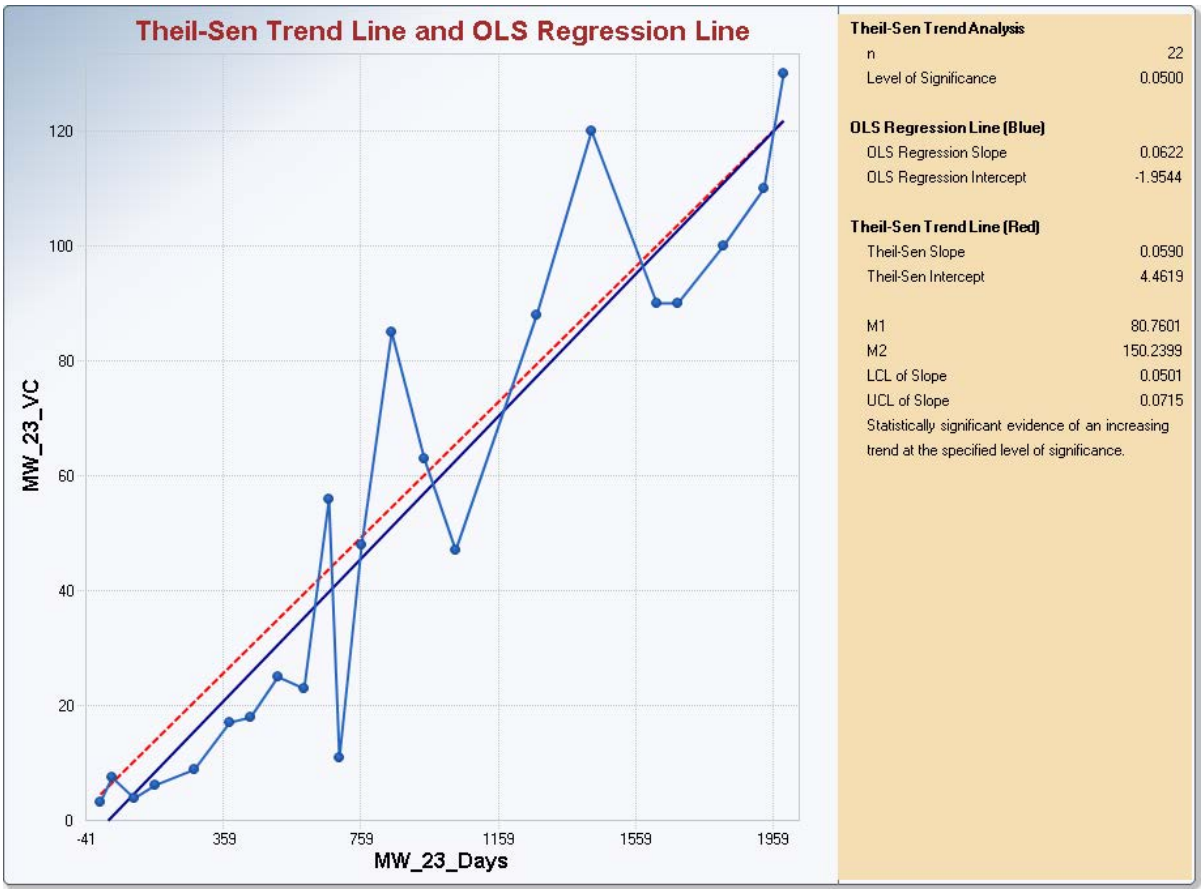


Figure 5: ProUCL software's Theil-Sen trend analysis output for well MW-23 (VC)

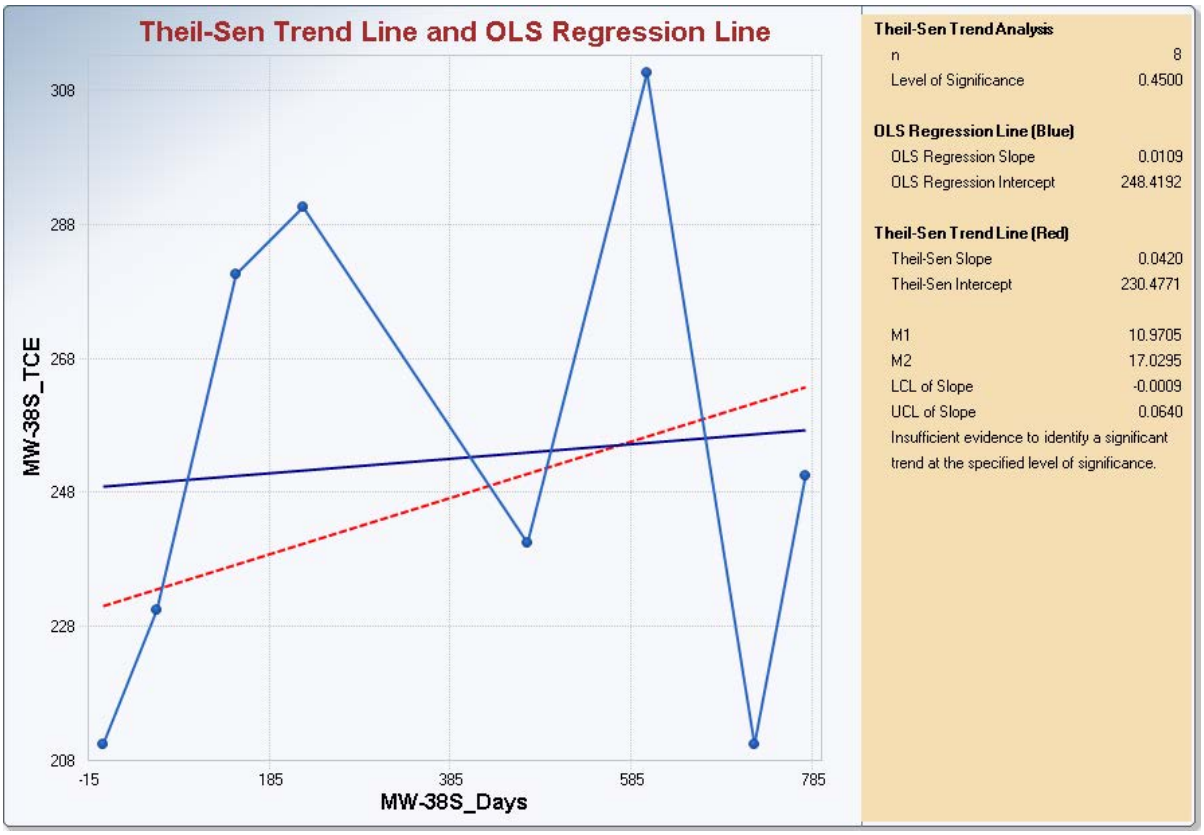


Figure 6: ProUCL software's Theil-Sen trend analysis output for well MW-38S (VC)

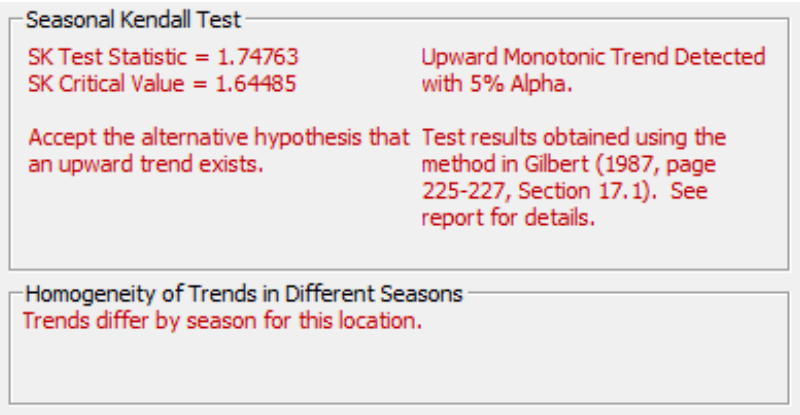


Figure 7: VSP software's Seasonal-Kendall trend analysis output for well MW-31 (TCE)

30 September 2015

earthVision analysis: Tecumseh Products

USEPA FIELDS Group
John Canar (canar.john@epa.gov), Environmental Scientist

The USEPA FIELDS Group received an MS Access database via TRC Solutions. That file was named "DB_Tecumseh_v2.accdb". That file was queried and exported as an Excel file. This Excel file was modified in the SAS software in order to be used in earthVision (Dynamic Graphics Incorporated). The earthVision software was used to display selected groundwater VOCs over time and space. The VOCs selected were: cis-1,2-Dichloroethene, trichloroethene, and vinyl chloride. These VOCs were chosen by the USEPA LCD project manager, Joe Kelly. The output from earthVision are provided in Appendices A, B, C, and D.

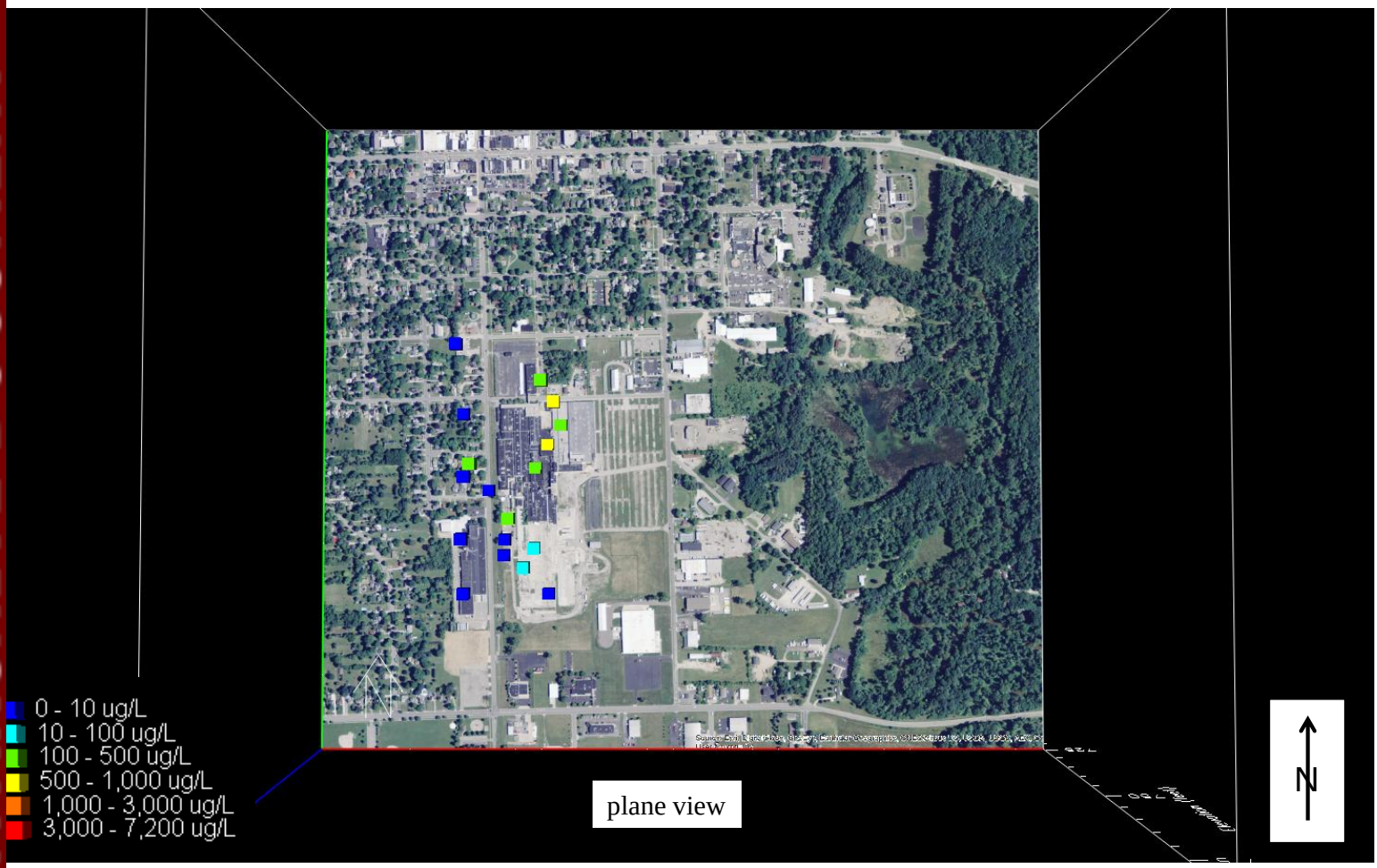
Appendix A

DCE 2008 through 2015

The DCE files used for these analyses are the maximum DCE by X, Y, Z by year. Where DCE is cis-1,2-Dichloroethene. The source of these data are an MS Access database received from TRC Solutions. That file was named "DB_Tecumseh_v2.accdb". That file was queried and exported as an Excel file. This Excel file was modified in the SAS software in order to be used in earthVision (Dynamic Graphics Incorporated).

The below output is from the earthVision software. All save the last four pages are postings of the DCE values (X,Y,Z) by year. The last four pages are interpolations (3D grids) of the DCE values for 2015.

DCE (ug/L) 2008



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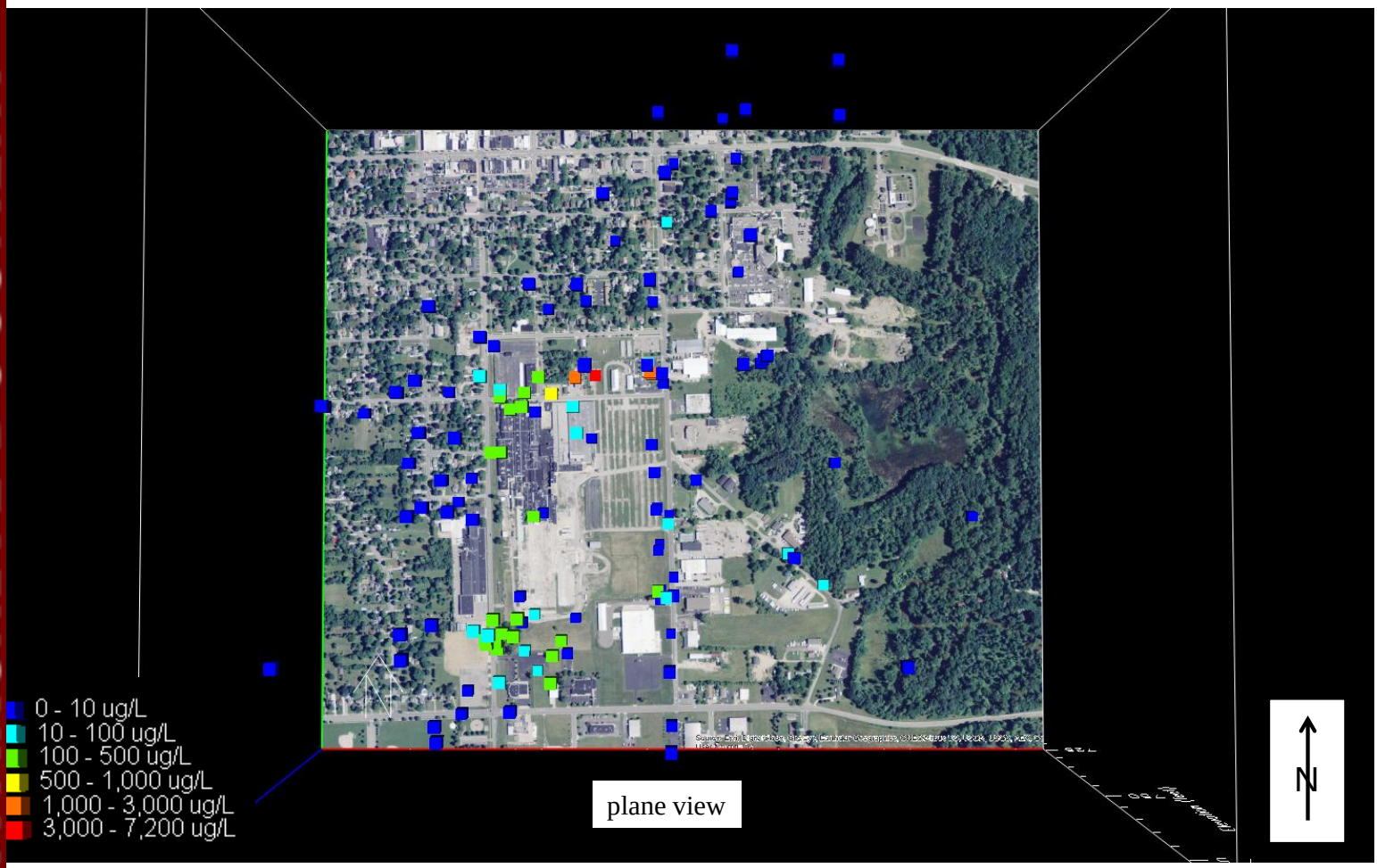

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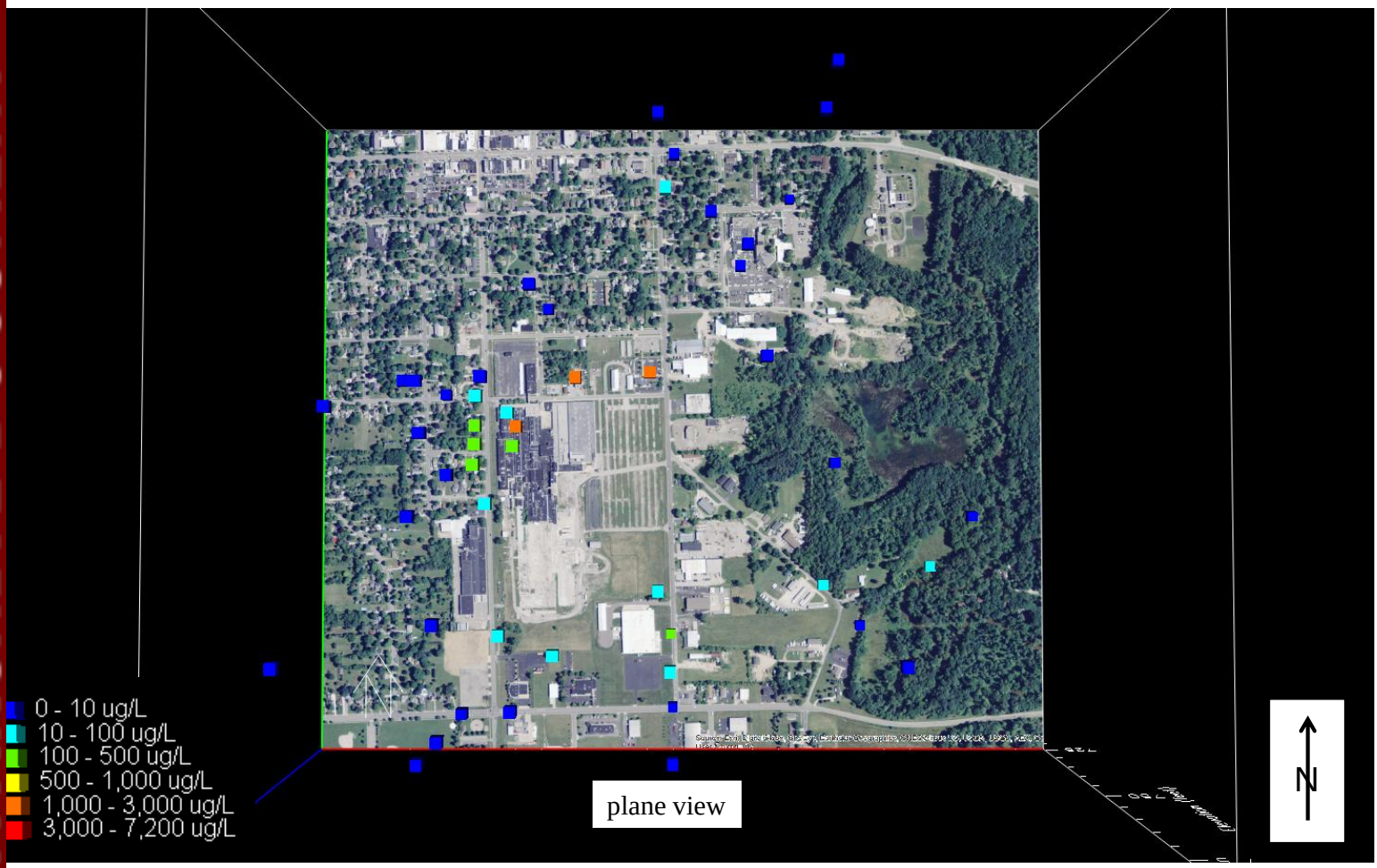

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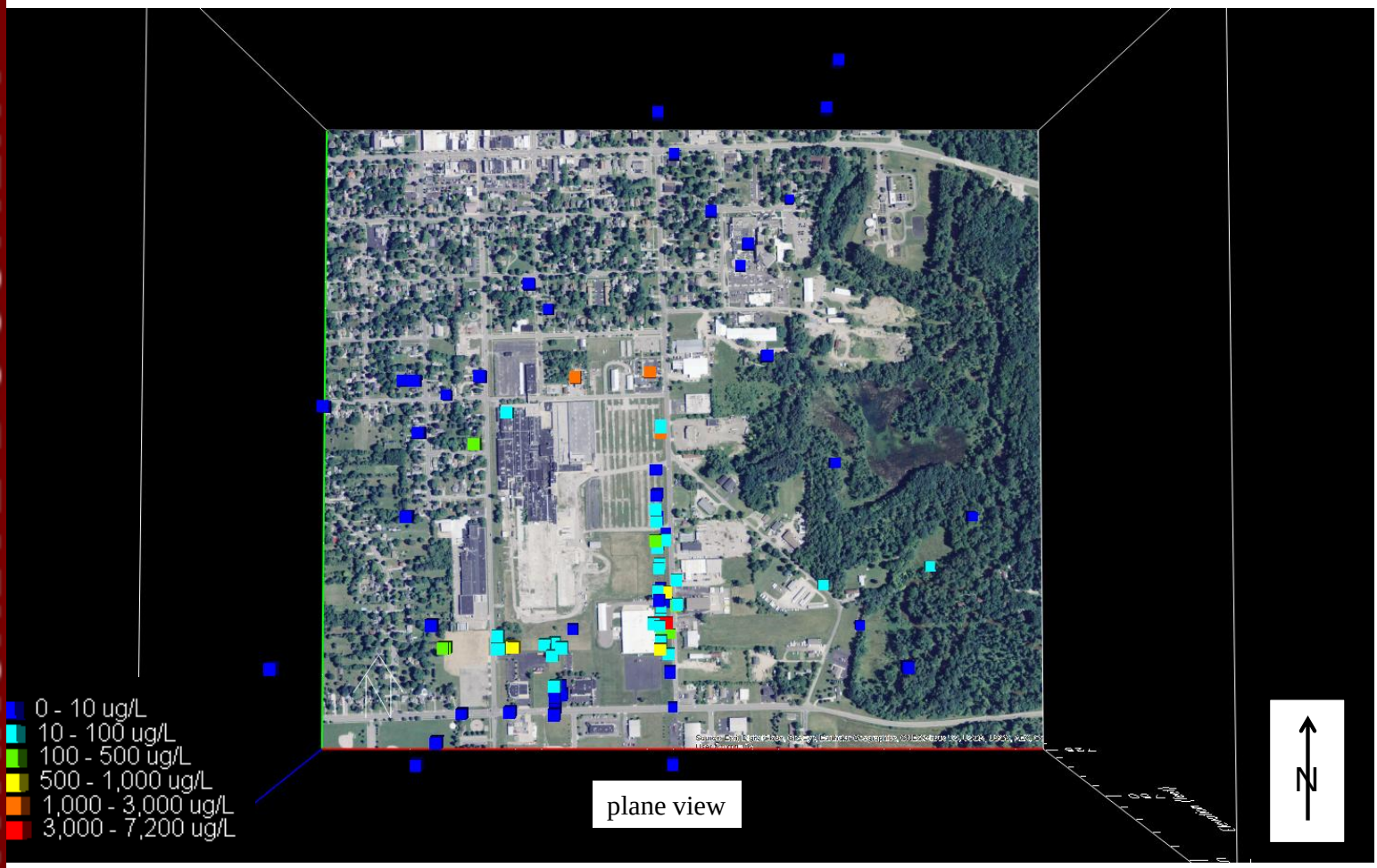

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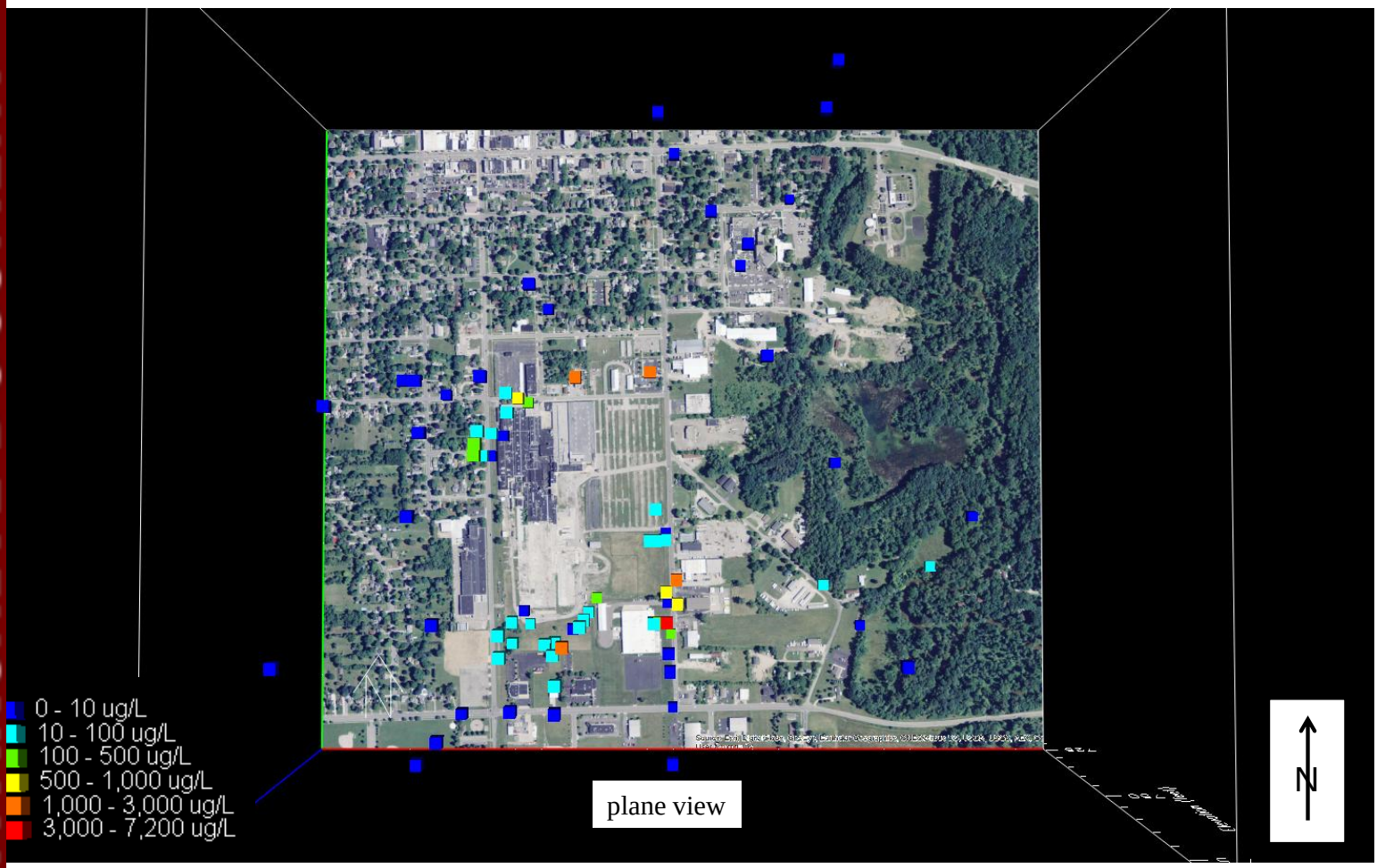

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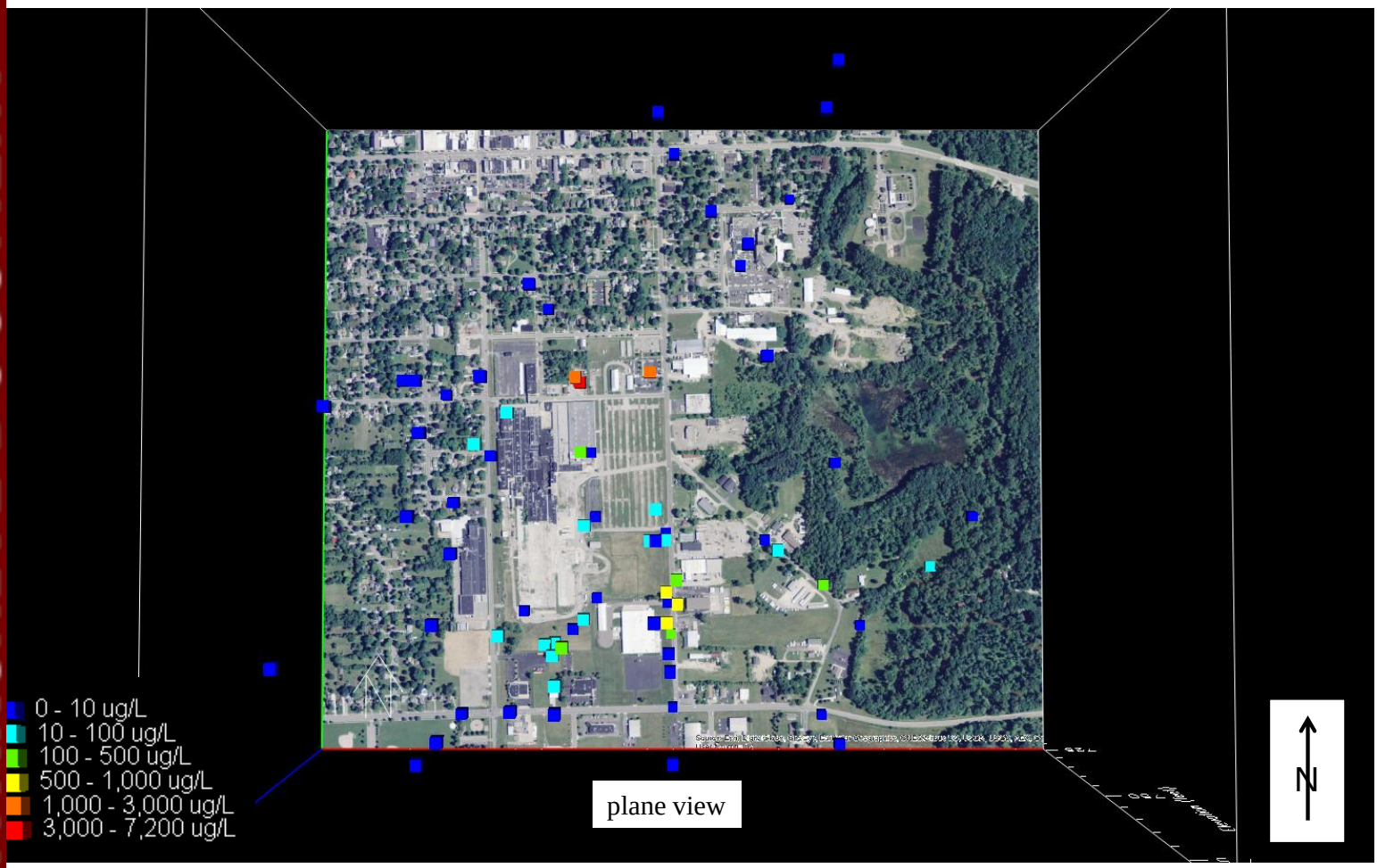
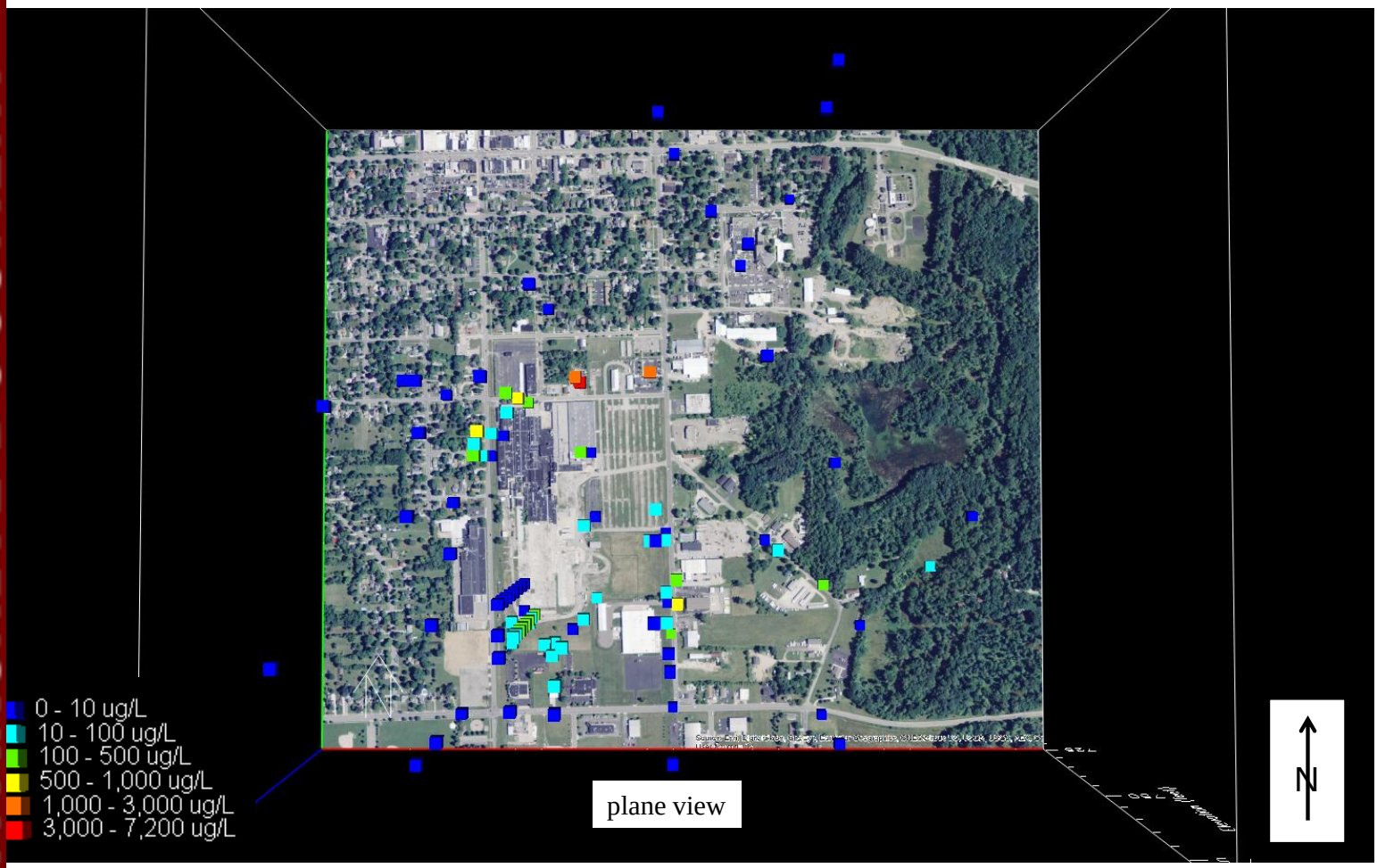


DCE (ug/L) 2014



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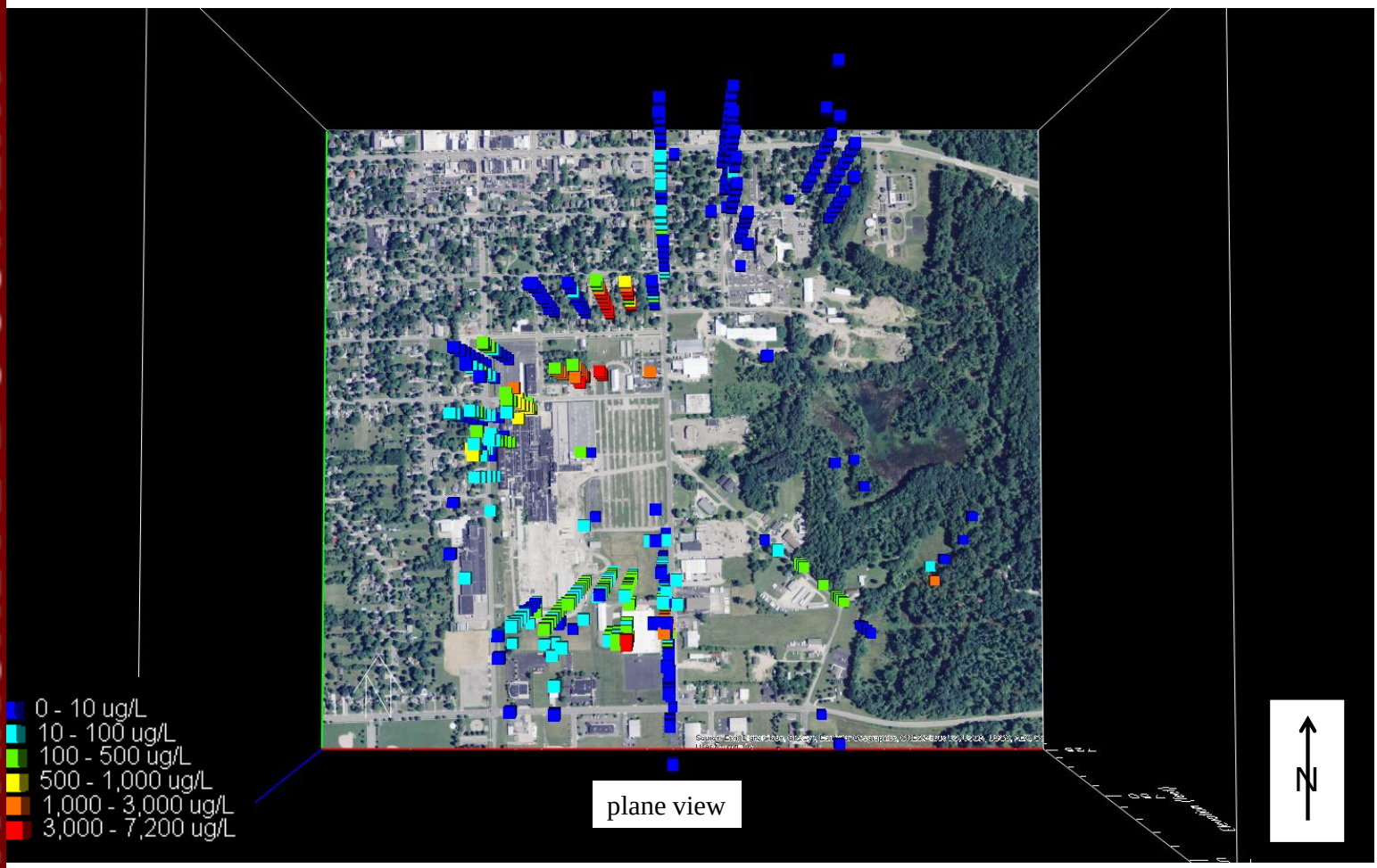

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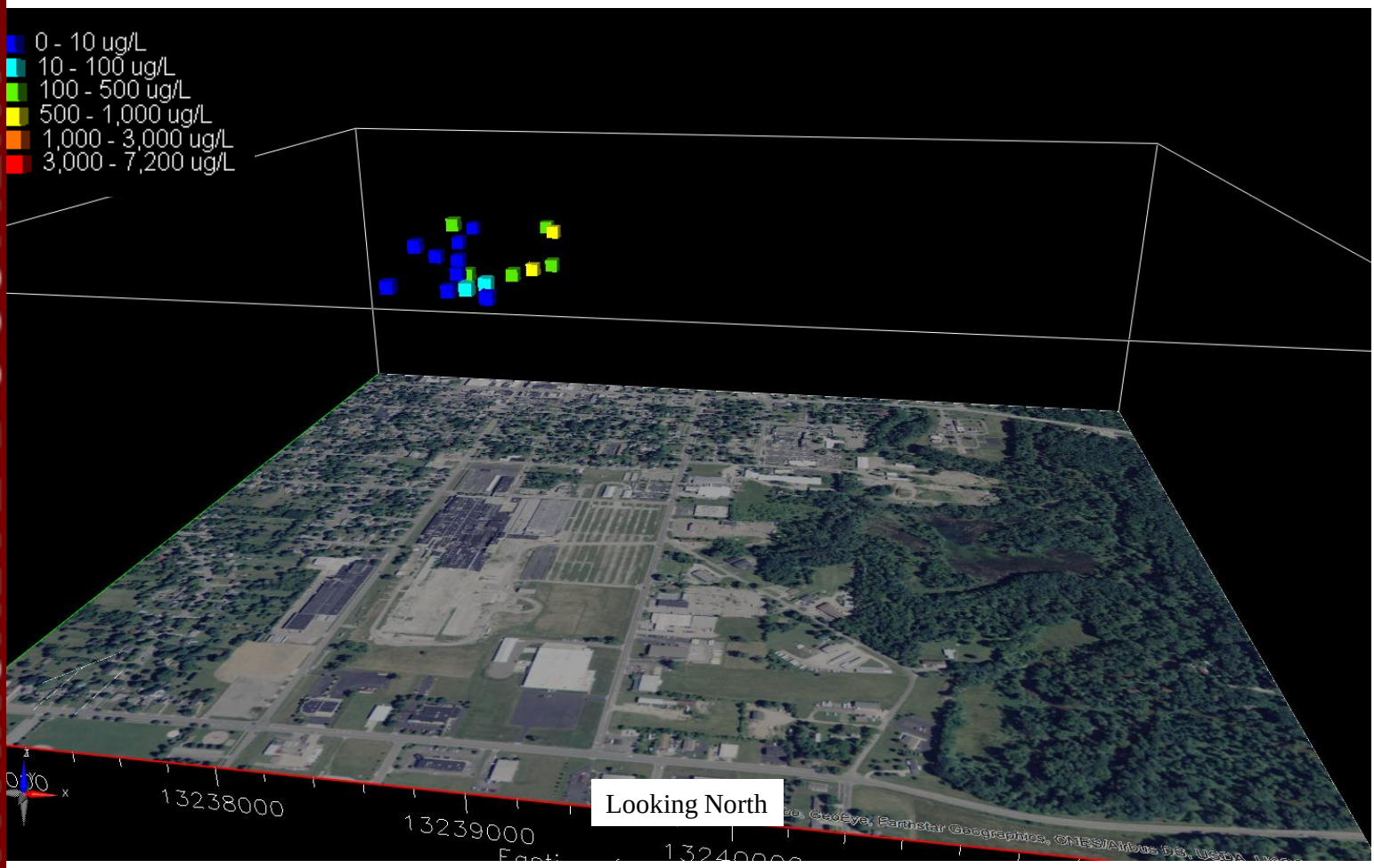

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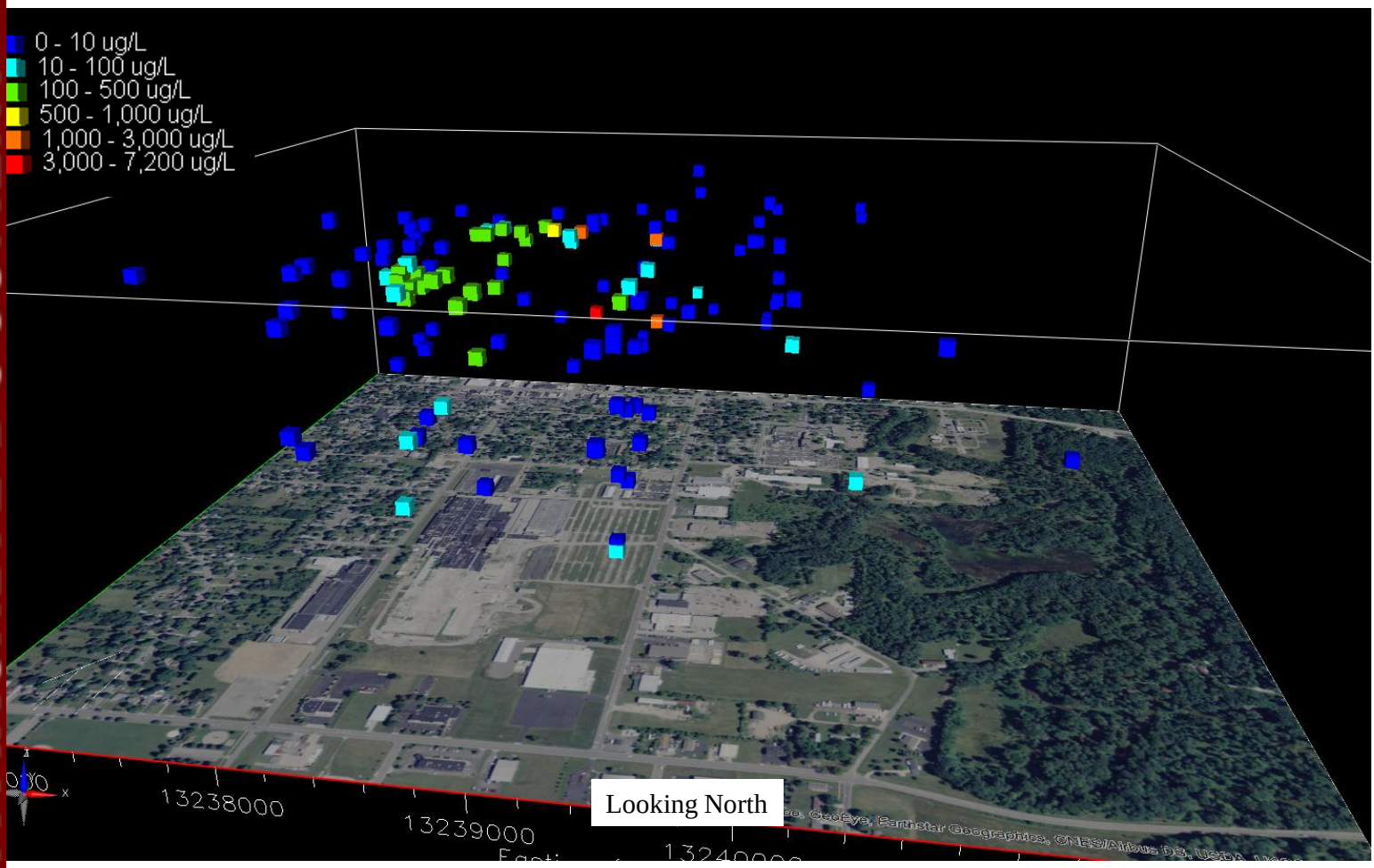

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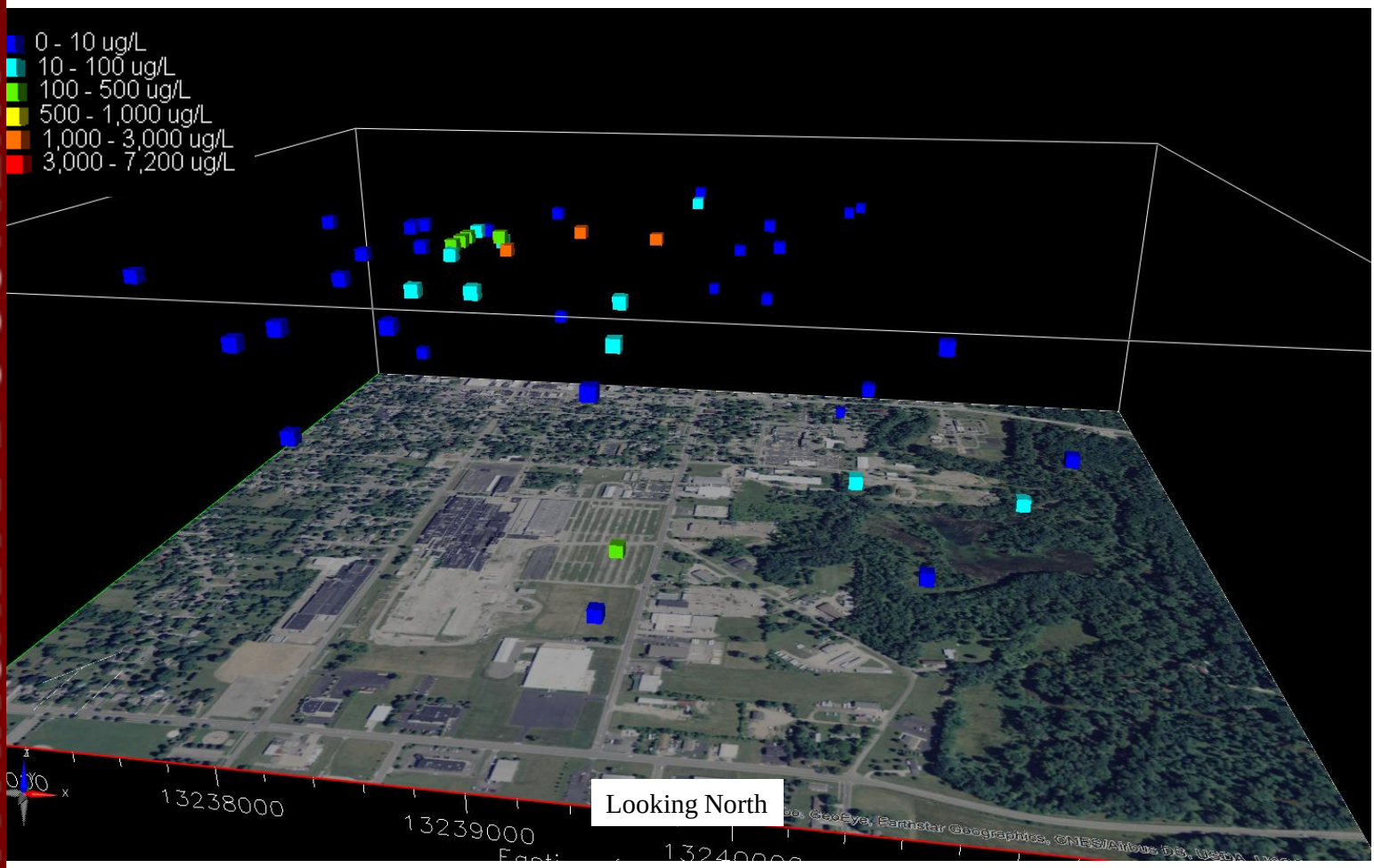

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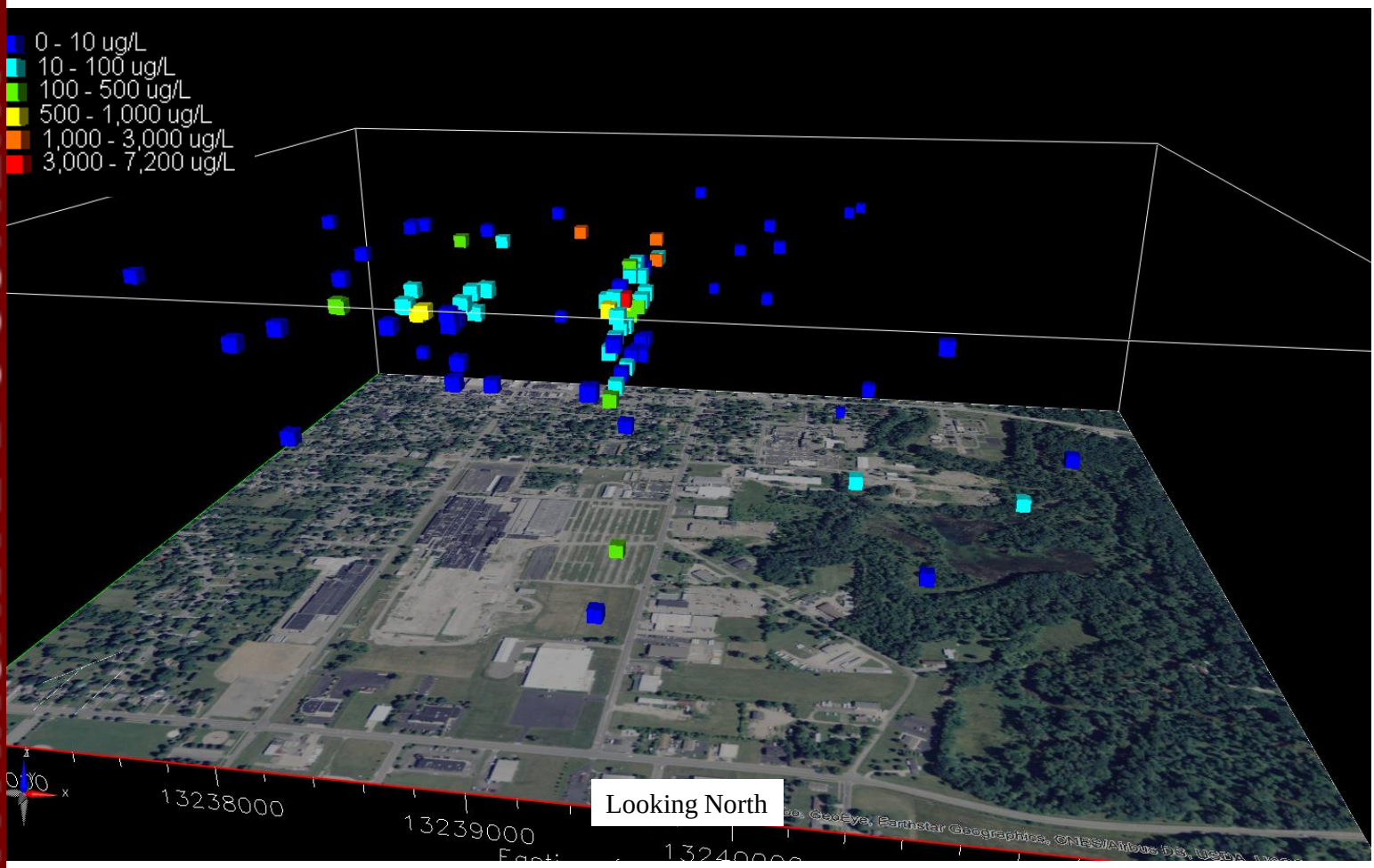

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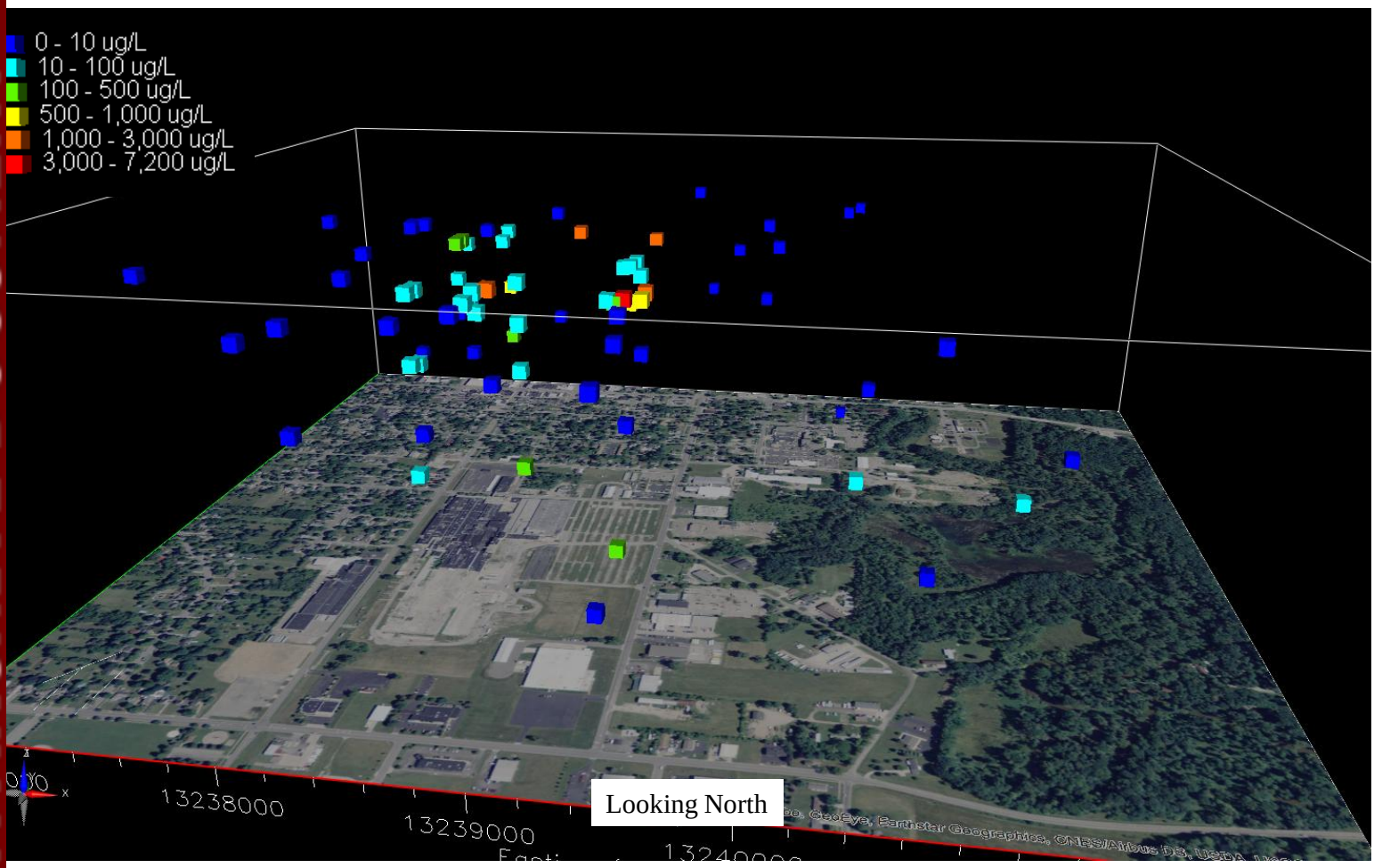

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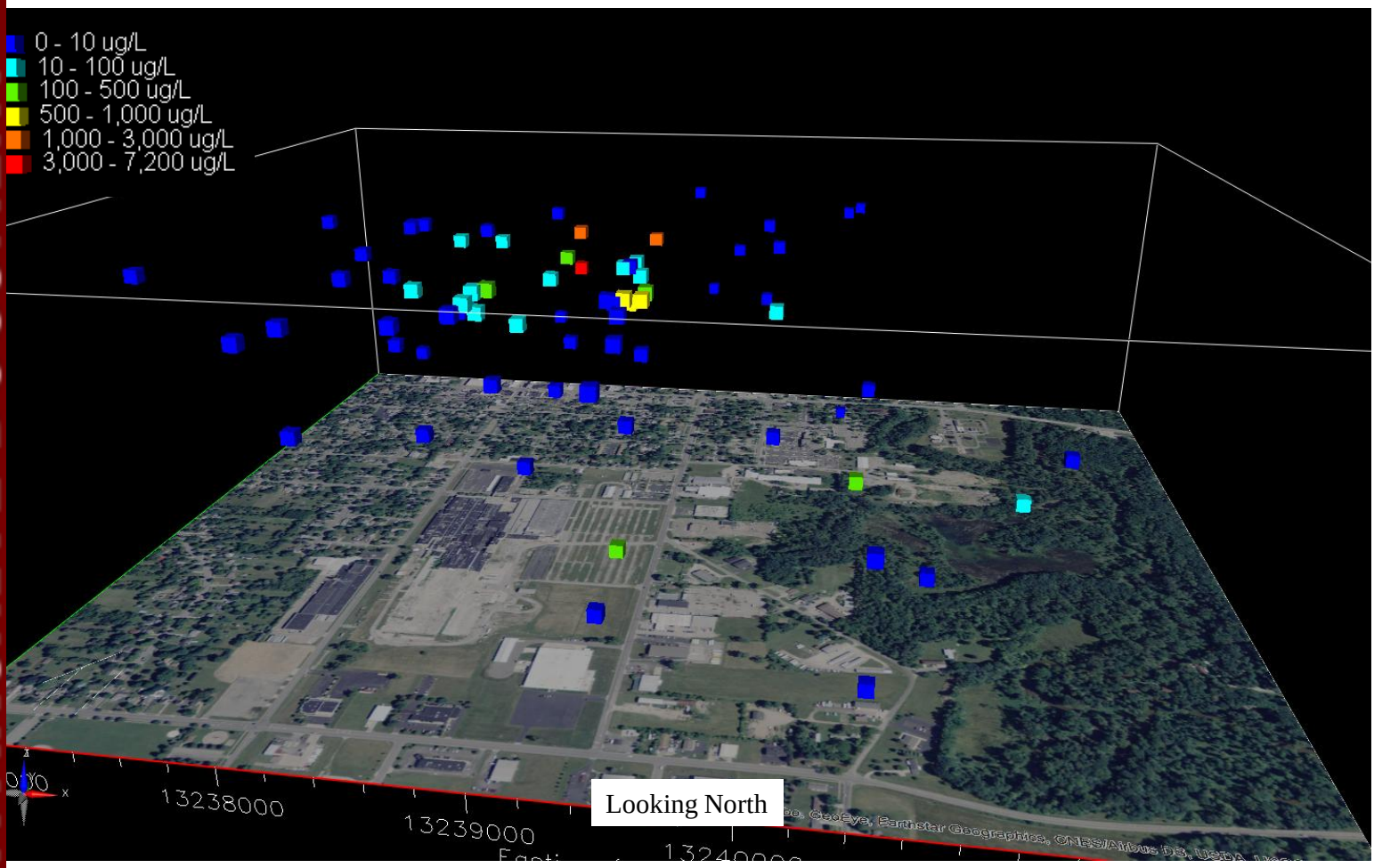

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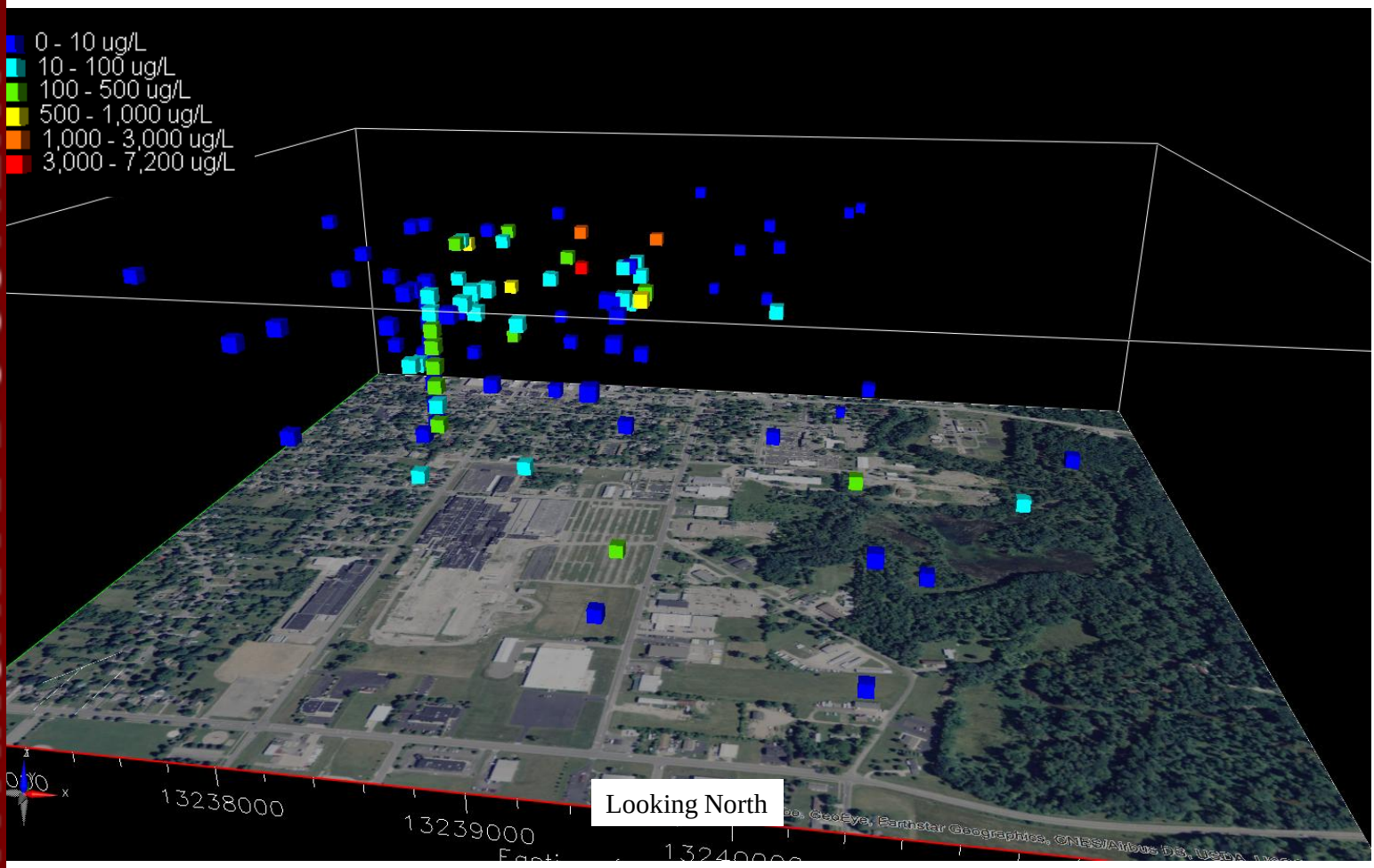

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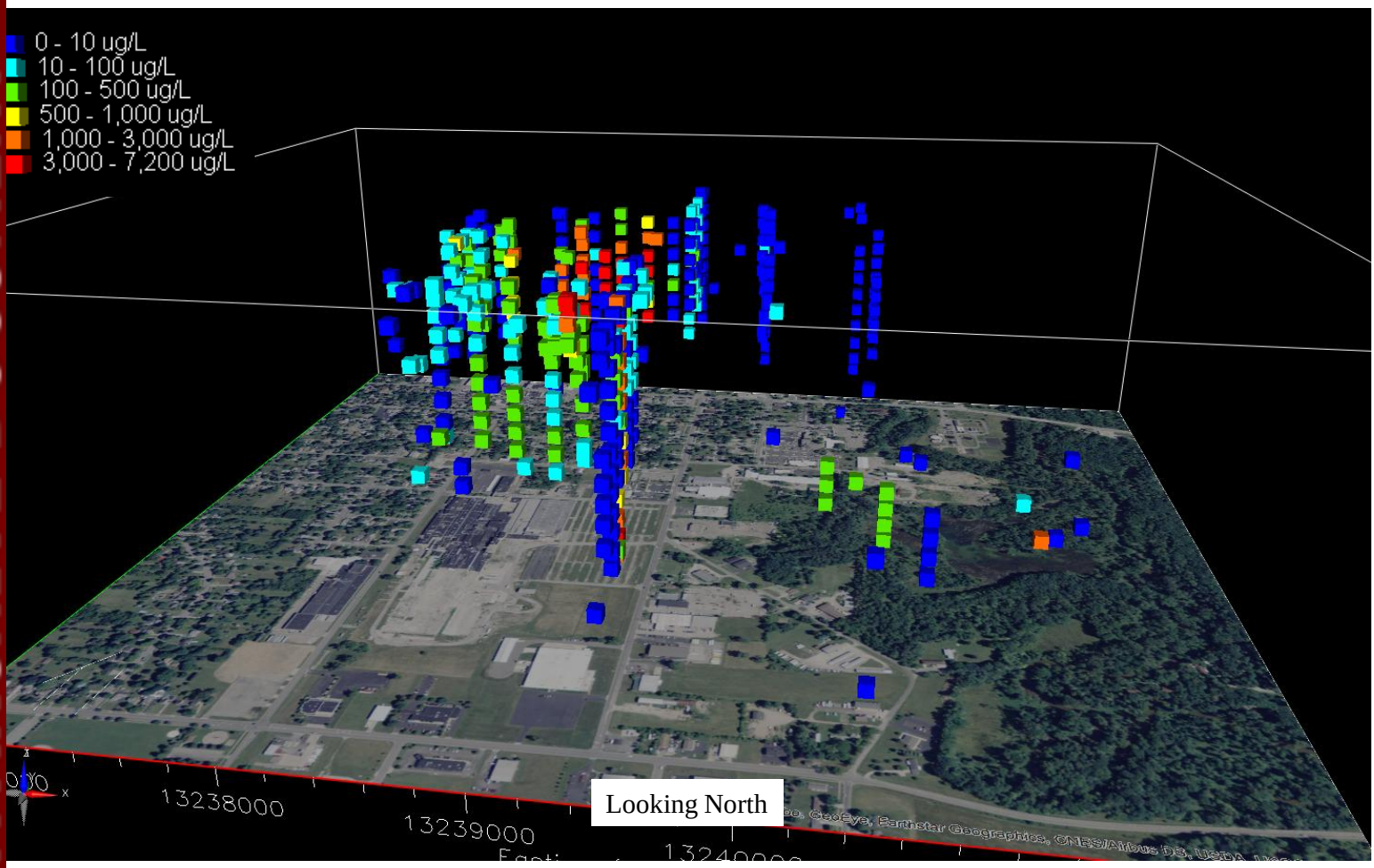

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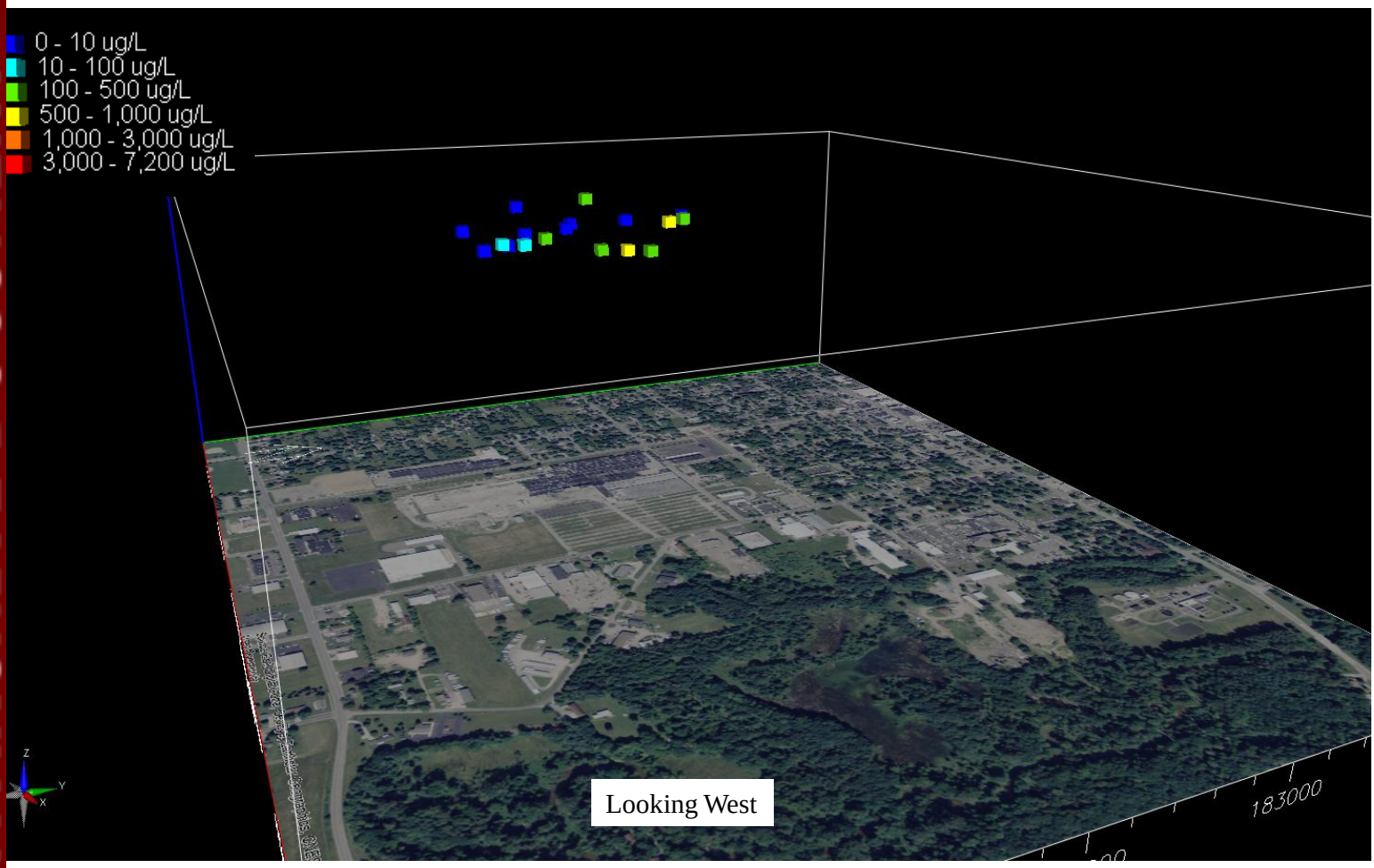

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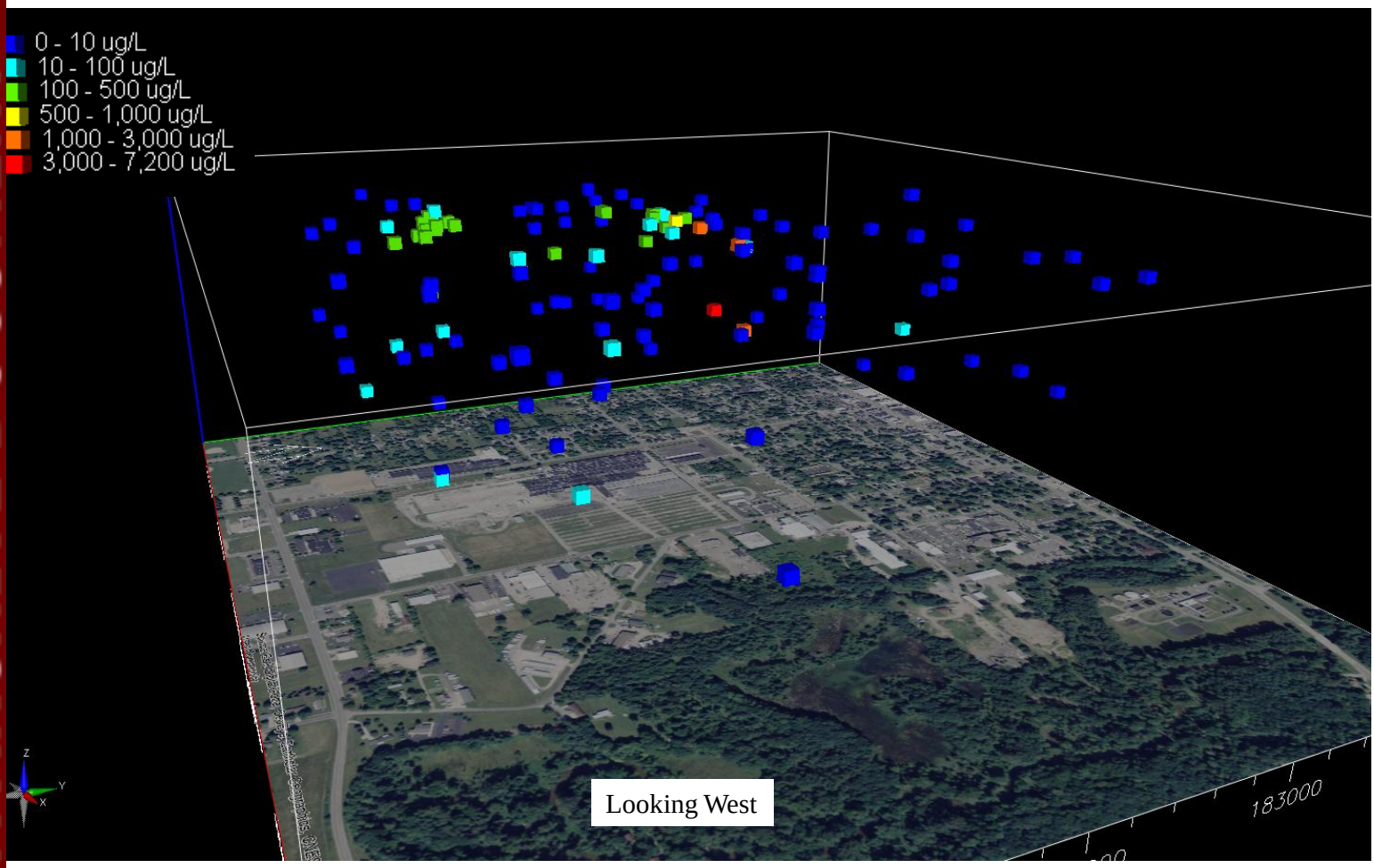
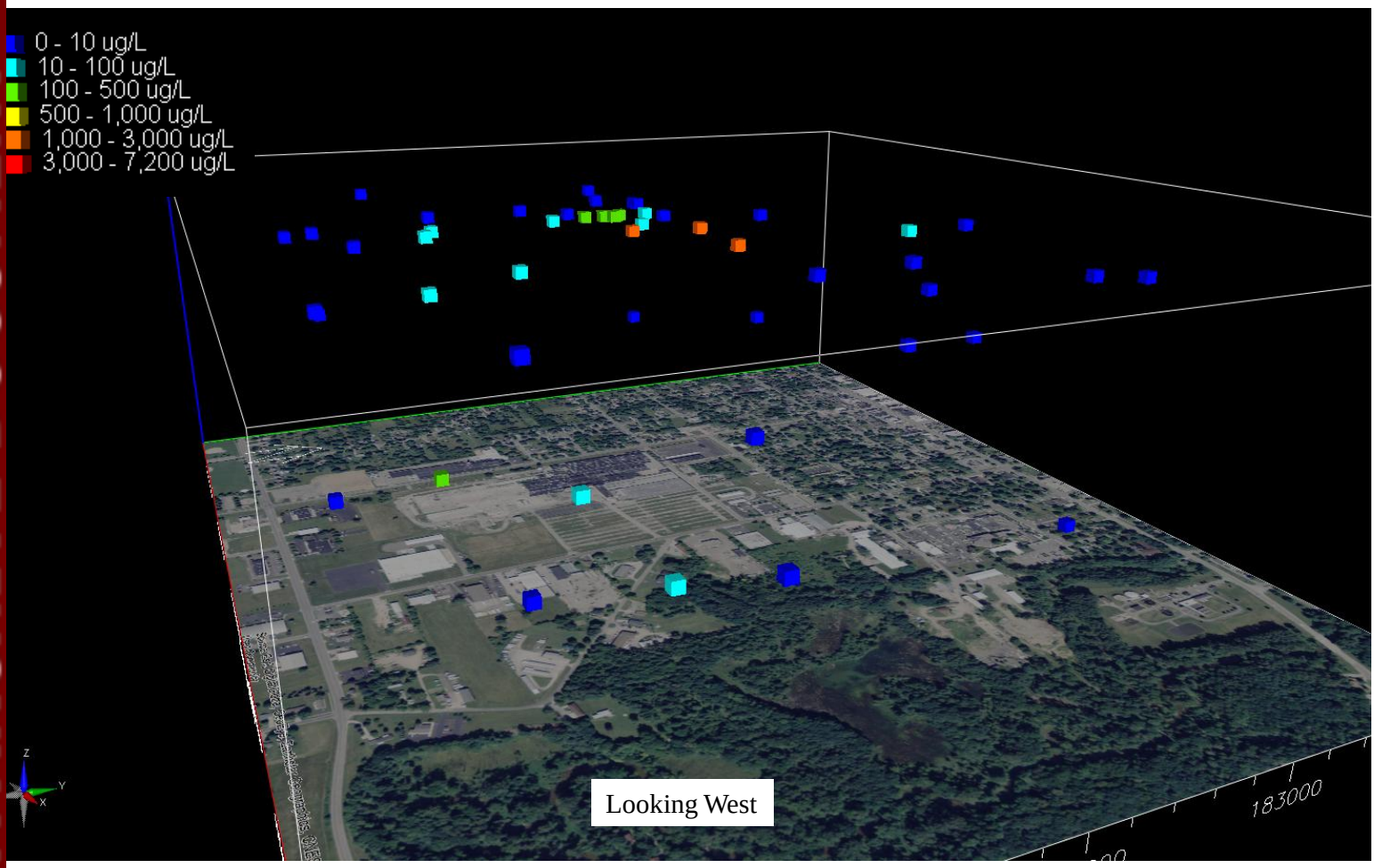
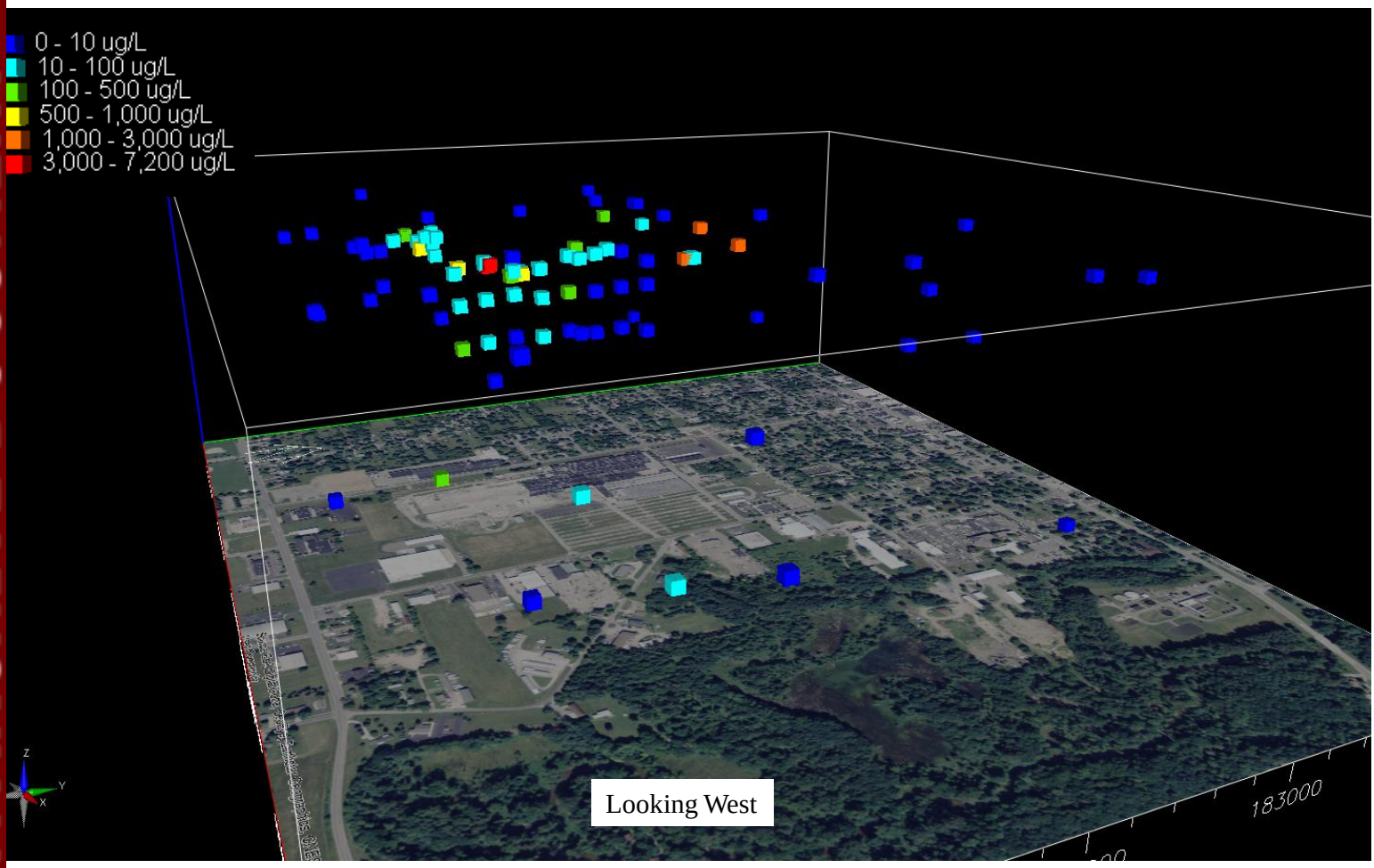


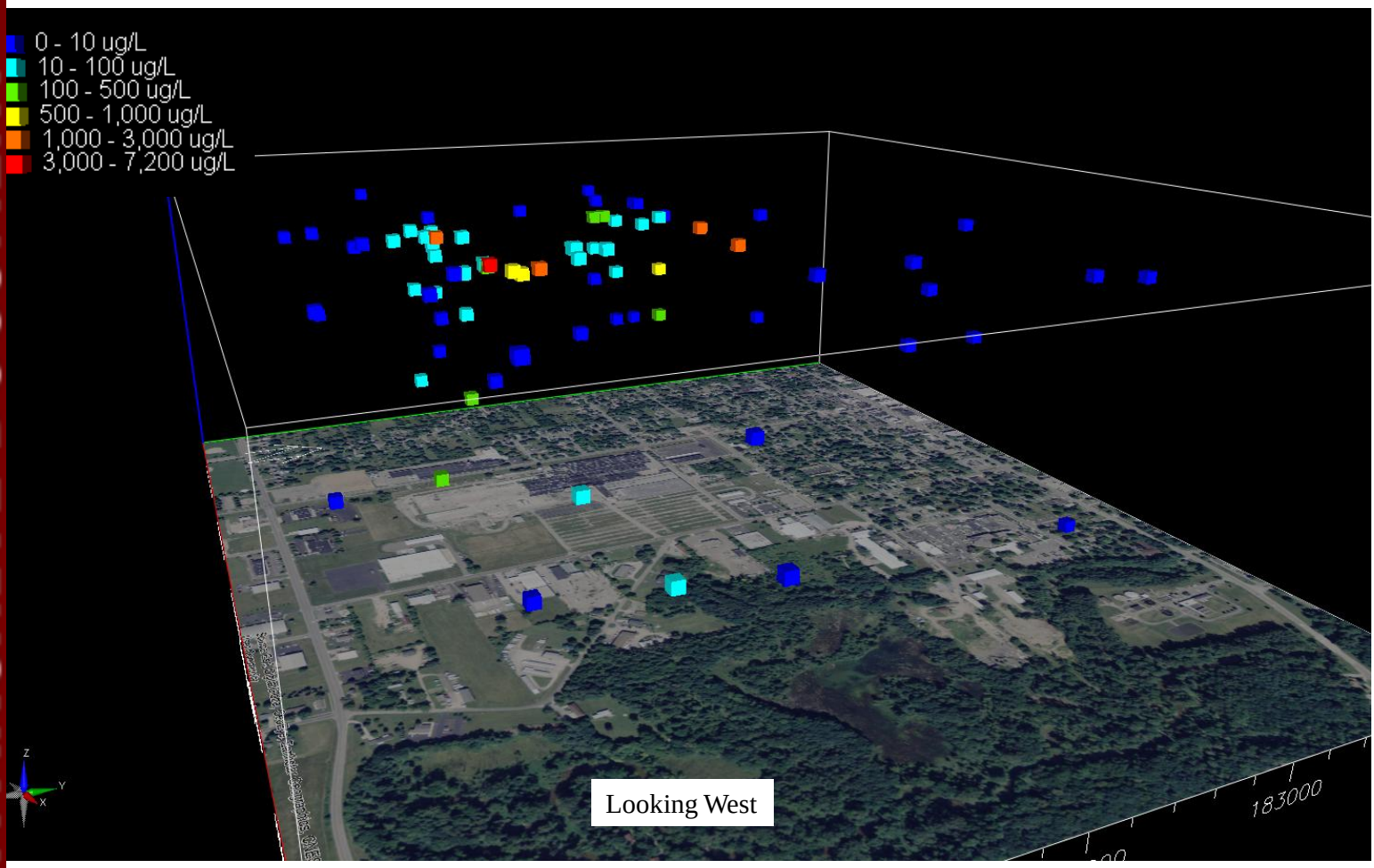
DCE (ug/L) 2010



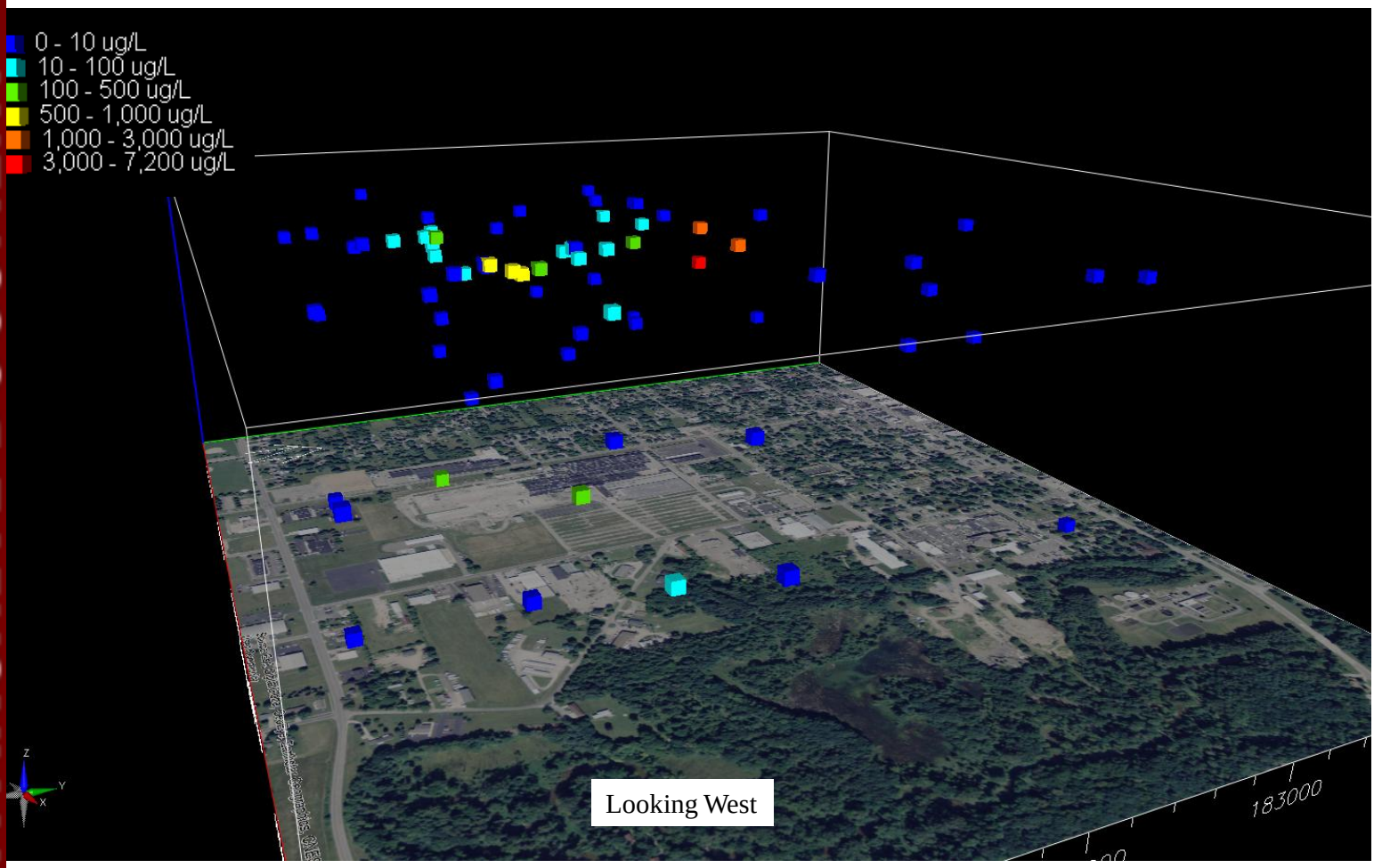
DCE (ug/L) 2011



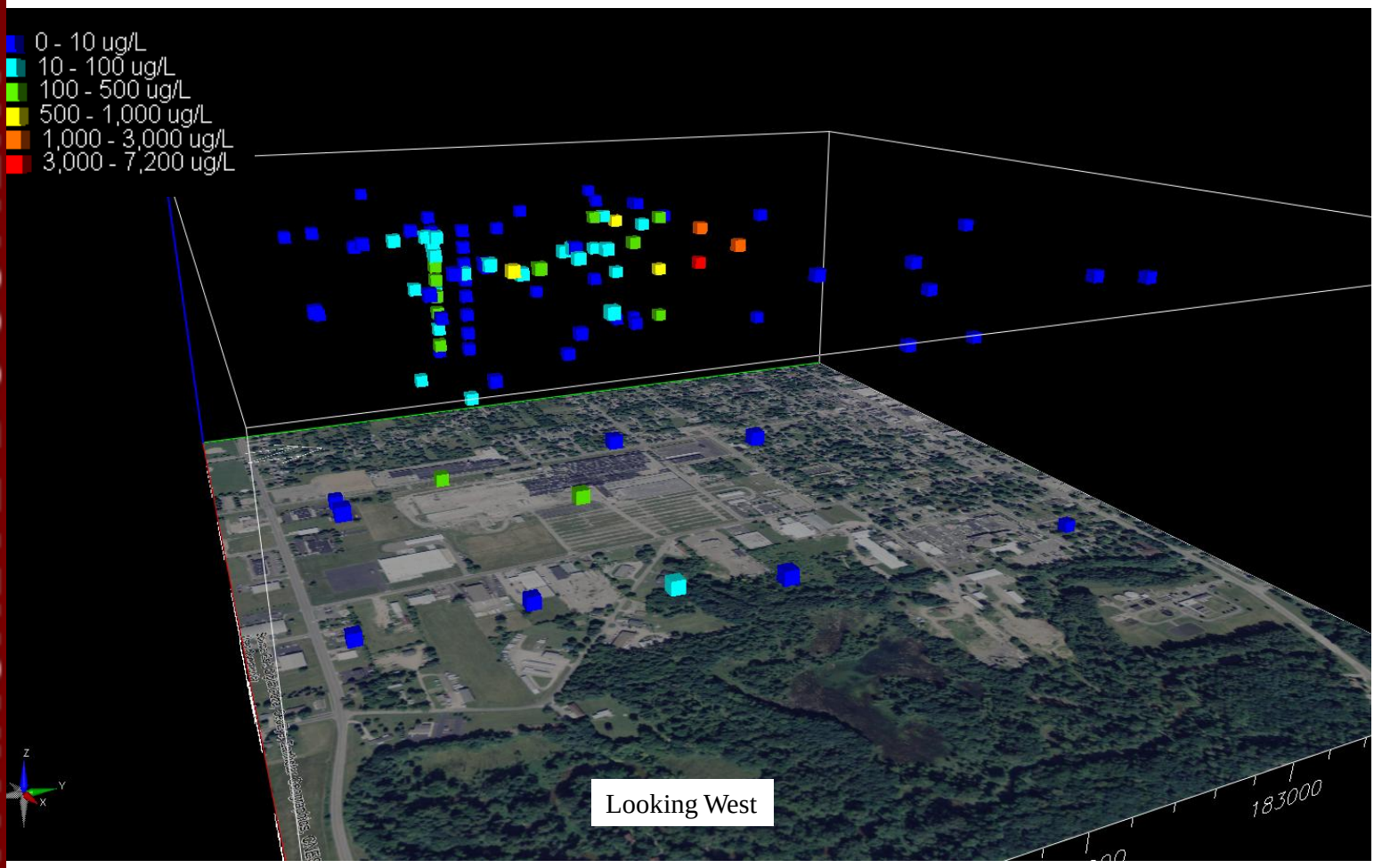
DCE (ug/L) 2012



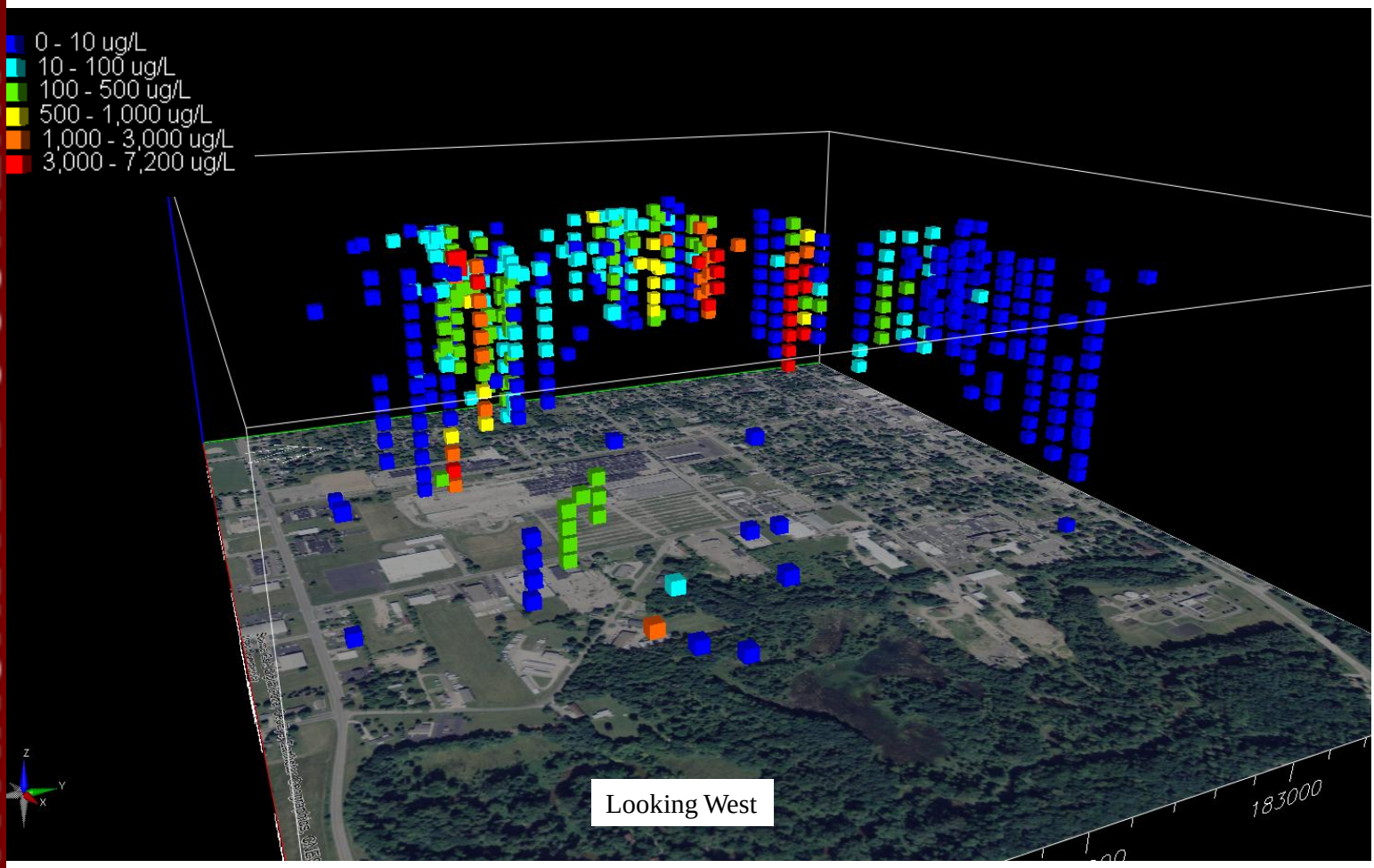
DCE (ug/L) 2013

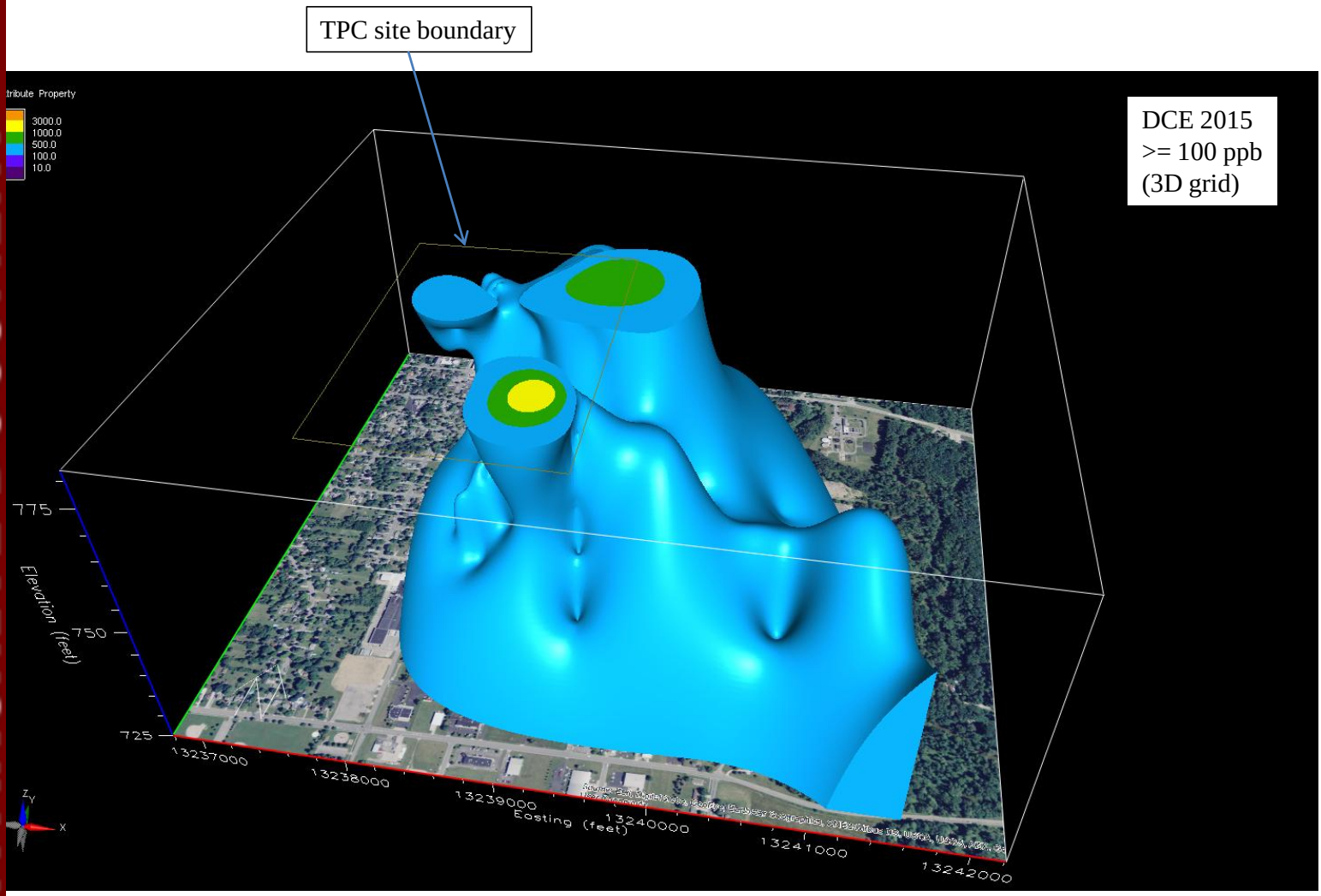


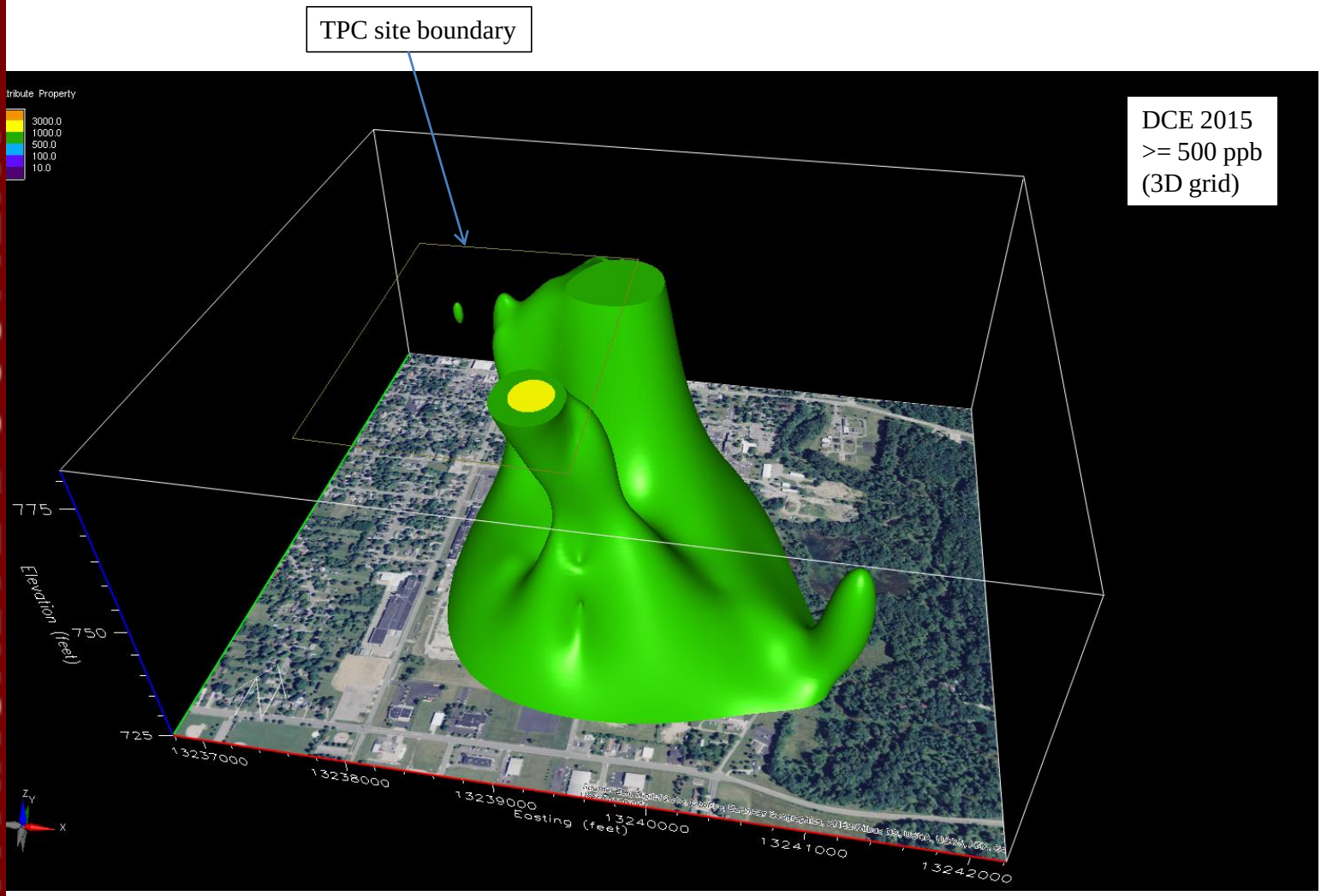
DCE (ug/L) 2014

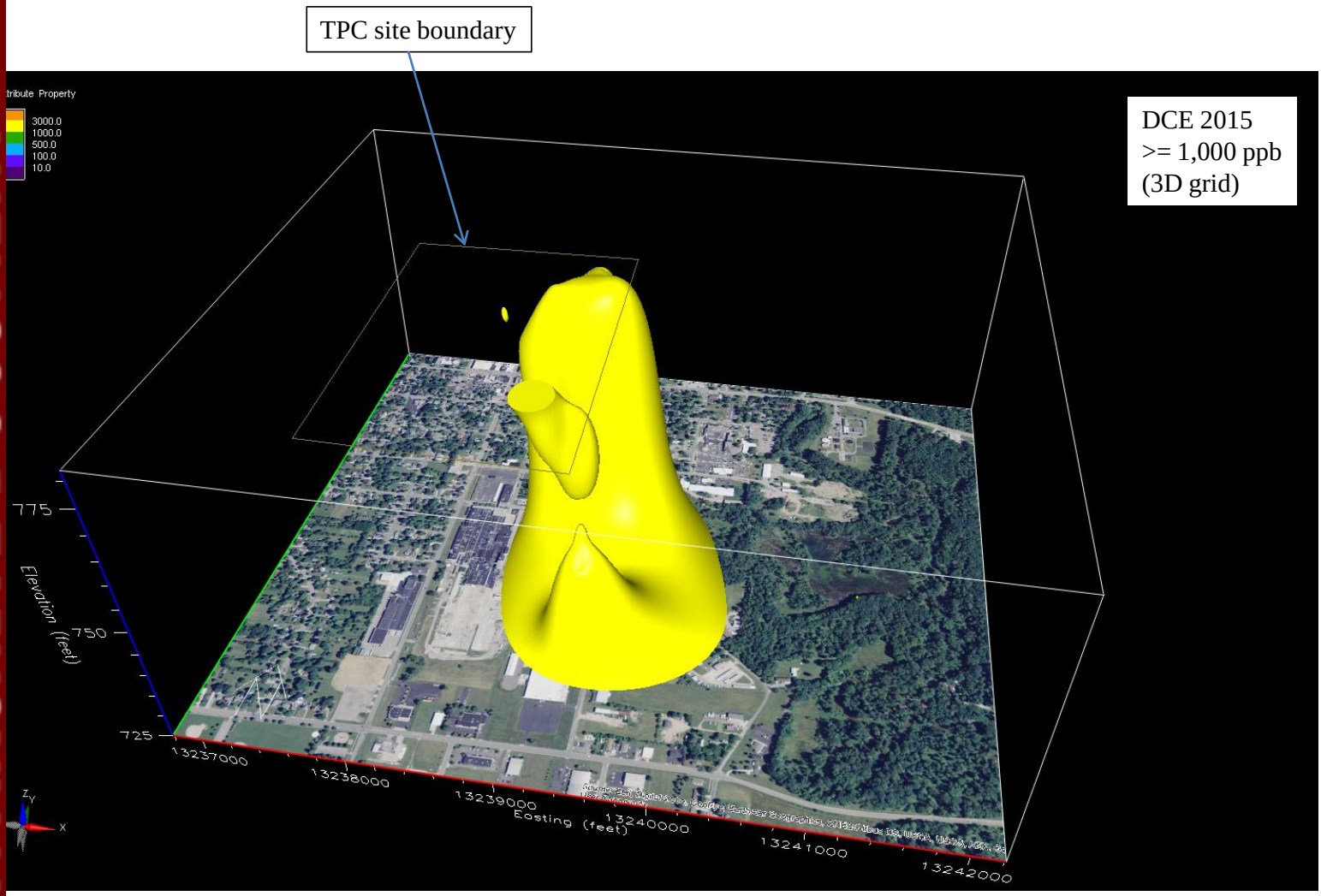


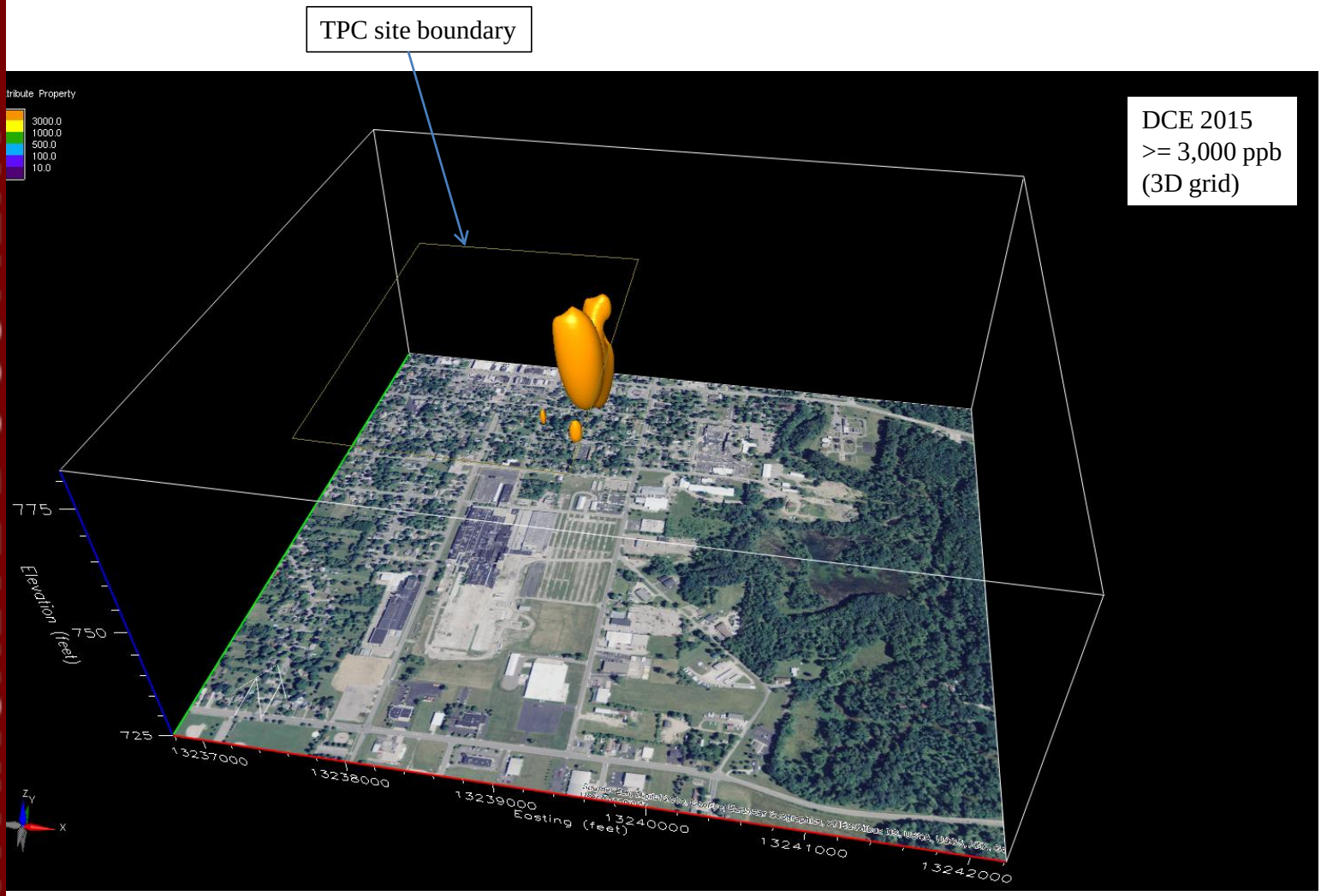
DCE (ug/L) 2015











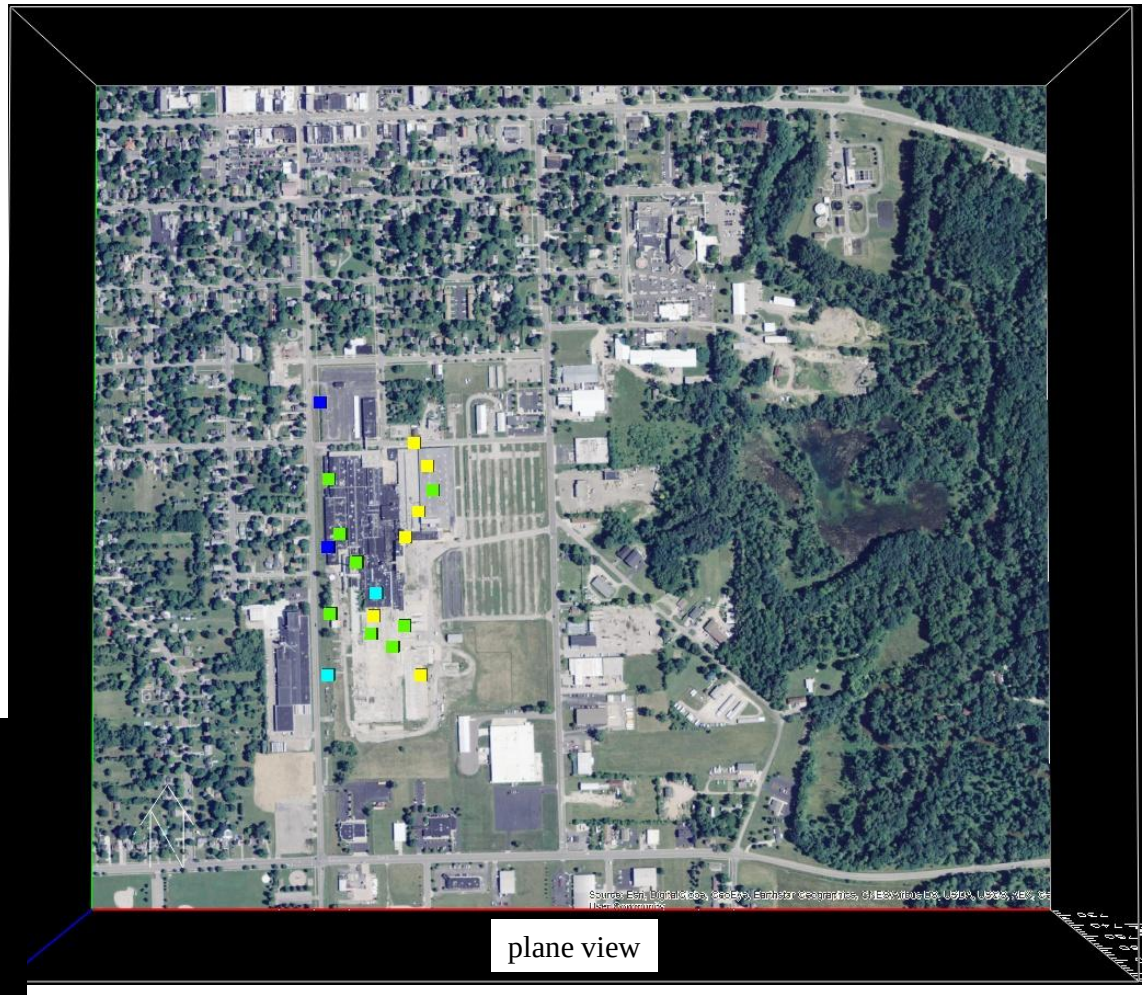
Appendix B

TCE (2008 through 2015)

The TCE files used for these analyses are the maximum TCE by X, Y, Z, by year. Where TCE is Trichloroethene. The source of these data are an MS Access database received from TRC Solutions. That file was named "DB_Tecumseh_v2.accdb". That file was queried and exported as an Excel file. This Excel file was modified in the SAS software in order to be used in earthVision (Dynamic Graphics Incorporated).

The below output is from the earthVision software. Pages 3 through 26 are postings of the TCE values (X,Y,Z) by year at different perspectives. Pages 27 through 42 are interpolations (3D grids) of the TCE values for by year, displayed by concentration ranges (500ppb and 1,000ppb). Pages 43 through 55 are interpolations of the TCE values for 2015, displayed at different concentration ranges, and sliced in the XY-plane and YZ-plane.

TCE (ug/L) 2008



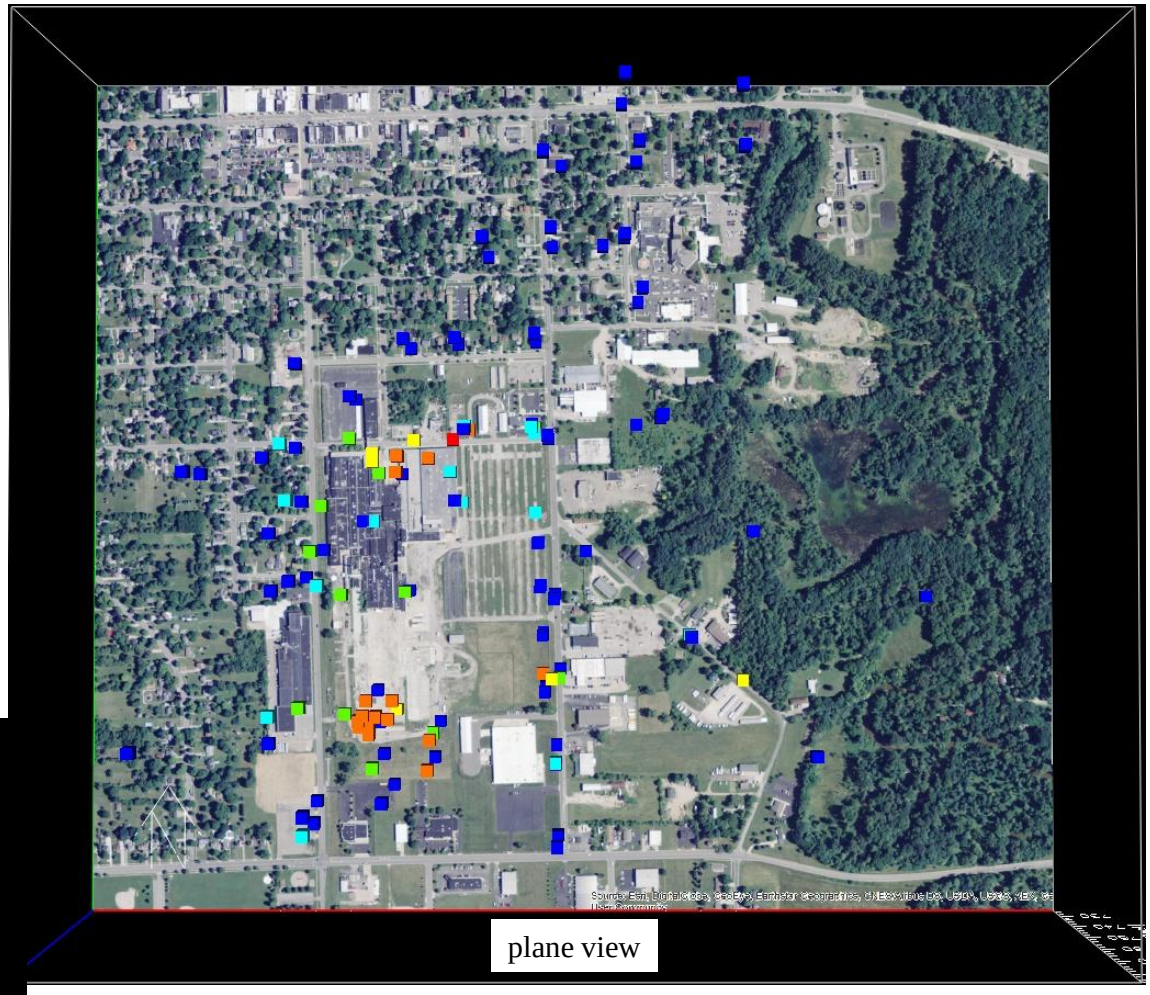
TCE ug/L

- 0 - 12 ug/L
- 12 - 100 ug/L
- 100 - 500 ug/L
- 500 - 1,000 ug/L
- 1,000 - 5,000 ug/L
- 5,000 - 12,000 ug/L

plane view

N

TCE (ug/L) 2009



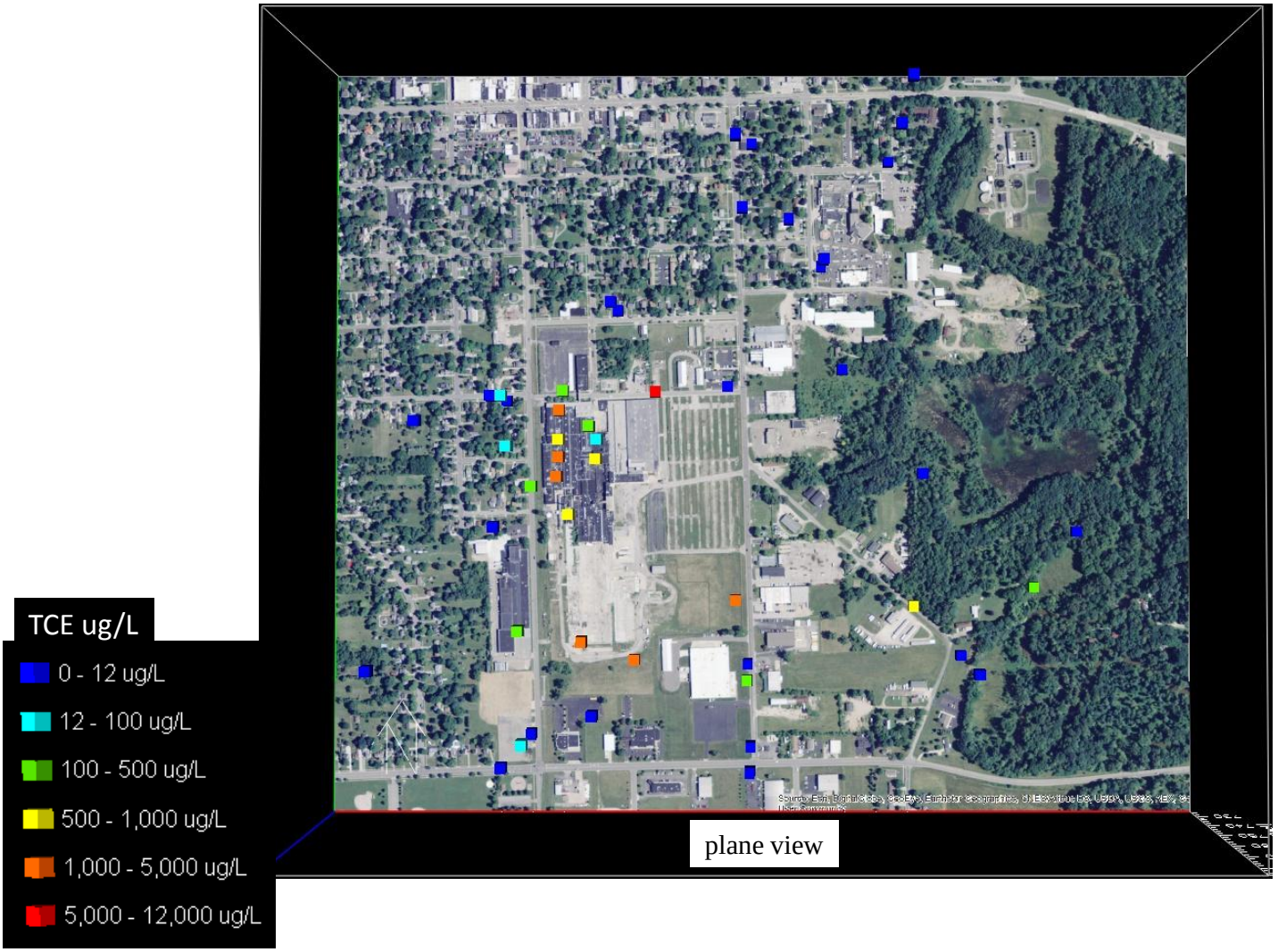
TCE ug/L

- 0 - 12 ug/L
- 12 - 100 ug/L
- 100 - 500 ug/L
- 500 - 1,000 ug/L
- 1,000 - 5,000 ug/L
- 5,000 - 12,000 ug/L

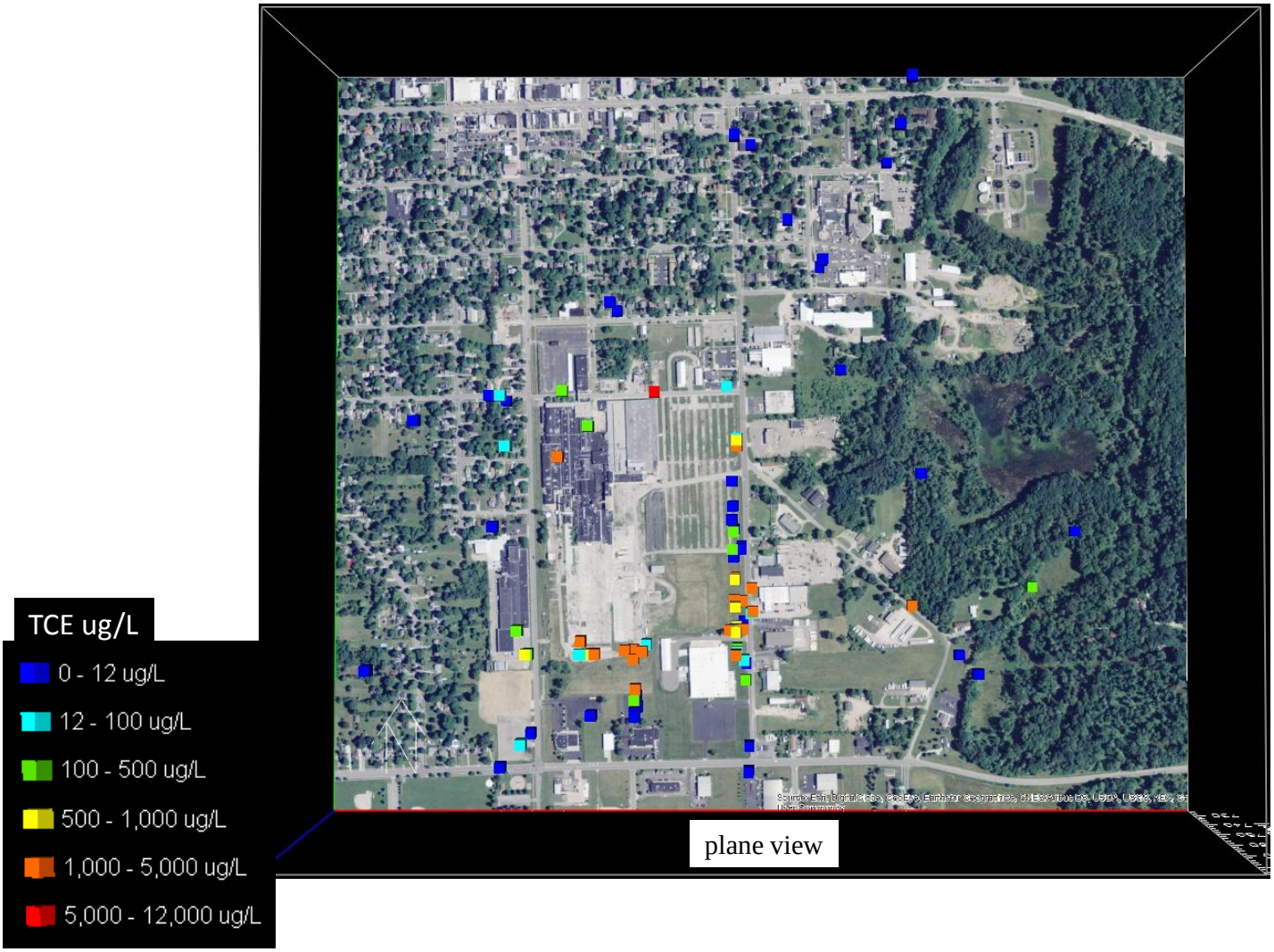
plane view

N

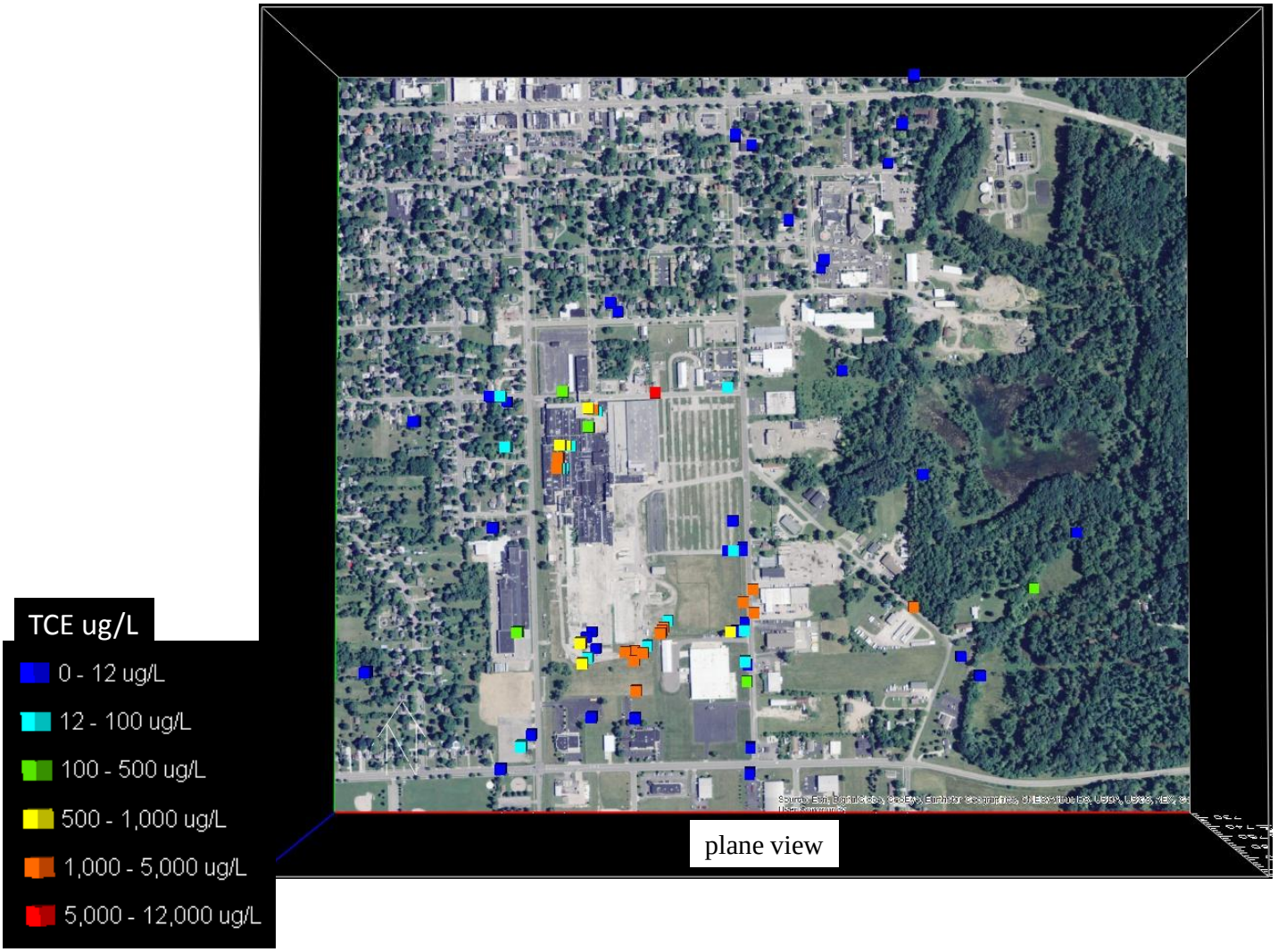
TCE (ug/L) 2010


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
plane view
N

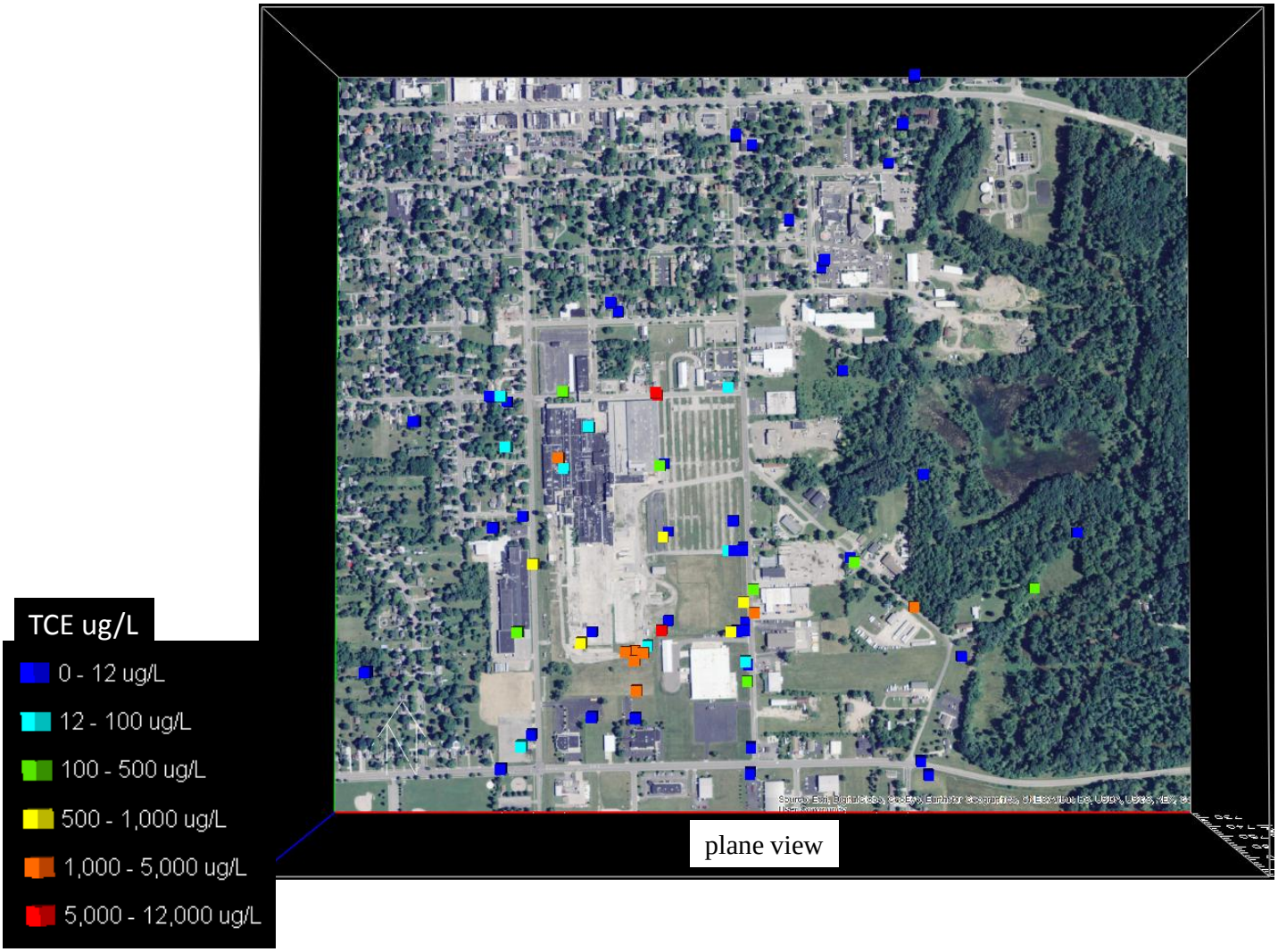
TCE (ug/L) 2011


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
plane view
N

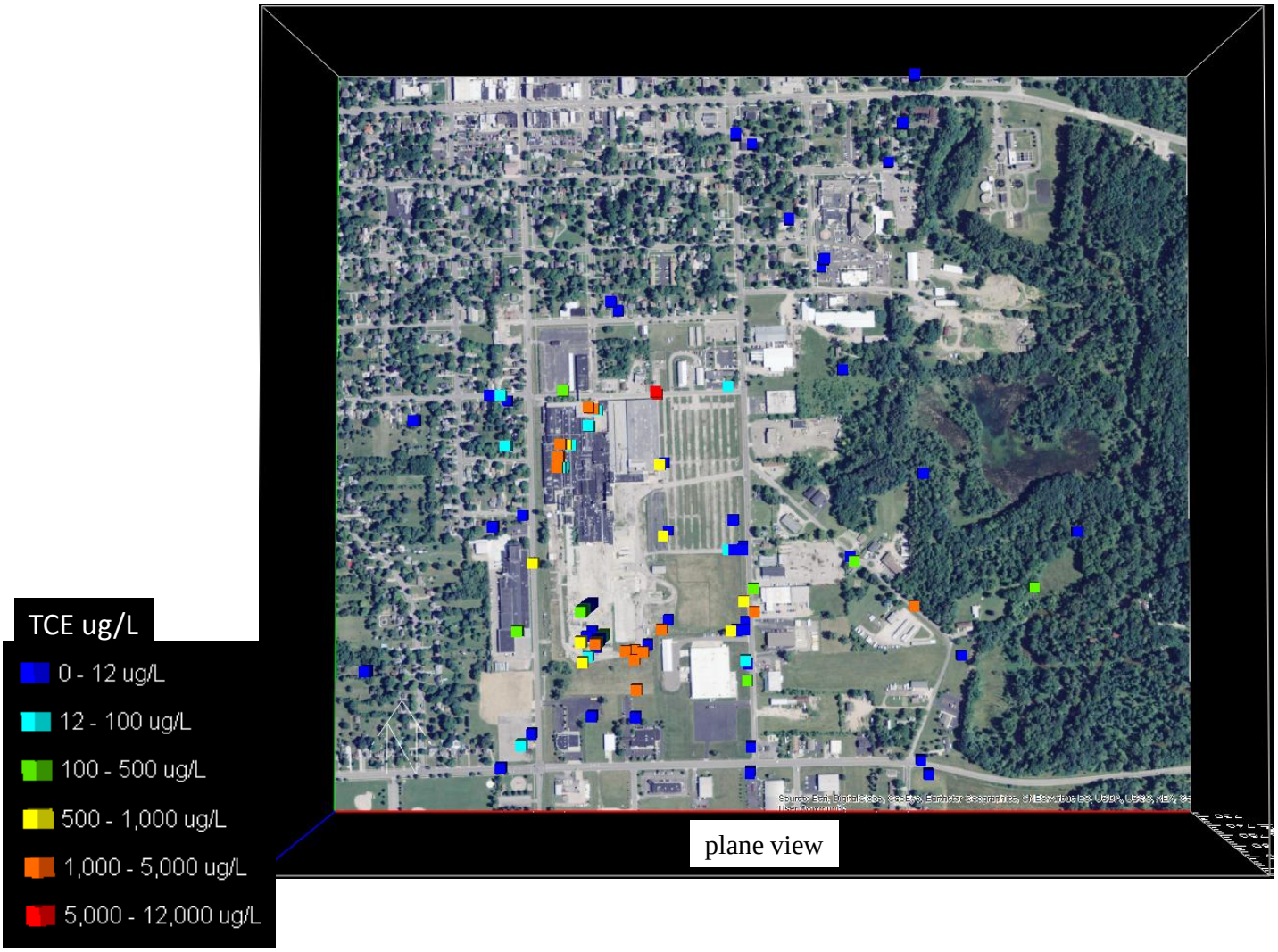
TCE (ug/L) 2012


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
plane view
N

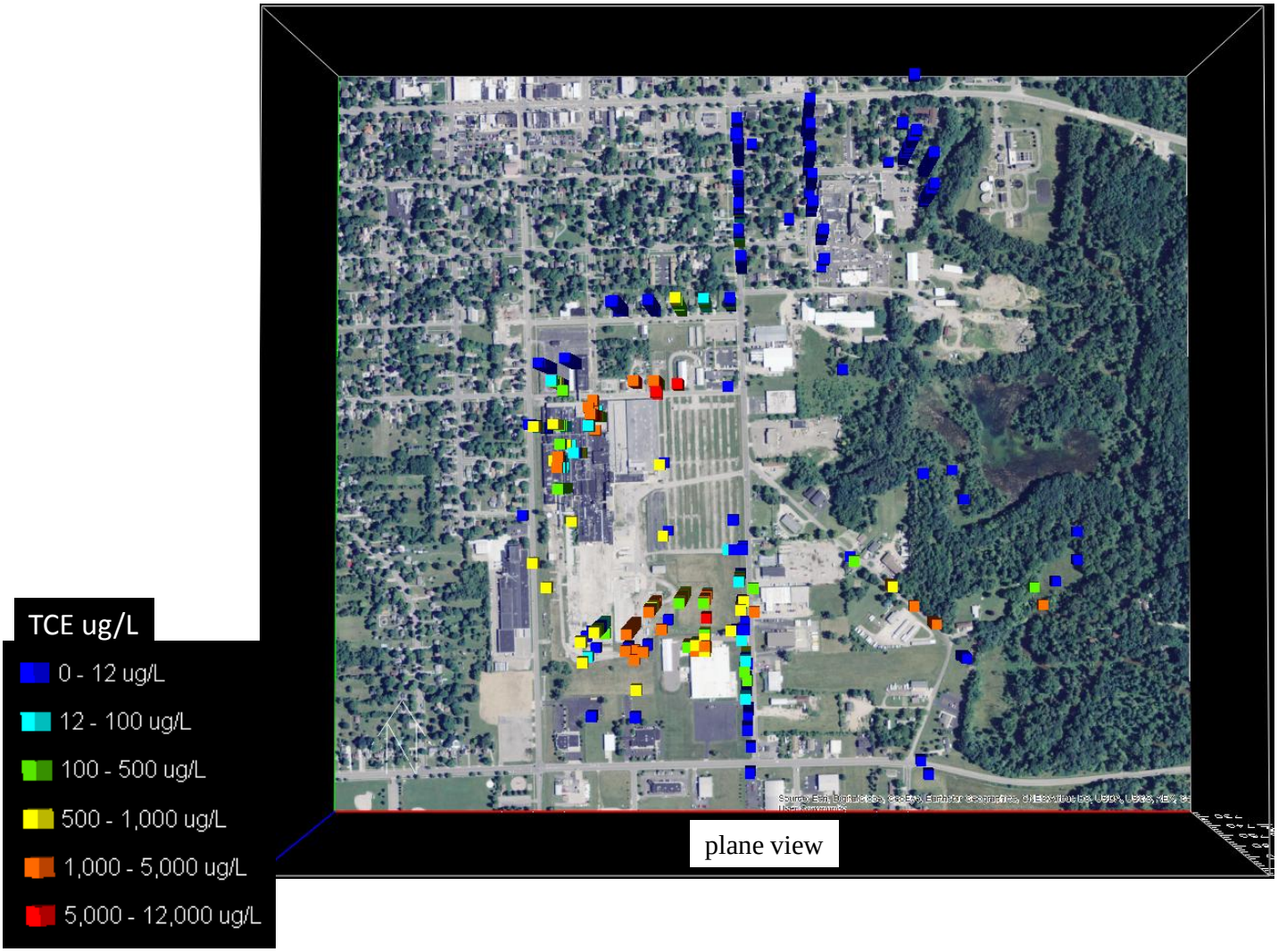
TCE (ug/L) 2013


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
plane view
N

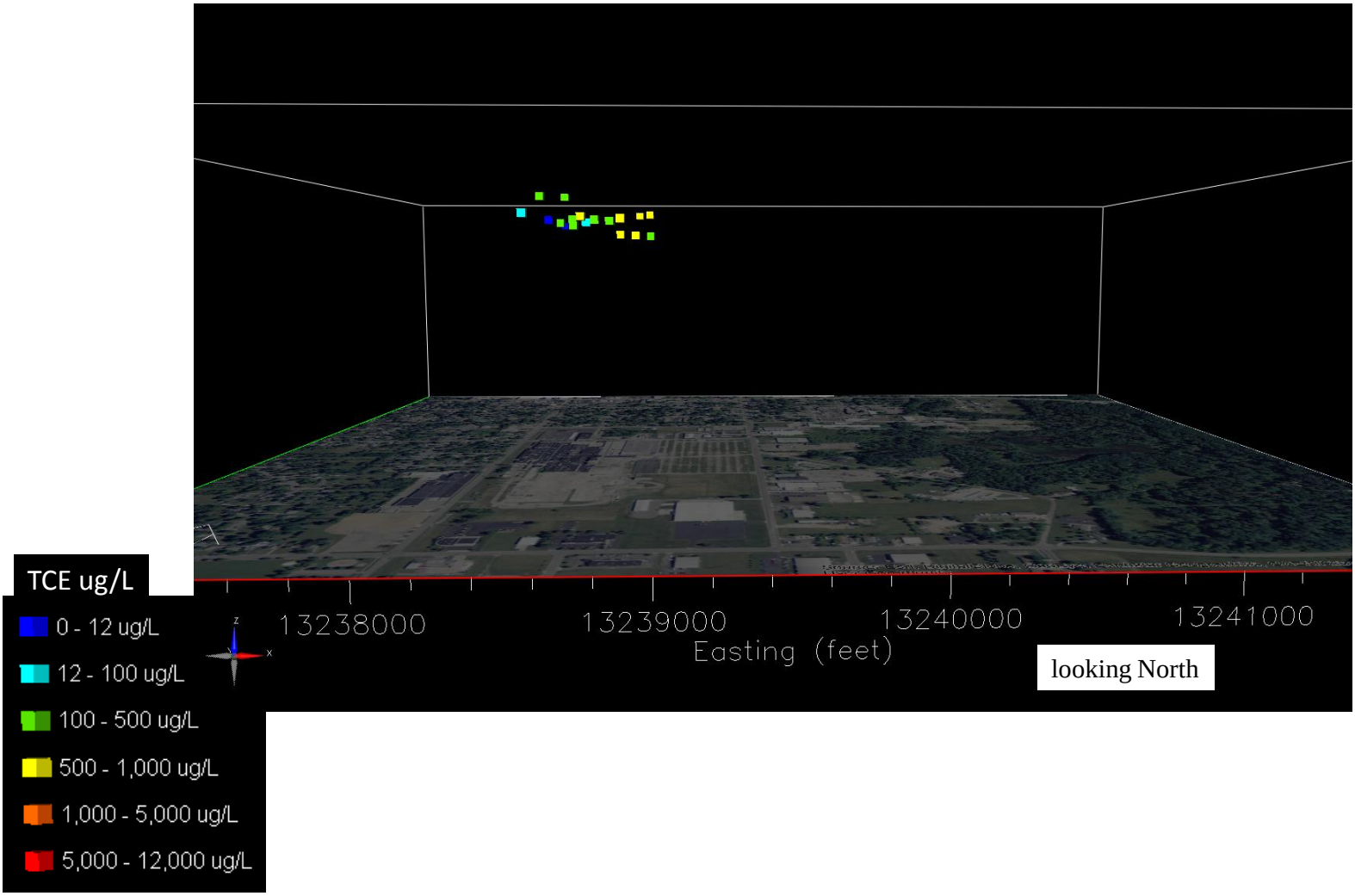
TCE (ug/L) 2014


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
plane view
N

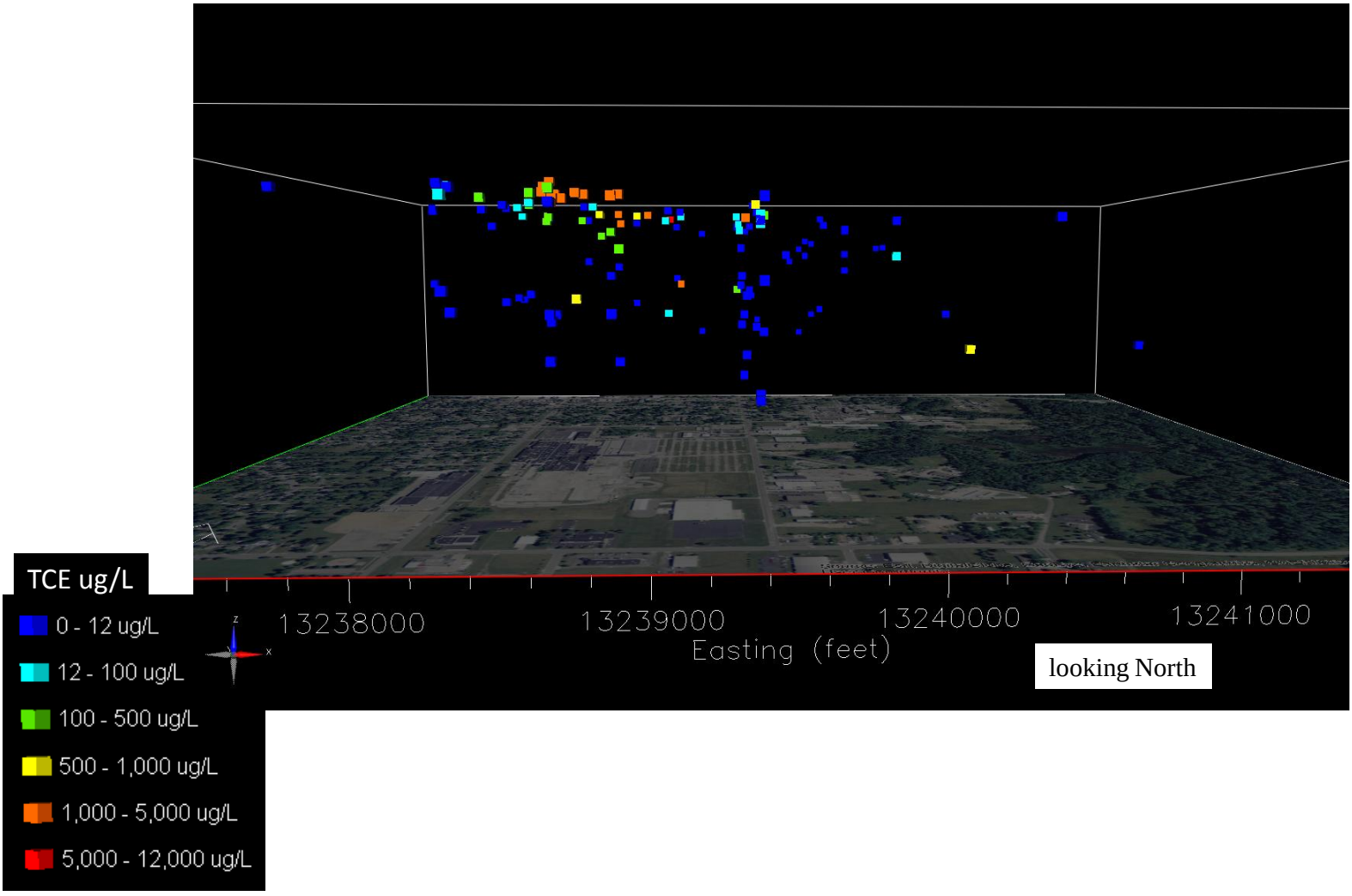
TCE (ug/L) 2015


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
plane view
N

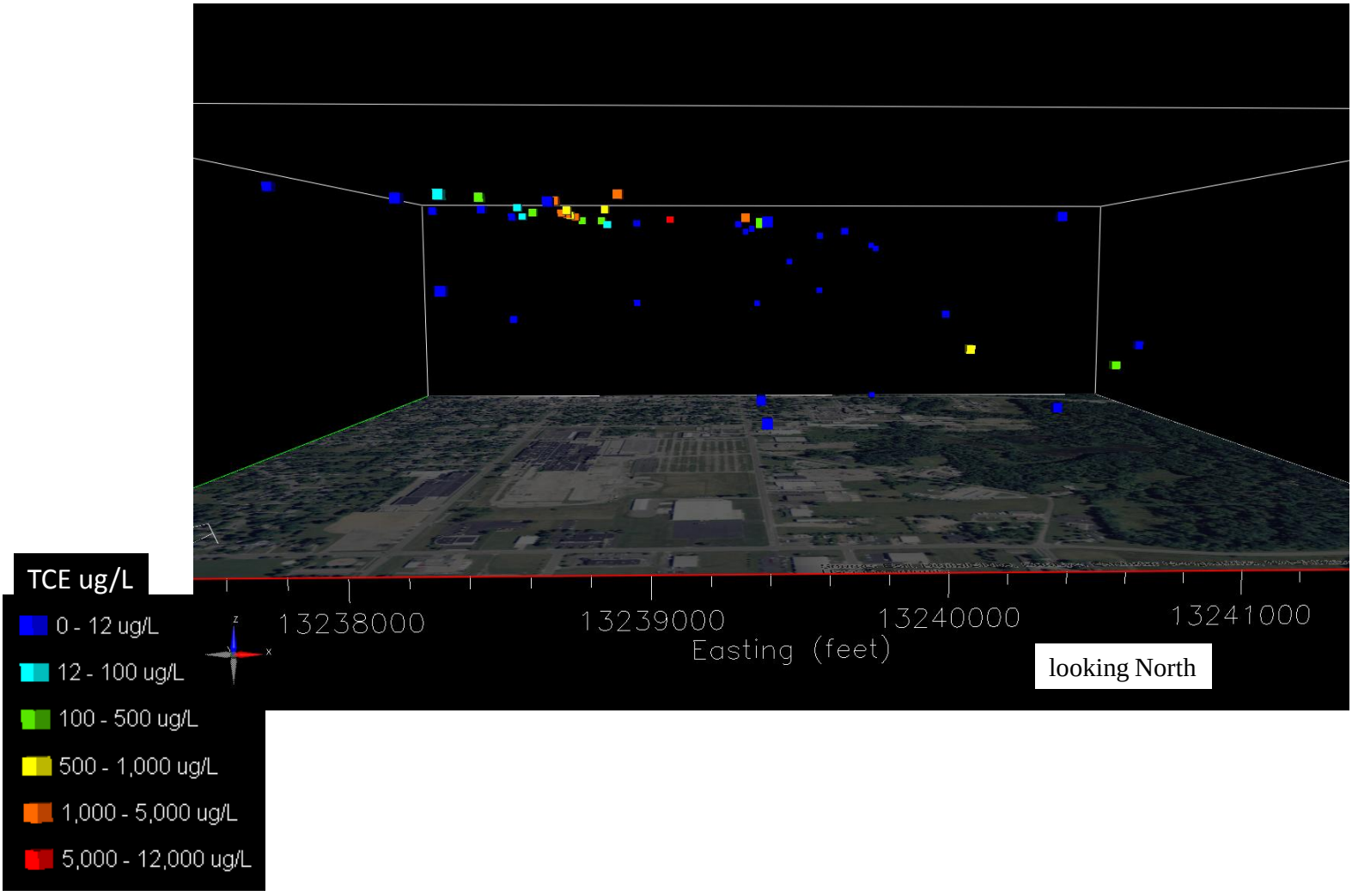
TCE (ug/L) 2008


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
13238000
13239000
13240000
13241000
Easting (feet)
looking North

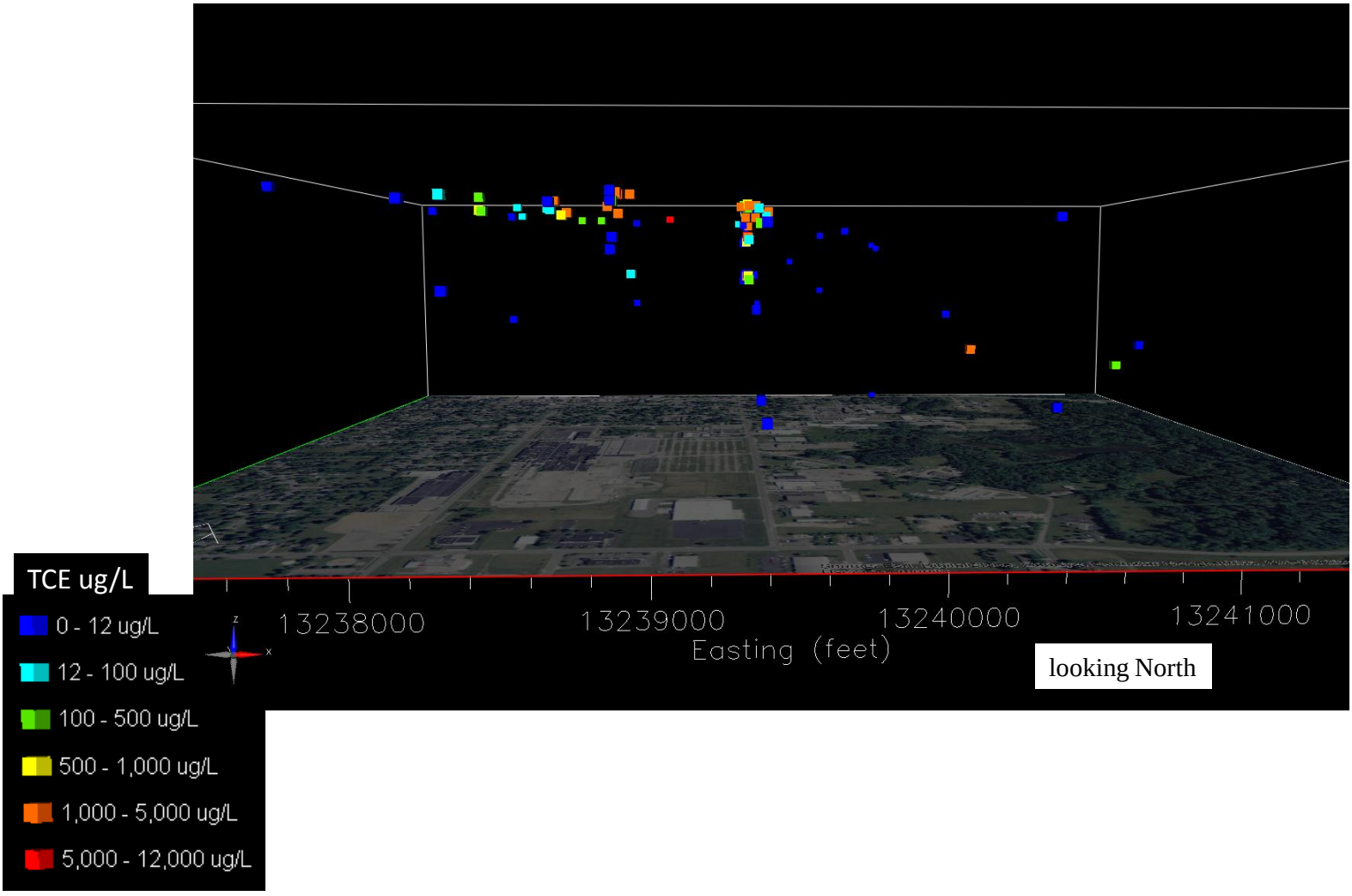
TCE (ug/L) 2009


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
13238000
13239000
13240000
13241000
Easting (feet)
looking North

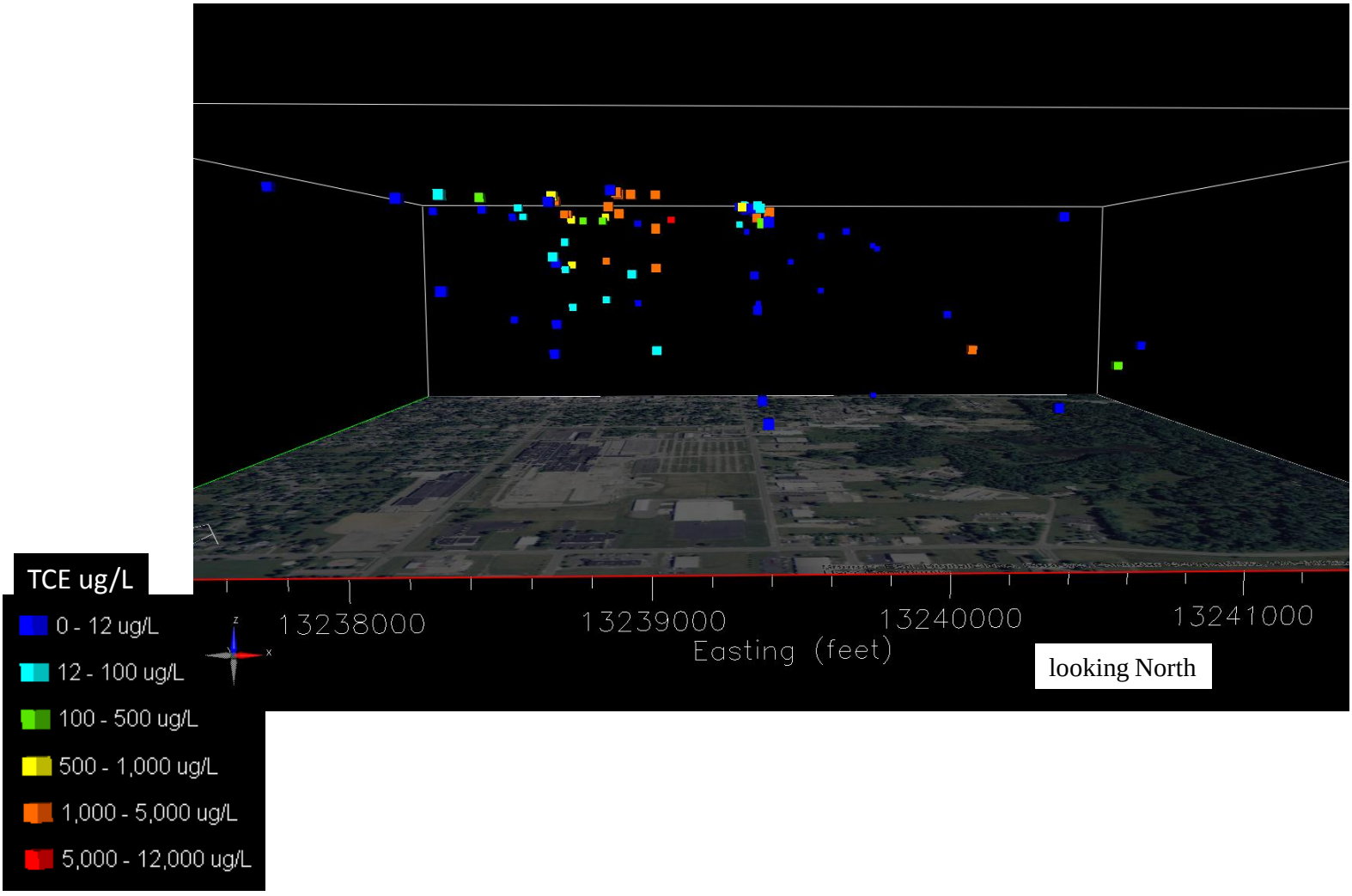
TCE (ug/L) 2010


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
13238000
13239000
13240000
13241000
Easting (feet)
looking North

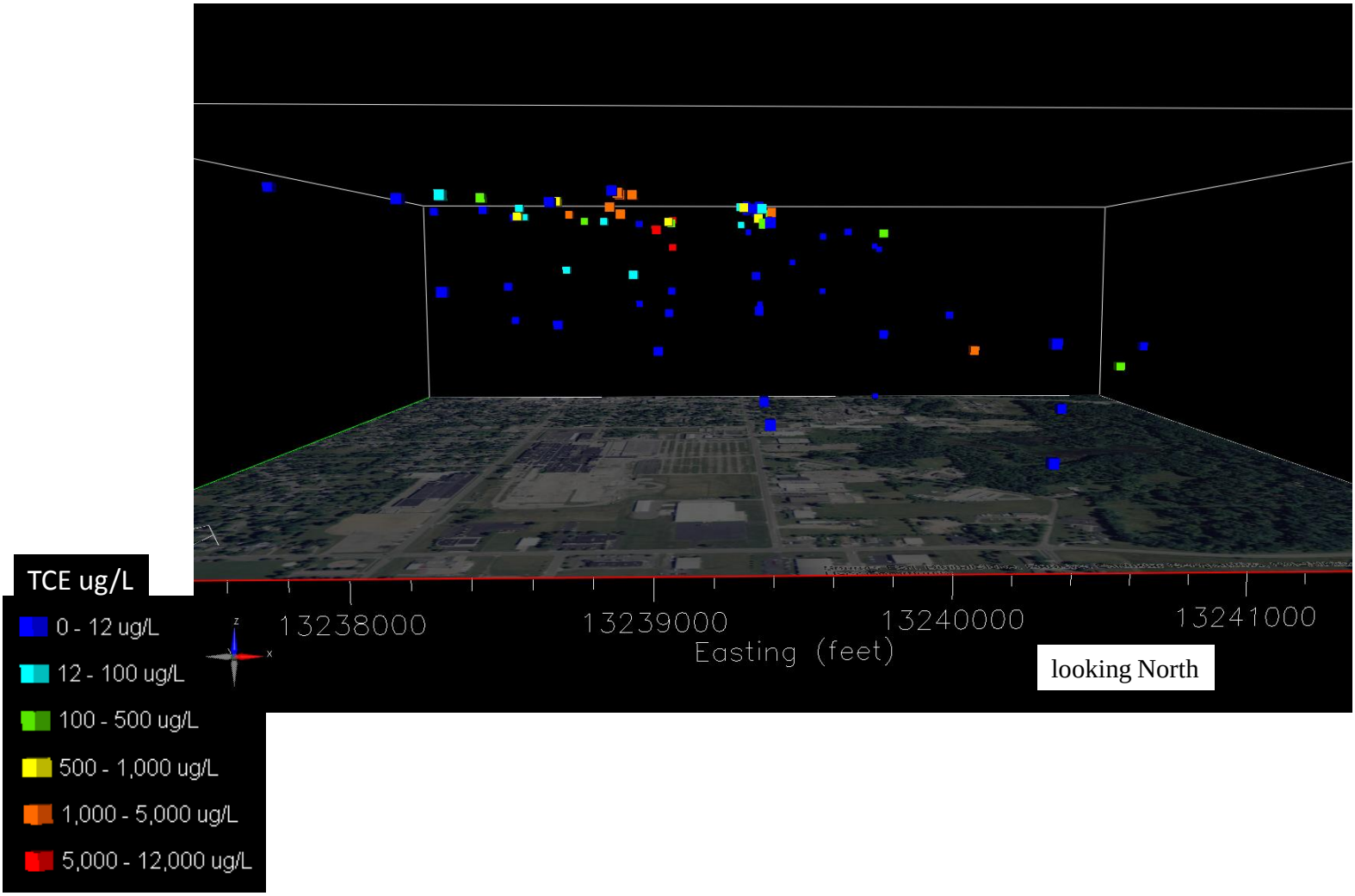
TCE (ug/L) 2011


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
13238000
13239000
13240000
13241000
Easting (feet)
looking North

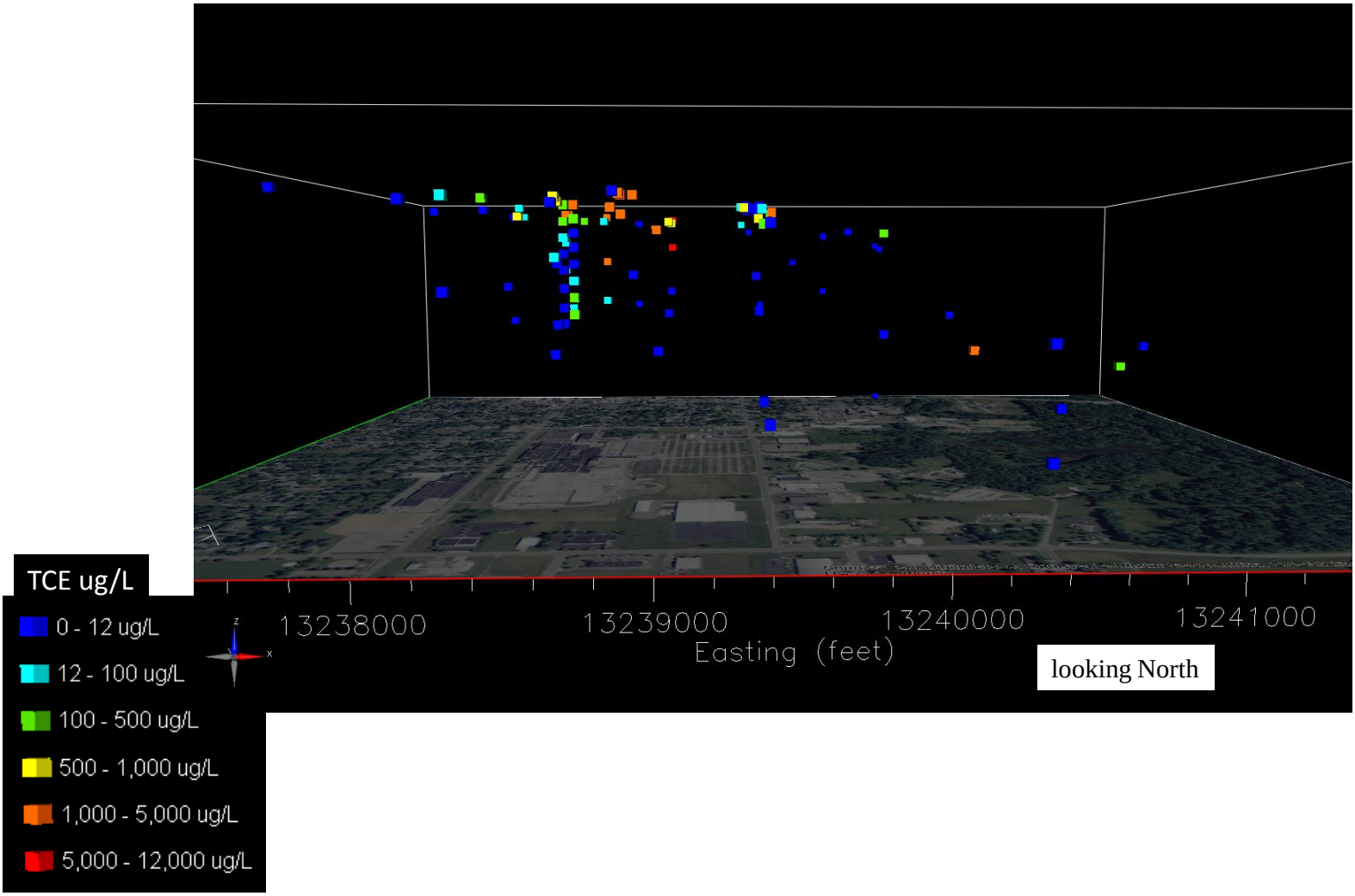
TCE (ug/L) 2012


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
13238000
13239000
13240000
13241000
Easting (feet)
looking North

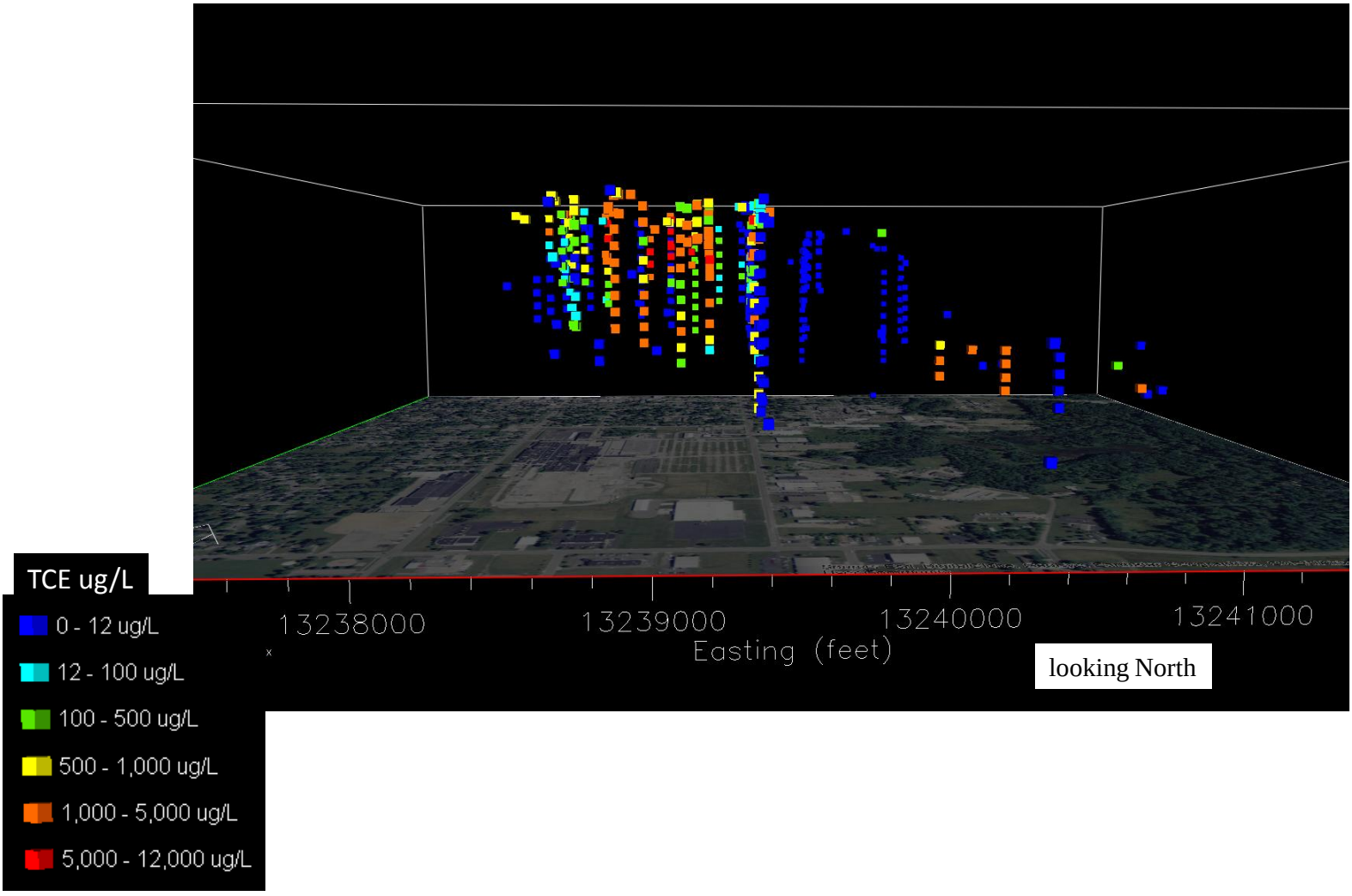
TCE (ug/L) 2013


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
13238000
13239000
13240000
13241000
Easting (feet)
looking North

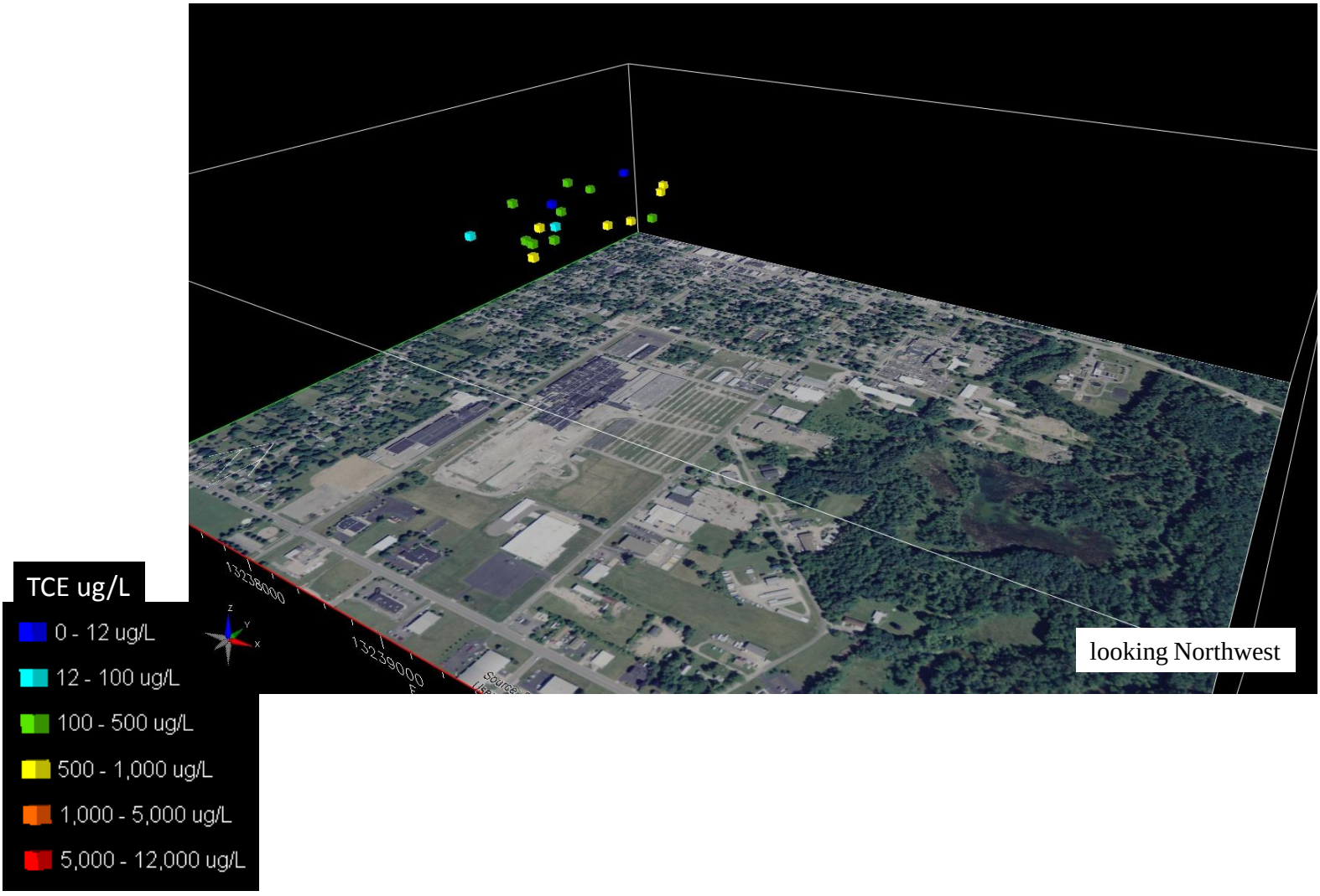
TCE (ug/L) 2014


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
13238000
13239000
13240000
13241000
Easting (feet)
looking North

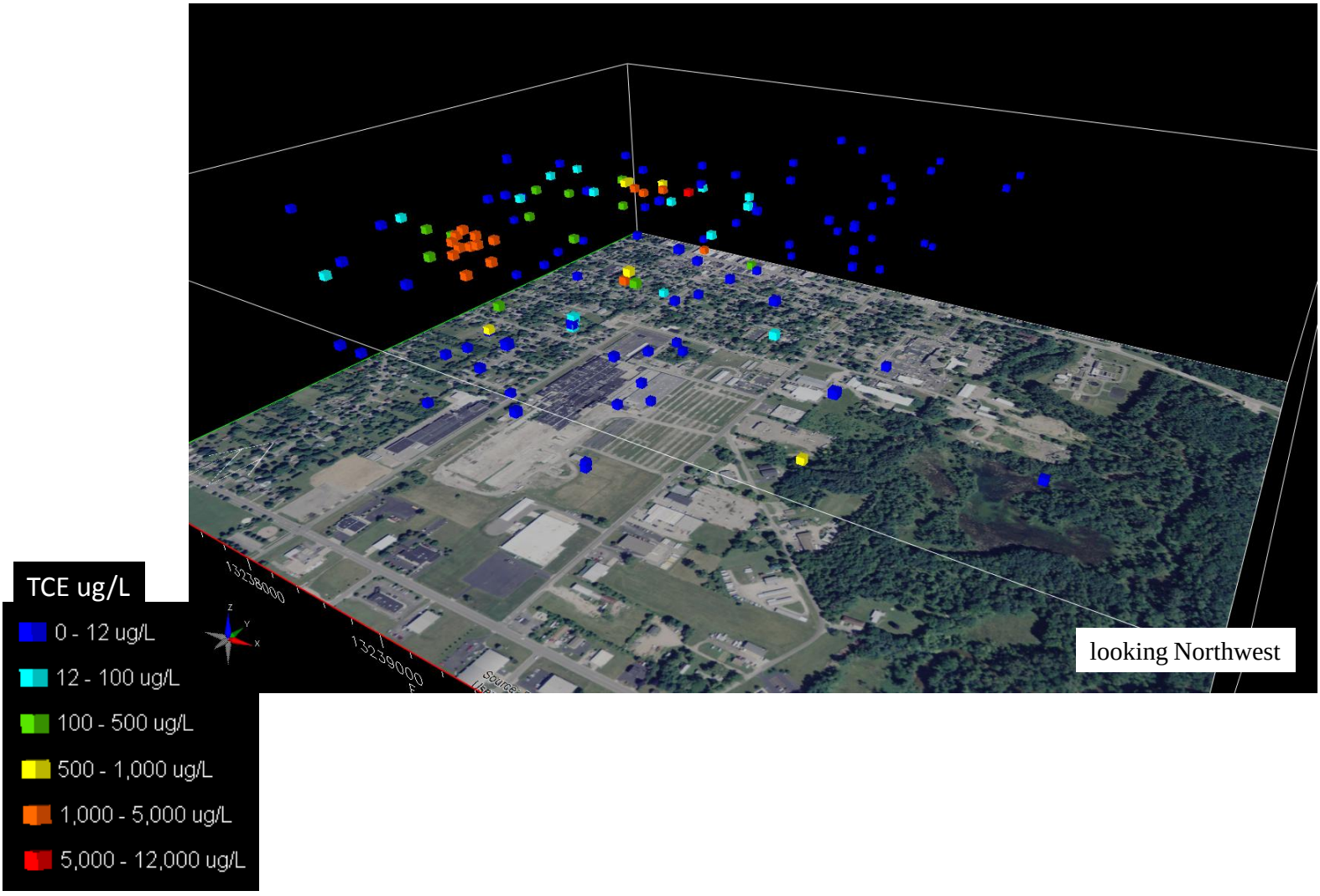
TCE (ug/L) 2015


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
13238000
13239000
13240000
13241000
Easting (feet)
looking North

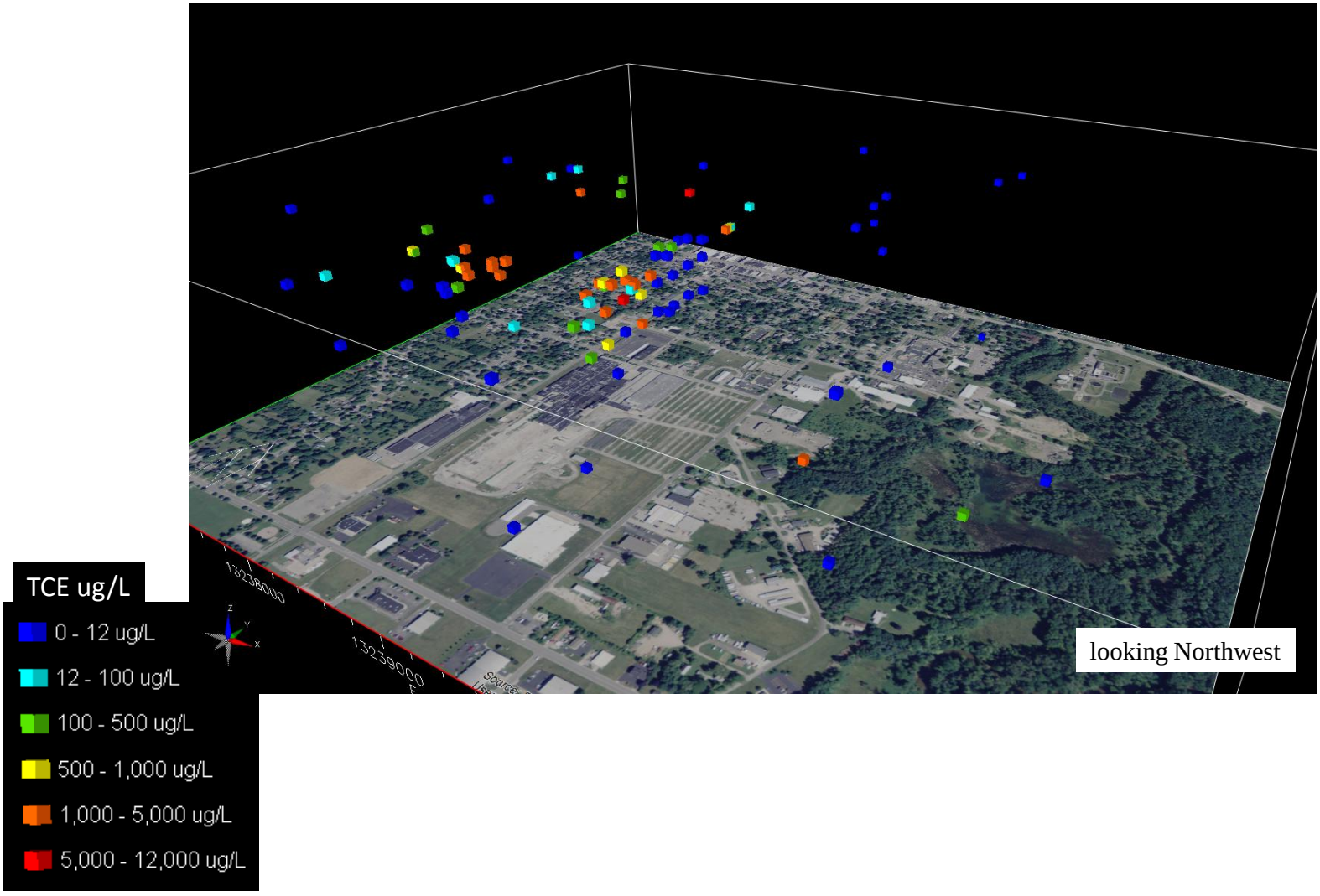
TCE (ug/L) 2008


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
looking Northwest

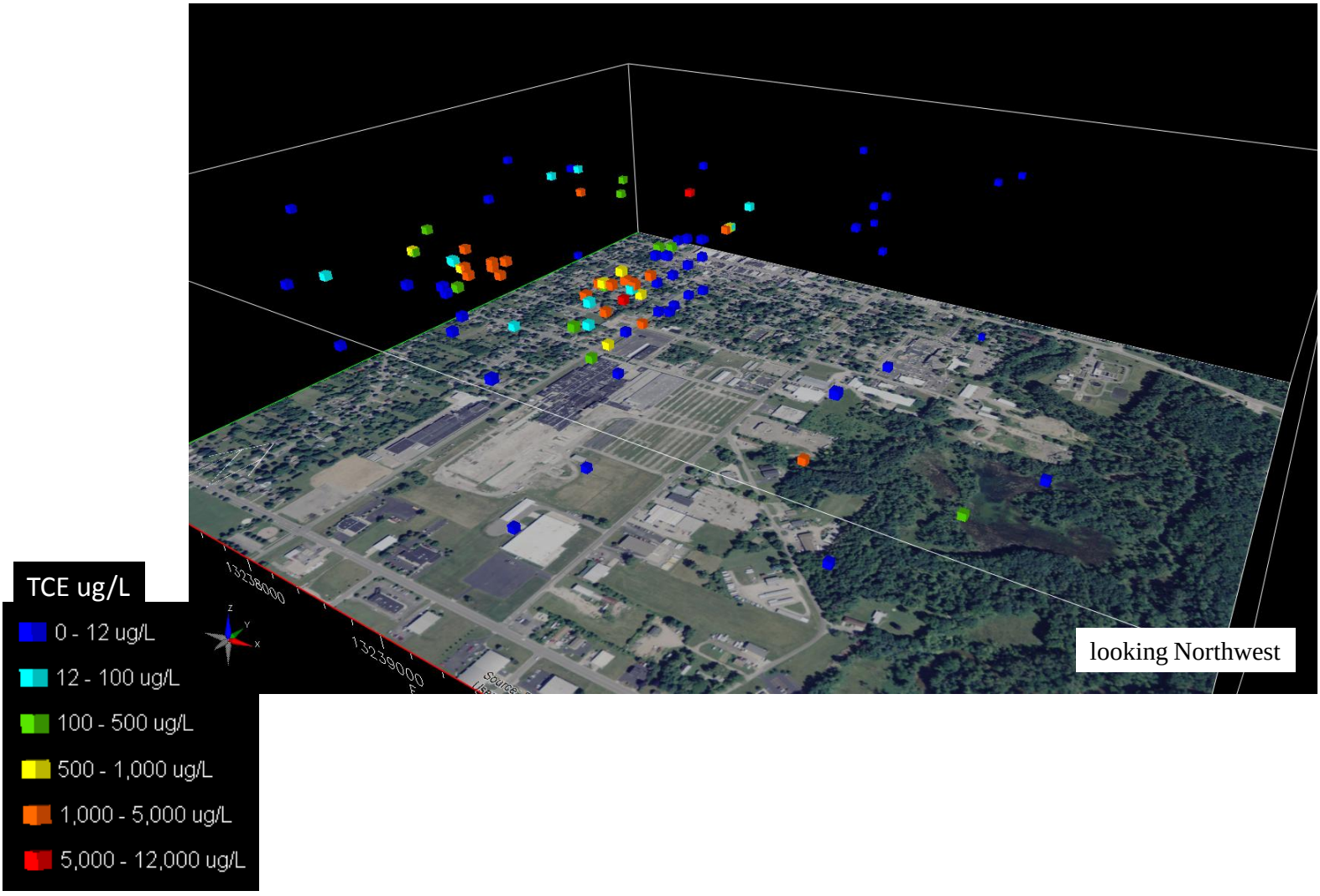
TCE (ug/L) 2009


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
looking Northwest

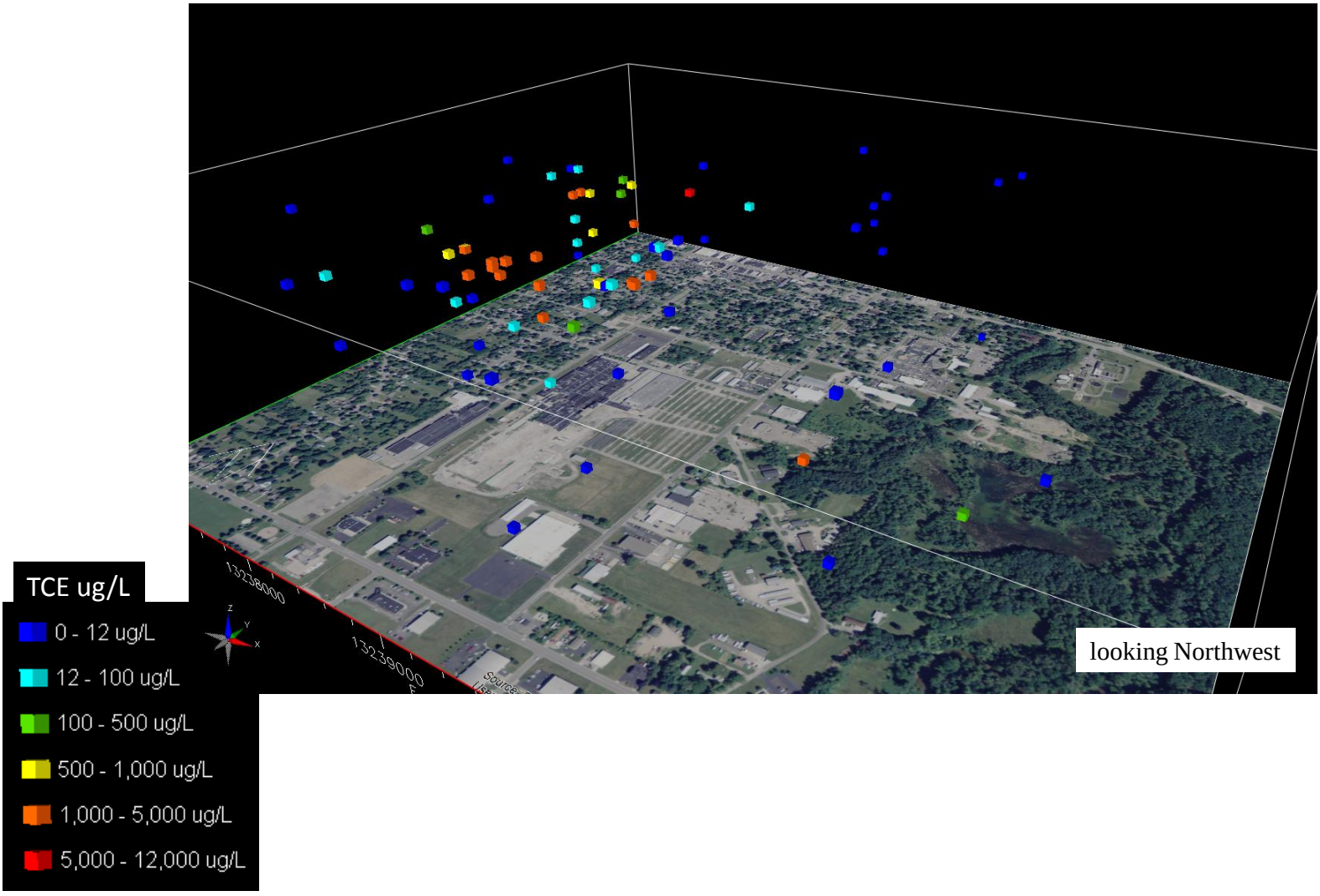
TCE (ug/L) 2010


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
looking Northwest

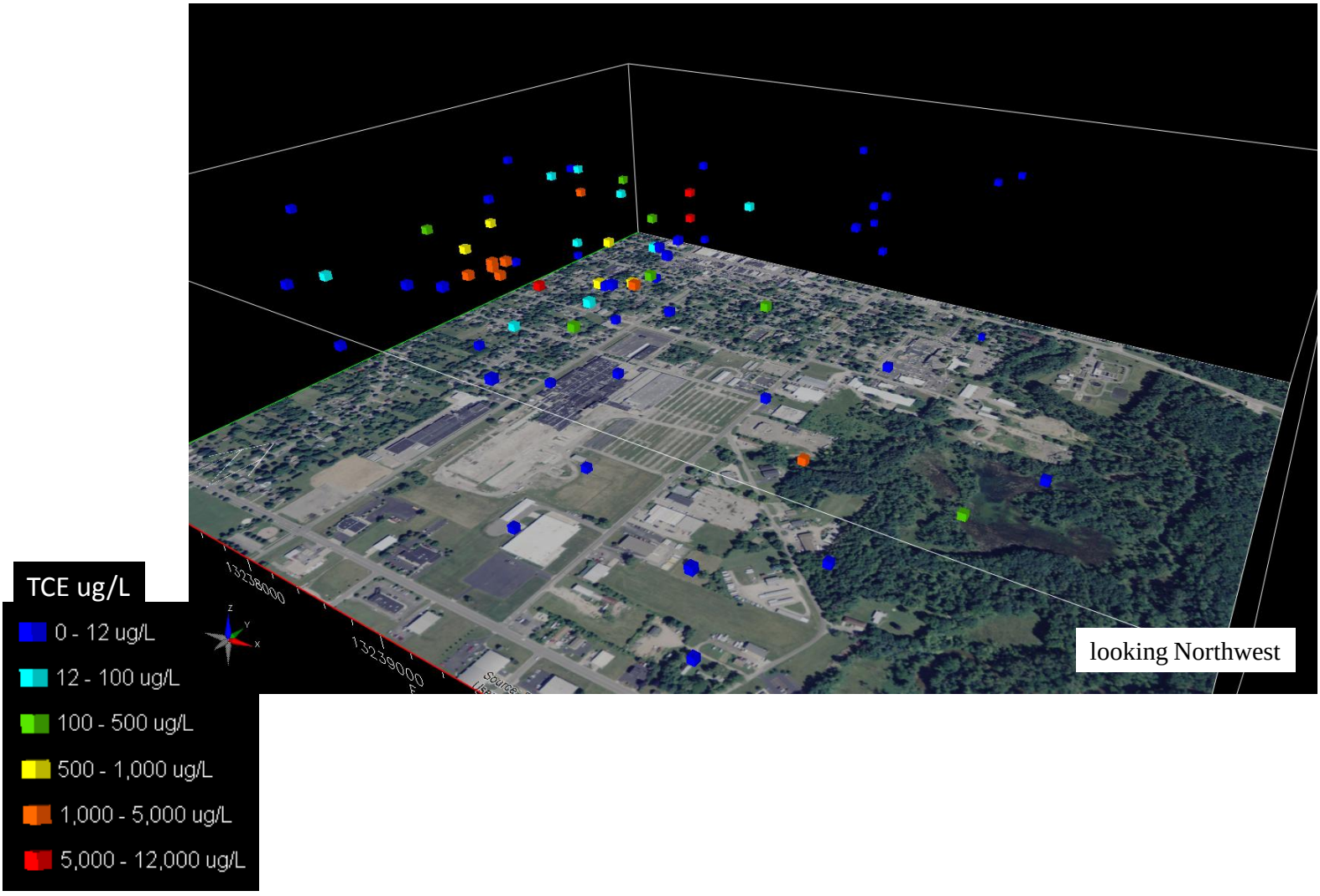
TCE (ug/L) 2011


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
looking Northwest

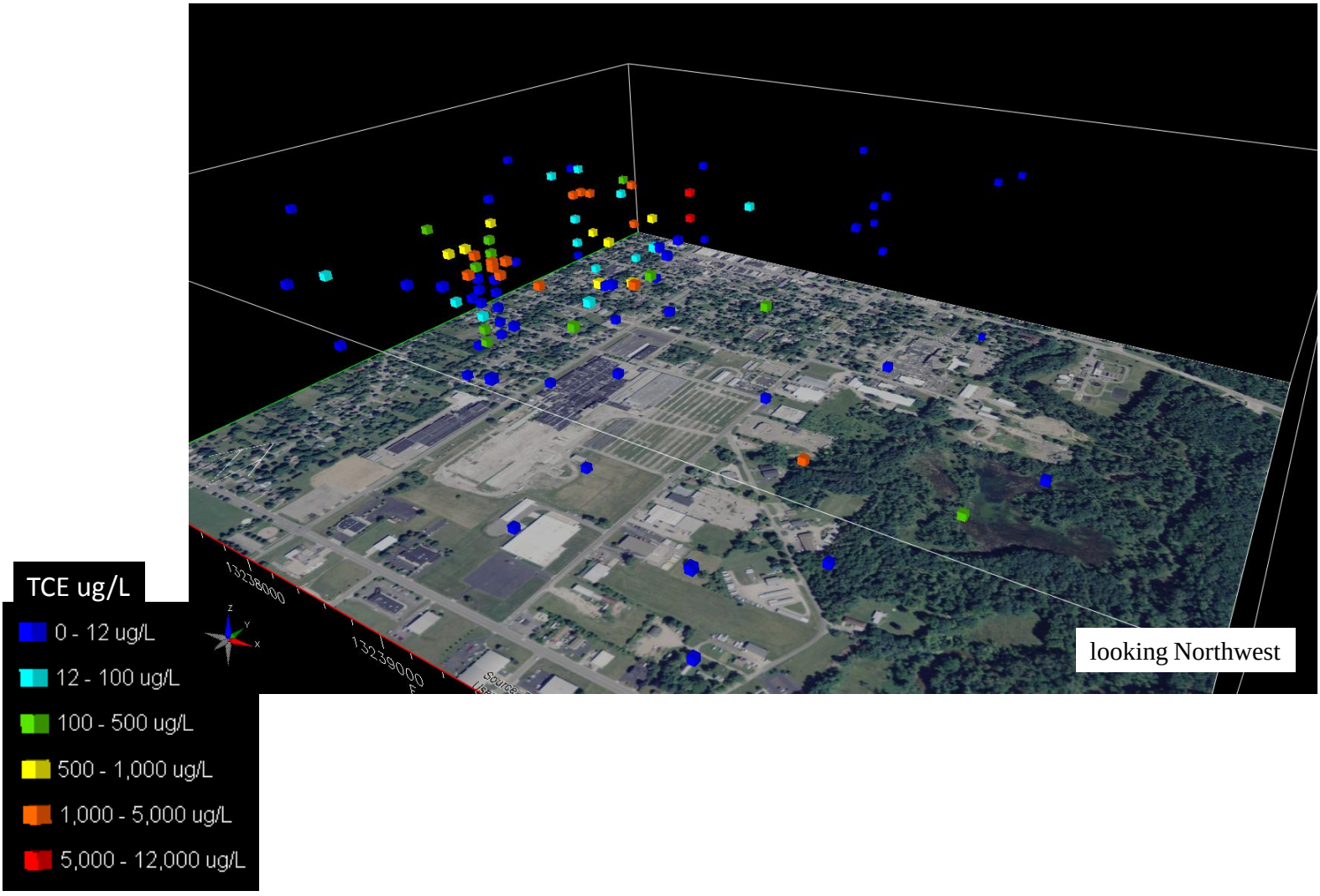
TCE (ug/L) 2012


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
looking Northwest

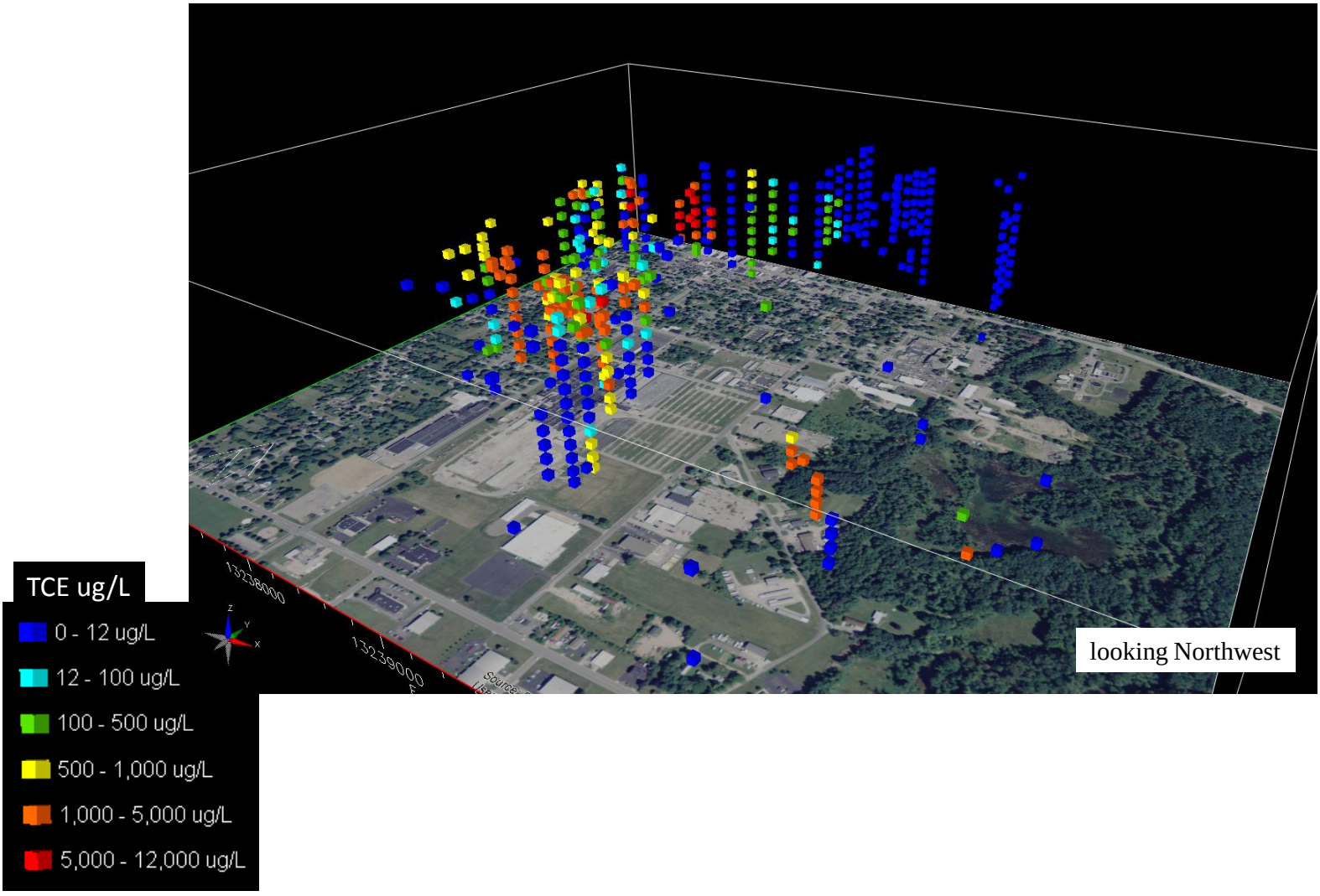
TCE (ug/L) 2013


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
looking Northwest

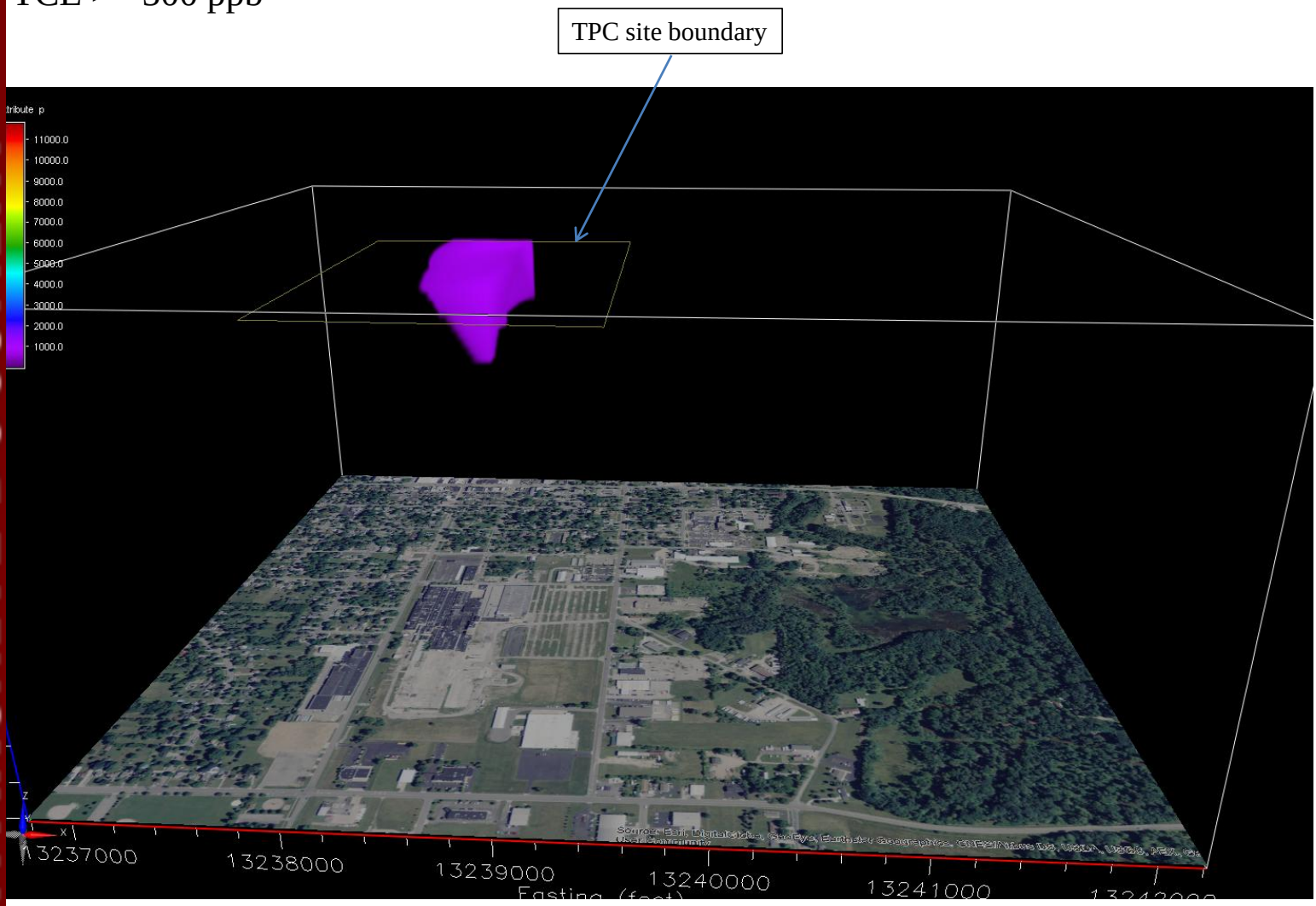
TCE (ug/L) 2014


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
looking Northwest

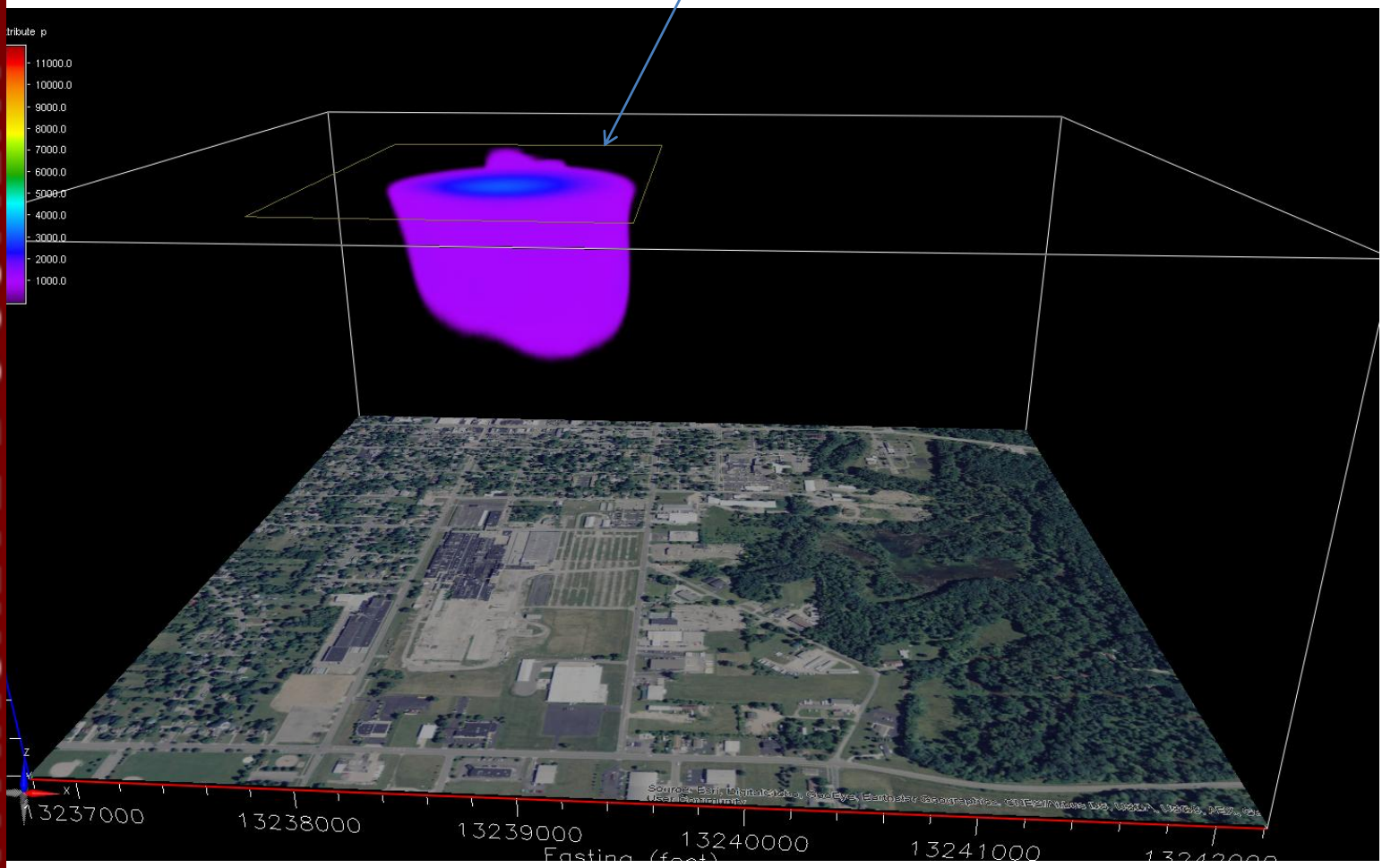
TCE (ug/L) 2015


TCE ug/L
0 - 12 ug/L
12 - 100 ug/L
100 - 500 ug/L
500 - 1,000 ug/L
1,000 - 5,000 ug/L
5,000 - 12,000 ug/L
looking Northwest

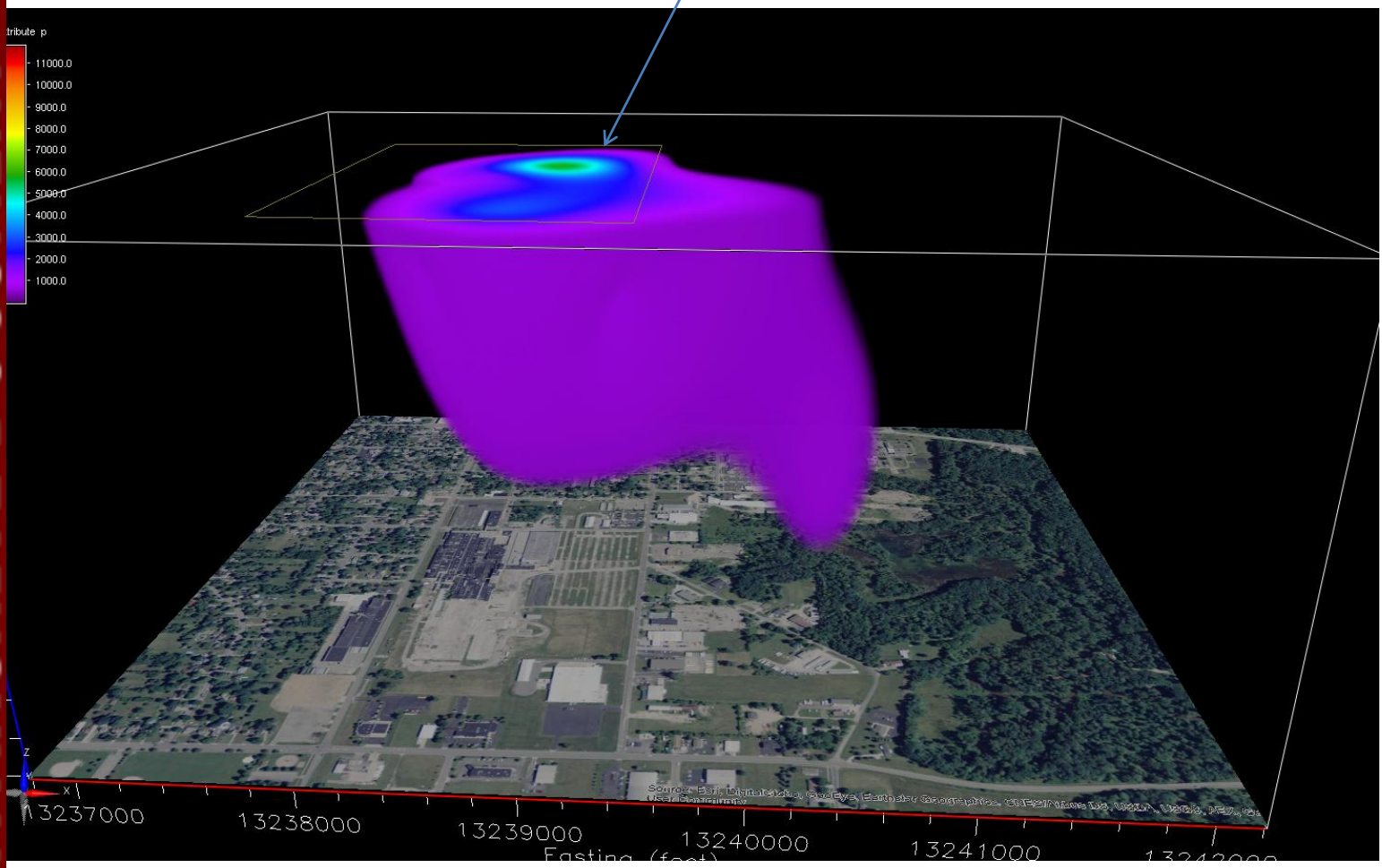
2008
TCE >= 500 ppb



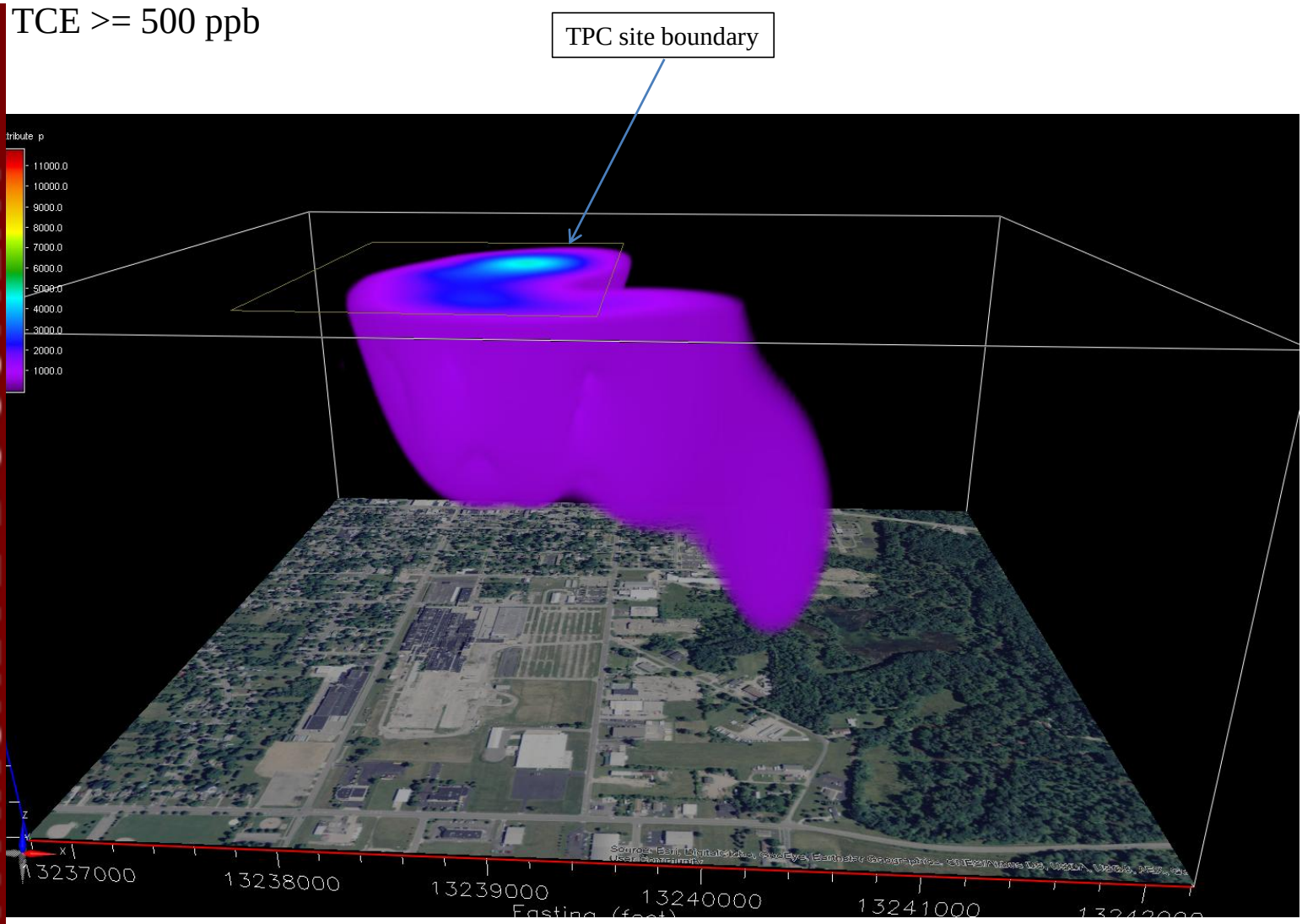
2009
TCE >= 500 ppb



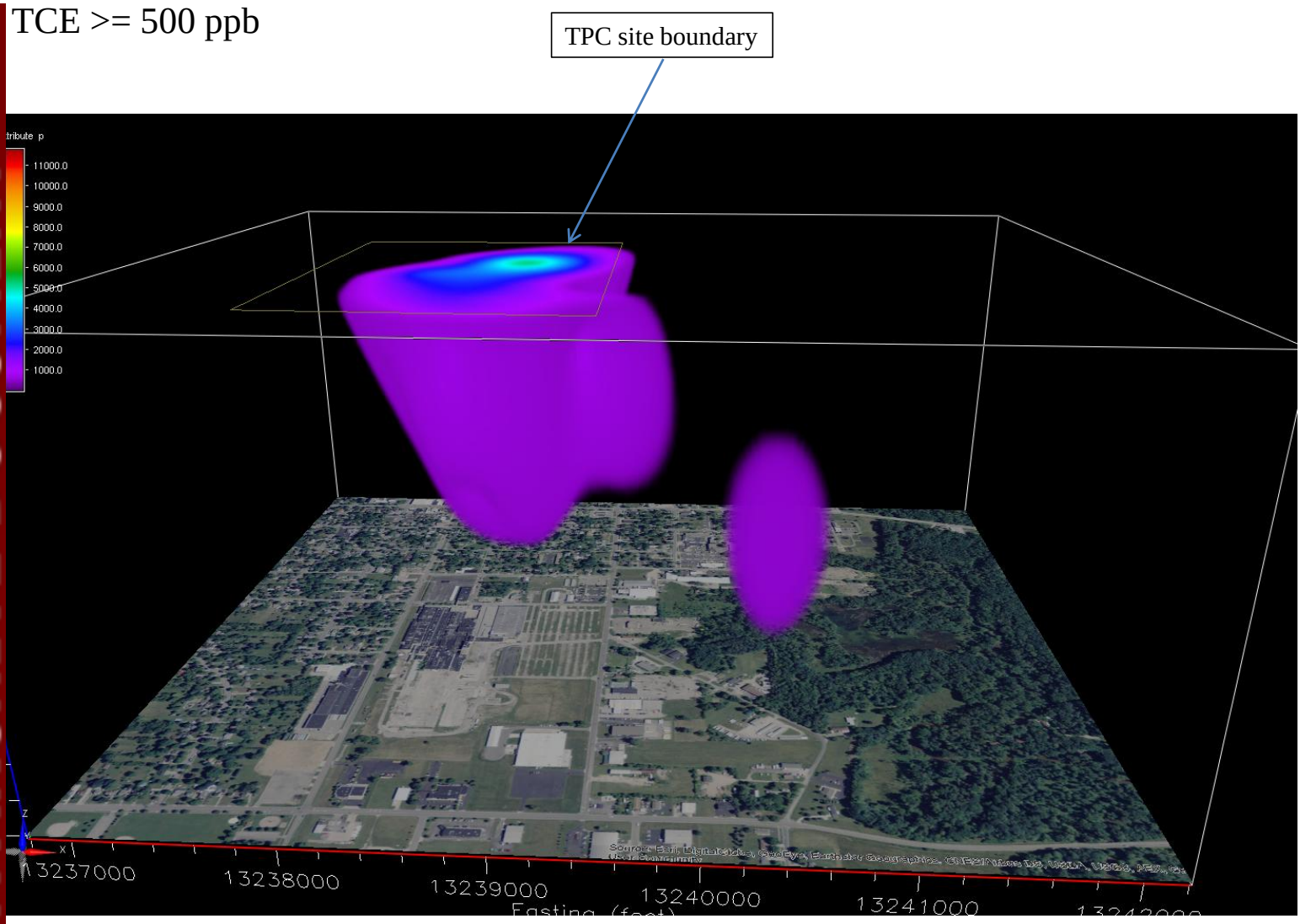
2010
TCE >= 500 ppb



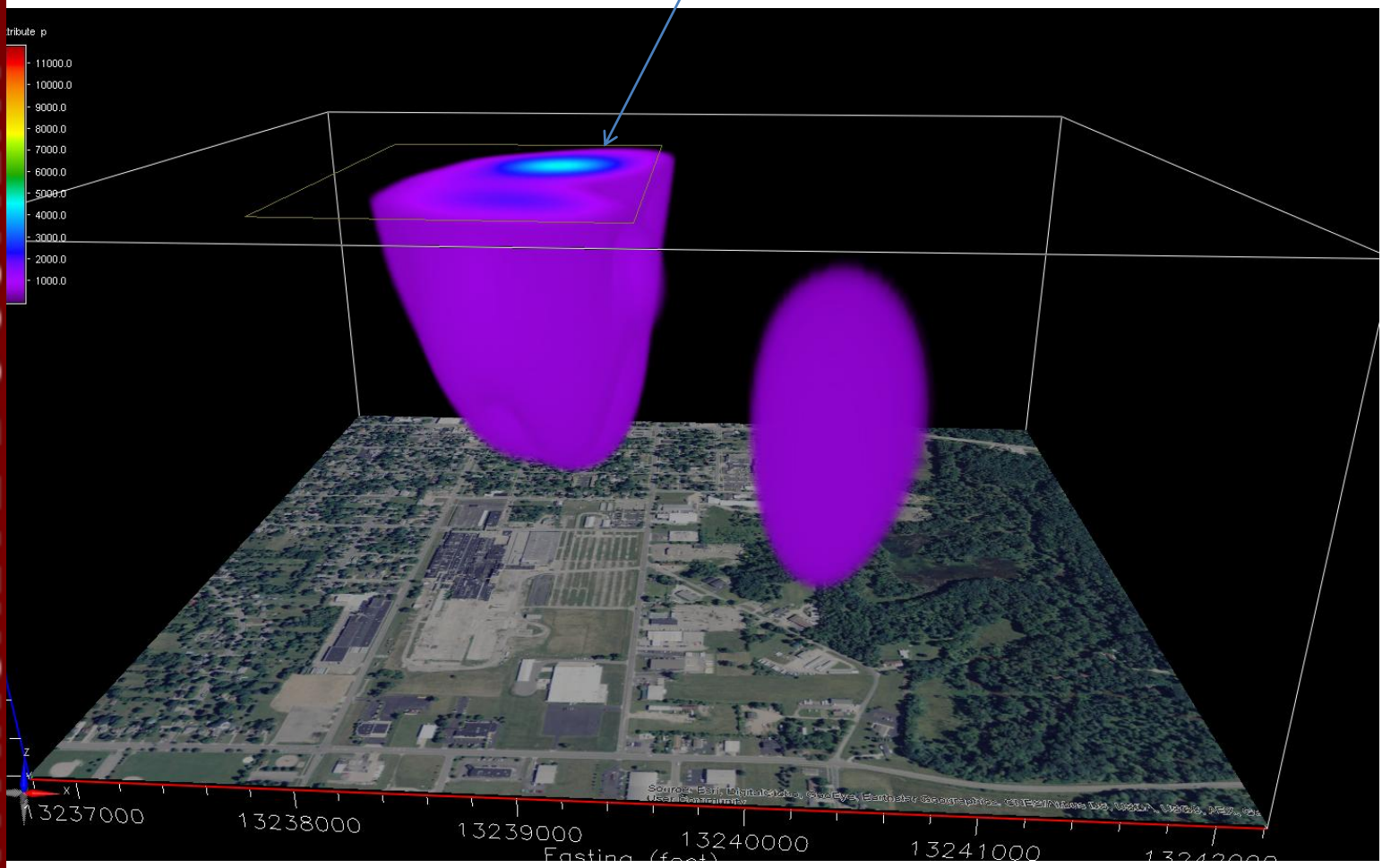
2011
TCE >= 500 ppb



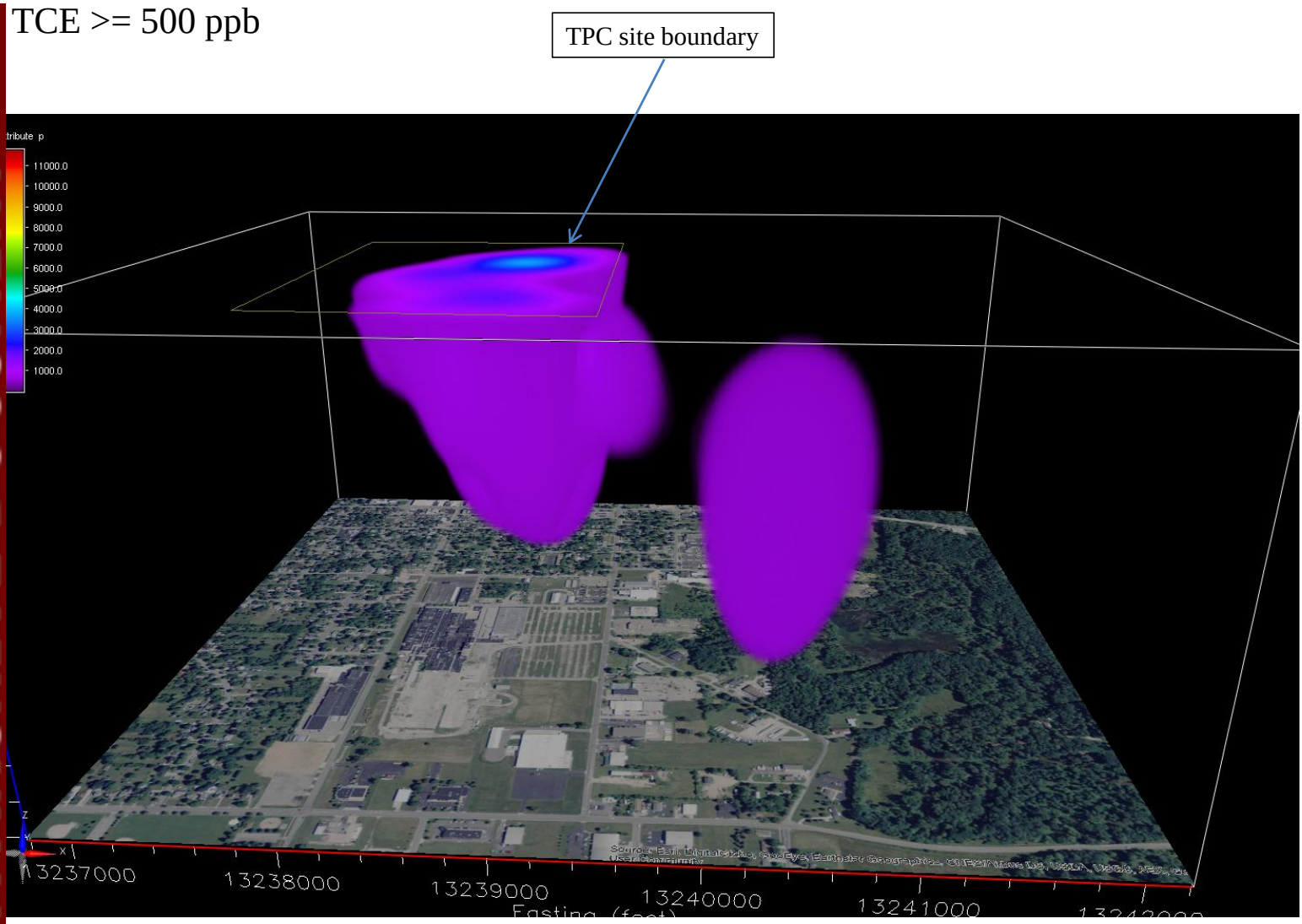
2012
TCE >= 500 ppb



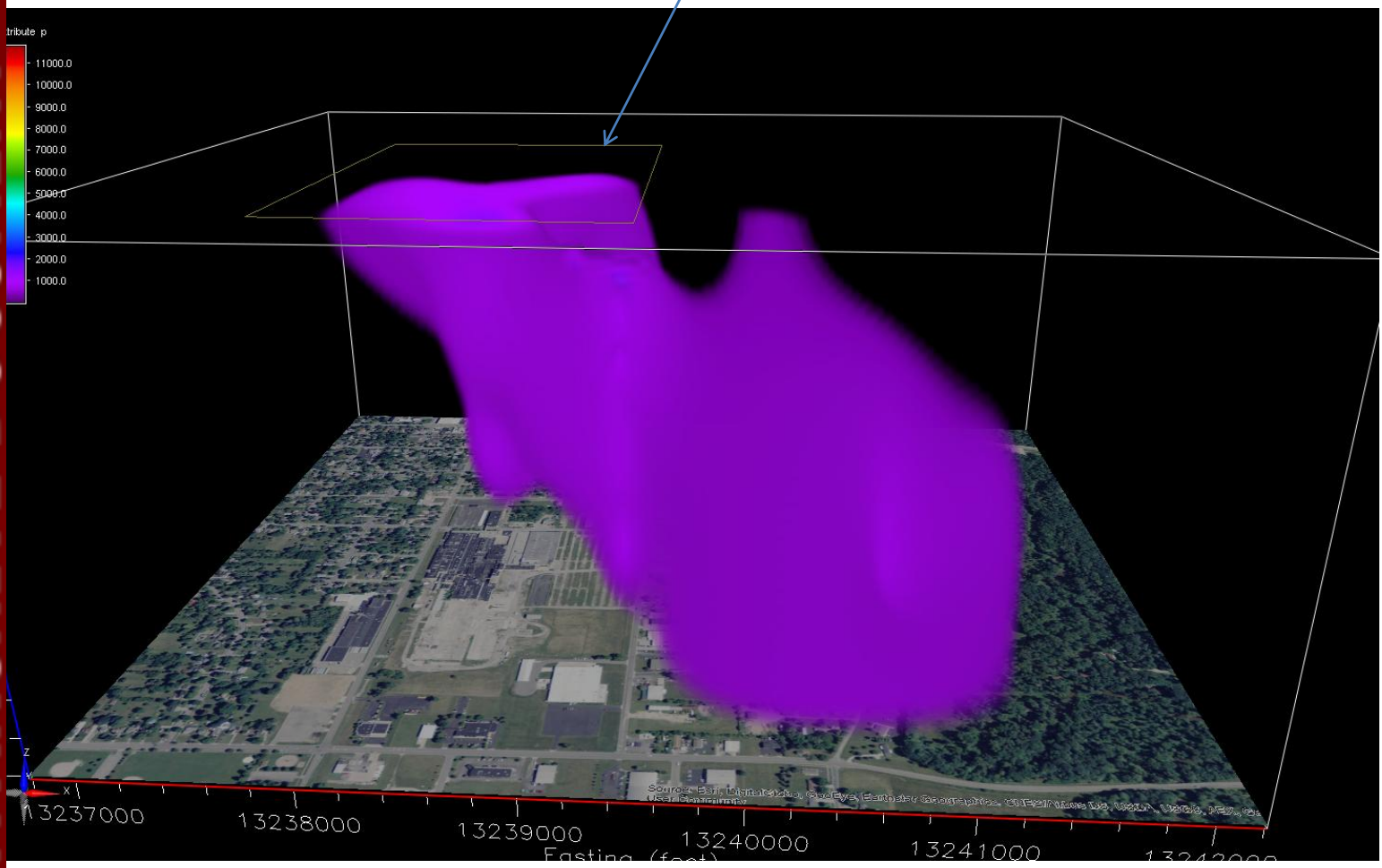
2013
TCE >= 500 ppb



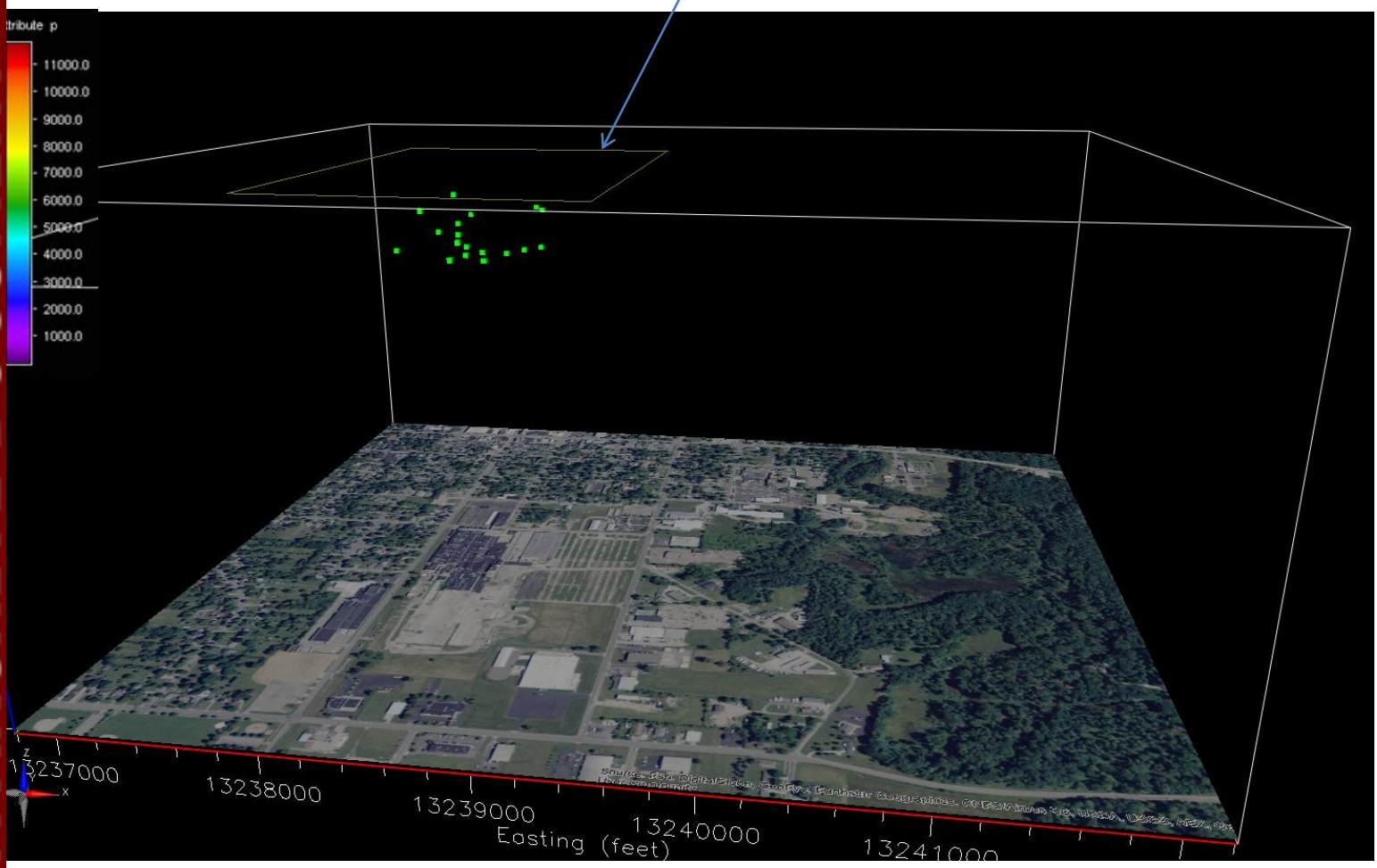
2014
TCE >= 500 ppb



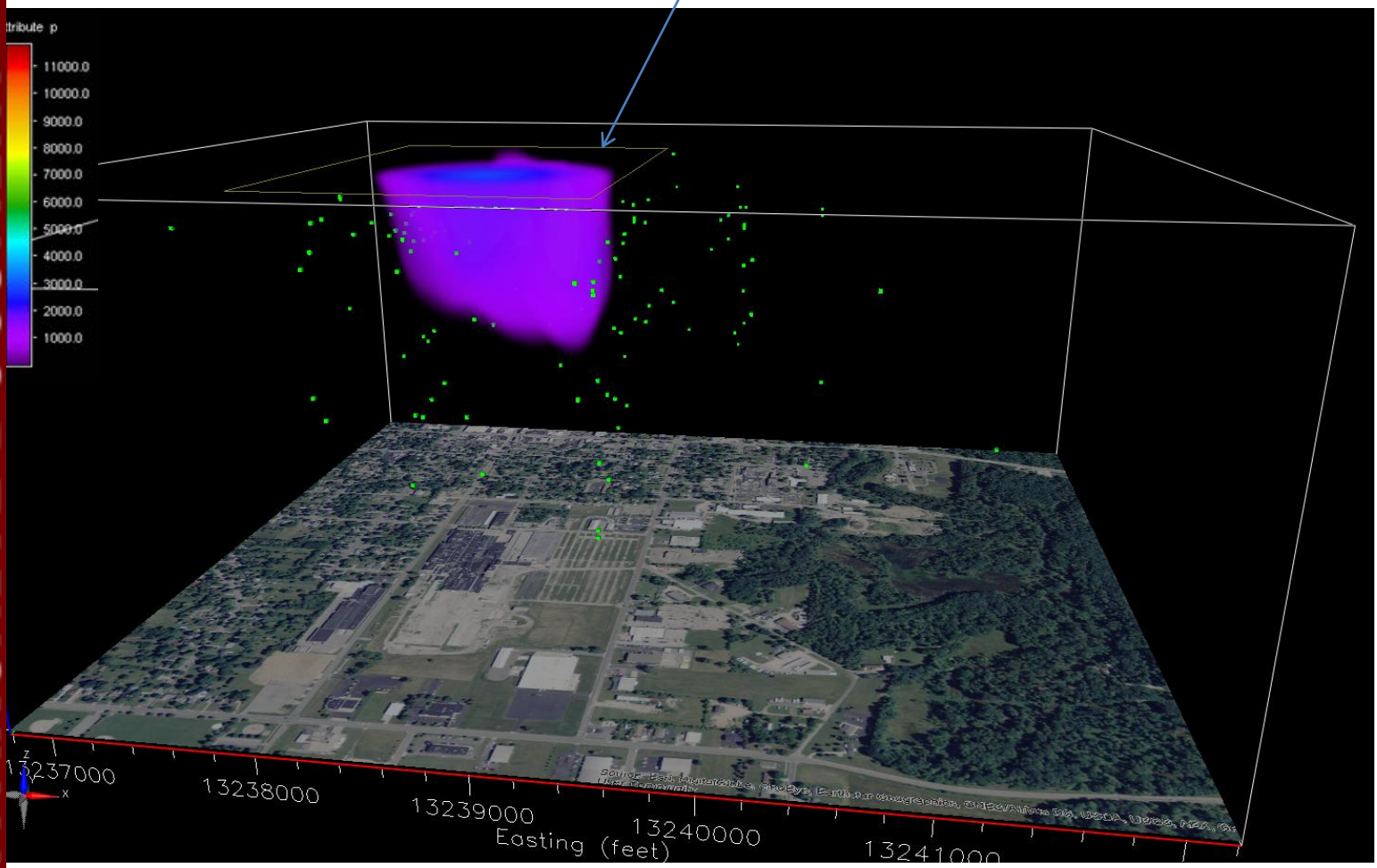
2015
TCE >= 500 ppb



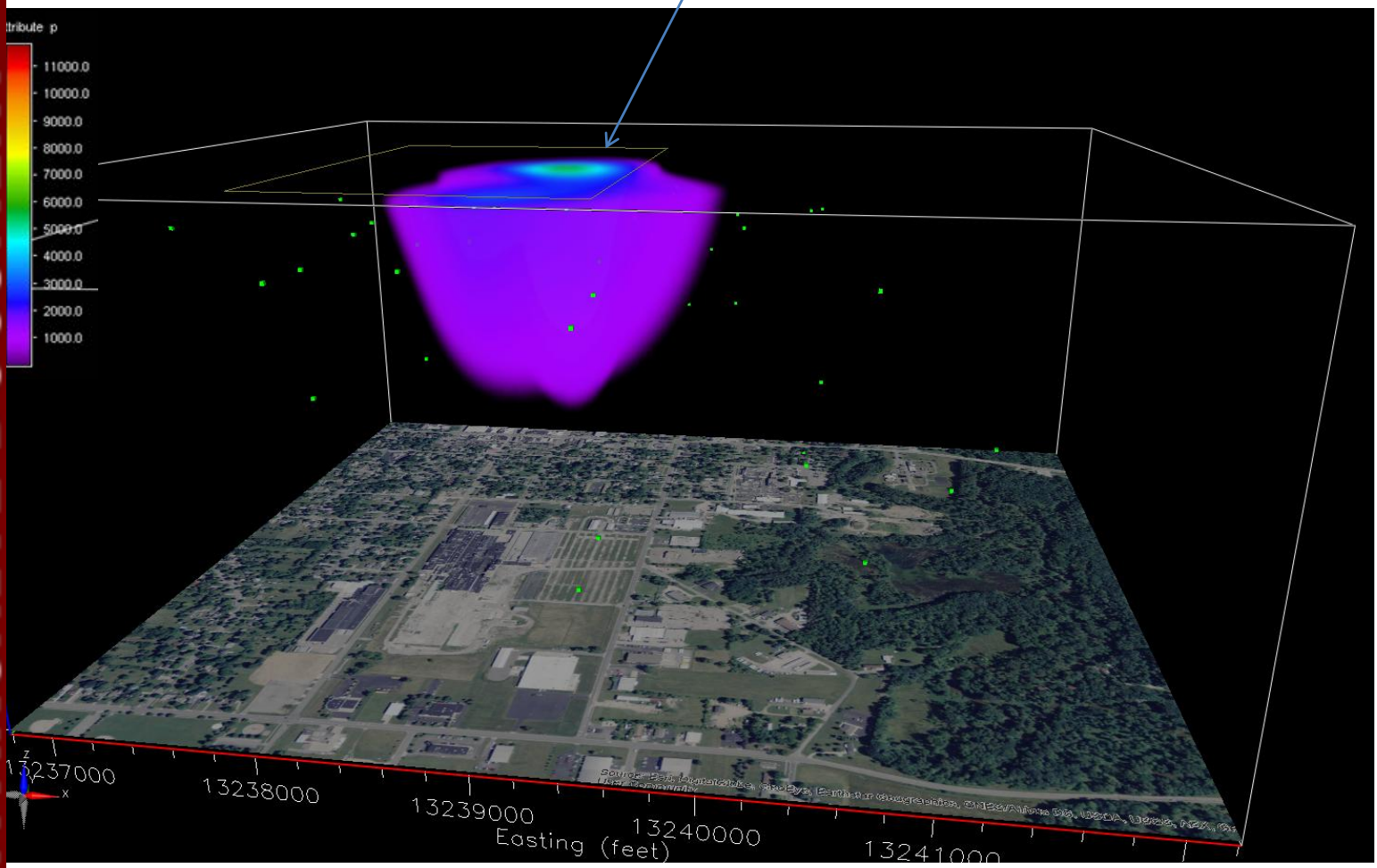
2008
TCE >= 1,000 ppb



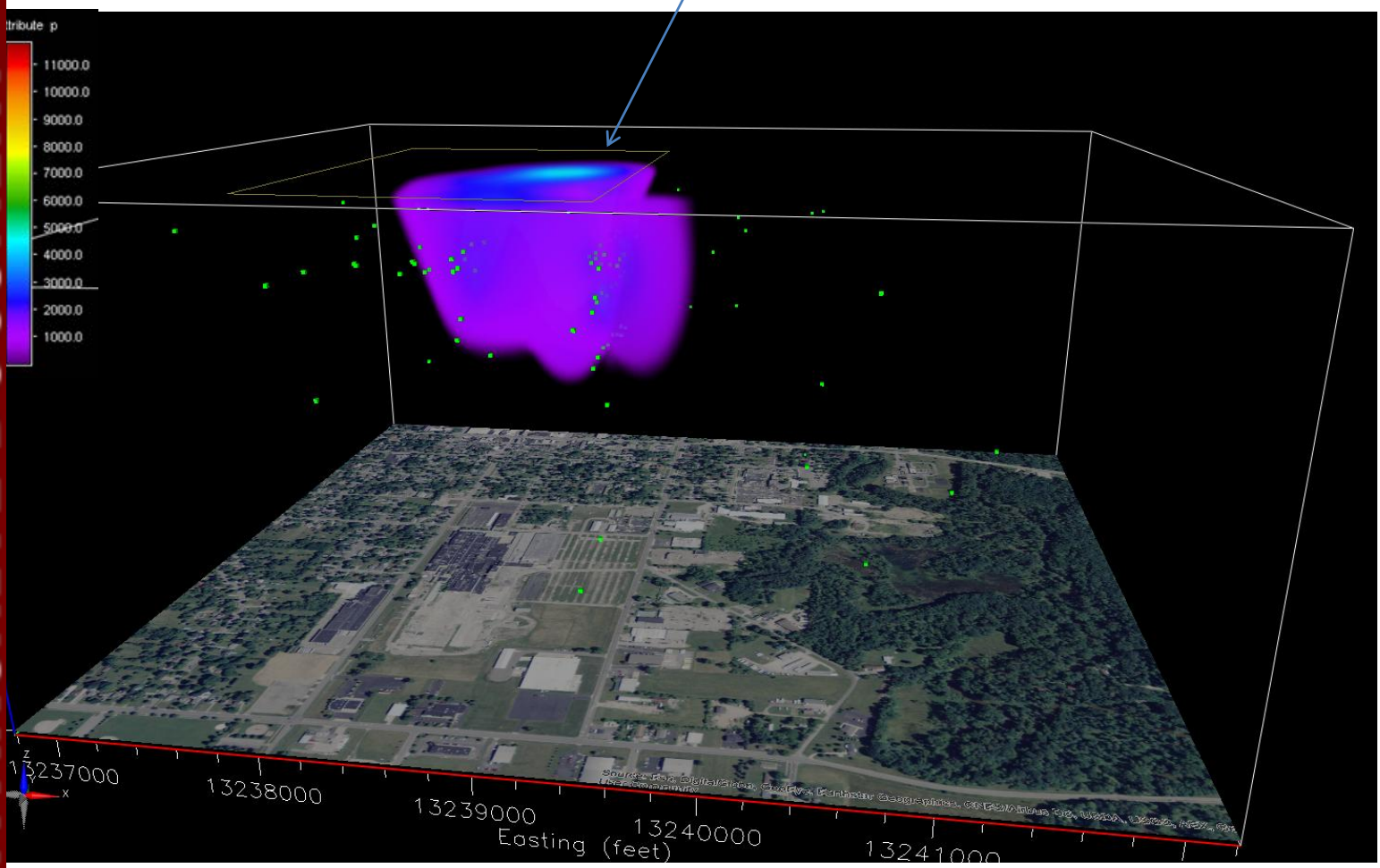
2009
TCE >= 1,000 ppb



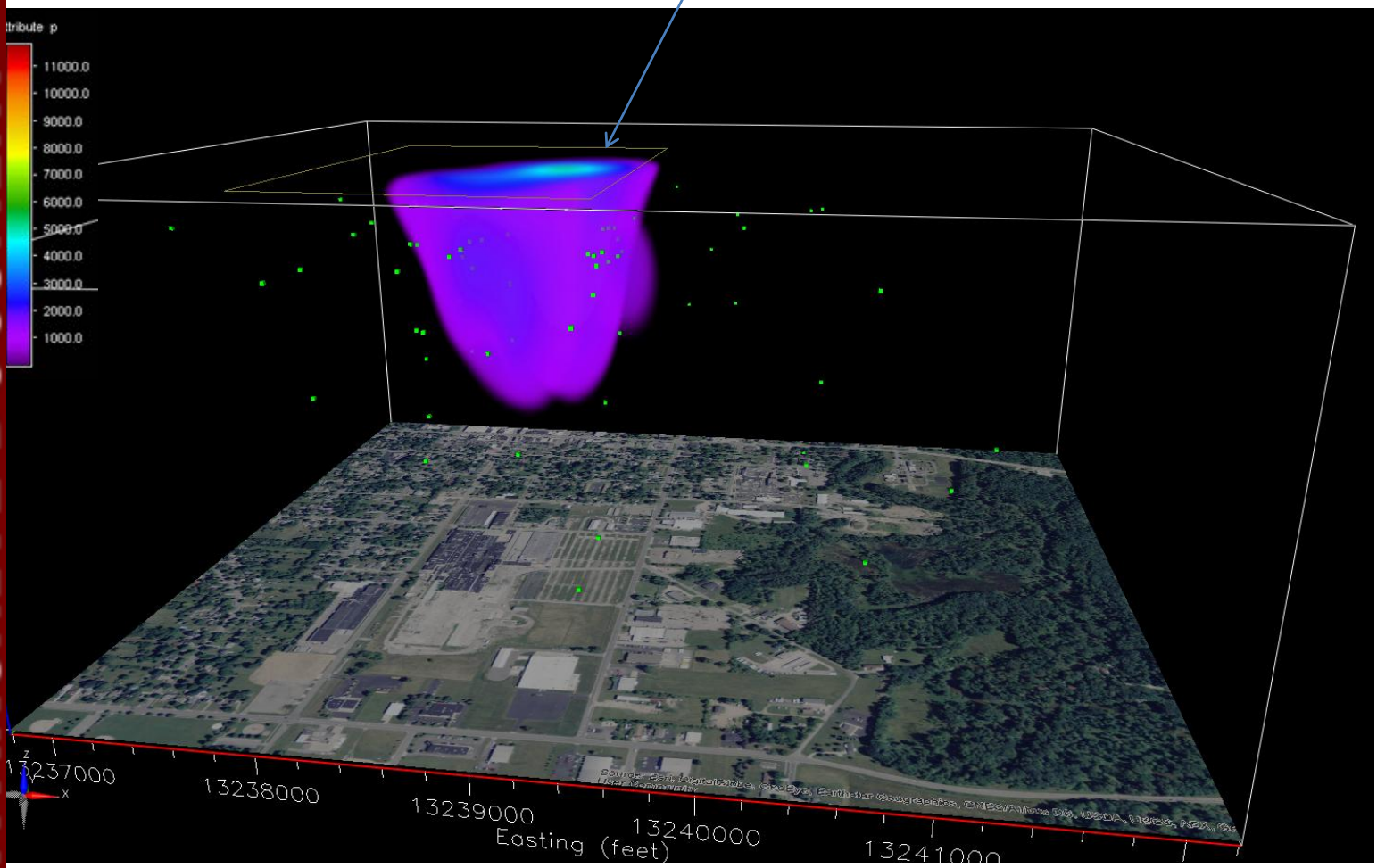
2010
TCE >= 1,000 ppb



2011
TCE >= 1,000 ppb

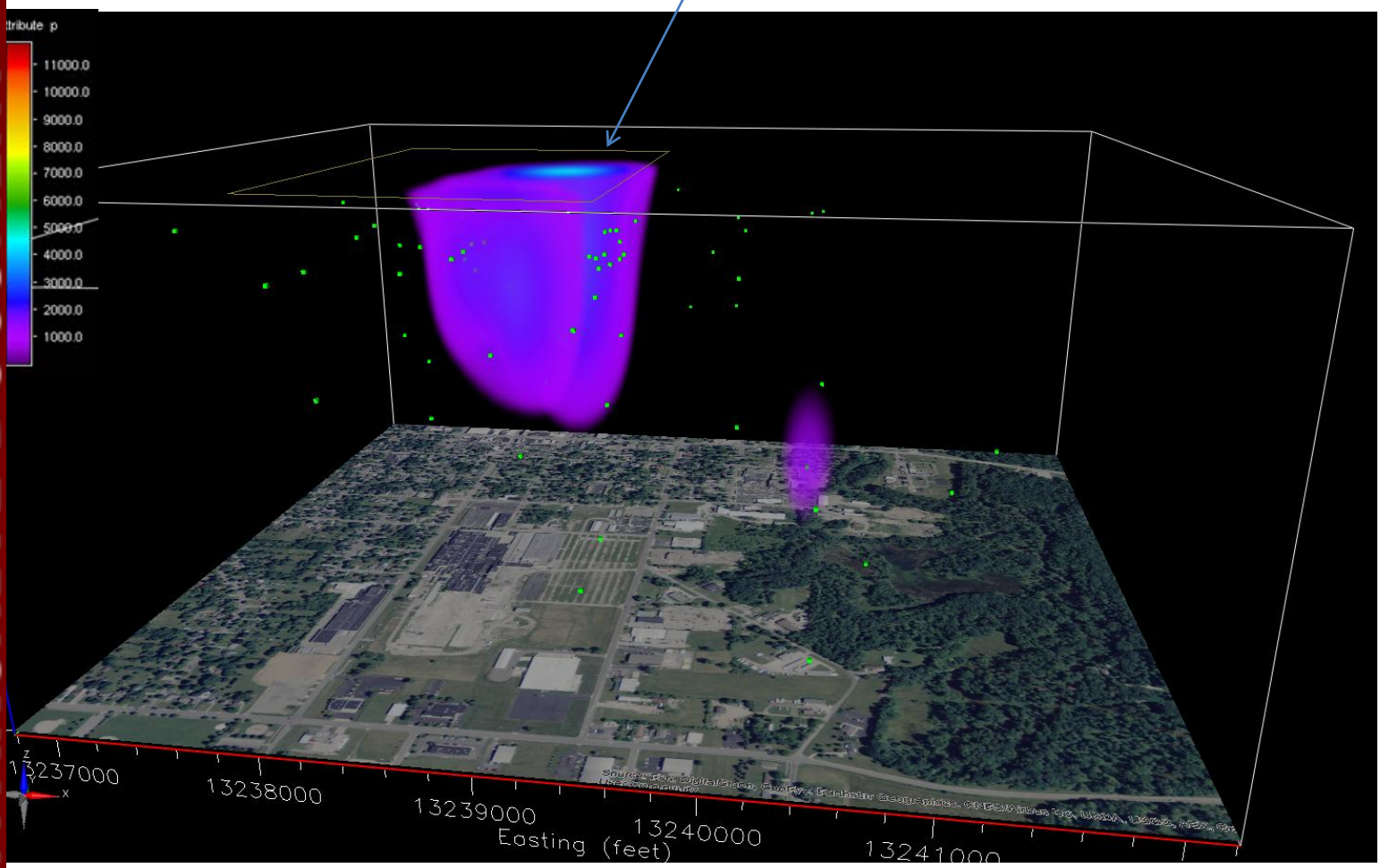


2012
TCE >= 1,000 ppb

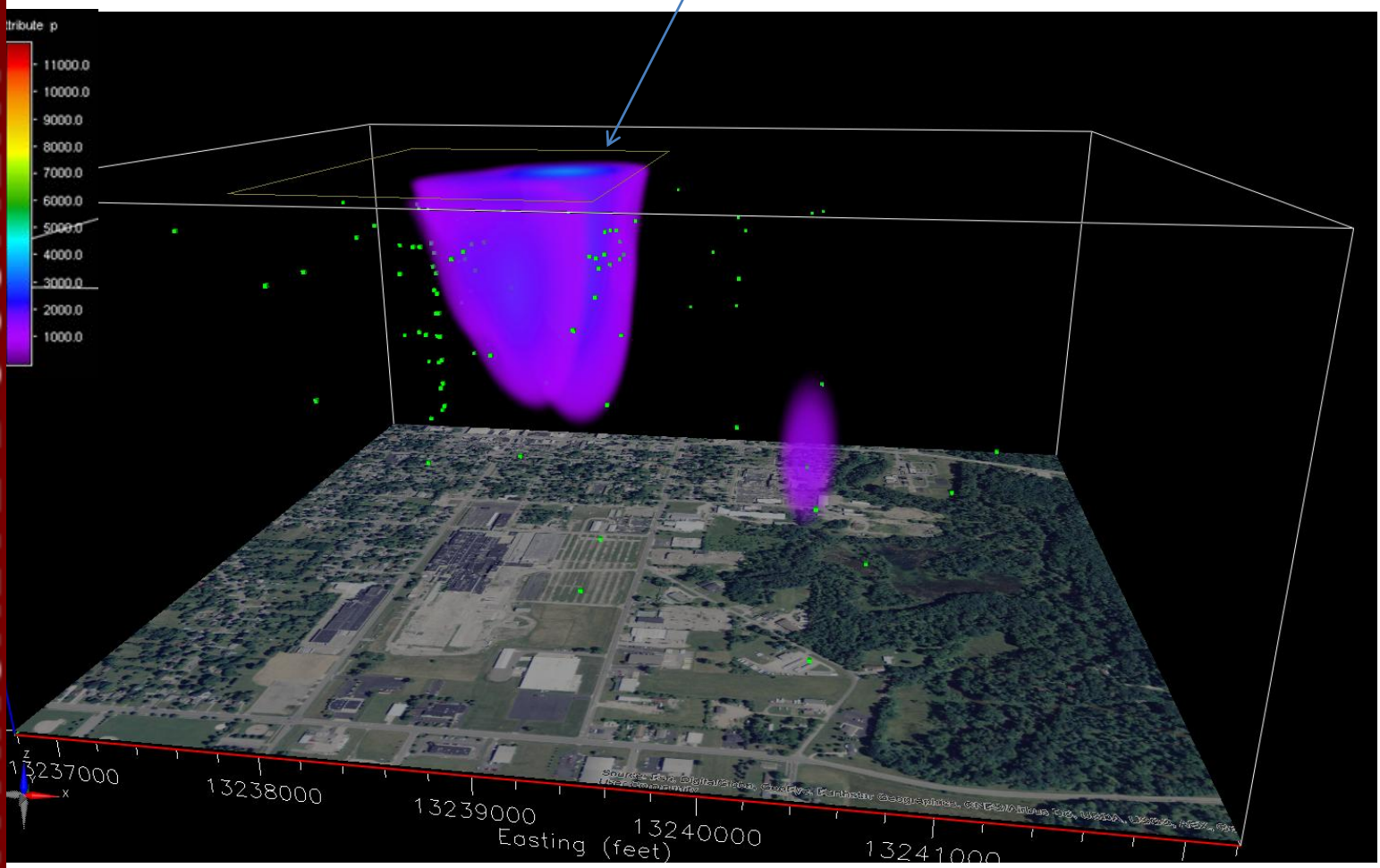


2013

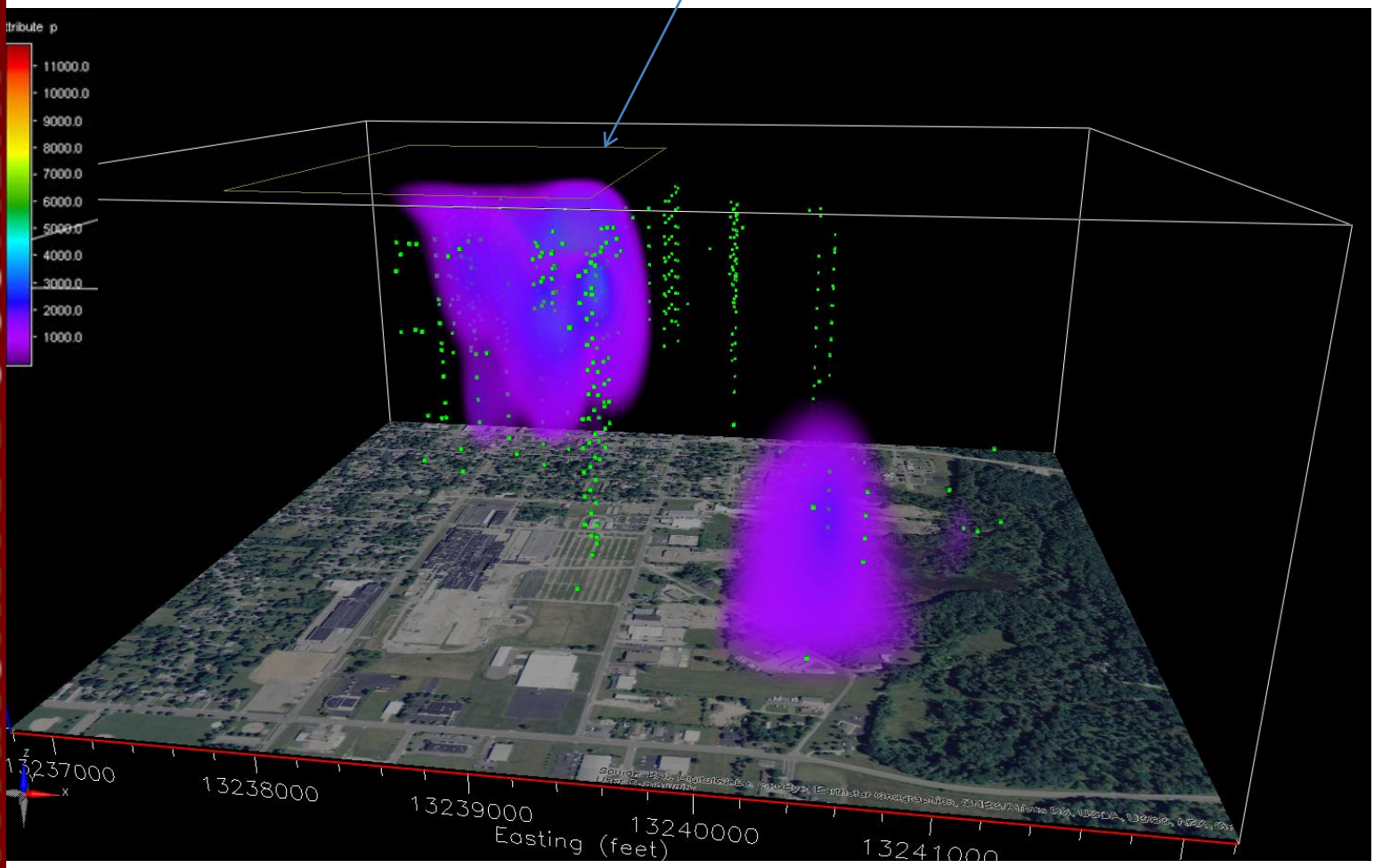
TCE >= 1,000 ppb

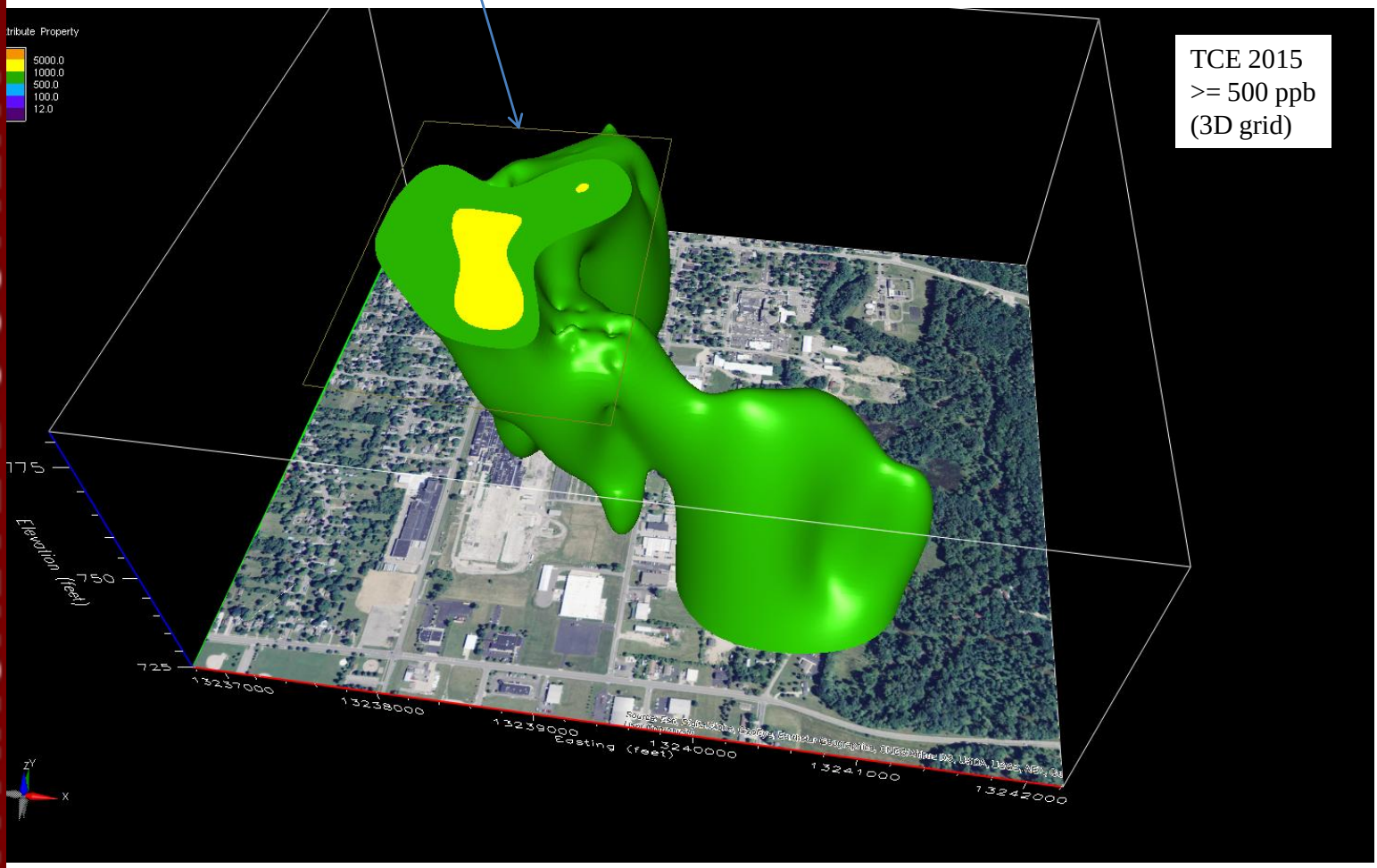


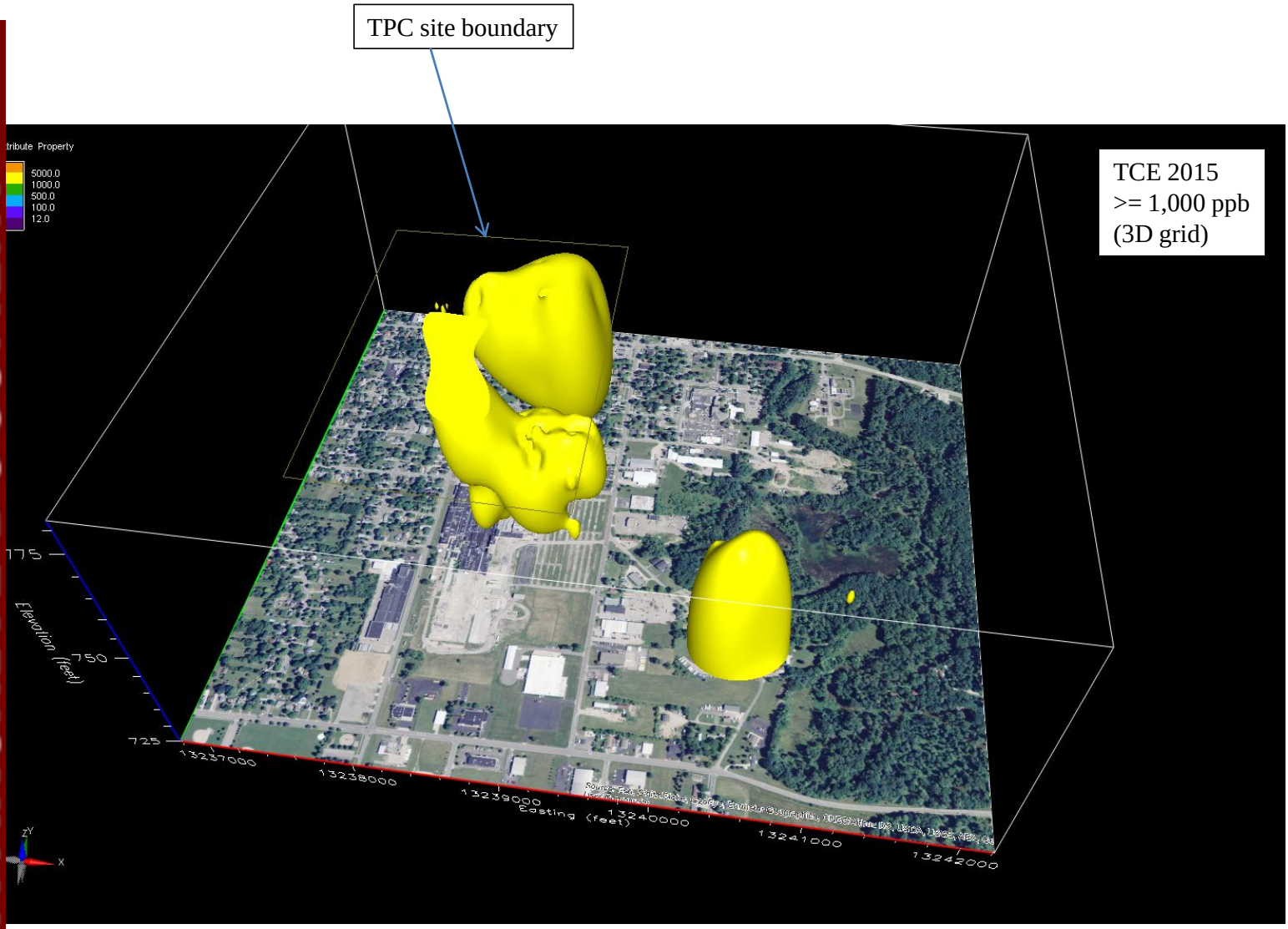
2014
TCE >= 1,000 ppb



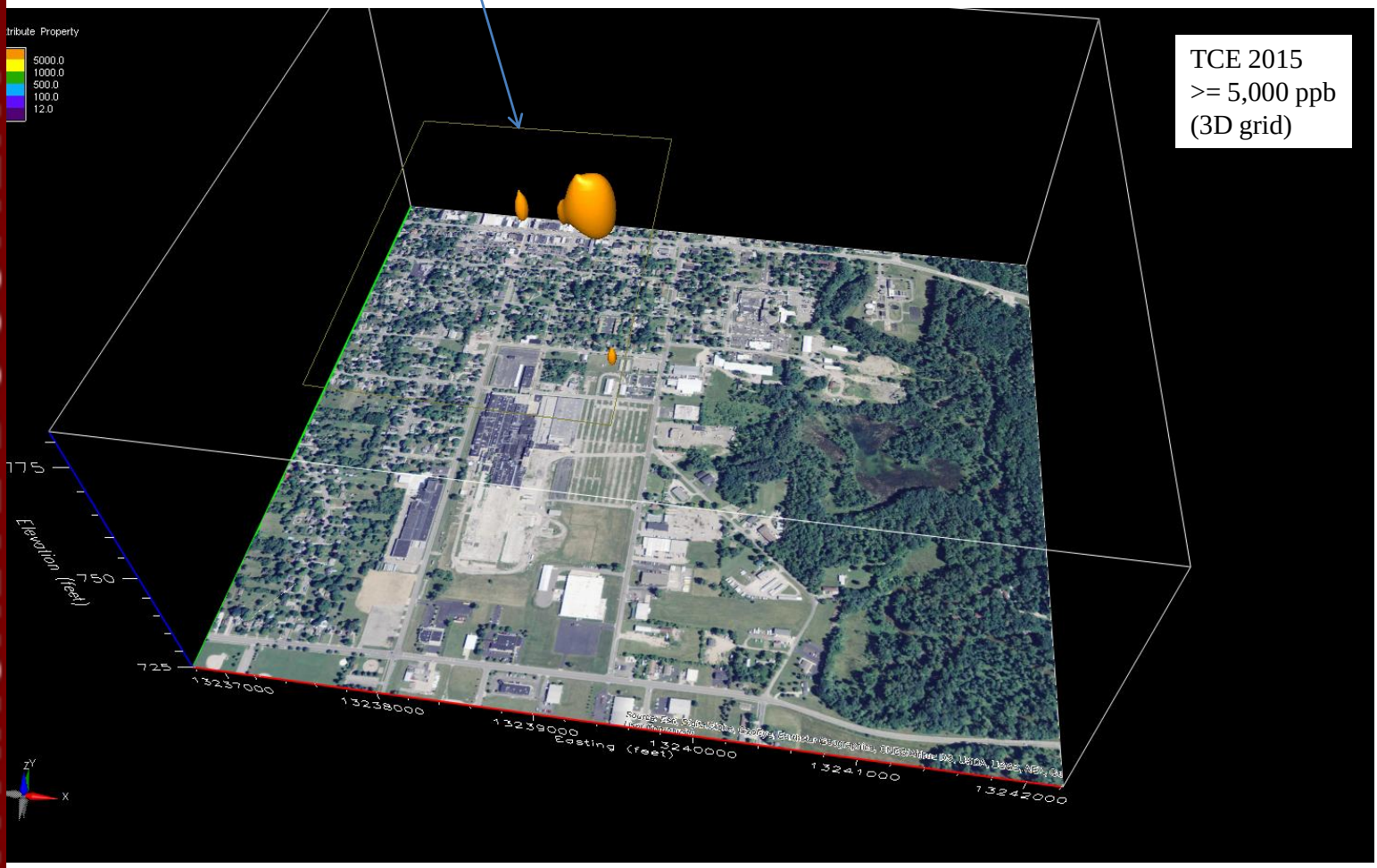
2015
TCE >= 1,000 ppb





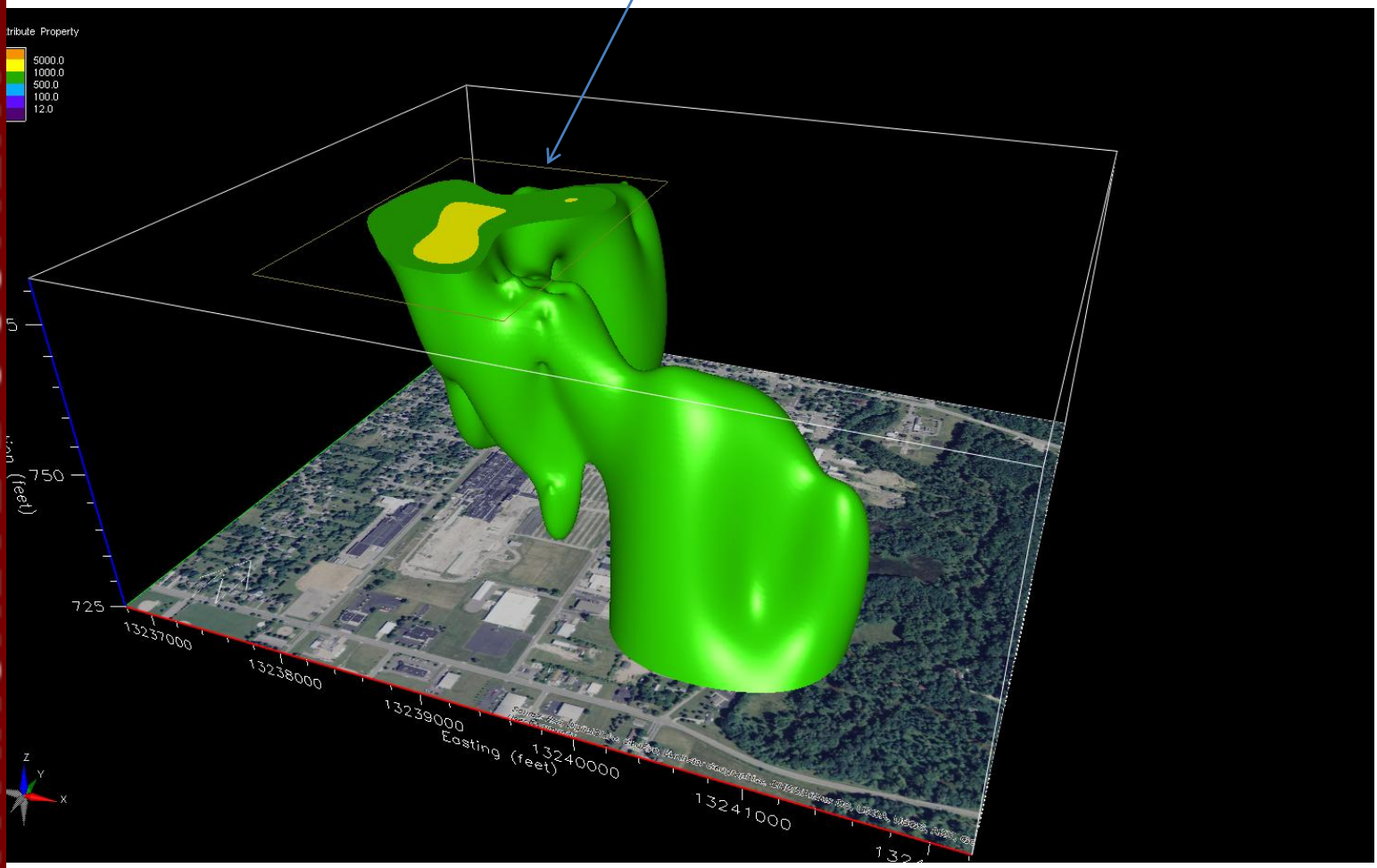


TPC site boundary

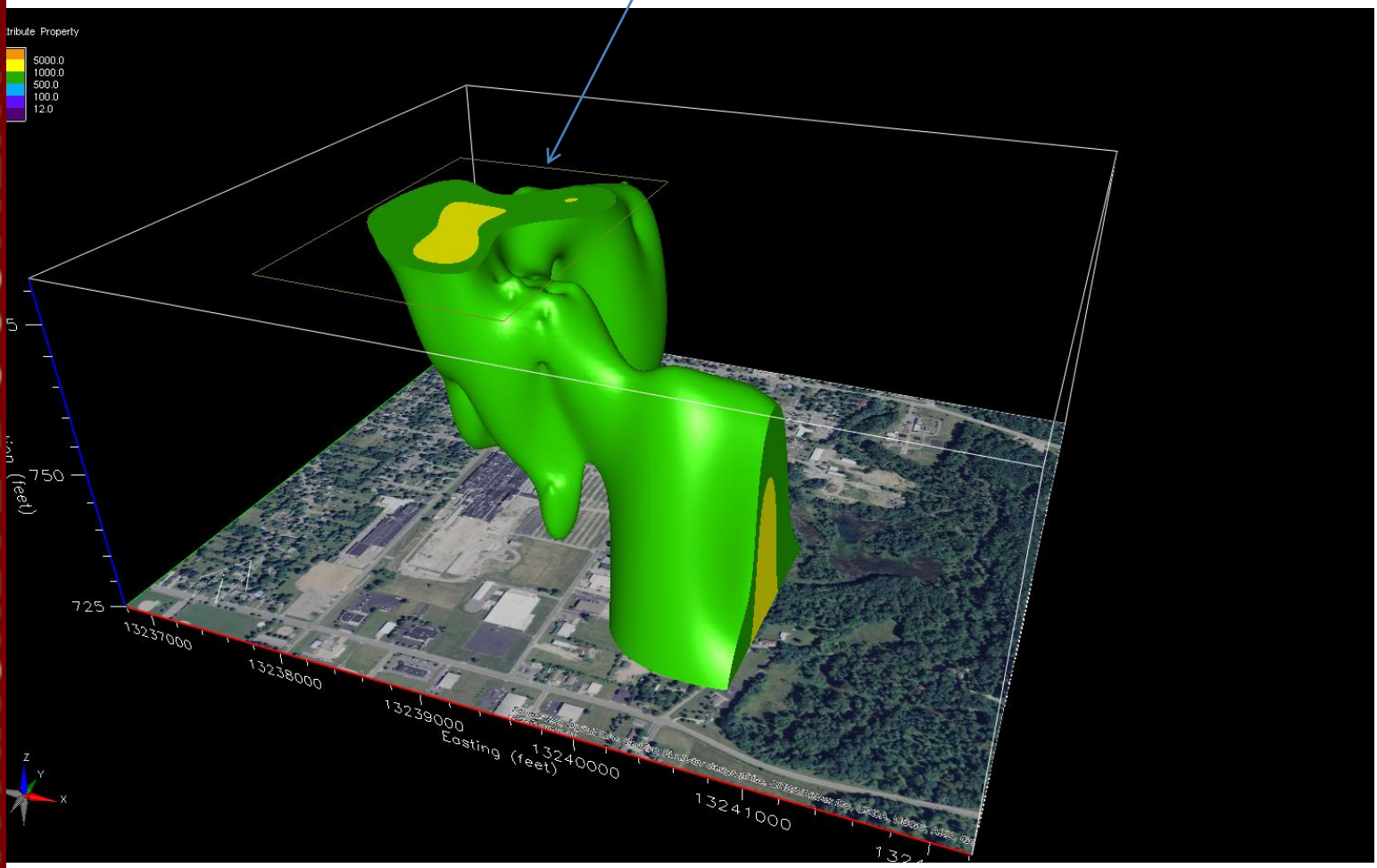


TCE 2015
>= 5,000 ppb
(3D grid)

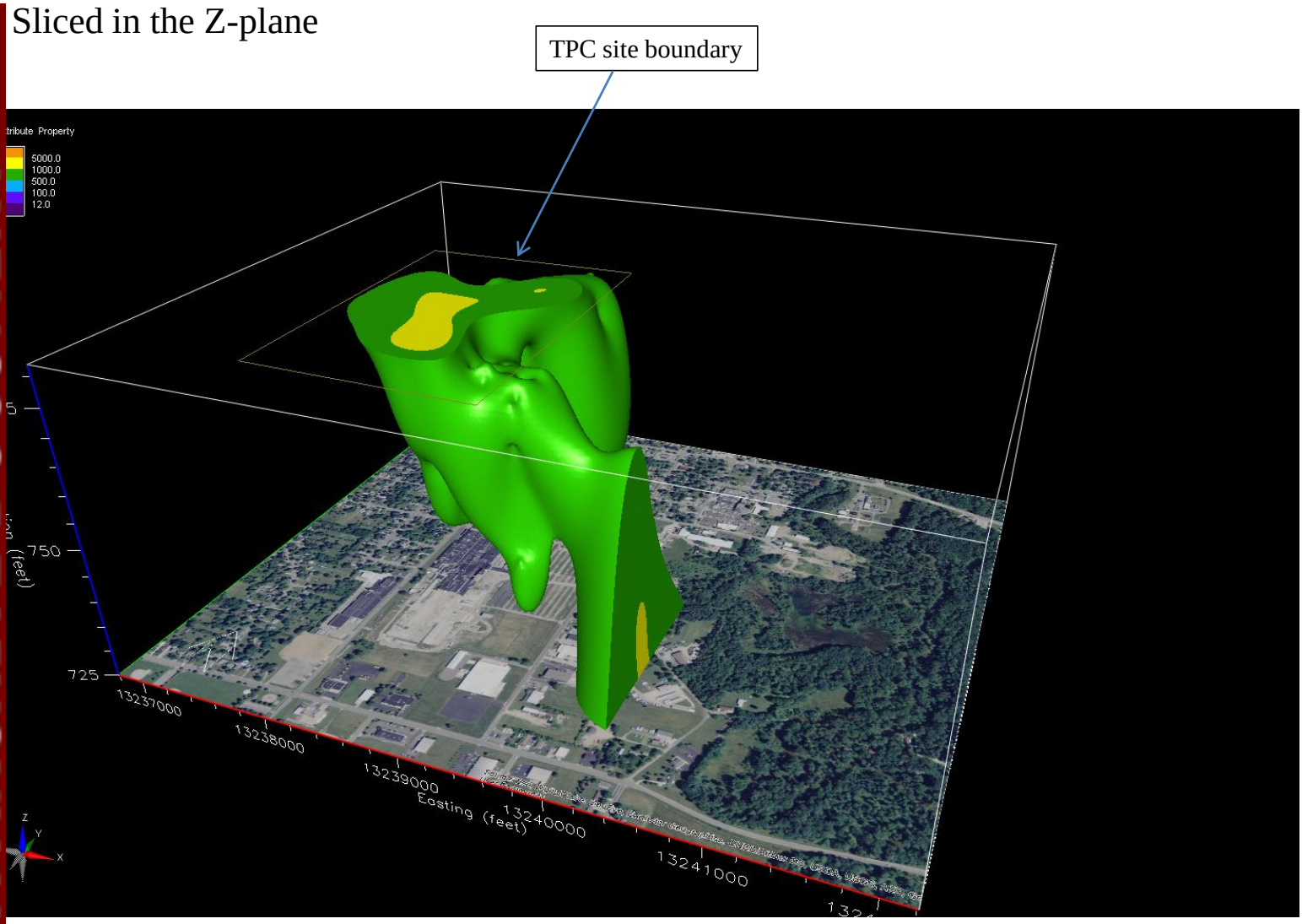
2015 TCE >= 500 ppb
Sliced in the Z-plane



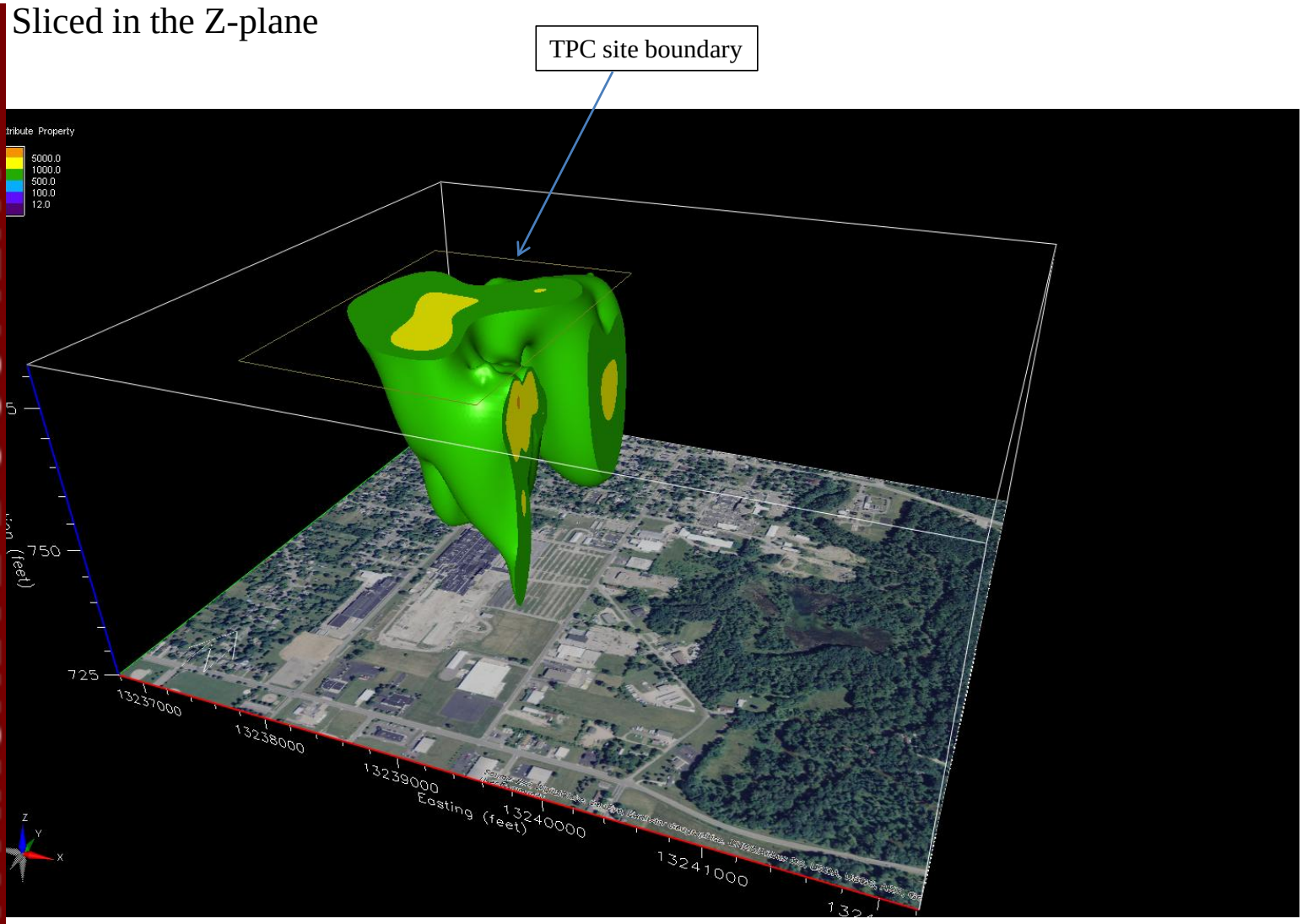
2015 TCE >= 500 ppb
Sliced in the Z-plane



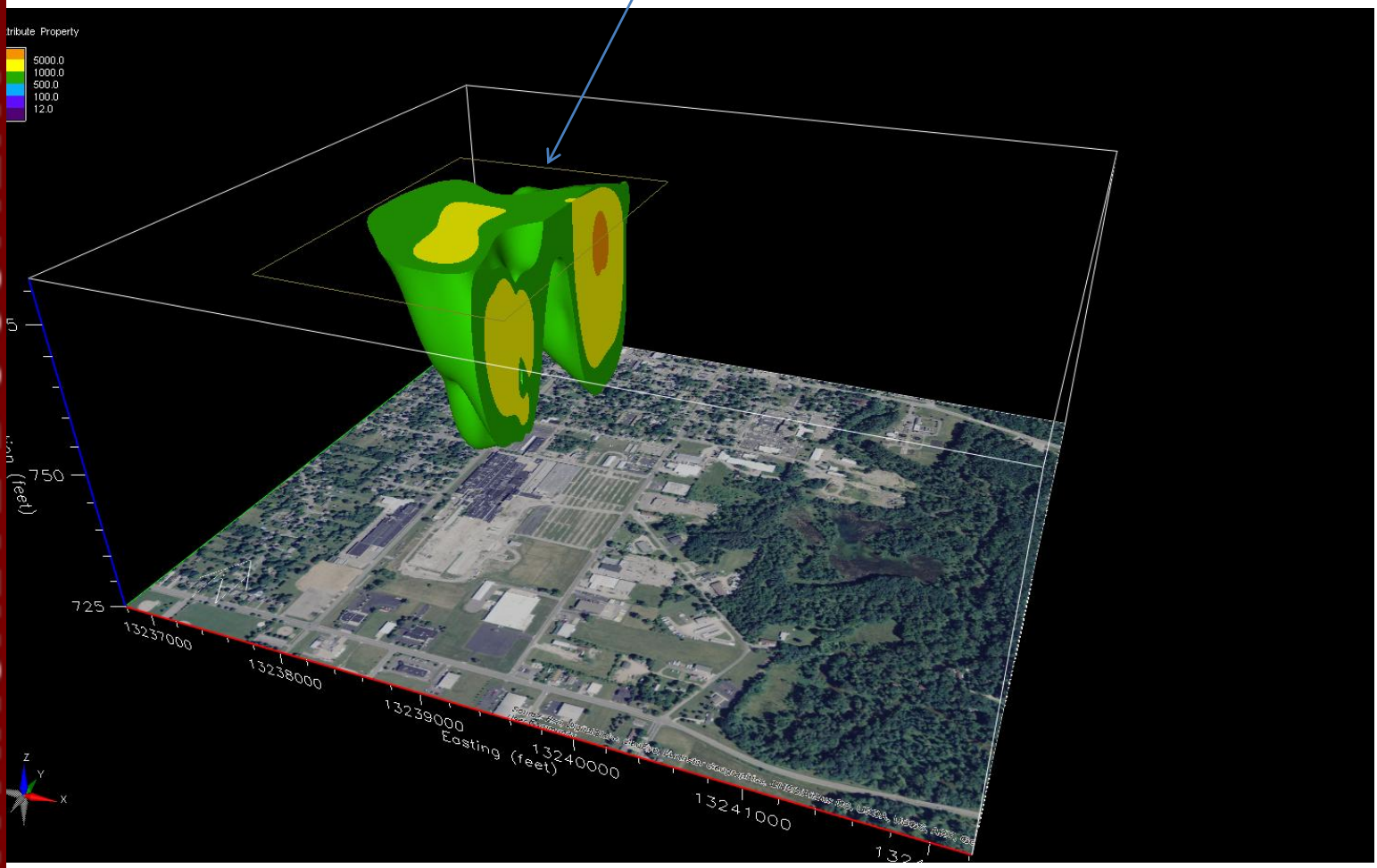
2015 TCE >= 500 ppb
Sliced in the Z-plane



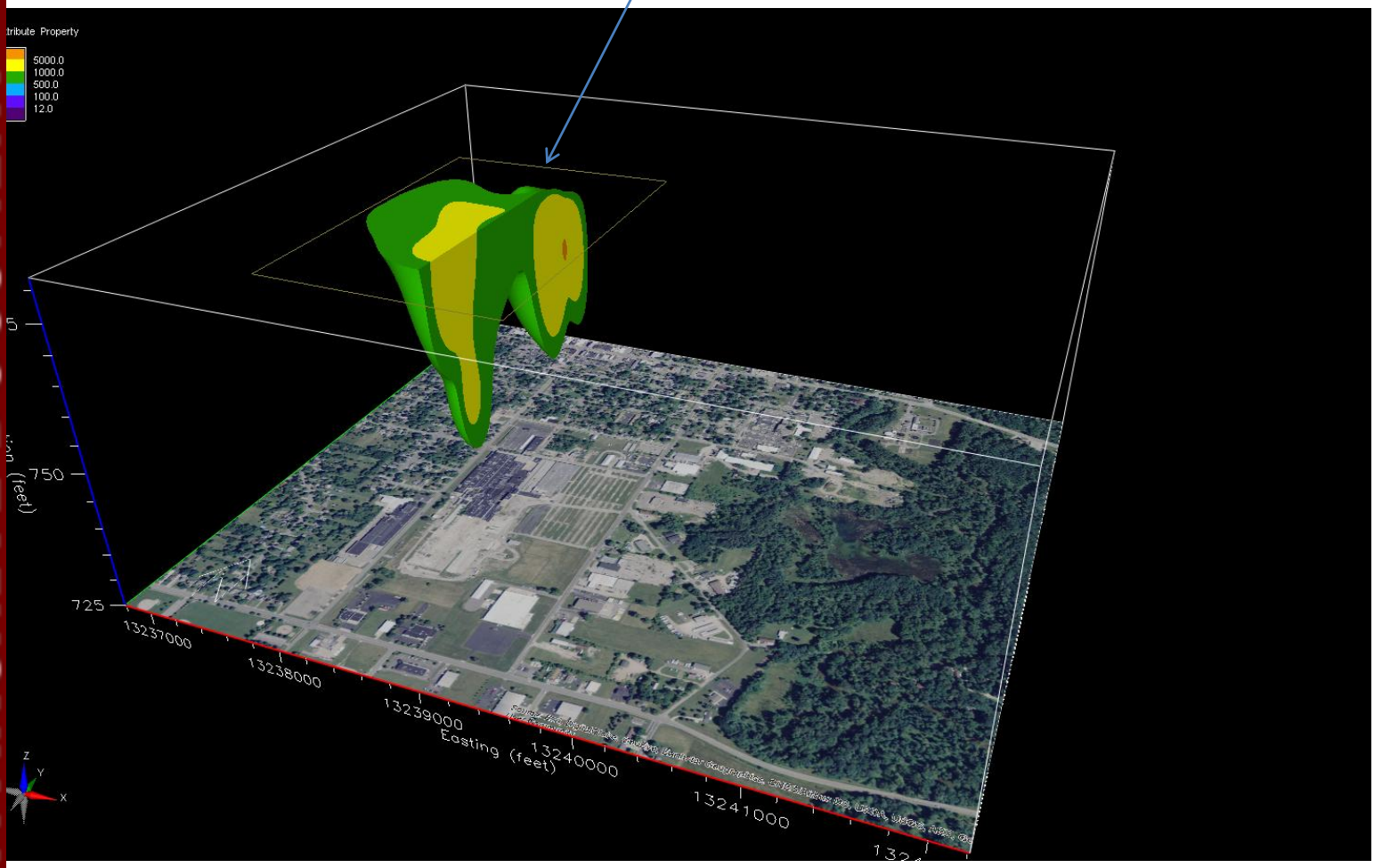
2015 TCE >= 500 ppb
Sliced in the Z-plane



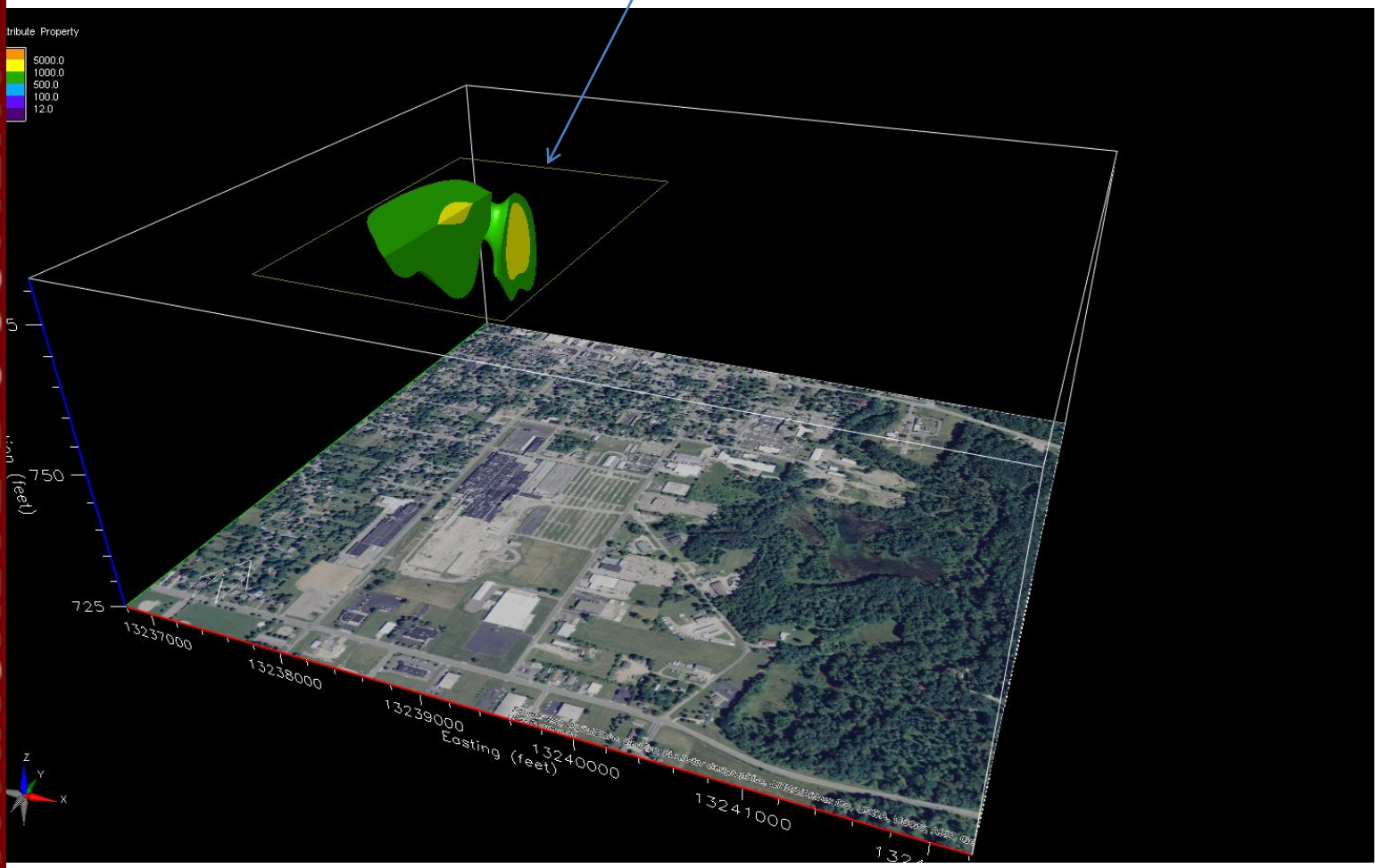
2015 TCE >= 500 ppb
Sliced in the Z-plane



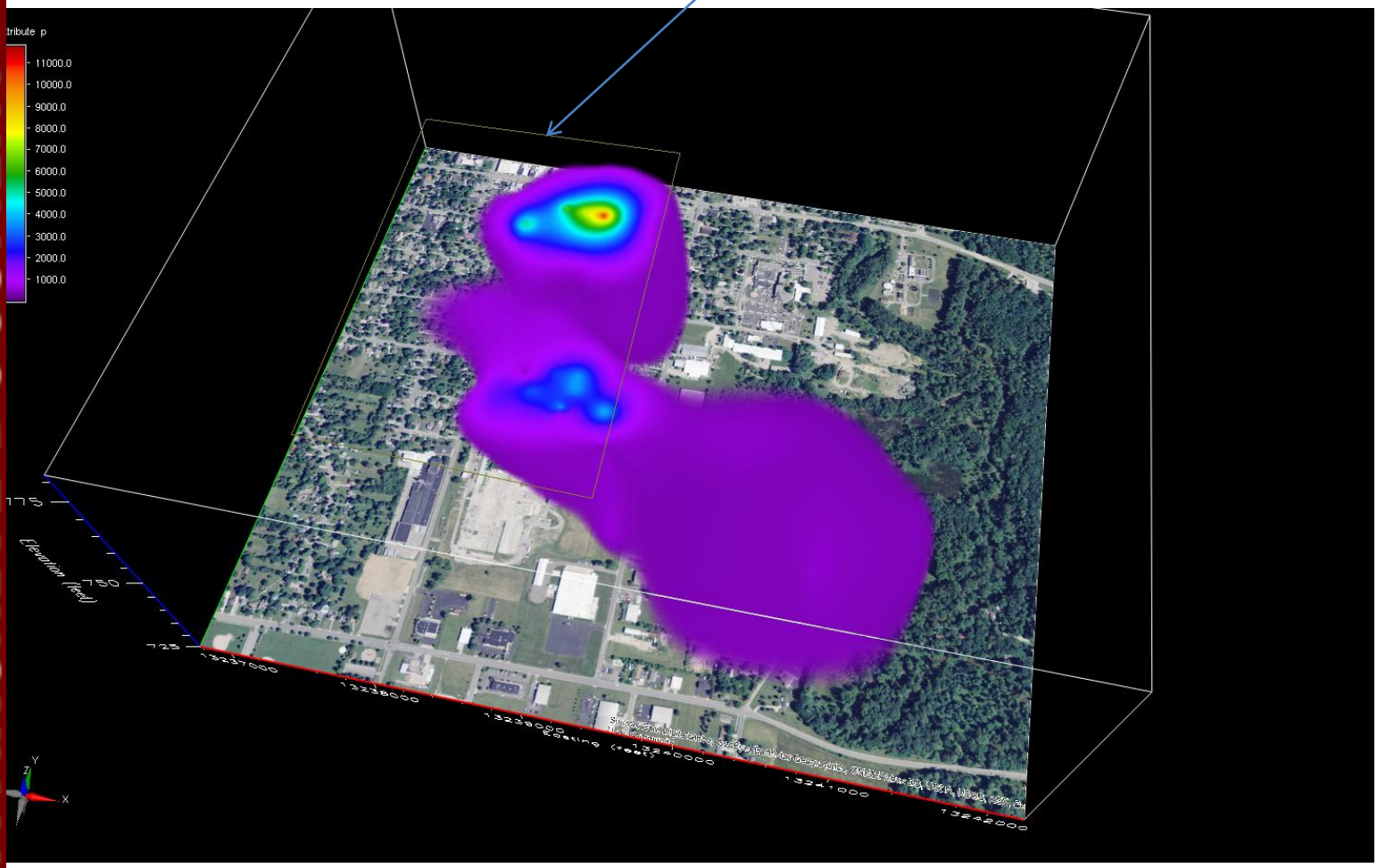
2015 TCE >= 500 ppb
Sliced in the Z-plane



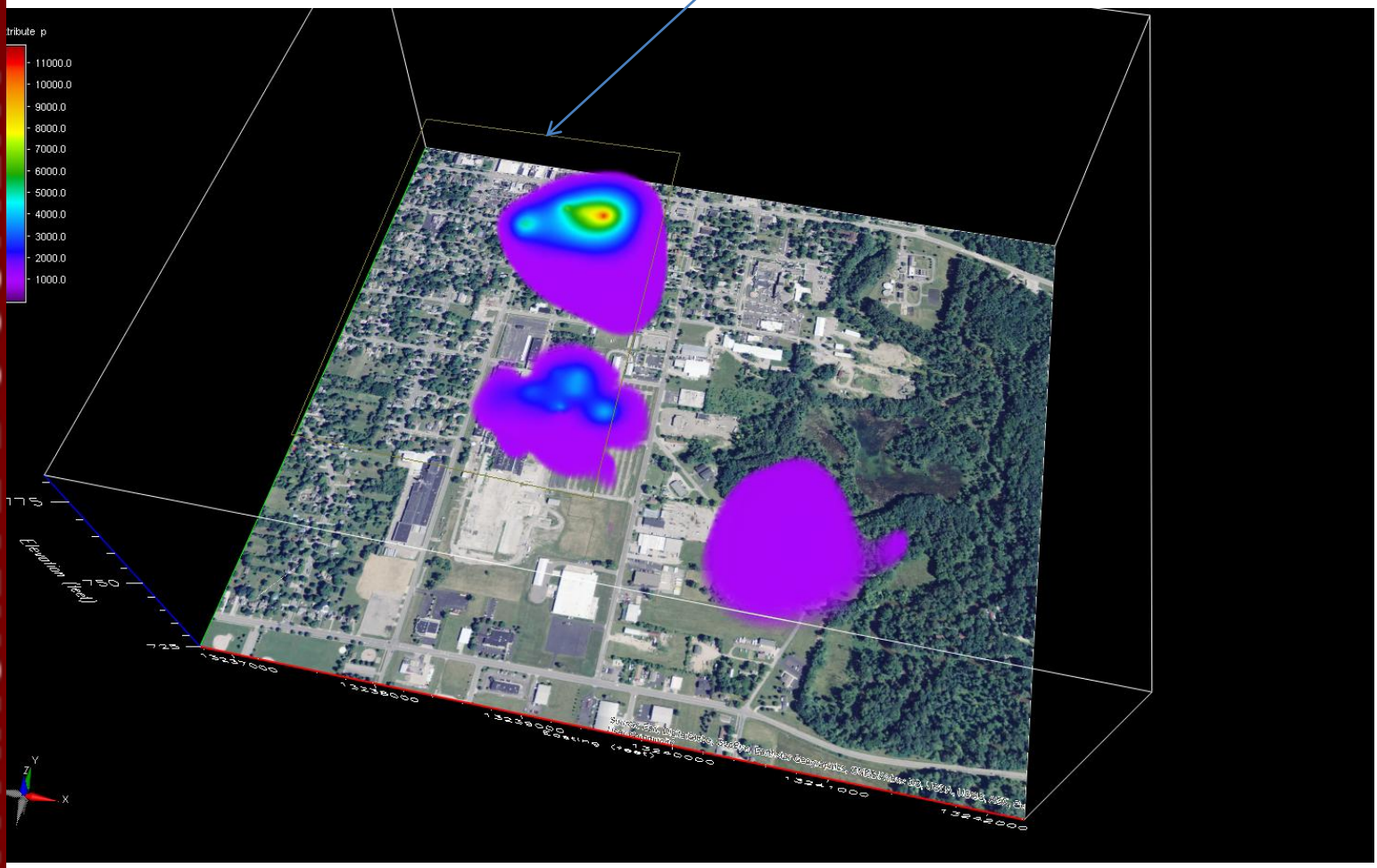
2015 TCE >= 500 ppb
Sliced in the Z-plane



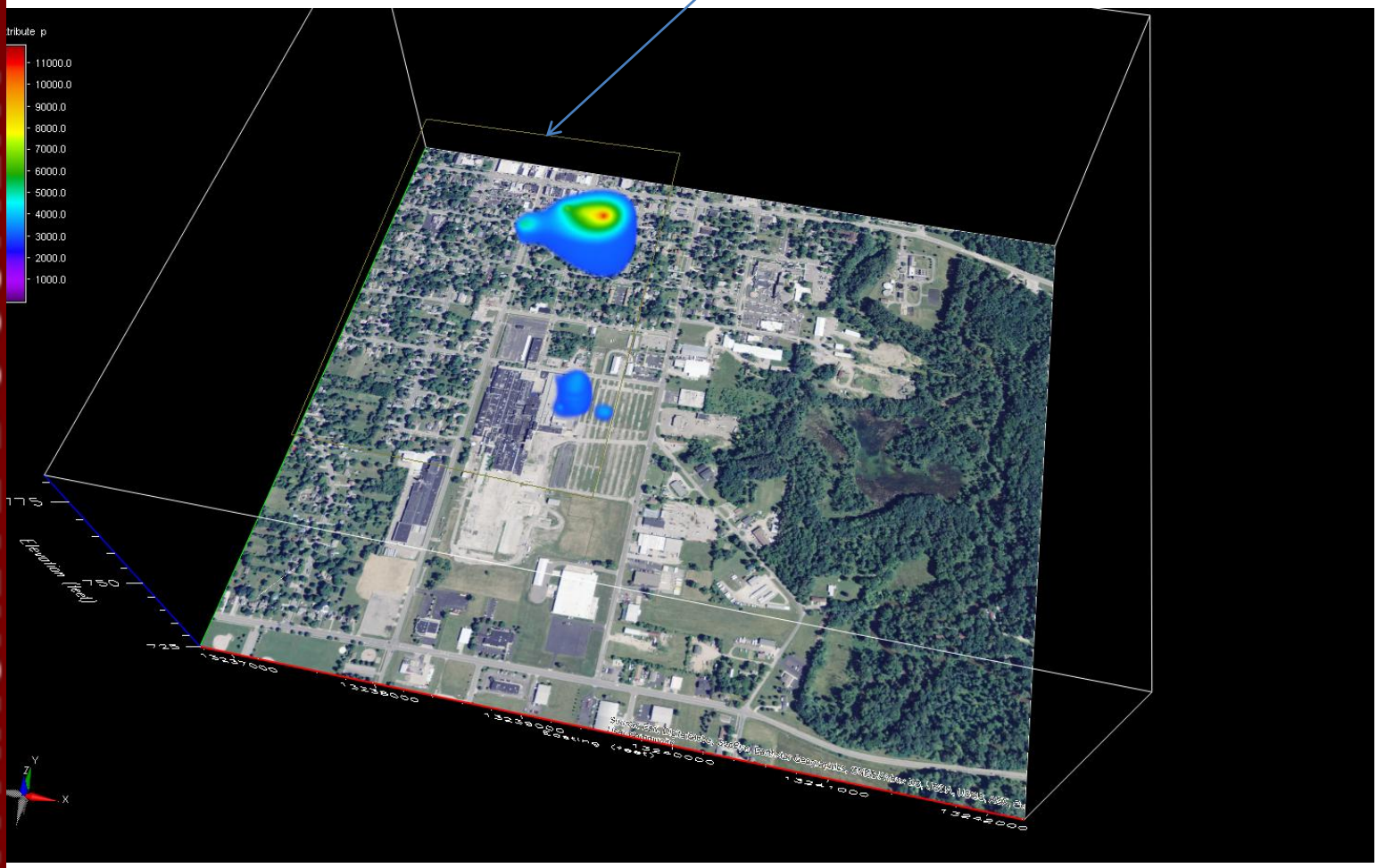
2015 TCE >= 500 ppb
Sliced at an elevation of 770 feet



2015 TCE >= 1,000 ppb
Sliced at an elevation of 770 feet



2015 TCE >= 3,000 ppb
Sliced at an elevation of 770 feet



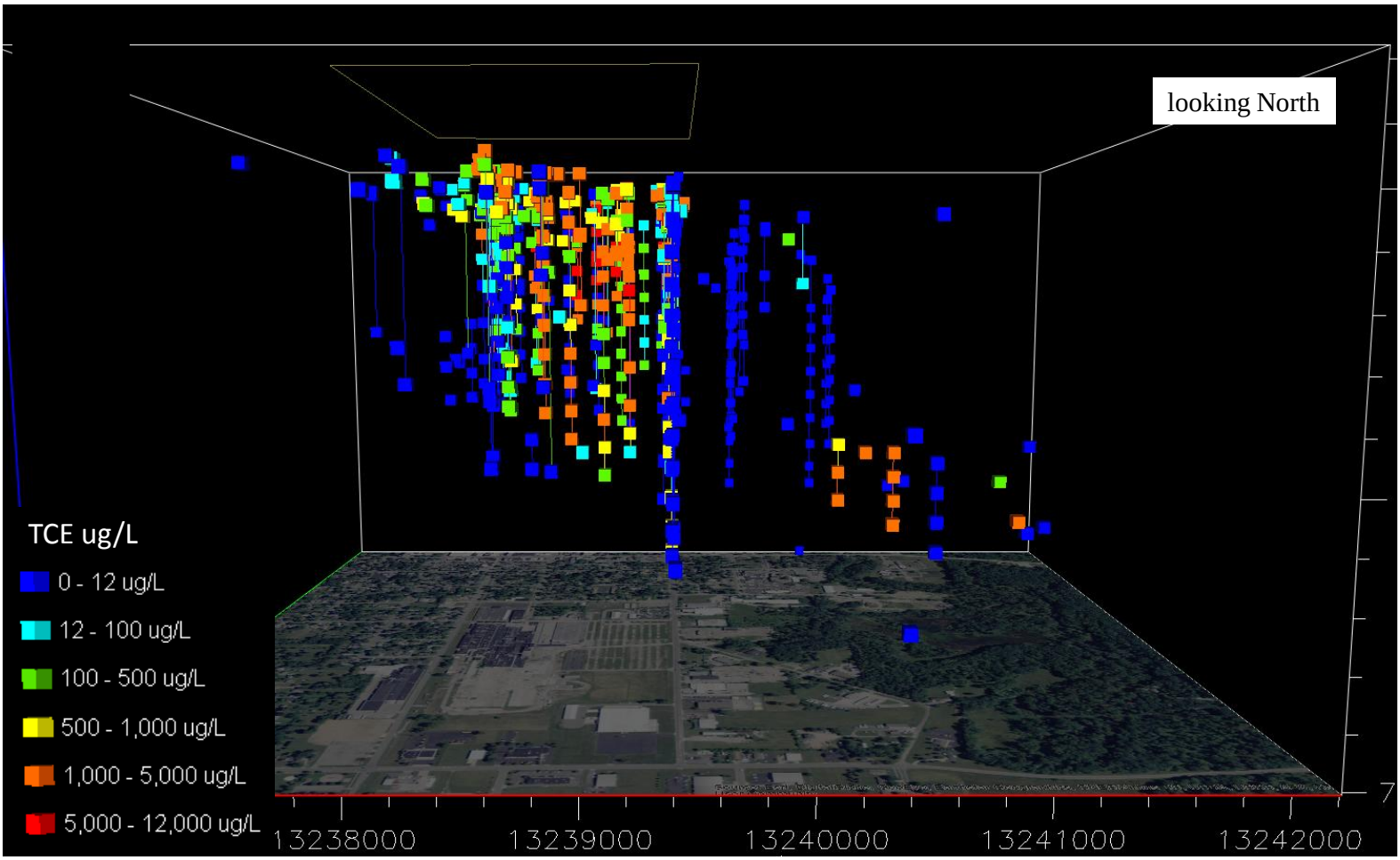
Appendix C

Max TCE (2008-2015)

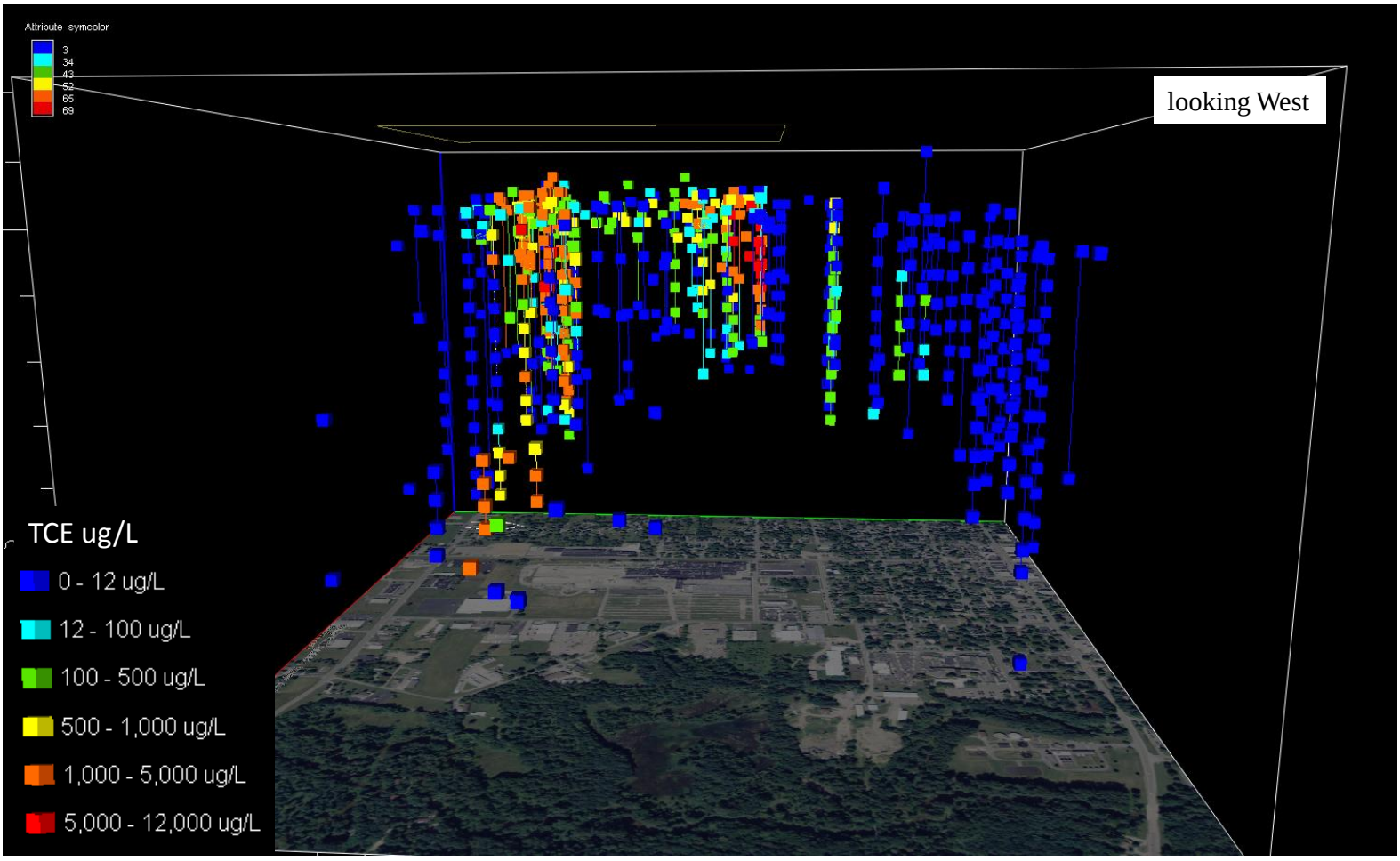
The TCE files used for these analyses are the maximum TCE by X, Y, Z for any year (2008-2015). Where TCE is Trichloroethene. The source of these data are an MS Access database received from TRC Solutions. That file was named "DB_Tecumseh_v2.accdb". That file was queried and exported as an Excel file. This Excel file was modified in the SAS software in order to be used in earthVision (Dynamic Graphics Incorporated).

The below output is from the earthVision software. Pages three through six contain postings of the maximum TCE values (X,Y,Z) by year. The remaining pages show interpolations (3D grids) of the maximum TCE values for 2015.

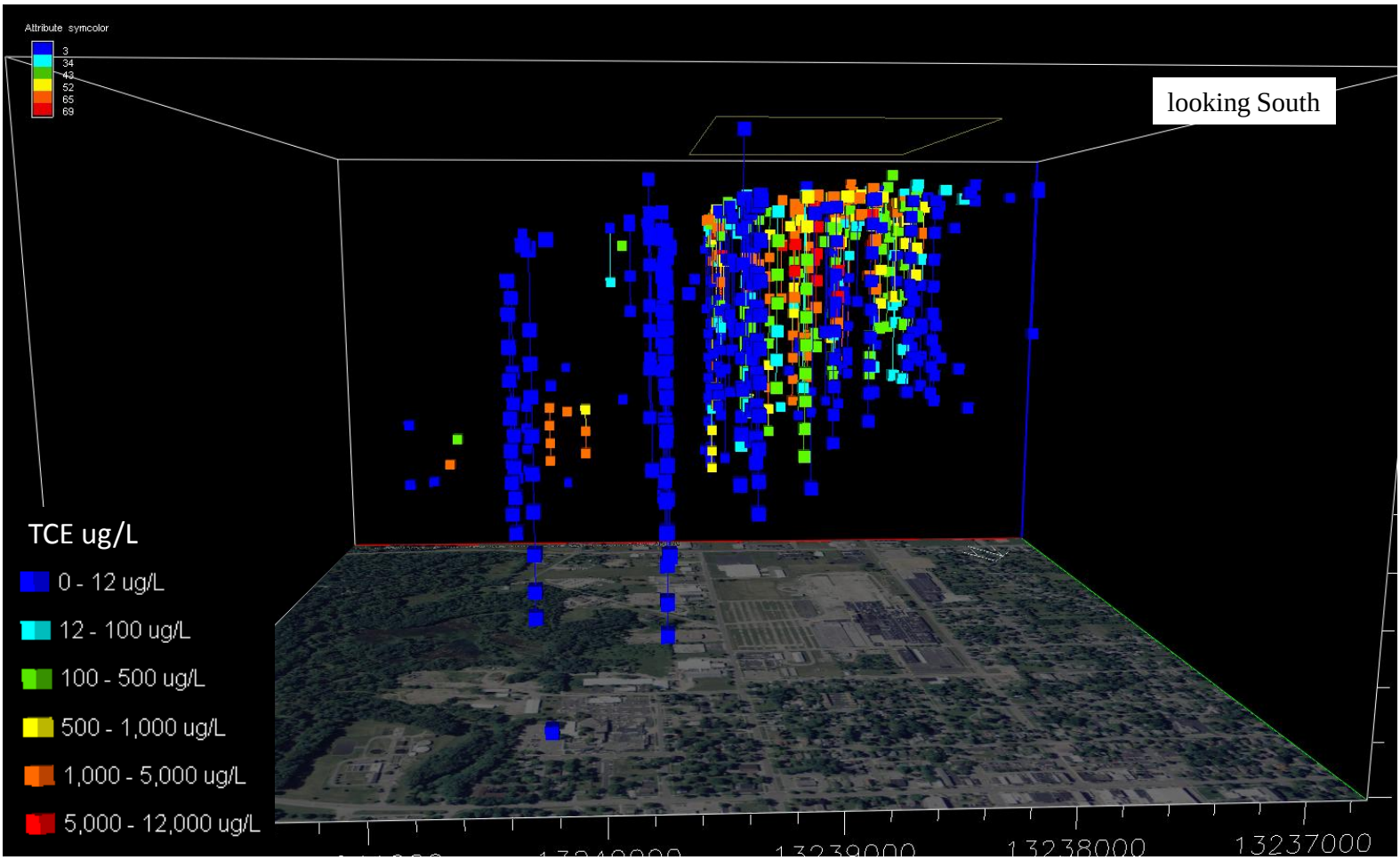
Maximum TCE (ug/L) (2008-2015)



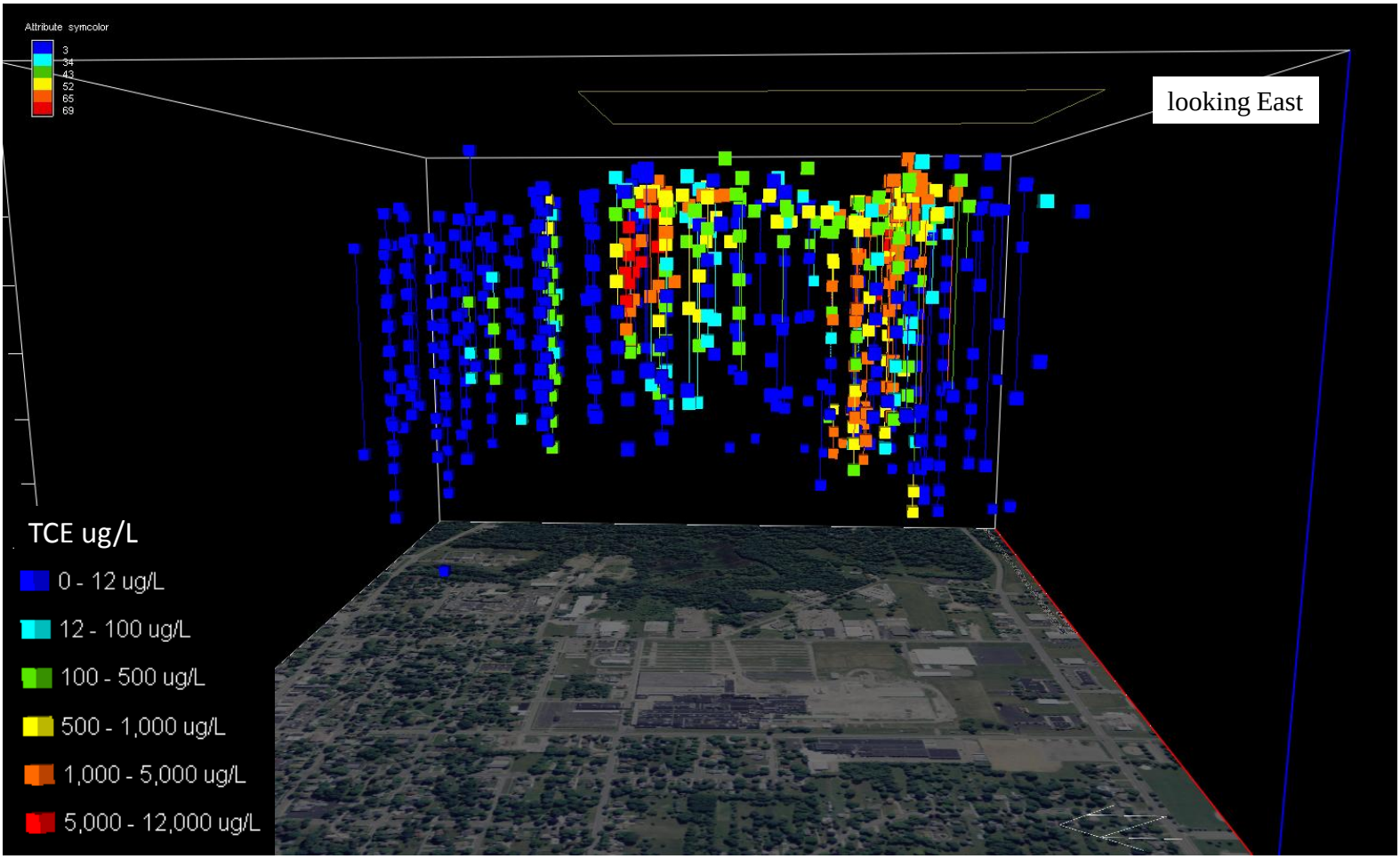
Maximum TCE (ug/L) (2008-2015)



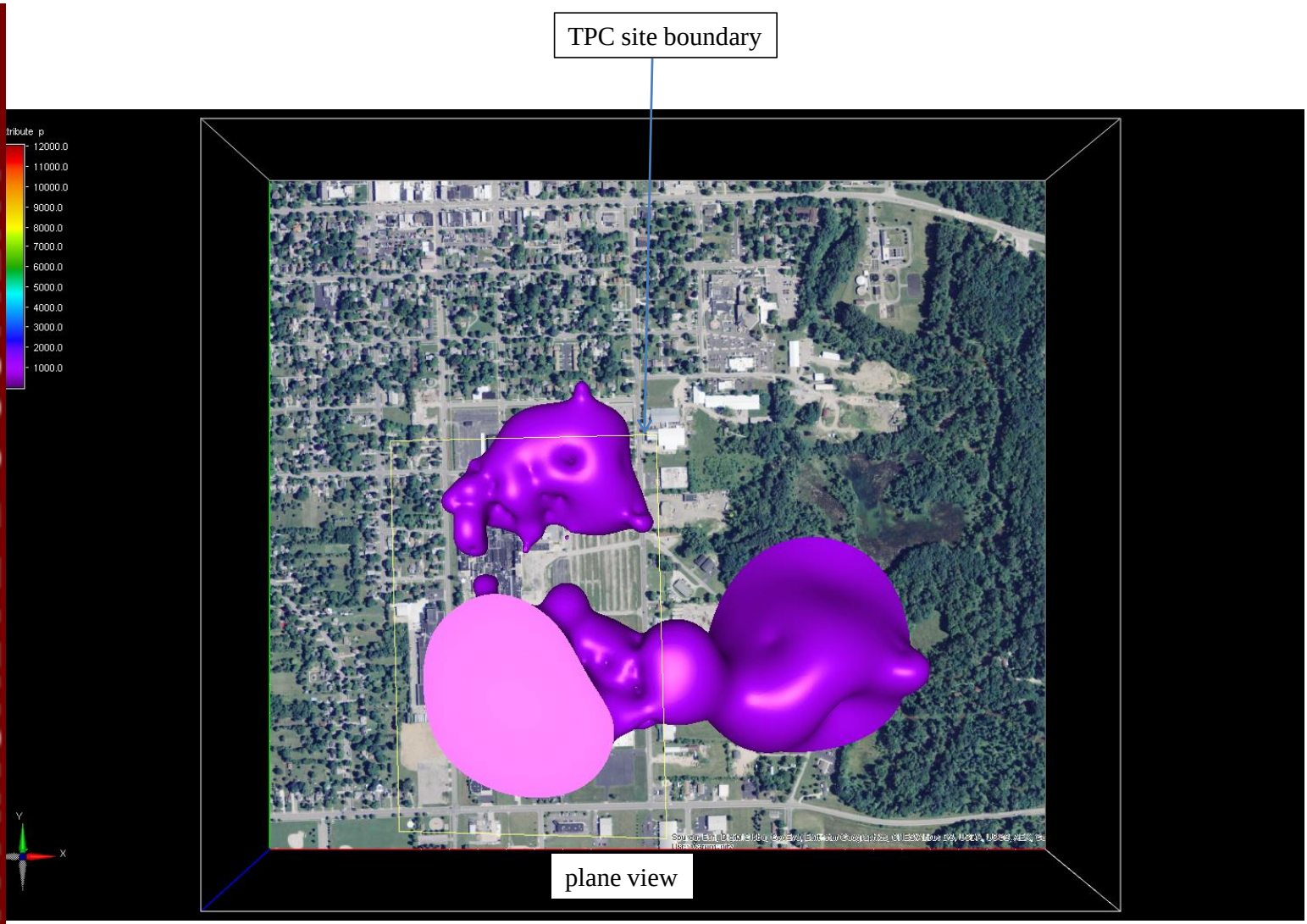
Maximum TCE (ug/L) (2008-2015)



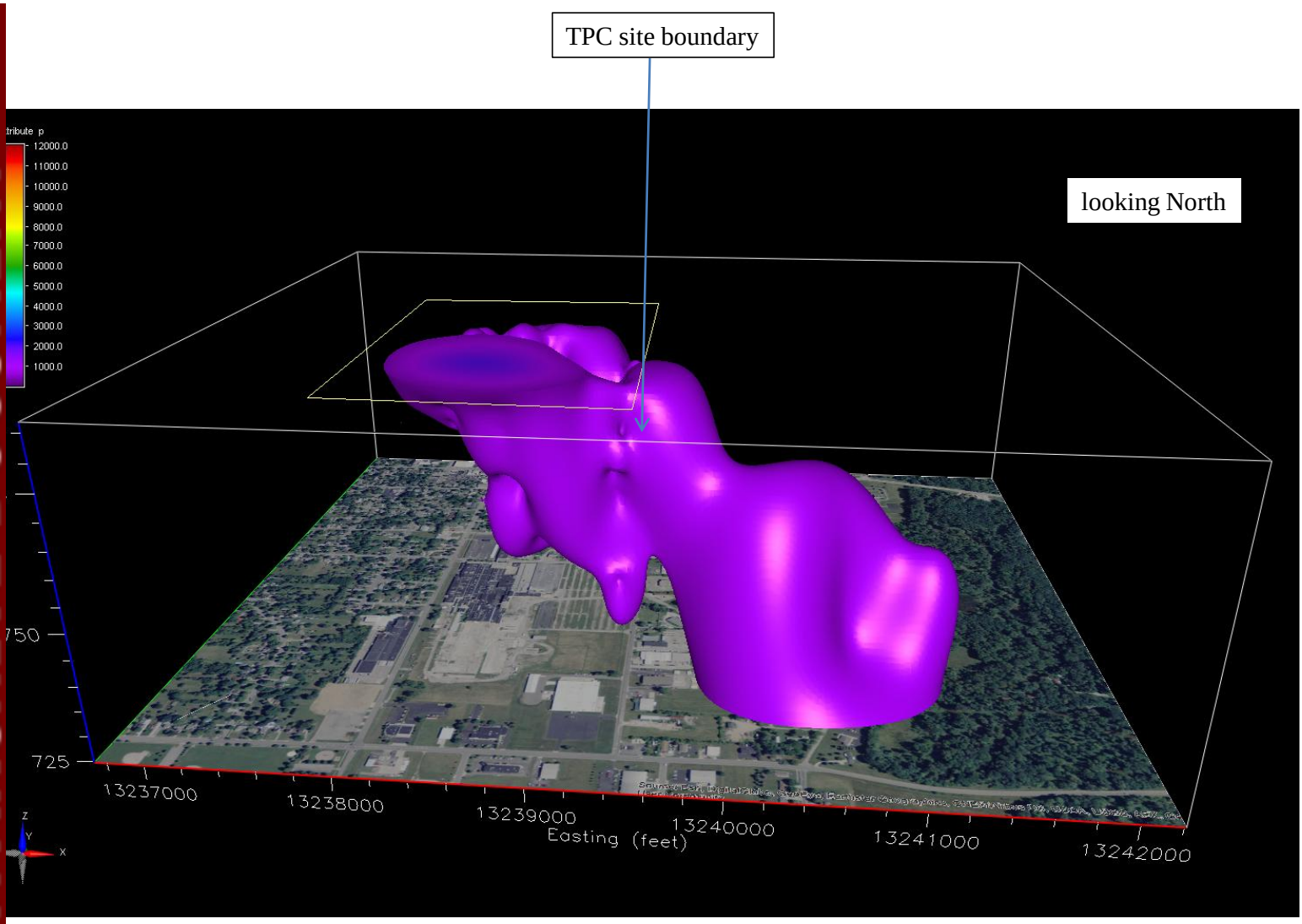
Maximum TCE (ug/L) (2008-2015)



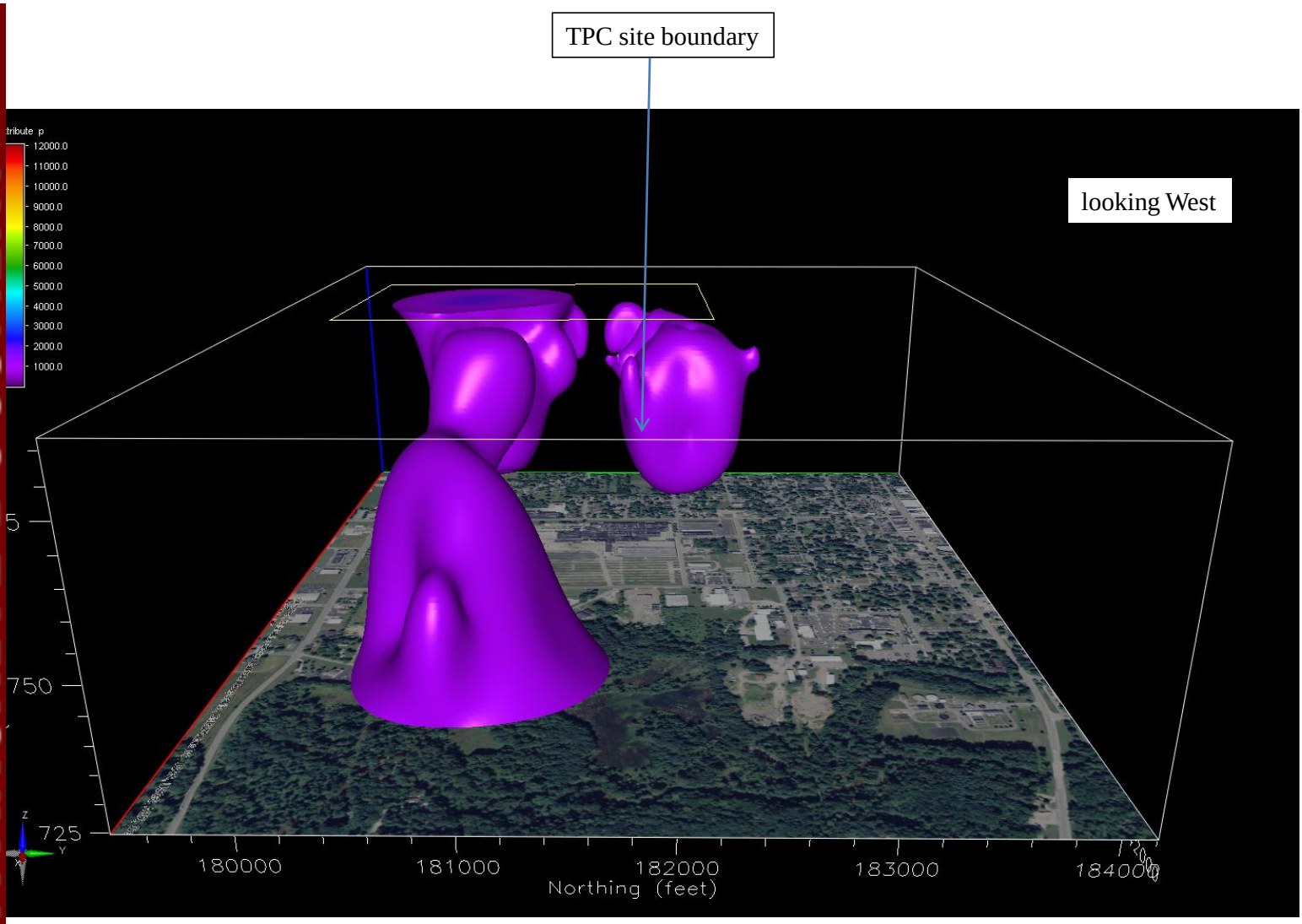
Maximum TCE (2008-2015) >= 500 ppb



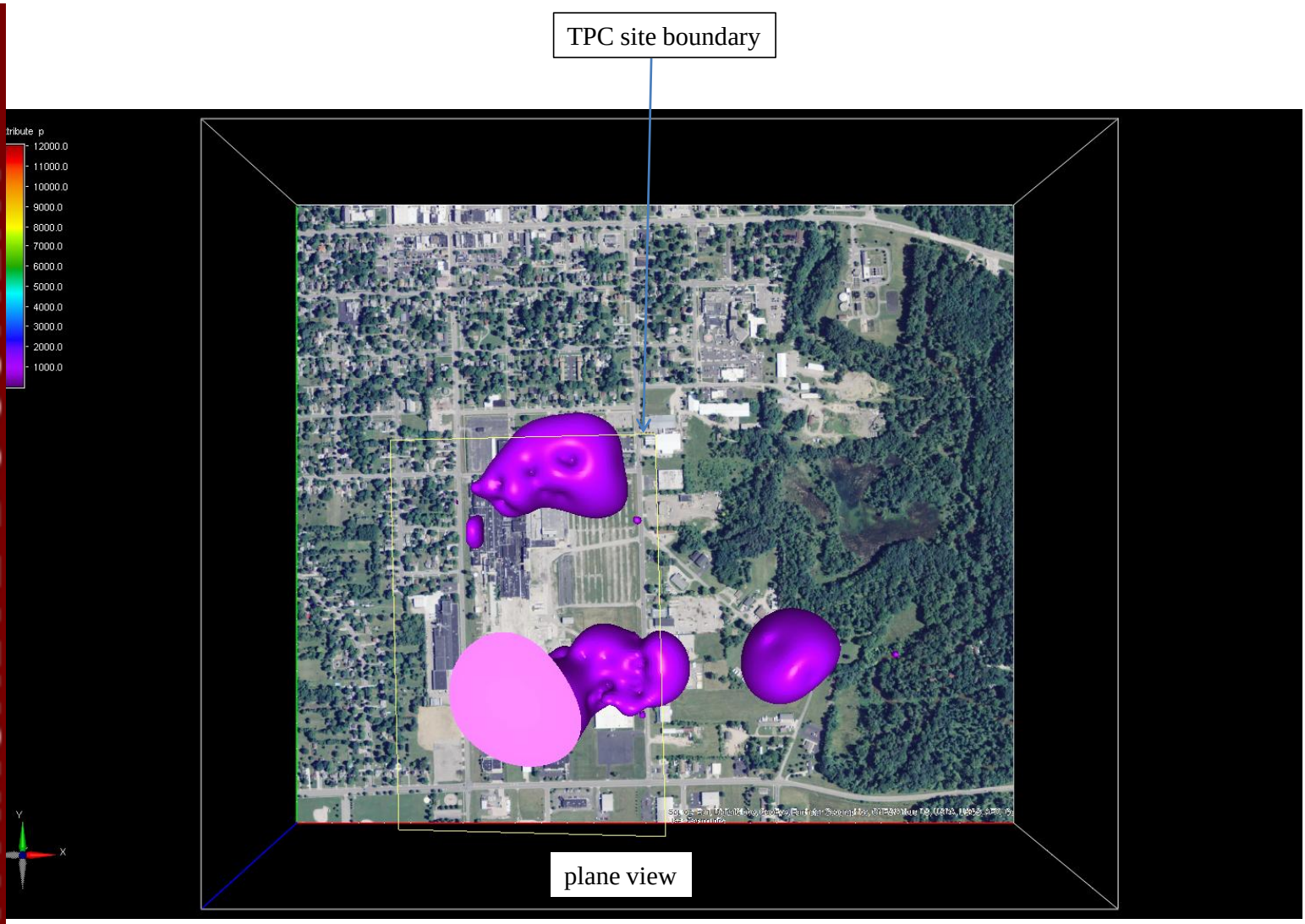
Maximum TCE (2008-2015) TCE >= 500 ppb



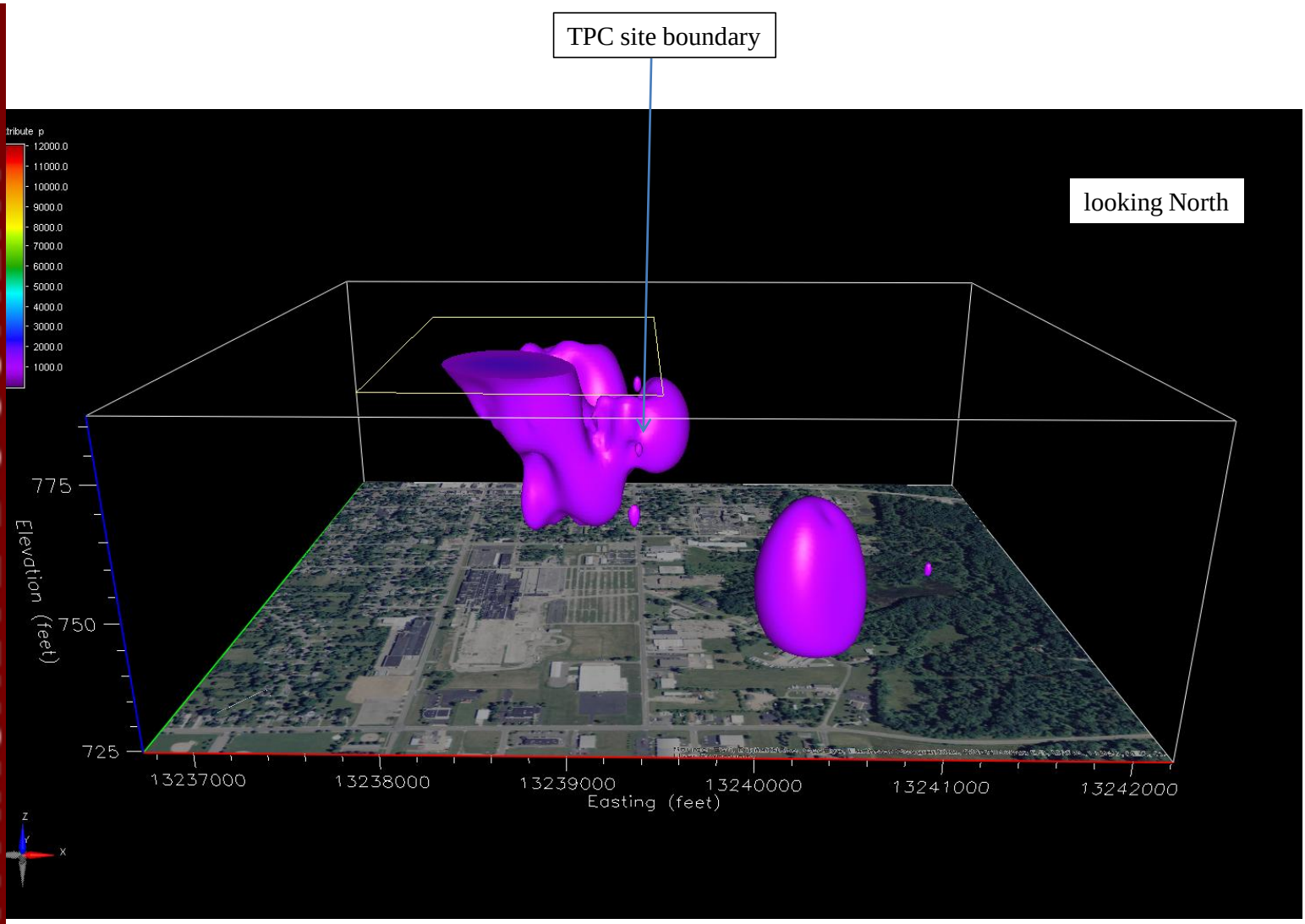
Maximum TCE (2008-2015) TCE >= 500 ppb



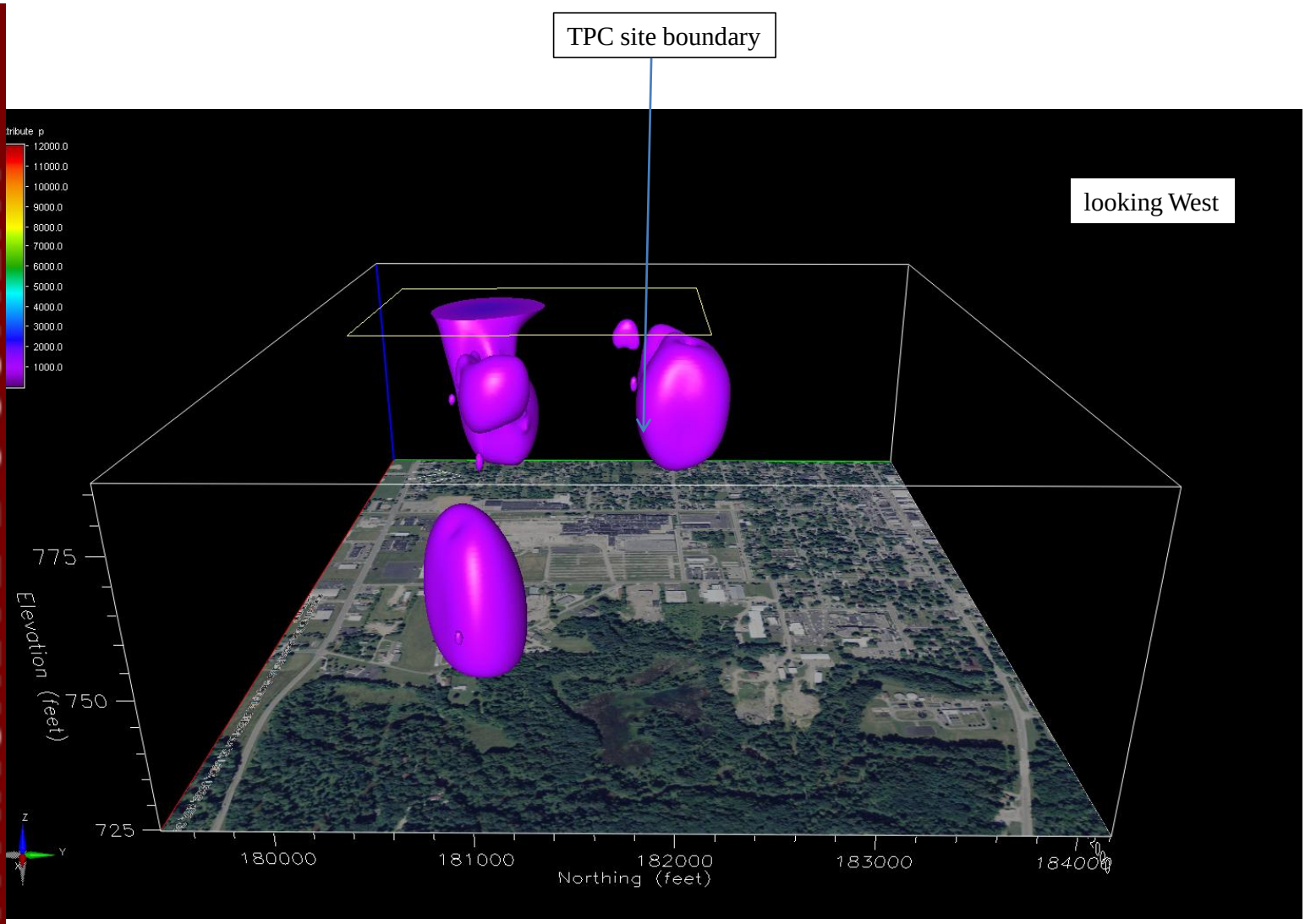
Maximum TCE (2008-2015) TCE >= 1,000 ppb



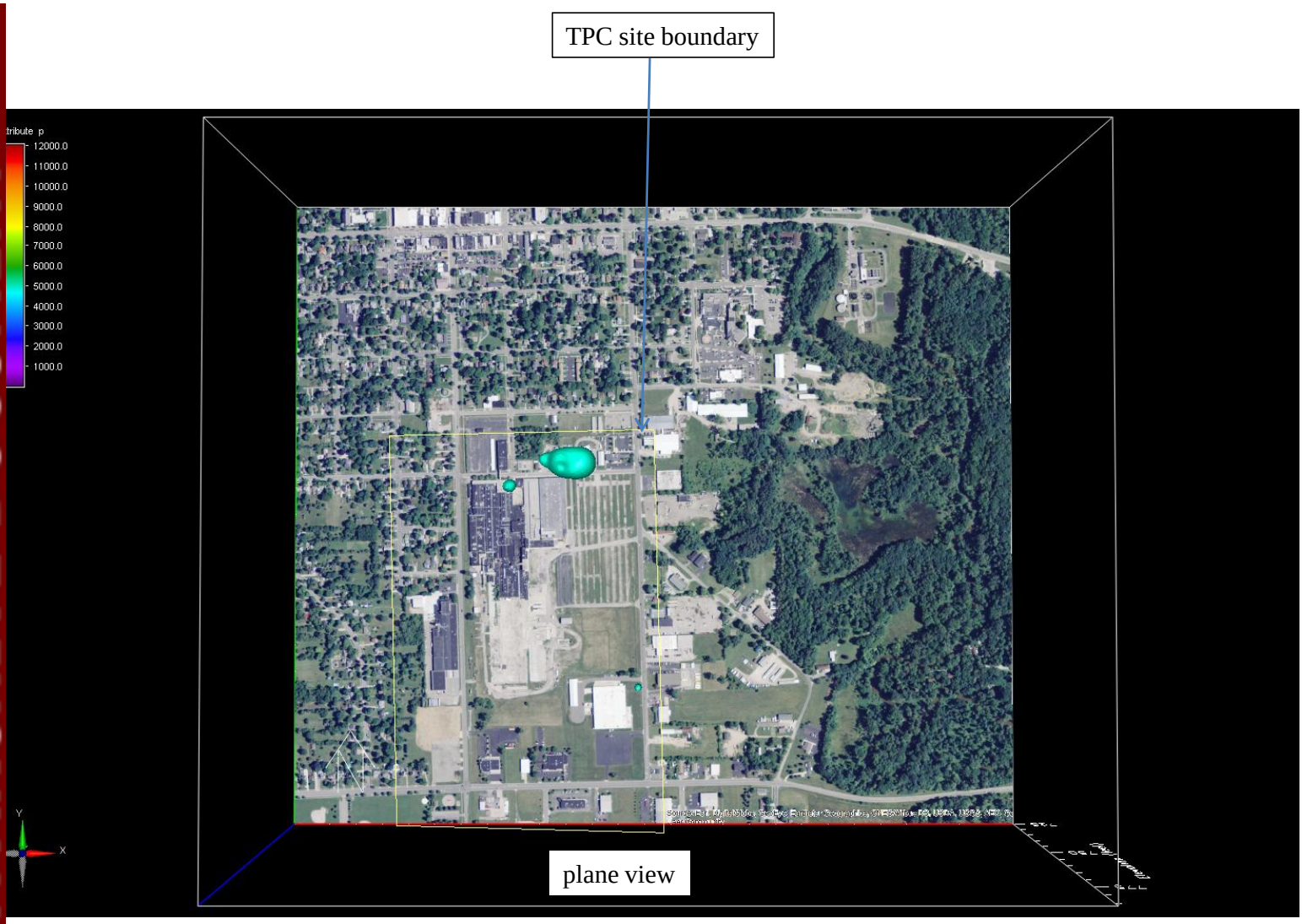
Maximum TCE (2008-2015) TCE >= 1,000 ppb



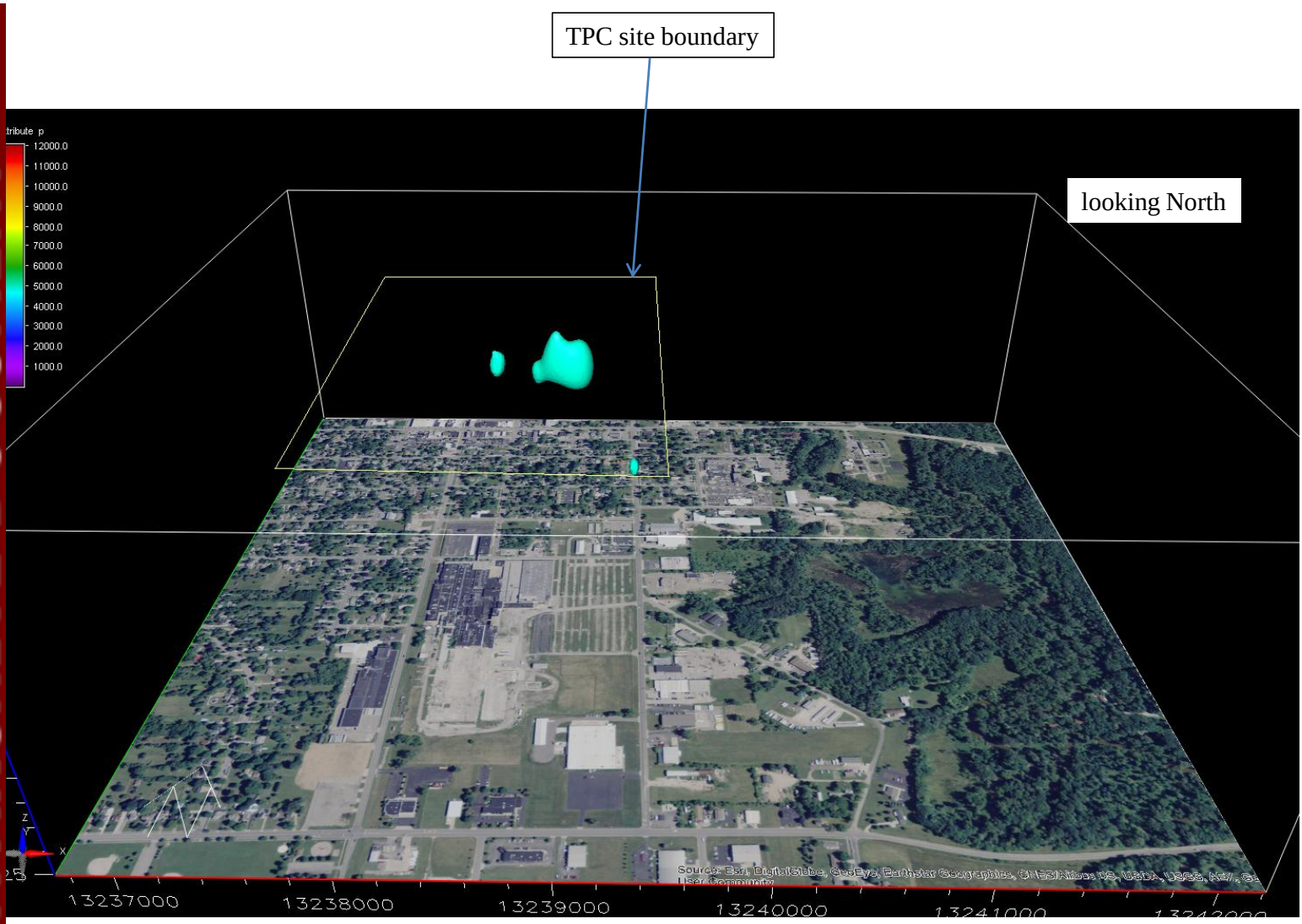
Maximum TCE (2008-2015) TCE >= 1,000 ppb



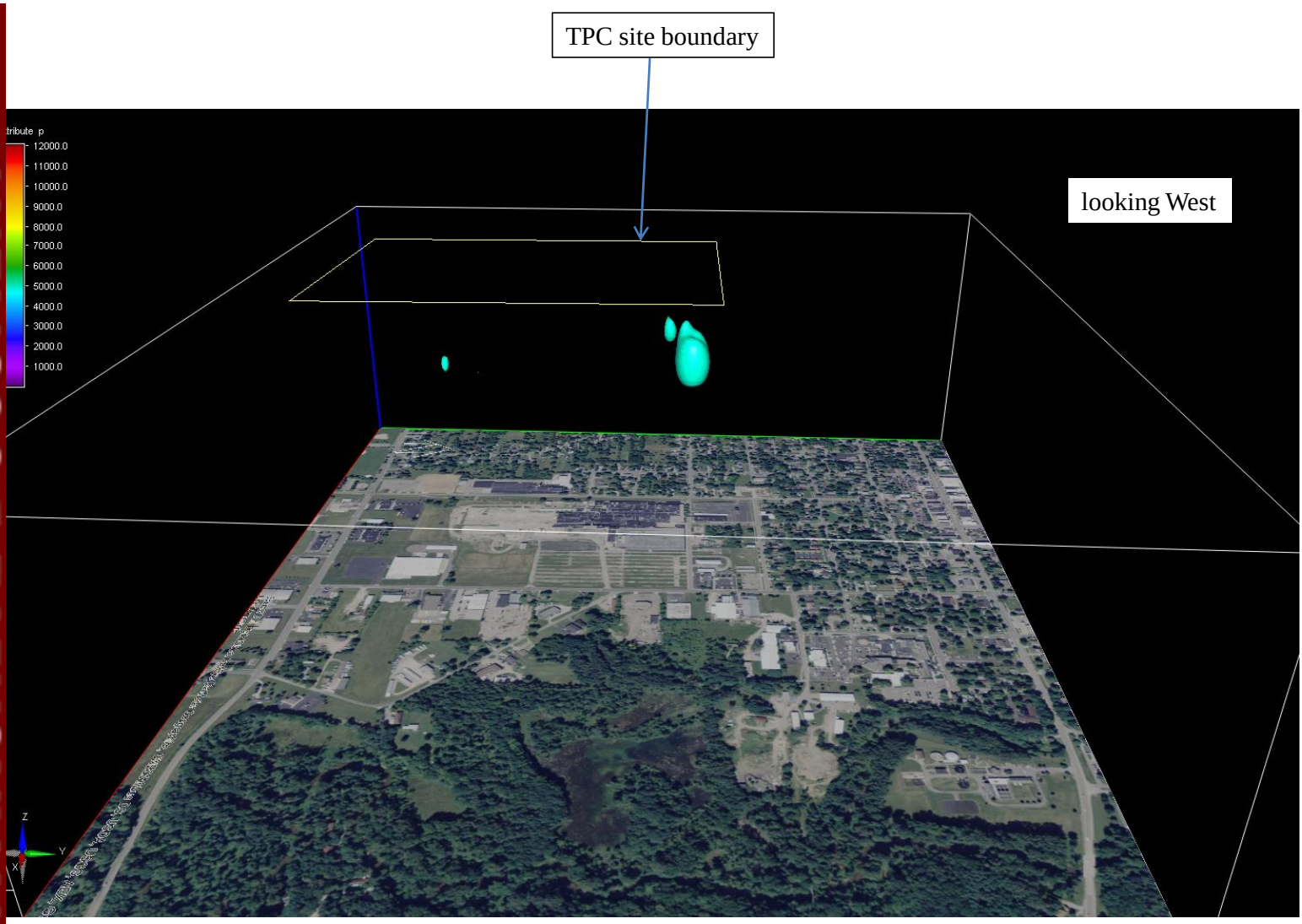
Maximum TCE (2008-2015) TCE >= 5,000 ppb



Maximum TCE (2008-2015) TCE >= 5,000 ppb



Maximum TCE (2008-2015) TCE >= 5,000 ppb



Appendix D

VC 2008 through 2015

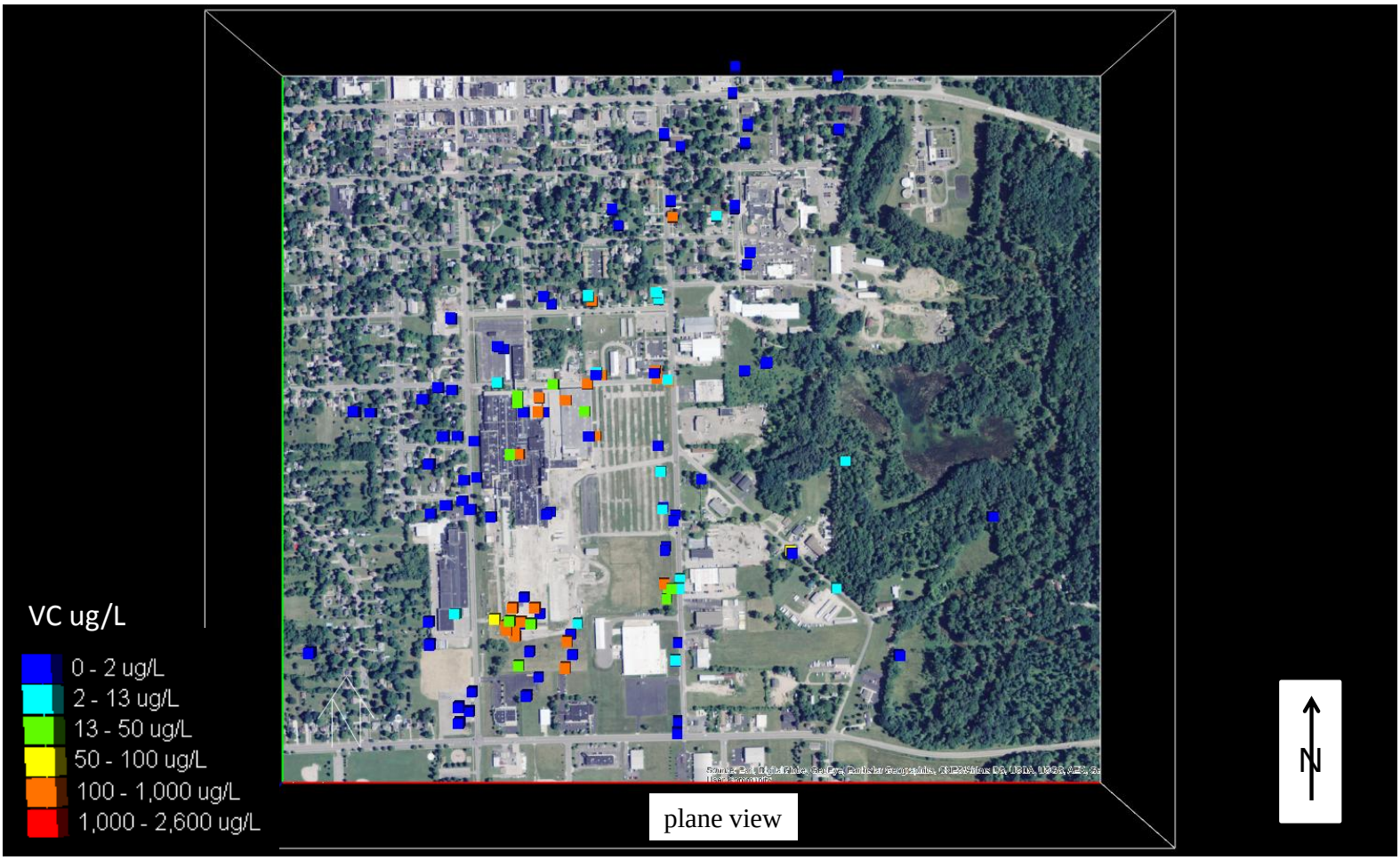
The VC files used for these analyses are the maximum VC by X, Y, Z by year. Where VC is Vinyl Chloride. The source of these data are an MS Access database received from TRC Solutions. That file was named "DB_Tecumseh_v2.accdb". That file was queried and exported as an Excel file. This Excel file was modified in the SAS software in order to be used in earthVision (Dynamic Graphics Incorporated).

The below output is from the earthVision software. All save the last two pages are postings of the VC values (X,Y,Z) by year. The last two pages are interpolations (3D grids) of the VC values for 2015.

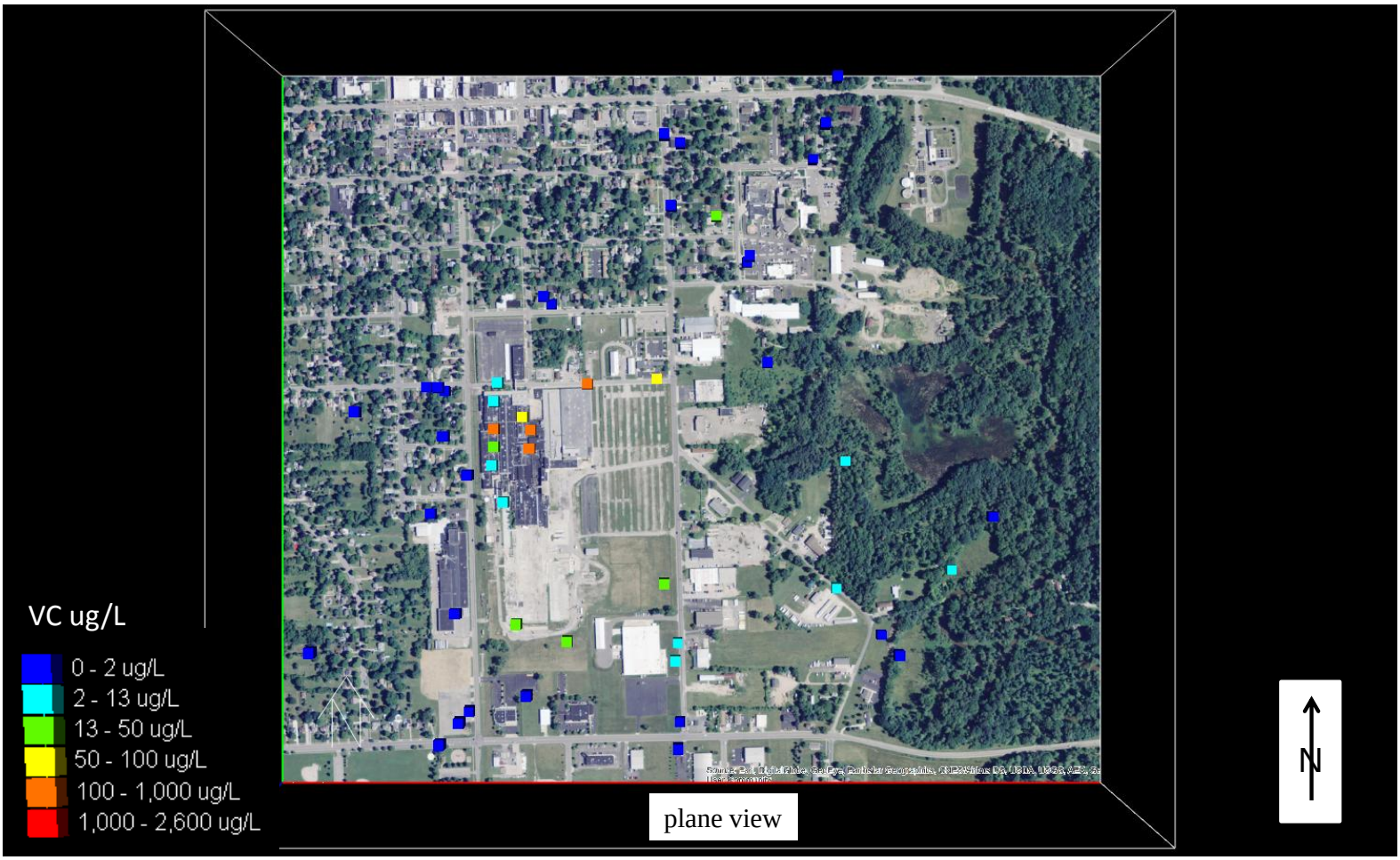
VC (ug/L) 2008


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
plane view
N

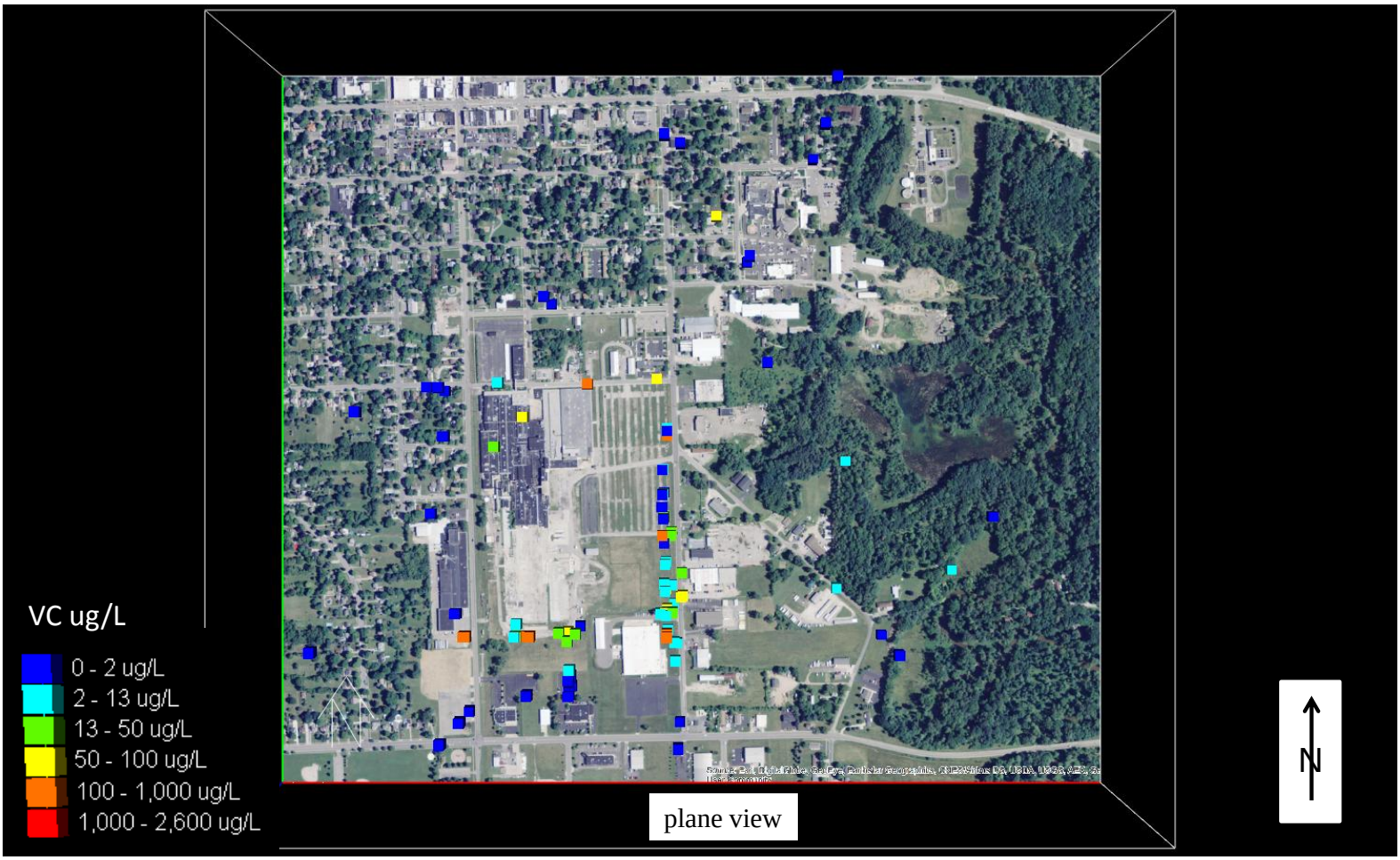
VC (ug/L) 2009


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
plane view
N

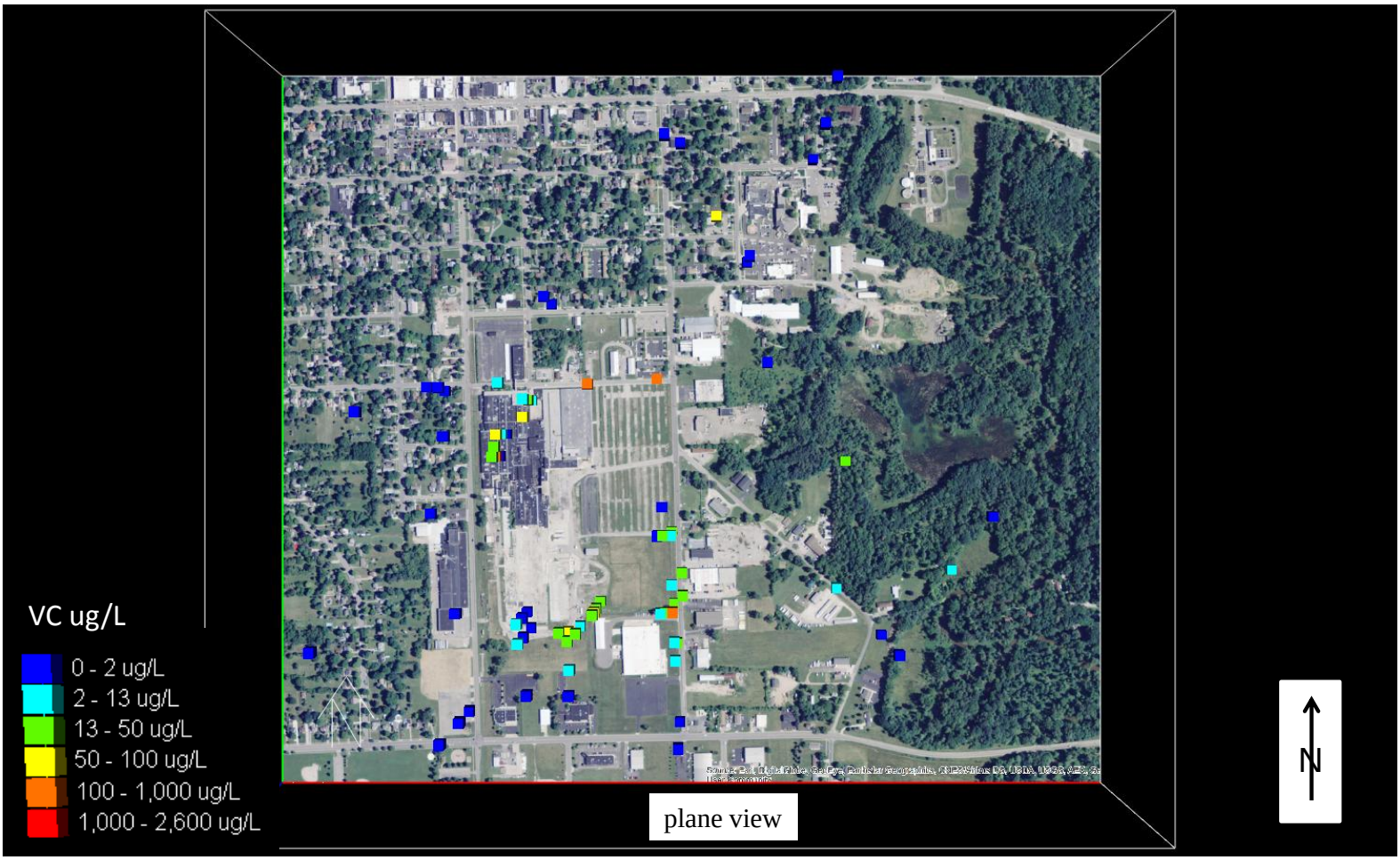
VC (ug/L) 2010


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
plane view
N

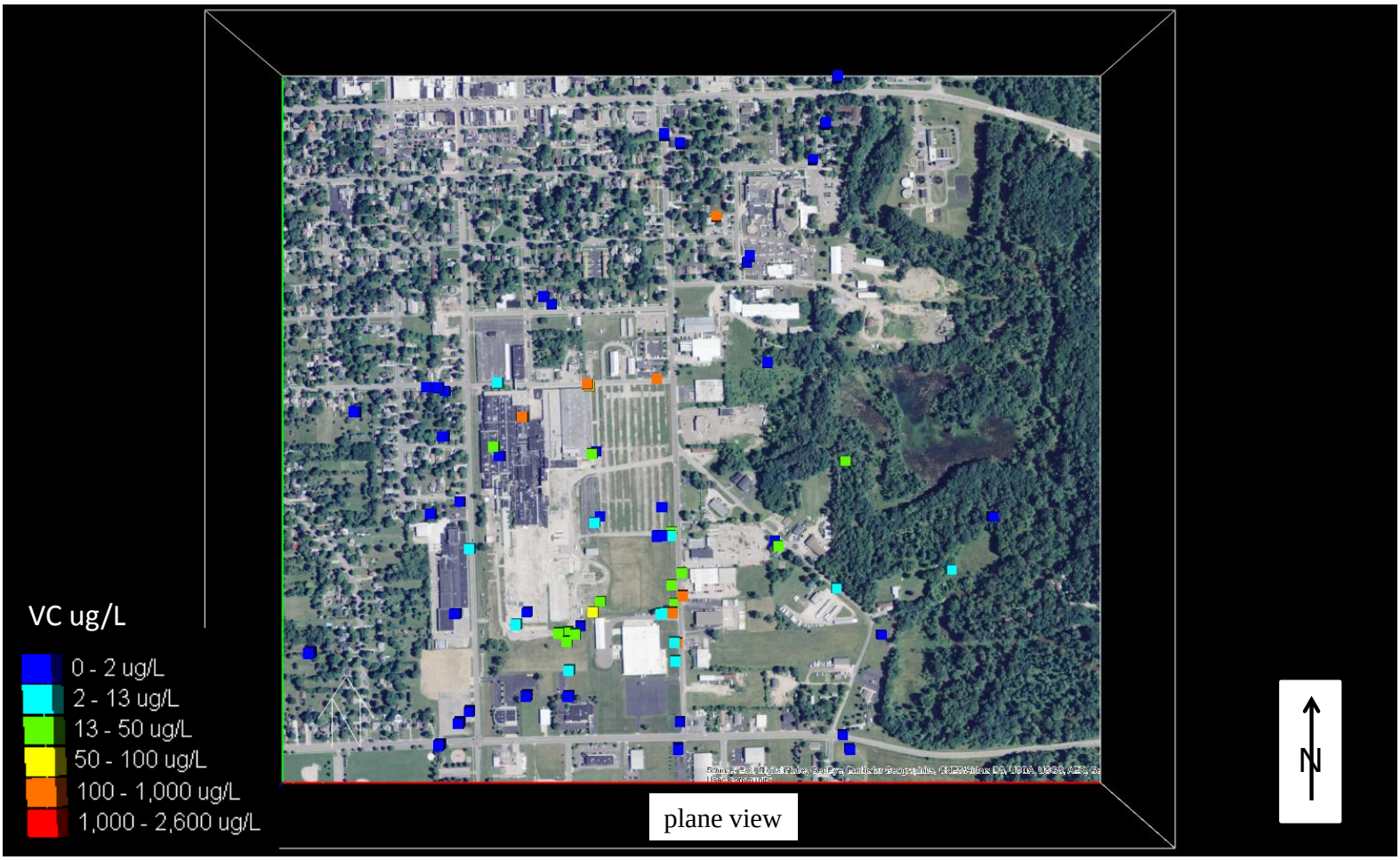
VC (ug/L) 2011


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
plane view
N

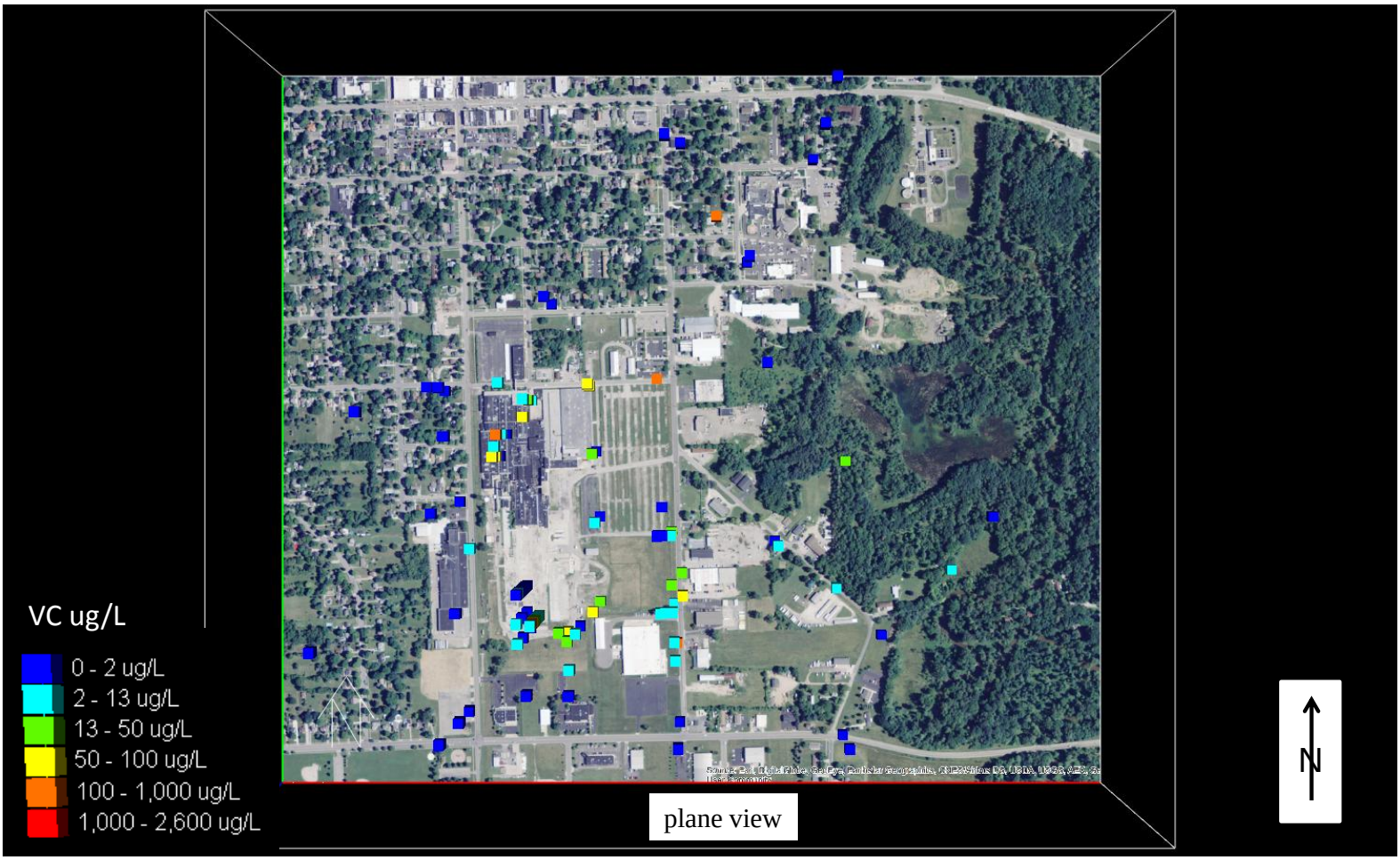
VC (ug/L) 2012


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
plane view
N

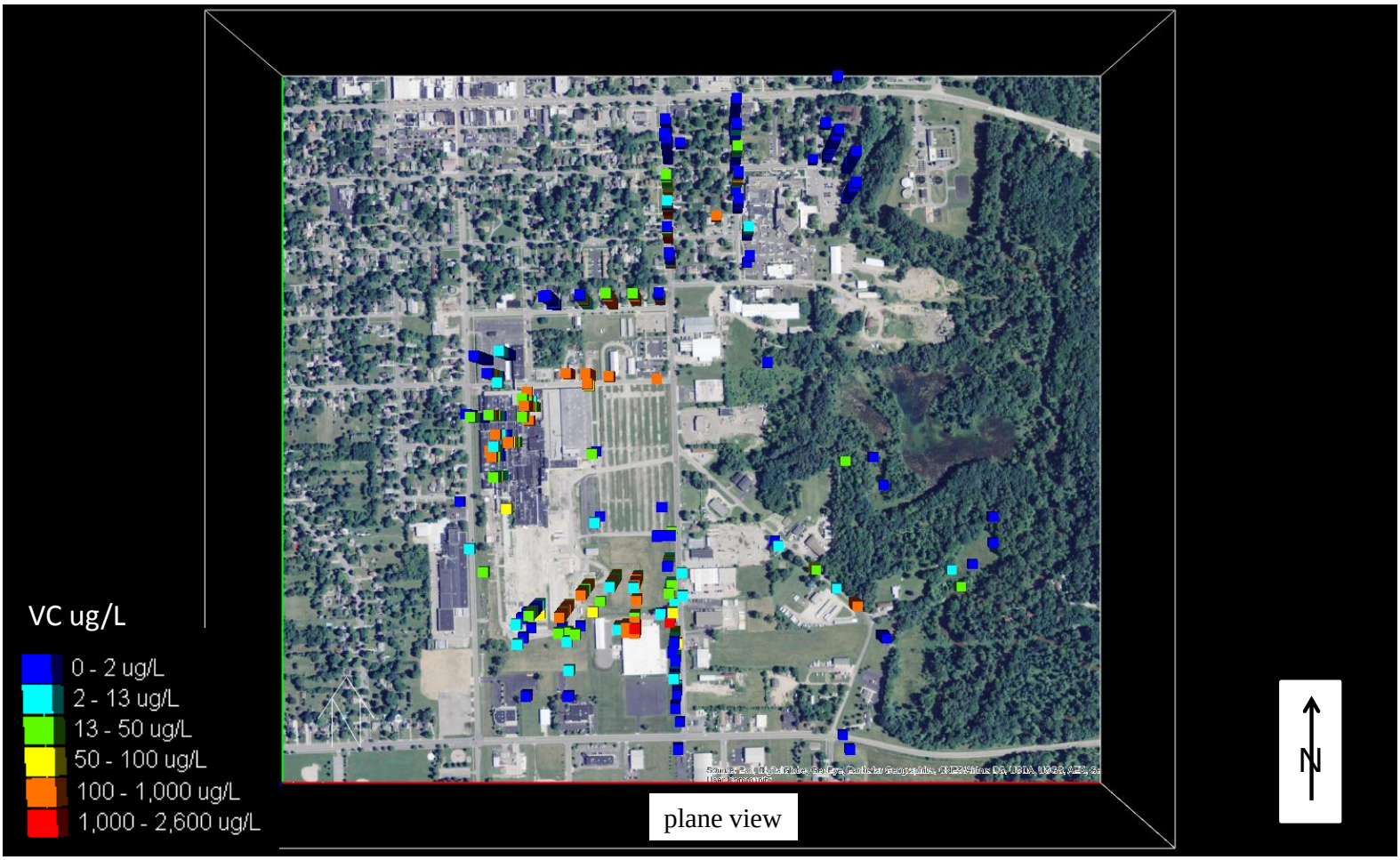
VC (ug/L) 2013


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
plane view
N

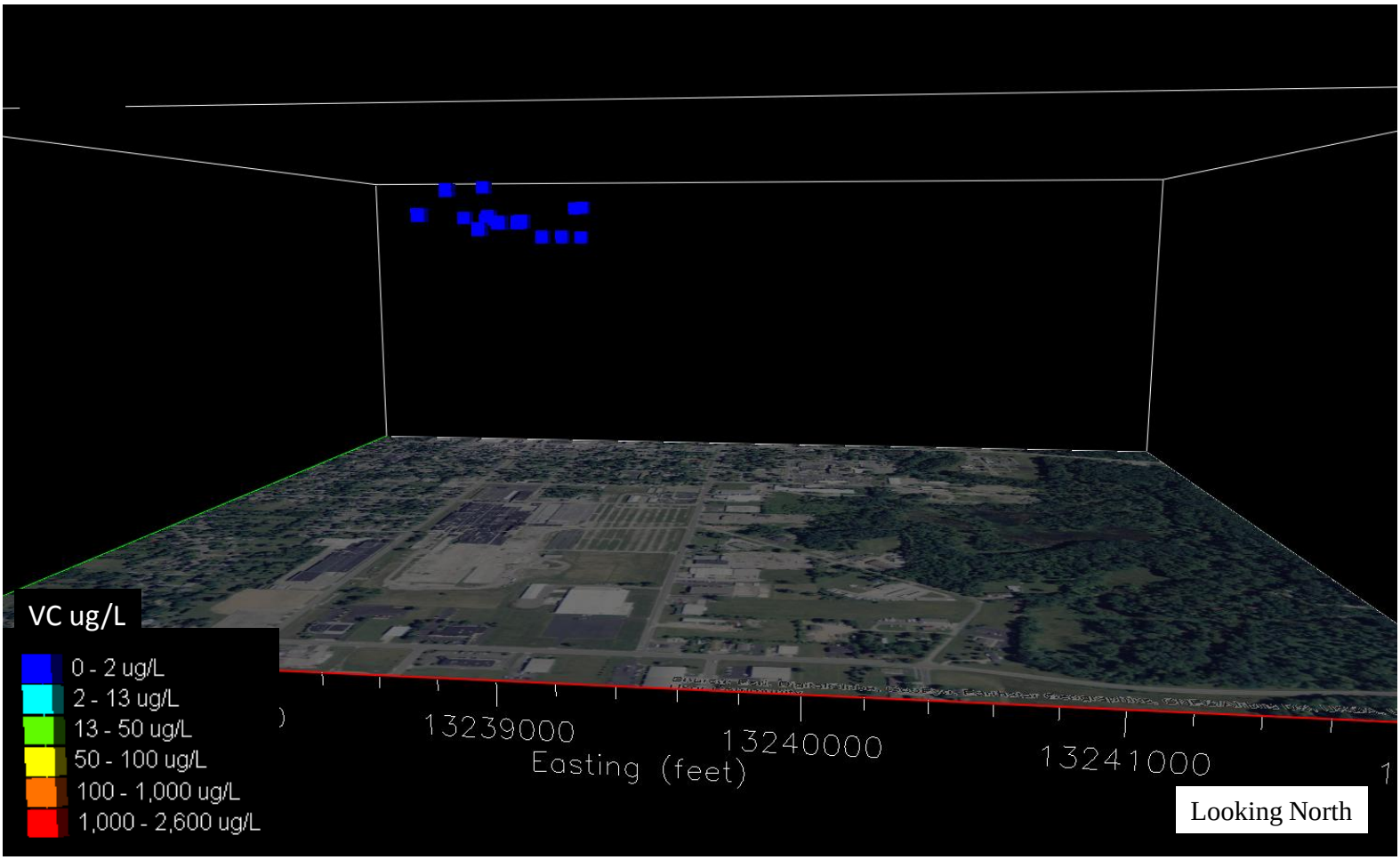
VC (ug/L) 2014


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
plane view
N

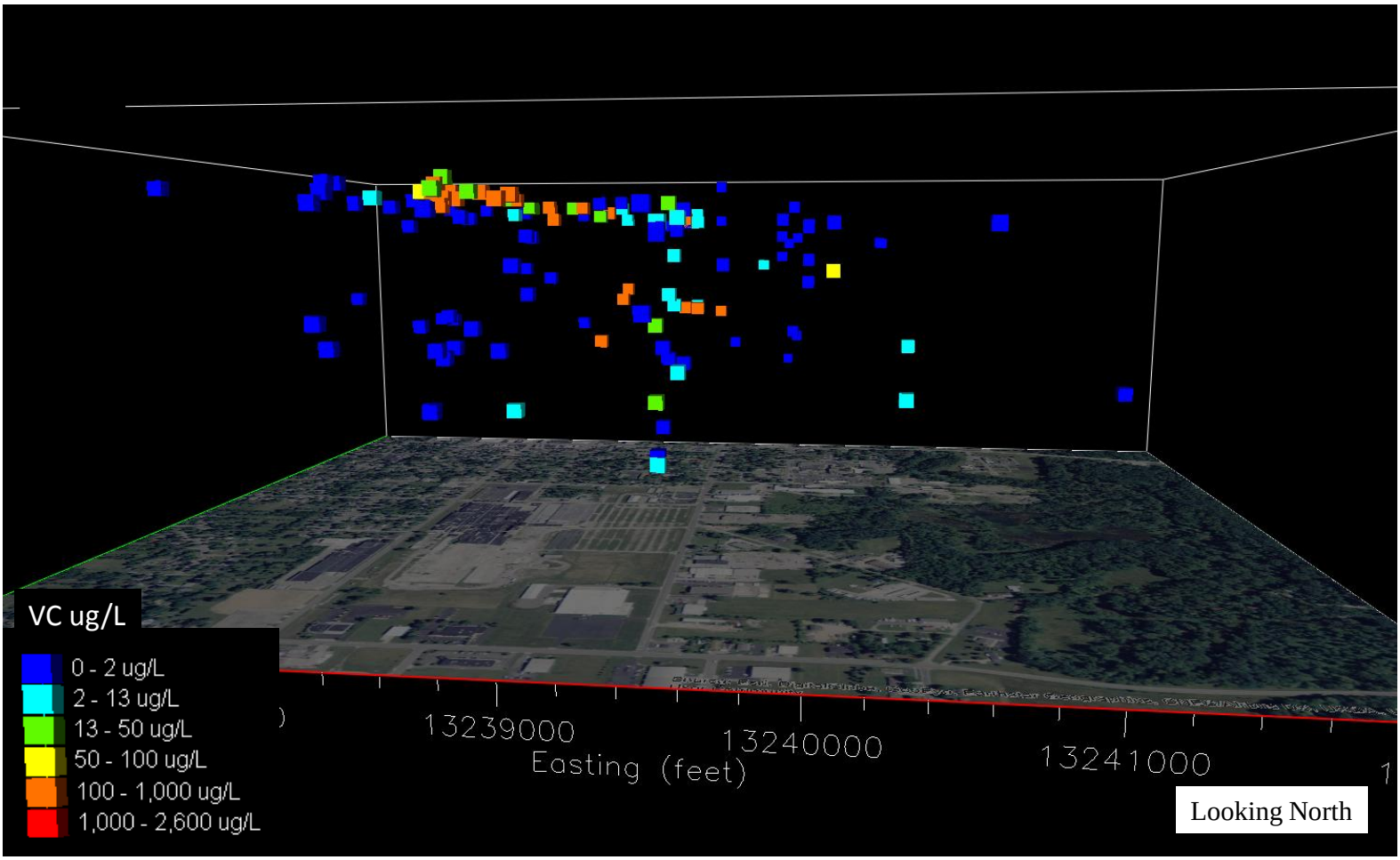
VC (ug/L) 2015


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
plane view
N

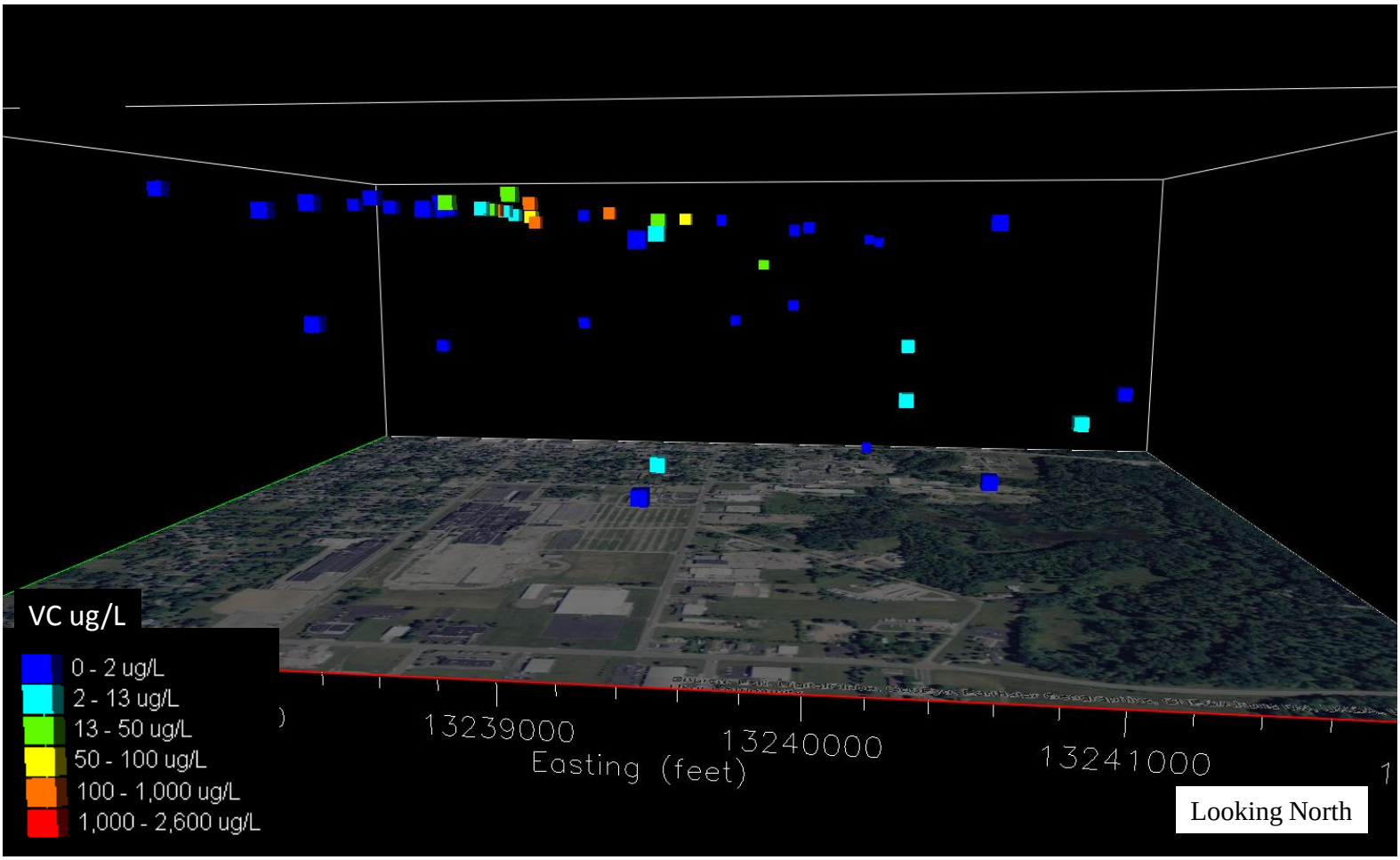
VC (ug/L) 2008


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
13239000
13240000
13241000
Easting (feet)
Looking North

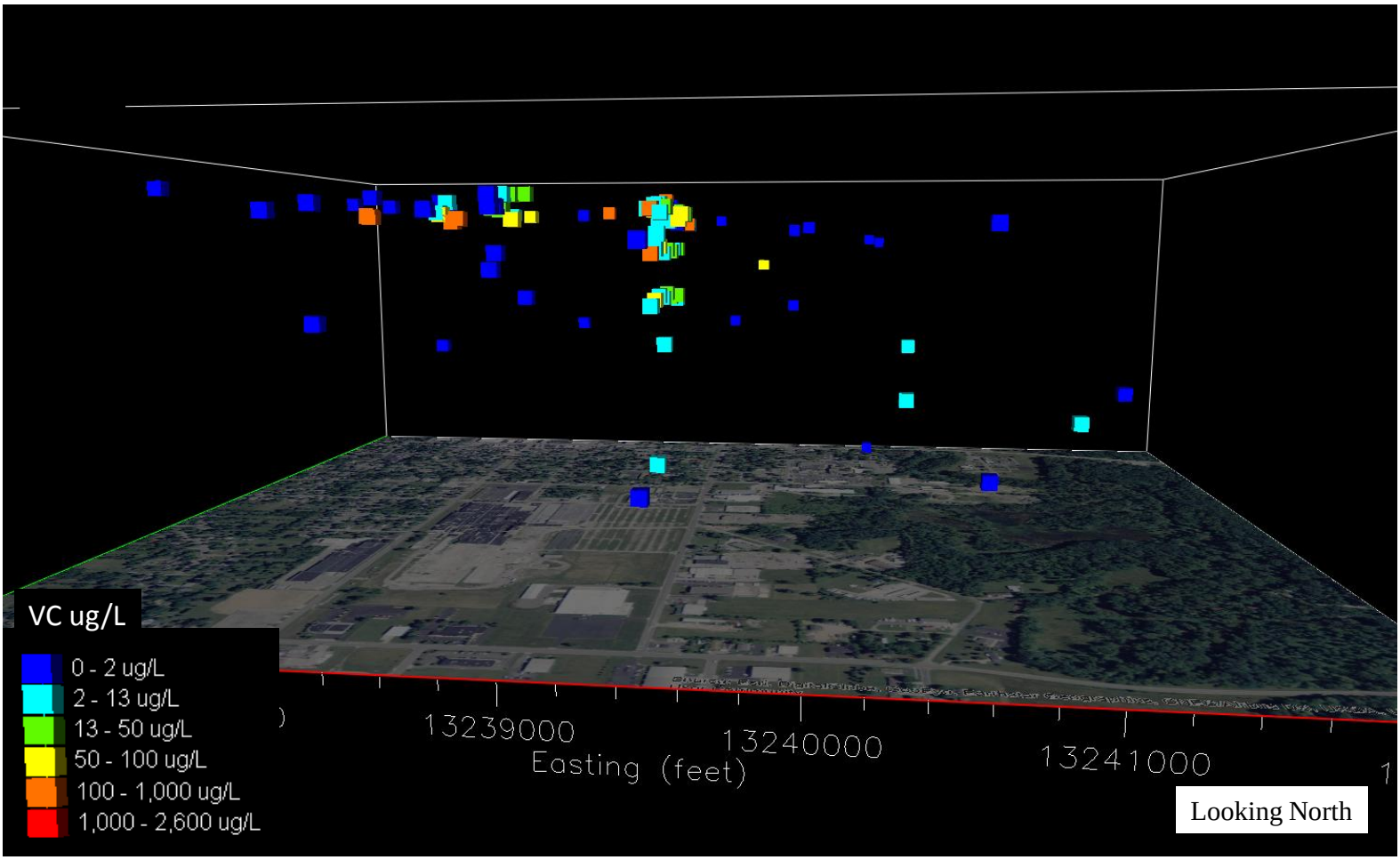
VC (ug/L) 2009


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
13239000
13240000
13241000
Easting (feet)
Looking North

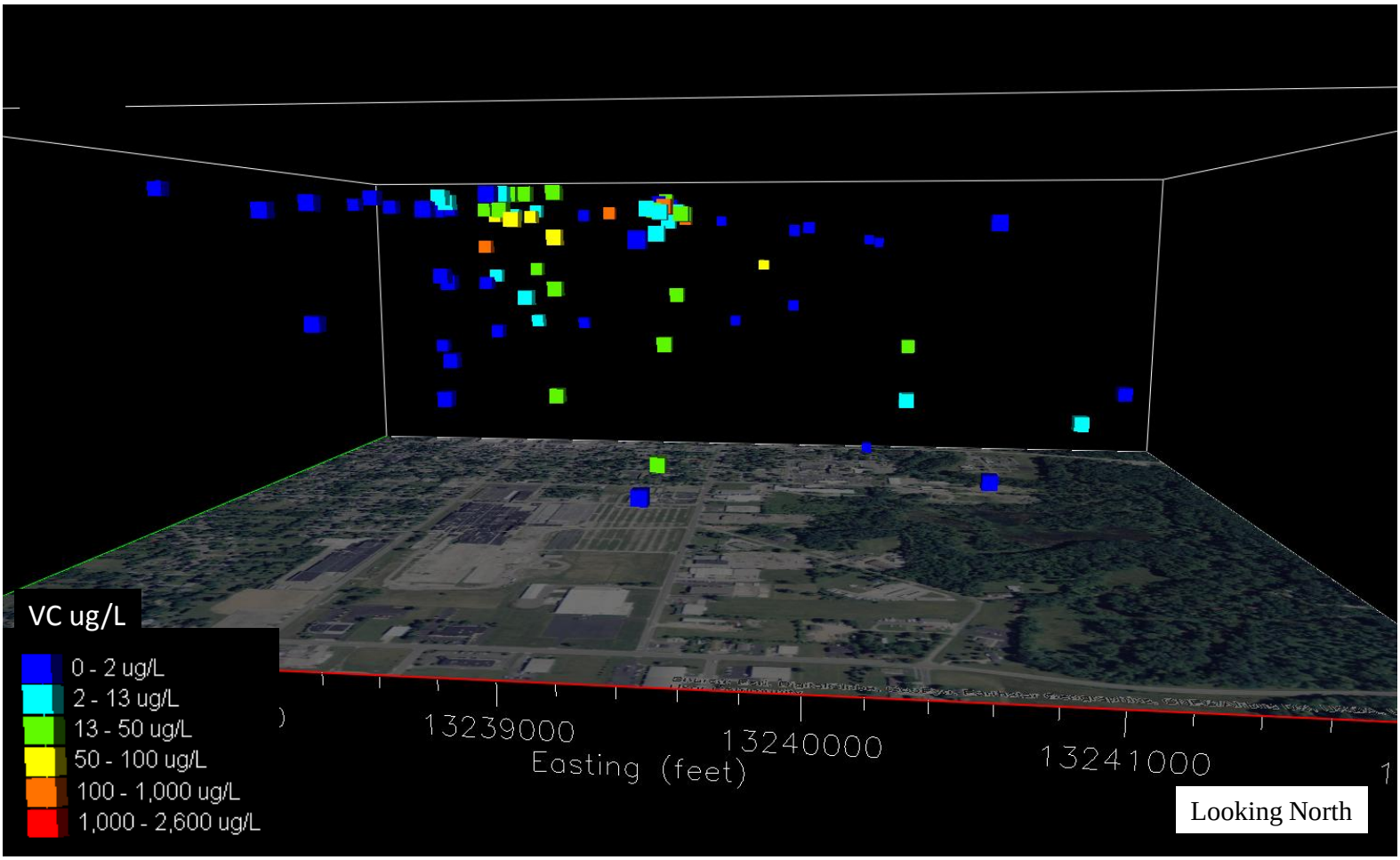
VC (ug/L) 2010


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
13239000
13240000
13241000
Easting (feet)
Looking North

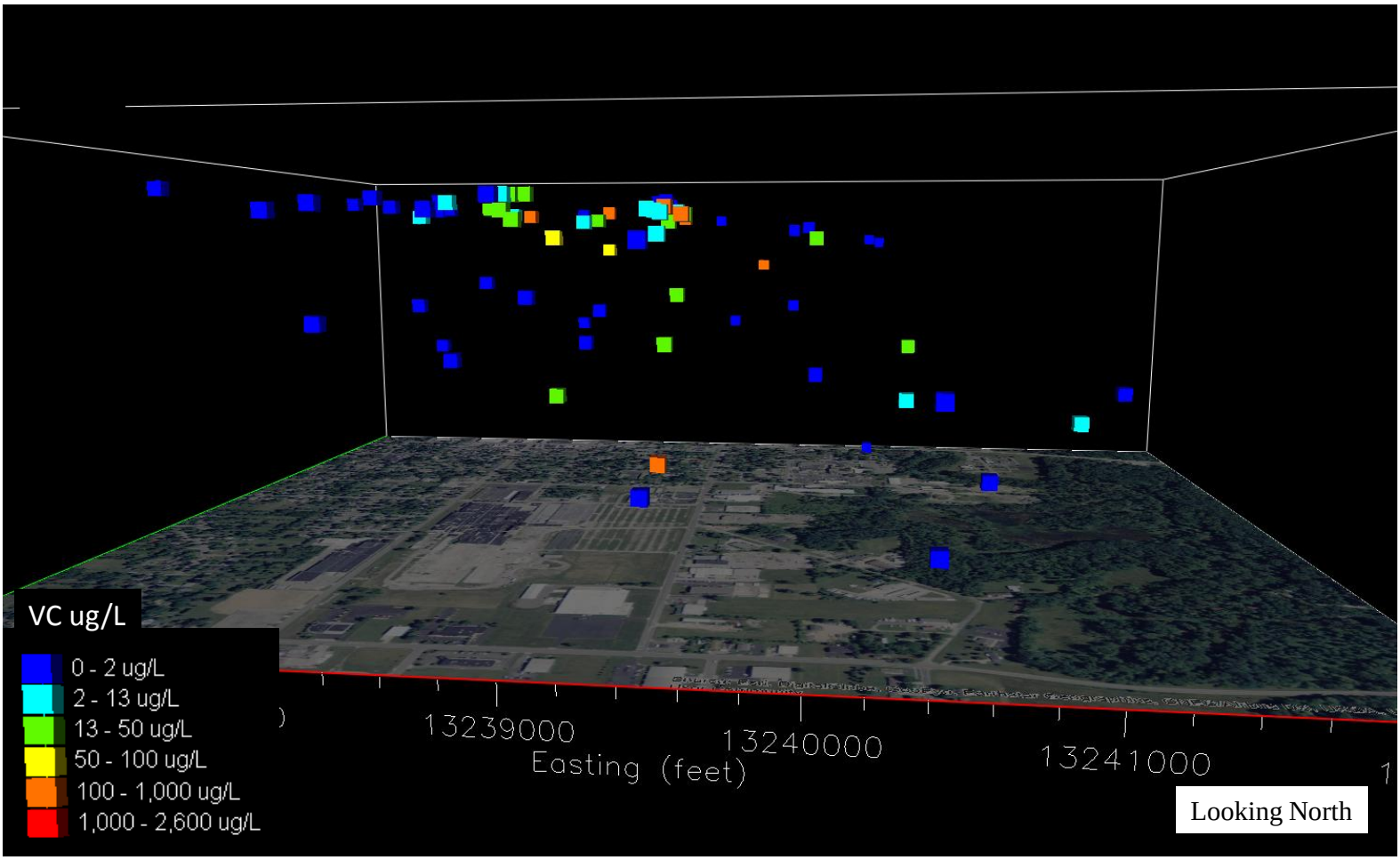
VC (ug/L) 2011


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
13239000
13240000
13241000
Easting (feet)
Looking North

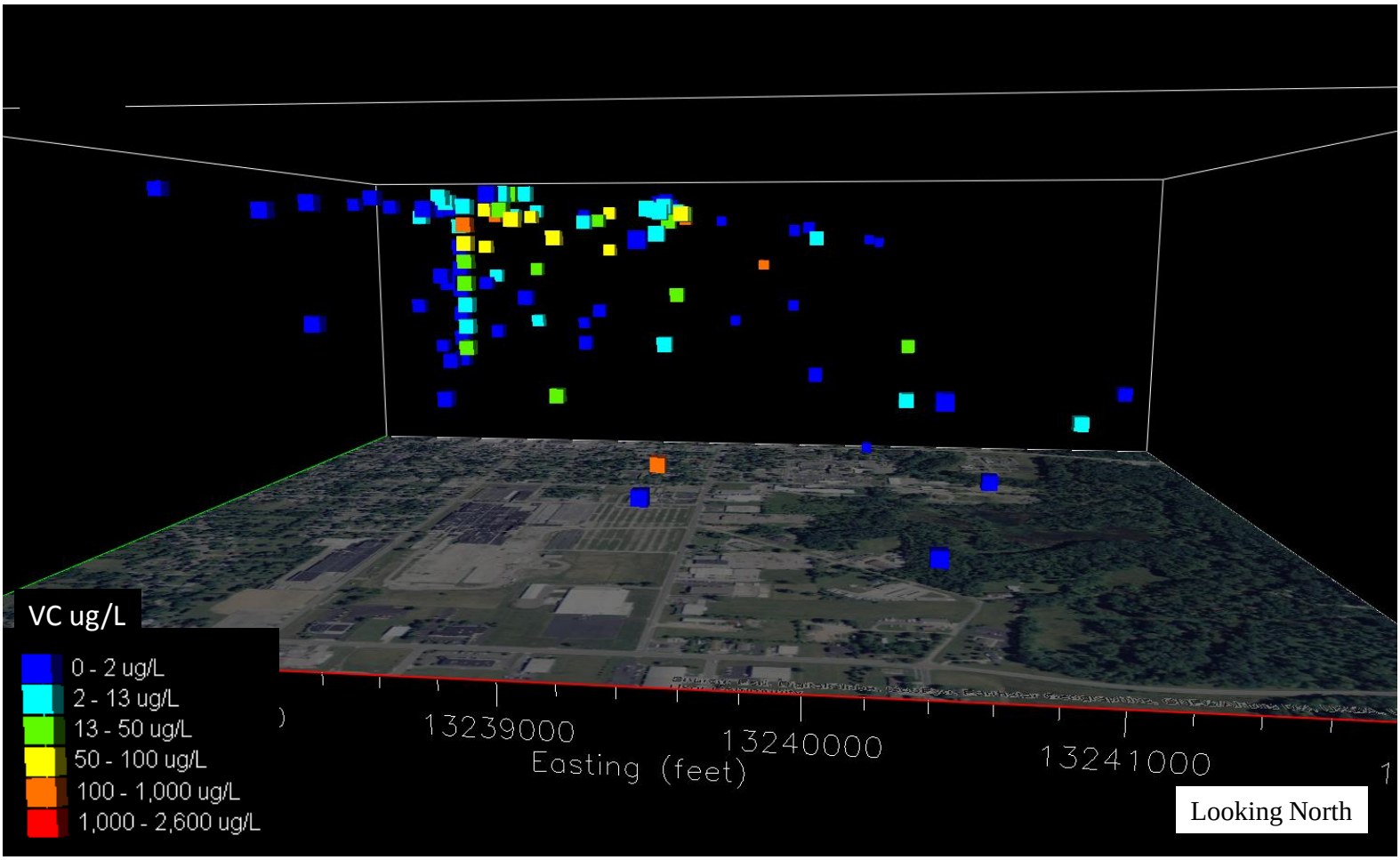
VC (ug/L) 2012


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
13239000
13240000
13241000
Easting (feet)
Looking North

VC (ug/L) 2013


VC ug/L
0 - 2 ug/L
2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
100 - 1,000 ug/L
1,000 - 2,600 ug/L
13239000
13240000
13241000
Easting (feet)
Looking North

VC (ug/L) 2014


VC ug/L
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2 - 13 ug/L
13 - 50 ug/L
50 - 100 ug/L
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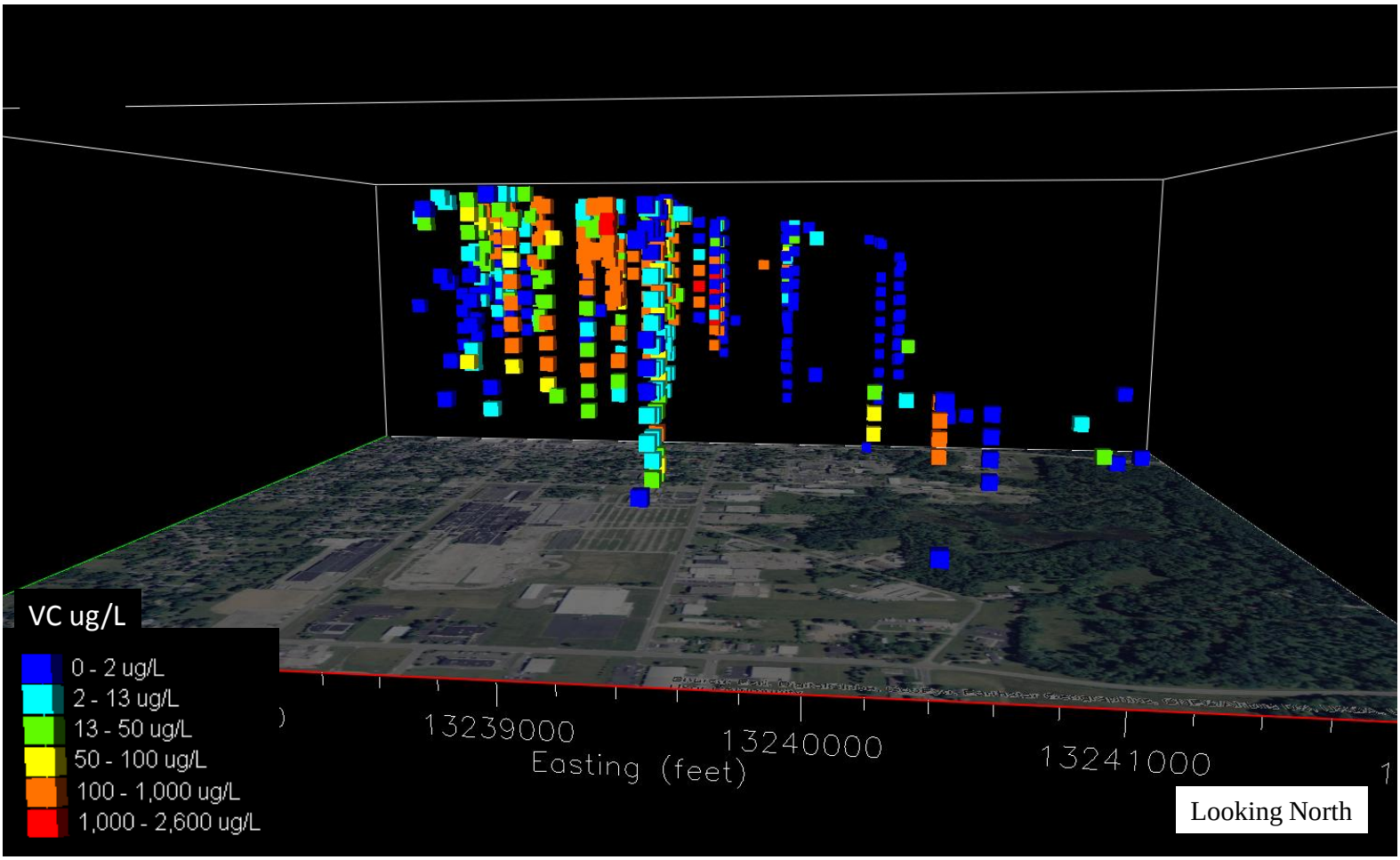
1,000 - 2,600 ug/L
13239000
13240000
13241000
Easting (feet)
Looking North

VC (ug/L) 2015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13239000
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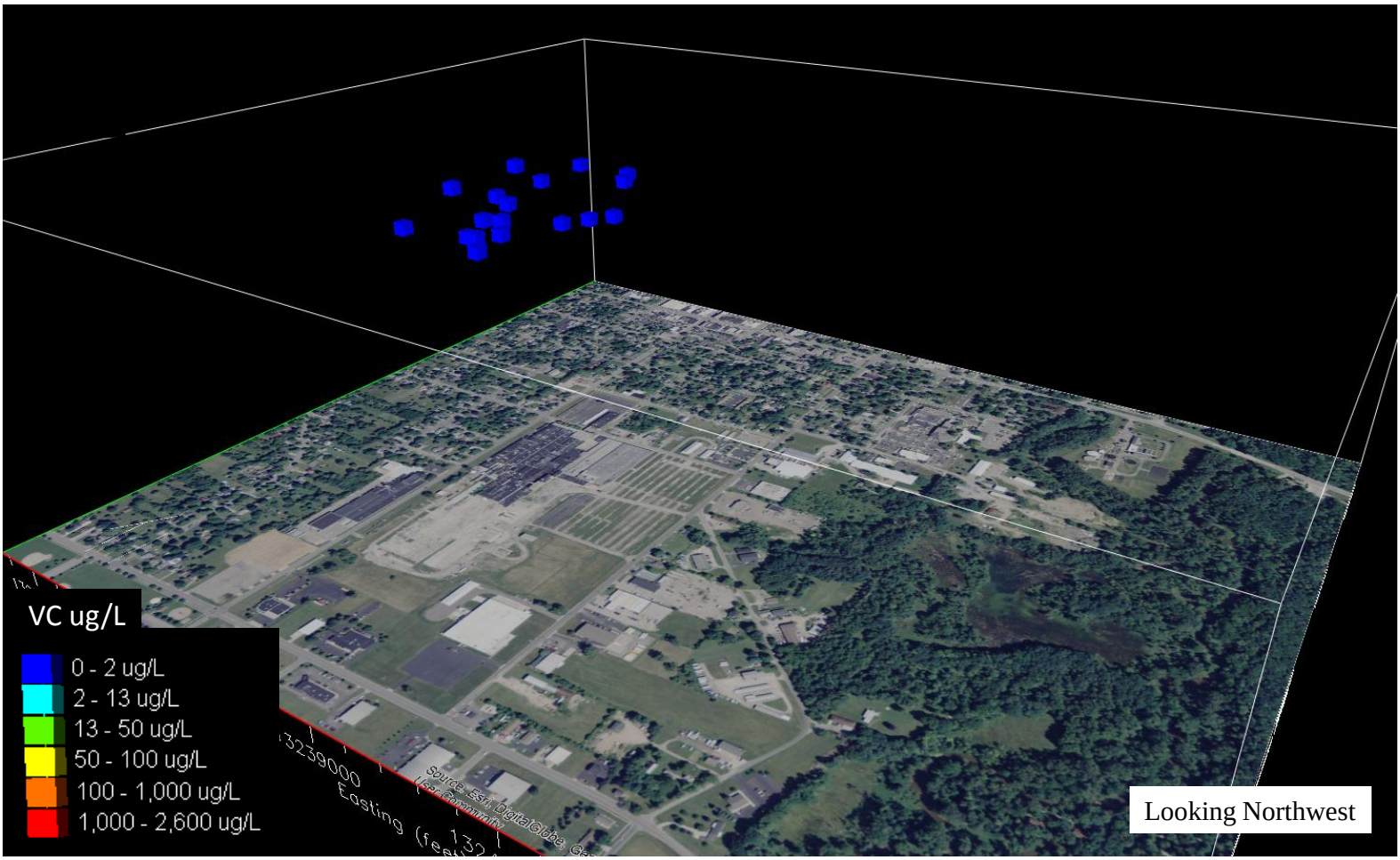
Easting (feet)
Looking North

VC (ug/L) 2008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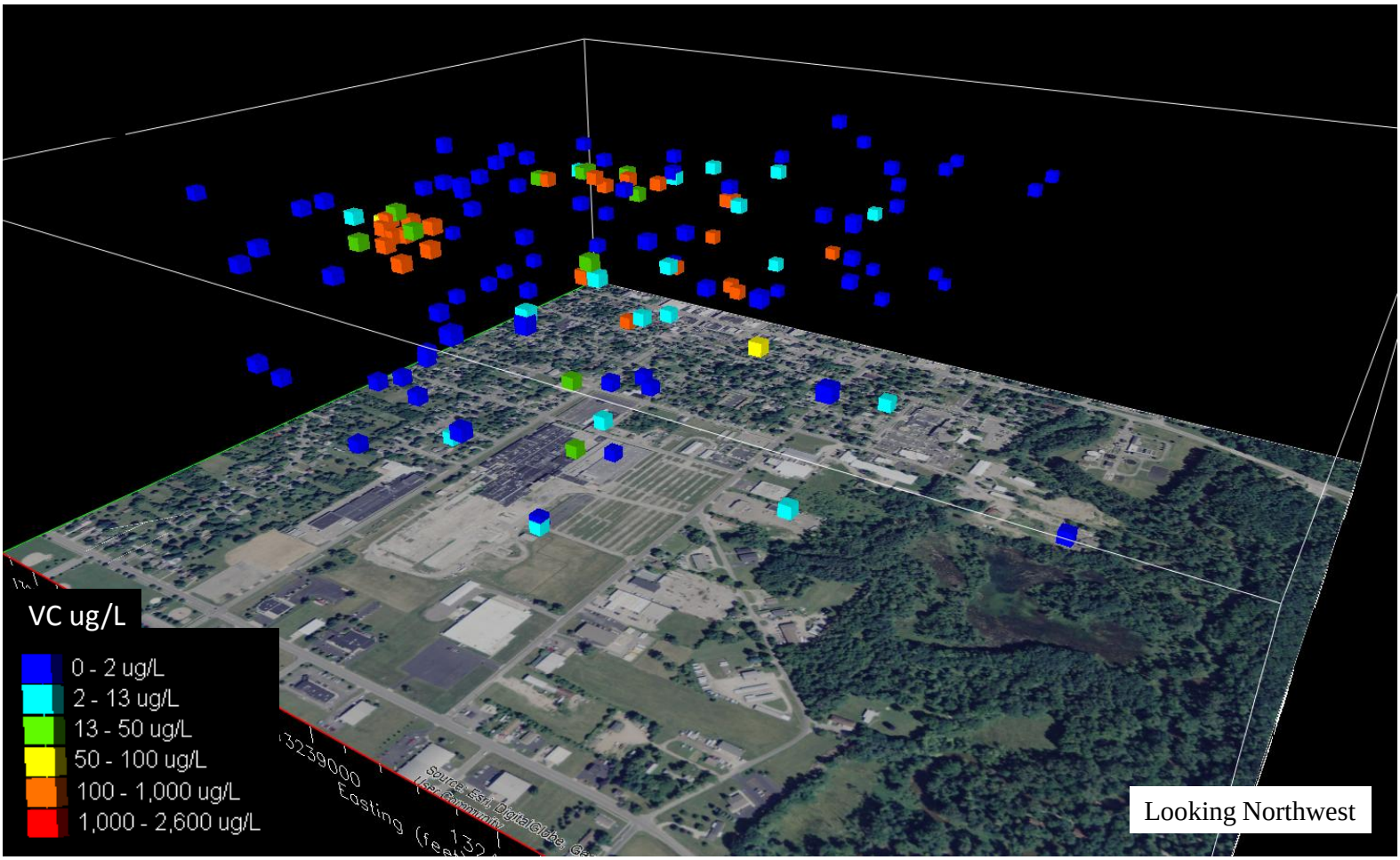
Looking Northwest

VC (ug/L) 2009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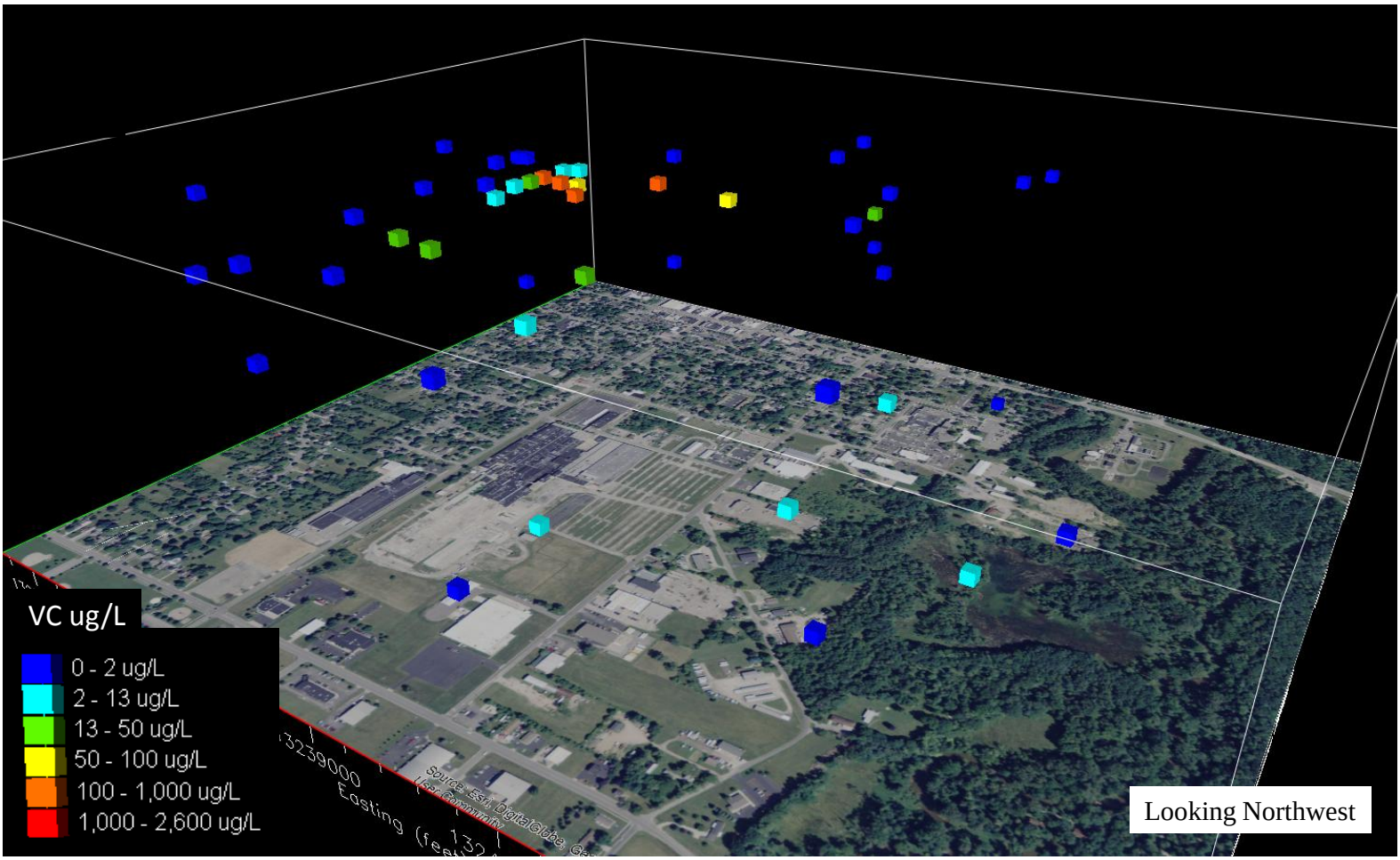
Looking Northwest

VC (ug/L) 2010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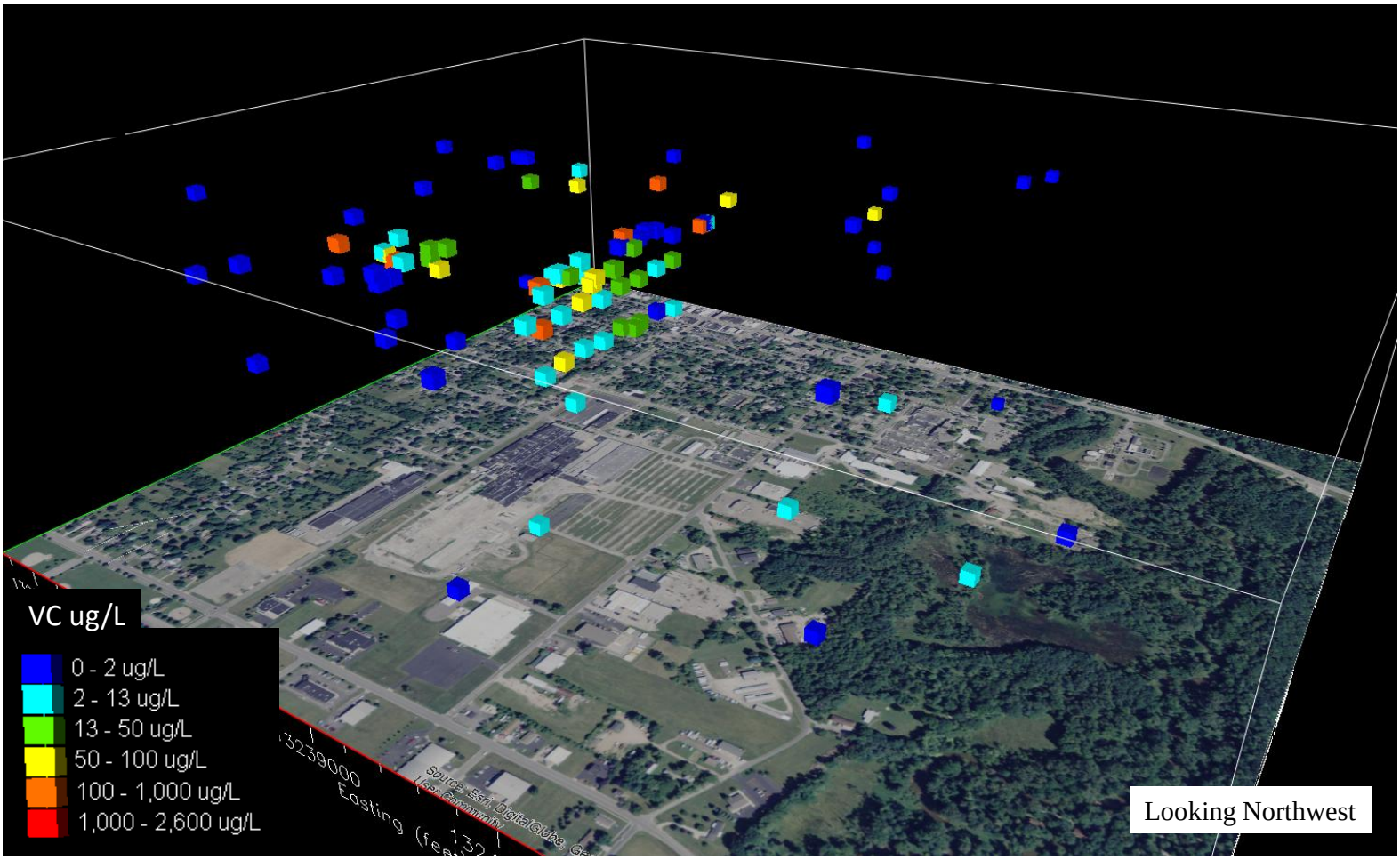
Looking Northwest

VC (ug/L) 2011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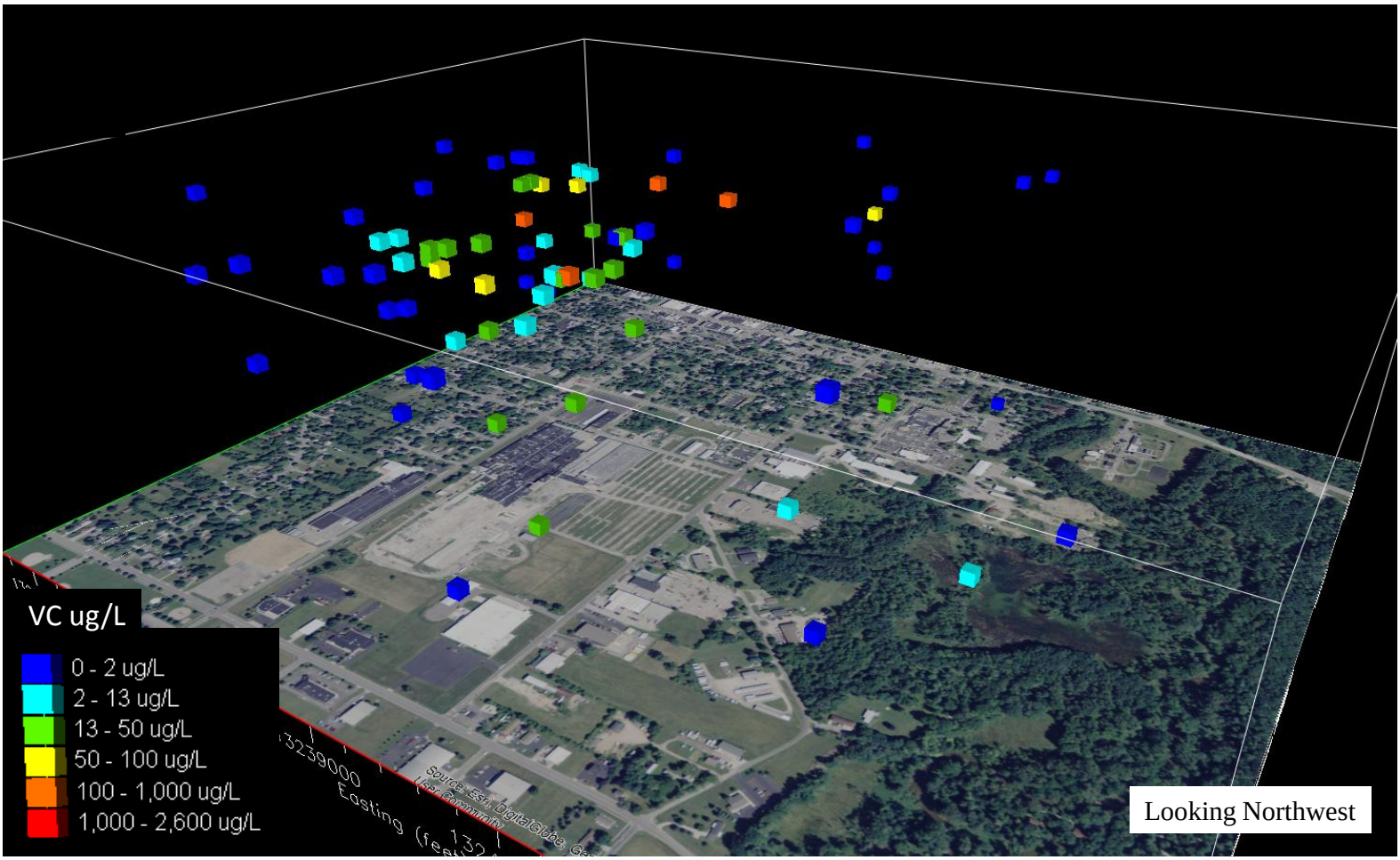
Looking Northwest

VC (ug/L) 2012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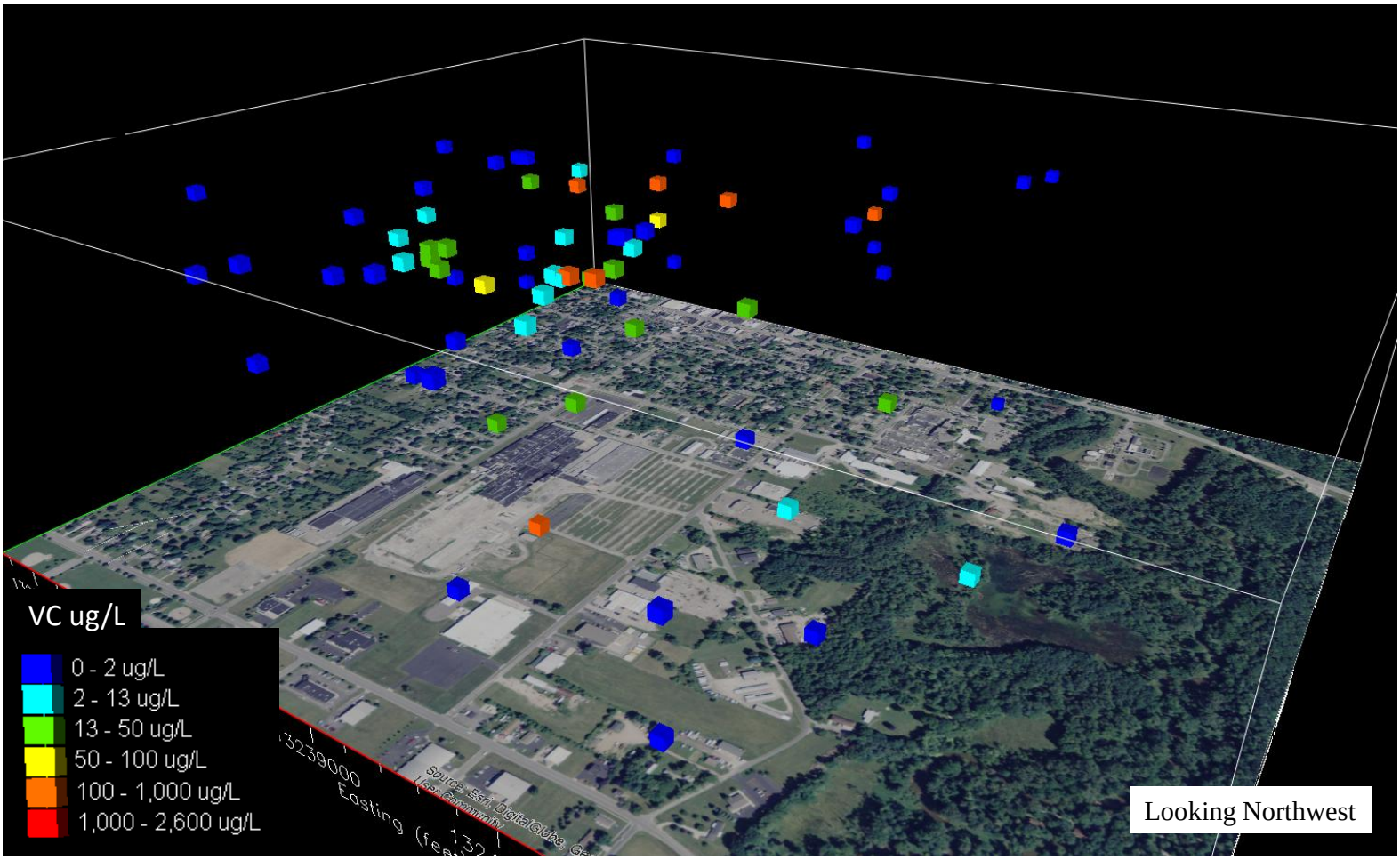
Looking Northwest

VC (ug/L) 2013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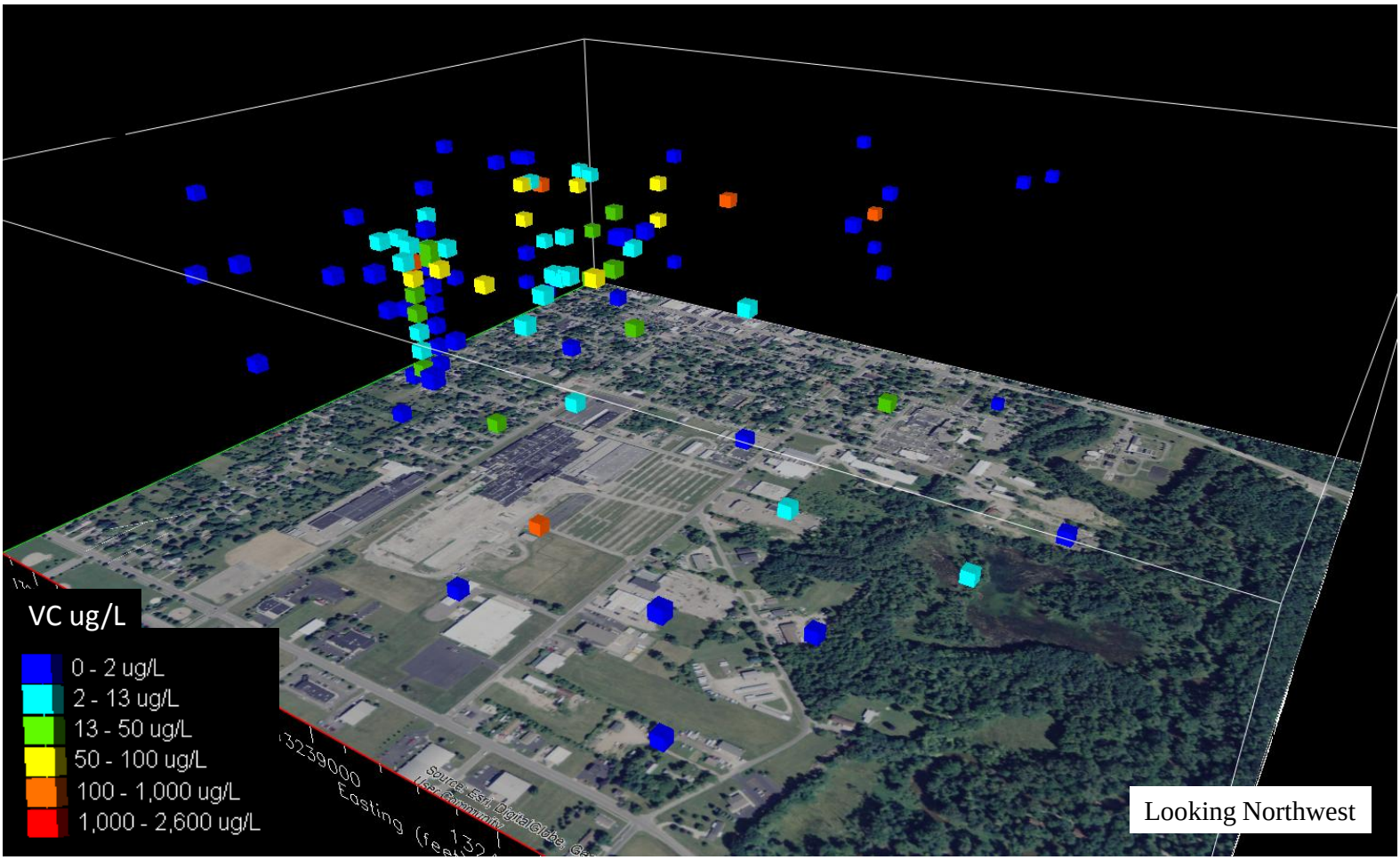
Looking Northwest

VC (ug/L) 2014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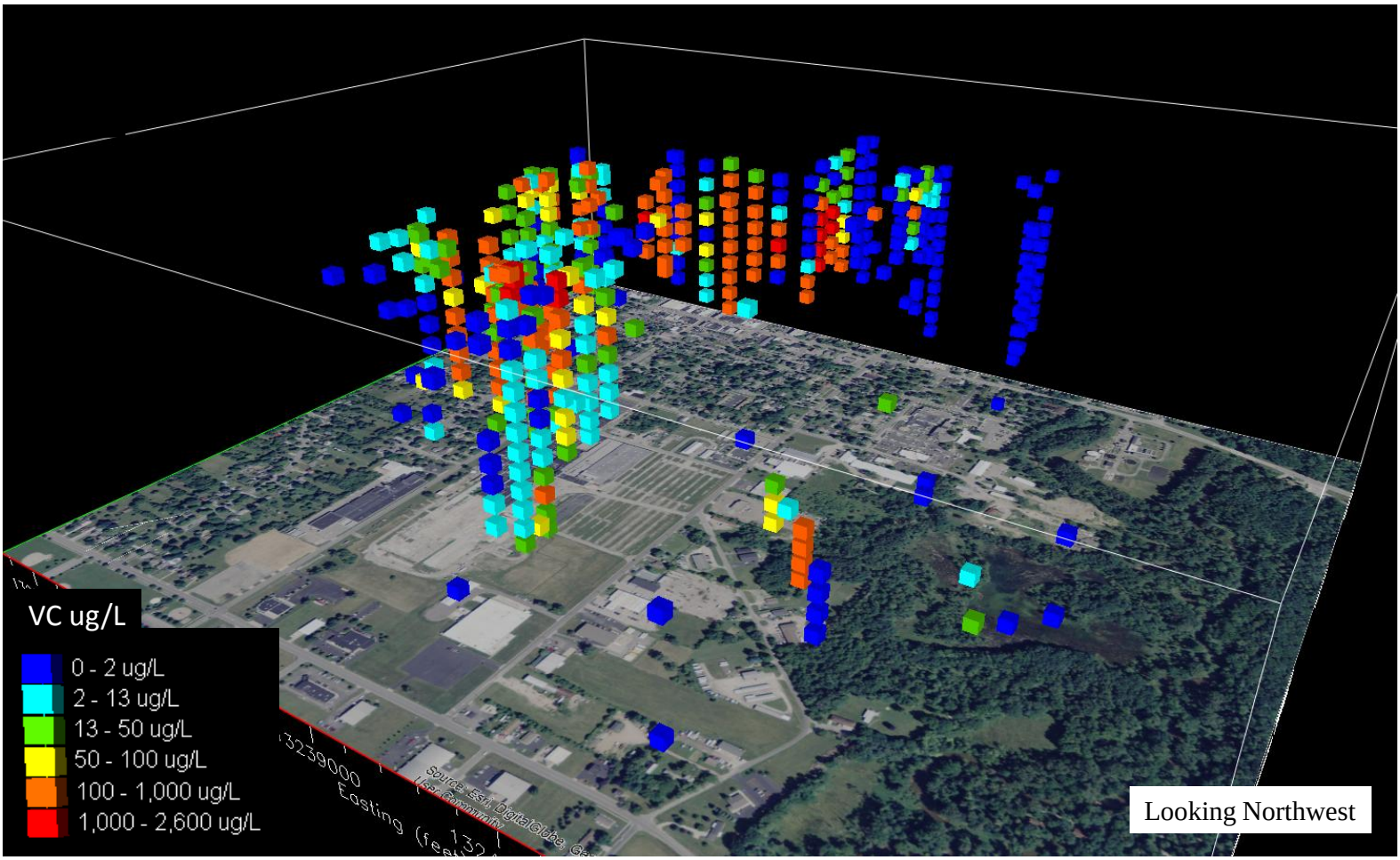
1,000 - 2,600 ug/L
Looking Northwest

VC (ug/L) 2015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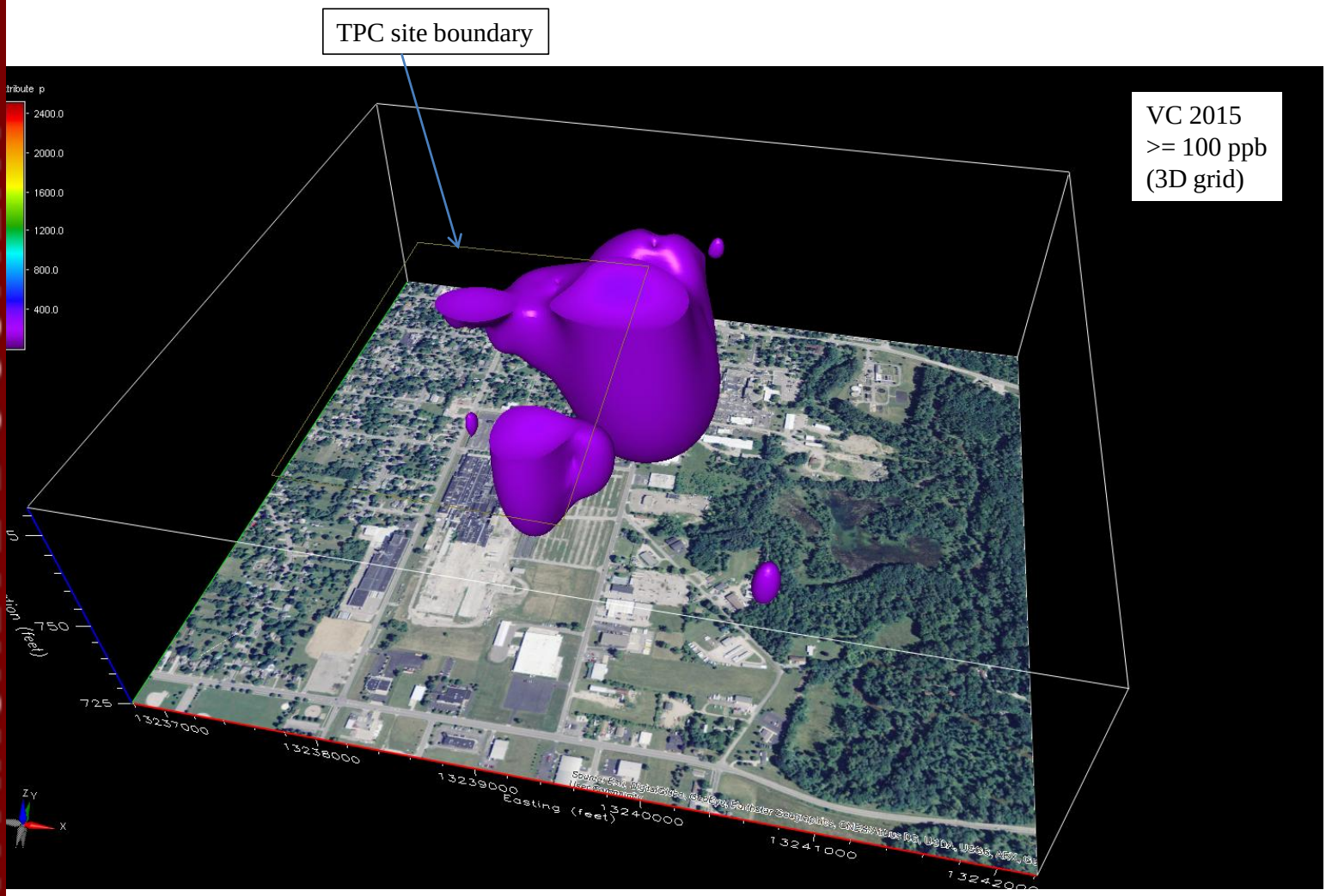

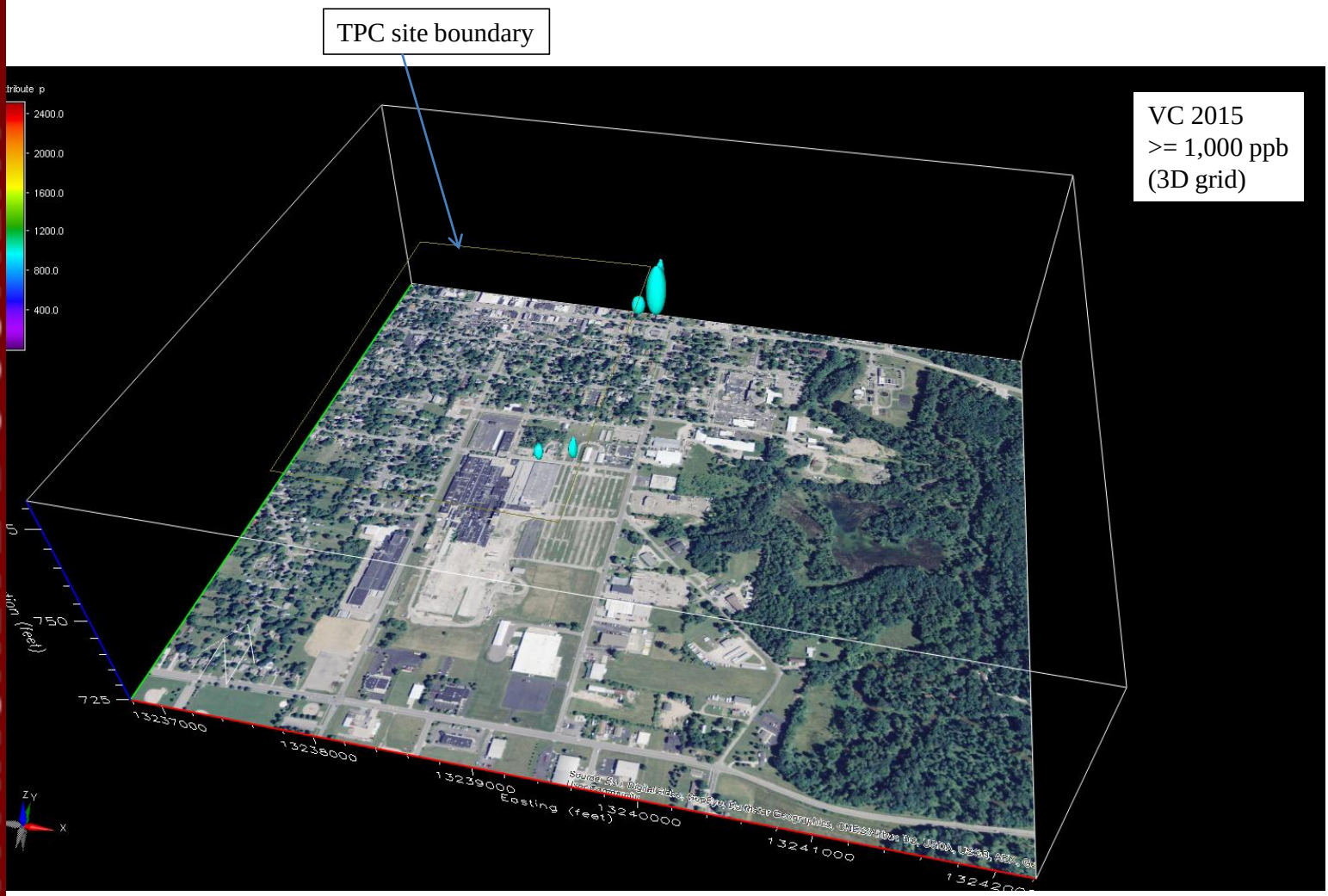

Attachment 2 – EPA Comments on Supplement to the Groundwater Environmental Indicator Report.

EPA has reviewed the *Supplement to Remedial Investigation and Environmental Indicator Report (Migration of Contaminated Groundwater Under Control)*, dated July 31, 2015 and submitted by TRC on behalf of Tecumseh Products Company (TPC). As acknowledged in your report, on March 6, 2013, USEPA granted an extension to the date set forth in Paragraph 13.b. of the Administrative Order on Consent (AOC) RCRA-05-2010-0012 to July 31, 2015, by which TPC was required to demonstrate that the Migration of Contaminated Groundwater (Corrective Action Environmental Indicator CA 750) had stabilized. EPA granted the extension so that TPC could provide additional information regarding increasing concentrations in certain monitoring wells that conflicted with TPC's conclusion in the September 2012 *Remedial Investigation and Groundwater Environmental Indicator Report* that the contaminant plumes were stable. EPA provided additional comments to TPC in January 2014 at TPC's request, related to repeated requests by EPA to address investigation deficiencies that EPA has been identifying since March 2010.

A meeting was held in May 2014 to discuss initial steps TPC should take to begin addressing the site investigation deficiencies outlined in EPA's January 2014 letter. Following that meeting, in June 2014, EPA provided a letter to TPC summarizing the elements EPA expected to see in TPC's scope of work In June-July 2014, TPC completed membrane interface probe (MIP) investigation at the site which identified (among other things) two source areas that had not yet been investigated by TPC, off-site to the north of the facility, and in the southeast corner of the facility. Over the course of the next year, TPC developed several drafts of a workplan to conduct verification sampling at certain MIP locations and complete high resolution groundwater site characterization (HRSC) sampling off-site to determine the migration pathways. Upon submittal of the final version of the work plan, TPC implemented the work, and later requested a 90-day extension to process a 3-dimensional model by October 2015, that it believed would demonstrate that contamination had stabilized. EPA informed TPC that a 90-day extension would not be sufficient to establish that the migration of contaminated groundwater had stabilized because the information necessary to prove that point could not be collected and analyzed within 90 days and TPC had not installed the permanent monitoring wells needed to adequately monitor the migration of contamination from the site. To date, the existing monitoring network remains inadequate for establishing that the groundwater plume(s) are stabilized. Information you have submitted demonstrates that:

1) Concentrations have increased in the few monitoring wells that were installed within the migration path for contaminant plumes (MW-21 and MW-23);

2) The area of contamination has increased since the time TPC submitted its first interpretation that the plume was stable in September 2012; and,

3) Higher levels of contamination than previously identified were recently found on-site and off-site in areas that are not being monitored (the levels indicate the potential of Non-Aqueous Phase Liquid - NAPL).

Based on this information, TPC has not demonstrated that the migration of contaminated groundwater from the site is under control, as was required by September 29, 2012 (initial deadline date in the AOC RCRA-05-2010-0012), and under the most recent deadline extension of July 31, 2015. Although TPC concedes that further assessment of the vapor intrusion migration pathway north and east of the site is needed, as well as an evaluation of the current monitoring program (including monitoring locations,

development of a correlation between MIP and groundwater chemistry data, and preparation of a 3D visualization to be provided to USEPA by October 15, 2015), the failure to accurately monitor the migration of contamination off-site and establish that the migration of the contaminant plumes have stabilized constitutes a violation of the terms of the AOC.

EPA has conducted an evaluation of concentrations trends and a spatial analysis of the plumes, and concludes that the plumes are not stable and are not being sufficiently monitored to confirm TPC's conclusion that contamination is stabilized. TPC suggests in its EI Supplemental report that there are increasing trends in certain wells, but that trends "appear" to have stabilized over the past year. This interpretation is inconsistent with EPA FIELDS Group's *Draft Trend Analysis: Tecumseh Products* (Attachment 1) that concludes that permanent wells downgradient from source areas have increasing trends.

Specific comments are provided below in response to statements TPC makes in its EI Supplemental report.

TPC indicates that recent findings regarding the use of chlorinated VOCs will be considered in the development of the Corrective Action Plan. TPC suggests: 1) that a former dry cleaner is the likely source of PCE found in groundwater at monitoring well MW-12s and soil boring B-85, and cis-1,2-DCE at monitoring MW-29s; and, 2) that there is not any known or documented use of PCE at the TPC site during the operational life of the facility.

With respect to TPC's first assertion, EPA finds there is insufficient information to confirm that contamination at MW-12S, B-85, and MW-29S is the result of a release from a former dry cleaner for the following reasons.

- The dry cleaner was located along Chicago Avenue and contamination from this site would be expected to migrate to the northeast from Chicago Avenue in the direction of groundwater flow, not to the southeast, in the opposite direction of groundwater flow to the upgradient area of TPC's investigation on Potawatomie.

- The BEA provided as an attachment to TPC's July 2015 report indicates the dry cleaner operated from 1930-1950, so it is unlikely that a release of this age would only be appearing now in TPC's wells, given TPC's documented groundwater flow rate of approximately 33 feet per year in the area of the site.

- The PCE concentrations in soil and groundwater on this former dry cleaner site are lower than the concentrations identified on the TPC site in 2009.

TPC's second assertion that it could find no information that PCE was ever used at the site contradicts information already in the record. Listed below are examples of such inconsistencies:

- Page 4-3 of the September 2009 Current Conditions Report by RMT indicates "In particular, CVOCs which were typically used for degreasing purposes including trichloroethene (TCE), tetrachloroethene (PCE) and 1,1,1-TCA, and associated byproducts of their decomposition such as cis-1,2-dichloroethene (cis 1,2-DCE), trans-1,2-dichloroethene (trans 1,2-DCE), 1,1-dichloroethene (1,1,-DCE), and vinyl chloride are present at elevated concentrations throughout the site ";

- The Restrictive Covenant drafted by TPC in connection with the original sale of the site that was recorded with the Lenawee County Register of Deeds states that "…In particular, CVOCs, which were historically used by the Prior Owner at the Property for degreasing purposes, including trichloroethene (TCE), tetrachloroethene (PCE) and 1,1,1-TCA, and associated byproducts of their decomposition such as cis-1,2-dichloroethene (cis(1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), and vinyl chloride, are present at elevated concentrations on or about the Property".
- Documentation from prior RCRA inspections of the TPC site indicates that TPC had failed to make accurate waste determinations[1].
- PCE was found in soil and groundwater at relatively high levels in 2009 at GP-14, GP-15, GP-16, prior to the sale of the subject property by TPC. PCE was later found at SS-03, NS- 07, NS-08, B-29b during TPC's assessment, before being identified recently in 2015 at SB-MIP-46, SB-MIP-48, B-81, B-99, B-100, B-102, B-104, B-105 at much higher levels;
- Information TPC provided by email on September 19, 2014 identified PCE as a parent compound for which removal rates for the southern SVE system operation were being tracked, approximately one-year before being identified during the 2015 soil and groundwater testing;

TPC's EI Supplemental report states that the Statistical Evaluation of groundwater trends indicates that the groundwater plume is stable. TPC interprets that concentrations of CVOCs above Part 201 criteria are not expected to migrate beyond the area where groundwater use is prohibited by a City ordinance. This interpretation based on groundwater chemistry trend data and groundwater flow data from existing permanent wells does not consider the vapor intrusion pathway. In addition, existing permanent monitoring wells were installed on TPC's belief that source areas were located in the northern portion of the building and the southern portion of the building, and recent results from MIP and HRSC testing show that TPC's wells are not downgradient from the heaviest source area impacts to support conclusions regarding plume stability. Recent MIP work and HRSC work performed at EPA's request identified the two areas of highest contamination: 1) off-site near the aforementioned NPDES-permitted sewer line along Patterson in the north; and, 2) near another sewer line in the southeast corner of the site near Maumee. The spatial distribution of the permanent wells relative to areas of contamination shows that only MW-21 and MW-23 are within the apparent path of contaminant flow within the plumes. MW-23 is installed at a shallow depth, and MW-31 appears to be positioned cross-gradient from the plume core between B-86 and the southeast corner of the site. This information, coupled with the fact that concentration trends in the wells (MW-21 and MW-23) within the plumes are increasing and that the area of impacted groundwater has expanded between 2012 and 2015, establishes that TPC has not demonstrated that the plume(s) are stable and contamination may negatively impact surface water at increasing levels into the future. Therefore, TPC has failed to demonstrate that the Groundwater Environmental Indicator has been attained. A copy of EPA's completed *RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA750) Migration of Contaminated Groundwater Under Control* is attached for reference as Attachment 4.

[1] TPC previously determined that "chloroethene" was 1,1,1-TCA, manufactured by Dow at the time of prior waste determinations. "Chloroethene" is another name for vinyl chloride, and has been used to describe chlorinated solvents such as trichloroethene (TCE) and tetrachloroethene (PCE). NPEDS-permitted sewers along Patterson were sampled for 1,1,1-TCA "chloroethene" based on Tecumseh's waste determination, but contamination from other chlorinated solvents has been found in this area.

TPC states in its Groundwater EI Report that chlorinated volatile organic compounds (CVOCs) at monitoring wells proximate to the former source areas are stable or decreasing (e.g., MW-32s, MW-33s, MW-34s and MW-01s), concluding that the overall CVOC mass is decreasing. EPA finds the lack of monitoring downgradient from the more dominant (MIP) source areas (discussed in the preceding paragraph) precludes any conclusion that contaminant levels are decreasing. Contaminant levels recently identified downgradient from these source areas through HRSC groundwater testing suggest that NAPL is potentially present, which may continue to migrate without significant degradation, and which may be the cause of the increasing downgradient groundwater concentrations. MIP/HRSC confirmation sampling near locations referenced by TPC as source where decreasing concentrations in groundwater are believed to demonstrate reductions in contaminant mass have yielded conflicting results. Without the benefit of sufficient permanent on-site wells, it is difficult to determine whether the decreases at fixed locations are related to reductions in contamination mass, or whether the contamination has simply migrated away from those areas. TPC's testing results contradict TPC's conclusion that contamination is reducing in these areas. The following examples illustrate this point.

- TCE was recently found at 9,100 ug/L (indicative of potential NAPL) near MW-33S, where TPC suggests a reduction in TCE concentrations demonstrates a decreasing contaminant mass.
- TCE was found at 560 ug/L in 2009, but at 1,500 ug/L in 2015 [see data for GP-22 (41'-45') and B-90 (41.5'-44.5')] near MW-1S, where TPC suggests a reduction in TCE concentrations at shallow intervals is evidence of decreasing contamination. Contamination believed to be present only in shallow groundwater at MW-1S is present throughout the entire water column at B-90.
- No assertions can be made regarding reductions in CVOC concentrations in the areas of heaviest contamination (identified MIP source areas near sewers off-site to the North, and on-site in the Southeast) because TPC has not monitored these areas, which potentially contain NAPL that does not readily degrade.

With respect to the statistical trend tests, TPC accurately states the data indicate upward trends at downgradient monitoring wells MW-23 (vinyl chloride), MW-22 (vinyl chloride), and MW-31 (TCE). EPA also notes an upward trend at MW-21. Monitoring wells MW-21 and MW-23 are the primary permanent monitoring wells established in proximity to the plumes downgradient from these primary sources. TPC has suggested that a visual inspection of trends shows that for the past 4 years concentrations at MW-31 appear stable; that concentrations at MW-22 and MW-23 appear to have stabilized over the past year to year-and-a-half, and that apparent stabilizations were checked by running trend tests using only data from the period of apparent stability which identified no statistically significant trends. Based on EPA's own trend tests, and considering the spatial distribution of wells relative to contamination and lack of wells within the path of contaminant migration, EPA does not agree with TPC's conclusions regarding the apparent stabilization of the plume.

TPC's report states that beginning during the third quarter 2015, quarterly sampling events at existing wells will be eliminated from the groundwater monitoring program. EPA disagrees with this course of action without a Corrective Measures Proposal to address the contamination, and without a monitoring network to accurately monitor contamination during the corrective action process. EPA will only consider a proposal for reduced sampling if TPC provides specific justifications for decommissioning each well, since evaluation of the contaminant migration paths and resulting exposures are ongoing.

Attachment 3 – Chronology of Pertinent Events Leading to TPC's July 31, 2015 Supplemental Determination

Provided below is the chronology of events and correspondences that resulted in EPA's agreement to extend the Groundwater Environmental Indicator Report deadline to July 31, 2015.

- September 28, 2012 – TPC submits Remedial Investigation and Groundwater Environmental Indicator Report, with an interpretation that the groundwater plume is stable even though contaminant concentrations in some wells are increasing.
- October 29-30, 2012 – EPA and TPC meet to discuss the work completed and deficiencies in investigation activities and EI determinations. EPA summarizes that through 2012, TPC has collected deep samples on-site from only the five most-recent soil borings (NS-18 through NS-20, and SS-09 through SS-10), where TCE was found at high levels near the deepest sampling intervals. EPA notes that TPC's field screening results suggest contamination appears to be sinking, but TPC has installed only one deep monitoring well on-site, and only three monitoring wells in *reported* source areas on the 50-acre site. EPA's meeting agenda establishes that EIs have not been met and requests that TPC remove similar statements from future reports.
- December 5, 2012 (revised December 19, 2012) – TPC submits Technical Memorandum outlining "punch-list" of items to address deficiencies discussed in October meeting. TPC attaches draft extension letter for EPA's use.
- December 26, 2012 - EPA requests work plan for proposed well installation that was to be provided to EPA in order to grant extension to TPC for Groundwater Environmental Indicator Report.
- January 15, 2013 – TPC provides work plan for well installation.
- February 1, 2013 – EPA responds that TPC's proposed workplan reduces the number of wells EPA requested in the meeting, without providing sufficient justification for the reduction.
- February 27, 2013 – TPC submits a revised work plan.
- March 6, 2013 – EPA grants extension and approves revised workplan. TPC notifies EPA of a force majeure event that prevents them from meeting quarterly sampling requirements (TPC is unable to sample due to demolition and inactive fire suppression controls). EPA agrees to extend the sampling deadline.
- June 24, 2013 – TPC notifies EPA that they will be completing a passive soil gas (PSG) survey near the solvent distillation unit because it believes the most significant source area likely contributing to the off-site VOC migration is near the SS-9 and SS-10 borings, and the PSG will assist in verifying that source and designing a remedy for this area.
- July 15, 2013 – TPC submits Quarterly Progress Report that contains first results from monitoring of newly installed wells and revised cross sections requested in October 2012 meeting. The report notes soil gas sampling issues that will require resampling, and includes cross-sections showing heaviest contamination at intermediate depths that were not being monitored prior to the installation of MW-35i, and are not being monitored downgradient at present.
- July 26, 2013 – EPA notifies TPC of concerns based on data presented in quarterly report. EPA notes current levels of contamination (MW-35i) twice as high as depicted on

the July 15th cross-sections, and renews its request for a PSG survey southeast of the building. EPA questions whether TPC will meet the approaching Human Health Environmental Indicator deadline, given these issues.

- August 5, 2013 – TPC responds to EPA's request indicating that the higher concentrations noted at MW-35i do not affect the conceptual site model or the path forward, and that PSG sampling suggests that a small isolated source of VOCs under the building upgradient from MW-35i.
  August 7, 2015 – EPA continues to doubt TPC will meet Human Health Environmental Indicator deadline and requests call to discuss further.
- September 12, 2013 – EPA contacts TPC to discuss concerns with the anticipated submittal of the Supplemental Human Health Environmental Indicator Report. TPC again states the new results do not affect prior interpretations or agreements. EPA instructs TPC to submit Supplemental Human Health Environmental Indicator Report Information, and EPA will respond with a comprehensive summary of outstanding concerns at TPC's request.
- September 21, 2013 – TPC sends letter to EPA Branch Chief expressing concern with prior agreements, and indicating that off-site customers want more cleanup, not more investigation.
- September 29, 2013 – TPC submits Supplemental Human Health Environmental Indicator Report.
- January 31, 2014 – EPA issues comprehensive letter describing cumulative deficiencies in site assessment and environmental indicator reports, outlining insufficient characterization of sources and pathways, monitoring of contamination in areas that reflect a potential low bias for contamination, and a potentially expanding plume that prevents assurance that human exposures are under control.
- February 12, 2014 – TPC proposes a meeting in March to discuss a workplan for limited additional fieldwork.
- February 20, 2014 – EPA provides correspondence outlining the need for a basic scope of work to address the concerns outlined in its January 31, 2014 letter before scheduling a proposed 2-day meeting.
- March 3, 2014 - TPC submits a *Draft* Scope of Work (SOW) in response to EPA's deficiency letter that proposes PSG data collection, membrane interface probe (MIP) work followed by limited confirmation sampling, off-site MIP work, additional soil gas investigation on the southeast adjacent site, further evaluation of potential vapor intrusion in the north based on data collected, but further evaluation of groundwater plume stability based on additional data collected only to verify outer-edge plume stability.
- March 11, 2014 - EPA provides comments on the SOW, noting acceptable aspects of proposed work, but citing the need for pre-emptive mitigation at residences in the north, soil gas sampling at other industrial/commercial properties, additional PSG investigation, expanded confirmation sampling of soil, installation of additional permanent groundwater wells, and Groundwater High Resolution Site Characterization (HRSC) in off-site transects to reduce uncertainty about site conditions, contaminant migration, and exposure pathways. EPA specifically notes the need for a transect between B-49 and MW-20 along Maumee Street that TPC omitted from the SOW based on its belief that this work was already completed during PRB design, in order to determine the accurate placement of future monitoring wells for the plume stability demonstration.

- March 27, 2014 – TPC revises SOW, agreeing to expanded PSG survey, and attaching PSG results from central portion of the building that showed additional source area(s). TPC noted a prior request for time to allow for perimeter soil vapor extraction (SVE) system in the north to have a positive affect before determining if residential sampling would be needed, and proposes using soil gas samples from perimeter vacuum monitoring points in the south to determine if further sampling of the property will be required.
- April 4, 2014 - TPC informs EPA that they will proceed with the scope of work submitted on March 27, 2014.
- April 17, 2014 – EPA provides correspondence reaffirming the need for permanent monitoring wells within the plume, reaffirming the need to collect off-site soil gas samples on the southeast adjacent site, and requesting a meeting to ensure agreement on the SOW before proceeding.
- May 12, 2014 – EPA and TPC meet at Region 5 to discuss the scope of work and specific sampling locations. EPA provides figures showing the apparent expansion of the plume, areas of highest contamination lacking investigation, areas of outstanding concerns, and suggested areas where additional monitoring wells will be required. EPA provides agenda items and figures to TPC following the meeting and agrees to memorialize the outcomes of the meeting in a letter.
- May 14, 2014 – TPC requests that figures 13-16 be removed from the forthcoming letter, specifically figure 16 that shows recommended permanent monitoring well locations. EPA reiterates the need for permanent wells, specifically at intermediate depths at B-50 and MW-20, and requests certain NS and SS wells to be added to the monitoring network, but agrees to remove the figure because specific well locations have not been discussed.
- June 3, 2014 – TPC notifies EPA of upcoming work and provides a generalized scope of work. EPA concurrently provides a copy of the *draft* of letter summarizing meeting discussion and outlining a detailed SOW that will be needed to address EPA's concerns.
- June 4, 2014- TPC provides further clarification on SOW, and objects to the requirement to collect "*excessive*" confirmation sampling results.
- June 6, 2014 – EPA reiterates need for quantitative confirmation sampling to develop a plan for corrective action, and to establish the locations for permanent monitoring wells, providing published reference materials for MIP confirmation sampling frequency and procedures.
- June 9, 2014 – EPA issues *final* letter summarizing discussions during the meeting. TPC repeats that it is unnecessary to undertake the extensive investigation EPA requires for confirmation sampling and expresses displeasure with EPA's efforts to clarify the scope of work.
- June 17, 2014 - TPC initiates MIP investigation.
- June 18, 2014 - TPC provides additional PSG data in response to EPA's May request. PSG survey identifies significant contamination southeast of the building.
- June 30, 2014 - EPA requests additional MIP work in the southeast based on the PSG provided after the SOW was negotiated (MIP and groundwater sampling results later confirm a significant source of TCE and PCE adjacent to a sewer in this area that was previously omitted from the investigation).

- July 24-28, 2015 – TPC completes MIP investigation, and EPA requests an update on the MIP work and analytical data for initial testing.
- August 5, 2014 – TPC provides draft MIP logs, maps, and data tables and requests a call the following week to discuss a plan for confirmation sampling.
- August 6, 2014 – EPA discusses with TPC the agreement to provide the MIP contractor's final report before proposing a scope of work for confirmation sampling.
- June - October 2014 - TPC prepares a three-dimensional analysis of MIP data for EPA's concurrence in targeting confirmation sampling locations. EPA concurrently evaluates the *draft* MIP logs and maps provided by TPC and develops figures, tables, and cross sections to outline anticipated confirmation sampling requests.
- October 23, 2014 - TPC conducts web-based presentation for EPA, including a 3-dimensional interpretation of contaminant distribution, and a general proposal for confirmation sampling. EPA notes concerns with interpretation of data in the southern source area, and requests a copy of the MIP contractor's report requested in August.
- October 27, 2014 - EPA provides email clarifying EPA's concerns with TPC's interpretation of conditions near MIP-03, MIP-05 and MW-1S.
- November 9, 2014 - EPA meets with TPC at Tecumseh City Hall to clarify expectations regarding the anticipated confirmation sampling plan.
- December 3, 2014 - EPA notifies TPC that it has still not received the MIP contractor's report requested in August and October to evaluate the next steps.
- December 5, 2014 - TPC provides drafts of the MIP contractor's report.
- January 1, 2015 - TPC submits for EPA's review the *MIP Investigation Report and Workplan for High Resolution Site Characterization.* Among other things, the workplan proposes confirmation sampling north of the southeastern MIP source area at MIP-23, MIP-30, and MIP-50 (while high PCE and TCE were later identified south of this MIP source area where sampling was requested by EPA at MIP-49), and proposes a HRSC transect along Kilbuck in the north, rather than Maumee as proposed by EPA (where investigation later confirmed that vinyl chloride extended east of the hospital).
- January 6 - 7, 2015 - EPA submits questions to TPC regarding depth discrepancies and identifies typographical errors in the *MIP Investigation Report and Workplan.*
- January 8, 2015 - TPC responds to EPA's questions, and indicates the report will be revised accordingly.
- January 29, 2015 - EPA provides comments on the workplan, requesting modifications, outlining a specific scope to address deep contamination in the south, specifying the need for expanded confirmation sampling downgradient from MIP sources at the north and southeast property perimeter, and expressing disagreement with the transect along Kilbuck, rather than Maumee. TPC informs EPA that they will be revising the report.
- March 3, 2015 - TPC submits a revised workplan that incorporates revisions to the MIP logs and contractor's report, in addition to the majority of EPA's requests, with the exception of the sampling requested by EPA to delineate deep contamination in the south.
- March 11, 2015 – TPC submits Final version of Revised Work Plan
- March 26, 2015 - EPA provides further clarifications on revised Workplan, noting that many of the concerns it raised in the in its January 2014 letter remain unaddressed.
- April 21, 2015 – EPA and TPC conduct conference call to discuss final comments on workplan.

- April 23, 2015 – EPA emails TPC a summary of issues discussed during a conference call regarding the work plan, and discusses the reasons why the 90-day extension TPC requested will not provide TPC sufficient time to meet the Groundwater EI deadline.
- April 30, 2015 – TPC submits final workplan.
- May 7, 2015 – EPA emails TPC final clarification regarding field screening and provides a schedule for the site visit.
- May-June, 2015 – TPC performs MIP confirmation testing and HRSC work.
- June 11, 2015 - TPC notifies EPA that final HRSC groundwater samples were collected on June 9, 2015.
- July 15, 2015 – TPC submits Quarterly Progress Report.
- July 21, 2015 – TPC submits additional notices of migration of contamination to affected off-site properties.
- July 31, 2015 – TPC submits *Supplement to Remedial Investigation and Environmental Indicator Report (Migration of Contaminated Groundwater Under Control)*, noting the majority of monitoring wells have no trend or decreasing trends, and wells with increasing trends "appear" to have stabilized.
- August 4, 2015 – In response to TPC's July 31, 2015 Report, EPA sends email to TPC requesting that TPC discuss their scope of work for groundwater/surface water interface (GSI) evaluation with MDEQ, prior to proceeding with the work proposed for August 24, 2015.
- August 6, 2015 – TPC emails MDEQ about GSI work and notes that it disagrees with EPA's interpretation that the plume is migrating.
- August 10, 2015 – EPA submits a response to TPC's July 15, 2015 Progress Report.
- August 11, 2015 – EPA responds to TPC's August 6, 2015 email reaffirming that permanent wells in the plumes are required to monitor groundwater migration and demonstrate that the plume is stable before the GSI work can be considered acceptable.

Attachment 4 –*RCRA Corrective Action Environmental Indicator (EI) RCRIS code (CA750) Migration of Contaminated Groundwater Under Control, Dated* **October, 2015.**

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final (2/5/99)

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name:	Former Tecumseh Products Company (Tecumseh Compressor) Facility
Facility Address:	100 E. Patterson, Tecumseh, MI
Facility EPA ID #:	MID005049440

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

X — If yes - check here and continue with #2 below.
— If no - re-evaluate existing data, or
— if data are not available skip to #6 and enter "IN" (more information needed) status code.
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BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

X — If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

— If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

— If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Soils and groundwater are contaminated with hazardous and non-hazardous wastes throughout the site. A groundwater monitoring program was implemented in 2009 during a property transaction between Tecumseh Products and a prospective purchaser, and has continued with modifications and additional monitoring wells through the present. Investigation was originally initiated in 2008 by the prospective purchaser. Investigation work is ongoing and the extent of soil and groundwater contamination has not yet been characterized. The primary contaminants are volatile organic compounds (VOCs), including tetrachloroethene (PCE), trichloroethene (TCE), 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethane (1,1-DCA), 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-DCE), trans-1,2-dichloroethene (trans-DCE), and vinyl chloride. Levels of TCE in the groundwater were detected at concentrations up to 7,500 ug/L at the north property line (MW-4S), and up to 5,400 ug/L at the southeast property line (B-50) during investigation completed through 2014. Contamination extends off-site to the northeast and east into residential areas. TCE levels 1,000 feet east of the site (MW-21) increased from 730 ug/L to 1,600 between 2009 and 2014. Vinyl chloride levels in the monitoring well 1,000 feet northeast of the site (MW-23) increased from 3.2 ug/L to 120 ug/L between 2009 and 2014, but was previously identified at 430 ug/L at deeper intervals that are not being monitored. Additional investigation requested by EPA and completed in 2015 identified TCE up to 12,000 ug/L off-site to the north of the property, and PCE up to 32,000 ug/L in the southeast corner of the property. Vinyl chloride was found at levels up to 2,600 ug/L one block north of the site, and up to 1,400 ug/L two blocks north of the site where shallower intervals were being monitored (MW-23). TCE was also found up to 2,800 ug/L 1,000 feet off-site to the east, south of MW-21, and at 1,200 ug/L immediately adjacent to the wetland during additional GSI evaluation in August 2015. The standards for groundwater are the Federal Maximum Contaminant Levels (MCLs); 5.0 ug/L for TCE and 2.0 ug/L for vinyl chloride.

REFERENCES: (a) Remedial Investigation and Groundwater Environmental Indicator Report, September 2012 (TRC); (b) Supplement to the Current Human Exposures Environmental Indicator Report and Proposed Extension Pursuant to Paragraph 21 of the AOC; RCRA 3008(h) Administrative Order on Consent (AOC) (RCRA-05-2010-0012), September 30, 2013 (TRC); (c) EPA's Response to Tecumseh Products Company's September 30, 2013 Supplemental Submission to the Human Exposure Environmental Indicator Report (MID005049440), January 31, 2014 (US EPA); (d) Fourth Quarter 2014 Progress Report – MID 005-049-440, January 15, 2015 (TRC); (e) Supplement to Remedial Investigation and Environmental Indicator Report, RCRA 3008(h) Administrative Order on Consent (RCRA-05-2010-0012), July 31, 2015.

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

___ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

X **If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.**

___ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The extent of groundwater contamination is not defined, and the monitoring network does not meet the criteria specified below[2]. There are insufficient permanent monitoring wells to evaluate a plume of this size and magnitude, and many monitoring wells are positioned at improper depths to define the extent of contamination in three dimensions[2]. In September 2012, the facility submitted a Remedial Investigation and Groundwater Environmental Indicator Report that included, *Figure 20 – Extent of VOCs above Part 201 Criteria*, showing the extent of groundwater contamination at the time the facility submitted their Groundwater EI determination. In July 2013, the facility submitted a quarterly monitoring report that included, *Figure 9 – Extent of VOCs above Part 201 Criteria*, showing that the extent of groundwater contamination had expanded since the time of their original determination. The demonstrated expansion of the plume by the facility was documented in EPA's June 9, 2014 correspondence letter as Figures 13 and 14. Increasing contaminant concentrations in certain wells (MW-23 and MW-21, among others) since the time of the facility's attempted Groundwater EI demonstration further support the interpretation that the plume is expanding and/or migrating. In August 2015, EPA prepared a revised TCE isoconcentration map, vinyl chloride isoconcentration map, and extent of groundwater contamination map based on MIP/HRSC investigation data from 2015 that further demonstrated the expansion of the plume beyond the area of contaminated groundwater defined by the facility in 2012.

REFERENCES: (a) Remedial Investigation and Groundwater Environmental Indicator Report, September 2012 (TRC); (b) Second Quarter 2013 Progress Report – MID 005-049-440, July 15, 2013 (TRC); (c) Summary of Additional Investigative Work to be Performed Following May 12, 2014 Meeting, Pursuant to Administrative Consent Order, MID005049440, June 9, 2014 (US EPA); (d) Fourth Quarter 2014 Progress Report – MID 005-049-440, January 15, 2015 (TRC); (e) Supplement to Remedial Investigation and Environmental Indicator Report, RCRA 3008(h) Administrative Order on Consent (RCRA-05-2010-0012), July 31, 2015; (f) Electronic correspondence with attachments, August 4, 2015 (EPA).

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[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

___ If yes - continue after identifying potentially affected surface water bodies.

___ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

X If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The Facility has made a determination that contaminated groundwater discharges to the River Raisin, located between 1,700 and 2,700 feet east of the facility. The facility submitted a Request to MDEQ for Mixing Zone-Based GSI Criteria on June 19, 2012 based on their interpretations of the extent of contamination. The facility later submitted a second request for Review of Site-Specific GSI Criteria on August 29, 2013 to MDEQ. On December 10, 2013, MDEQ informed the facility that: 1) the flow path and fate of the impacted groundwater had not been adequately delineated; 2) there is no data regarding whether groundwater is discharging directly into the River Raisin or first into the wetland; 3) impacted groundwater discharging into a wetland is afforded no dilution or mixing, so only the generic GSI criteria apply; 4) the volume of impacted groundwater discharging to the wetland and the volume of impacted groundwater discharging to the River Raisin must be quantified before evaluating the mixing zone or de minimis determination; and 5) the facility's site-specific GSI criteria was found to be inadequate. MDEQ's comments that "discharges to wetlands are afforded no dilution" is consistent with EPA's discussions with the facility during our October 2012 meeting, in which we discussed the need to address impacts to ecological receptors. To date the facility has not provided any additional information, but developed a scope of work to address MDEQ's comments, provided as an attachment to the July 31, 2015 Supplemental Groundwater Environmental Indicator Report. There are contaminants in wells adjacent to the wetland and River Raisin, at levels exceeding MDEQ's default GSI screening criteria that are increasing in concentrations. This criteria is marked urknown because the facility has not determined if contaminated groundwater exceeding the default GSI criteria is impacting the wetland or the river, or if concentrations within the contaminant plume will continue to increase. The facility interprets that concentrations above MDEQ's Final Acute Values will not impact the River Raisin, and therefore, has not made efforts to control the groundwater plume, but has also not monitored the migration of contamination within the plume core to determine if that interpretation is accurate.

REFERENCES: (a) Remedial Investigation and Groundwater Environmental Indicator Report, September 2012 (TRC); (b) Action Items from the October 2012 Project Meeting for Environmental Work Associated with the Former Tecumseh Products Company Site (RCRA-05-2010-0012), December 5, 2012; Revised December 19, 2012 (TRC), (c) Request for Mixing Zone-Based GSI Criteria, June 19, 2012 (TRC); (d) Review of Site-Specific GSI Criteria, August 29, 2013 (TRC); (e) Electronic Correspondence, December 10, 2013 (MDEQ); (f) Electronic Correspondence, August 20, 2015 (EPA).

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be "**insignificant**" (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

X

If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

On December 10, 2013, MDEQ informed the facility that the facility's site-specific GSI criteria was found to be inadequate. The facility has not appropriately evaluated the criteria outlined below[a]. At present contaminant concentrations adjacent to the river and wetland are less than 10 times the default GSI criteria under MDEQ's Part 201 regulations, and more than 10 times EPA's MCLs. However, monitoring wells located upgradient from groundwater source areas contained TCE at levels that suggest the potential presence of free-phase solvent in source areas. Groundwater source areas were identified during membrane Interface Probe (MIP) investigation in 2014, and assessed in HRSC transects in 2015. Confirmation sampling identified concentrations in groundwater at or above 1% solubility, further suggesting the presence of free-phase NAPL, with the potential to migrate. The aquifer is primarily sand, and there are insufficient monitoring wells downgradient from perimeter source areas to track the potential migration of contamination. Areas of heaviest groundwater contamination are centered on former abandoned sewer lines in the north and southeast portions of the site. Monitoring wells positioned at great distances downgradient have increasing contaminants trends downgradient from these unmonitored source areas.

REFERENCES: (a) Electronic Correspondence, December 10, 2013 (MDEQ); (b) MIP Investigation Report and Workplan for High Resolution Site Characterization, December 31, 2014 (TRC); (c) Electronic Correspondence, January 29, 2015 (EPA) .

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[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

___ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment,[5] appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

___ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

X If unknown - skip to 8 and enter "IN" status code.

Rationale and Reference(s):

Discharges have not been fully assessed (see 5).

REFERENCES: (a) Electronic Correspondence, December 10, 2013 (MDEQ); (b) Summary of Additional Investigative Work…, June 9, 2014 (US EPA).

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

___ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

___ If no - enter "NO" status code in #8.

X
___ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

It is unclear when a sufficient monitoring well network will be established to demonstrate that the migration of contaminated groundwater plumes from the Tecumseh facility is stable. The facility was required to demonstrate that the migration of contaminated groundwater was under control by September 2012. The facility was granted an extension by EPA in October 2012 because the monitoring network was determined to be insufficient. The new deadline for the EI determination was July 2015. The facility was informed in January 2014 that additional work would be required, and that it had not met its obligations under Paragraph 11, Paragraph 13.a., and Paragraph 13.b., under Administrative Order on Consent (RCRA-05-1010-0012), dated March 29, 2010. Between the time of the meeting in May 2014 and May 2015, the facility has collected only screening level MIP data, with the exception of certain samples from SB-MIP-01 and SB-MIP-03. Sampling from temporary locations was completed in May and June 2015, but the facility failed to meet the monitoring requirements by the July 2015 deadline because the magnitude and extent of impacts has not been determined, and the stability of the plume has not been demonstrated.

REFERENCES: (a) EPA's Response to Tecumseh Products Company's September 30, 2013 Supplemental Submission to the Human Exposure Environmental Indicator Report (MID005049440), January 31, 2014 (US EPA); (b) Summary of Additional Investigative Work to be Performed Following May 12, 2014 Meeting, Pursuant to Administrative Consent Order, MID005049440, June 9, 2014 (US EPA); (c) Electronic Correspondence, January 29, 2015 (EPA).

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI

determination below (attach appropriate supporting documentation as well as a map of the facility).

___ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the (facility). Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

X NO - Unacceptable migration of contaminated groundwater is observed or expected at the former **Tecumseh Products Company site, 100 E. Patterson, Tecumseh, MI (MID005049440)**.

___ IN - More information is needed to make a determination.

Completed by	(signature)		Date	
	(print)	*Joseph Kelly*		10/5/15
	(title)	*Corrective Action Project Manager*		
Supervisor	(signature)		Date	
	(print)	*Michael Beedle*		10.5.15
	(title)	*Chief, Corrective Action Section 1*		
	(EPA Region or State)	*U.S. EPA, Region 5*		

Locations where References may be found:
US EPA Region 5 RCRA Records Center, 77 West Jackson Blvd., Chicago, IL 60604 Corrective Action Site Web Page: http://www.epa.gov/region5/cleanup/rcra/tecumseh/ Tecumseh District Library, Tecumseh Products Information Repository, 215 N. Ottawa Street Tecumseh, MI 49286

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