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Phase 2 Removal Site Evaluation Report for National Zinc Site, Cherryvale, Kansas

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Phase 2 Removal Site Evaluation Report for National Zinc Site, Cherryvale, Kansas

Prepared for

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United States Steel Corporation

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June 3, 2016

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Doc. no. 1208309.000 - 2763

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Acronyms and Abbreviations

ADS	agency decision statement
ARARs	applicable or relevant and appropriate requirements
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
COC	chemicals of concern
CSM	conceptual site model
EPA	U.S. Environmental Protection Agency
IC	institutional control
KDHE	Kansas Department of Health and Environment
PNL	Project Navigator Ltd.
QA/QC	quality assurance/quality control
RAD	removal action design
RCRA	Resource Conservation and Recovery Act
Respondents	United States Steel Corporation and Citigroup Global Market Holdings, Inc.
ROW	right of way
RSE	removal site evaluation
SACO	Second Amendment to Consent Order
SAP	sampling and analysis plan
Site	the corporate limits of the City of Cherryvale
SRM	smelter residue material
SSV	soil screening value
TACO	Third Amendment to Consent Order
XRF	x-ray fluorescence

Executive Summary

This Phase 2 Removal Site Evaluation (RSE) Report for the National Zinc Site, Cherryvale, Kansas, has been prepared on behalf of United States Steel Corporation and Citigroup Global Market Holdings, Inc. (Respondents), pursuant to the Second Amendment to Consent Order[1] (SACO) (Kansas Department of Health and Environment [KDHE] 2013a) between the Respondents and KDHE dated May 3, 2013. The purpose of the Phase 2 RSE is to assess the nature and extent of smelter-related exceedances of soil screening values (SSVs) for lead, which is the primary chemical of concern, in areas within the corporate limits of the City of Cherryvale (the Site) outside the former National Zinc Smelter Property (former smelter property) (Figure 1). The residential SSV for lead at the Site is 400 mg/kg; the commercial/industrial SSV for lead is 1,000 mg/kg. The Site evaluation was conducted in accordance with the Phase 2 RSE work plan (Exponent 2014b) approved by KDHE on August 18, 2014 (KDHE 2014b).

To determine the nature and extent of soils with elevated lead resulting from direct placement of smelter residue material (SRM) within the Site, a City-wide survey was conducted using a visual classification system that correlates the visible occurrence of SRM with the likelihood of associated soils exceeding the SSV for lead. Classification was based on the frequency, abundance, type, and location of the SRM. The classes ranged from SRM commonly observed to no SRM apparent; identified as A, B, B-Fill, C, and D classes, with the A class having the most identified SRM, and the D class with no visible SRM.

The SRM classes were verified by collection of soil samples at a subset of residential yards (including daycare centers), driveways, brick walkways, and city alleys throughout the Site, and measured by x-ray fluorescence (XRF). This sampling showed that the visual classification for these properties and features is appropriate, the data are explainable and predictive, and based on discussions with KDHE, no additional sampling was determined to be necessary to proceed with the City-wide survey. Parks, schools, and commercial/industrial properties were also sampled and surveyed.

During the work to validate the SRM classes, the Respondents identified a small group of high-priority properties, the Early Action Properties, where lead in soil composite samples was above the residential SSV of 400 mg/kg, SRM was usually observed at the surface or in the shallow subsurface, and the properties may be frequently used by children for extended play periods. The Respondents conducted an early, expedited removal action at KDHE's request to remediate five daycare facilities (housed at residences) and one owner-occupied single-family residence, one park property (E 1st St), and an isolated area of exposed brick next to the Logan Park gazebo. Work at the Early Action Properties was completed by November 2015.

Once SRM classes were validated and approved by KDHE, the City-wide SRM survey was completed on properties and public ditches, walkways, and alley rights of way (ROWs) within

[1] A Third Amendment to Consent Order (TACO) was issued September 15, 2015, to address removal actions at a small group of properties (the "Early Action Properties").

the City limits of Cherryvale. During the City-wide survey, 1,113 properties were reviewed[2], including:

- Residential properties (yards, drip lines, driveways, and private walkways)
- Public ROWs (city ditches, walkways, and alleys)
- Commercial/industrial properties
- Parks and schools.

For properties with multiple features (i.e., yard, drip line, and driveway), the overall classification for the property was the highest classification of either the yard, drip line, private walkway, or driveway. City walkways, ditches, and alleys adjacent to a property were classified and recorded but were not considered when assigning the overall class of a property. Overall property and feature classifications for all properties (i.e., residential and commercial/industrial) are shown on Figures 17 and 18, and in Table ES-1. Overall property and feature classifications for residential properties are shown in Table ES-2, and those for commercial/industrial properties are shown in Table ES-3.

Table ES-1. Summary of property features and associated SRM class observed at all properties

	SRM Class					
Feature	A	B	B-Fill	C	D	Total
Yard	65	127	14	225	634	1,065
Drip line	41	70	11	325	440	887
Driveway	53	80	9	176	665	983
City ditch	30	52	0	75	222	379
City walkway	18	18	0	84	802	922
City alley	47	88	1	294	348	778
Overall properties	122	186	23	397	385	1,113

[2] There were multiple efforts to obtain access from property owners by the Respondents' representatives, which included mailing, door to door visits, and leaving flyers requesting access when no one answered. Additionally, KDHE made efforts to obtain access by certified mail. Despite these efforts by the Respondents' representatives and KDHE, there were 125 parcels on which the owners denied access and 217 parcels on which the owners could not be located or refused to respond to requests for access.

Table ES-2. Summary of property features and associated SRM class observed at residential properties

	SRM Class					
Feature	A	B	B-Fill	C	D	Total
Yard	55	120	12	223	606	1,016
Drip line	32	64	11	314	411	832
Driveway	43	72	8	164	631	918
City ditch	29	51	0	72	214	366
City walkway	17	18	0	83	744	862
City alley	36	81	1	283	328	729
Overall properties	105	175	21	380	357	1,038

Table ES-3. Summary of property features and associated SRM class observed at commercial/industrial properties

	SRM Class					
Feature	A	B	B-Fill	C	D	Total
Yard	10	7	2	2	28	49
Drip line	9	6	0	11	29	55
Driveway	10	8	1	12	34	65
City ditch	1	1	0	3	8	13
City walkway	1	0	0	1	58	60
City alley	11	7	0	11	20	49
Overall properties	17	11	2	17	28	75

The primary source of lead at the Site is the widespread use of SRM (slag and crushed retorts) for fill and road base throughout Cherryvale. Aerial emissions from smelter operations also contributed lead to properties close to the smelter; those properties have been remediated. Principal exposure pathways for residents and workers at the Site are incidental ingestion of or dermal contact with soil in city ditches and accessible soils, which are considered to be those at the surface (e.g., granulated slag mixed with soil on a driveway or former building foundation, or bare or thinly vegetated soil in a residential yard) or found at shallow depths beneath grass that could easily be exposed through landscaping or casual digging by people or pets.

Removal action alternatives have been developed for residential yards and the following property features: drip lines, driveways, City ditches, City and private walkways, and City alleys; the removal action alternatives also apply to those portions of commercial/industrial properties that are adjacent to residential properties. The removal action alternatives are summarized in Table ES-4. Focused removal actions for the parks will be provided in the draft removal action design (RAD) Plan.

Table ES-4. Removal alternatives by feature

Feature	Alternative 1	Alternative 2	Alternative 3
Yard (Y)	Y1—No action	Y2—Phosphate amendment, cap, and sod	Y3—Soil removal, fill, and sod
Drip line (DL)	DL1—No action	DL2—Visible SRM removal and cover	DL3—Soil removal, fill, and cover
Driveway (DW)	DW1—No action	DW2—Pave	DW3—Remove and replace driveway and adjacent soils
City ditches (CD)	CD1—No action	CD2—Institutional Controls (ICs)	CD3—ICs with environmental improvements
Brick walkways (BW)	BW1—No action	BW2—ICs	BW3—ICs with replacement of disturbed brick sections with concrete, and soil sampling and removal
City alleys (CA)	CA1—No action	CA2—ICs	CA3—ICs with alley rehabilitation and fringe soil sampling and removal

Alternative 3 for all features would be the most effective set of removal actions, and the suite of recommended removal actions is:

- Yard alternative Y3: Soil removal, fill, and sod
- Drip line alternative DL3: Soil removal, fill, and cover
- Driveway alternative DW3: Remove and replace driveway and adjacent soils
- City ditches alternative CD3: Institutional controls (ICs) with stabilization of unstable exposed SRM areas
- Brick walkways alternative BW3: ICs with replacement of disturbed brick sections with concrete, and soil sampling and removal
- City alleys alternative CA3: ICs with alley rehabilitation and fringe soil sampling and removal

This set of removal action alternatives is the most effective, protective, and cost-beneficial of the alternatives evaluated. The yard alternative (Y3) is the presumptive remedy that has already been applied to Cherryvale properties during three previous yard removal campaigns. The approach for drip lines (DL3) and driveways (DW3), and for disturbed brick walkways (BW3), addresses the presence of SRM and soil lead above the SSV on private property.

The alternatives for the city brick walkways (BW3), ditches (CD3), and alleys (CA3) address SRM present on the City-owned ROWs. The emphasis for the City-owned property is institutional controls (ICs) combined with proactive improvements during the implementation of

the removal program. The intent of the ICs program is to provide for the long-term protection of human health and the environment in a manner that is affordable and practical for the City to manage.

Note that this Executive Summary does not contain all of Exponent's technical evaluations, analyses, conclusions, and recommendations. Hence, the main body of this report is at all times the controlling document.

1 Introduction

This Phase 2 Removal Site Evaluation (RSE) Report for the National Zinc Site, Cherryvale, Kansas, has been prepared on behalf of United States Steel Corporation and Citigroup Global Market Holdings, Inc. (Respondents), pursuant to the Second Amendment to Consent Order[3] (SACO) (Kansas Department of Health and Environment [KDHE] 2013a) between the Respondents and KDHE dated May 3, 2013.

The RSE is being completed in two phases. Under the Phase 1 RSE, soil bioavailability testing was conducted to develop site-specific soil delineation and screening levels for arsenic and lead. The Phase 1 report (Exponent 2014a) was approved by KDHE on April 10, 2014 (KDHE 2014a). This Phase 2 RSE report pertains to the second phase of this work.

1.1 Purpose

The purpose of the Phase 2 RSE is to assess the nature and extent of smelter-related exceedances of soil screening values (SSVs) in areas within the corporate limits of the City of Cherryvale (the Site) outside the former National Zinc Smelter Property (former smelter property) (Figure 1). The Site evaluation was conducted in accordance with the Phase 2 RSE work plan (Exponent 2014b) approved by KDHE on August 18, 2014 (KDHE 2014b). Deviations from the work plan are noted in this report.

1.2 Report Organization

The remainder of this Phase 2 RSE Report is organized as follows:

- Section 2—Summary of Site Assessment. Describes the assessment/evaluation work completed to determine the nature and extent of smelter-related impacts, which included visual field classification and soil sampling. Also includes a discussion of amendments to the work plan (Exponent 2014b).

- Section 3—Summary and Discussion of Data Collected. Identifies site-specific chemicals of concern (COCs) determined in the Phase 2 RSE, and presents a summary and discussion of data collected, with quality assurance/quality control (QA/QC) and data validation information.

- Section 4—Evaluation of Potential Exposure Pathways. Discusses potential exposure pathways, including the areal extent of COCs.

- Section 5—Removal Action Goals and Appropriate Cleanup Levels. Describes removal action goals and appropriate cleanup levels.

[3] A Third Amendment to Consent Order (TACO) was issued September 15, 2015, to address removal actions at a small group of properties (the "Early Action Properties").

- Section 6—Removal Action Alternatives. Details rationale for the presumptive remedy. Describes two potential removal action alternatives and a "no action" alternative for each property type at the Site, including an evaluation of the effectiveness of the remedial action alternatives in terms of the long-term objectives and reduction of risk to health and the environment. Also presents a comparison and justification of the costs of each removal action, and considers appropriate regulations (including applicable or relevant and appropriate requirements [ARARs]) pertinent to each removal action alternative evaluated.

- Section 7—Recommended Removal Actions. Presents appropriate removal actions with supporting rationale for selection. Also establishes adequate post-removal confirmation sampling and/or monitoring to assess removal action performance.

- Section 8—Sampling Prior to the Removal Action Design Plan. Describes the approach for sampling of a subset of properties prior to preparing the draft Removal Action Design (RAD) Plan.

- Section 9—Schedule. Lists the activity or milestone and its associated target date or period for completion.

- Section 10—References.

Appendices include all x-ray fluorescence (XRF)-measured lead results (Appendix A), wet-chemistry laboratory data packages not yet submitted to KDHE (Appendix B), photos of smelter residue material (SRM) class examples by feature (Appendix C), and detailed field notebooks, inspection forms, parcel maps, and photos (Appendix D) .

2 Summary of Site Assessment

A City-wide SRM survey was performed to determine the nature and extent of soils with elevated lead resulting from direct placement of SRM within the city limits of Cherryvale.[4] The survey was conducted using a visual classification system that correlates the visual occurrence of SRM with the likelihood of associated soils exceeding the SSV for lead. This visual survey approach was presented in the Phase 2 RSE work plan (Exponent 2014b) and approved by KDHE. As described below, the visual survey approach was validated by soil sampling and analysis.

All properties, parks, walkways, alleys, and ditches throughout the Site were evaluated in a series of field surveys, during which the relative amount of SRM at a property or feature (if present) was visually classified. The classes ranged from SRM commonly observed to no SRM apparent; identified as A, B, C, and D classes, with the A class having the most identified SRM and the D class with no visible SRM. Soil samples were collected to validate that the class of SRM observed at a property (A, B, C, D) correlates to the likelihood of associated soils exceeding (or not exceeding) the SSV for lead.

Work was performed as described in the work plan (Exponent 2014b) unless otherwise noted. The elements of the Site evaluation, which include conducting the initial SRM surveys, collecting soil samples to validate SRM classes, finalizing the SRM classes with KDHE input, and performing the City-wide SRM survey are summarized below; the data collected as part of the Site evaluation are summarized and discussed in Section 3.

2.1 Conducted Initial SRM Surveys to Develop SRM Classes

Initial SRM surveys were conducted on a representative group of residential properties, alleys, and ditches, beginning in September 2014 (Project Navigator Ltd. [PNL] 2014a). As requested by KDHE and outlined in the work plan (Exponent 2014b), daycare centers, parks, and residences previously identified by KDHE, were also evaluated during this time. To assist with the initial classification, contact was made with the City of Cherryvale Maintenance Department staff to identify ditches and right of ways (ROWs) with exposed SRM (PNL 2014a). Residents also provided information on the locations and distribution of possible SRM (PNL 2014a).

At the request of KDHE, an early RSE evaluation was performed at the former McKinley School, Lincoln Elementary School, and Cherryvale Middle/High School in August 2014 (prior to the resumption of fall classes). The results of this early RSE evaluation are described in PNL (2015c), and were included in the validation and refinement of SRM classes (described below).

[4] Early in Phase 2, it was determined that all properties impacted by SRM from air dispersion had been identified and remediated during the EPA time-critical removal action in 2001 and 2002 (TetraTech 2014), or the 2012 removal action at eight residential properties located within the boundaries of the National Zinc Smelter Property conducted by the Respondents at the request of KDHE (PNL 2013a), and that no further sampling or assessment activities were needed to locate properties impacted by air deposition.

2.2 Sampled Soils to Validate SRM Classes

Observations made during the initial SRM classification surveys described above and discussions with KDHE informed soil sampling locations for validation of SRM classes (PNL 2014b). As outlined in the work plan (Exponent 2014b), soil samples were collected from each SRM class (A, B, C, D) at a subset of each property type (residential, daycare, school, park, City ditch, and City alley), and gradient samples[5] were collected from walkways, driveways, ditches, and alleys. Soil samples were also collected from three commercial/industrial properties.[6] A summary of the property types sampled and sample types collected is given in Table 1; a list of each property type, sample type, associated SRM class, and number of samples collected is given in Table 2. As with the initial SRM classification, samples from daycare centers, residences previously identified by KDHE, and parks were collected early on in the field surveys. Soil sampling results are presented and discussed in Section 3.

2.3 Finalized SRM Classes with KDHE Input

A meeting with KDHE staff was held on March 30, 2015, to review the SRM classifications, observations, and soil sampling results in order to finalize the SRM classes for use in the City-wide SRM survey (Exponent 2015a). SRM classes for walkways, driveways, and ditches were finalized with no changes from the work plan (Exponent 2014b). However, the following amendments were made.

2.3.1 Residential Properties

As a result of the SRM classification validation, a B-Fill class was added for residential properties where SRM is not observed, but one or more of the following are present:

- Sloped grade, mound, or elevated foundation
- Raised curb, retaining wall
- Change in lawn vegetation or soil color, indicating subsurface SRM
- Brick replaced by concrete where there has been an indication of past disturbance of brick and exposure of SRM.

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[5] Gradient samples are three five-point, linear composites collected to determine whether a soil lead concentration gradient exists from a feature with observed SRM into the rest of a residential (or other) property. The three lines are marked parallel to the feature (i.e., driveway, walkway, ditch, and alley) edge, at 1.5, 3, and 4.5 ft from the edge.

[6] One inactive/abandoned railway ROW was also sampled, because in some areas, it is adjacent to residential (both occupied and vacant) as well as commercial/industrial properties. As with the active railroad ROWs, this inactive/abandoned railway ROW is the responsibility of the successor rail line, and as the RSE Phase 2 work plan (Exponent 2014b) provides, it is excluded from the City-wide survey and outside the scope of this report. Sample and visual survey results for this one inactive/abandoned railway ROW will be summarized in a memorandum that will be submitted to KDHE under separate cover.

KDHE also requested collection of more detailed observations and photos of drip lines around houses during the City-wide SRM survey.

2.3.2 City Alleys

Supplemental sampling of alley gradients was also proposed for the refinement of SRM classes. This sampling was intended to provide information on the gradient of soil lead concentrations extending from the edges of alleys into residential yards. The alley gradient data collected during the validation phase were skewed to the A class alleys and were somewhat limited in geographic representation (alley gradient sample data are presented and discussed in Section 3.2.6). The supplemental sampling addressed B, C, and D class alleys with wider geographic occurrence throughout the City. Exponent provided KDHE with a draft sampling plan in October 2015 and a finalized sampling plan in January 2016 (Exponent 2015b, 2016).

2.4 Performed City-Wide SRM Survey

Following refinement of the SRM classes, the City-wide SRM survey was completed on properties and public ditch, walkway, and alley ROWs within the City limits of Cherryvale that were not reviewed during the initial SRM surveys, as discussed in Section 2.2 above. During the City-wide survey, 1,113 properties were reviewed (Table 3) including:

- Residential properties (yards, drip lines, driveways, and private walkways)
- Public ROWs (city ditches, walkways, and alleys)
- Commercial/industrial properties
- Parks and schools.

In accordance with the work plan (Exponent 2014b), each property and ROW was visually inspected to classify observed SRM (if present). Classifications were based on the frequency, abundance, type, and location of SRM at each property and ROW, with SRM classes ranging from commonly observed (A class) to no SRM apparent (D class). For properties with multiple features (i.e., yard, drip line, and driveway), the overall classification for the property would be the highest classification of either the yard, drip line, or driveway. For example, a residential property with a D class yard, C class driveway, and B class drip line would have an overall property classification of B class. City walkways, ditches, and alleys were classified and recorded but were not considered when assigning the overall class of a property. Using the example above, if the B class property was adjacent to an A class alley, then the property would remain classified as a B class property. The final/refined SRM classes that were applied to all properties and ROWs assessed during the City-wide survey are below.

2.4.1 Residential and Commercial/Industrial Properties

- A class—Obvious SRM presence on property or driveway/parking area; barren or stressed vegetation present.
- B class—Moderate SRM easily identifiable without extensive inspection; stressed vegetation typically present.
- B-Fill class—SRM not observed. However, one or more of the following features were observed: sloped grade, mounds, or elevated foundation present; raised curbs, retaining walls present; change in vegetation or soil color present; brick replaced by concrete.
- C class—Some visible SRM at drip line, or isolated fragments on property that requires effort to locate; stressed vegetation may or may not be present.
- D class—SRM not observed; good, full grass growth.

2.4.2 City Ditches

- A class—Multiple SRM fragments exposed in ditch bottom or sidewall where soil is exposed.
- B class—SRM fragments along partially vegetated ditch bottom or sidewall.
- C class—SRM observed after close inspection.
- D class—No SRM observed.

2.4.3 City Brick Walkways

- A class—SRM exposed due to obvious and common disturbance of bricks
- B class—SRM exposed in several areas of disturbed bricks
- C class—SRM sparsely exposed in minor areas of disturbed bricks
- D class—No SRM observed from brick disturbance.

2.4.4 City Alleys

- A class—Obvious SRM; large retort fragments, brick, and fill; brick, rock, clay, and gravel placed over the years

- B class—Multiple SRM fragments exposed in road bed or flank; moderate effort required to locate and characterize

- C class—Isolated individual fragments or small areas of granular glassy or ashy SRM; requires effort to find and identify

- D class—No SRM observed after close inspection; grading and recent gravel application effectively covers alley.

2.4.5 Documentation of City-wide Survey

During the City-wide survey, all SRM observations were recorded in field notebooks and inspection forms for each property. In addition to observation of SRM, the presence of painted structures and the condition of the exterior paint on those structures were also observed and recorded for each property. Copies of the field notebooks, inspection forms, parcel maps, and photos are provided in Appendix D. Results of the City-wide survey are discussed below in Section 3.3.

3 Summary and Discussion of Data Collected

This section summarizes and discusses the soil screening data and visual SRM data collected as part of the Phase 2 RSE.

3.1 Lead is the Primary Chemical of Concern

Lead is the primary COC at the Site. The residential SSV for lead is 400 mg/kg; the commercial/industrial SSV for lead is 1,000 mg/kg. Other chemicals of concern at the Site are arsenic, cadmium, and zinc. The KDHE risk-based standards (KDHE 2010) for arsenic were adjusted based on the bioavailability testing of Site soils (Exponent 2014a,b).[7] Cadmium and zinc have been measured in Site soils at levels that exceed, in some samples, the applicable risk-based Tier 2 levels as specified in the KDHE risk-based standards (KDHE 2010).

However, where soil samples have been analyzed for arsenic, cadmium and zinc, the data show that lead is the driver for determining whether a property exceeds standards for any of the four metals. That is, if lead is greater than 400 mg/kg, then exceedances of any other metals, if present, would be addressed by dealing with the lead. Therefore, lead concentration, measured by XRF, is summarized in this report, and is the driver for removal action decisions at the Site. Removal action goals and appropriate cleanup levels are discussed in Section 5.

3.2 Soil Samples

Soil samples were collected as part of the SRM class validation (discussed in Section 2.2). The soil samples were collected from each SRM class (A, B, C, D) at a subset of each property type (residential, daycare, park, City ditch, and City alley), and gradient samples were collected from driveways, walkways, ditches, and alleys (Tables 1 and 2). Soil samples were also collected from three schools and three commercial/industrial properties (Tables 1 and 2). The samples were composite samples composed of, in most cases, five aliquot locations, and were collected at 6–in. depth intervals: 0–6, 6–12, and 12–18 in. All samples were analyzed by XRF at a field laboratory after being dried, sieved with a No. 10 sieve (2 mm), and homogenized. All XRF-measured lead results are presented in Appendix A. To confirm the XRF field measurement results, five percent of the sieved and dried samples were sent to a wet-chemistry laboratory for confirmatory analysis. The wet-chemistry laboratory packages not yet submitted to KDHE are included in Appendix B. The analysis of XRF- and laboratory-analyzed samples and the subsequent adjustment to the XRF-measured lead concentration are discussed below, followed by the presentation and discussion of the soil data.

[7] Bioavailability testing of Site soils resulted in residential and non-residential site-specific screening criteria for arsenic of 53.6 mg/kg and 179.2 mg/kg, respectively.

3.2.1 XRF versus Laboratory Confirmation Samples

XRF concentrations determined by field screening were adjusted to a predicted laboratory-measured concentration based on the predictive relationship derived from the subset of samples with laboratory-measured concentrations. The predictive relationship was fit using standard least squares regression based on log-transformed concentrations, in order to meet the homogeneity-of-variance assumption. The regression model predicted XRF screening concentrations based on the measured laboratory concentrations (i.e., XRF screening concentrations were dependent on laboratory concentrations, such that the least squares coefficients minimized variability in the XRF values). The fitted model included both a linear and a square term, to fit the curvature in the relationship at higher concentrations (Figure 2). The fitted model was back-transformed to estimate the predicted laboratory concentration from a specified XRF field screening value.

The fitted least squares relationship is:

$$\log_{10}(XRF) = -1.56 + 2.07 * \log_{10}(LAB) - 0.197 * \log_{10}(LAB^2)$$

From which the back-transformed predictive equation[8] becomes:

$$\text{LAB} = 10^{\left[\frac{\{-2.07+\sqrt{4.288-0.788*(-1.56-\log_{10}(XRF))}\}}{-0.394}\right]} * 1.015$$

This equation was used to adjust the XRF field screening values to the predicted laboratory concentration (Table 4), which allowed relevant comparisons with the SSVs of 400 and 1,000 mg/kg. Adjusted (i.e., predicted) lead concentrations (corrected XRF-readings) are presented and discussed in this report.

Subsequent samples that were XRF screened after August 2015 utilized a different XRF instrument, therefore a separate predictive relationship was developed for the second instrument. The same least squares regression approach was applied to the XRF and laboratory-measured concentrations. Model fitting began with the complex model above, including an intercept, linear, and square term, but the square and intercept terms were not significant at a 0.05 significance level so they were removed sequentially (P = 0.35 and P = 0.16, respectively). The final best-fit predictive relationship is:

$$\log_{10}(XRF) = 0.967 * \log_{10}(LAB)$$

The back-transformed predictive equation for this relationship becomes:

$$\text{LAB} = XRF^{\left[\frac{1}{0.967}\right]} * 0.9833$$

[8] The final multiplicative factor of 1.015 adjusts for the bias created by back-transforming the least square error term from log-space. The residual error term has an expected value of zero in log-space, but back-transformed is no longer zero. The bias correction factor is a function of the mean square error (Newman 1993).

3.2.2 Yards

Soil samples were collected from 20 residential yards and 6 daycare centers. The initial SRM classes sampled in these 26 residential yards included:

- A class: 4 yards
- B class: 8 yards
- C class: 5 yards (including 2 daycare centers)
- D class: 9 yards (including 4 daycare centers).

The lead concentrations measured at these residences and daycares are listed in Table 5 and shown in Figures 3a–3f. Box plots showing the lead concentrations measured at all depths (0–6, 6–12, and 12–18 in.), and just the 0- to 6-in. depth in these four classes are shown in Figures 4 and 5, respectively.[9] The median lead concentrations for the A, B, and C classes generally decrease (Figures 4 and 5). Initial analysis of the D class results showed that the median lead concentration of the D class is higher than that of the C class, and a number of samples from D class residences exceed the residential SSV (Figure 4), including at the 0- to 6-in. depth (Figure 5).

Four of the D class residences had lead concentrations above the residential SSV of 400 mg/kg, even though no SRM was observed on the soil surface, which was inconsistent with the intent of the visual survey classification. However, closer inspection of these yards showed that these four D class yards had elevated grade, erratic slope, and/or raised curbs or retaining walls, indicating that the property had likely been filled, and sod and topsoil obscured SRM below the ground surface. Therefore, as described in Section 2.3.1, a B-Fill class was added for residential properties where SRM was not observed, but one or more of the following features are present:

- Sloped grade, mound, or elevated foundation
- Raised curb, retaining wall
- Change in lawn vegetation or soil color, indicating subsurface SRM
- Brick replaced by concrete where there has been an indication of past disturbance of brick resulting in exposed SRM.

As a result, these four D class yards were reclassified as B-Fill class (Table 5). The box plots showing the added B-Fill class (along with the A, B, C, and D classes) for soil samples collected from all depths and just the 0- to 6-in. depth are shown in Figures 6 and 7, respectively. With the creation of the B-Fill class and the reclassification of the four D class residences, the median

[9] Note that in addition to residential properties, schools and walkway gradients were also included in the classification analysis.

lead concentration for the D class is similar to that of the C class (as opposed to higher without the B-Fill class).

However, one D class residence (500 W 1st St) still had an exceedance of the residential SSV for lead in the 0–6 in. depth in the front yard composite sample (Figure 8). The reason for the residential SSV exceedance in this D class property was likely the result of a combination of conditions present at this parcel. Namely, this parcel is small and narrow, bordered by two roads on a corner lot, an alley, and a B class ditch; and SRM was observed in dirt recently excavated for a water line. This combination of conditions contributed to the presence of SRM in the yard that was not visible at the surface.

Based on the soil sampling results and analyses, the classification for residential yards is appropriate, and the data are explainable and predictive. As discussed above, the data validate A, B, and C classes and the D class with the B-Fill class broken out. Based on discussions with KDHE, no additional sampling was determined to be necessary to proceed with the City-wide survey.

3.2.2.1 Early Action Properties

During the work to validate the SRM classes, the Respondents identified a small group of high-priority properties where lead in soil composite samples was above the KDHE residential SSV of 400 mg/kg, SRM was usually observed at the surface or in the shallow subsurface, and the properties may be frequently used by children for extended play periods. The early action data evaluation report (PNL 2015a) identified five daycare facilities (housed at residences) and one owner-occupied single-family residence (416 N Maple St, 529 W 1st St, 219 W 1st St, 902 W Main St, 326 W 4th St, 317 W 4th St), one park property (E 1st St), and an isolated area of exposed brick next to the Logan Park gazebo. Lead concentrations measured in soil samples collected for the data evaluation of the Early Action Properties are summarized in PNL (2015a).

The Respondents conducted an early, expedited removal action at KDHE's request to remediate these properties pursuant to the Third Amendment to Consent Order (TACO) between the Respondents and KDHE dated September 15, 2015 (KDHE 2015a). Respondents and KDHE concluded that, subject to conditions established in the TACO, early expedited removal actions were appropriate before completion of the City-wide SRM survey. The Early Action Property soil removal work plan (PNL 2015b) summarizes activities performed at the Early Action Properties. Work at the Early Action Properties was completed by November 2015. The early action completion report will be submitted by PNL in March 2016.

The Respondents also conducted a removal action in 2012 at KDHE's request, involving eight residential properties that were within the boundaries of the former National Zinc Smelter Property (PNL 2013a), but that had not been included in the U.S. Environmental Protection Agency (EPA) time-critical removal action in 2001 and 2002 (TetraTech 2014).

3.2.3 Driveways

Soil gradient samples were collected from five A class driveways. The locations of these driveways are shown in Figure 9, and the lead concentrations measured are presented in Table 6. Results from these A class driveway gradients show that lead concentrations exceeding the residential SSV can be found at the surface and in the subsurface (to approximately 12 in.) as far away as 4.5 ft from the edge of the driveway. The likely reason for SRM being observed and the residential SSV being exceeded 4.5 ft away from the driveway is that many of the driveway boundaries have moved over time. The driveway classification is appropriate, and the data are explainable and predictive. Based on the soil sampling results and discussions with KDHE, no additional sampling was determined to be necessary prior to the City-wide survey.

3.2.4 City Ditches

Soil samples were collected from 15 ditches. The SRM classes sampled in these ditches included:

- A class: 5 ditches
- B class: 2 ditches
- C class: 4 ditches
- D class: 4 ditches.

The lead concentrations measured in these ditches are presented in Table 7, and shown in Figure 10. Lead concentrations exceeding the residential SSV were observed in surface and subsurface soils in the A class ditches, in surface soils in B class ditches, and in subsurface soils in C class ditches. One D class ditch (529 W 1st St, a daycare) had lead concentrations above the residential SSV in surface and subsurface soils down to 18 in. Gradient samples were also collected at this location and are discussed below.

Soil gradient samples were collected from six ditches. The SRM classes sampled in these ditches included:

- B class: 1 ditch
- C class: 2 ditches
- D class: 3 ditches.

The locations of these gradient samples are shown in Figure 10, and the lead concentrations measured are presented in Table 8. Results from these ditch gradients show that, for the most part, where lead concentrations exceed the residential SSV, they occur in the subsurface. However, the gradient samples for the D class ditch discussed above (529 W 1st St, a daycare that had lead concentrations exceeding the residential SSV in surface and subsurface soils down

to 18 in.) showed high lead concentrations in surface soils out to 4.5 ft (Table 8). It is likely that the yard had been reworked at some point, and SRM material from the ditch was spread outward into the yard, and covered with topsoil. This property (529 W 1st St) was one of the Early Action Properties where removal actions were performed by the Respondents in 2015 (PNL 2015a,b), and discussed in Section 3.2.2.1.

The ditch classification is appropriate, and the data are explainable and predictive. Based on the soil sampling results, no additional sampling was determined to be necessary.

3.2.5 Brick Walkways

Soil gradient samples were collected adjacent to five brick walkways. Four of the walkways were D class, and one was B class (visible SRM from disturbed brick area). The locations of these walkways are shown in Figure 11, and the lead concentrations measured are presented in Table 9. Results from these walkway gradients show that, for four of the five walkways, lead did not exceed the residential SSV adjacent to the brick walkways. The one gradient that did have lead above 400 mg/kg exceeded that level only in the subsurface.

The walkway classification is appropriate, and the data are explainable and predictive. Based on the soil sampling results, no additional sampling was determined to be necessary.

3.2.6 City Alleys

Soil samples were collected from 16 alleys. The SRM classes sampled in these alleys included:

- A class: 5 alleys
- B class: 4 alleys
- C class: 3 alleys
- D class: 4 alleys.

A summary of the lead concentrations measured in these alleys is presented in Table 10 and shown in Figure 12. Lead concentrations exceeding the residential SSV were observed in surface and subsurface soils in the A and B class alleys, and in subsurface soils in one C class alley. One D class alley had lead concentrations exceeding the residential SSV in surface and subsurface soils down to 18 in.

Soil gradient samples were collected from 21 alleys (which is more than was proposed in the work plan [Exponent 2014b], as discussed in Section 2.3.2). The SRM classes sampled in these alleys included:

- A class: 5 alleys
- B class: 5 alleys

- C class: 3 alleys
- D class: 8 alleys.

The locations of these gradient samples are shown in Figure 13, and the lead concentrations measured are presented in Table 11. Results from these alley gradients show that lead concentrations exceed the residential SSV in the surface at the C class alleys and in the surface and subsurface in the A, B and D class alleys out to 4.5 ft from the edge of the alleys. Looking at where they occur, the exceedances of the residential SSV are most common on the west side of town but do occur in all parts of the City (i.e., northeast, northwest, southwest, and southeast quadrants). These observations are consistent with the alleys' complicated history of varying application and grading with SRM, brick, and fill.

3.2.7 Commercial/Industrial Properties

Although not specified in the work plan (Exponent 2014b), soil samples were collected from three commercial/industrial properties to calibrate SRM observations, because they were identified by a landowner/resident, or because they are at or near a residential property. The sample locations and results are shown in Figure 14, and the lead concentrations measured are presented in Table 12. Results from these A class commercial/industrial properties show that lead concentrations exceed the industrial SSV (1,000 mg/kg).

3.2.8 Parks

Soil samples were collected from three parks in the City: the small park on E 1st St, Logan Park, and South Galveston Ball Field. The lead concentrations measured at the parks are presented in Table 13 and shown in Figure 15. Box plots showing the lead concentrations measured at all depths (0–6, 6–12, and 12–18 in.) are in Figure 16. Samples from the park on East 1st St and an isolated area of disturbed brick walkway near the Logan Park gazebo exceeded the residential SSV (Table 13 and Table 2 in PNL [2015a]). The park on East 1st St and an isolated area of exposed brick next to the Logan Park gazebo were both Early Action Properties where removal actions were performed by the Respondents in 2015 (PNL 2015a,b), and are discussed in Section 3.2.2.1.

3.2.9 Schools

Soil samples were collected from three schools, the former McKinley School, Lincoln Elementary School, and Cherryvale Middle/High School. Trace amounts of SRM were observed at each school location. The soil lead concentrations measured at the schools are presented in Table 13 and shown in Figure 15. Only one sample exceeded the residential SSV (819 mg/kg lead in one sample from 6–12 in.), and that was in an isolated location at the former McKinley School, which is not currently used by the City. The results of this early RSE evaluation are described in further detail in the soil sample results report prepared by PNL (2015c) and submitted to KDHE in January 2015.

3.3 Visual SRM Survey

As discussed in Section 2.4, 1,113 properties were visually inspected during the City-wide survey to classify observed SRM (if present) (Table 3). These classifications ranged from commonly observed SRM (A class) to no SRM apparent (D class). As noted in Section 2.4, for properties with multiple features, the property was classified according to the highest classification of all individual features found on that property. Overall property classifications for all parcels are shown on Figures 17 and 18 and Table 14 and included:

- A class: 122 properties
- B class: 186 properties
- B-Fill class: 23 properties
- C class: 397 properties
- D class: 385 properties.

As shown on Figures 19–22, the main feature that determined a property's classification was yards (A, B, and B-Fill classes) and drip lines (C class). Figure 23 provides a similar presentation for D class properties.

Figures 24–27 show the distribution of property classification by quadrant (i.e., the northeast, northwest, southwest, and southeast areas of the City), and the majority of properties in each quadrant are C and D class properties. The majority of each property classification was identified in the following quadrants:

- A class: Northwest quadrant
- B class: Northwest and southeast quadrants
- B-Fill class: Southeast quadrant
- C class: Southeast quadrant
- D class: Southeast quadrant.

The spatial distribution of overall classifications is also shown on Figures 17 and 18, and as noted above, approximately 70 percent of the overall classifications are C class (36 percent of the properties) and D class (35 percent of the properties). As discussed below, the majority of property features were also classified as C or D class.

3.3.1 Yards

During the City-wide survey, 1,016 residential yards[10] were observed and classified (without regard to other features such as drip lines, driveways, or private walkways) as follows (Table 14):

- A class: 55 properties
- B class: 120 properties
- B-Fill class: 12 properties
- C class: 223 properties
- D class: 606 properties.

Approximately 22 percent of the yards observed were classified as C class (i.e., isolated SRM fragments on property that requires effort to locate; stressed vegetation may or may not be present), and 60 percent were classified as D class (i.e., no SRM observed and full grass growth). Note that many more properties had D class yards (606) than the number of properties that were classified overall as D class (385). As discussed earlier, if a property had a drip line or a driveway that had an A, B, or C class designation, then that property was assigned an overall designation equivalent to the highest rating for that feature—even though the yard itself received a D class rating. The spatial distribution of yard classifications is shown on Figures 28 and 29.

3.3.2 Drip Lines

During the City-wide survey, 832 drip lines[11] were observed on residential properties and classified as follows (Table 14):

- A class: 32 drip lines
- B class: 64 drip lines
- B-Fill class: 11 drip lines
- C class: 314 drip lines
- D class: 411 drip lines.

Approximately 38 percent of the observed drip lines were classified as C class (i.e., some visible SRM at drip line, stressed vegetation may or may not be present), and 50 percent were classified

[10] Of the total of 1,113 properties inspected as referenced in Section 3.3, 1,016 were residences with yards.

[11] Of the total of 1,113 properties inspected as referenced in Section 3.3, 832 were residential properties with a drip line.

as D class (i.e., no SRM observed and full grass growth). The spatial distribution of drip line classifications is shown on Figures 30 and 31.

3.3.3 Driveways

During the City-wide survey, 918 driveways[12] were observed and classified as follows (Table 14):

- A class: 43 driveways
- B class: 72 driveways
- B-Fill class: 8 driveways
- C class: 164 driveways
- D class: 631 driveways.

Approximately 18 percent of the observed driveways were classified as C class (i.e., isolated fragments on property that requires effort to locate; stressed vegetation may or may not be present), and 69 percent were classified as D class (i.e., no SRM observed). The spatial distribution of driveway classifications is shown on Figures 32 and 33.

3.3.4 City Ditches

During the City-wide survey, 366 city ditches[13] were observed and classified as follows (Table 14):

- A class: 29 ditches
- B class: 51 ditches
- B-Fill class: none
- C class: 72 ditches
- D class: 214 ditches.

Approximately 20 percent of the observed City ditches were classified as C class (i.e., SRM observed after close inspection), and 58 percent were classified as D class (i.e., no SRM observed). A visual survey and classification of all City ditches was also performed and the

[12] Of the total of 1,113 properties inspected as referenced in Section 3.3, 918 were residential properties with a driveway.

[13] Of the total of 1,113 properties inspected as referenced in Section 3.3, 366 had a city ditch adjacent to the property.

results are presented in Figures 34 and 35. The spatial distribution of City ditch classifications is shown on Figures 34 and 35.

3.3.5 Brick Walkways

During the City-wide survey, 862 brick walkways[14] were observed and classified as follows (Table 14):

- A class: 17 walkways
- B class: 18 walkways
- B-Fill class: none
- C class: 83 walkways
- D class: 744 walkways.

Approximately 9 percent of the observed brick walkways were classified as C class (i.e., SRM sparsely exposed in minor areas of disturbance of bricks) and 86 percent were classified as D class (i.e., no SRM observed from brick disturbance). The spatial distribution of brick walkway classifications is shown on Figures 36 and 37.

3.3.6 City Alleys

During the City-wide survey, 729 city alleys[15] were observed and classified as follows (Table 14):

- A class: 36 alleys
- B class: 81 alleys
- B-Fill class: 1 alley
- C class: 283 alleys
- D class: 328 alleys.

Approximately 39 percent of the observed City alleys were classified as C class (i.e., isolated individual fragments or small areas of granular glassy or ashy SRM; requires effort to find and identify), and 45 percent were classified as D class (i.e., no SRM observed after close inspection; grading and recent gravel application effectively covers alley). A visual survey and

[14] Of the total of 1,113 properties inspected as referenced in Section 3.3, 862 had a brick walkway either adjacent to or on the property.

[15] Of the total of 1,113 properties inspected as referenced in Section 3.3, 729 had a city alley adjacent to the property.

classification of all City alleys was also performed and the results are presented in Figures 38 and 39. The spatial distribution of City alley classifications is shown on Figures 38 and 39.

3.3.7 Commercial/Industrial Properties

During the City-wide survey, 75 commercial/industrial properties were observed and classified as follows (Table 14):

- A class: 17 properties
- B class: 11 properties
- B-Fill class: 2 properties
- C class: 17 properties
- D class: 28 properties.

Approximately 23 percent of the observed commercial/industrial properties were classified as C class (i.e., some visible SRM at drip line, or isolated fragments on property that requires effort to locate; stressed vegetation may or may not be present), and 37 percent were classified as D class (i.e., SRM not observed; good, full grass growth). The spatial distribution of commercial/ industrial property classifications and associated SRM classifications for the overall property, yard, drip line, and driveway (if present) are shown on Figures 17–18 and 28–33.

3.3.8 Parks

As discussed in Section 3.2.8, three parks in the City were visually inspected during the SRM class validation: the small park on E 1st St, Logan Park, and South Galveston Ball Field. SRM was observed at the small park on E 1st St, and in discrete, limited areas of Logan Park and South Galveston Ball Field. The lead concentrations measured in soil samples collected from the three parks are presented in Table 13 and shown in Figure 15. Samples from the small park on East 1st St and an isolated area of disturbed brick walkway near the Logan Park gazebo exceeded the residential SSV (Table 13 and Table 2 in PNL [2015a]). The park on East 1st St and an isolated area of exposed brick next to the Logan Park gazebo were both Early Action Properties where removal actions were performed by the Respondents in 2015 (PNL 2015a,b), and discussed in Section 3.2.2.1.

3.3.9 Schools

As discussed in Section 3.2.9, three schools in the City were visually inspected during the SRM class validation: the former McKinley School, Lincoln Elementary School, and Cherryvale Middle/High School. Trace amounts of SRM were observed at each school location. The lead concentrations measured in soil samples collected from the three parks are presented in Table 13 and shown in Figure 15. Only one sample exceeded the residential SSV (819 mg/kg lead in one

sample from 6–12 in.), and that was in an isolated location at the former McKinley School, which is not currently used by the City. The results of this early RSE evaluation are described in further detail in the soil sample results report prepared by PNL (2015c) and submitted to KDHE in January 2015.

4 Evaluation of Potential Exposure Pathways

This section describes the pathways by which people may be exposed to lead at the Site. The evaluation of potential exposure pathways is based on the conceptual site model (CSM) presented in the RSE Phase 2 work plan (Exponent 2014b), and has been updated as necessary based on data collected during the Site Evaluation. Sources, release and transport mechanisms, and exposure pathways are discussed in this section and illustrated in Figure 40.

4.1 Sources

The primary source of lead at the Site is the widespread use of SRM (slag and crushed retorts) for fill and road base throughout Cherryvale. Aerial emissions from smelter operations also contributed lead to properties close to the smelter; those properties have been remediated (see footnote 4 on page 3).

There are other sources of lead to residential and commercial/industrial properties, unrelated to the smelter, that are not shown on Figure 40. The most important of these alternative sources are historical emissions of leaded gasoline, flaking or chalking of exterior lead paint, and lead arsenate pesticides. Historical use of lead arsenate pesticides was predominantly in orchards and along railroad ROWs. Lead sources also include other industrial materials such as chat, which was used as ballast for railroads in Cherryvale and in asphalt and concrete as aggregate throughout Cherryvale.

4.2 Primary and Secondary Release and Transport Mechanisms

Aerial emissions from smelter operations and the exposed waste piles were transported by wind, and the dust settled out on properties near the former smelter property. The deposited lead was subject to surface-water runoff and erosion and, to a certain extent, leaching into lower soil horizons. Lead is generally strongly attenuated in surface soils (McLean and Bledsoe 1992). As noted previously, the properties affected by aerial dispersion have been the focus of the previous sampling and soil remediation activities by EPA, KDHE, and the Respondents. Direct placement of SRM was the predominant transport mechanism.

The most important secondary release mechanisms of lead from emplaced residue would likely have been by mechanical abrasion (i.e., traffic), and to a lesser extent, by leaching. Slag used for driveways and alleys could also have been spread beyond the original placement due to traffic or grading.

Release of lead from emplaced residue has been contained or minimized by covering the material used for roads, alleys, and driveways with pavement and/or clean gravel, walkways with bricks or concrete, and building pads with structures.

4.3 Affected Media and Exposure Pathways

4.3.1 Surface Water and Soils in Ditches

As shown in Figure 40, ingestion or dermal contact with surface water by residents or workers is a "complete pathway," though a minor one because there are very few opportunities for exposure. A "complete pathway" refers to a pathway by which a receptor could feasibly be exposed. Roadside ditches and temporarily ponded water would offer only temporary exposure opportunities. Soils in roadside ditches also offer minimal opportunities for exposure.

4.3.2 Groundwater

Groundwater is an incomplete pathway, because Cherryvale residents obtain their water from Big Hill Lake, which is approximately 5 miles east of town, according to the ESI report (KDHE 2001). No domestic wells were identified within the City limits, according to Figure 9 from the ESI (KDHE 2001). Moreover, the ESI reported that shallow groundwater in this area is of marginal quality due to sulfates and excessive hardness.

4.3.3 Accessible Soil

Accessible soils are considered those at the surface (e.g., granulated slag mixed with soil on a driveway or former building foundation, or bare or thinly vegetated soil in a residential yard) or found at shallow depths beneath grass, which could easily be exposed through landscaping or casual digging by people or pets. Residents and workers can be exposed to lead in accessible soil by direct contact resulting from incidental ingestion or dermal absorption.

Indirect pathways from accessible soils to people include plant uptake and vegetable consumption, and particle resuspension and inhalation. Both of these pathways are minor compared to the direct-contact route.

4.3.4 Inaccessible Soil

Soil that is inaccessible because of capping with pavement, packed gravel, or other surface covering or a structure, does not provide an exposure route unless it is disturbed. As shown on Figure 40, workers who expose these soils during construction (e.g., trenching along a road to install a utility line), and residents who expose these soils during excavation work on their property (e.g., landscaping, foundation or driveway repair) could be exposed via incidental ingestion, dermal contact, or dust inhalation.

5 Removal Action Goals and Appropriate Cleanup Levels

Lead is the primary chemical of concern at the Site, and lead concentration, measured by XRF, is the driver for removal-action decisions at the Site. The residential SSV for lead is 400 mg/kg; the commercial/industrial SSV for lead is 1,000 mg/kg.

The residential SSV for lead will also apply to ROWs (i.e., unpaved alleys, ditches, and vegetated drainage swales) adjacent to residential properties. However, it is important to note that these public ROWs are controlled by the City. Potential recontamination of residential property will be mitigated by institutional controls (ICs) applicable to both the streets and the ROWs.

6 Removal Action Alternatives

As specified in the SACO, this RSE Report should include a discussion of removal action alternatives, as follows:

- Detailed rationale for any presumptive remedy and/or a description of at least two potential removal action alternatives and a "no action" alternative for the site, including an evaluation of the effectiveness of the removal action alternatives in terms of the long-term objectives and reduction of risk to health and the environment
- A comparison and justification of the costs of each removal action
- A consideration of appropriate regulations, ARARs, etc., pertinent to each removal action alternative evaluated
- Recommendation of appropriate removal action giving adequate supporting rationale for its selection based on the above-defined criteria
- Establishment of adequate post-removal confirmation sampling and/or monitoring to assess removal action performance.

The recommended removal actions should be discussed in sufficient detail in this report to allow KDHE to draft an Agency Decision Statement. After the Decision Statement is issued, then a draft Removal Action Design plan will be prepared by the Respondents, which will provide a more detailed description of the planned actions.

Removal action alternatives have been developed for residential yards and the following property features: drip lines, driveways, ditches, walkways, and alleys (see Table 17). The alternatives are summarized in Table 15 and described by feature below. The vast majority of properties are residential (SSV = 400 mg/kg lead), but some are commercial/industrial (SSV = 1,000 mg/kg lead), and the removal action alternatives described below also apply to those portions of commercial/industrial properties adjacent to residential properties.[16]

6.1 Yards

Yards have been classified based on the presence and frequency of SRM and an indication of historical fill (B-Fill class) as shown in Figures 28 and 29, and Photos 1–9 in Appendix C. The removal alternatives for yards are no action (Y1); phosphate amendment, cap and revegetate with sod (Y2); and soil removal, fill, and revegetate with sod (Y3). In this section, the alternatives are defined, and relative effectiveness, risk reduction, and cost are evaluated.

[16] The remedial action for commercial/industrial properties that do not adjoin a residential property will be addressed in the RAD Plan.

6.1.1 Alternative Y1—No Action

Under the Y1 alternative, if a yard had subareas with soil exceeding the lead cleanup level, no action would be taken. Alternative Y1 would not be effective in reducing lead exposure, and would not reduce risks, but would be the least costly of the alternatives.

6.1.2 Alternative Y2—Phosphate Amendment, Cap and Sod

For Alternative Y2, if an area of a yard exceeded the SSV, a phosphate amendment would be tilled in, an approximate 6–in. layer of top soil would be added, and the area would be revegetated with sod. Phosphate amendments can reduce the bioavailability of lead in soil, thus reducing the risks due to soil ingestion (Scheckel et al. 2013; U.S. EPA 2015). Phosphate amendments, such as super triple phosphate or rock phosphate, act through substitution and replacement of calcium by lead in its crystalline structures, making a pyromorphite ($Pb_5(PO_4)3Cl$) type of mineral. The effectiveness of phosphate amendment is strongly influenced by soil properties, and site-specific testing is needed to determine its effectiveness and to design the appropriate application method and rates. If the effectiveness is acceptable after testing, the amendment would be tilled into the subareas of the yard that require remediation, an approximate 6–in. layer of top soil would be placed on the area, and then the area would be revegetated with sod.[17] ICs would be needed to minimize access to treated areas.

The effectiveness of this alternative is less than that of soil removal, because the phosphate amendment does not affect the total contaminant concentration, but instead changes the chemical composition of the contaminant to make it less bioavailable. The decrease in bioavailability would likely be in the range of 30 percent (Scheckel et al. 2013). Therefore, if site-specific studies found a 30 percent reduction, then lead concentrations greater than about 520 mg/kg (400 mg/kg plus 30 percent) would still exceed the residential cleanup level for bioavailable lead. Also, phosphate treatment may not be effective for decreasing bioavailability of soils impacted by mill waste[18] (Scheckel et al. 2013). The reduction in risk for Alternative Y2 would be greater than No Action, but less than soil removal. The cost would be greater than No Action (Y1) but less than Soil Removal (Y3).

6.1.3 Alternative Y3—Soil Sampling, Removal, Fill, and Sod

The soil removal alternative is similar to the methods that have already been implemented by EPA for the time-critical removal action in 2001 and 2002 (Tetra Tech 2014), by the Respondents for eight properties in 2012 (PNL 2013a), and by the Respondents for the Early Action Properties in 2015 (PNL 2015a,b). The soil sampling and removal approach for yards is described below and illustrated in Figure 41.

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[17] If the surface of the yard or open area is not sod, but gravel or bare soil, which may be the case for some residential and commercial/industrial properties, then the surface will be backfilled with similar material to allow for continuation of the past use (e.g., parking).

[18] Mill waste refers to waste generated from milling activities related to mining and smelting.

Some portions of properties may also require remediation for other features as a result of visible SRM and/or SSV exceedance (e.g., drip lines, driveways, exposed brick walkways, discrete piles of debris with SRM, and adjacent alleys). The removal alternatives for these other features are discussed separately.

6.1.3.1 Sampling

If a property has been classified as an A, B, or C class (i.e., visible SRM in yard, drip line, and/or driveway) or B-Fill class (portion of yard is elevated, indicating imported fill) property, then the soils would be sampled to delineate areas that exceed the SSV. D class properties would not be sampled. Specifically, if a yard has visible SRM, then a five-point composite sample would be collected in that area of the yard with SRM observed. The composite samples would be collected at depths of 0–6 in. and 6–12 in., as described in the Phase 2 RSE work plan (Exponent 2014b). If only the composite sample from 0–6 in. exceeds the SSV, then only the upper 6-in. depth would be removed. If the 6- to 12-in. composite sample exceeds the SSV, then the 0- to 12-in. depth would be removed. A five-point composite sample would be collected at a 6–in. depth at the bottom of the excavation (as described in the Phase 2 RSE work plan [Exponent 2014b]) after the top 12 in. has been removed. If the lead concentration is greater than the SSV, then appropriate demarcation material (e.g., orange plastic construction fencing material) would be placed at the bottom of the excavation prior to backfilling (consistent with the Cherryvale early action removal work plan [PNL 2015b]) to indicate that soils below this demarcation material should not be disturbed. Excavation will not go below 12 in., except for gardens, where excavation to 24 in. will occur if indicated by sampling of the 12- to 18-in. depth, or discrete play areas, where excavation to 18 in. will occur if indicated by sampling of the 12- to 18-in. depth.

6.1.3.2 Excavation

Consistent with the Cherryvale early action removal work plan (PNL 2015b), excavation would be performed using typical earth-moving equipment, sized appropriately for the property conditions. Mini-excavators, dump trucks, skid-steer loaders, and backhoes are typical equipment employed for residential remediation. In sensitive areas, shovels and hand tools may be used to remove soils. The selection of equipment would be at the discretion of the excavation contractor, but the use of heavy mechanized equipment would be precluded within 3 ft of a residence or outbuilding sidewalls.

Excavation around sensitive structures to a depth of less than 1 ft may be required where a 1-ft dig depth is not feasible, practical, or recommended for structural, esthetic, or safety reasons. This may include certain fixed structures, concrete slabs, walkways, driveways, and locations near utilities, large trees, and other obstructions. In such cases, a flat or sloped grade (to prevent water ponding), to a maximum depth of 6 in. would be the target removal depth.

Where excavation is performed to a depth less than the specified depth, and soil lead levels remain above the SSV, marker material would be placed before backfilling and revegetating. The specific excavation details would be at the discretion of the removal action contractor and would be performed in accordance with common practices employed for residential soil removal.

6.1.3.3 Disposal

Consistent with the Cherryvale early action removal work plan (PNL 2015b), excavated soil from the removal action could be placed in one or more landfill cells at the former National Zinc Smelter site EPA Repository location.[19] The location and construction details for waste placement would be described in a separate document and submitted to KDHE for approval, once the volume and removal details are adequately determined. Generally, the soil would be placed, leveled, and lightly compacted in one or more cells that can be managed along with the existing soil stockpiles and other soils expected to be received in the future. Soil would be contained to prevent runoff and covered with clean soil or other caps or cover, to prevent direct contact, inhalation, and ingestion at levels above the SSV. The various options available would need to be considered further once a removal contractor evaluates site conditions, logistics, and costs.

6.1.3.4 Excavation Backfill and Revegetation

Consistent with the Cherryvale early action removal work plan (PNL 2015b), after confirmation sample analysis (by XRF in the field) indicates that all excavation areas meet closure specifications, approved clean fill material would be imported from a nearby source to backfill and replace soil removed during the excavation. Backfill would be tested prior to use at the residential properties.[20] Random composite samples of backfill material would be analyzed and the results compared with KDHE Tier-2 risk-based residential SSVs (Appendix A, KDHE 2010). The frequency of sampling would depend on the nature of the source (check KDHE guidance for differing sources); however, no less than four sample aliquots would be taken per composite sample. Previous soil sampling procedures approved by KDHE at the former smelter property specify 1 sample per 50,000 cubic yards for soil removed from in-place sources.

Topsoil would be replaced and the properties revegetated with sod as discussed above. Fences, yard fixtures, play structures, and other items removed during the course of work would be replaced and the properties restored to pre-removal condition to the extent possible. For topsoil sources, if not already tested, the material would be analyzed for the following parameters: PCBs, pesticides, herbicides, Resource Conservation and Recovery Act (RCRA) eight metals, total petroleum hydrocarbons (gasoline-range organics, diesel-range organics, and oil-range organics), and volatile and semi-volatile organic compounds.

6.1.3.5 Effectiveness, Risk Reduction, and Cost

This alternative would be effective in meeting the removal action objectives and in reducing the risk of lead exposure to acceptable SSVs. However, this alternative would be much more costly than phosphate amendment and capping (Alternative Y2).

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[19] The stockpile management plan for the National Zinc EPA Repository is described in PNL (2013b).

[20] If the source of the backfill material has not already been tested, it will be analyzed for polychlorinated biphenyls, metals, pesticides, herbicides, total petroleum hydrocarbons, semivolatile organic compounds, and volatile organic compounds. These analytes are consistent with those analyzed in borrow soil used during the removal action performed by the Respondents in 2012 (PNL 2013a).

6.2 Drip Lines

SRM has been observed in varying degrees in drip lines of structures throughout Cherryvale (see Section 3.3.2 and Figures 30 and 31, and Photos 10–16 in Appendix C for A, B, and C SRM class drip line examples). Three removal alternatives for drip lines are discussed below.

6.2.1 Alternative DL1—No Action

Under the DL1 alternative, if a drip line had visible SRM and/or soil exceeding the SSV, no action would be taken. Alternative DL1 would not be effective in reducing lead exposure, and would not reduce risks, but would be the least costly of the alternatives.

6.2.2 Alternative DL2—Visible SRM Removal and Cover

Under Alternative DL2, visible SRM, if present in the drip line area, would be collected to a depth of 2 in. by the removal action contractors and disposed at the EPA Repository cell at the former smelter property. (The underlying soils and adjacent soils would not be sampled or remediated.) The drip line surface would then be restored in the area of SRM removal (typically soil or gravel).

The effectiveness, risk reduction, and cost of Alternative DL2 are greater than no action (DL1) and less than SRM and soil removal (Alternative DL3).

6.2.3 Alternative DL3—Visible SRM Removal, Soil Removal, Fill, and Cover

Under Alternative DL3, both visible SRM and soil exceeding the SSV would be removed. The decision flowchart for the drip line removal alternative is shown in Figure 42.

6.2.3.1 Sampling

If a property has SRM in the drip line area, as discussed in Section 3.3.2 and shown in Figures 30 and 31, then a five-point composite sample (0–6 in. and 6–12 in. depths) would be collected along one side of the house that has the most SRM.

If the drip line composite sample exceeds the SSV, then a linear composite (5 subsamples) would be collected parallel to the drip line sample at a distance of 3 ft from the drip line composite.

If the linear composite collected 3 ft out from the drip line exceeds the SSV, then both the drip line and the 3-ft fringe would be subject to soil removal to the appropriate depth (discussed below). Also, a five-point yard composite sample would be collected in the yard adjacent to that drip line. (If the yard is being sampled anyway because of the presence of SRM, then no additional sampling is needed.) If the yard composite exceeds the SSV, then that yard may be subject to remediation, as discussed in Section 6.1.

If the linear composite 3 ft from the drip line does not exceed the SSV, then only the drip line will be remediated, and the yard does not need to be sampled (unless sampling is required under Alternative Y3).

Also, if the drip line composite on the side of the structure with the most visible SRM exceeds the SSV, then there is a potential for the drip lines on the other sides of the structure to exceed the SSV. Therefore, five-point linear drip line composites would also be collected from the other three sides of the structure. If any of those samples exceed the SSV, then a second linear composite would be collected 3 ft out from that drip line, followed by collection of a yard composite sample, if needed, as discussed above.

6.2.3.2 Soil Removal from Drip Line Areas

Soil removal and disposal for targeted drip line areas would follow the procedures described for Alternative Y3. However, the soil removal would be conducted in a manner that does not damage or weaken the adjacent structures. In some cases, it may be necessary to excavate a shallow depth next to a footing or other structural member.

6.2.3.3 SRM Removal

If neither the drip line nor the linear composite collected 3 ft from the drip line exceeds the SSV, then visible SRM would be removed from drip line areas, as described in Alternative DL2.

6.2.3.4 Effectiveness, Risk reduction, and Cost

Alternative DL3 would be effective in meeting the removal action objectives and in reducing the risk of lead exposure to acceptable levels. However, this alternative would be much more costly than visible SRM removal and cover (Alternative DL2).

6.3 Driveways

SRM has been observed in varying degrees in driveways throughout Cherryvale (see Section 3.3.3, Figures 32 and 33, and Photos 17–23 in Appendix C for A, B, C, and D SRM class driveway examples). Three removal alternatives for driveways are discussed below.

6.3.1 Alternative DW1—No Action

Under the DW1 alternative, if a driveway had visible SRM and/or soil exceeding the SSV, no action would be taken. Alternative DW1 would not be effective in reducing lead exposure, and would not reduce risks, but would be the least costly of the alternatives.

6.3.2 Alternative DW2—Pave

If SRM has been identified on a driveway during the City-wide survey, then a five-point composite (0–6 in. depth) would be collected down the center of the driveway. If the sample

exceeds the SSV, then that driveway would be graded and paved without removing the old driveway. No soil sampling would be conducted adjacent to the driveway.

The effectiveness, risk reduction, and cost of Alternative DW2 are greater than those of no action (DW1). This alternative would be as effective as Alternative DW3 for meeting long-term goals and reducing risk of exposure to SRM on the driveway. However, adjacent soils are not addressed by this alternative. Because the driveway footprint may have changed over the years, and SRM may have sloughed off the driveway, the adjacent soils may have elevated lead. For that reason, Alternative DW2 is not typically as effective or protective as Alternative DW3. However, the cost for this alternative would be lower than for Alternative DW3.

6.3.3 Alternative DW3—Remove and Replace Driveway and Adjacent Soils

Under Alternative DW3, the driveway and (potentially) adjacent soil would be sampled. If the samples exceed the SSV, then the soil would be removed and the driveway replaced with either gravel or pavement. The adjacent soils, if above the SSV, would be remediated following the same method as described in Section 6.1. The decision flow chart for Alternative DW3 is shown in Figure 43. If a portion of the driveway is made of old brick (i.e., that would have had granular SRM as a base), then the procedures under the alternatives for City brick walkways would be followed (i.e., Alternative BW3). The option of replacing the driveway with pavement without removing the underlying soil would be available if the driveway was sunken and below ground level, making paving less costly, provided that adjacent soils, if above the SSV, would be remediated as provided in Section 6.1.

6.3.3.1 Sampling

If a property has SRM on the driveway based on the City-wide survey (i.e., A, B, B-Fill, or C class), then a linear five-point composite sample (0–6 in. depth) would be collected down the center of the driveway. A deeper sample (6–12 in.) is not needed, because the driveways have been tightly compacted and the probability of exposure to deeper material is remote.

If the composite sample exceeds the SSV, then the driveway would be removed and replaced (see below), and a five-point linear composite soil sample (0–6 and 6–12 in.) would be collected on one side of the driveway at 3 ft from the edge of the driveway. Driveway fringe samples would be collected from the side with the most SRM or where the most SRM is likely to be present (i.e., B-Fill class driveways). If the SRM on each side of the driveway is comparable, then the side to be sampled would be determined based on the proximity to the area of most potential exposure (i.e., side closest to the house or a play area). If there are no apparent differences in potential exposure proximity, then the side to be sampled would be randomly selected.

If the linear composite collected 3 ft out from the driveway exceeds the SSV, then the 3-ft fringe would be subject to soil removal to the appropriate depth. Following the procedures for Alternative Y3, the composite samples would be collected at depths of 0–6 in. and 6–12 in., as described in the Phase 2 RSE work plan (Exponent 2014b). If only the composite sample from

0–6 in. exceeds the SSV, then only the upper 6-in. depth would be removed. If the 6- to 12-in. composite sample exceeds the SSV, then the 0- to 12-in. depth would be removed. A five-point composite sample would be collected at a 6–in. depth at the bottom of the excavation (i.e., 12–18 in.) (as described in the Phase 2 RSE work plan [Exponent 2014b]) after the top 12 in. has been removed. If the lead concentration is greater than the SSV, then appropriate demarcation material (e.g., orange plastic construction fencing material) would be placed at the bottom of the excavation prior to backfilling to indicate that soils below this demarcation material should not be disturbed. Excavation would not go below 12 in.

Exceedance of the SSV in the 3-ft fringe sample would also trigger potentially two sampling efforts. First, the other side of the driveway (if present) would be sampled at a 3-ft distance with a five-point linear composite. Second, a composite sample would be collected in the yard adjacent to the fringe sample (could be both sides of the driveway) that exceeded the SSV. If that yard composite sample(s) exceed(s) the SSV, then the yard area(s) could be subject to remediation as discussed in Section 6.1.

If the linear composite 3 ft from the driveway does not exceed the SSV, then only the driveway would be remediated.

6.3.3.2 Soil Removal from Driveway and Driveway Replacement

Soil removal and disposal for driveways would follow the procedures described for Alternative Y3, with the exception that the excavation depth for the driveway itself would be a maximum of 6 in. After removal, the driveway would be replaced with compacted gravel or pavement, using standard construction practices.

6.3.3.3 Soil Removal, Backfilling, and Revegetation of Driveway Fringe Areas

If the fringe areas need to be removed, the soil would be excavated to a maximum depth of 12 in., and marker material would be placed before backfilling and revegetating as described in Alternative Y3.

6.3.3.4 Effectiveness, Risk Reduction, and Cost

This Alternative DW3 would be effective in meeting the removal action objectives and in reducing the risk of lead exposure to acceptable levels. However, this alternative would be more costly than simply paving the driveway (Alternative DW2).

6.4 City Ditches

City ditches are present primarily in the northwest and southeast sections of Cherryvale (Figures 34 and 35). SRM is present in some of the ditches as a result of direct placement for erosion control (see Photos 24–28 in Appendix C for A, B, C, and D SRM class ditch examples). SRM was used as a road base throughout the City. The removal alternatives for City ditches include no action (CD1), institutional controls (CD2), and ICs with environmental improvements (CD3).

6.4.1 Alternative CD1—No Action

Under the CD1 alternative, if a ditch had visible SRM and/or soil exceeding SSV, no action would be taken. Alternative CD1 would not be effective in reducing lead exposure, and would not reduce risks, but would be the least costly of the alternatives.

6.4.2 Alternative CD2—Institutional Controls

Under this alternative, ICs would be developed (an IC Plan) to minimize the risk of exposure to lead in the City ditches. The ICs would consist of the following components:

Permit for Excavation in or Adjacent to Ditches—The IC Plan would describe a permit process by which the City would control excavation activities in or adjacent to their ditches. The plan would provide procedures for safe handling of soil and SRM encountered during the excavation, and proper disposal of that material.

Soil Management Plan—The IC Plan would include a Soil Management Plan for proper handling and disposal of excavated material. The Soil Management Plan would also include guidelines for safe ditch maintenance to minimize exposures to SRM.

Community Outreach—The IC Plan would include a Community Outreach Plan, whereby the City and KDHE would educate the public regarding the potential presence of SRM in City ditches and explain the risks of children playing in the ditches and the need for a permit for any excavation in or adjacent to the ditches.

6.4.2.1 Effectiveness, Reduction in Risk, and Cost

Alternative CD2 would be effective in achieving long-term goals and reducing risks of exposure to lead compared to the no-action alternative, but not as effective as the enhanced program described in Alternative CD3. Alternative CD2 would be less costly than Alternative CD3.

6.4.3 Alternative CD3—Institutional Controls with Environmental Improvements

Alternative CD3 incorporates all of the instructional controls described in Alternative CD2 but would also include an Environmental Improvement Plan. This Plan would include two proactive activities that would address both the risks of exposure and the public concern of visible SRM in certain ditches. These activities are as follows:

Stabilization of Eroding Sidewalls—In some cases, the sidewall of a ditch is eroding next to the subgrade of the road (see Photos 24 and 26 in Appendix C). In these cases, SRM can fall along the sidewall and into the ditch from the road subgrade. These locations would be stabilized with sprayed concrete (e.g., shotcrete[21]) or other suitable methods.

[21] http://www.shotcrete.org/media/pdf/ASAShotcretebrochure.pdf.

SRM Collection Program—The City would be provided with a detailed map showing which ditches have SRM (A, B, and C classes). A plan would be prepared that describes an SRM collection program. The plan would be developed with the City to provide for efficient collection of visible SRM by City workers when they have available time not devoted to other activities. The SRM would be collected using hand tools and properly disposed of. This activity would not be a financial burden on the City and over time would help to reduce the potential concerns of the public from visible SRM in City ditches, and further provide some minimal reduction in the risk of SRM exposure.

6.4.3.1 Effectiveness, Reduction in Risk, and Cost

Alternative CD3 would be effective in achieving long-term goals and reducing risks of exposure to lead compared to the no-action alternative and Alternative CD2. However, this alternative would be somewhat more costly than Alternative CD2.

6.5 Brick Walkways

Brick walkways are a potential source of lead exposure, because they were commonly underlain with a base of granular SRM. Fortunately, very few walkways have been disturbed to the point where the underlying SRM has been exposed (see Figures 36 and 37 and Photos 29–35 in Appendix C for A, B, C, and D SRM class walkway examples). Also, the soil sampling of the gradients adjacent to walkways indicates that the SSV is unlikely to be exceeded due to proximity to a walkway. Some landowners (not many) have older brick walkways and/or driveways on their property. These walkways are included in these removal alternatives.

6.5.1 Alternative BW1—No Action

Under the BW1 alternative, if a brick walkway had visible SRM and/or soil exceeding SSV, no action would be taken. Alternative BW1 would not be effective in reducing lead exposure, and would not reduce risks, but would be the least costly of the alternatives.

6.5.2 Alternative BW2—Institutional Controls

Under this alternative, ICs would be developed (an IC Plan) to minimize the risk of exposure to lead in the SRM that was used as a base for the brick walkways throughout the City. The ICs would consist of the following components:

Permit for Disturbance of Brick Walkways—The IC Plan would provide for a permit process by which the City would control disturbance of intact brick walkways. The plan would provide procedures for safe handling of soil and SRM encountered during the excavation, and proper disposal of that material.

Soil Management Plan—The IC Plan would include a Soil Management Plan for proper handling and disposal of excavated material. The Soil Management Plan would also include guidelines for proper walkway maintenance to minimize exposure to SRM.

Community Outreach—The IC Plan would include a Community Outreach Plan[22] whereby the City and KDHE would educate the public regarding the potential presence of SRM underneath brick walkways and would explain the risks related to disturbance of the bricks and the need for a permit for any disturbance of the bricks that could expose the underlying SRM.

6.5.2.1 Effectiveness, Reduction in Risk, and Cost

Alternative BW2 would be effective in achieving long-term goals and reducing risks of exposure to lead compared to the no-action alternative, but not as effective as the enhanced program described in Alternative BW3. Alternative BW2 would be less costly than Alternative BW3.

6.5.3 Alternative BW3—Institutional Controls with Replacement of Disturbed Brick Sections with Concrete and Soil Sampling and Removal

Alternative BW3 incorporates all of the instructional controls described in Alternative BW2 but would also include an Environmental Improvement Plan. This Plan would include additional proactive activities that would address both the risks of exposure and the public concern about visible SRM where disturbed brick walkways are present. The decision flowchart for this alternative is shown in Figure 44.

6.5.3.1 Replace Disturbed Sections of Brick with Concrete

If bricks are disturbed, as documented in the City-wide survey, then the disturbed section would be removed and replaced with a standard concrete walkway.

6.5.3.2 Sample Soil Adjacent to Disturbed Brick Section

A five-point linear composite sample (0–6 in. and 6–12 in.) would be collected at a 3-ft distance parallel to the edge of the disturbed walkway section, or, if both sides of the walkway are disturbed, then samples would be collected on the side closest to a residence. If the lead level in the sample is less than the SSV, then no further sampling is needed. If the sample exceeds the SSV, then a five-point composite (0–6 in. and 6–12 in.) would be collected from the adjacent yard, and another linear composite would be collected on the other side of the disturbed section. If that second linear composite exceeds the SSV, then a five-point composite would be collected in the yard adjacent to that side of the walkway. The yard composites would not be collected if that yard was to be sampled anyway for another reason.

[22] Note that the Community Outreach Plan would include a discussion of all features under the IC Plan.

6.5.3.3 Remove Soil Exceeding SSV

The 3-ft fringe areas adjacent to the disturbed brick section that exceed the SSV may be remediated as described in Section 6.1. The adjacent yards, if exceeding SSV, will also be remediated following standard procedures (Section 6.1).

6.5.3.4 Effectiveness, Reduction in Risk, and Cost

Alternative BW3 would be effective in achieving long-term goals and reducing risks of exposure to lead compared to the no-action alternative and Alternative BW2. However, alternative BW3 would be more costly than Alternative BW2.

6.6 City Alleys

The City historically used SRM as fill material and gravel substitute for their alleys. The historical SRM has been buried by the clean limestone gravel that has been used to maintain the alleys in more recent times. However, some historical SRM is still visible at the surface in some alleys (see Figures 38 and 39, and Photos 36–41 in Appendix C for A, B, C, and D SRM class alley examples). In addition, soil samples collected on the outer boundary of the 20-ft ROW often exceeds the SSV, especially on the west side of Cherryvale (see Table 11). The removal alternatives for City alleys include no action (CA1), ICs (CA2), and ICs with alley rehabilitation and fringe soil sampling (CA3).

6.6.1 Alternative CA1—No Action

Under Alternative CA1, no action would be taken, even if an alley had visible SRM or adjacent soils were above the SSV. Alternative CA1 would not be effective in reducing lead exposure, would not reduce risks, but would be the least costly of the alternatives.

6.6.2 Alternative CA2—Institutional Controls

Under this alternative, an IC Plan would be developed to minimize the risk of exposure to lead in the SRM that was used historically for alley maintenance throughout the City. The ICs would consist of the following components:

Permit for Excavation in Alley Right of Ways—The IC Plan would lay out a permit process by which the City would control excavation in alley ROWs and fringe areas adjoining alleys. The plan would provide procedures for safe handling of soil and SRM encountered during the excavation and proper disposal of that material.

Soil Management Plan—The IC Plan would include a Soil Management Plan for proper handling and disposal of excavated material. The Soil Management Plan would also include guidelines for proper alley maintenance to minimize the exposure of SRM.

Community Outreach—The IC Plan would include a Community Outreach Plan whereby the City and KDHE would educate the public regarding the potential presence of SRM and soil with

elevated lead in and adjacent to alleys. The plan would explain the risks related to disturbance of the alley and adjacent areas and the need for a permit for any excavation in or adjoining the alley ROW.

6.6.2.1 Effectiveness, Reduction in Risk, and Cost

Alternative CA2 would be effective in achieving long-term goals and reducing risks of exposure to lead compared to the no-action alternative, but not as effective as the enhanced program described in Alternative CA3. Alternative CA2 would be less costly than Alternative CA3.

6.6.3 Alternative CA3—Institutional Controls with Alley Rehabilitation and Fringe Soil Sampling and Removal

Alternative CA3 incorporates all of the ICs described in Alternative CA2 but would also include an Environmental Improvement Plan. This Plan would include two proactive activities that would address both the risks of exposure and the public concern of visible SRM in alleys. The decision flowchart for this alternative is shown in Figure 45.

6.6.3.1 Rehabilitate A and B Class Alleys

Alleys identified as A and B class alleys in the City-wide survey would be rehabilitated. Specifically, the alleys would be graded, and a layer of limestone gravel approximately 6 in. thick, including additional limestone where needed to maintain the uniform 6-in. thickness, would be placed and compacted on the alley.

6.6.3.2 Sample and Remove Soils along Edges of Alley ROWs

As shown in Table 11, soil samples collected at 4.5 ft from the edge of the active surface of the alley often exceed the SSV, especially on the west side of the City. The ROW is 20 ft wide and the active alley footprint is typically 10 ft wide. Therefore, the fringe area between the active alley and the private property boundary is approximately 5 ft.

To address the uncertainty of elevated lead in soils at the edge of the alley ROW and in the adjacent yard, all previously unsampled alleys would be sampled on one edge of the ROW. A linear five-point composite sample would be collected along the length of the alley at the edge of the ROW (i.e., about 5 ft from the working edge of the alley, or about 10 ft from the alley center line). This is essentially at the property line between the City ROW and the adjacent private property.

If the ROW transect sample exceeds the SSV, then a parallel linear composite (five-point sample at depths of 0–6 in. and 6–12 in.) would be collected 5 ft away from the property line in any adjacent back yard where access has been granted. If the yard linear composite is less than SSV, then no further sampling is needed. However, if the yard linear composite exceeds the SSV, then a five-point yard composite would be collected, as described in Section 6.1. A yard composite is not needed if that yard was to be sampled anyway for another reason.

If the five-point yard composite exceeds the SSV, then the yard would be remediated to the property line. However, if the five-point yard composite is less than the SSV, then soil removal would only occur along the 5-ft strip adjacent to the alley.

6.6.3.3 Effectiveness, Reduction in Risk, and Cost

Alternative CA3 would be effective in achieving long-term goals and reducing risks of exposure to lead compared to the no-action alternative and Alternative CA2. However, alternative CA3 would be more costly than Alternative CA2.

6.7 Parks

Logan Park and the South Galveston Ball Field have observed SRM in several different settings (i.e., in a grassy area, disturbed brick walkways, and along roadbeds). The remedial approach for these subareas of the two parks will be presented in detail in the draft RAD Plan.

6.8 Applicable or Relevant and Appropriate Requirements

As specified in the SACO, ARARs pertinent to each removal action alternative were evaluated.

Requirements under federal or state law may be either “applicable” or “relevant and appropriate” to Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) clean-up actions, but not both. However, requirements must be both relevant and appropriate for compliance to be necessary. “Applicable” and “relevant and appropriate” requirements are defined as follows:

- **Applicable requirements** are those cleanup standards, standards of control and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal and State law that specifically address a hazardous substance, pollutant or contaminant, remedial action, location, or other circumstances at a CERCLA site (U.S. EPA 1988).
- **Relevant and appropriate requirements** are those cleanup standards, standards of control and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State Law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site addresses problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site (U.S. EPA 1988).

EPA’s (1989) and KDHE’s policy BER-RS-015 (KDHE 2005) provide guidance on the three categories of potential ARARs (chemical-specific, location-specific, and action-specific). Chemical-specific ARARs are those that pertain to handling or control of certain chemicals and are typically health- or risk-based numerical values or methods. Location-specific ARARs are

those that control activities based on location, such as floodplains, wetlands, historic sites, or sensitive ecosystems. Action-specific ARARs are those that govern discrete actions that may include the use of certain technologies for remedial actions or use of certain types of equipment. Additionally, an evaluation of "to be considered" standards was completed (i.e., standards that have not been promulgated but are used in conjunction with ARARs to achieve acceptable risk levels at a site).

A summary of ARARs for each remedial action alternative is presented in Table 16. Those ARARs listed in Table 16 that are determined to be applicable will be evaluated in more detail in the RAD Plan.

7 Recommended Removal Actions

Alternative 3 for all features would be the most effective set of removal actions. Specifically, the suite of recommended removal actions is:

- Yard alternative Y3: Soil removal, fill, and revegetate with sod
- Drip line alternative DL3: Visible SRM removal, soil removal, fill, and cover
- Driveway alternative DW3: Remove and replace driveway and adjacent soils
- City ditches alternative CD3: ICs with environmental improvements
- Brick walkways alternative BW3: ICs with replacement of disturbed brick sections with concrete, and soil sampling and removal
- City alleys alternative CA3: ICs with alley rehabilitation and fringe soil sampling and removal
- Parks: Focused removal actions will be detailed in the draft RAD Plan.

This set of alternatives is the most effective, protective and cost/beneficial of the alternatives evaluated. The yard alternative (Y3) is the presumptive remedy that has already been applied to Cherryvale properties during three previous yard removal campaigns. The approach for drip lines and driveways, and for disturbed brick walkways, addresses the presence of SRM and soil lead above the SSV on private property.

The alternatives for the city brick walkways (BW3), ditches (CD3), and alleys (CA3) address SRM present on the City-owned ROWs. The emphasis for the City-owned property is ICs combined with proactive improvements during the implementation of the removal program. The proactive improvements (ditch stabilization, replacement of damaged brick walkways, and rehabilitation of high-priority alleys) will allow the City to simply maintain the improved features, rather than investing in remedial activities. The intent of the ICs program is to provide for the long-term protection of human health and the environment in a manner that is affordable and practical for the City to manage. Post-removal confirmation sampling and/or monitoring to assess removal action performance will be addressed in the RAD Plan.

8 Sampling Prior to the Removal Action Design Plan

As described in Section 6, a significant amount of soil sampling would need to be conducted during the removal actions. The purpose of the sampling is to delineate which areas of a property exceed the SSV and require removal. Although the City-wide survey provided useful information on the extent and nature of SRM throughout Cherryvale, there is still uncertainty regarding the need for remediation in yards with visible SRM, especially the C class properties that had very little visible SRM, and some D class properties that may have a fringe of soil in the backyard adjacent to certain alleys that exceed the SSV.

In order to reduce the uncertainty regarding how many properties need remediation, and to provide better information for the RAD Plan, a subset of properties would need to be sampled prior to the RAD Plan. A pre-RAD sampling and analysis plan will be prepared and submitted to KDHE for approval.

All other delineation sampling will be conducted by the removal contractor during implementation of the approved removal action.

9 Schedule

The proposed schedule going forward after submittal of the Final Phase 2 RSE Report is shown below.

Activity or Milestone	Target Date or Period
Final Phase 2 RSE report	June 3, 2016
Draft sampling and analysis plan (SAP) for pre-RAD Plan sampling	June 17, 2016
Final SAP for pre-RAD sampling and start of sampling program	2 weeks after receipt of KDHE comments on draft SAP
Agency Decision Statement (ADS) public review draft	2 months after receipt of final Phase 2 RSE Report
Public Meeting on ADS	1 month after draft ADS
Final ADS	2 months after public meeting
Completion of pre-RAD Plan sampling	6 months after sampling begins
Draft RAD Plan	2 months after Final ADS or pre-RAD sampling
Draft Soil Management Plan	2 months after Final ADS
Draft Land-Use Controls (LUCs)	2 months after Final ADS
Begin negotiation for Third (Fourth) Amendment to Consent Order to implement RAD Plan	20 days after approval of RAD Plan (including Soil Management Plan and LUCs)
Complete negotiation and preparation of Third (Fourth) Amendment to Consent Order if agreement reached to implement RAD Plan	80 days after approval of RAD Plan (including Soil Management Plan and LUCs)

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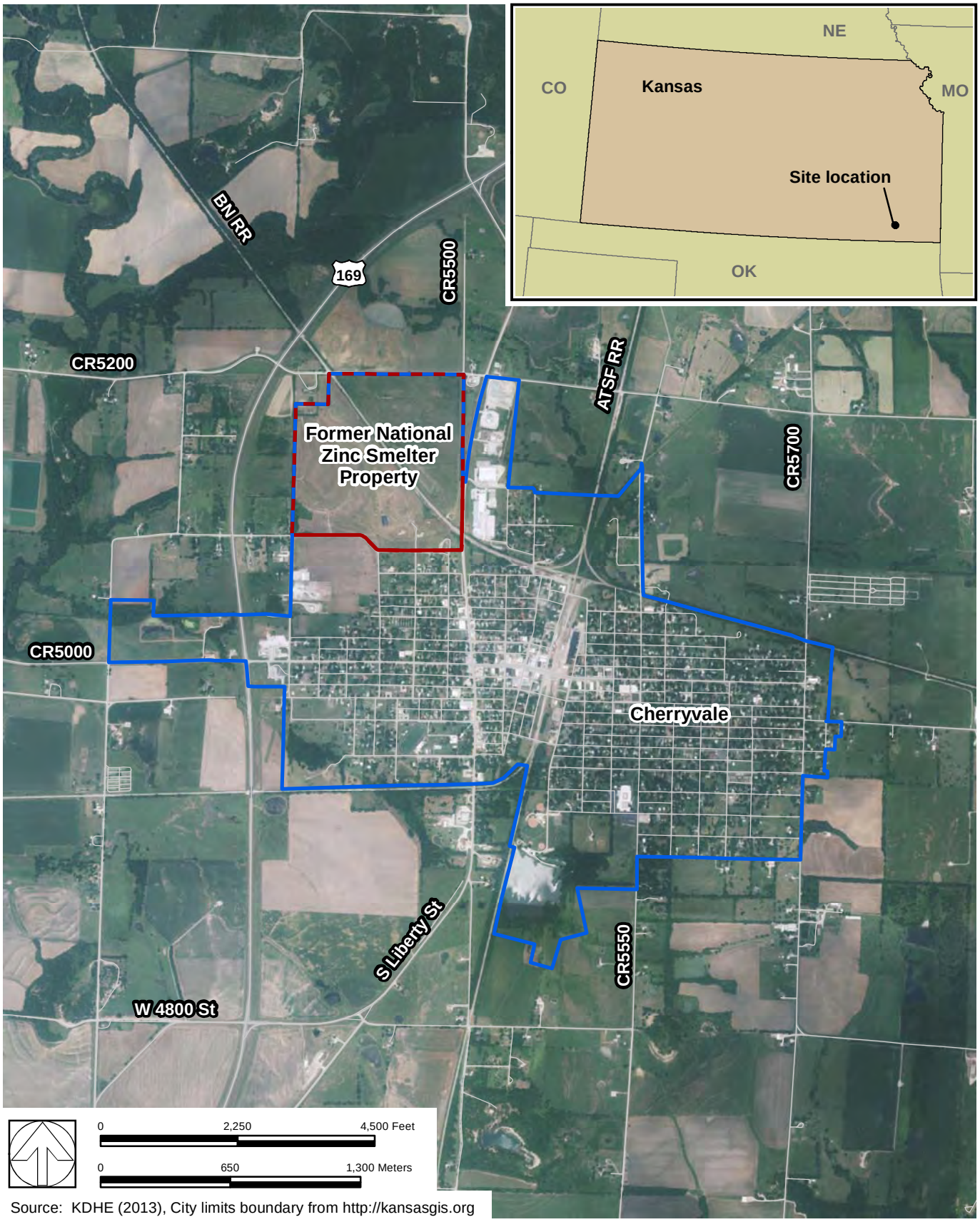
Figures



Source: KDHE (2013), City limits boundary from http://kansasgis.org

Figure 1. Cherryvale city limits and boundary of former National Zinc Smelter property

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June 27, 2014 / P:\12\1208309_Cherryvale\GIS\projects\Site map.mxd

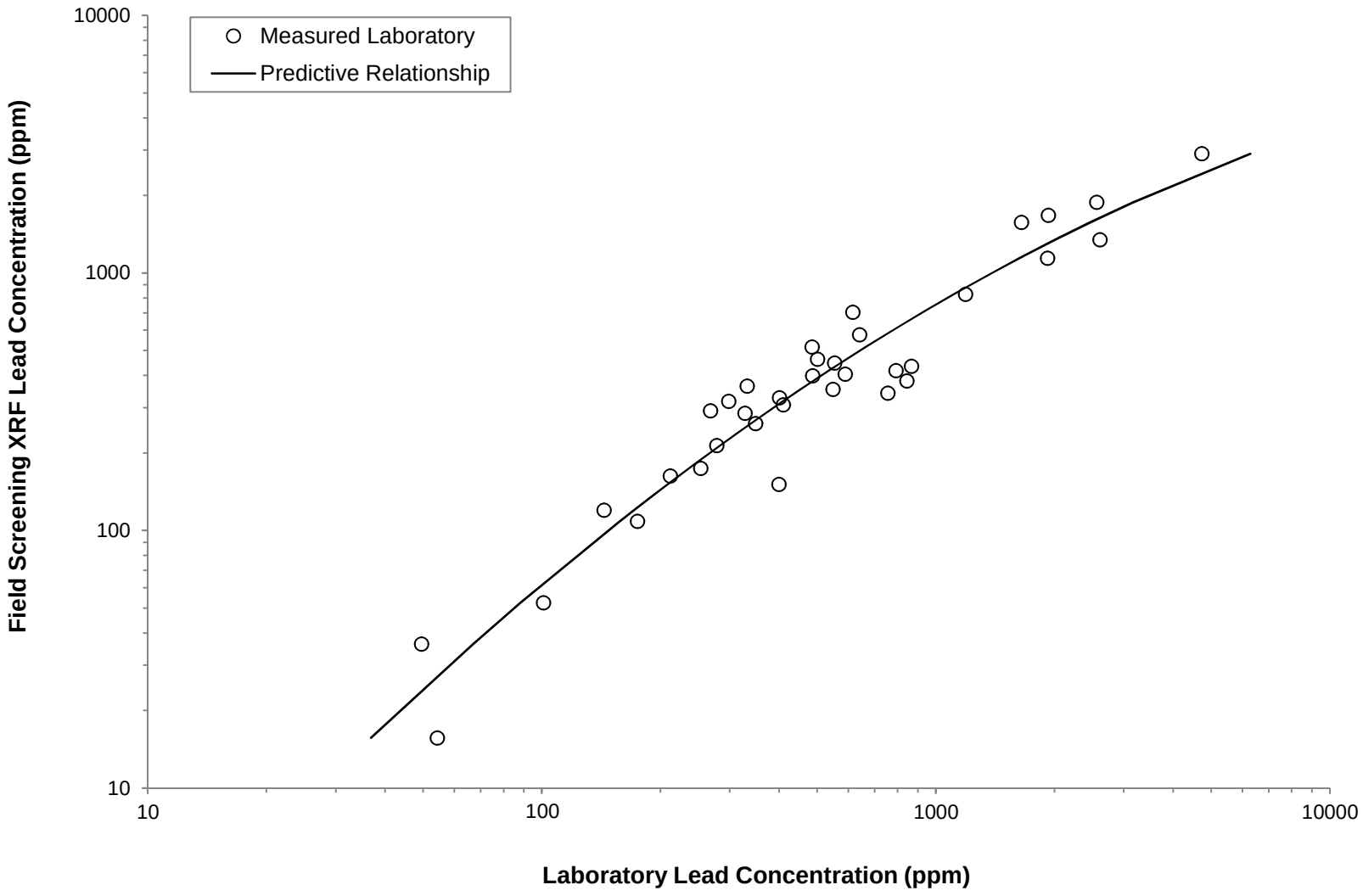
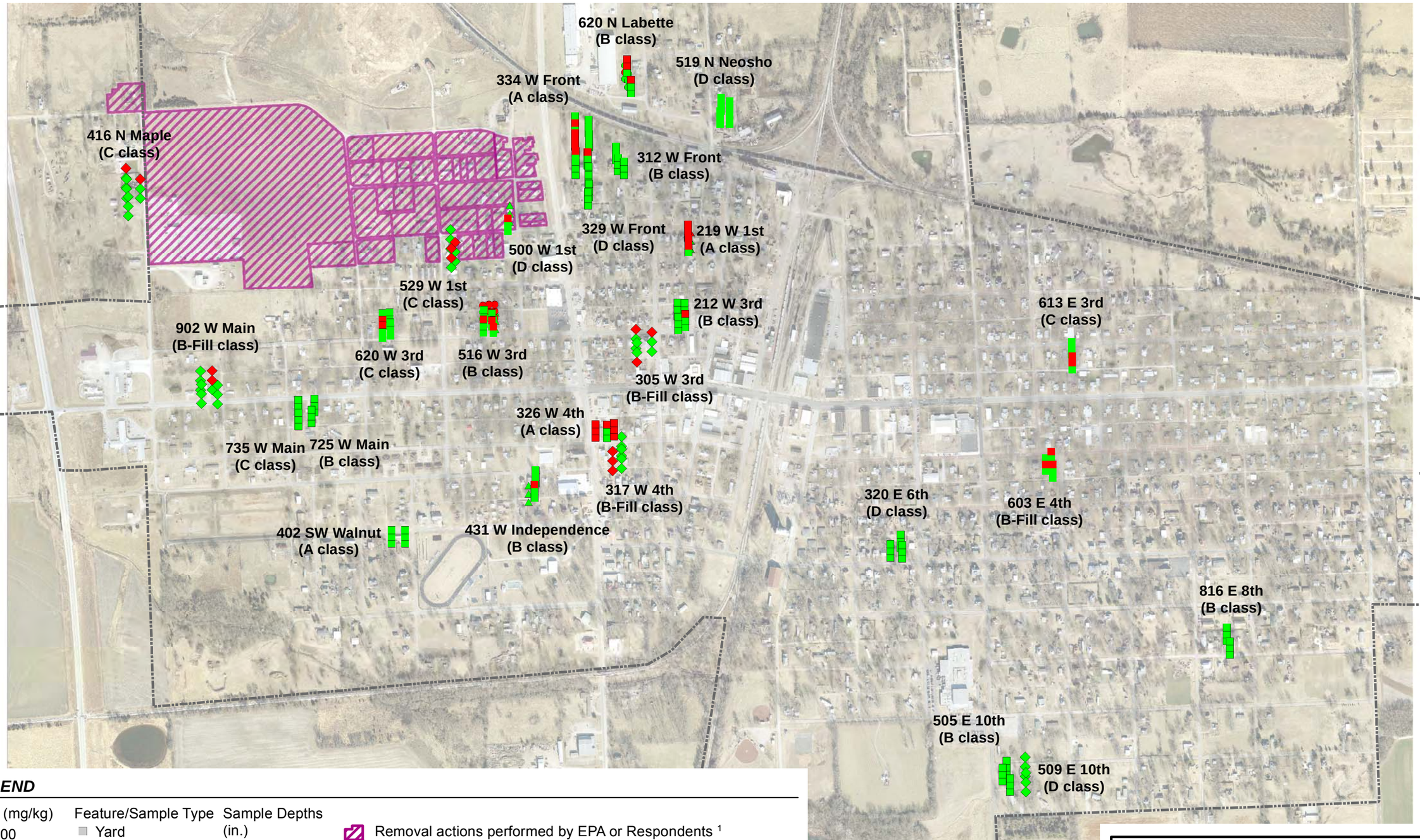


Figure 2. Relationship between lead concentrations measured by laboratory and field screening methods



LEGEND

Lead (mg/kg)
- >400
- ≤400

Feature/Sample Type
- Yard
- Garden
- Play Area
- Daycare

Sample Depths (in.)
- 0 - 6
- 6 - 12
- 12 - 18

Removal actions performed by EPA or Respondents [1]

Cherryvale city limit

[1] See Figures 17 and 18 for early action removal properties from 2015.

0 650 1,300 Feet

0 200 400 Meters

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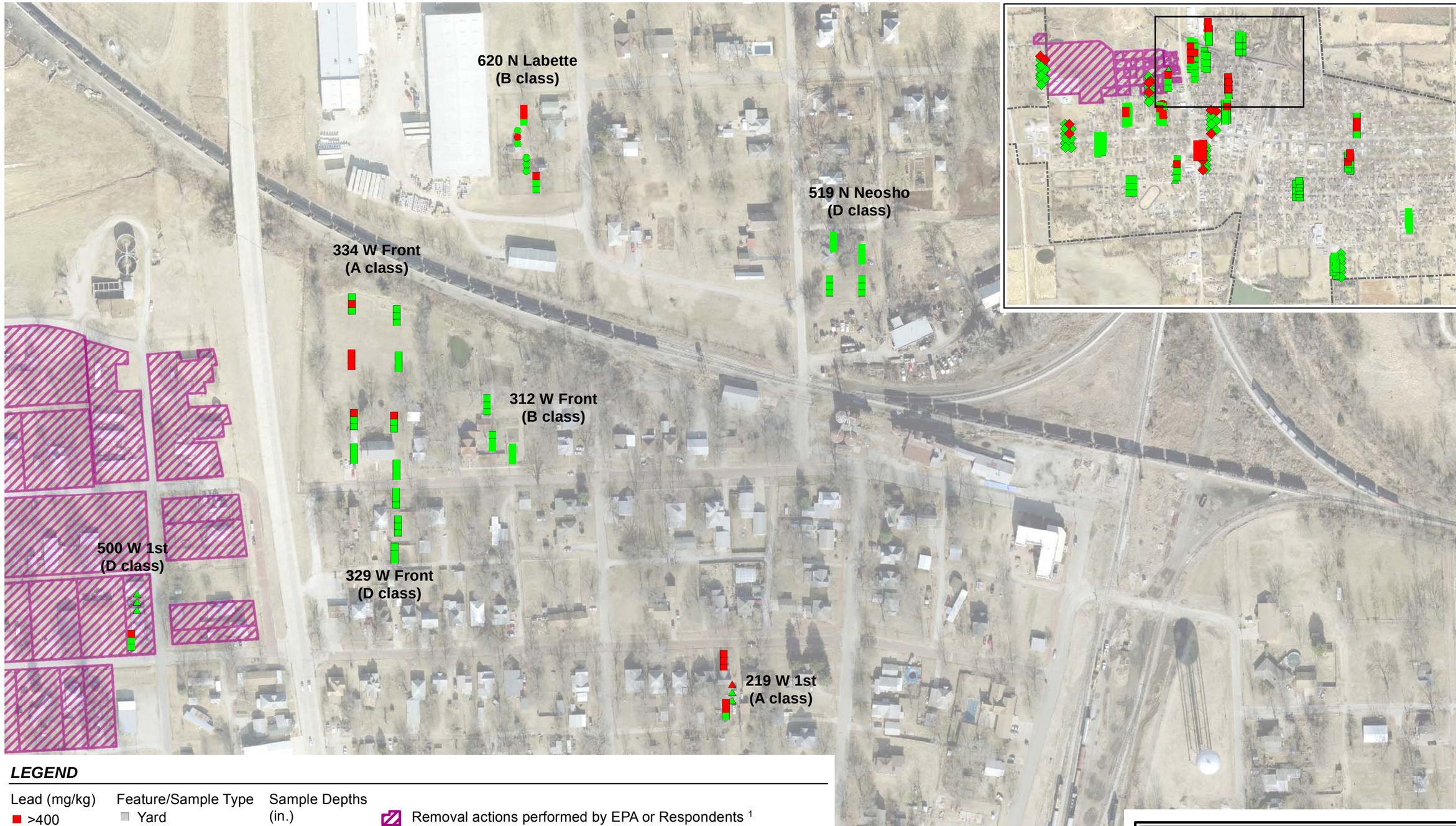
Figure 3a. Residential soil sample locations and results (all)



LEGEND

Lead (mg/kg)
- >400
- ≤400

Feature/Sample Type
- Yard
- Garden
- Play Area
- Daycare

Sample Depths (in.)
- 0 - 6
- 6 - 12
- 12 - 18

Removal actions performed by EPA or Respondents [1]

Cherryvale city limit

[1] See Figures 17 and 18 for early action removal properties from 2015.

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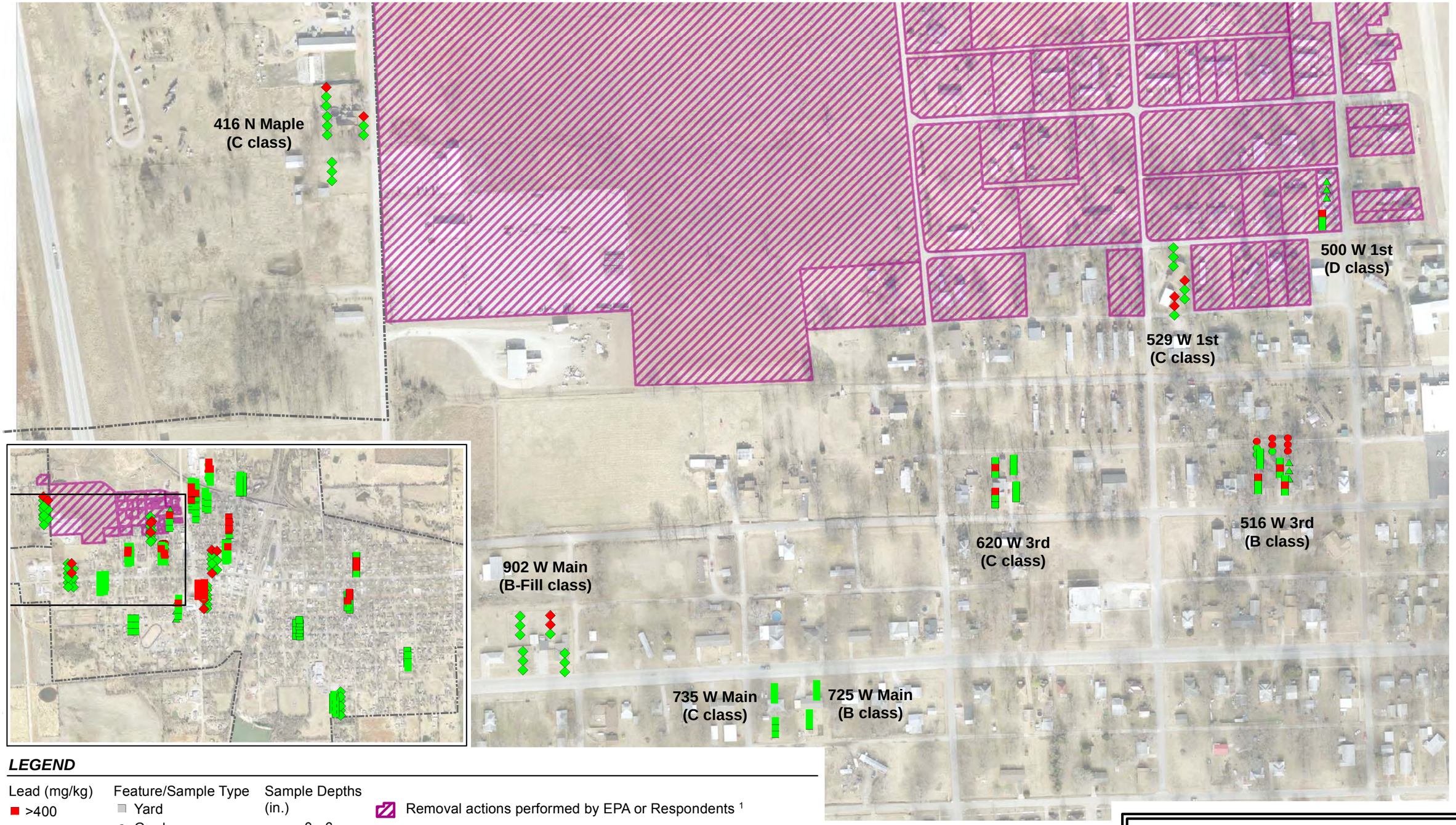
Figure 3b. Residential soil sample locations and results (zoom 1)



LEGEND

Lead (mg/kg)
- >400
- ≤400

Feature/Sample Type
- Yard
- Garden
- Play Area
- Daycare

Sample Depths (in.)
- 0 - 6
- 6 - 12
- 12 - 18

Removal actions performed by EPA or Respondents [1]

Cherryvale city limit

[1] See Figures 17 and 18 for early action removal properties from 2015.

0 250 500 Feet

0 50 100 Meters

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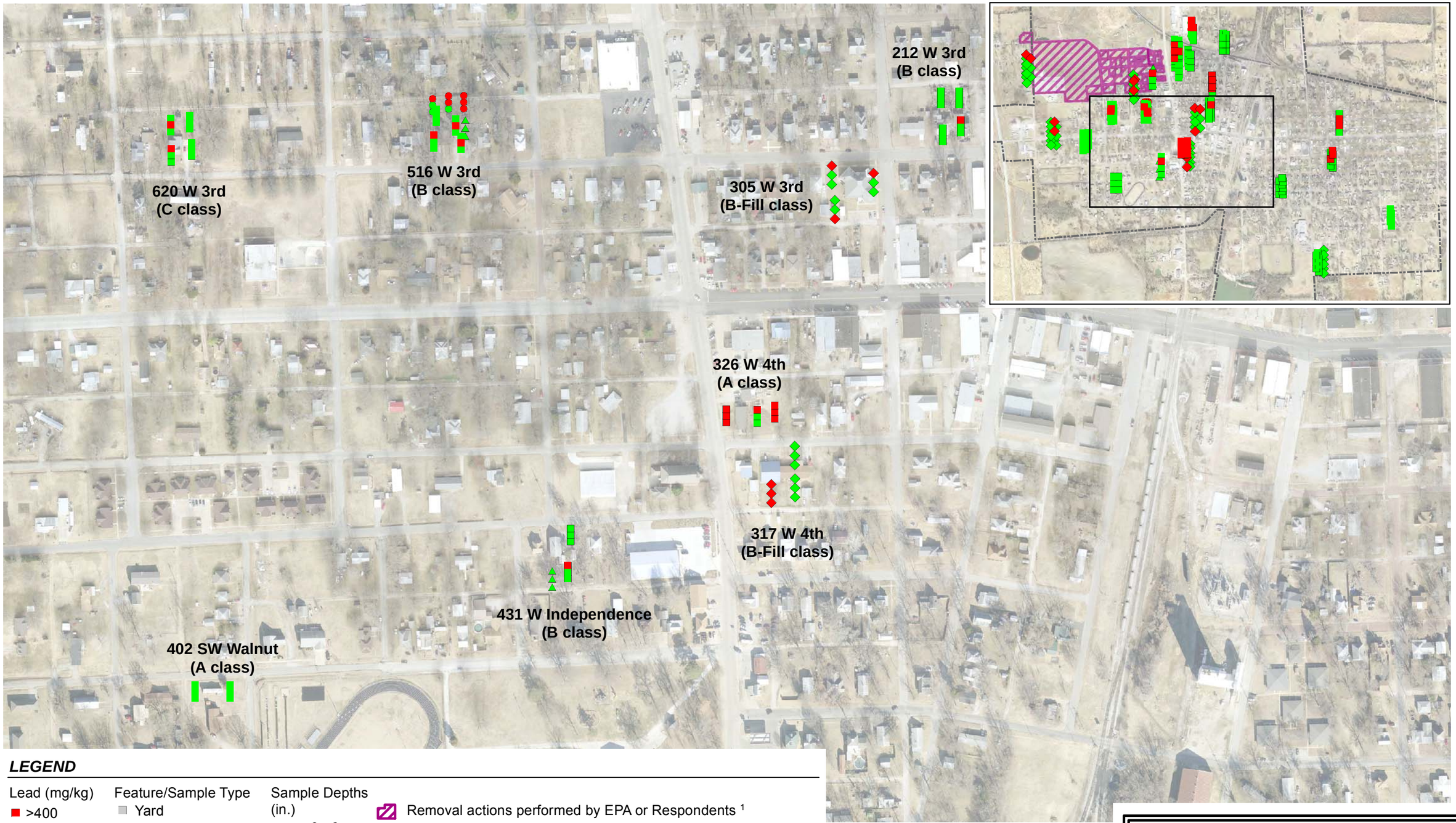
Figure 3c. Residential soil sample locations and results (zoom 2)



LEGEND

Lead (mg/kg)
- >400
- ≤400

Feature/Sample Type
- Yard
- Garden
- Play Area
- Daycare

Sample Depths (in.)
- 0 - 6
- 6 - 12
- 12 - 18

Removal actions performed by EPA or Respondents [1]

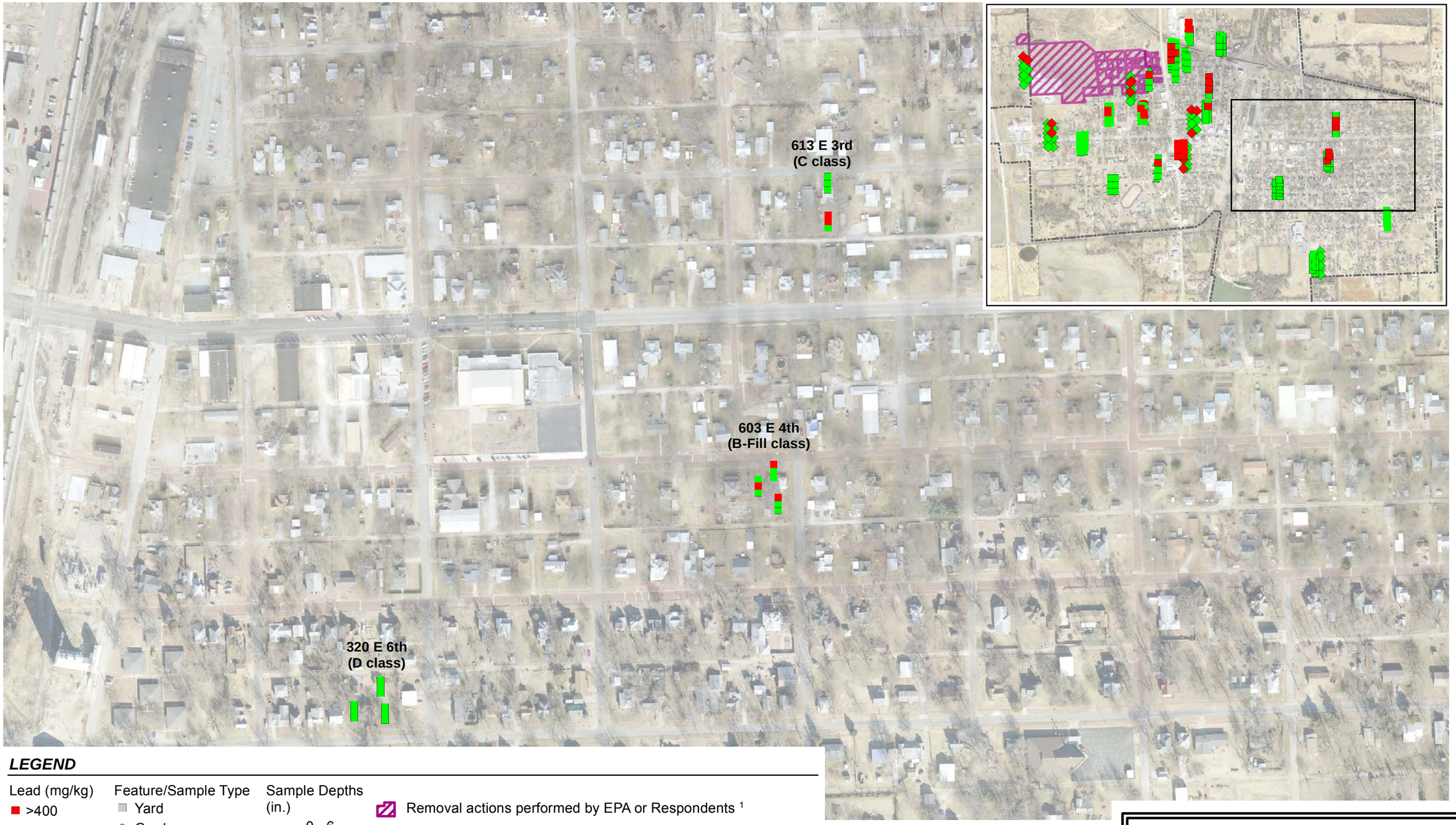
Cherryvale city limit

[1] See Figures 17 and 18 for early action removal properties from 2015.

0 250 500 Feet

0 50 100 Meters

Figure 3d. Residential soil sample locations and results (zoom 3)



LEGEND

Lead (mg/kg)
- >400
- ≤400

Feature/Sample Type
- Yard
- Garden
- Play Area
- Daycare

Sample Depths (in.)
- 0 - 6
- 6 - 12
- 12 - 18

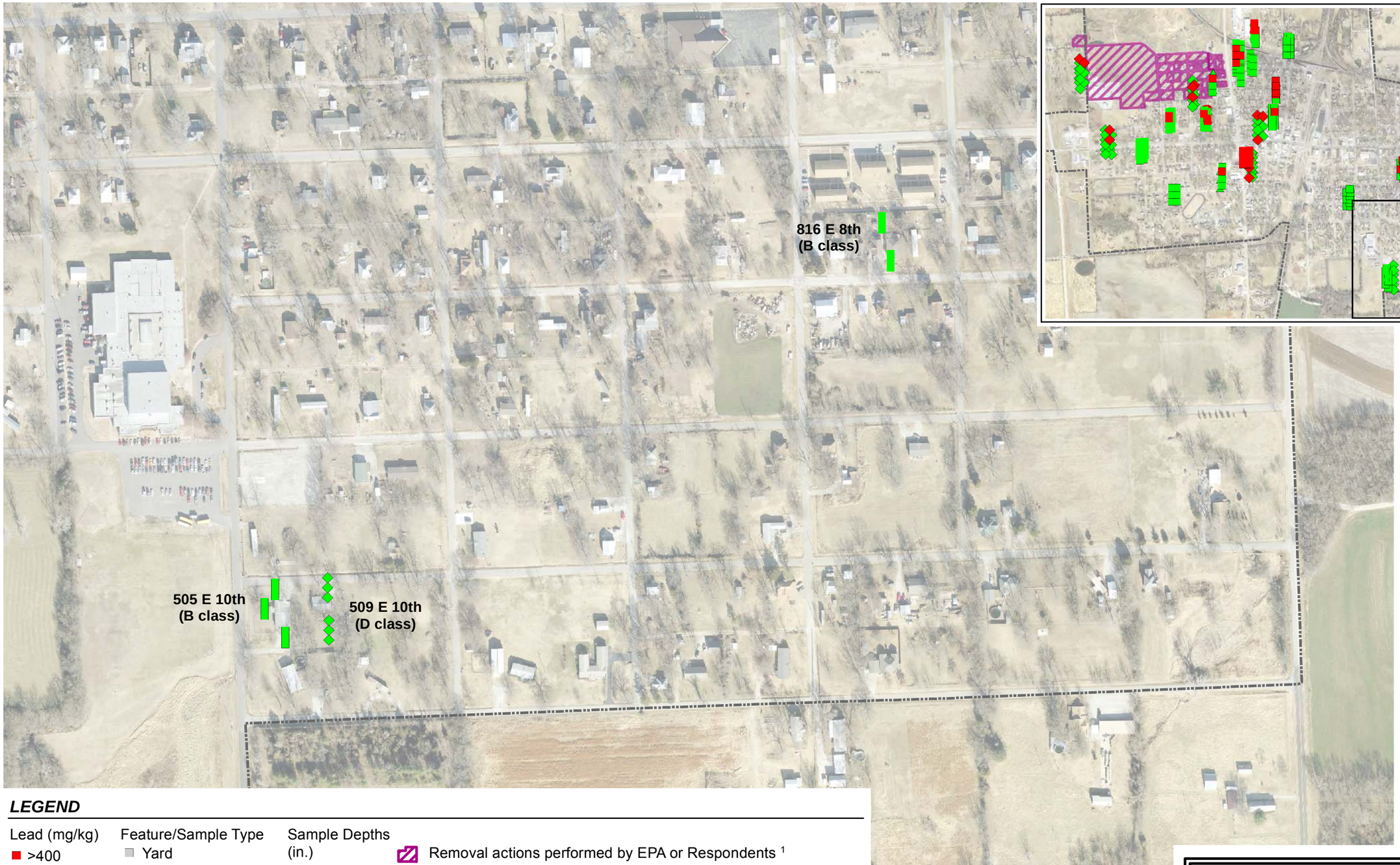
- Removal actions performed by EPA or Respondents [1]
- Cherryvale city limit

[1] See Figures 17 and 18 for early action removal properties from 2015.

0 250 500 Feet

0 50 100 Meters

Figure 3e. Residential soil sample locations and results (zoom 4)



LEGEND

Lead (mg/kg)
- >400
- ≤400

Feature/Sample Type
- Yard
- Garden
- Play Area
- Daycare

Sample Depths (in.)
- 0 - 6
- 6 - 12
- 12 - 18

- Removal actions performed by EPA or Respondents [1]
- Cherryvale city limit

[1] See Figures 17 and 18 for early action removal properties from 2015.

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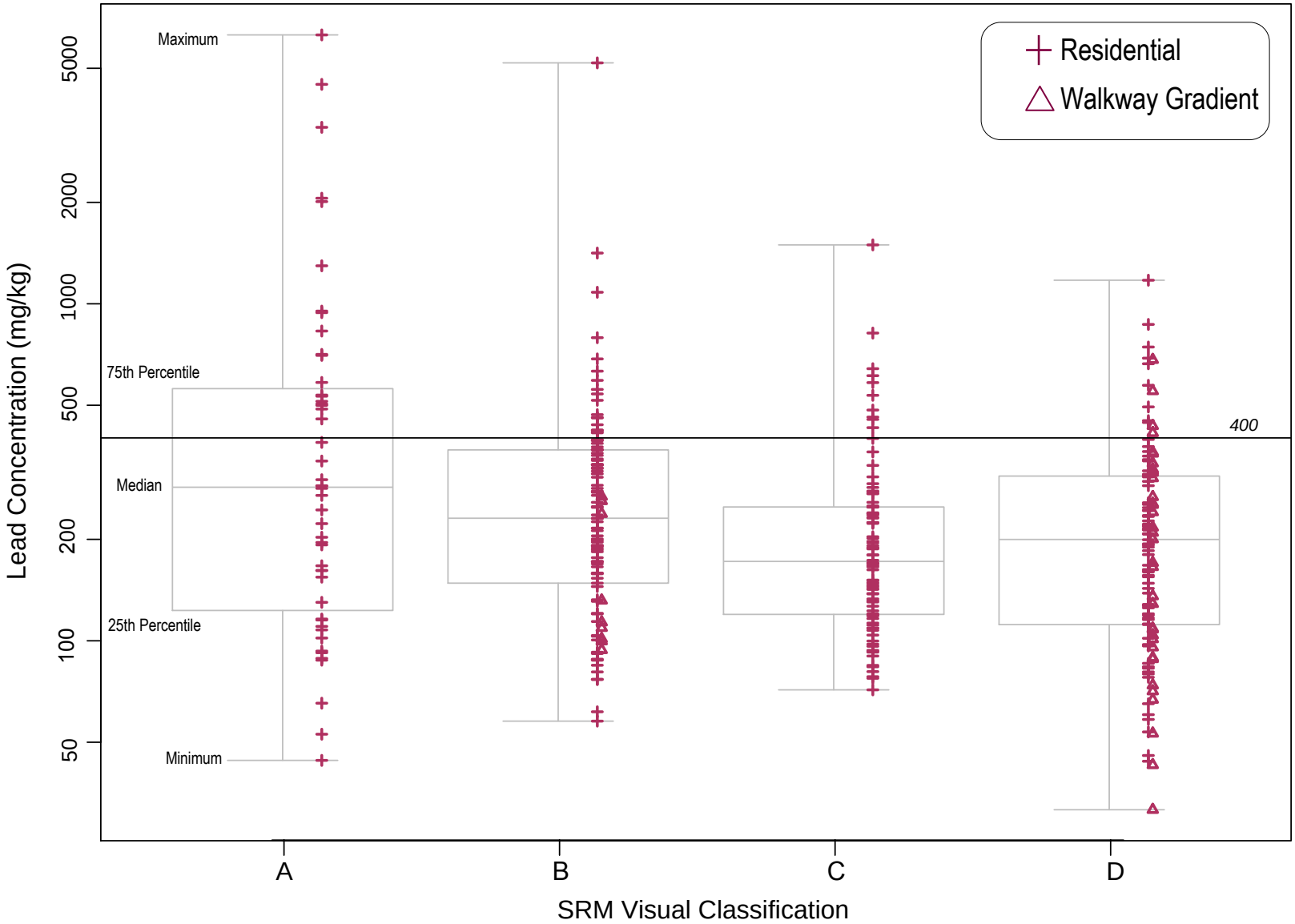
Figure 3f. Residential soil sample locations and results (zoom 5)



* Residential classification analysis includes residences, schools, and walkway gradients

Figure 4. Lead concentrations by SRM visual classification for residential soil samples of all depths (0–6, 6–12, and 12–18 in.)

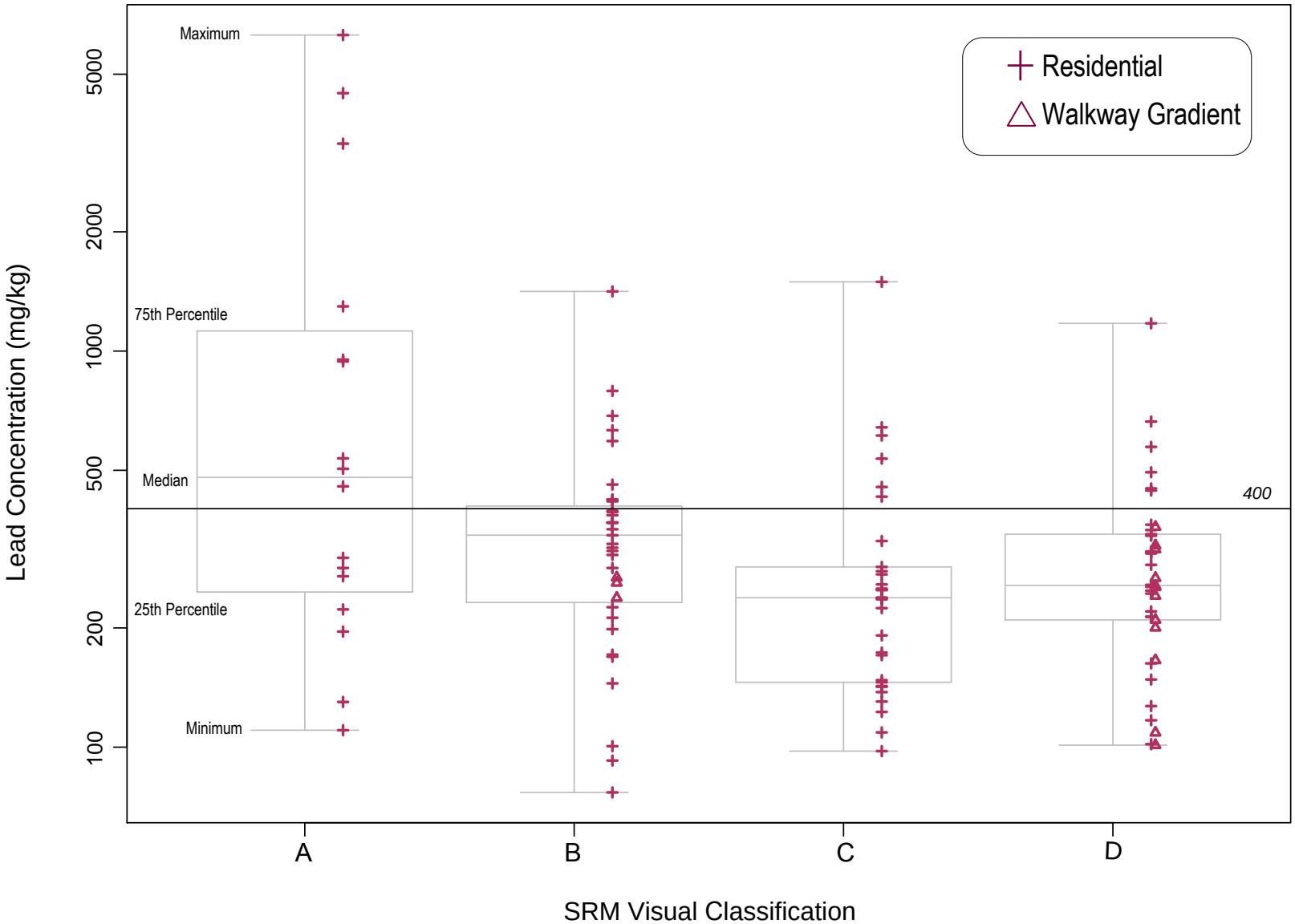


Figure 5. Lead concentrations by SRM visual classification for residential soil samples of 0–6 in. depth

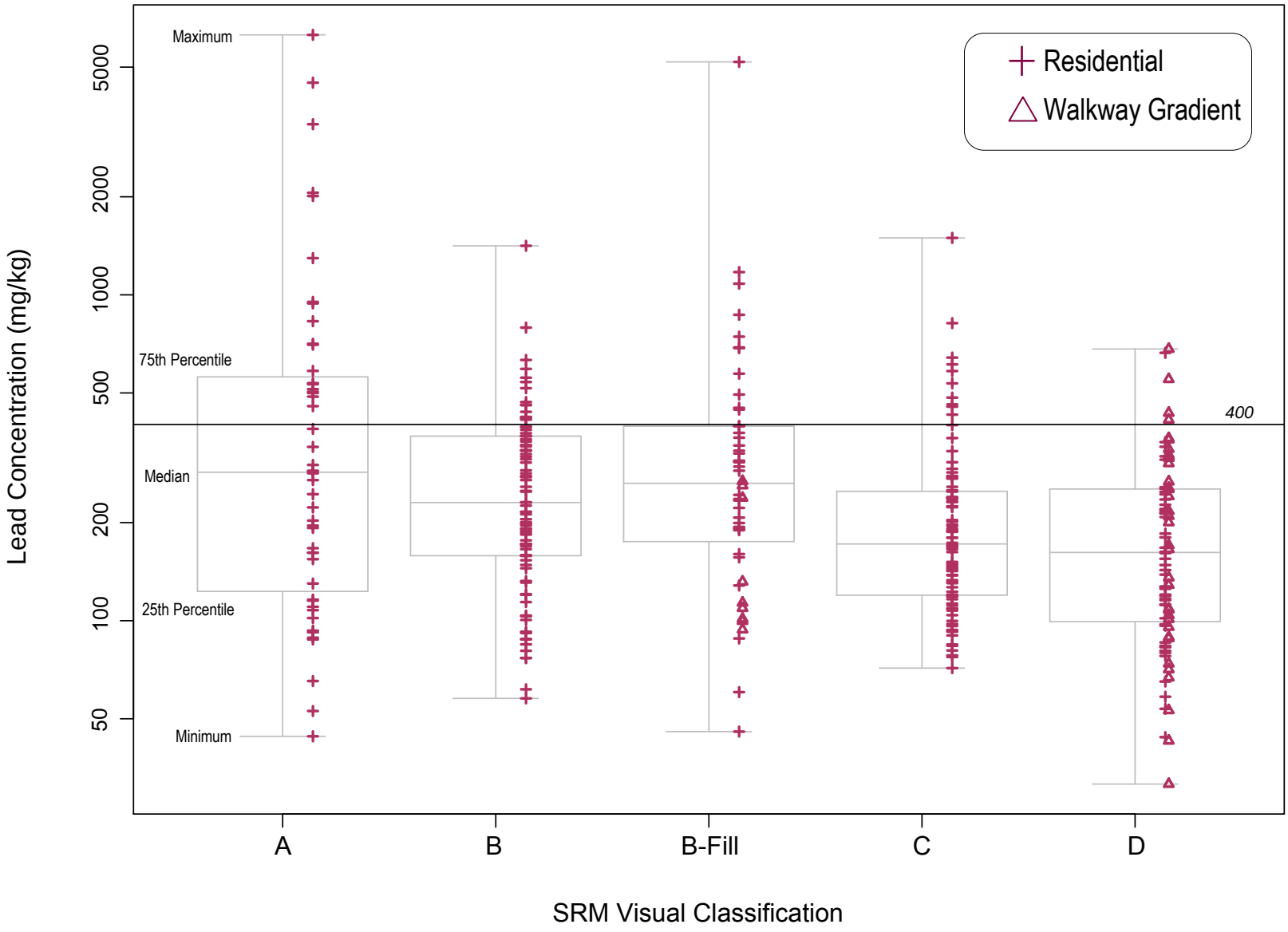


Figure 6. Lead concentrations by SRM visual classification with B-Fill class for residential soil samples of all depths (0–6, 6–12, and 12–18 in.)

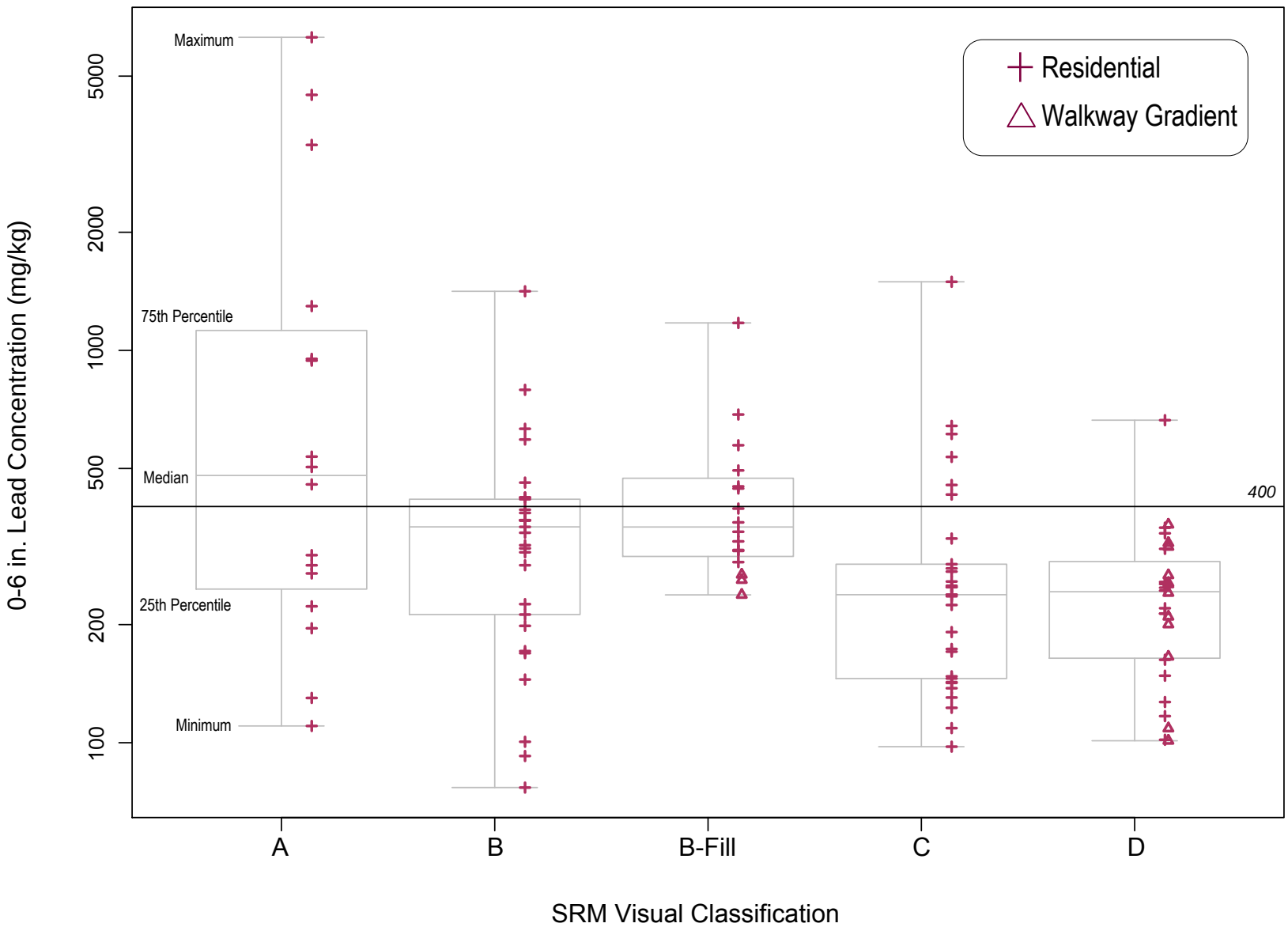


Figure 7. Lead concentrations by SRM visual classification with B-Fill class for residential soil samples of 0–6 in. depth

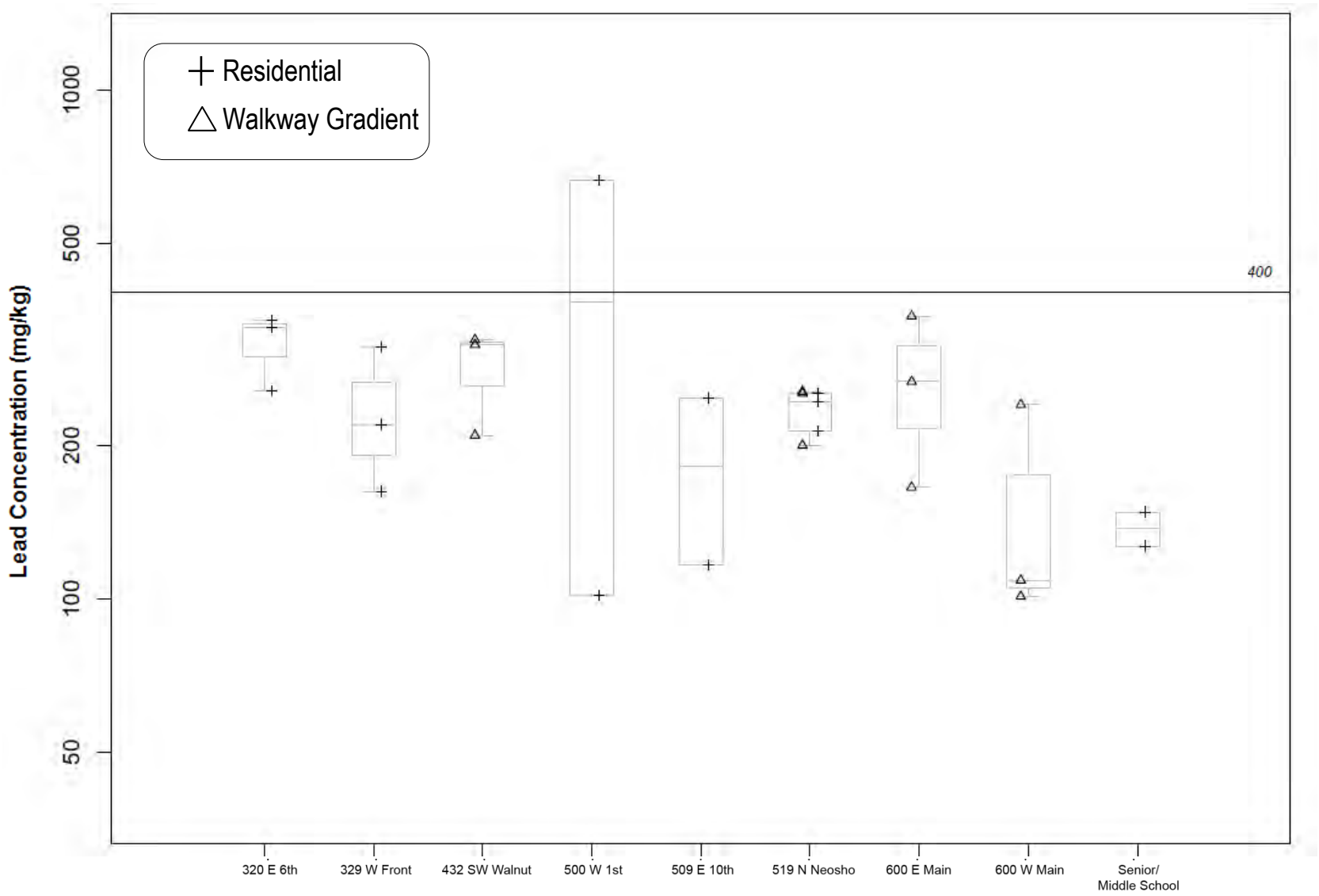
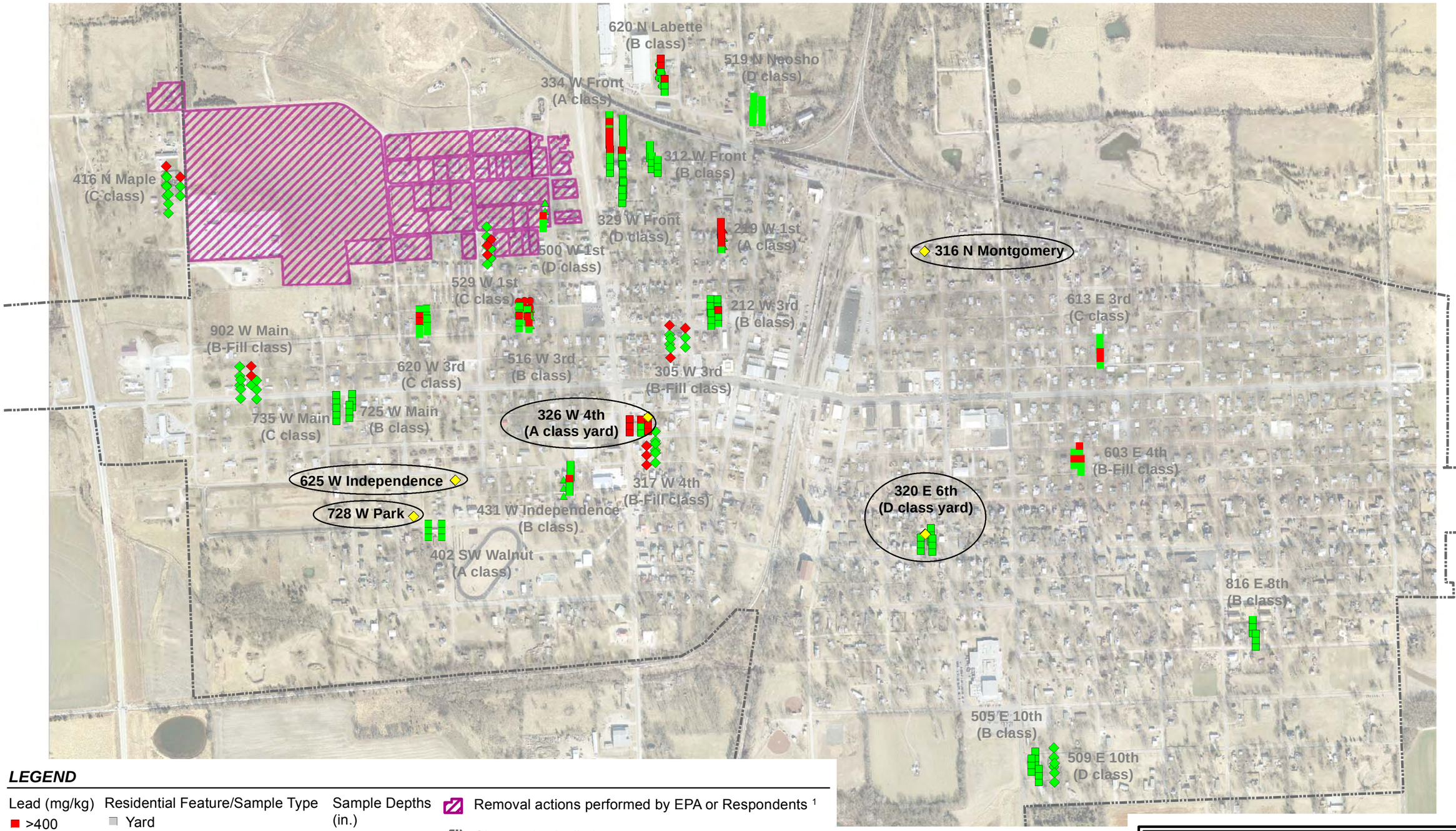


Figure 8. Lead concentrations for D class residential property soil samples of 0–6 in. depth



LEGEND

Lead (mg/kg)
- >400
- ≤400

Residential Feature/Sample Type
- Yard
- Garden
- Play Area
- Daycare
- Driveway Gradients (all A class)

Sample Depths (in.)
- 0 - 6
- 6 - 12
- 12 - 18

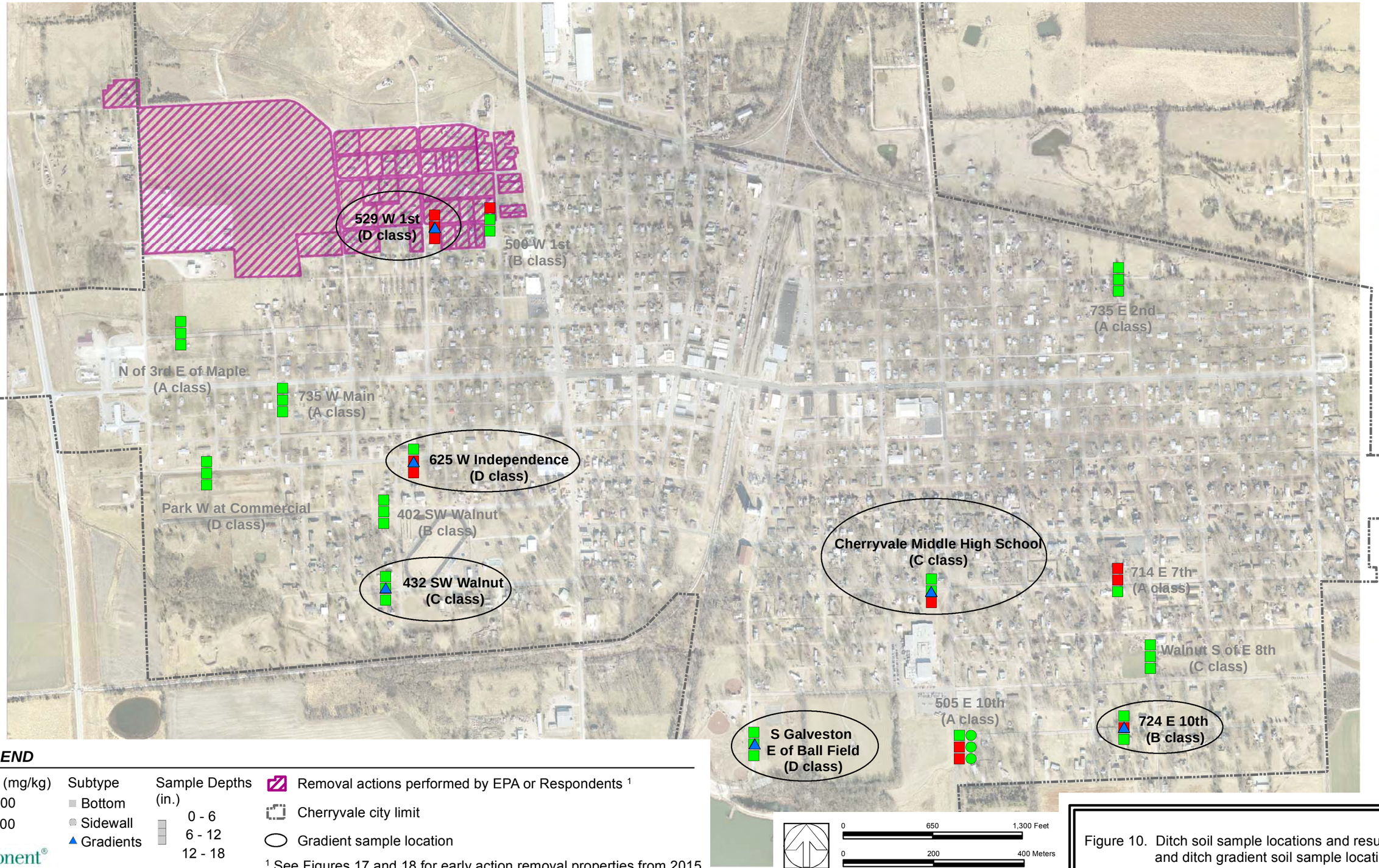
- Removal actions performed by EPA or Respondents [1]
- Cherryvale city limit
- Gradient sample location

[1] See Figures 17 and 18 for early action removal properties from 2015.

0 650 1,300 Feet

0 200 400 Meters

Figure 9. Driveway gradient soil sample locations



LEGEND

Lead (mg/kg)
- >400
- ≤400

Subtype
- Bottom
- Sidewall
- Gradients

Sample Depths (in.)
- 0 - 6
- 6 - 12
- 12 - 18

- Removal actions performed by EPA or Respondents [1]
- Cherryvale city limit
- Gradient sample location

[1] See Figures 17 and 18 for early action removal properties from 2015.

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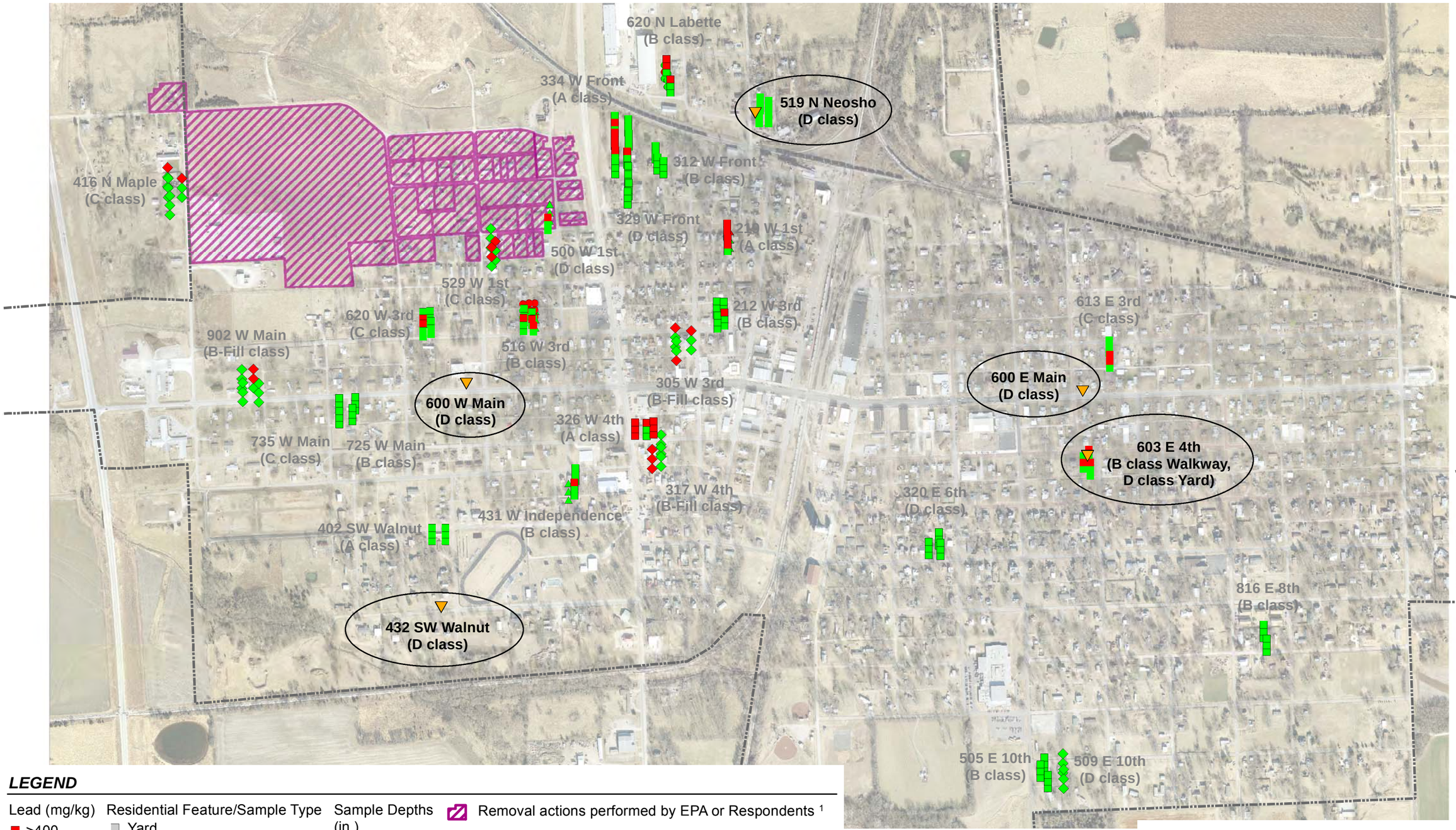
Figure 10. Ditch soil sample locations and results, and ditch gradient soil sample locations



LEGEND

Lead (mg/kg)
- >400
- ≤400

Residential Feature/Sample Type
- Yard
- Garden
- Play Area
- Daycare
- Walkway Gradients

Sample Depths (in.)
- 0 - 6
- 6 - 12
- 12 - 18

- Removal actions performed by EPA or Respondents [1]
- Cherryvale city limit
- Gradient sample location

[1] See Figures 17 and 18 for early action removal properties from 2015.

0 650 1,300 Feet

0 200 400 Meters

Figure 11. Walkway gradient soil sample locations

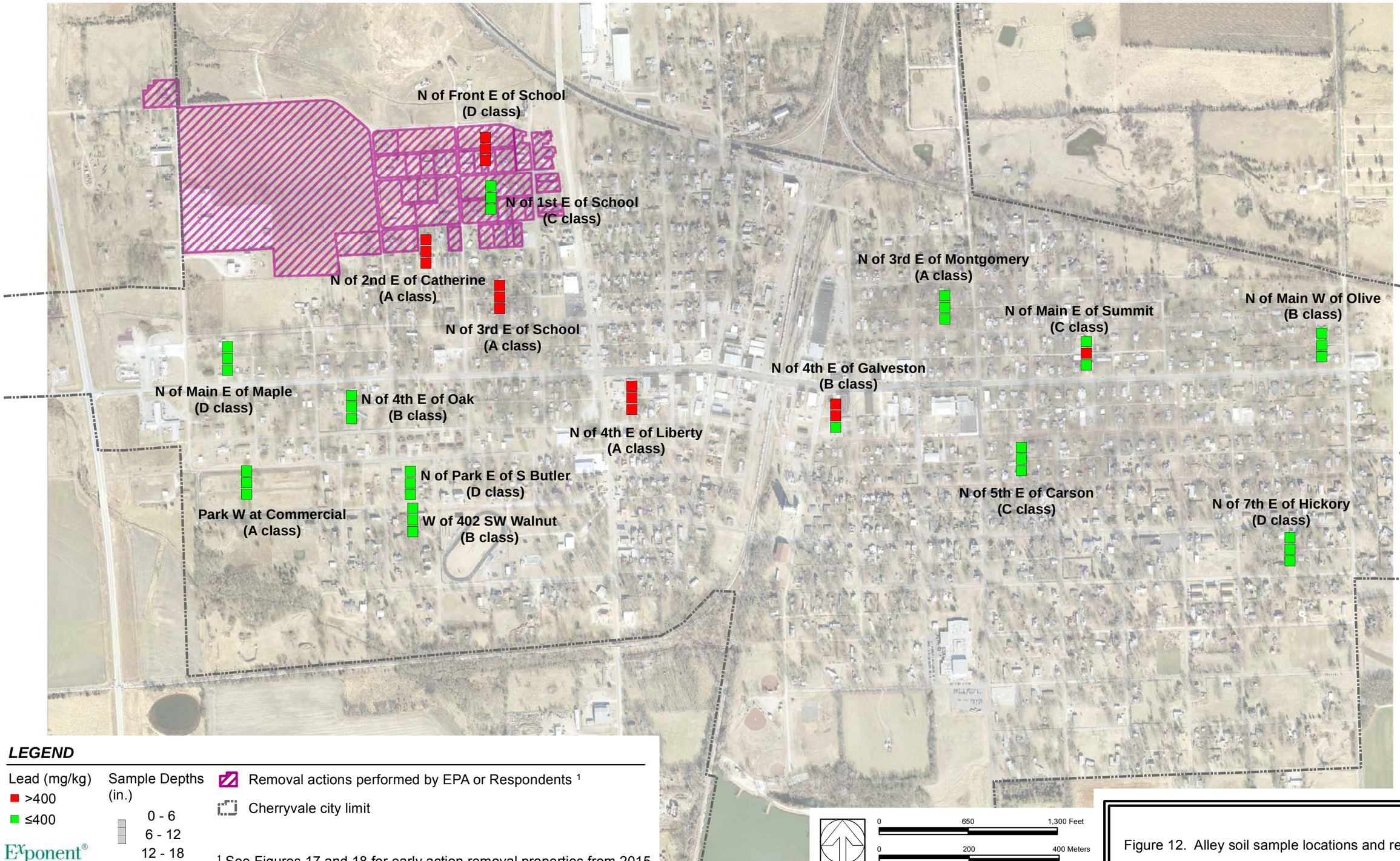


Figure 12. Alley soil sample locations and results

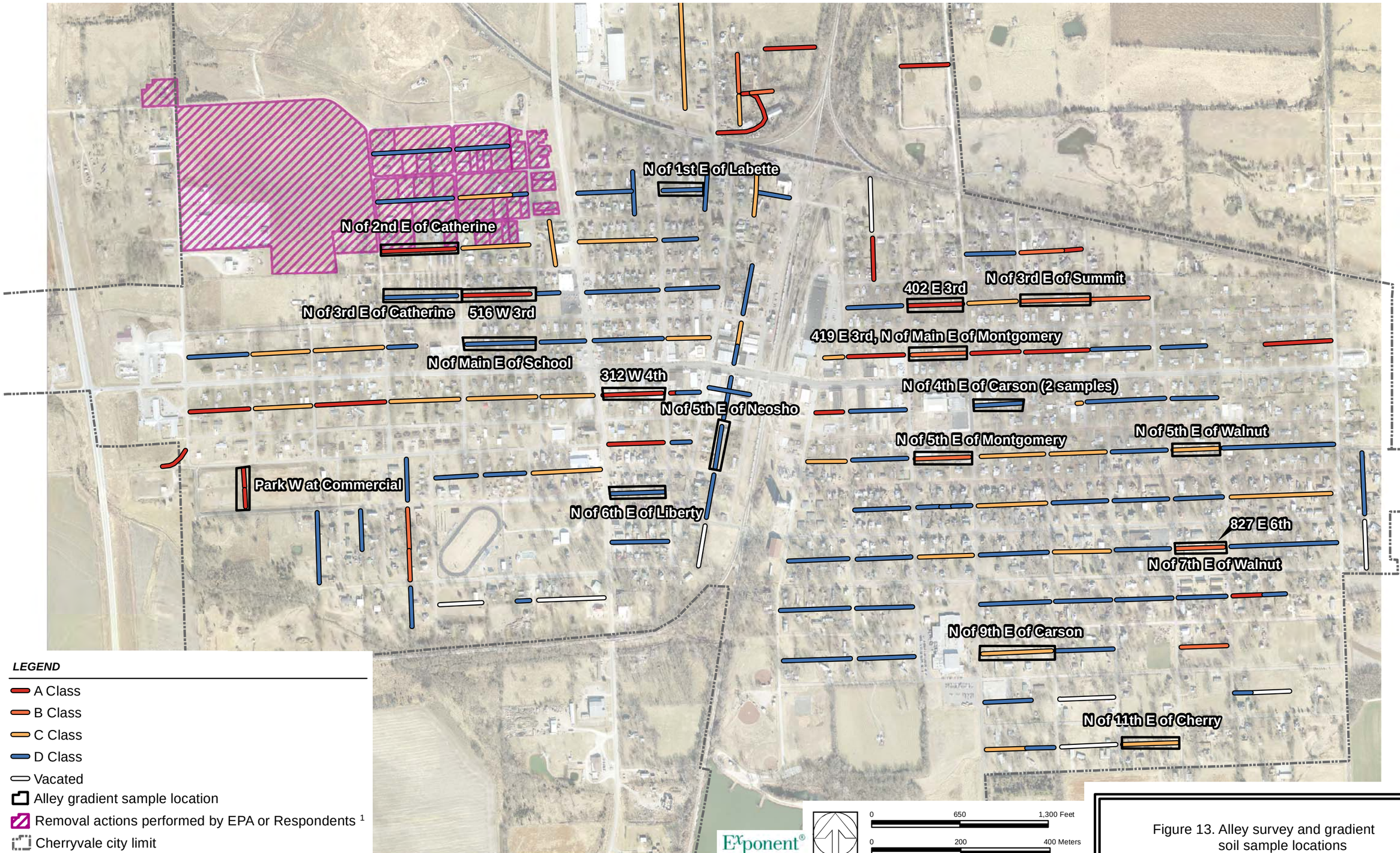
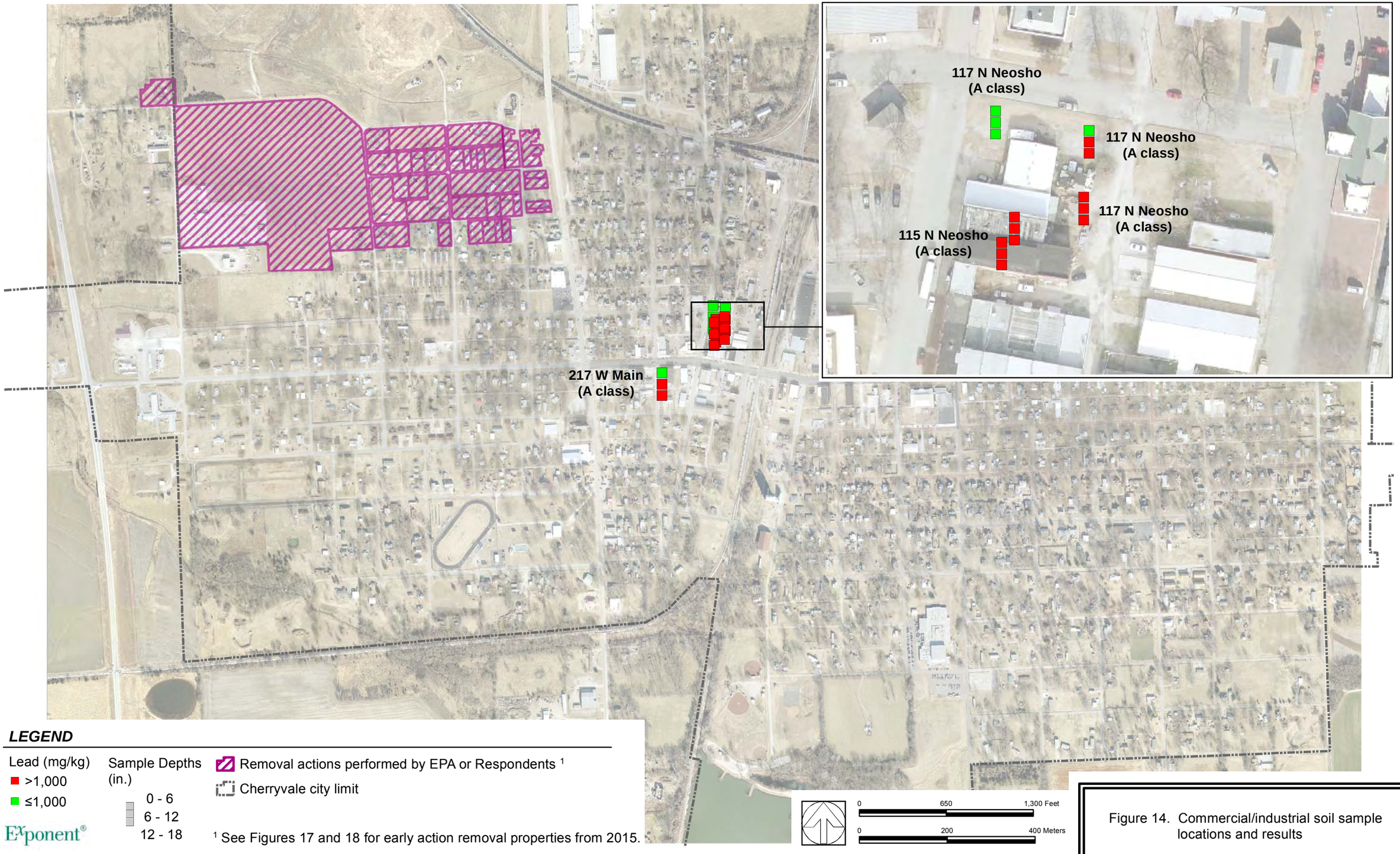


Figure 13. Alley survey and gradient soil sample locations



LEGEND

Lead (mg/kg)
- >1,000
- ≤1,000

Sample Depths (in.)
- 0 - 6
- 6 - 12
- 12 - 18

Removal actions performed by EPA or Respondents [1]

Cherryvale city limit

[1] See Figures 17 and 18 for early action removal properties from 2015.

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Figure 14. Commercial/industrial soil sample locations and results

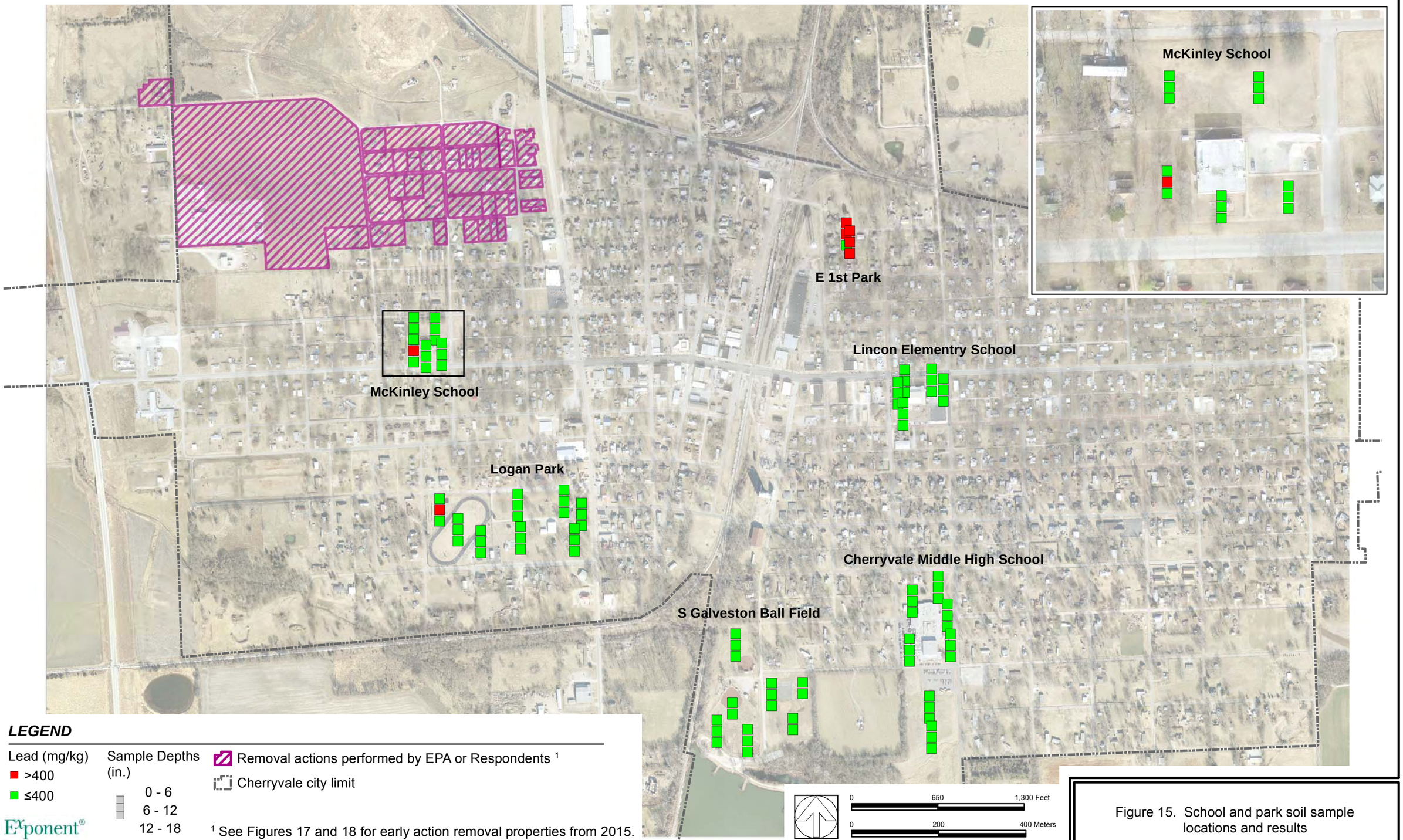

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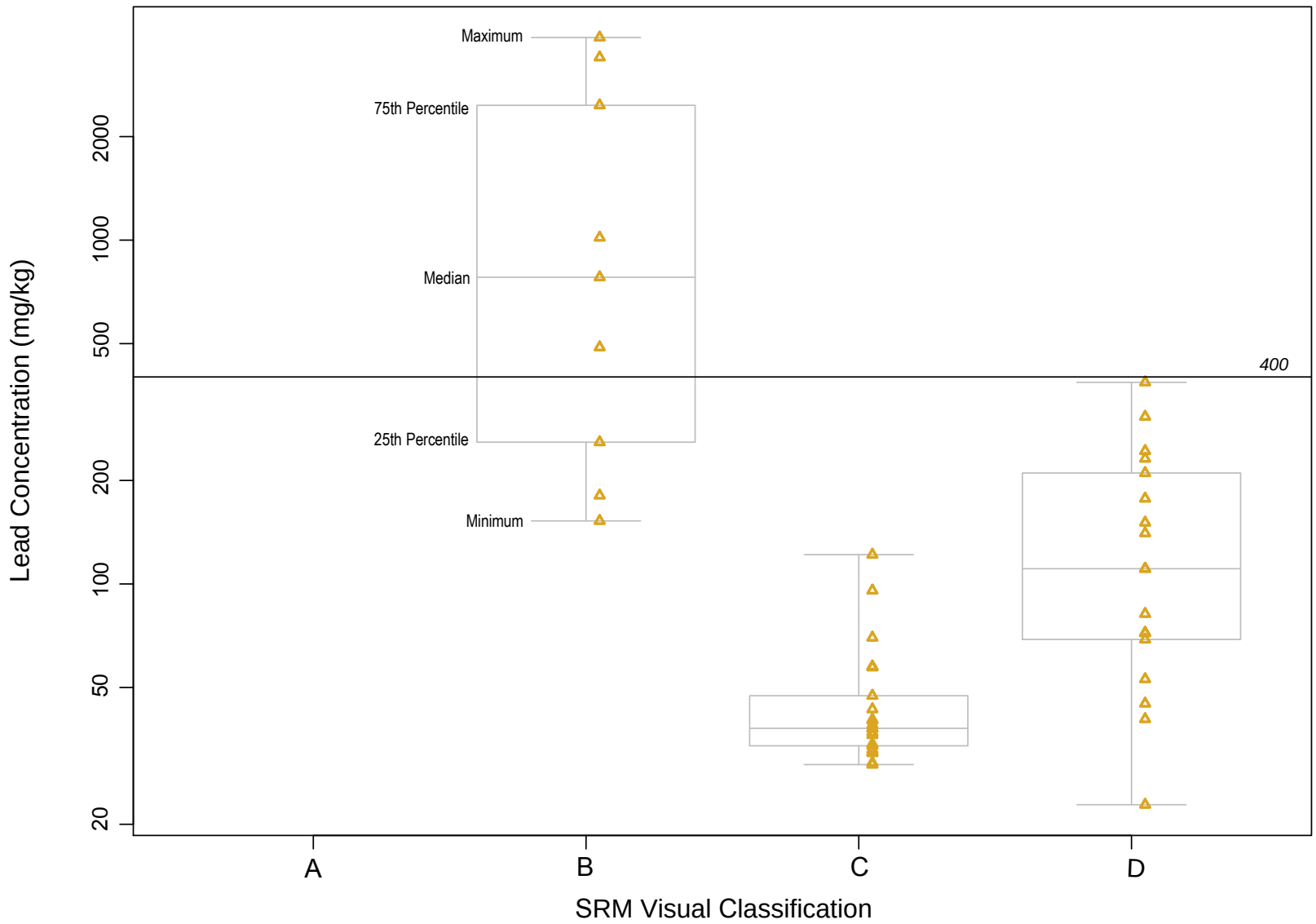
Figure 15. School and park soil sample locations and results



* Parks classification analysis includes only parks; schools are included with the residential analysis

Figure 16. Lead concentrations by SRM visual classification for park soil samples of all depths (0–6, 6–12, and 12–18 in.)

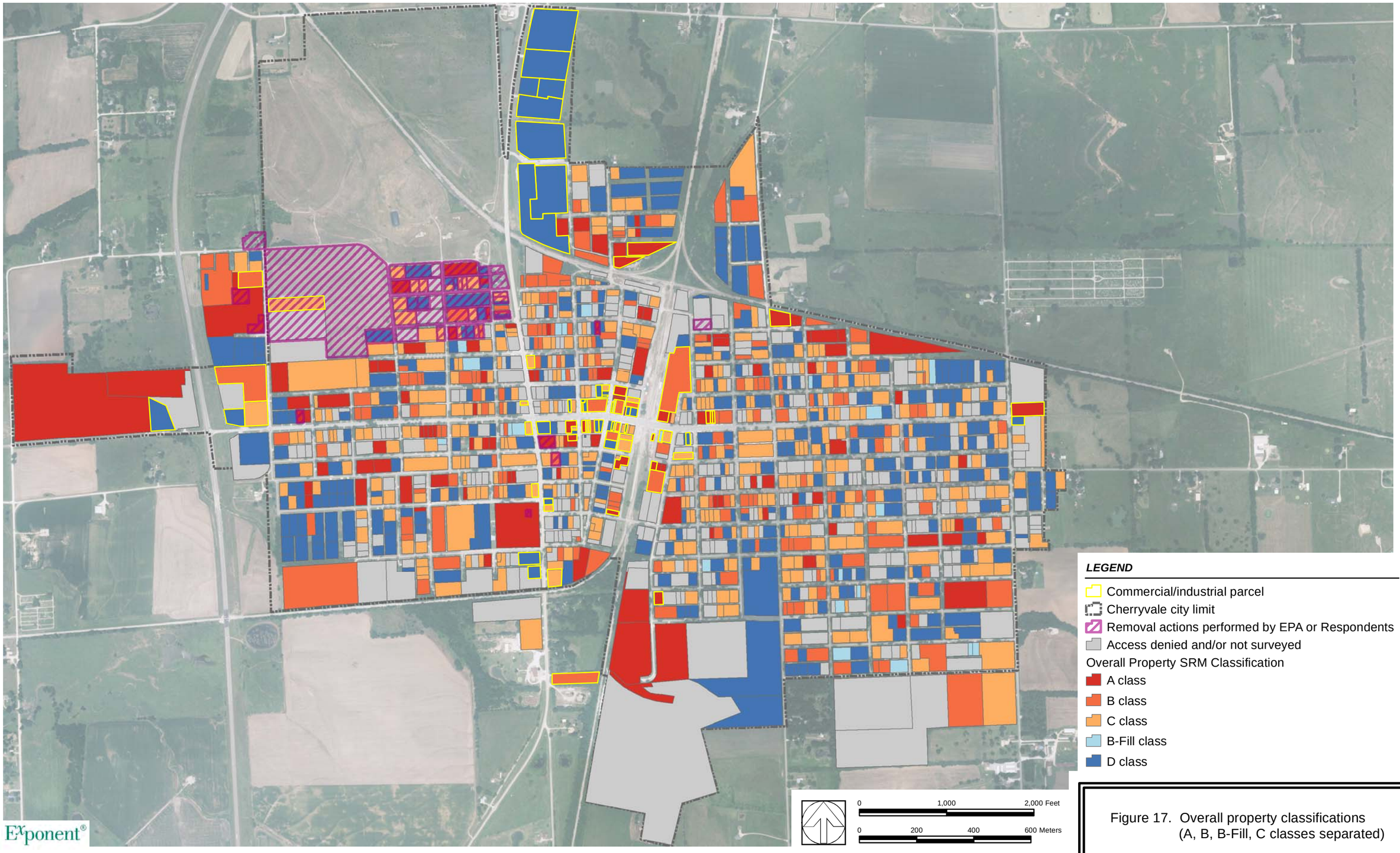


Figure 17. Overall property classifications (A, B, B-Fill, C classes separated)

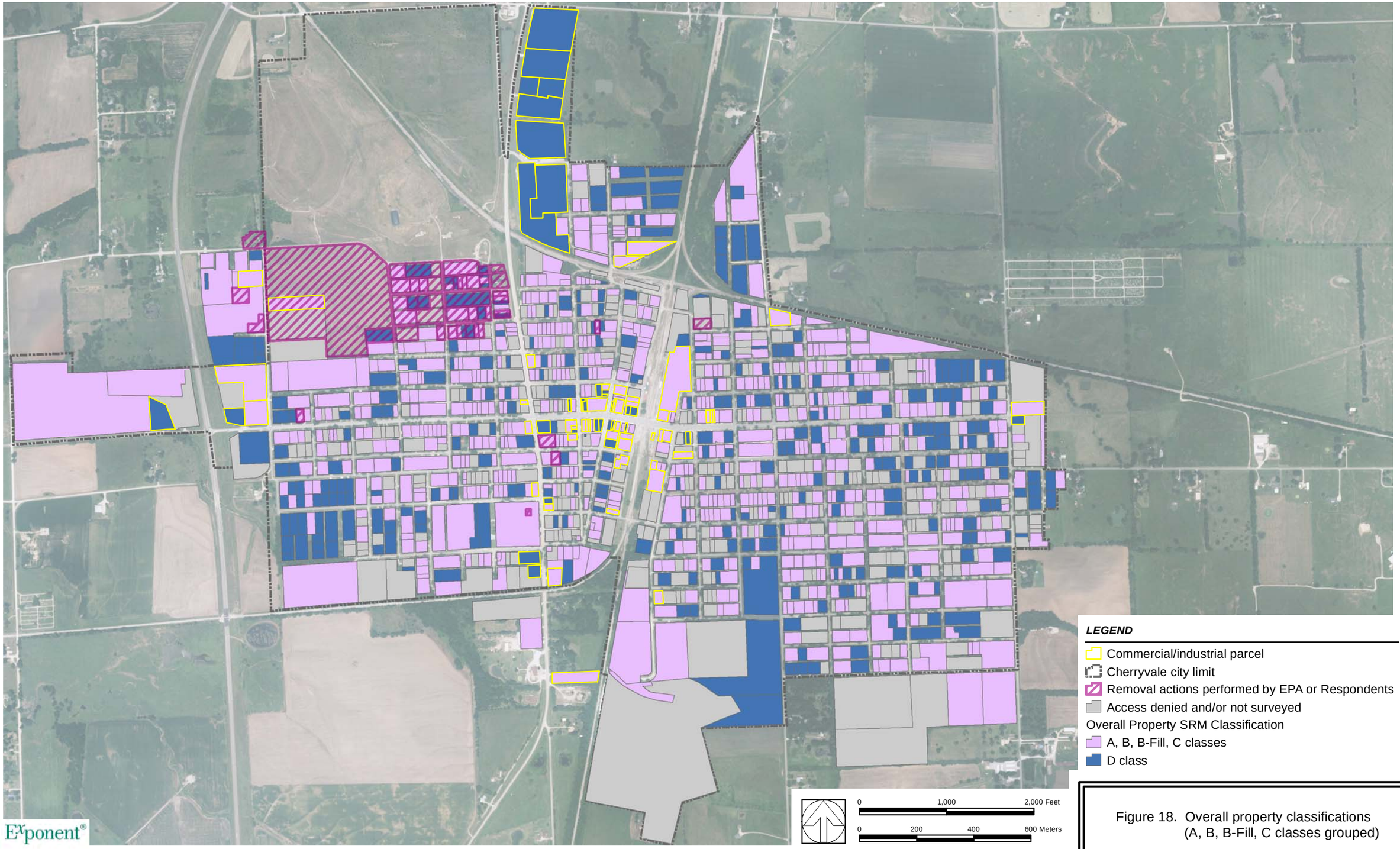


Figure 18. Overall property classifications (A, B, B-Fill, C classes grouped)

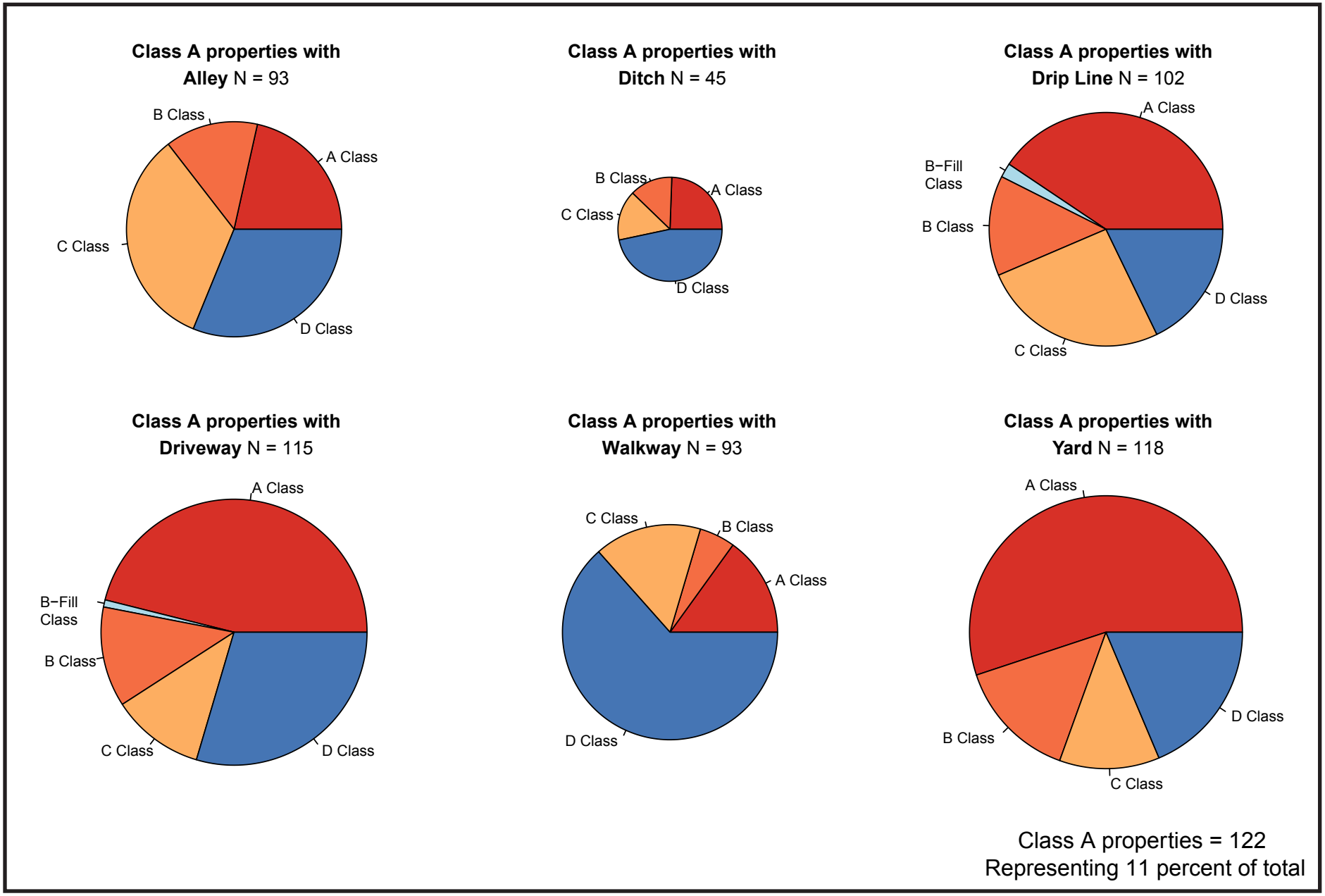


Figure 19. Distribution of SRM visual classification by feature for A class properties

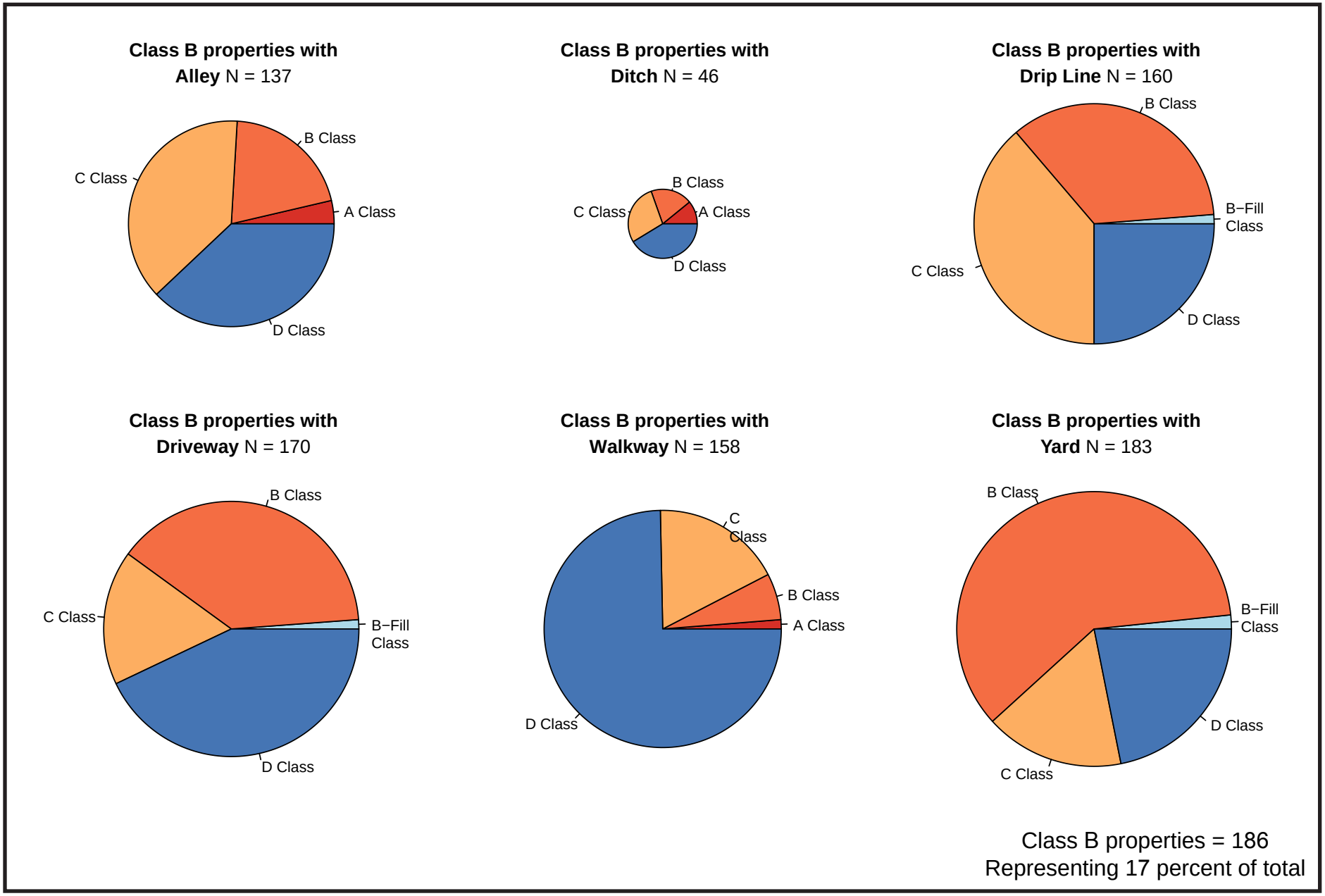


Figure 20. Distribution of SRM visual classification by feature for B class properties

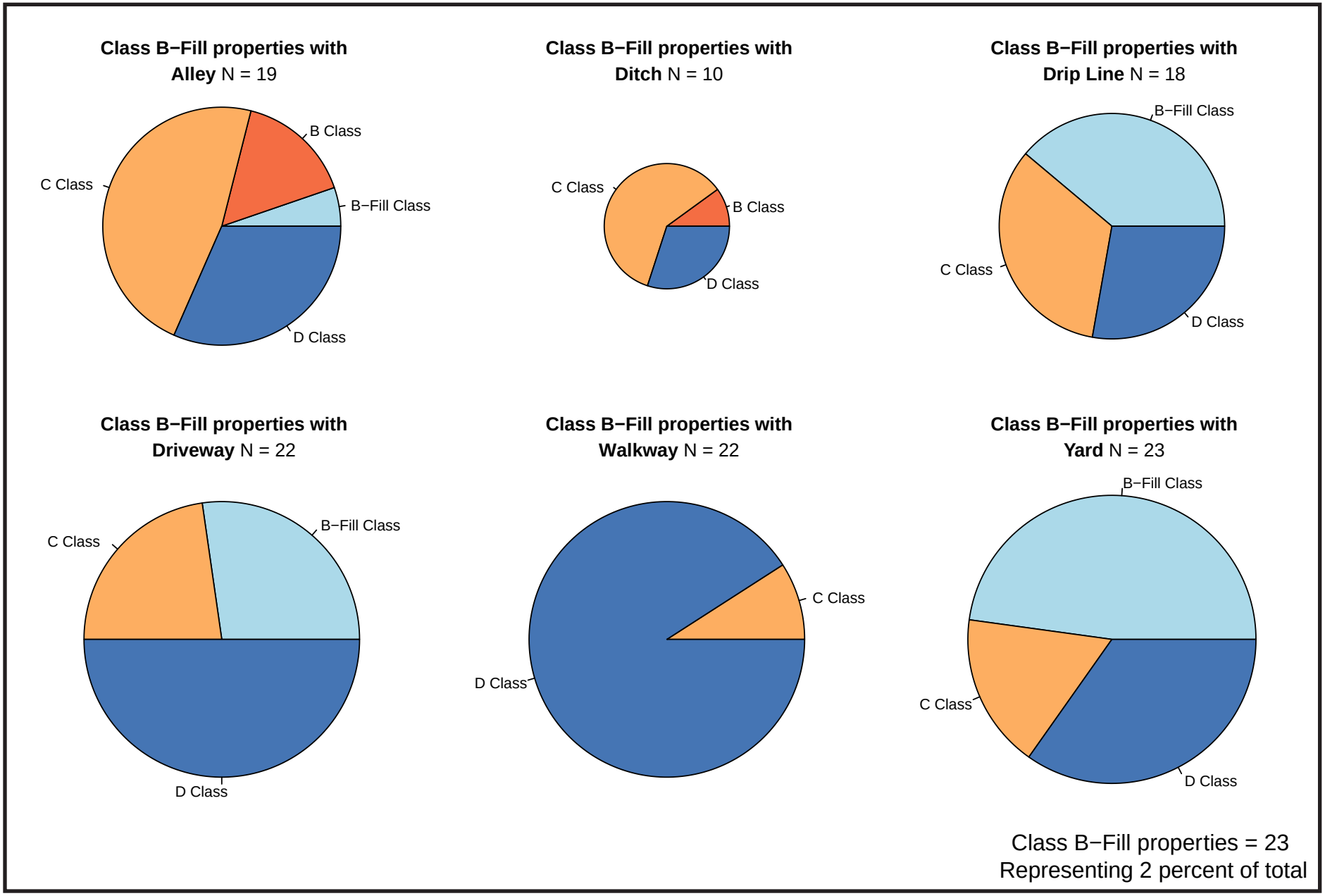


Figure 21. Distribution of SRM visual classification by feature for B-Fill class properties

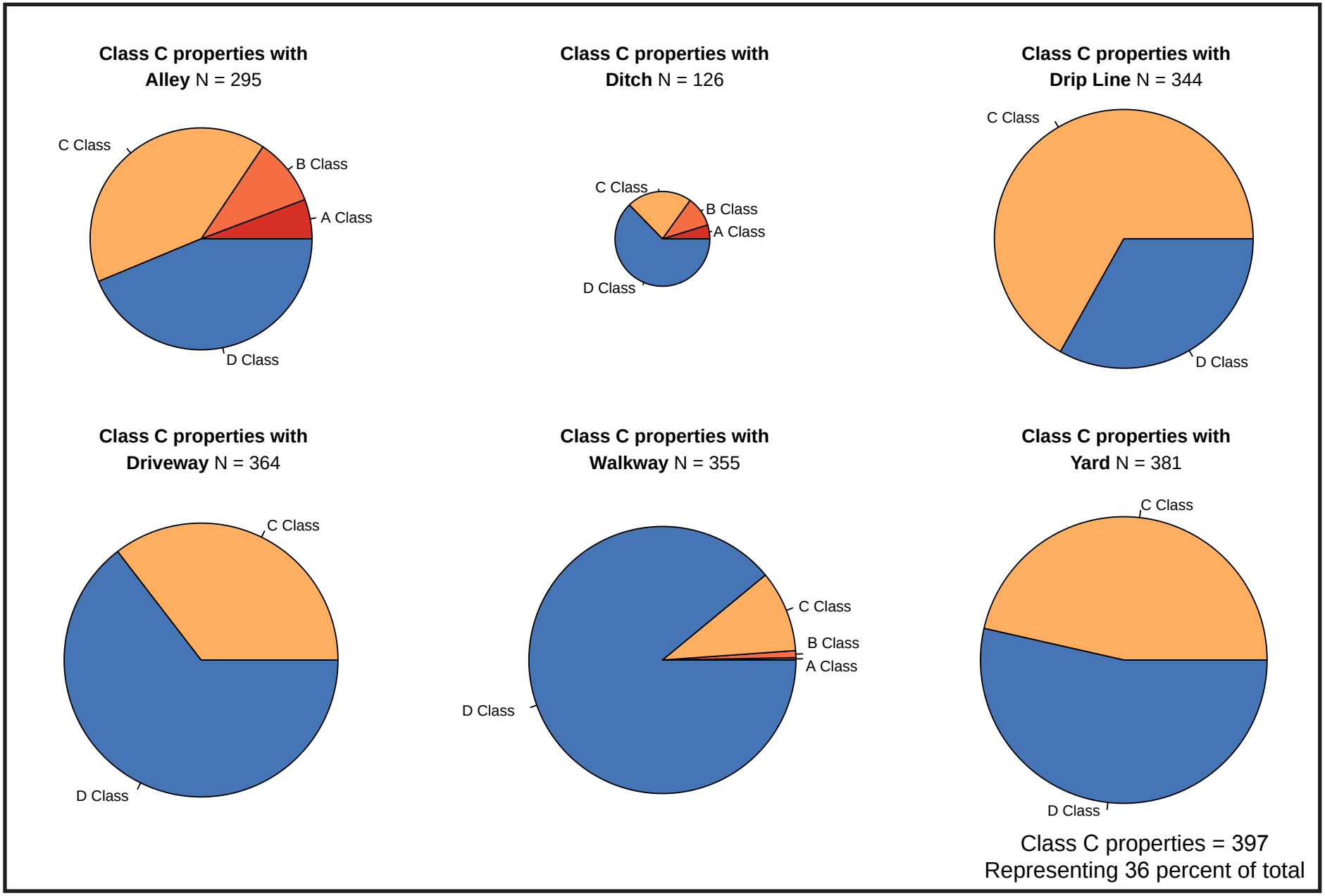


Figure 22. Distribution of SRM visual classification by feature for C class properties

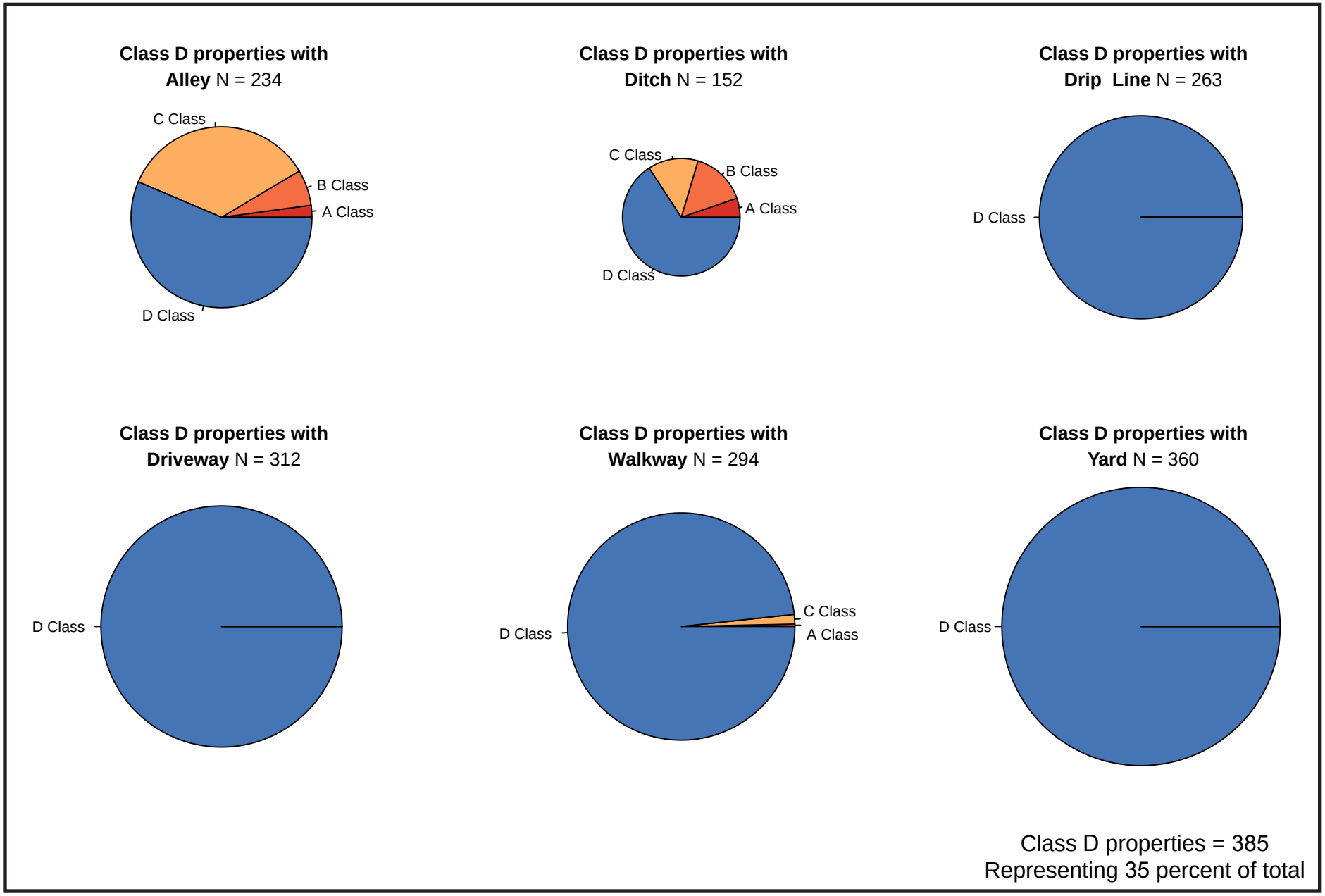


Figure 23. Distribution of SRM visual classification by feature for D class properties

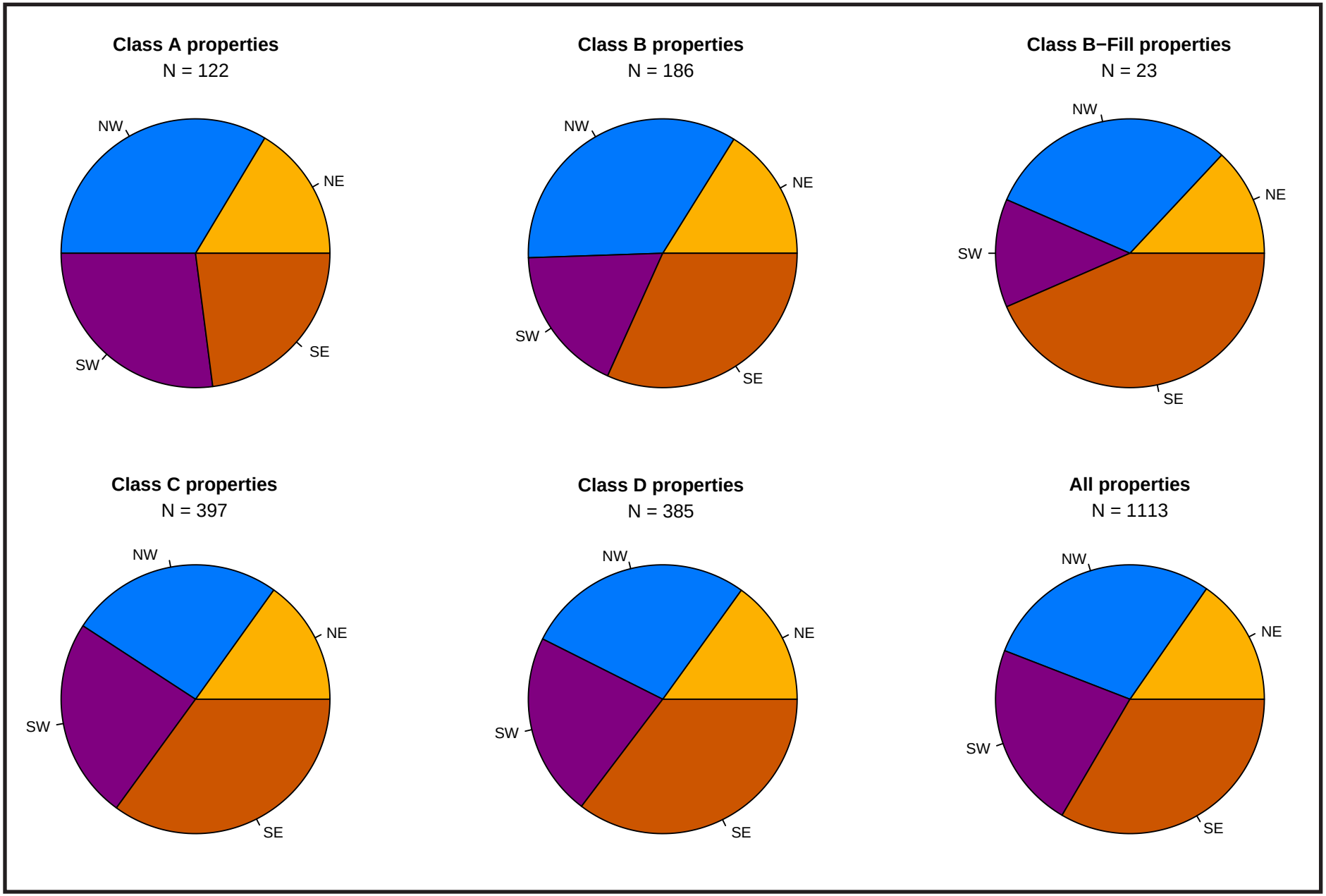


Figure 24. Distribution by quadrant of SRM visual classification properties

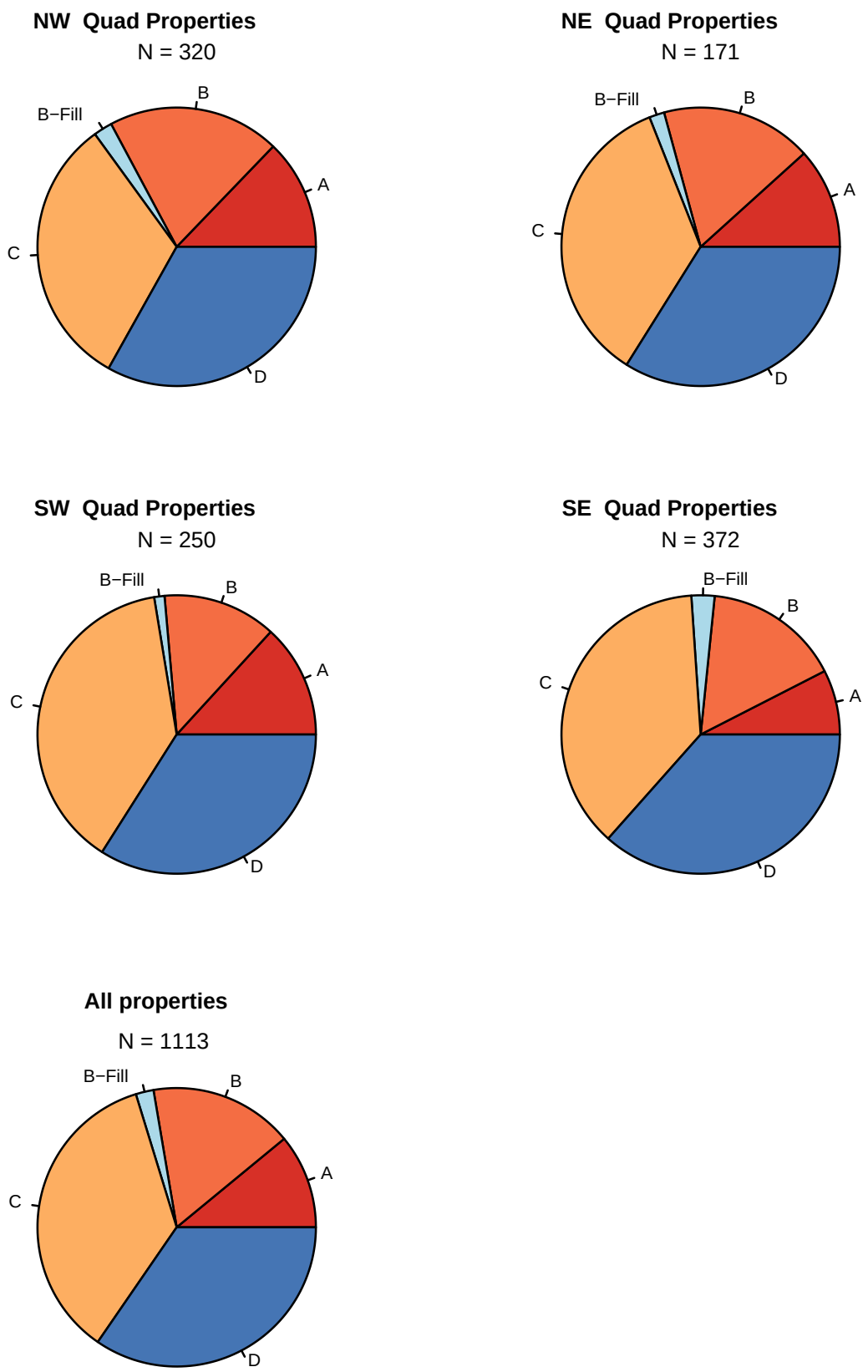


Figure 25. Distribution of SRM visual classifications for properties by quadrant

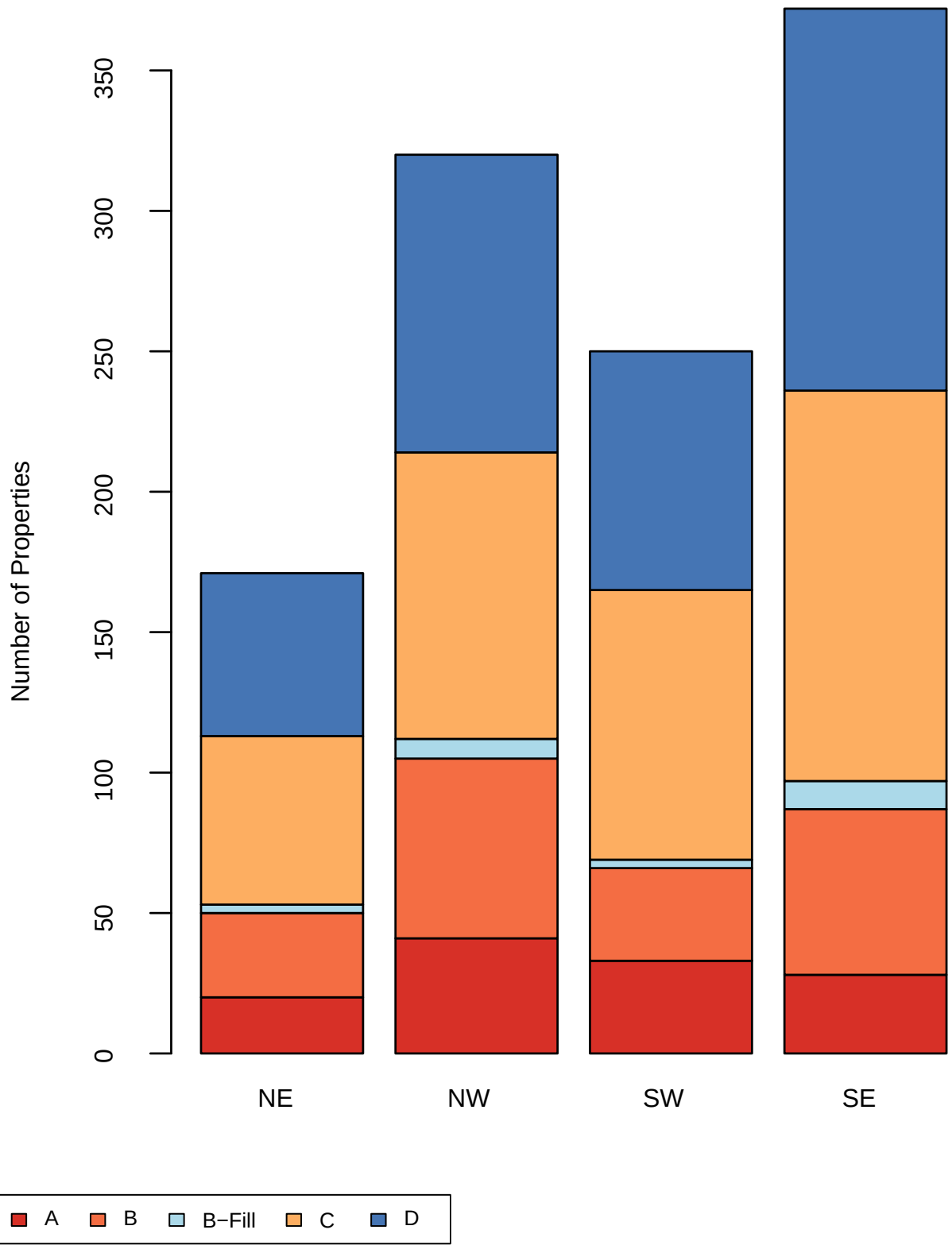


Figure 26. Property counts by quadrant for SRM visual classifications

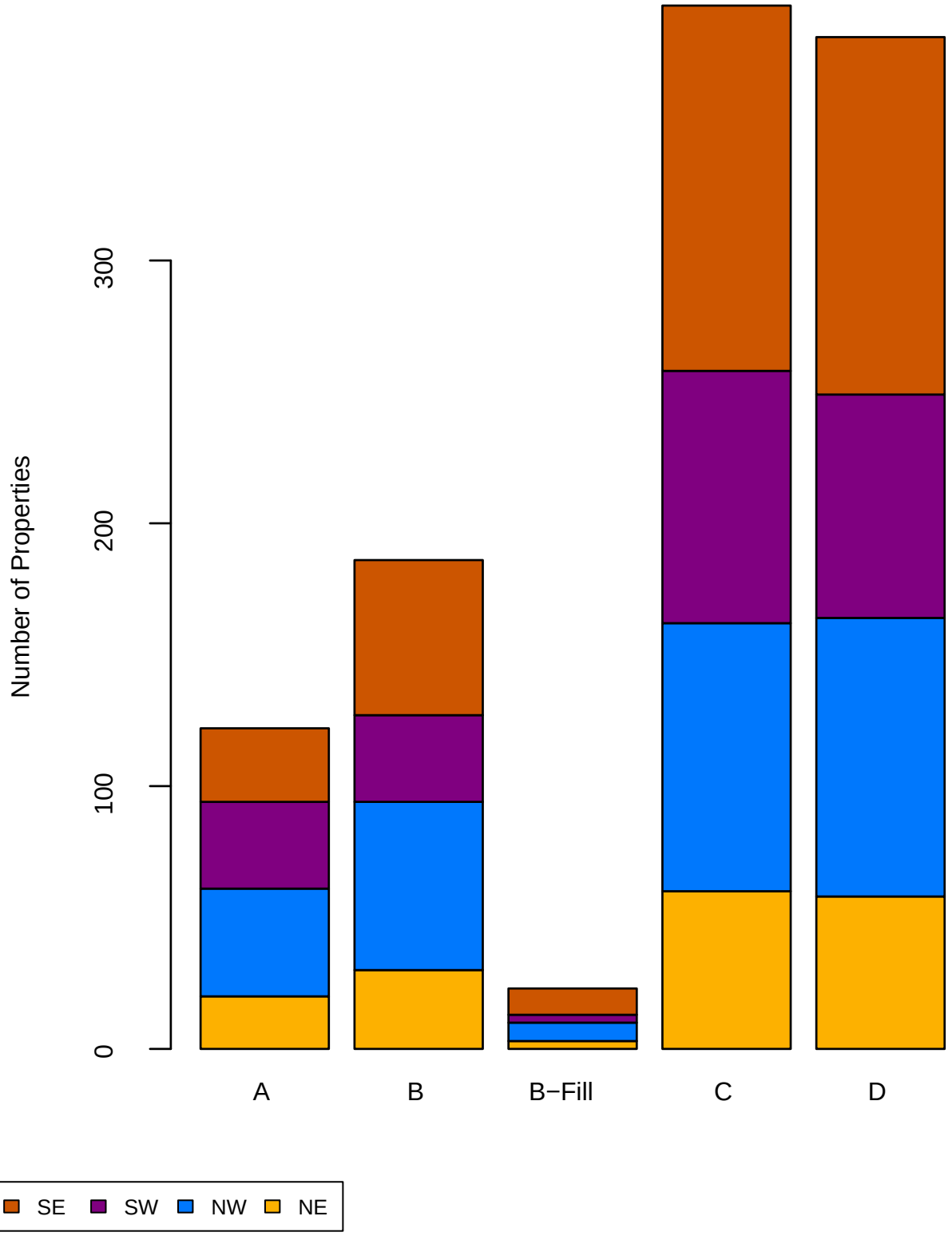


Figure 27. Property counts by SRM visual classifications for quadrants

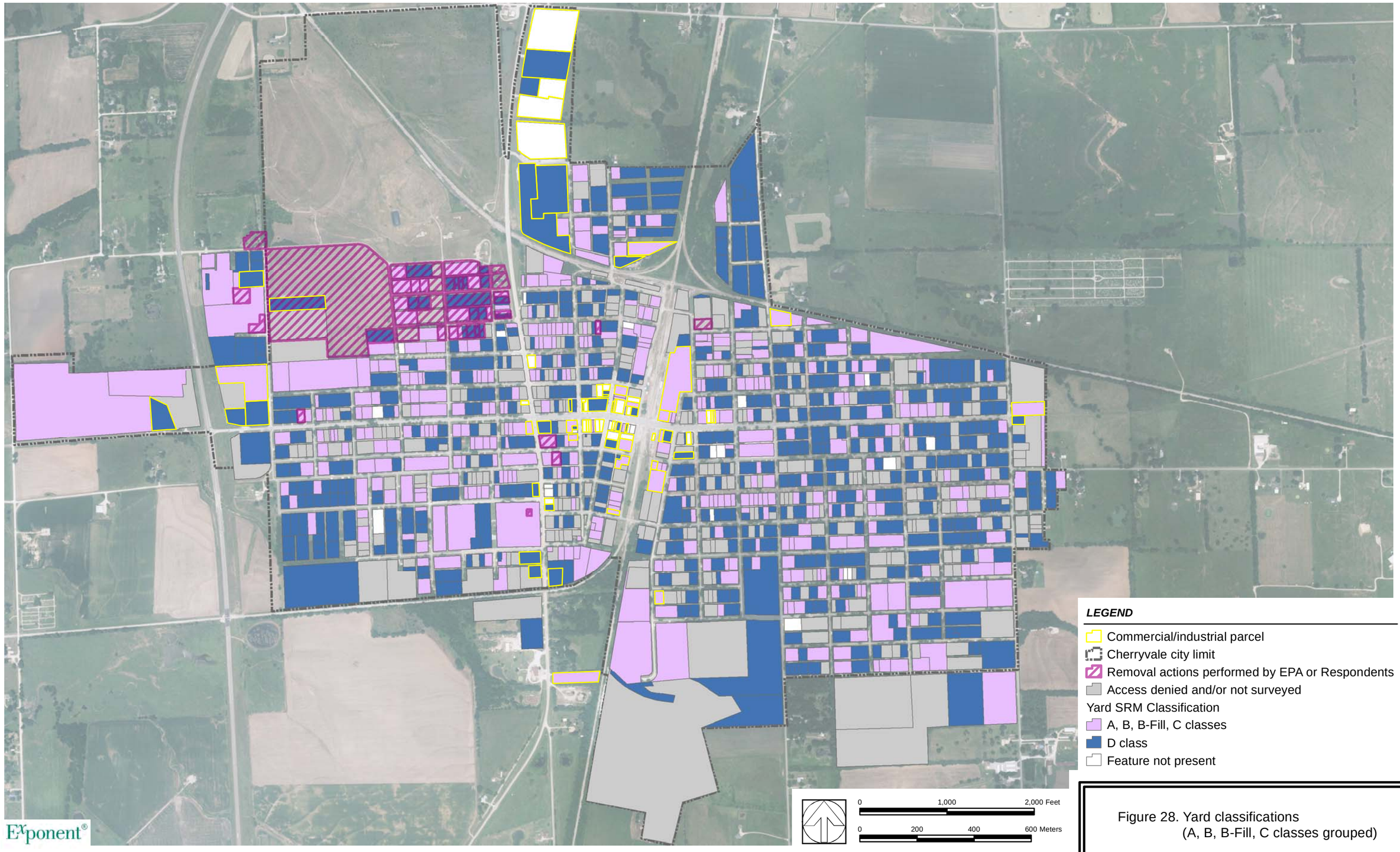


Figure 28. Yard classifications
(A, B, B-Fill, C classes grouped)

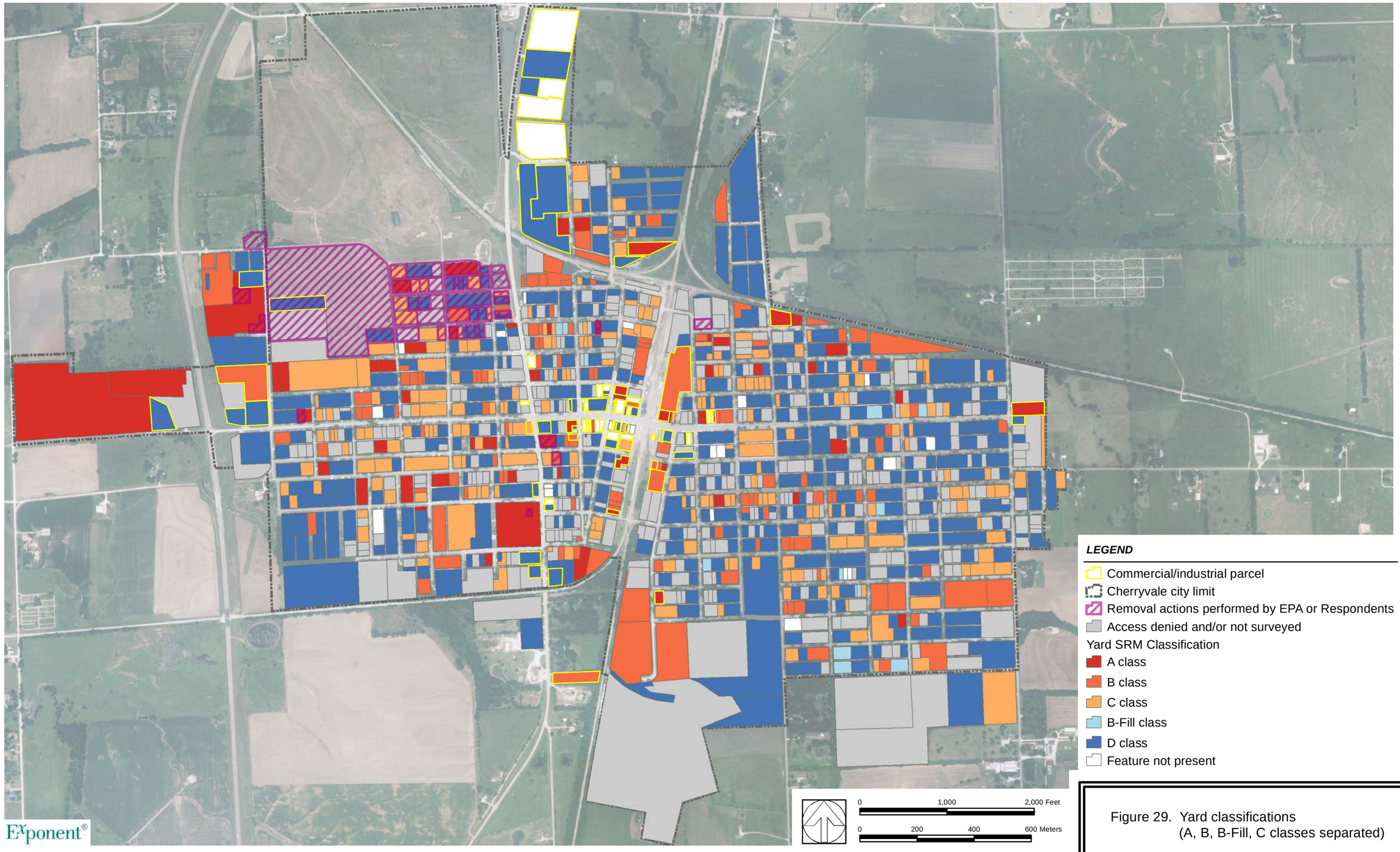


Figure 29. Yard classifications
(A, B, B-Fill, C classes separated)

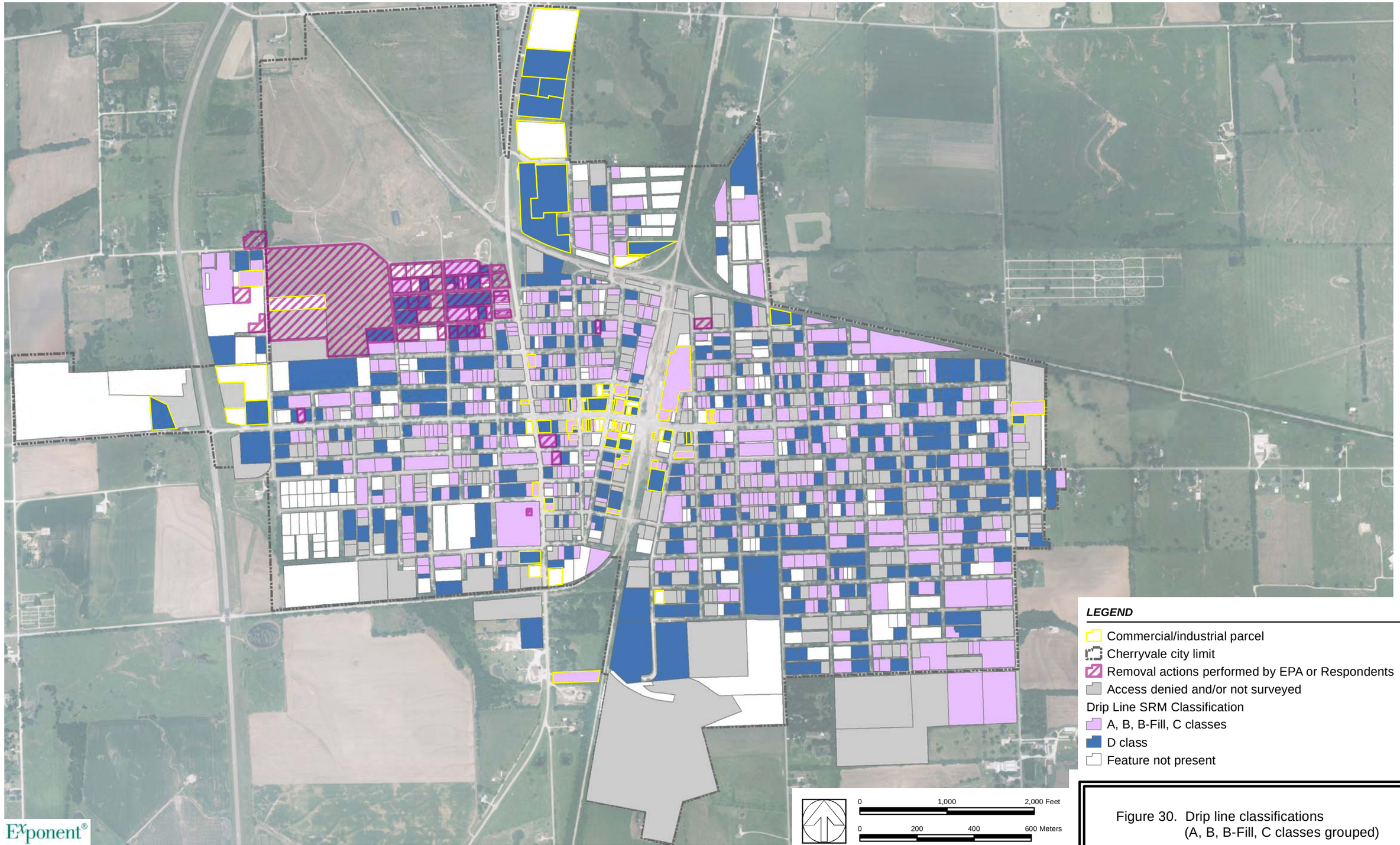


Figure 30. Drip line classifications
(A, B, B-Fill, C classes grouped)

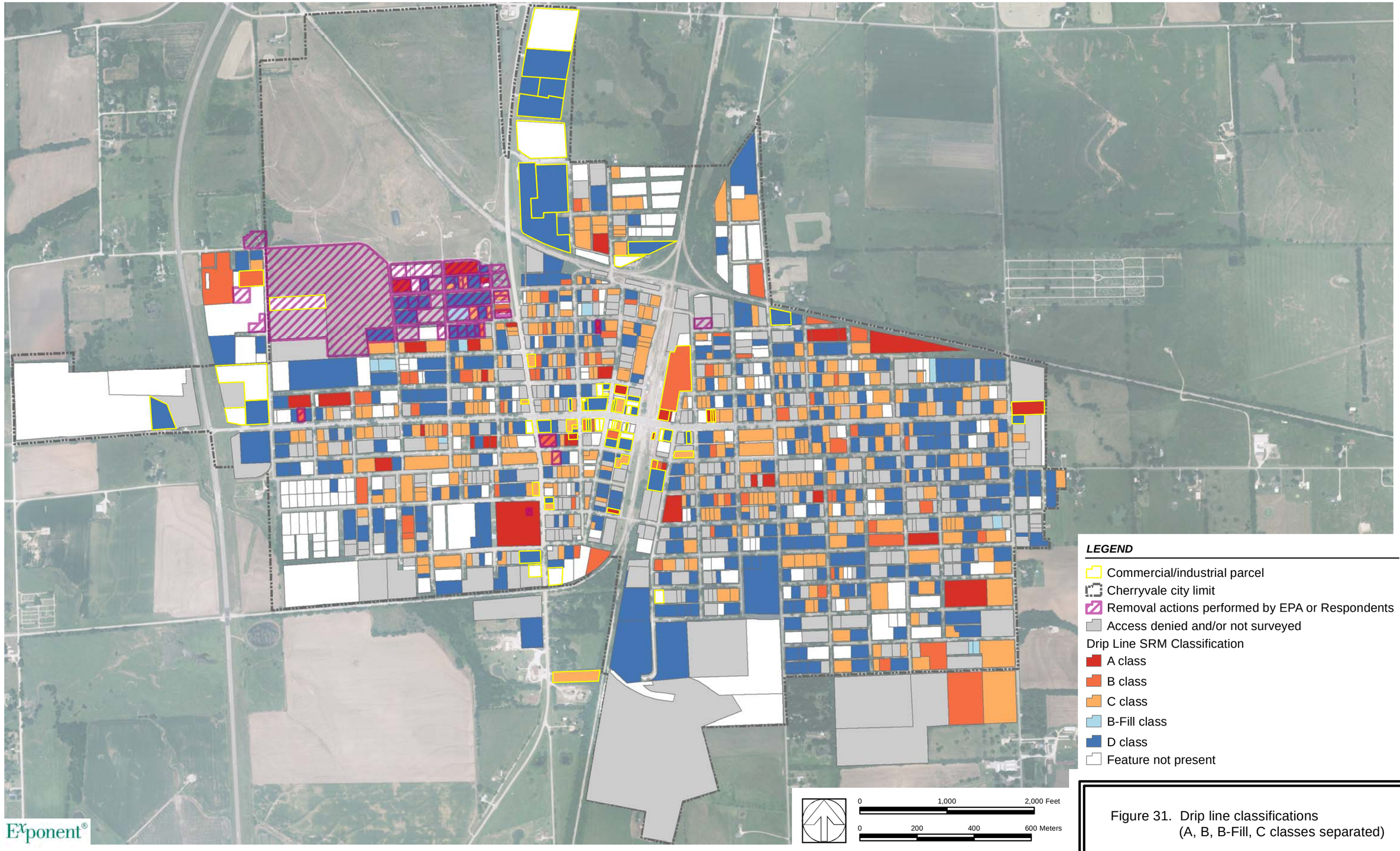


Figure 31. Drip line classifications
(A, B, B-Fill, C classes separated)

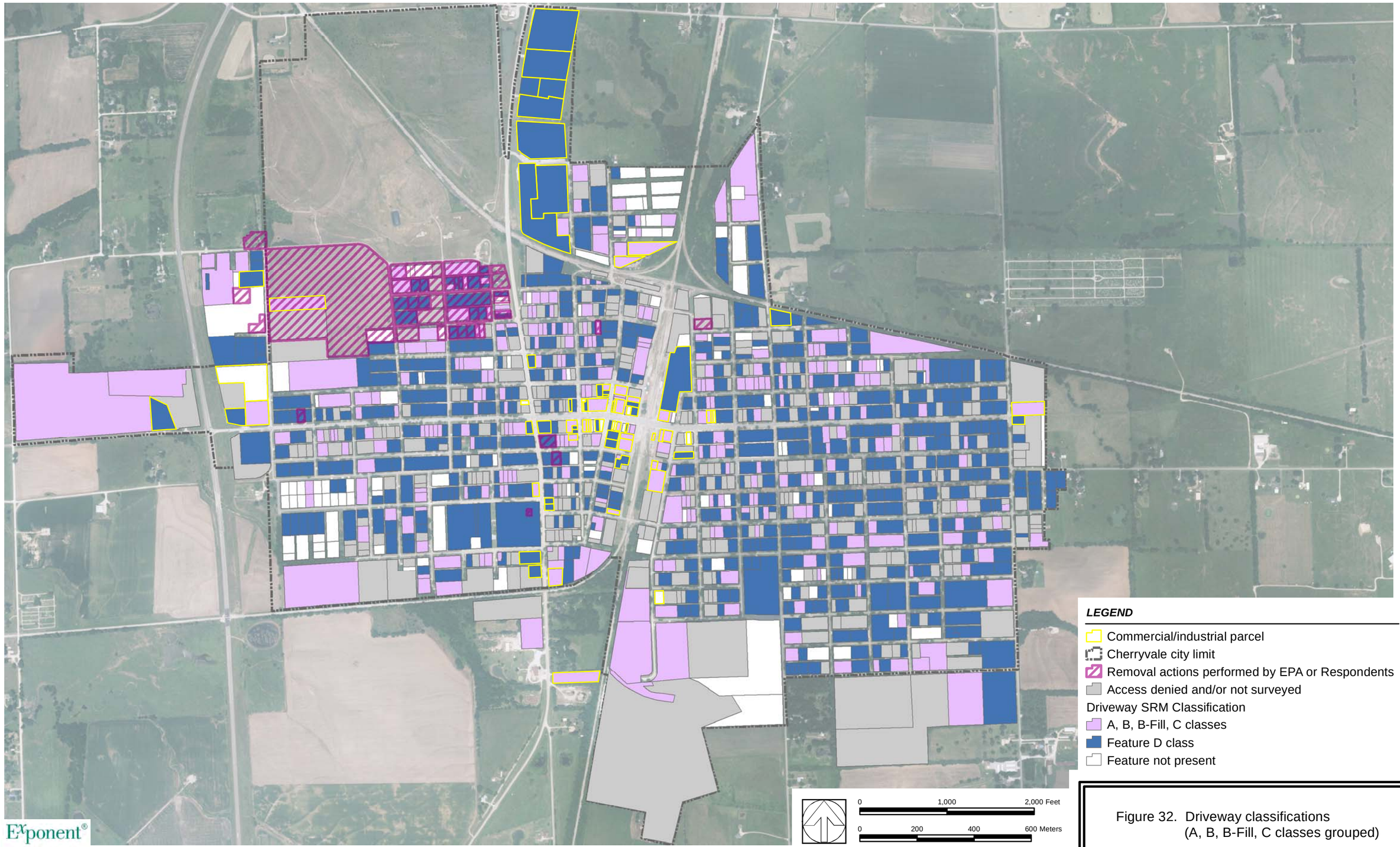


Figure 32. Driveway classifications
(A, B, B-Fill, C classes grouped)

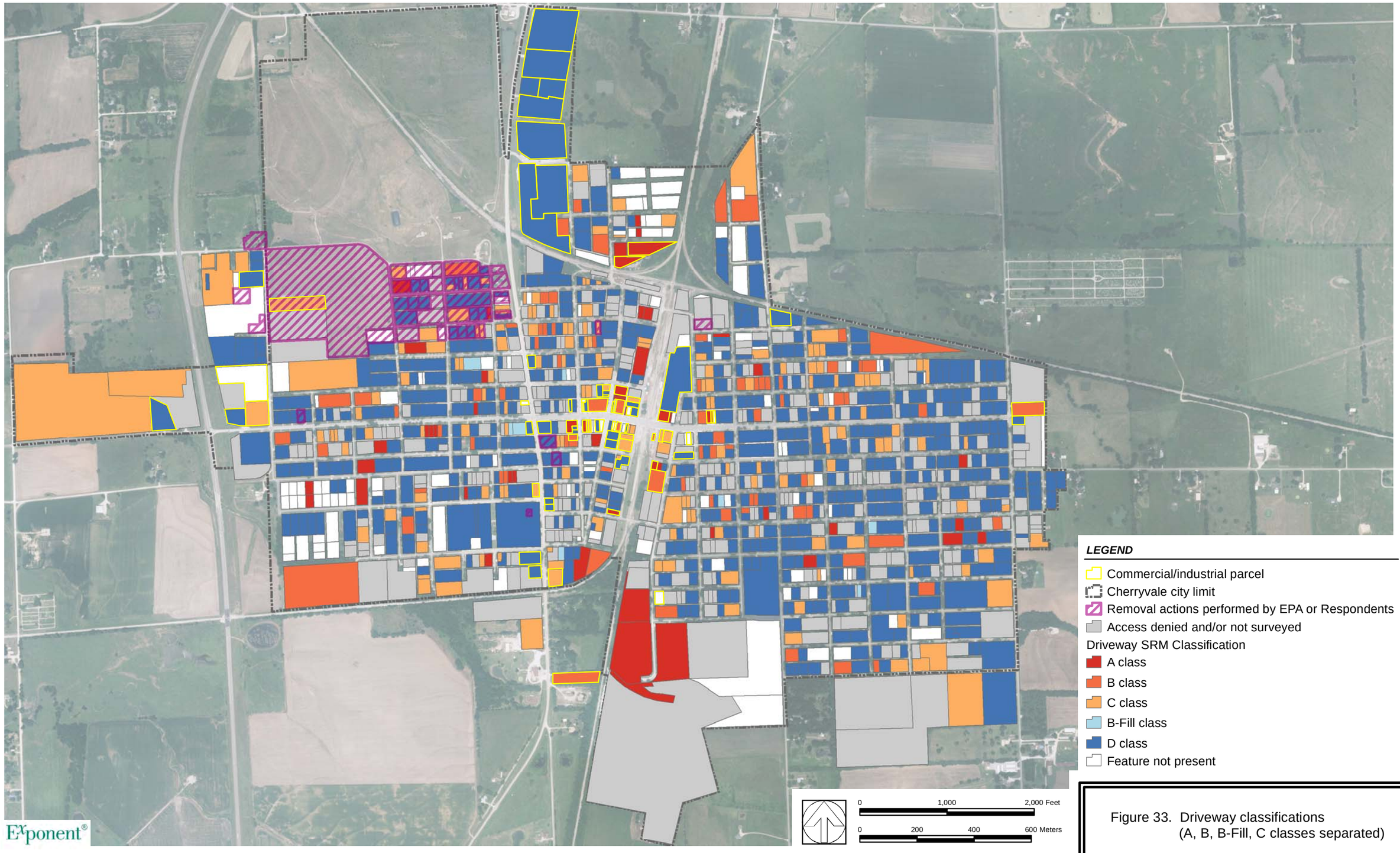


Figure 33. Driveway classifications
(A, B, B-Fill, C classes separated)

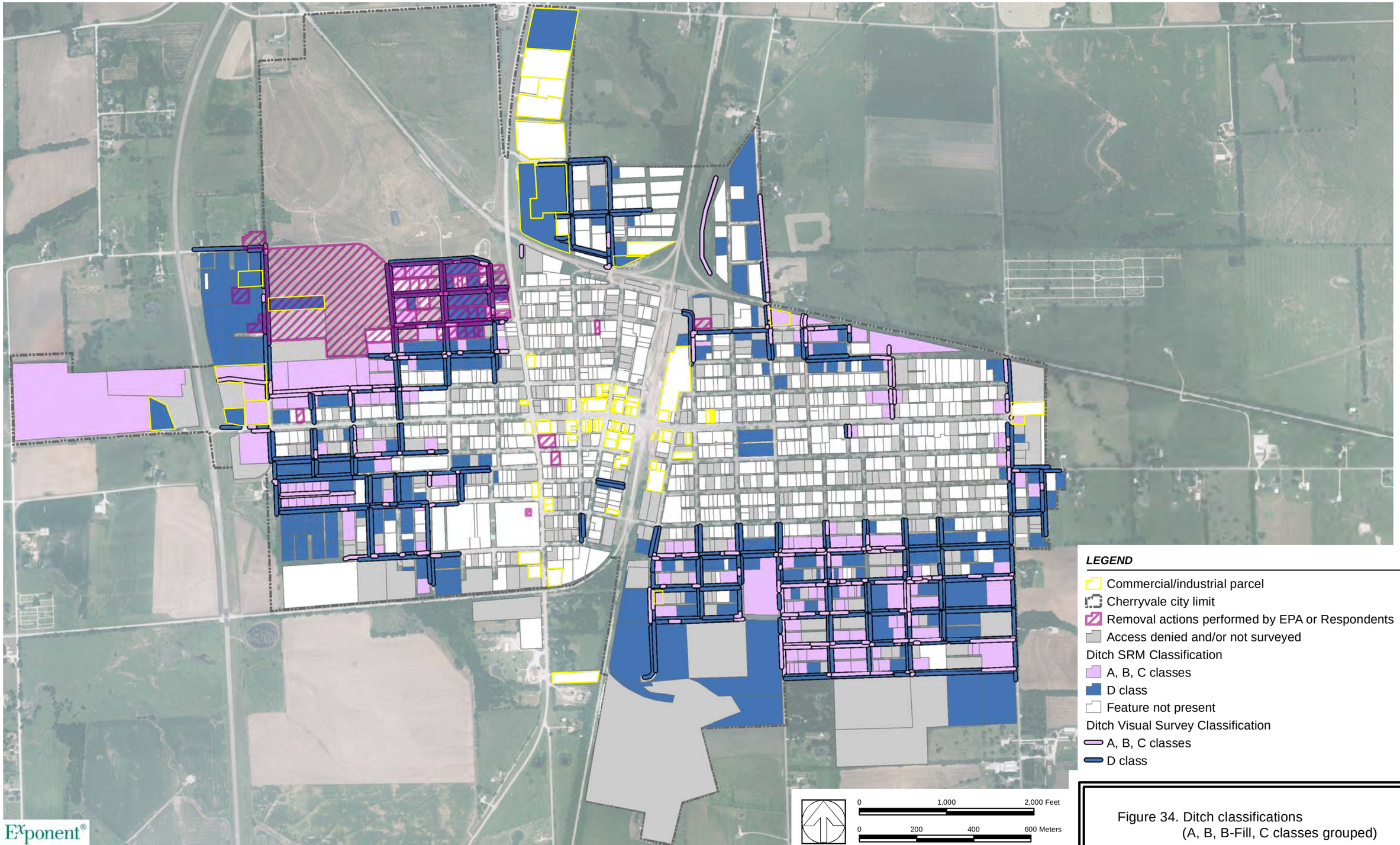


Figure 34. Ditch classifications
(A, B, B-Fill, C classes grouped)

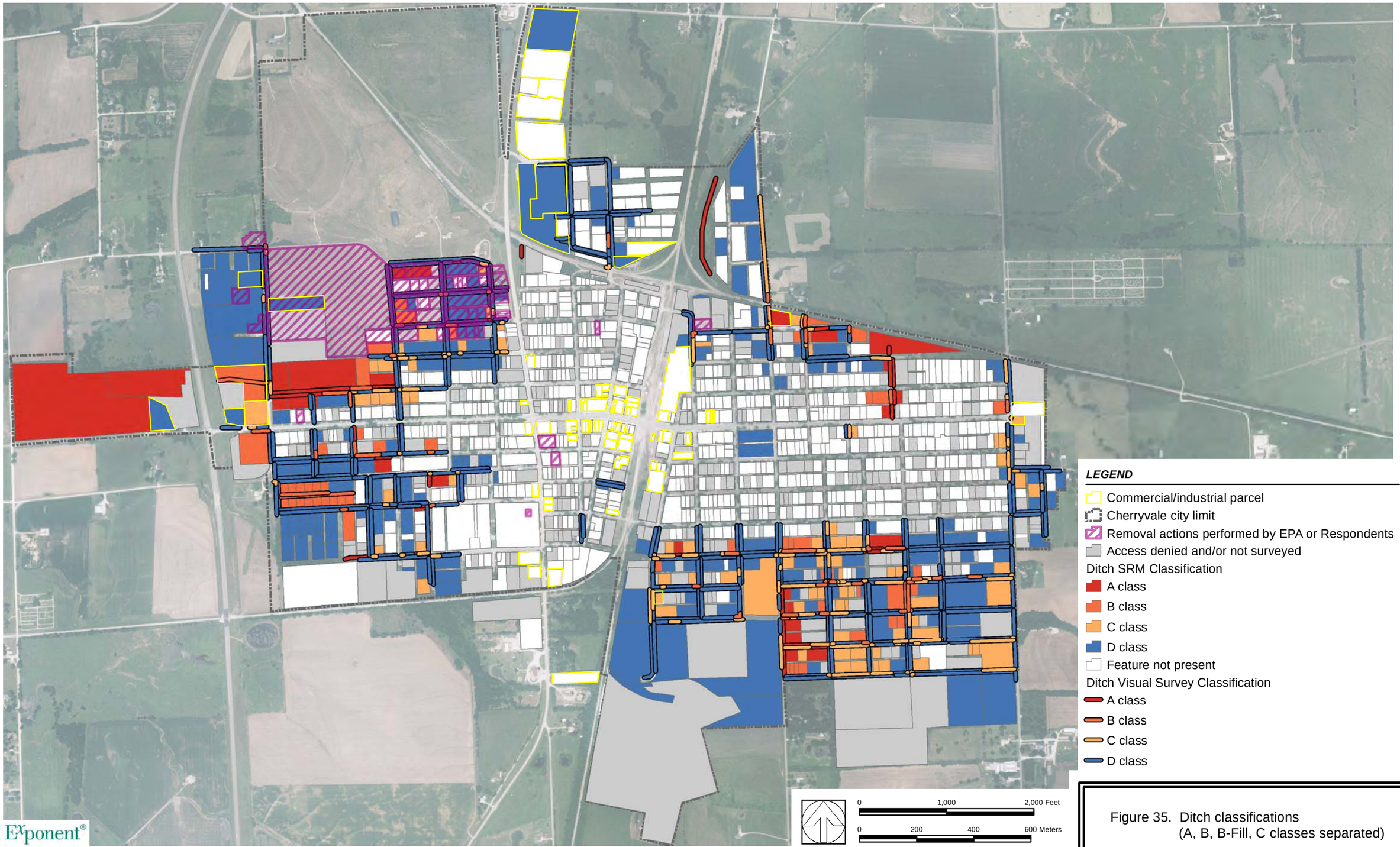


Figure 35. Ditch classifications
(A, B, B-Fill, C classes separated)

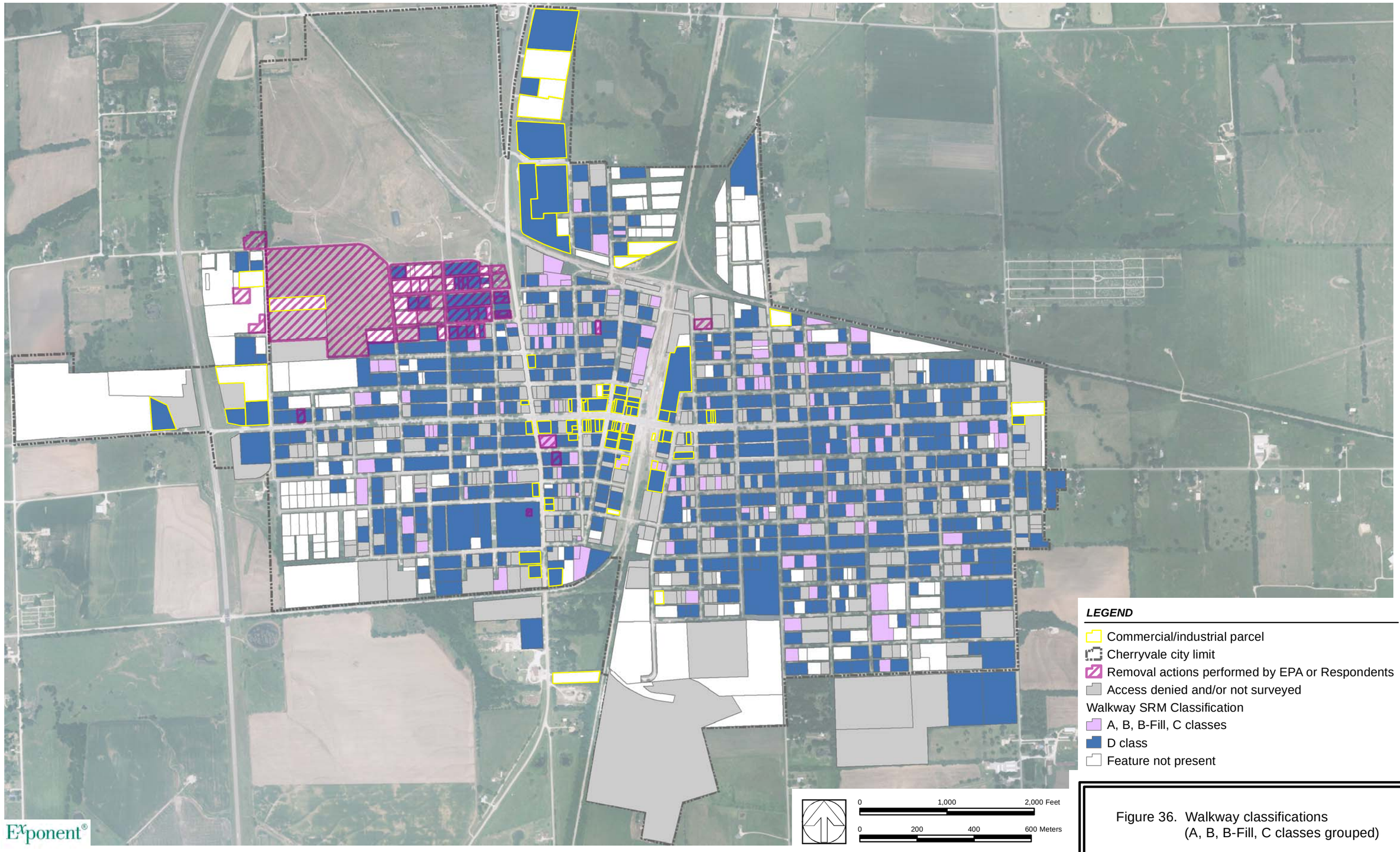


Figure 36. Walkway classifications
(A, B, B-Fill, C classes grouped)

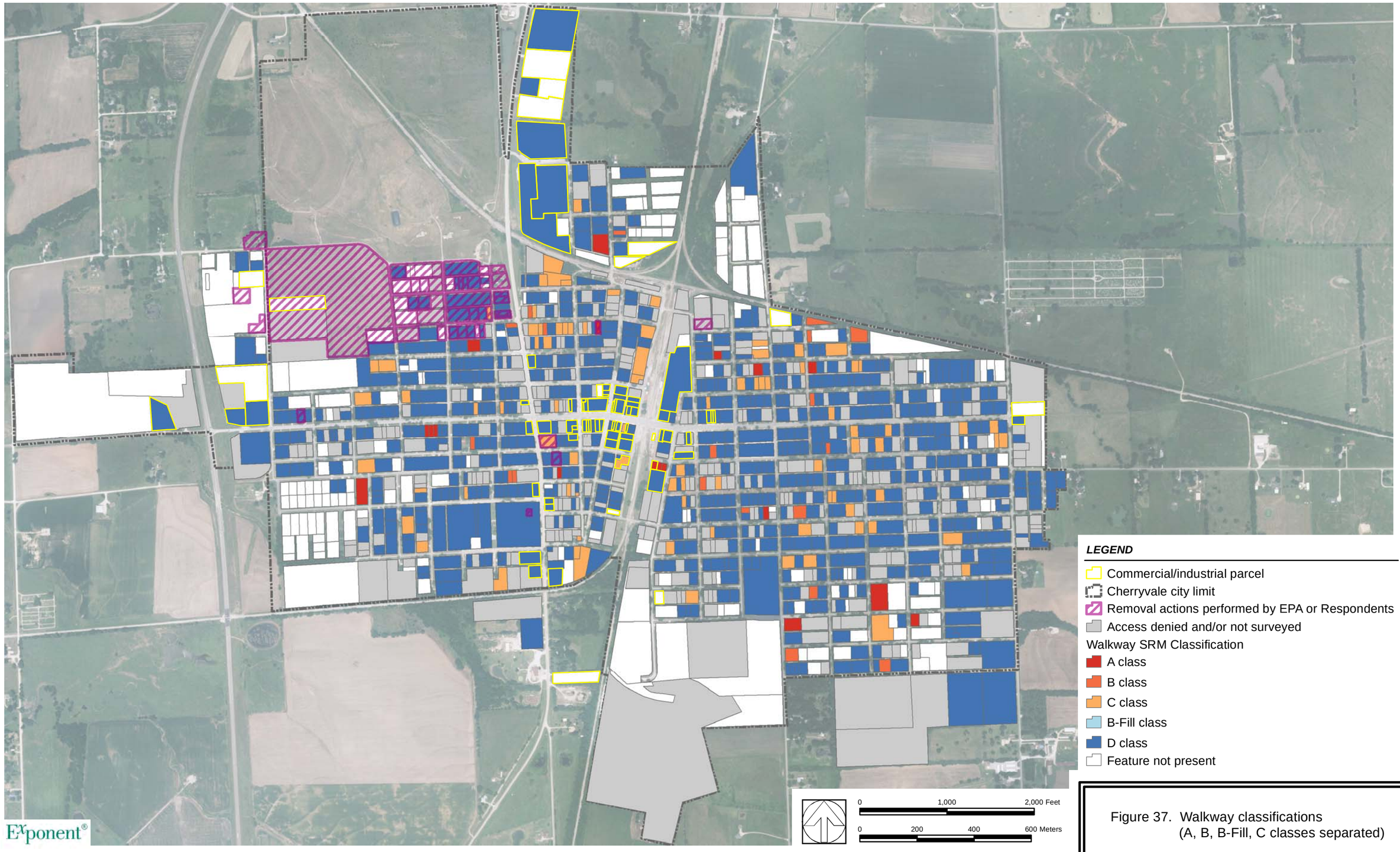


Figure 37. Walkway classifications
(A, B, B-Fill, C classes separated)

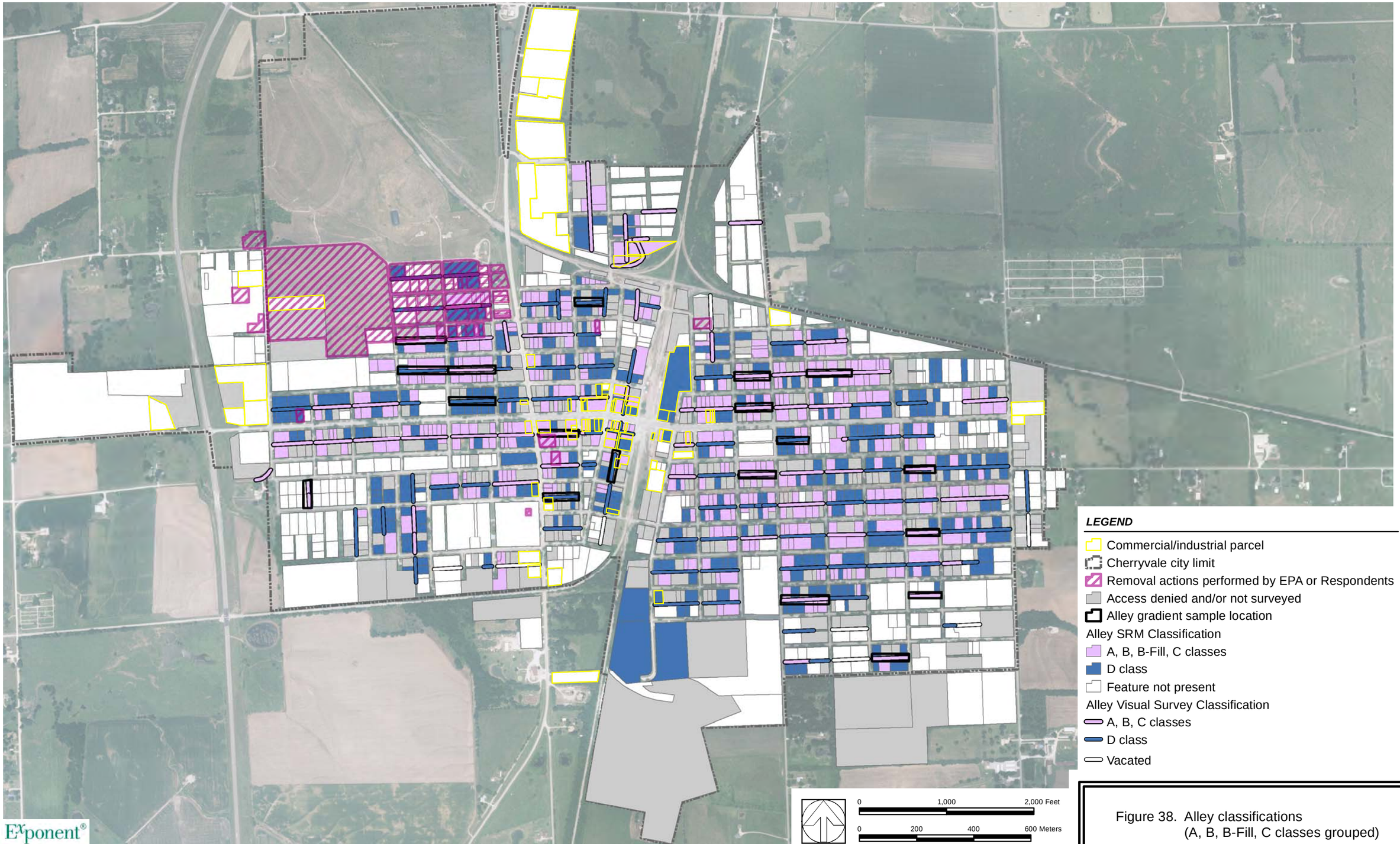


Figure 38. Alley classifications
(A, B, B-Fill, C classes grouped)

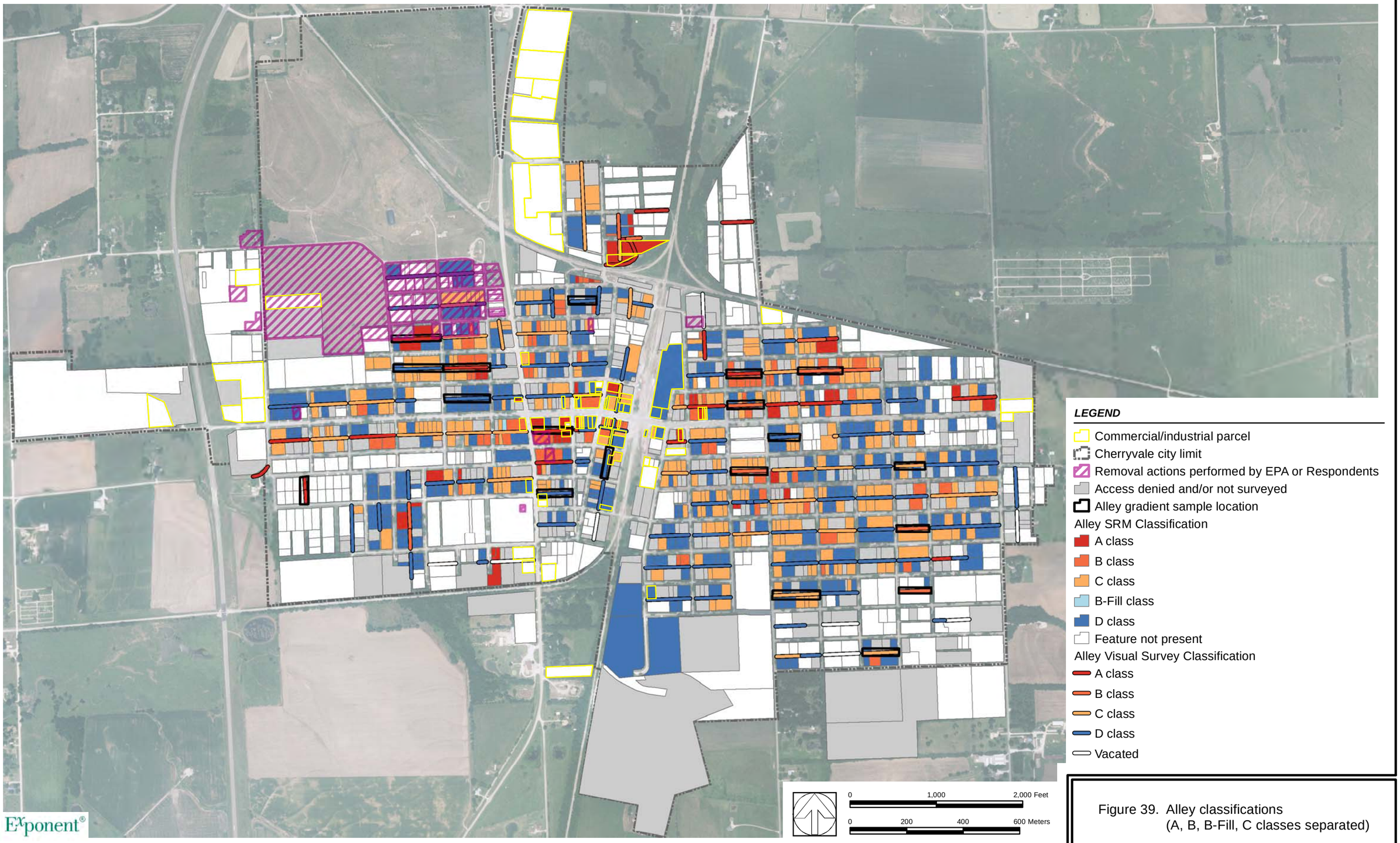


Figure 39. Alley classifications
(A, B, B-Fill, C classes separated)

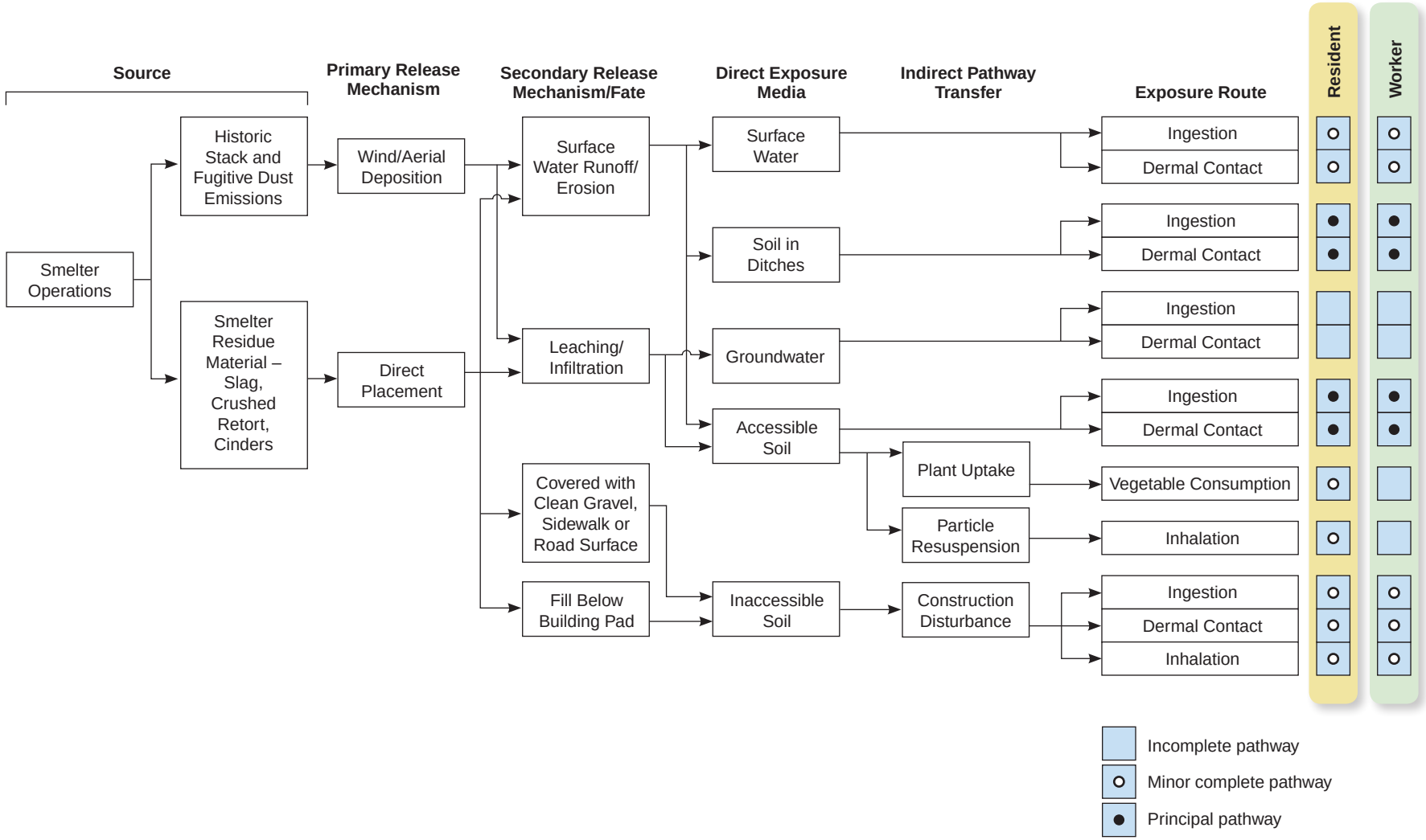


Figure 40. Conceptual site model for residential and worker exposure

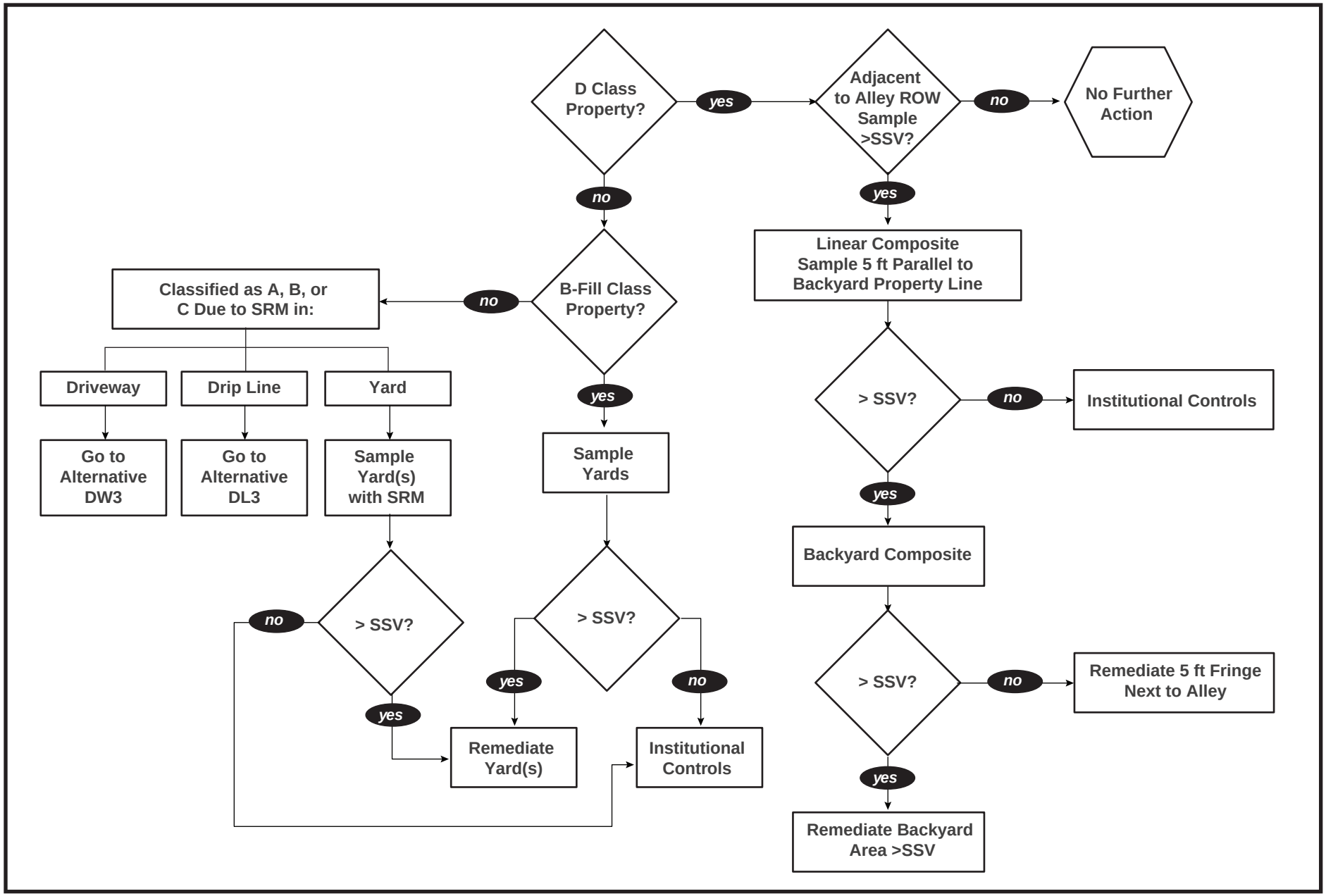
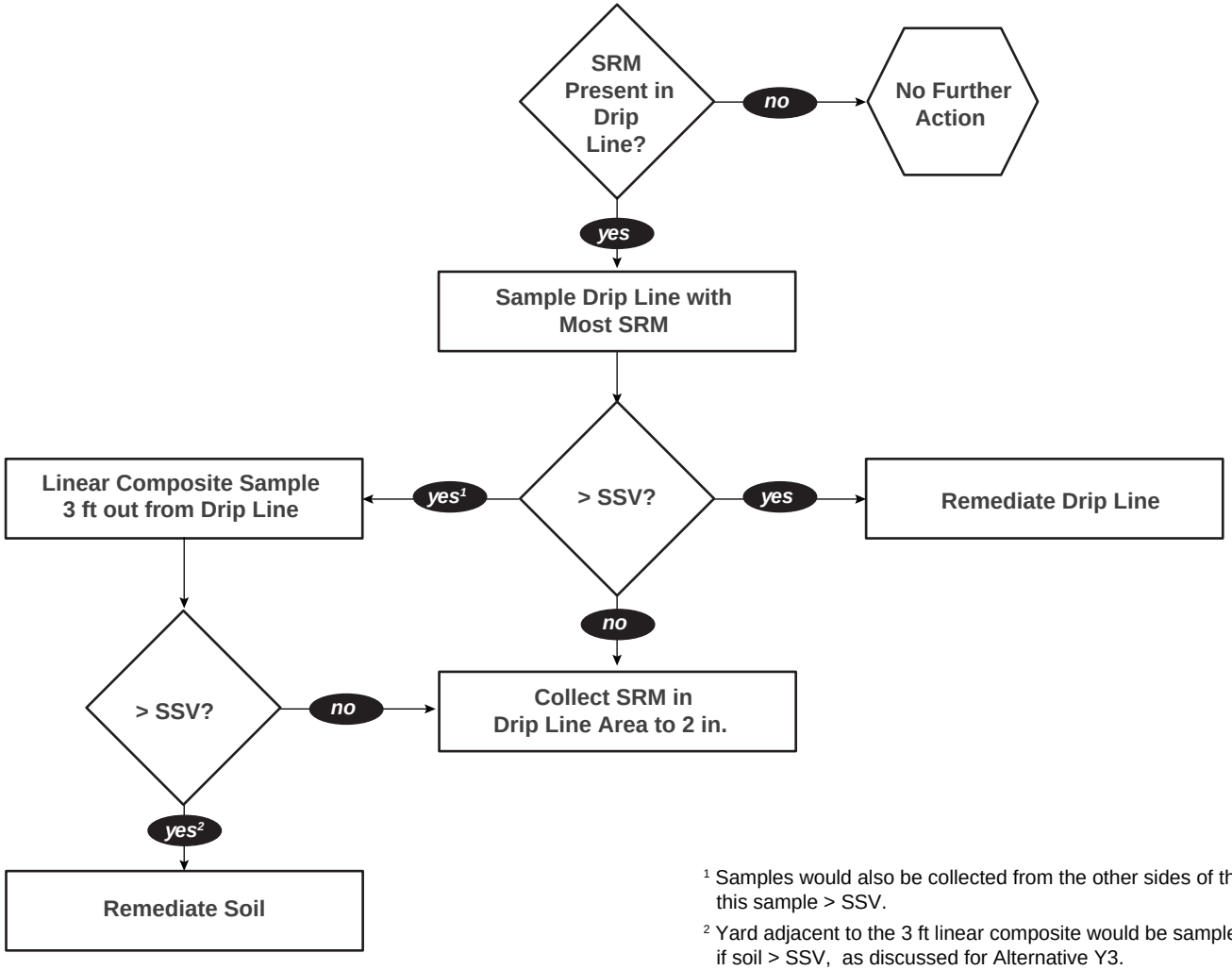


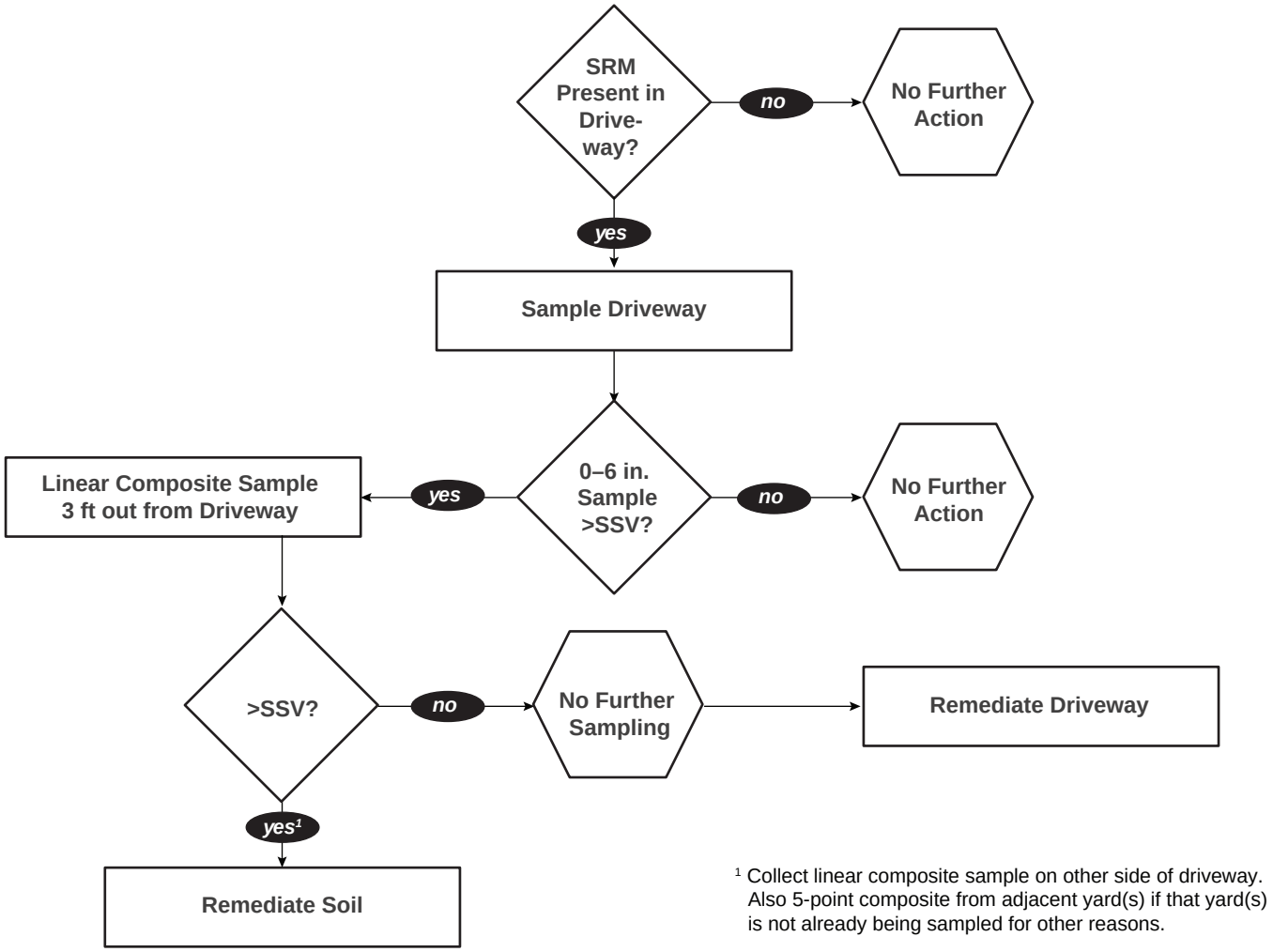
Figure 41. Decision flowchart for yard removal alternative (Y3)



[1] Samples would also be collected from the other sides of the structure if this sample > SSV.

[2] Yard adjacent to the 3 ft linear composite would be sampled and remediated, if soil > SSV, as discussed for Alternative Y3.

Figure 42. Decision flowchart for drip line removal alternative (DL3)



[1] Collect linear composite sample on other side of driveway. Also 5-point composite from adjacent yard(s) if that yard(s) is not already being sampled for other reasons.

Figure 43. Decision flowchart for driveway alternative (DW3)

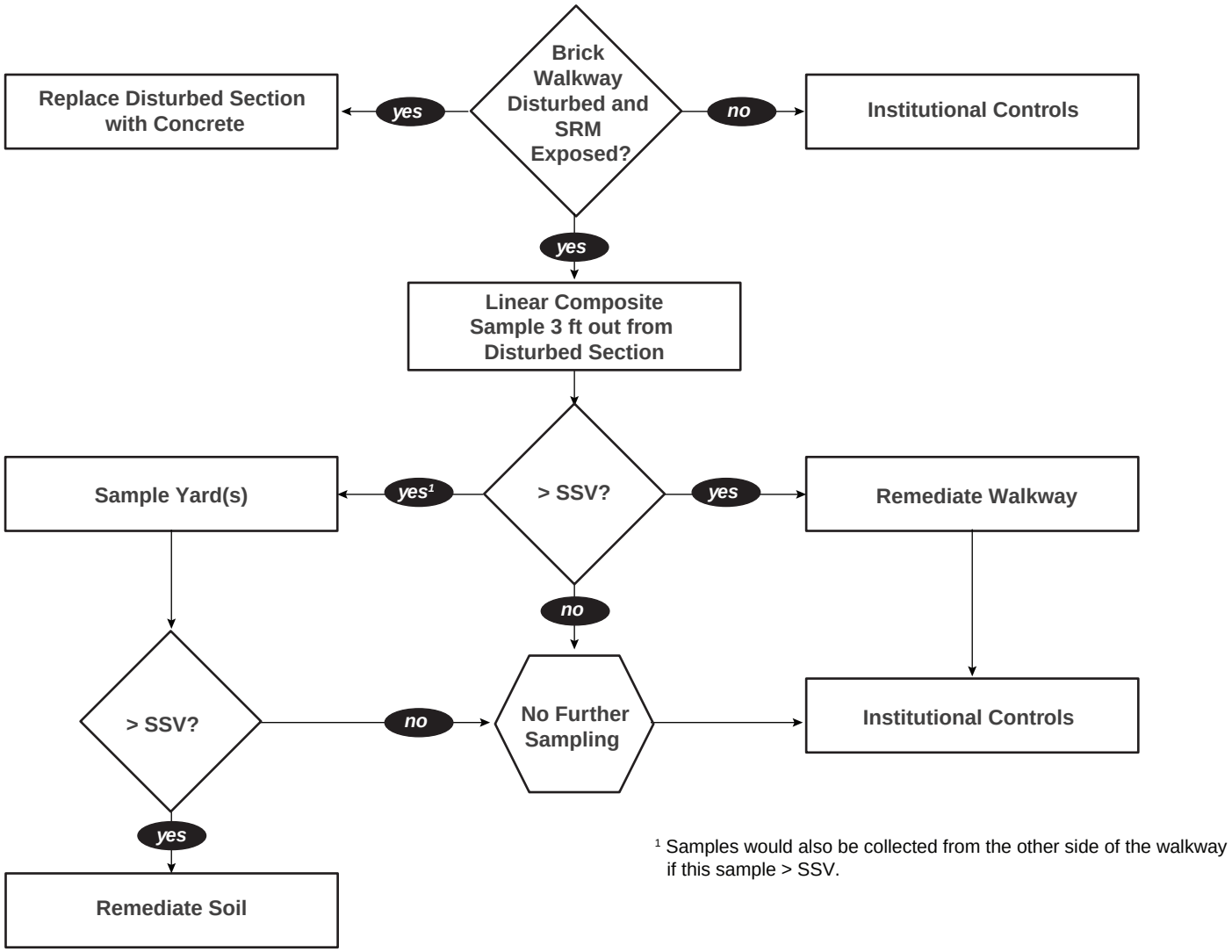
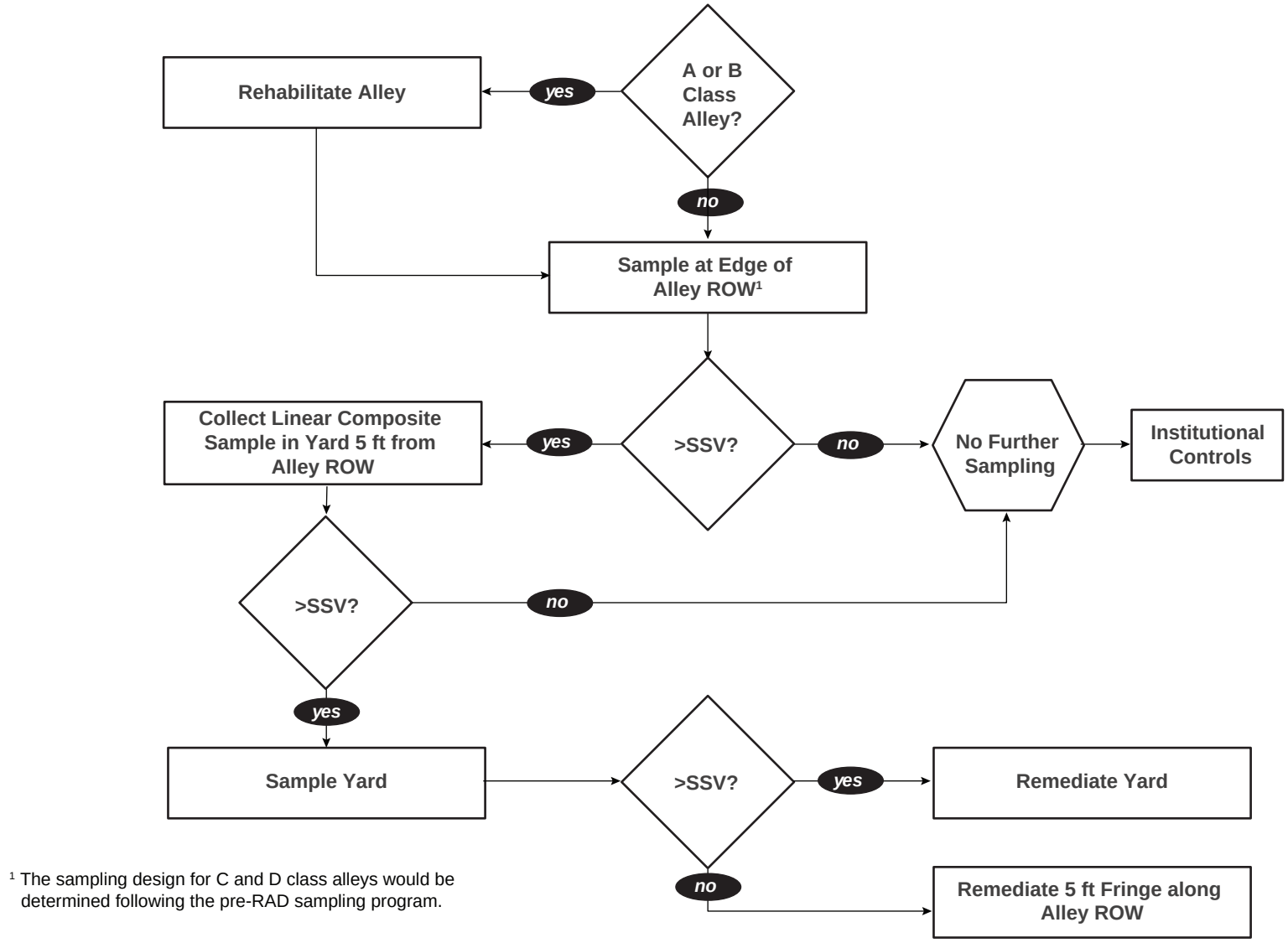


Figure 44. Decision flowchart for brick walkway removal alternative (BW3)



[1] The sampling design for C and D class alleys would be determined following the pre-RAD sampling program.

Figure 45. Decision flowchart for city alleys alternative (CA3)

Tables

Table 1. Summary of properties sampled for SRM class validation

Property Type[a]	Feature/Sample Type	Properties: Proposed[b]	Properties: Sampled	Number of Soil Samples Collected
Residential	Yard	16	20	204
	Daycare	6	6	57
	Walkway Gradient	5	5	45
	Driveway Gradient	5	5	45
Ditch	Bottom	12	15	45
	Sidewall	0	1	3
	Gradient	5	6	54
Alley	Bottom	12	16	48
	Gradient	5	21 [c]	189
School	--	3	3	51
Park	--	3	3	48
Commercial/Industrial	--	0	3	18
Total		**72**	**104**	**807**

Notes: Only composite samples are included in this summary; single-point grab samples are not included in this summary.

SRM - smelter residue material

[a]As discussed in footnote 6 of the report, one inactive/abandoned railway right of way (ROW) was sampled during the SRM class validation. As with the active railway ROWs, the inactive/abandoned railway ROW is the responsibility of the successor rail line, and as the Phase 2 RSE work plan (Exponent 2014b) provides, it is excluded from the City-wide survey and outside the scope of this report. Soil sample results for this one inactive/abandoned railway ROW will be summarized in a memorandum that will be submitted to KDHE under separate cover.

[b]As outlined in Table 4-1 of the work plan (Exponent 2014b)

[c]This value includes the supplemental alley gradient sampling discussed in Sections 2.3.2 and 3.2.6 of the report.

Table 2. Properties sampled (by property type) for SRM class validation

Property Type	SRM Class	Feature/Sample Type	Location Sampled	Number of Composite Area(s)	Number of Composite Soil Samples
Residential (Including Daycares)					
	A	Yard[a]	219 W 1st	3	9
	A	Yard	326 W 4th	3	9
	A	Yard	334 W Front	8	24
	A	Yard	402 SW Walnut	2	6
	B	Yard	212 W 3rd	4	12
	B	Yard	312 W Front	3	9
	B	Yard[a]	431 W Independence	3	9
	B	Yard	505 E 10th	3	9
	B	Yard[b]	516 W 3rd	8	24
	B	Yard[c]	620 N Labette	4	12
	B	Yard	725 W Main	2	6
	B	Yard	816 E 8th	2	6
	B-Fill	Yard (Daycare)	305 W 3rd	3	9
	B-Fill	Yard (Daycare)	317 W 4th	3	9
	B-Fill	Yard	603 E 4th	3	9
	B-Fill	Yard (Daycare)	902 W Main	4	12
	C	Yard (Daycare)	416 N Maple	4	12
	C	Yard (Daycare)	529 W 1st	3	9
	C	Yard	613 E 3rd	2	6
	C	Yard	620 W 3rd	4	12
	C	Yard	735 W Main	2	6
	D	Yard	320 E 6th	3	9
	D	Yard	329 W Front	3	9
	D	Yard[a]	500 W 1st	2	6
	D	Yard (Daycare)	509 E 10th	2	6
	D	Yard	519 N Neosho	4	12
	D	Walkway Gradient	432 SW Walnut	3	9
	D	Walkway Gradient	519 N Neosho	3	9
	D	Walkway Gradient	600 E Main	3	9
	D	Walkway Gradient	600 W Main at McKinley School	3	9
	B	Walkway Gradient	603 E 4th	3	9
	A	Driveway Gradient	316 N Montgomery	3	9
	A	Driveway Gradient	320 E 6th	3	9
	A	Driveway Gradient	326 W 4th	3	9
	A	Driveway Gradient	625 W Independence	3	9
	A	Driveway Gradient	728 W Park	3	9
School					
	NA	Yard/Open Area	Cherryvale Middle High School	7	18
	NA	Yard/Open Area	Lincoln Elementary	5	15
	NA	Yard/Open Area	McKinley School	5	15
Park					
	NA	Yard/Open Area	E 1st St Park	2	6
	NA	Yard/Open Area	S Galveston Ball Field	7	21
	NA	Yard/Open Area	Logan Park	8	24

Table 2. (cont.)

Property Type	SRM Class	Feature/Sample Type	Location Sampled	Number of Composite Area(s)	Number of Composite Soil Samples
Ditch					
	A	Ditch Bottom	N of 3rd E of Maple	1	3
	A	Ditch Bottom	735 W Main	1	3
	A	Ditch Bottom	505 E 10th	1	3
	A	Ditch Sidewall	505 E 10th	1	3
	A	Ditch Bottom	714 E 7th	1	3
	A	Ditch Bottom	735 E 2nd	1	3
	B	Ditch Bottom	402 SW Walnut	1	3
	B	Ditch Bottom	500 W 1st	1	3
	C	Ditch Bottom	432 SW Walnut	1	3
	C	Ditch Bottom	Cherryvale Middle High School	1	3
	C	Ditch Bottom	Walnut S of E 8th	1	3
	C	Ditch Bottom	724 E 10th (E 10th E of Cherry)	1	3
	D	Ditch Bottom	529 W 1st	1	3
	D	Ditch Bottom	625 W Independence	1	3
	D	Ditch Bottom	Park W at Commercial	1	3
	D	Ditch Bottom	S Galveston E of Ball Field	1	3
	C	Ditch Gradient	432 SW Walnut	3	9
	B	Ditch Gradient	724 E 10th (E 10th E of Cherry)	3	9
	C	Ditch Gradient	Cherryvale Middle High School	3	9
	D	Ditch Gradient	625 W Independence	3	9
	D	Ditch Gradient	529 W 1st	3	9
	D	Ditch Gradient	S Galveston E of Ball Field	3	9
Alley					
	A	Alley Bottom	N of 2nd E of Catherine	1	3
	A	Alley Bottom	N of 3rd E of Montgomery	1	3
	A	Alley Bottom	N of 3rd East of School	1	3
	A	Alley Bottom	N of 4th E of Liberty	1	3
	A	Alley Bottom	Park W at Commercial	1	3
	B	Alley Bottom	N of 4th E of Galveston	1	3
	B	Alley Bottom	N of 4th E of Oak	1	3
	B	Alley Bottom	N of Main W of Olive	1	3
	B	Alley Bottom	W of 402 SW Walnut	1	3
	C	Alley Bottom	N of 1st E of School	1	3
	C	Alley Bottom	N of 5th E of Carson	1	3
	C	Alley Bottom	N of Main E of Summit	1	3
	D	Alley Bottom	N of 7th E of Hickory	1	3
	D	Alley Bottom	N of Front E of School	1	3
	D	Alley Bottom	N of Main E of Maple	1	3
	D	Alley Bottom	N of Park E of S Butler	1	3
	A	Alley Gradient	N of 2nd E of Catherine	3	9
	A	Alley Gradient	N of 3rd E of Montgomery (402 E 3rd)	3	9
	A	Alley Gradient	N of 3rd E of School (516 W 3rd)	3	9
	A	Alley Gradient	N of 4th E of Liberty (N 312 W 4th)	3	9
	A	Alley Gradient	Park W at Commercial	3	9
	B	Alley Gradient	N of 3rd E of Summit	3	9
	B	Alley Gradient	N of Main E of Montgomery	3	9
	B	Alley Gradient	419 E 3rd	3	9
	B	Alley Gradient	N of 5th E of Montgomery	3	9
	B	Alley Gradient	N of 7th E of Walnut	3	9

Table 2. (cont.)

Property Type	SRM Class	Feature/Sample Type	Location Sampled	Number of Composite Area(s)	Number of Composite Soil Samples
Alley (cont.)	C	Alley Gradient	N of 11th E of Cherry	3	9
	C	Alley Gradient	N of 9th E of Carson	3	9
	C	Alley Gradient	N of 5th E of Walnut	3	9
	D	Alley Gradient	N 5th E of Neosho	3	9
	D	Alley Gradient	N of 1st E of Labette	3	9
	D	Alley Gradient	N of 3rd E Catherine	3	9
	D	Alley Gradient	N of 4th E of Carson	3	9
	D	Alley Gradient	N of 6th E of Liberty	3	9
	D	Alley Gradient	N of Main E of School	3	9
	D	Alley Gradient	827 E 6th	3	9
	D	Alley Gradient	N of 4th E of Carson	3	9
Commercial					
	A	Yard/Open Area	115 N Neosho	2	6
	A	Yard/Open Area	117 N Neoso	3	9
	A	Yard/Open Area	217 W Main	1	3
Total				270	807

Notes: Each composite sample was comprised of five aliquot locations collected at 0−6, 6−12, and 12−18 in. depth intervals.

SRM - smelter residue material

[a]Includes one play area.

[b]Includes one play area and three garden areas.

[c]Includes two garden areas.

Table 3. Summary of parcels assessed and not assessed during the City-wide survey

Description	Number of Parcels
Parcels Assessed	
Parcels assessed with Access Agreements obtained by PNL	935
Parcels assessed with Access Agreements obtained by KDHE (does not include 11 on which access has already been accepted to PNL)	189
(Parcels previously remediated, but not assessed during the City-wide survey)	(9)
(Inactive/abandoned railway ROW)[a]	(2)
Total Parcels Assessed	**1,113**
Parcels Not Assessed	
Parcels on which access was denied to PNL (does not include 68 on which access was later granted to KDHE)	115
Parcels on which access was denied to KDHE (does not include 15 on which access had already been denied to PNL)	10
Parcels on which no contact was made with parcel owner	217
Total Parcels Not Assessed	**342**
Total Parcels in Cherryvale	**1,455**

Notes: KDHE - Kansas Department of Health and Environment
PNL - Project Navigator, Ltd.
ROW - right of way

[a]See footnote a in Table 1.

Table 4. Lead concentrations measured by laboratory and field screening methods

Location Sampled	Lead Concentration (mg/kg)			Conversion Factor[b]
	Measured Lab	XRF	Predicted[a] Lab	
Park West	54.3	15.6	36.8	2.354
600 E Main St	49.5	36.2	66.9	1.848
600 W Main St	101	52.4	88.3	1.686
Park West	175	109	158	1.453
516 W 3rd St	144	120	171	1.429
725 W Main St	400	151	208	1.380
334 W Front St	212	163	223	1.366
416 N Maple St	253	174	236	1.355
334 W Front St	278	214	283	1.325
312 W 4th St	349	260	339	1.303
620 N Labette St	328	285	369	1.296
305 W 3rd St	268	291	377	1.294
625 W Independence Ave	410	307	397	1.290
316 N Montgomery St	298	317	409	1.289
2nd St and Catherine St	401	327	421	1.287
500 W 1st St	756	341	438	1.285
620 W 3rd St	548	353	454	1.284
724 E 10th St	332	363	466	1.283
Logan Park	844	381	488	1.282
516 W 3rd St	487	399	511	1.281
115 N Neosho St	589	405	519	1.281
529 W 1st St	793	418	535	1.281
516 W 3rd St	867	434	556	1.282
603 E 4th St	554	447	573	1.282
431 W Independence Ave	501	462	593	1.283
500 W 1st St	485	516	664	1.287
902 W Main St	641	575	744	1.294
519 N Neosho St	616	703	925	1.316
529 W 1st St	1,190	827	1,110	1.343
320 E 6th St	1,920	1,140	1,626	1.427
326 W 4th St	2,610	1,347	2,010	1.492
Park at E 1st St	1,650	1,572	2,466	1.569
NE of W 3rd St and N School St	1,930	1,673	2,686	1.605
115 N Neosho St	2,560	1,880	3,166	1.684
219 W 1st St	4,730	2,905	6,280	2.162

Notes: XRF - x-ray fluorescence

[a]Derived from fitted regression model.

[b]Multiplicative factor to convert XRF concentration to predicted laboratory concentration.

Table 5. Summary of lead concentrations in residential soil samples

Location Sampled		SRM Class	Sample Depth (in.)	Lead Concentration (mg/kg) Area 1	2	3	4	5	6	7	8	Play Area
219 W 1st[a]												
	Yard	A	0–6	6,280		942						
			6–12	703		708						
			12–18	532		167						
	Play Area	A	0–6									1,297
			6–12									162
			12–18									115
326 W 4th[a]												
	Yard	A	0–6	951	536	4,479						
			6–12	584	388	2,010						
			12–18	514	203	830						
334 W Front												
	Yard	A	0–6	196	283	270	3,340	504	223	301	455	
			6–12	487	193	288	2,057	162	93	108	342	
			12–18	288	116	154	500	92	102	89	245	
402 SW Walnut												
	Yard	A	0–6	130	110							
			6–12	53	88							
			12–18	65	44							
212 W 3rd												
	Yard	B	0–6	369	319	1,414	369					
			6–12	324	230	346	159					
			12–18	216	121	184	85					
312 W Front												
	Yard	B	0–6	385	313	369						
			6–12	332	186	188						
			12–18	153	103	114						
431 W Independence												
	Yard	B	0–6	355	593							
			6–12	250	249							
			12–18	81	159							
	Play Area	B	0–6									77
			6–12									104
			12–18									120
505 E 10th												
	Yard	B	0–6	199	306	283						
			6–12	131	196	276						
			12–18	62	148	172						
516 W 3rd												
	Yard	B	0–6	212	169	171	422					
			6–12	333	438	469	270					
			12–18	201	258	216	88					
	Garden	B	0–6	631	417	421						
			6–12	557	517	289						
			12–18	414	360	278						
	Play Area	B	0–6									343
			6–12									191
			12–18									58

Table 5. (cont.)

Location Sampled		SRM Class	Sample Depth (in.)	Lead Concentration (mg/kg) Area 1	2	3	4	5	6	7	8	Play Area
620 N Labette												
	Yard	B	0–6	793	460							
			6–12	458	334							
			12–18	192	205							
	Garden	B	0–6	392	369							
			6–12	376	540							
			12–18	394	231							
725 W Main												
	Yard	B	0–6	101	145							
			6–12	132	166							
			12–18	92	176							
816 E 8th												
	Yard	B	0–6	92	226							
			6–12	88	172							
			12–18	77	158							
305 W 3rd												
	Daycare	B-Fill	0–6	445	450	289						
			6–12	306	377	396						
			12–18	190	207	690						
317 W 4th[a]												
	Daycare	B-Fill	0–6	395	326	686						
			6–12	236	332	5,188						
			12–18	88	191	1,082						
603 E 4th												
	Yard	B-Fill	0–6	494	573	308						
			6–12	194	243	869						
			12–18	192	199	297						
902 W Main[a]												
	Daycare	B-Fill	0–6	310	1,175	364	345					
			6–12	222	744	128	234					
			12–18	46	160	60	156					
416 N Maple[a]												
	Daycare	C	0–6	429	236	173	642					
			6–12	204	166	162	149					
			12–18	151	104	93	145					
529 W 1st[a]												
	Daycare	C	0–6	331	535	1,496						
			6–12	240	274	584						
			12–18	85	81	187						
613 E 3rd												
	Yard	C	0–6	250	612							
			6–12	109	461							
			12–18	107	189							
620 W 3rd												
	Yard	C	0–6	285	251	238	454					
			6–12	484	306	195	238					
			12–18	223	132	96	133					
735 W Main												
	Yard	C	0–6	123	142							
			6–12	169	138							
			12–18	399	151							

Table 5. (cont.)

Location Sampled		SRM Class	Sample Depth (in.)	Lead Concentration (mg/kg) Area 1	2	3	4	5	6	7	8	Play Area
320 E 6th												
	Yard	D	0–6	342	257	353						
			6–12	180	127	319						
			12–18	185	84	155						
329 W Front												
	Yard	D	0–6	312	163	220						
			6–12	120	208	235						
			12–18	54	78	58						
500 W 1st												
	Yard	D	0–6	664								
			6–12	143								
			12–18	83								
	Play Area	D	0–6									102
			6–12									97
			12–18									168
509 E 10th												
	Daycare	D	0–6	248	117							
			6–12	112	227							
			12–18	44	216							
519 N Neosho												
	Yard	D	0–6	213	213	254	244					
			6–12	116	86	219	138					
			12–18	80	81	125	65					

Notes: Lead concentrations are corrected concentrations based on the relationship between laboratory-measured and XRF-measured concentrations.

Lead concentrations greater than 400 mg/kg are outlined.

SRM - smelter residue material
XRF - x-ray fluorescence

[a]The Respondents conducted an early, expedited removal action at this property in 2015.

Table 6. Summary of lead concentrations in driveway gradient soil samples

Location Sampled	SRM Class	Sample Depth (in.)	Lead Concentration (mg/kg) from Edge of Driveway 1.5 ft	3.0 ft	4.5 ft
316 N Montgomery	A	0–6	313	409	649
		6–12	344	470	578
		12–18	231	343	264
320 E 6th	A	0–6	359	454	392
		6–12	456	368	292
		12–18	245	347	234
326 W 4th	A	0–6	673	603	767
		6–12	412	349	434
		12–18	488	308	373
625 W Independence	A	0–6	442	632	560
		6–12	612	419	401
		12–18	397	733	269
728 W Park	A	0–6	128	132	126
		6–12	77	118	119
		12–18	71	102	66

Notes: Lead concentrations are corrected concentrations based on the relationship between laboratory-measured and XRF-measured concentrations.

Lead concentrations greater than 400 mg/kg are outlined.

SRM - smelter residue material
XRF - x-ray fluorescence

Table 7. Summary of lead concentrations in ditch bottom and sidewall soil samples

Location Sampled	SRM Class	Sample Depth (in.)	Lead Concentration (mg/kg) Bottom	Lead Concentration (mg/kg) Sidewall
505 E 10th	A	0–6	301	
		6–12	419	
		12–18	474	
		0–6		273
		6–12		194
		12–18		327
714 E 7th	A	0–6	1,626	
		6–12	844	
		12–18	393	
735 E 2nd	A	0–6	223	
		6–12	126	
		12–18	231	
735 W Main	A	0–6	211	
		6–12	237	
		12–18	237	
N of 3rd E of Maple	A	0–6	209	
		6–12	153	
		12–18	147	
402 SW Walnut	B	0–6	136	
		6–12	192	
		12–18	225	
500 W 1st	B	0–6	720	
		6–12	338	
		12–18	274	
432 SW Walnut	C	0–6	299	
		6–12	161	
		12–18	147	
724 E 10th (E 10th E of Cherry)	C	0–6	204	
		6–12	476	
		12–18	217	
Cherryvale Middle High School	C	0–6	193	
		6–12	276	
		12–18	463	
Walnut S of E 8th	C	0–6	72	
		6–12	89	
		12–18	59	

Table 7. (cont.)

Location Sampled	SRM Class	Sample Depth (in.)	Lead Concentration (mg/kg) Bottom	Lead Concentration (mg/kg) Sidewall
529 W 1st	D	0–6	1,104	
		6–12	1,541	
		12–18	527	
625 W Independence	D	0–6	156	
		6–12	565	
		12–18	626	
Park W at Commercial	D	0–6	38	
		6–12	37	
		12–18	53	
S Galveston E of Ball Field	D	0–6	159	
		6–12	55	
		12–18	48	

Notes: Lead concentrations are corrected concentrations based on the relationship between laboratory-measured and XRF-measured concentrations.

Lead concentrations greater than 400 mg/kg are outlined.

SRM - smelter residue material
XRF - x-ray fluorescence

Table 8. Summary of lead concentrations in ditch gradient soil samples

Location Sampled	SRM Class	Sample Depth (in.)	Lead Concentration (mg/kg) from Center of Ditch		
			1.5 ft	3.0 ft	4.5 ft
724 E 10th (E 10th E of Cherry)	B	0–6	237	147	323
		6–12	466	285	175
		12–18	302	110	108
432 SW Walnut	C	0–6	229	168	133
		6–12	241	108	142
		12–18	78	143	75
Cherryvale Middle High School	C	0–6	177	221	194
		6–12	266	142	184
		12–18	181	98	72
529 W 1st	D	0–6	1,228	1,021	1,110
		6–12	772	591	242
		12–18	207	149	254
625 W Independence	D	0–6	317	206	132
		6–12	581	339	284
		12–18	670	450	238
S Galveston E of Ball Field	D	0–6	65	70	50
		6–12	65	58	76
		12–18	39	38	58

Notes: Lead concentrations are corrected concentrations based on the relationship between laboratory-measured and XRF-measured concentrations.

Lead concentrations greater than 400 mg/kg are outlined.

SRM - smelter residue material
XRF - x-ray fluorescence

Table 9. Summary of lead concentrations in walkway gradient soil samples

Location Sampled	SRM Class	Sample Depth (in.)	Lead Concentration (mg/kg) from Edge of Walkway		
			1.5 ft	3.0 ft	4.5 ft
603 E 4th	B	0–6	238	268	260
		6–12	94	113	132
		12–18	109	100	101
432 SW Walnut	D	0–6	316	323	210
		6–12	414	682	434
		12–18	217	551	304
519 N Neosho	D	0–6	255	253	200
		6–12	255	108	71
		12–18	43	89	32
600 E Main	D	0–6	360	267	166
		6–12	170	129	74
		12–18	104	67	53
600 W Main	D	0–6	241	101	109
		6–12	363	337	136
		12–18	96	319	88

Notes: Lead concentrations are corrected concentrations based on the relationship between laboratory-measured and XRF-measured concentrations.

Lead concentrations greater than 400 mg/kg are outlined.

SRM - smelter residue material
XRF - x-ray fluorescence

Table 10. Summary of lead concentrations in alley soil samples

Location Sampled	SRM Class	Sample Depth (in.)	Lead Concentration (mg/kg)
N of 2nd E of Catherine	A	0–6	2,497
		6–12	1,497
		12–18	778
N of 3rd E of Montgomery	A	0–6	363
		6–12	207
		12–18	87
N of 3rd E of School	A	0–6	16,297
		6–12	6,246
		12–18	968
N of 4th E of Liberty	A	0–6	1,271
		6–12	1,591
		12–18	3,357
Park W at Commercial	A	0–6	397
		6–12	383
		12–18	234
N of 4th E of Galveston	B	0–6	420
		6–12	995
		12–18	111
N of 4th E of Oak	B	0–6	131
		6–12	306
		12–18	323
N of Main W of Olive	B	0–6	256
		6–12	89
		12–18	73
W of 402 SW Walnut	B	0–6	83
		6–12	168
		12–18	158
N of 1st E of School	C	0–6	158
		6–12	202
		12–18	89
N of 5th E of Carson	C	0–6	234
		6–12	167
		12–18	97
N of Main E of Summit	C	0–6	395
		6–12	937
		12–18	90

Table 10. (cont.)

Location Sampled	SRM Class	Sample Depth (in.)	Lead Concentration (mg/kg)
N of 7th E of Hickory	D	0–6	66
		6–12	40
		12–18	39
N of Front E of School	D	0–6	1,110
		6–12	477
		12–18	469
N of Main E of Maple	D	0–6	215
		6–12	266
		12–18	162
N of Park E of S Butler	D	0–6	99
		6–12	147
		12–18	96

Notes: Lead concentrations are corrected concentrations based on the relationship between laboratory-measured and XRF-measured concentrations.

Lead concentrations greater than 400 mg/kg are outlined.

SRM - smelter residue material
XRF - x-ray fluorescence

Table 11. Summary of lead concentrations in alley gradient soil samples

Location	SRM Class	City Quadrant	Sample Depth (in.)	Lead Concentration (mg/kg) from Active Traffic Edge 1.5 ft	3.0 ft	4.5 ft
N of 2nd E of Catherine	A	NW	0–6	561	1,097	1,048
			6–12	421	479	654
			12–18	113	139	279
516 W 3rd	A	NW	0–6	511	368	243
			6–12	622	556	313
			12–18	264	324	5,236
312 W 4th	A	SW	0–6	457	339	649
			6–12	1,034	1,195	747
			12–18	4,286	3,282	722
Park W at Commercial	A	SW	0–6	146	192	158
			6–12	61	75	139
			12–18	40	48	124
402 E 3rd	A	NE	0–6	409	310	316
			6–12	297	355	949
			12–18	136	234	221
N of 3rd E of Summit	B	NE	0–6	168	255	268
			6–12	223	264	302
			12–18	180	315	181
N of Main E of Montgomery	B	NE	0–6	346	508	629
			6–12	250	430	342
			12–18	249	235	94
419 E 3rd (adjacent to D class yard)	B	NE	0–6	324	273	264
			6–12	370	379	371
			12–18	191	285	158
N of 5th E of Montgomery	B	SE	0–6	286	416	519
			6–12	244	547	397
			12–18	106	446	442
N of 7th E of Walnut	B	SE	0–6	79	98	63
			6–12	64	123	74
			12–18	51	83	30
N of 11th E of Cherry	C	SE	0–6	124	239	181
			6–12	212	221	167
			12–18	177	124	75
N of 9th E of Carson	C	SE	0–6	300	484	482
			6–12	337	259	302
			12–18	133	147	120
N of 5th E of Walnut	C	SE	0–6	228	601	427
			6–12	171	357	160
			12–18	96	108	107

Table 11. (cont.)

Location	SRM Class	City Quadrant	Sample Depth (in.)	Lead Concentration (mg/kg) from Active Traffic Edge 1.5 ft	3.0 ft	4.5 ft
N of 1st E of Labette	D	NW	0–6	275	272	255
			6–12	290	384	462
			12–18	564	482	421
N of 3rd E Catherine	D	NW	0–6	971	1,110	1,066
			6–12	974	1,416	1,141
			12–18	508	647	741
N of Main E of School	D	NW	0–6	338	630	1,184
			6–12	747	649	687
			12–18	372	207	295
N of 6th E of Liberty	D	SW	0–6	233	321	463
			6–12	408	458	658
			12–18	184	364	427
N of 5th E of Neosho	D	SW	0–6	622	816	759
			6–12	1,774	1,463	1,178
			12–18	1,932	1,459	770
N of 4th E of Carson	D	SE	0–6	400	298	278
			6–12	358	424	409
			12–18	758	295	430
827 E 6th (adjacent to D class yard)	D	SE	0–6	125	112	750
			6–12	277	703	587
			12–18	539	333	503
N of 4th E of Carson	D	SE	0–6	248	590	223
			6–12	84	806	249
			12–18	65	222	91

Notes: Lead concentrations are corrected concentrations based on the relationship between laboratory-measured and XRF-measured concentrations.

Lead concentrations greater than 400 mg/kg are outlined.

SRM - smelter residue material
XRF - x-ray fluorescence

Table 12. Summary of lead concentrations in commercial/industrial soil samples

Location Sampled	SRM Class	Sample Depth (in.)	Lead Concentration (mg/kg) Area 1	2	3
115 N Neosho	A	0–6	4,994	8,557	
		6–12	5,658	5,383	
		12–18	8,610	3,684	
117 N Neosho	A	0–6	384	993	2,469
		6–12	519	3,362	1,817
		12–18	374	1,237	3,166
217 W Main	A	0–6	845		
		6–12	2,856		
		12–18	2,187		

Notes: Lead concentrations are corrected concentrations based on the relationship between laboratory-measured and XRF-measured concentrations.

Lead concentrations greater than 1,000 mg/kg are outlined.

SRM - smelter residue material
XRF - x-ray fluorescence

Table 13. Summary of lead concentrations in school and park soil samples

Location Sampled	SRM Class	Sample Depth (in.)	Lead Concentration (mg/kg) Area 1	2	3	4	5	6	7	Football Field	Play Area
Schools											
Lincon Elementry School	C	0–6	249	238	258	171	138				
		6–12	189	232	231	72	180				
		12–18	202	277	127	120	224				
McKinley School	C	0–6	278	273	191	98	224				
		6–12	167	364	100	119	819				
		12–18	84	180	120	197	169				
Cherryvale Middle High School	C	0–6	130	146	109	143	148				
		6–12	111	78	90	116	118				
		12–18	93	77	94	113	293				
Cherryvale Middle High School	D	0–6						127	148		
		6–12						112	161		
		12–18						119	97		
Parks											
E 1st Park[a]	B	0–6	1,017	2,466							
		6–12	780	3,885							
		12–18	153	3,400							
Logan Park	B	0–6								181	
		6–12								488	
		12–18								258	
Logan Park	C	0–6								122	
		6–12								96	
		12–18								70	
S Galveston Ball Field	C	0–6	58	39	40	43	38	47	37		
		6–12	57	36	34	32	40	32	38		
		12–18	30		34		33	30			
Logan Park	D	0–6	177	210	151	244				45	306
		6–12	69	111	140	231				53	111
		12–18	23	72	72	82				72	386

Notes: Lead concentrations are corrected concentrations based on the relationship between laboratory-measured and XRF-measured concentrations.

Lead concentrations greater than 400 mg/kg are outlined.

SRM - smelter residue material
XRF - x-ray fluorescence

[a]The Respondents conducted an early, expedited removal action at this property in 2015.

Table 14. Summary of property features and associated SRM class observed during the City-wide survey

	SRM Class					
Feature	A	B	B-Fill	C	D	Total
All Properties						
Yard	65	127	14	225	634	1,065
Drip line	41	70	11	325	440	887
Driveway	53	80	9	176	665	983
City ditch	30	52	0	75	222	379
City walkway	18	18	0	84	802	922
City alley	47	88	1	294	348	778
Overall properties	122	186	23	397	385	1,113
Residential Properties						
Feature	A	B	B-Fill	C	D	Total
Yard	55	120	12	223	606	1,016
Drip line	32	64	11	314	411	832
Driveway	43	72	8	164	631	918
City ditch	29	51	0	72	214	366
City walkway	17	18	0	83	744	862
City alley	36	81	1	283	328	729
Overall properties	105	175	21	380	357	1,038
Commercial/Industrial Properties						
Feature	A	B	B-Fill	C	D	Total
Yard	10	7	2	2	28	49
Drip line	9	6	0	11	29	55
Driveway	10	8	1	12	34	65
City ditch	1	1	0	3	8	13
City walkway	1	0	0	1	58	60
City alley	11	7	0	11	20	49
Overall properties	17	11	2	17	28	75

Note: SRM - smelter residue material

Table 15. Removal alternatives by feature

Feature	Alternative 1	Alternative 2	Alternative 3
Yard (Y)	Y1—No action	Y2—Phosphate amendment, cap, and sod	Y3—Soil removal, fill, and sod
Drip line (DL)	DL1—No action	DL2—Visible SRM removal and cover	DL3—Visible SRM removal, soil removal, fill, and cover
Driveway (DW)	DW1—No action	DW2—Pave	DW3—Remove and replace driveway and adjacent soils
City ditches (CD)	CD1—No action	CD2—ICs	CD3—ICs with environmental improvements
Brick walkways (BW)	BW1—No action	BW2—ICs	BW3—ICs with replacement of disturbed brick sections with concrete and soil sampling and removal
City alleys (CA)	CA1—No action	CA2—ICs	CA3—ICs with alley rehabilitation and fringe soil sampling and removal

Notes: IC - institutional control
SRM - smelter residue material

Table 16. Summary of ARARs for each removal action alternative

ARARs	Yard (Y) Alternatives			Drip Line (DL) Alternatives			Driveway (DW) Alternatives			City Ditch (CD) Alternatives			Brick Walkway (BW) Alternatives			City Alley (CA) Alternatives			Comments
	Y1	Y2	Y3	DL1	DL2	DL3	DW 1	DW 2	DW 3	CD1	CD2	CD3	BW 1	BW 2	BW 3	CA1	CA2	CA3	
Chemical-Specific																			
15 U.S.C. § 2601 et seq. Toxic Substances Control Act of 1976	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	Applicable to actions that involve SRM.
42 U.S.C. § 9601 et seq. as amended by SARA of 1986 CERCLA	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	Applicable; enacted to provide Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health and the environment. Provides for liability of persons responsible for releases of hazardous substances.
42 U.S.C. § 6901 et seq. as amended by the HSWA of 1984 and 1986, the Federal Facilities Compliance Act of 1992, and the Land Disposal Program Flexibility Act of 1996 RCRA of 1976	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	Applicable; enacted to provide control of hazardous waste by imposing management requirements on generators and transporters of hazardous waste and upon owners and operators of TSD facilities. Also set forth a framework for management of non-hazardous waste. Focuses only on active or future facilities. HSWA requires phasing out land disposal of hazardous waste.
40 CFR 300 NCP	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	Applicable, Federal government's blueprint for responding to spills or releases of oil and hazardous substances.
40 CFR 300.440 Amendment to the NCP; Procedures for Planning and Implementing Off-site Response Action	NA	NA	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if excavated/removed material that is determined to be hazardous is disposed of off-site.
40 CFR 261 Standards for Identification and Listing of Hazardous Waste	NA	NA	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if excavated/removed material exhibits the characteristic of toxicity and is considered RCRA hazardous waste.

See last page of table for definitions of abbreviations and acronyms.

Table 16. (cont.)

ARARs	Yard (Y) Alternatives			Drip Line (DL) Alternatives			Driveway (DW) Alternatives			City Ditch (CD) Alternatives			Brick Walkway (BW) Alternatives			City Alley (CA) Alternatives			Comments
	Y1	Y2	Y3	DL1	DL2	DL3	DW 1	DW 2	DW 3	CD1	CD2	CD3	BW 1	BW 2	BW 3	CA1	CA2	CA3	
40 CFR 262 Standards Applicable to Generators of Hazardous Waste	NA	NA	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if excavated/removed material is considered RCRA hazardous waste.
40 CFR 263 Standards Applicable to Transporters of Hazardous Waste	NA	NA	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if excavated/removed material is considered RCRA hazardous waste.
40 CFR 264 Standards for Owners and Operators of Hazardous Waste TSD Facilities	NA	NA	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if excavated/removed material is considered RCRA hazardous waste.
40 CFR 264.70-264.77 Manifesting, Record Keeping, and Reporting Requirements	NA	NA	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if excavated/removed material is considered RCRA hazardous waste.
40 CFR 268 Land Disposal Restrictions	NA	NA	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if excavated/removed material is considered RCRA hazardous waste.
49 U.S.C. § 5101 et seq. Federal Hazardous Materials Transportation Law	NA	NA	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if excavated/removed material is considered RCRA hazardous waste.
49 CFR Parts 171-179 DOT Regulations	NA	NA	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable to transportation of excavated/removed material that is considered RCRA hazardous waste.
K.A.R. 28-31-1 to 28-31-16 Hazardous Waste Management Standards and Regulations	NA	NA	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if excavated/removed material is considered RCRA hazardous waste.

Table 16. (cont.)

ARARs	Yard (Y) Alternatives			Drip Line (DL) Alternatives			Driveway (DW) Alternatives			City Ditch (CD) Alternatives			Brick Walkway (BW) Alternatives			City Alley (CA) Alternatives			Comments
	Y1	Y2	Y3	DL1	DL2	DL3	DW 1	DW 2	DW 3	CD1	CD2	CD3	BW 1	BW 2	BW 3	CA1	CA2	CA3	
Risk Based Standards Manual, March 1, 2003, as amended KDHE BER Risk Based Standards for Kansas	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	Applicable, compiles risk-based cleanup screening goals for contaminants in soil.
Location-Specific																			
7 U.S.C. § 136 and 16 U.S.C. § 460 et seq. Endangered Species Act of 1973	NA	PA	PA	NA	PA	PA	NA	PA	PA	NA	NA	PA	NA	NA	PA	NA	NA	PA	Applicable if federal and/or state threatened or endangered species are located within the removal action area (i.e., American Burying beetle, habitat is undisturbed ecosystems so should not be present in Cherryvale city limits).
K.A.R. 115-15-1 to 115-15-4 Non-Game, Threatened or Endangered Species	NA	PA	PA	NA	PA	PA	NA	PA	PA	NA	NA	PA	NA	NA	PA	NA	NA	PA	Applicable if federal and/or state threatened or endangered species are located within the removal action area (i.e., American Burying beetle, habitat is undisturbed ecosystems so should not be present in Cherryvale city limits).
16 U.S.C. § 460 Flood Control Act of 1944	NA	PA	PA	NA	PA	PA	NA	PA	PA	NA	NA	PA	NA	NA	PA	NA	NA	PA	Applicable if any removal action is conducted within a designated flood plain.
16 U.S.C. § 470 et seq. National Historic Preservation Act of 1966	NA	PA	PA	NA	PA	PA	NA	PA	PA	NA	NA	PA	NA	NA	PA	NA	NA	PA	Applicable to sites listed on historic registry and if activities requiring permitting are initiated at the site (i.e., Cherryvale Carnegie Free Library located at 329 E Main St).
K.A.R. 118-3-1 to 118-3-16 Kansas Historic Preservation Act of 1966	NA	PA	PA	NA	PA	PA	NA	PA	PA	NA	NA	PA	NA	NA	PA	NA	NA	PA	Applicable if a site or building is listed on the state or federal historic registry and activities requiring permitting are initiated at that site (i.e., Cherryvale Carnegie Free Library located at 329 E Main St).

Table 16. (cont.)

ARARs	Yard (Y) Alternatives			Drip Line (DL) Alternatives			Driveway (DW) Alternatives			City Ditch (CD) Alternatives			Brick Walkway (BW) Alternatives			City Alley (CA) Alternatives			Comments
	Y1	Y2	Y3	DL1	DL2	DL3	DW 1	DW 2	DW 3	CD1	CD2	CD3	BW 1	BW 2	BW 3	CA1	CA2	CA3	
Action-Specific																			
33 U.S.C. § 1251 et seq. as amended in 1987 Clean Water Act of 1977	NA	R&A	R&A	NA	R&A	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if removal actions result in impacted discharges to streams, rivers, or lakes. Removal actions are not anticipated to result in contaminated discharges.
40 CFR 122.2633 Storm Water Discharges	NA	R&A	R&A	NA	R&A	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if storm water comes in contact with SRM-impacted soil during removal activities. Removal actions are not anticipated to result in contamination of storm water.
40 CFR 22 230-233 and 33 CFR 320-330 Wetlands Protection	NA	R&A	R&A	NA	R&A	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if designated wetlands will be impacted by removal actions. Removal actions are not anticipated to result in impacts to designated wetlands.
42 USC § 7401 et seq. (1970) as amended in 1977 and 1990 Clean Air Act (40 CFR 63)	NA	R&A	R&A	NA	R&A	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if removal actions result in releases of contaminants to air. Removal actions are not anticipated to result in substantial emissions of contaminants to the air.
K.A.R. 28-19-1 to 28-19-801 Ambient Air Quality Standards and Air Pollution Control	NA	R&A	R&A	NA	R&A	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if removal actions result in releases of contaminants to air. Removal actions are not anticipated to result in substantial emissions of contaminants to the air.
29 U.S.C. § 651 et seq. Occupational Safety and Health Standards (29 CFR 1910)	NA	A	A	NA	A	A	NA	A	A	NA	NA	A	NA	NA	A	NA	NA	A	Applicable to removal actions; provides standards for workers and the workplace including: working surfaces; means of egress; ventilation; noise; hazardous materials; personal protective equipment; sanitation; medical services and first aid; fire protection, detection, and suppression; materials handling and storage; machinery and machinery guards; power tools; and welding and electrical equipment. Also requires training for workers.

Table 16. (cont.)

ARARs	Yard (Y) Alternatives			Drip Line (DL) Alternatives			Driveway (DW) Alternatives			City Ditch (CD) Alternatives			Brick Walkway (BW) Alternatives			City Alley (CA) Alternatives			Comments
	Y1	Y2	Y3	DL1	DL2	DL3	DW 1	DW 2	DW 3	CD1	CD2	CD3	BW 1	BW 2	BW 3	CA1	CA2	CA3	
29 U.S.C. § 651 et seq. Occupational Safety and Health Standards Safety and Health Regulations for Construction (29 CFR 1926)	NA	A	A	NA	A	A	NA	A	A	NA	NA	A	NA	NA	A	NA	NA	A	Applicable to removal actions; provides standards for construction activities including: work practices; safety equipment; scaffolding and ladders; fall protection; heavy equipment; excavations; concrete and masonry construction; steel erection; tunnels and shafts; demolition; use of explosives; power transmission and distribution; and overhead protection.
RCRA Subtitle D, 40 CFR 258 Criteria for Municipal Solid Waste Landfills	NA	NA	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if excavated/removed material is deposited in a sanitary landfill. If other disposal methods are used, Subtitle D may be applicable.
40 CFR 257-258 Solid Waste Disposal Facility Criteria	NA	NA	A	NA	A	A	NA	NA	A	NA	NA	A	NA	NA	A	NA	NA	A	Applicable to disposal of excavated/removed material.
40 CFR 264.90-264.101 Releases from Solid Waste Management Units	NA	NA	A	NA	A	A	NA	NA	A	NA	NA	A	NA	NA	A	NA	NA	A	Applicable to disposal of excavated/removed material.
K.A.R. 28-29-1 to 28-29-121 and K.A.R. 28-29-2101 to 28-29-2113 Solid Waste Management	NA	NA	A	NA	A	A	NA	NA	A	NA	NA	A	NA	NA	A	NA	NA	A	Applicable to disposal of excavated/removed material.
K.S.A. 65-1,221 to 65-1,235 Environmental Use Controls	NA	A	A	NA	A	A	NA	A	A	NA	A	A	NA	A	A	NA	A	A	Applicable to properties where institutional controls will be placed.
K.A.R. 66-6-1 through 66-14-12 Kansas Board of Technical Professions	NA	PA	PA	NA	PA	PA	NA	PA	PA	NA	NA	PA	NA	NA	PA	NA	NA	PA	Applicable if the services of a geologist, engineer or land surveyor are required for site investigations or removal activities.

Table 16. (cont.)

ARARs	Yard (Y) Alternatives			Drip Line (DL) Alternatives			Driveway (DW) Alternatives			City Ditch (CD) Alternatives			Brick Walkway (BW) Alternatives			City Alley (CA) Alternatives			Comments
	Y1	Y2	Y3	DL1	DL2	DL3	DW 1	DW 2	DW 3	CD1	CD2	CD3	BW 1	BW 2	BW 3	CA1	CA2	CA3	
40 CFR 264 Subpart S Special Provisions for Cleanup	NA	NA	R&A	NA	R&A	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	NA	NA	R&A	Applicable if the soil repository area is designated as a corrective action management unit or a temporary unit pursuant to 40 CFR 264.552 and 264.553.
KDHE Bureau of Water, General Permit S-MCST-0312-1 Stormwater Runoff from Construction Activities	NA	PA	PA	NA	PA	PA	NA	PA	PA	NA	NA	NA	NA	NA	PA	NA	NA	PA	Applicable if removal activities will disturb a cumulative total of one or more acres; must have authorization to discharge stormwater by submitting Notice of Intent for discharge of stormwater runoff from construction activities.
To Be Considered																			
KDHE BER Policy #BER-RS-005 Evaluating Future Land Use	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	Future land use influences the types and frequencies of exposures that may occur to any residual contamination remaining on the site and therefore must be considered in making corrective action decisions.
KDHE BER Policy #BER-RS-033 Consideration for Remedial Standards	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	Identifies remedial standards and situations where they should be used.
KDHE BER Policy #BER-RS-055 Developing a Soil Waste Management Plan	NA	NA	TBC	NA	TBC	TBC	NA	NA	TBC	NA	NA	TBC	NA	NA	TBC	NA	NA	TBC	Provides standards for management of solid wastes. Establishes administrative procedures. Establishes the requirement for development and submittal of Solid Waste Management Plans.
EPA OSWER-9285.7-50, August 2003 Superfund Lead-Contaminated Residential Sites Handbook	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	Provides nationally consistent decision-making process for assessing and managing risks associated with lead-contaminated residential sites across the country.

Table 16. (cont.)

ARARs	Yard (Y) Alternatives			Drip Line (DL) Alternatives			Driveway (DW) Alternatives			City Ditch (CD) Alternatives			Brick Walkway (BW) Alternatives			City Alley (CA) Alternatives			Comments
	Y1	Y2	Y3	DL1	DL2	DL3	DW 1	DW 2	DW 3	CD1	CD2	CD3	BW 1	BW 2	BW 3	CA1	CA2	CA3	
EPA Standard Operating Procedure 4230.19A, July 2007 Soil Sampling at Lead-Contaminated Residential Sites	NA	TBC	TBC	NA	TBC	TBC	NA	TBC	TBC	NA	NA	NA	NA	NA	TBC	NA	NA	TBC	Describes the procedures for the collection of representative surface soil samples at lead-contaminated residential sites as described in the Superfund Lead-Contaminated Residential Sites Handbook.
EPA OSWER 9285.7-38, April 2000 Short Sheet: TRW Recommendations for Sampling and Analysis of Soil at Lead (Pb) Sites	NA	TBC	TBC	NA	TBC	TBC	NA	TBC	TBC	NA	NA	NA	NA	NA	TBC	NA	NA	TBC	Provides recommendations for sampling and analysis of soil at lead-contaminated sites.
EPA Method 6200, February 2007 Field Portable X-ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment	NA	TBC	TBC	NA	TBC	TBC	NA	TBC	TBC	NA	NA	NA	NA	NA	TBC	NA	NA	TBC	Provides a brief introduction to X-ray fluorescence analysis of soil and sediment.
EPA OSWER 9285.7-76 Assessing Intermittent or Variable Exposure at Lead Sites	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	Guidance for the assessment of lead risks when exposures are not continuous and chronic.
EPA 540-G-89-004, October 1988 Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	Provides the methodology that the Superfund program uses to characterize the nature and extent of risk posed by uncontrolled hazardous wastes sites and for evaluating potential remedial alternatives.
EPA, July 2007 Generic Quality Assurance Project Plan for Region 7's Superfund Lead Contaminated Sites	NA	TBC	TBC	NA	TBC	TBC	NA	TBC	TBC	NA	NA	TBC	NA	NA	TBC	NA	NA	TBC	Addresses Superfund investigations on former and active mining, milling and smelter facilities and the associated impacted areas from the operations of these facilities.

Table 16. (cont.)

ARARs	Yard (Y) Alternatives			Drip Line (DL) Alternatives			Driveway (DW) Alternatives			City Ditch (CD) Alternatives			Brick Walkway (BW) Alternatives			City Alley (CA) Alternatives			Comments
	Y1	Y2	Y3	DL1	DL2	DL3	DW 1	DW 2	DW 3	CD1	CD2	CD3	BW 1	BW 2	BW 3	CA1	CA2	CA3	
EPA 240-R-02-009, December 2002 Guidance for Quality Assurance Project Plans	NA	TBC	TBC	NA	TBC	TBC	NA	TBC	TBC	NA	NA	NA	NA	NA	TBC	NA	NA	TBC	Describes the Quality Assurance Project Plan as four basic element groups covering project management, data generation and acquisition, assessment and oversight, and data validation and usability.
EPA 600-R-96-055, August 2000 Guidance for the Data Quality Objectives Process	NA	TBC	TBC	NA	TBC	TBC	NA	TBC	TBC	NA	NA	NA	NA	NA	TBC	NA	NA	TBC	Provides a systematic planning process to develop acceptance or performance criteria for collection, evaluation, or use of environmental data.
EPA 540-R-95-059, June 1995 Remedial Design/Remedial Action Handbook	NA	TBC	TBC	NA	TBC	TBC	NA	TBC	TBC	NA	NA	TBC	NA	NA	TBC	NA	NA	TBC	Provides an overview of the remedial design and remedial action processes.
EPA 530-F-98-026, October 1998 Management of Remediation Waste under RCRA	NA	TBC	TBC	NA	TBC	TBC	NA	TBC	TBC	NA	NA	TBC	NA	NA	TBC	NA	NA	TBC	Describes management of contaminated environmental media, etc.
EPA 832-R-92-005, October 1992 Storm Water Management for Construction Activities	NA	TBC	TBC	NA	TBC	TBC	NA	TBC	TBC	NA	NA	TBC	NA	NA	TBC	NA	NA	TBC	Describes water pollution prevention measures.

Footnotes appear on the following page.

Table 16. (cont.)

Notes: See Section 6 and Table 15 for a description of removal alternatives by feature.

A	-	applicable
ARAR	-	applicable or relevant and appropriate requirement
BER	-	Bureau of Environmental Remediation
CERCLA	-	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
CFR	-	Code of Federal Regulations
EPA	-	United States Environmental Protection Agency
DOT	-	Department of Transportation
HSWA	-	Hazardous and Solid Waste Amendments
KAR	-	Kansas Administrative Regulation
KDHE	-	Kansas Department of Health and Environment
KSA	-	Kansas statutes annotated
NA	-	not applicable
NCP	-	National Oil and Hazardous Substances Pollution Contingency Plan
OSWER	-	Office of Solid Waste and Emergency Response
PA	-	potentially applicable
R&A	-	relevant and appropriate
RCRA	-	Resource Conservation and Recovery Act
SARA	-	Superfund Amendments and Reauthorization Act
SRM	-	smelter residue material
TBC	-	to be considered
TRW	-	Technical Review Workgroup
TSD	-	treatment, storage and disposal
USC	-	United States Code

Appendix A

XRF-Measured Lead Results

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
McKinley School	School		0	6	C	08/06/14	278.15
McKinley School	School		6	12	C	08/06/14	167.14
McKinley School	School		12	18	C	08/06/14	83.73
McKinley School	School		0	6	C	08/06/14	273.01
McKinley School	School		6	12	C	08/06/14	363.52
McKinley School	School		12	18	C	08/06/14	179.93
McKinley School	School		0	6	C	08/06/14	191.43
McKinley School	School		6	12	C	08/06/14	99.84
McKinley School	School		12	18	C	08/06/14	119.76
McKinley School	School		0	6	C	08/06/14	97.71
McKinley School	School		6	12	C	08/06/14	119.27
McKinley School	School		12	18	C	08/06/14	197.34
McKinley School	School		0	6	C	08/06/14	224.38
McKinley School	School		6	12	C	08/06/14	818.78
McKinley School	School		12	18	C	08/06/14	169.31
Lincon Elementry School	School		0	6	C	08/06/14	249.22
Lincon Elementry School	School		6	12	C	08/06/14	189.01
Lincon Elementry School	School		12	18	C	08/06/14	201.52
Lincon Elementry School	School		0	6	C	08/06/14	238.34
Lincon Elementry School	School		6	12	C	08/06/14	232.37
Lincon Elementry School	School		12	18	C	08/06/14	277.29
Lincon Elementry School	School		0	6	C	08/06/14	257.54
Lincon Elementry School	School		6	12	C	08/06/14	231.21
Lincon Elementry School	School		12	18	C	08/06/14	126.67
Lincon Elementry School	School		0	6	C	08/06/14	170.65
Lincon Elementry School	School		6	12	C	08/06/14	71.52
Lincon Elementry School	School		12	18	C	08/06/14	120.22
Lincon Elementry School	School		0	6	C	08/07/14	137.70
Lincon Elementry School	School		6	12	C	08/07/14	179.61
Lincon Elementry School	School		12	18	C	08/07/14	224.23
Senior/Middle School	School		0	6	C	08/07/14	130.37
Senior/Middle School	School		6	12	C	08/07/14	111.34
Senior/Middle School	School		12	18	C	08/07/14	93.03
Senior/Middle School	School		0	6	C	08/07/14	145.78
Senior/Middle School	School		6	12	C	08/07/14	78.25
Senior/Middle School	School		12	18	C	08/07/14	77.39
Senior/Middle School	School		0	6	C	08/07/14	108.94
Senior/Middle School	School		6	12	C	08/07/14	90.11
Senior/Middle School	School		12	18	C	08/07/14	93.69
Senior/Middle School	School		0	6	C	08/07/14	142.68
Senior/Middle School	School		6	12	C	08/07/14	116.40
Senior/Middle School	School		12	18	C	08/07/14	112.86
Senior/Middle School	School		0	6	C	08/07/14	147.63
Senior/Middle School	School		6	12	C	08/07/14	118.47
Senior/Middle School	School		12	18	C	08/07/14	292.51
Senior/Middle School	School		0	6	D	08/07/14	126.98
Senior/Middle School	School		6	12	D	08/07/14	112.23
Senior/Middle School	School		12	18	D	08/07/14	119.13
Senior/Middle School	School		0	6	D	08/07/14	148.16

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
Senior/Middle School	School		6	12	D	08/07/14	161.22
Senior/Middle School	School		12	18	D	08/07/14	96.51
316 N Montgomery	Driveway	Gradient	0	6	A	01/21/15	313.28
316 N Montgomery	Driveway	Gradient	6	12	A	01/21/15	343.83
316 N Montgomery	Driveway	Gradient	12	18	A	01/21/15	231.06
316 N Montgomery	Driveway	Gradient	0	6	A	01/21/15	408.61
316 N Montgomery	Driveway	Gradient	6	12	A	01/21/15	469.78
316 N Montgomery	Driveway	Gradient	12	18	A	01/21/15	343.14
316 N Montgomery	Driveway	Gradient	0	6	A	01/21/15	648.72
316 N Montgomery	Driveway	Gradient	6	12	A	01/21/15	578.31
316 N Montgomery	Driveway	Gradient	12	18	A	01/21/15	264.37
432 SW Walnut	Ditch	Bottom	0	6	C	01/21/15	298.81
432 SW Walnut	Ditch	Bottom	6	12	C	01/21/15	161.13
432 SW Walnut	Ditch	Bottom	12	18	C	01/21/15	146.85
432 SW Walnut	Ditch	Gradient	0	6	C	01/21/15	229.28
432 SW Walnut	Ditch	Gradient	6	12	C	01/21/15	241.39
432 SW Walnut	Ditch	Gradient	12	18	C	01/21/15	77.84
432 SW Walnut	Ditch	Gradient	0	6	C	01/21/15	167.86
432 SW Walnut	Ditch	Gradient	6	12	C	01/21/15	108.44
432 SW Walnut	Ditch	Gradient	12	18	C	01/21/15	143.32
432 SW Walnut	Ditch	Gradient	0	6	C	01/21/15	133.07
432 SW Walnut	Ditch	Gradient	6	12	C	01/21/15	141.99
432 SW Walnut	Ditch	Gradient	12	18	C	01/21/15	74.76
432 SW Walnut	Sidewalk	Gradient	0	6	D	01/21/15	315.70
432 SW Walnut	Sidewalk	Gradient	6	12	D	01/21/15	413.83
432 SW Walnut	Sidewalk	Gradient	12	18	D	01/21/15	217.01
432 SW Walnut	Sidewalk	Gradient	0	6	D	01/21/15	322.93
432 SW Walnut	Sidewalk	Gradient	6	12	D	01/21/15	682.24
432 SW Walnut	Sidewalk	Gradient	12	18	D	01/21/15	551.10
432 SW Walnut	Sidewalk	Gradient	0	6	D	01/21/15	209.51
432 SW Walnut	Sidewalk	Gradient	6	12	D	01/21/15	434.25
432 SW Walnut	Sidewalk	Gradient	12	18	D	01/21/15	304.01
Senior/Middle School on E 7th	Ditch	Bottom	0	6	C	01/21/15	192.93
Senior/Middle School on E 7th	Ditch	Bottom	6	12	C	01/21/15	276.42
Senior/Middle School on E 7th	Ditch	Bottom	12	18	C	01/21/15	462.92
Senior/Middle School	Ditch	Gradient	0	6	C	01/21/15	177.09
Senior/Middle School	Ditch	Gradient	6	12	C	01/21/15	265.86
Senior/Middle School	Ditch	Gradient	12	18	C	01/21/15	181.36
Senior/Middle School	Ditch	Gradient	0	6	C	01/21/15	221.22
Senior/Middle School	Ditch	Gradient	6	12	C	01/21/15	141.73
Senior/Middle School	Ditch	Gradient	12	18	C	01/21/15	97.87
Senior/Middle School	Ditch	Gradient	0	6	C	01/21/15	194.31
Senior/Middle School	Ditch	Gradient	6	12	C	01/21/15	183.54
Senior/Middle School	Ditch	Gradient	12	18	C	01/21/15	72.17
N of Main E of Maple	Alley		0	6	D	01/21/15	215.35
N of Main E of Maple	Alley		6	12	D	01/21/15	265.75
N of Main E of Maple	Alley		12	18	D	01/21/15	162.18
N of 7th E of Hickory	Alley		0	6	D	01/21/15	65.96
N of 7th E of Hickory	Alley		6	12	D	01/21/15	40.02

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
N of 7th E of Hickory	Alley		12	18	D	01/21/15	38.77
N of 3rd E of Montgomery	Alley		0	6	A	01/21/15	362.93
N of 3rd E of Montgomery	Alley		6	12	A	01/21/15	206.55
N of 3rd E of Montgomery	Alley		12	18	A	01/21/15	87.48
320 E 6th	Driveway	Gradient	0	6	A	01/22/15	359.41
320 E 6th	Driveway	Gradient	6	12	A	01/22/15	456.44
320 E 6th	Driveway	Gradient	12	18	A	01/22/15	244.93
320 E 6th	Driveway	Gradient	0	6	A	01/22/15	454.39
320 E 6th	Driveway	Gradient	6	12	A	01/22/15	368.24
320 E 6th	Driveway	Gradient	12	18	A	01/22/15	347.32
320 E 6th	Driveway	Gradient	0	6	A	01/22/15	392.38
320 E 6th	Driveway	Gradient	6	12	A	01/22/15	292.33
320 E 6th	Driveway	Gradient	12	18	A	01/22/15	234.33
S Galveston E of Ball Field	Ditch	Bottom	0	6	D	01/22/15	158.76
S Galveston E of Ball Field	Ditch	Bottom	6	12	D	01/22/15	55.12
S Galveston E of Ball Field	Ditch	Bottom	12	18	D	01/22/15	48.07
S Galveston E of Ball Field	Ditch	Gradient	0	6	D	01/22/15	65.03
S Galveston E of Ball Field	Ditch	Gradient	6	12	D	01/22/15	64.52
S Galveston E of Ball Field	Ditch	Gradient	12	18	D	01/22/15	38.50
S Galveston E of Ball Field	Ditch	Gradient	0	6	D	01/22/15	69.85
S Galveston E of Ball Field	Ditch	Gradient	6	12	D	01/22/15	57.64
S Galveston E of Ball Field	Ditch	Gradient	12	18	D	01/22/15	38.29
S Galveston E of Ball Field	Ditch	Gradient	0	6	D	01/22/15	50.19
S Galveston E of Ball Field	Ditch	Gradient	6	12	D	01/22/15	76.30
S Galveston E of Ball Field	Ditch	Gradient	12	18	D	01/22/15	58.42
E 10th E of Cherry	Ditch	Bottom	0	6	C	01/22/15	203.96
E 10th E of Cherry	Ditch	Bottom	6	12	C	01/22/15	475.85
E 10th E of Cherry	Ditch	Bottom	12	18	C	01/22/15	216.52
E 10th E of Cherry	Ditch	Gradient	0	6	B	01/22/15	237.12
E 10th E of Cherry	Ditch	Gradient	6	12	B	01/22/15	466.33
E 10th E of Cherry	Ditch	Gradient	12	18	B	01/22/15	301.51
E 10th E of Cherry	Ditch	Gradient	0	6	B	01/22/15	147.17
E 10th E of Cherry	Ditch	Gradient	6	12	B	01/22/15	284.88
E 10th E of Cherry	Ditch	Gradient	12	18	B	01/22/15	109.70
E 10th E of Cherry	Ditch	Gradient	0	6	B	01/22/15	322.76
E 10th E of Cherry	Ditch	Gradient	6	12	B	01/22/15	175.37
E 10th E of Cherry	Ditch	Gradient	12	18	B	01/22/15	107.77
728 W Park	Driveway	Gradient	0	6	A	01/22/15	128.38
728 W Park	Driveway	Gradient	6	12	A	01/22/15	76.62
728 W Park	Driveway	Gradient	12	18	A	01/22/15	71.14
728 W Park	Driveway	Gradient	0	6	A	01/22/15	132.24
728 W Park	Driveway	Gradient	6	12	A	01/22/15	117.65
728 W Park	Driveway	Gradient	12	18	A	01/22/15	102.12
728 W Park	Driveway	Gradient	0	6	A	01/22/15	126.35
728 W Park	Driveway	Gradient	6	12	A	01/22/15	118.67
728 W Park	Driveway	Gradient	12	18	A	01/22/15	65.83
402 E 3rd	Alley	Gradient	0	6	A	01/22/15	409.18
402 E 3rd	Alley	Gradient	6	12	A	01/22/15	296.94
402 E 3rd	Alley	Gradient	12	18	A	01/22/15	136.34

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
402 E 3rd	Alley	Gradient	0	6	A	01/22/15	310.27
402 E 3rd	Alley	Gradient	6	12	A	01/22/15	355.45
402 E 3rd	Alley	Gradient	12	18	A	01/22/15	233.82
402 E 3rd	Alley	Gradient	0	6	A	01/22/15	316.13
402 E 3rd	Alley	Gradient	6	12	A	01/22/15	949.07
402 E 3rd	Alley	Gradient	12	18	A	01/22/15	221.47
N of 2nd E of Catherine	Alley	Gradient	0	6	A	01/22/15	561.01
N of 2nd E of Catherine	Alley	Gradient	6	12	A	01/22/15	421.22
N of 2nd E of Catherine	Alley	Gradient	12	18	A	01/22/15	113.00
N of 2nd E of Catherine	Alley	Gradient	0	6	A	01/22/15	1097.34
N of 2nd E of Catherine	Alley	Gradient	6	12	A	01/22/15	478.88
N of 2nd E of Catherine	Alley	Gradient	12	18	A	01/22/15	138.80
N of 2nd E of Catherine	Alley	Gradient	0	6	A	01/22/15	1048.36
N of 2nd E of Catherine	Alley	Gradient	6	12	A	01/22/15	653.69
N of 2nd E of Catherine	Alley	Gradient	12	18	A	01/22/15	278.89
N of 2nd E of Catherine	Alley		0	6	A	01/22/15	2496.99
N of 2nd E of Catherine	Alley		6	12	A	01/22/15	1496.84
N of 2nd E of Catherine	Alley		12	18	A	01/22/15	778.08
N of Park E of S Butler	Alley		0	6	D	01/22/15	99.47
N of Park E of S Butler	Alley		6	12	D	01/22/15	146.52
N of Park E of S Butler	Alley		12	18	D	01/22/15	95.84
Walnut S of E 8th	Ditch	Bottom	0	6	C	01/22/15	72.45
Walnut S of E 8th	Ditch	Bottom	6	12	C	01/22/15	88.56
Walnut S of E 8th	Ditch	Bottom	12	18	C	01/22/15	59.20
N of 4th E of Galveston	Alley		0	6	B	01/22/15	419.53
N of 4th E of Galveston	Alley		6	12	B	01/22/15	995.27
N of 4th E of Galveston	Alley		12	18	B	01/22/15	111.22
625 W Independence	Ditch	Bottom	0	6	D	01/23/15	156.00
625 W Independence	Ditch	Bottom	6	12	D	01/23/15	565.33
625 W Independence	Ditch	Bottom	12	18	D	01/23/15	625.59
625 W Independence	Driveway	Gradient	0	6	A	01/23/15	442.10
625 W Independence	Driveway	Gradient	6	12	A	01/23/15	612.21
625 W Independence	Driveway	Gradient	12	18	A	01/23/15	396.69
625 W Independence	Driveway	Gradient	0	6	A	01/23/15	632.30
625 W Independence	Driveway	Gradient	6	12	A	01/23/15	418.59
625 W Independence	Driveway	Gradient	12	18	A	01/23/15	732.77
625 W Independence	Driveway	Gradient	0	6	A	01/23/15	560.31
625 W Independence	Driveway	Gradient	6	12	A	01/23/15	401.08
625 W Independence	Driveway	Gradient	12	18	A	01/23/15	268.91
625 W Independence	Ditch	Gradient	0	6	D	01/23/15	317.13
625 W Independence	Ditch	Gradient	6	12	D	01/23/15	580.65
625 W Independence	Ditch	Gradient	12	18	D	01/23/15	669.85
625 W Independence	Ditch	Gradient	0	6	D	01/23/15	206.50
625 W Independence	Ditch	Gradient	6	12	D	01/23/15	338.67
625 W Independence	Ditch	Gradient	12	18	D	01/23/15	449.59
625 W Independence	Ditch	Gradient	0	6	D	01/23/15	132.35
625 W Independence	Ditch	Gradient	6	12	D	01/23/15	283.73
625 W Independence	Ditch	Gradient	12	18	D	01/23/15	237.84
115 N Neosho	Commercial		0	6	A	01/23/15	4993.53

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
115 N Neosho	Commercial		6	12	A	01/23/15	5658.41
115 N Neosho	Commercial		12	18	A	01/23/15	8610.18
115 N Neosho	Commercial		0	6	A	01/23/15	8556.60
115 N Neosho	Commercial		6	12	A	01/23/15	5382.95
115 N Neosho	Commercial		12	18	A	01/23/15	3684.04
117 N Neosho	Commercial		0	6	A	01/23/15	384.09
117 N Neosho	Commercial		6	12	A	01/23/15	518.93
117 N Neosho	Commercial		12	18	A	01/23/15	373.57
117 N Neosho	Commercial		0	6	A	01/23/15	992.54
117 N Neosho	Commercial		6	12	A	01/23/15	3361.63
117 N Neosho	Commercial		12	18	A	01/23/15	1236.78
117 N Neosho	Commercial		0	6	A	01/23/15	2468.79
117 N Neosho	Commercial		6	12	A	01/23/15	1817.17
117 N Neosho	Commercial		12	18	A	01/23/15	3165.54
212 W 3rd	Residential	Yard	0	6	B	01/23/15	369.11
212 W 3rd	Residential	Yard	6	12	B	01/23/15	324.45
212 W 3rd	Residential	Yard	12	18	B	01/23/15	215.66
212 W 3rd	Residential	Yard	0	6	B	01/23/15	318.76
212 W 3rd	Residential	Yard	6	12	B	01/23/15	230.45
212 W 3rd	Residential	Yard	12	18	B	01/23/15	120.65
212 W 3rd	Residential	Yard	0	6	B	01/23/15	1414.45
212 W 3rd	Residential	Yard	6	12	B	01/23/15	346.39
212 W 3rd	Residential	Yard	12	18	B	01/23/15	183.79
212 W 3rd	Residential	Yard	0	6	B	01/23/15	368.50
212 W 3rd	Residential	Yard	6	12	B	01/23/15	158.85
212 W 3rd	Residential	Yard	12	18	B	01/23/15	84.61
217 W Main	Commercial		0	6	A	01/23/15	845.16
217 W Main	Commercial		6	12	A	01/23/15	2856.17
217 W Main	Commercial		12	18	A	01/23/15	2187.07
219 W 1st	Residential	Yard	0	6	A	01/23/15	6279.94
219 W 1st	Residential	Yard	6	12	A	01/23/15	702.98
219 W 1st	Residential	Yard	12	18	A	01/23/15	531.94
219 W 1st	Residential	Play Area	0	6	A	01/23/15	1296.58
219 W 1st	Residential	Play Area	6	12	A	01/23/15	161.58
219 W 1st	Residential	Play Area	12	18	A	01/23/15	115.26
219 W 1st	Residential	Yard	0	6	A	01/23/15	941.50
219 W 1st	Residential	Yard	6	12	A	01/23/15	707.82
219 W 1st	Residential	Yard	12	18	A	01/23/15	166.95
305 W 3rd	Residential	Daycare	0	6	B-Fill	01/23/15	444.57
305 W 3rd	Residential	Daycare	6	12	B-Fill	01/23/15	306.40
305 W 3rd	Residential	Daycare	12	18	B-Fill	01/23/15	189.63
305 W 3rd	Residential	Daycare	0	6	B-Fill	01/23/15	450.04
305 W 3rd	Residential	Daycare	6	12	B-Fill	01/23/15	377.08
305 W 3rd	Residential	Daycare	12	18	B-Fill	01/23/15	207.21
305 W 3rd	Residential	Daycare	0	6	B-Fill	01/23/15	288.59
305 W 3rd	Residential	Daycare	6	12	B-Fill	01/23/15	395.90
305 W 3rd	Residential	Daycare	12	18	B-Fill	01/23/15	689.83
312 W 4th	Alley	Gradient	0	6	A	01/23/15	457.19
312 W 4th	Alley	Gradient	6	12	A	01/23/15	1034.30

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
312 W 4th	Alley	Gradient	12	18	A	01/23/15	4286.06
312 W 4th	Alley	Gradient	0	6	A	01/23/15	338.85
312 W 4th	Alley	Gradient	6	12	A	01/23/15	1194.62
312 W 4th	Alley	Gradient	12	18	A	01/23/15	3281.60
312 W 4th	Alley	Gradient	0	6	A	01/23/15	649.18
312 W 4th	Alley	Gradient	6	12	A	01/23/15	746.51
312 W 4th	Alley	Gradient	12	18	A	01/23/15	722.33
317 W 4th	Residential	Daycare	0	6	B-Fill	01/26/15	395.20
317 W 4th	Residential	Daycare	6	12	B-Fill	01/26/15	236.27
317 W 4th	Residential	Daycare	12	18	B-Fill	01/26/15	88.20
317 W 4th	Residential	Daycare	0	6	B-Fill	01/26/15	325.97
317 W 4th	Residential	Daycare	6	12	B-Fill	01/26/15	332.40
317 W 4th	Residential	Daycare	12	18	B-Fill	01/26/15	190.78
317 W 4th	Residential	Daycare	0	6	B-Fill	01/26/15	686.24
317 W 4th	Residential	Daycare	6	12	B-Fill	01/26/15	5187.64
317 W 4th	Residential	Daycare	12	18	B-Fill	01/26/15	1081.95
320 E 6th	Residential	Yard	0	6	D	01/26/15	341.79
320 E 6th	Residential	Yard	6	12	D	01/26/15	180.20
320 E 6th	Residential	Yard	12	18	D	01/26/15	185.09
320 E 6th	Residential	Yard	0	6	D	01/26/15	256.87
320 E 6th	Residential	Yard	6	12	D	01/26/15	127.32
320 E 6th	Residential	Yard	12	18	D	01/26/15	83.75
320 E 6th	Residential	Yard	0	6	D	01/26/15	353.25
320 E 6th	Residential	Yard	6	12	D	01/26/15	319.50
320 E 6th	Residential	Yard	12	18	D	01/26/15	154.89
326 W 4th	Residential	Yard	0	6	A	01/26/15	951.36
326 W 4th	Residential	Yard	6	12	A	01/26/15	584.32
326 W 4th	Residential	Yard	12	18	A	01/26/15	513.55
326 W 4th	Residential	Yard	0	6	A	01/26/15	535.95
326 W 4th	Residential	Yard	6	12	A	01/26/15	387.86
326 W 4th	Residential	Yard	12	18	A	01/26/15	202.87
326 W 4th	Residential	Yard	0	6	A	01/26/15	4479.01
326 W 4th	Residential	Yard	6	12	A	01/26/15	2010.23
326 W 4th	Residential	Yard	12	18	A	01/26/15	830.21
326 W 4th	Driveway	Gradient	0	6	A	01/26/15	673.40
326 W 4th	Driveway	Gradient	6	12	A	01/26/15	411.88
326 W 4th	Driveway	Gradient	12	18	A	01/26/15	487.89
326 W 4th	Driveway	Gradient	0	6	A	01/26/15	603.04
326 W 4th	Driveway	Gradient	6	12	A	01/26/15	348.55
326 W 4th	Driveway	Gradient	12	18	A	01/26/15	308.36
326 W 4th	Driveway	Gradient	0	6	A	01/26/15	767.17
326 W 4th	Driveway	Gradient	6	12	A	01/26/15	433.50
326 W 4th	Driveway	Gradient	12	18	A	01/26/15	372.65
329 W Front	Residential	Yard	0	6	D	01/26/15	311.99
329 W Front	Residential	Yard	6	12	D	01/26/15	120.25
329 W Front	Residential	Yard	12	18	D	01/26/15	53.64
329 W Front	Residential	Yard	0	6	D	01/26/15	162.71
329 W Front	Residential	Yard	6	12	D	01/26/15	207.89
329 W Front	Residential	Yard	12	18	D	01/26/15	77.92

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
329 W Front	Residential	Yard	0	6	D	01/26/15	220.18
329 W Front	Residential	Yard	6	12	D	01/26/15	235.50
329 W Front	Residential	Yard	12	18	D	01/26/15	58.43
334 W Front	Residential	Yard	0	6	A	01/26/15	195.76
334 W Front	Residential	Yard	6	12	A	01/26/15	487.20
334 W Front	Residential	Yard	12	18	A	01/26/15	288.45
334 W Front	Residential	Yard	0	6	A	01/26/15	283.35
334 W Front	Residential	Yard	6	12	A	01/26/15	192.58
334 W Front	Residential	Yard	12	18	A	01/26/15	116.02
334 W Front	Residential	Yard	0	6	A	01/26/15	270.06
334 W Front	Residential	Yard	6	12	A	01/26/15	287.78
334 W Front	Residential	Yard	12	18	A	01/26/15	154.47
334 W Front	Residential	Yard	0	6	A	01/26/15	3339.56
334 W Front	Residential	Yard	6	12	A	01/26/15	2057.35
334 W Front	Residential	Yard	12	18	A	01/26/15	499.71
334 W Front	Residential	Yard	0	6	A	01/26/15	504.31
334 W Front	Residential	Yard	6	12	A	01/26/15	161.71
334 W Front	Residential	Yard	12	18	A	01/26/15	92.19
334 W Front	Residential	Yard	0	6	A	01/26/15	222.67
334 W Front	Residential	Yard	6	12	A	01/26/15	93.21
334 W Front	Residential	Yard	12	18	A	01/26/15	101.90
334 W Front	Residential	Yard	0	6	A	01/26/15	300.66
334 W Front	Residential	Yard	6	12	A	01/26/15	107.71
334 W Front	Residential	Yard	12	18	A	01/26/15	88.68
334 W Front	Residential	Yard	0	6	A	01/26/15	455.39
334 W Front	Residential	Yard	6	12	A	01/26/15	341.51
334 W Front	Residential	Yard	12	18	A	01/26/15	244.50
402 SW Walnut	Residential	Yard	0	6	A	01/26/15	130.04
402 SW Walnut	Residential	Yard	6	12	A	01/26/15	52.82
402 SW Walnut	Residential	Yard	12	18	A	01/26/15	65.29
402 SW Walnut	Residential	Yard	0	6	A	01/26/15	110.33
402 SW Walnut	Residential	Yard	6	12	A	01/26/15	87.60
402 SW Walnut	Residential	Yard	12	18	A	01/26/15	44.17
W of 402 SW Walnut	Alley		0	6	B	01/26/15	82.79
W of 402 SW Walnut	Alley		6	12	B	01/26/15	168.22
W of 402 SW Walnut	Alley		12	18	B	01/26/15	158.20
402 SW Walnut	Ditch	Bottom	0	6	B	01/26/15	135.56
402 SW Walnut	Ditch	Bottom	6	12	B	01/26/15	191.81
402 SW Walnut	Ditch	Bottom	12	18	B	01/26/15	225.35
416 N Maple	Residential	Daycare	0	6	C	01/26/15	428.99
416 N Maple	Residential	Daycare	6	12	C	01/26/15	203.62
416 N Maple	Residential	Daycare	12	18	C	01/26/15	151.18
416 N Maple	Residential	Daycare	0	6	C	01/26/15	236.17
416 N Maple	Residential	Daycare	6	12	C	01/26/15	165.69
416 N Maple	Residential	Daycare	12	18	C	01/26/15	103.96
416 N Maple	Residential	Daycare	0	6	C	01/26/15	173.36
416 N Maple	Residential	Daycare	6	12	C	01/26/15	162.42
416 N Maple	Residential	Daycare	12	18	C	01/26/15	92.55
416 N Maple	Residential	Daycare	0	6	C	01/26/15	641.90

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
416 N Maple	Residential	Daycare	6	12	C	01/26/15	149.05
416 N Maple	Residential	Daycare	12	18	C	01/26/15	144.52
431 W Independence	Residential	Yard	0	6	B	01/26/15	354.88
431 W Independence	Residential	Yard	6	12	B	01/26/15	250.16
431 W Independence	Residential	Yard	12	18	B	01/26/15	80.84
431 W Independence	Residential	Yard	0	6	B	01/26/15	592.62
431 W Independence	Residential	Yard	6	12	B	01/26/15	248.93
431 W Independence	Residential	Yard	12	18	B	01/26/15	158.52
431 W Independence	Residential	Play Area	0	6	B	01/26/15	76.86
431 W Independence	Residential	Play Area	6	12	B	01/26/15	103.70
431 W Independence	Residential	Play Area	12	18	B	01/26/15	120.14
500 W 1st	Residential	Play Area	0	6	D	01/26/15	101.73
500 W 1st	Residential	Play Area	6	12	D	01/26/15	97.48
500 W 1st	Residential	Play Area	12	18	D	01/26/15	167.54
500 W 1st	Residential	Yard	0	6	D	01/26/15	663.87
500 W 1st	Residential	Yard	6	12	D	01/26/15	143.03
500 W 1st	Residential	Yard	12	18	D	01/26/15	82.92
500 W 1st	Ditch	Bottom	0	6	B	01/26/15	720.22
500 W 1st	Ditch	Bottom	6	12	B	01/26/15	337.64
500 W 1st	Ditch	Bottom	12	18	B	01/26/15	274.40
509 E 10th	Residential	Daycare	0	6	D	01/26/15	248.38
509 E 10th	Residential	Daycare	6	12	D	01/26/15	111.72
509 E 10th	Residential	Daycare	12	18	D	01/26/15	43.91
509 E 10th	Residential	Daycare	0	6	D	01/26/15	116.89
509 E 10th	Residential	Daycare	6	12	D	01/26/15	226.87
509 E 10th	Residential	Daycare	12	18	D	01/26/15	215.58
516 W 3rd	Residential	Yard	0	6	B	01/26/15	212.19
516 W 3rd	Residential	Yard	6	12	B	01/26/15	332.84
516 W 3rd	Residential	Yard	12	18	B	01/26/15	200.58
516 W 3rd	Residential	Yard	0	6	B	01/26/15	169.15
516 W 3rd	Residential	Yard	6	12	B	01/26/15	437.61
516 W 3rd	Residential	Yard	12	18	B	01/26/15	257.57
516 W 3rd	Residential	Yard	0	6	B	01/26/15	171.23
516 W 3rd	Residential	Yard	6	12	B	01/26/15	468.90
516 W 3rd	Residential	Yard	12	18	B	01/26/15	215.98
516 W 3rd	Residential	Yard	0	6	B	01/26/15	422.10
516 W 3rd	Residential	Yard	6	12	B	01/26/15	270.10
516 W 3rd	Residential	Yard	12	18	B	01/26/15	87.89
516 W 3rd	Alley	Gradient	0	6	A	01/26/15	511.05
516 W 3rd	Alley	Gradient	6	12	A	01/26/15	622.19
516 W 3rd	Alley	Gradient	12	18	A	01/26/15	264.37
516 W 3rd	Alley	Gradient	0	6	A	01/26/15	368.21
516 W 3rd	Alley	Gradient	6	12	A	01/26/15	555.91
516 W 3rd	Alley	Gradient	12	18	A	01/26/15	324.18
516 W 3rd	Alley	Gradient	0	6	A	01/26/15	242.52
516 W 3rd	Alley	Gradient	6	12	A	01/26/15	312.66
516 W 3rd	Alley	Gradient	12	18	A	01/26/15	5235.57
516 W 3rd	Residential	Garden	0	6	B	01/26/15	631.18
516 W 3rd	Residential	Garden	6	12	B	01/26/15	556.98

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
516 W 3rd	Residential	Garden	12	18	B	01/26/15	414.10
516 W 3rd	Residential	Garden	0	6	B	01/26/15	417.43
516 W 3rd	Residential	Garden	6	12	B	01/26/15	517.13
516 W 3rd	Residential	Garden	12	18	B	01/26/15	360.42
516 W 3rd	Residential	Garden	0	6	B	01/26/15	421.33
516 W 3rd	Residential	Garden	6	12	B	01/26/15	289.39
516 W 3rd	Residential	Garden	12	18	B	01/26/15	278.12
516 W 3rd	Residential	Play Area	0	6	B	01/26/15	342.90
516 W 3rd	Residential	Play Area	6	12	B	01/26/15	191.27
516 W 3rd	Residential	Play Area	12	18	B	01/26/15	57.75
519 N Neosho	Residential	Yard	0	6	D	01/26/15	213.40
519 N Neosho	Residential	Yard	6	12	D	01/26/15	115.60
519 N Neosho	Residential	Yard	12	18	D	01/26/15	79.71
519 N Neosho	Residential	Yard	0	6	D	01/26/15	213.39
519 N Neosho	Residential	Yard	6	12	D	01/26/15	85.72
519 N Neosho	Residential	Yard	12	18	D	01/26/15	80.84
519 N Neosho	Residential	Yard	0	6	D	01/26/15	253.89
519 N Neosho	Residential	Yard	6	12	D	01/26/15	218.53
519 N Neosho	Residential	Yard	12	18	D	01/26/15	125.26
519 N Neosho	Residential	Yard	0	6	D	01/26/15	244.21
519 N Neosho	Residential	Yard	6	12	D	01/26/15	138.45
519 N Neosho	Residential	Yard	12	18	D	01/26/15	65.05
519 N Neosho	Sidewalk	Gradient	0	6	D	01/26/15	255.39
519 N Neosho	Sidewalk	Gradient	6	12	D	01/26/15	254.76
519 N Neosho	Sidewalk	Gradient	12	18	D	01/26/15	42.80
519 N Neosho	Sidewalk	Gradient	0	6	D	01/26/15	253.36
519 N Neosho	Sidewalk	Gradient	6	12	D	01/26/15	108.14
519 N Neosho	Sidewalk	Gradient	12	18	D	01/26/15	89.12
519 N Neosho	Sidewalk	Gradient	0	6	D	01/26/15	200.26
519 N Neosho	Sidewalk	Gradient	6	12	D	01/26/15	70.87
519 N Neosho	Sidewalk	Gradient	12	18	D	01/26/15	31.52
529 W 1st	Residential	Daycare	0	6	C	01/26/15	331.45
529 W 1st	Residential	Daycare	6	12	C	01/26/15	239.80
529 W 1st	Residential	Daycare	12	18	C	01/26/15	84.52
529 W 1st	Residential	Daycare	0	6	C	01/26/15	535.07
529 W 1st	Residential	Daycare	6	12	C	01/26/15	274.08
529 W 1st	Residential	Daycare	12	18	C	01/26/15	81.01
529 W 1st	Residential	Daycare	0	6	C	01/26/15	1495.51
529 W 1st	Residential	Daycare	6	12	C	01/26/15	583.64
529 W 1st	Residential	Daycare	12	18	C	01/26/15	187.38
529 W 1st	Ditch	Gradient	0	6	D	01/26/15	1228.20
529 W 1st	Ditch	Gradient	6	12	D	01/26/15	772.30
529 W 1st	Ditch	Gradient	12	18	D	01/26/15	207.40
529 W 1st	Ditch	Gradient	0	6	D	01/26/15	1021.17
529 W 1st	Ditch	Gradient	6	12	D	01/26/15	590.68
529 W 1st	Ditch	Gradient	12	18	D	01/26/15	148.96
529 W 1st	Ditch	Gradient	0	6	D	01/26/15	1109.95
529 W 1st	Ditch	Gradient	6	12	D	01/26/15	242.05
529 W 1st	Ditch	Gradient	12	18	D	01/26/15	253.75

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
529 W 1st	Ditch	Gradient	0	6	D	01/26/15	1104.21
529 W 1st	Ditch	Gradient	6	12	D	01/26/15	1540.58
529 W 1st	Ditch	Gradient	12	18	D	01/26/15	527.04
505 E 10th	Residential	Yard	0	6	B	01/27/15	198.54
505 E 10th	Residential	Yard	6	12	B	01/27/15	130.96
505 E 10th	Residential	Yard	12	18	B	01/27/15	61.57
505 E 10th	Residential	Yard	0	6	B	01/27/15	305.73
505 E 10th	Residential	Yard	6	12	B	01/27/15	196.26
505 E 10th	Residential	Yard	12	18	B	01/27/15	148.28
505 E 10th	Residential	Yard	0	6	B	01/27/15	283.36
505 E 10th	Residential	Yard	6	12	B	01/27/15	275.78
505 E 10th	Residential	Yard	12	18	B	01/27/15	172.08
505 E 10th	Ditch	Sidewall	0	6	A	01/27/15	272.60
505 E 10th	Ditch	Sidewall	6	12	A	01/27/15	193.81
505 E 10th	Ditch	Sidewall	12	18	A	01/27/15	327.18
505 E 10th	Ditch	Bottom	0	6	A	01/27/15	301.34
505 E 10th	Ditch	Bottom	6	12	A	01/27/15	419.10
505 E 10th	Ditch	Bottom	12	18	A	01/27/15	474.18
600 E Main	Sidewalk	Gradient	0	6	D	01/27/15	359.63
600 E Main	Sidewalk	Gradient	6	12	D	01/27/15	170.48
600 E Main	Sidewalk	Gradient	12	18	D	01/27/15	103.97
600 E Main	Sidewalk	Gradient	0	6	D	01/27/15	267.24
600 E Main	Sidewalk	Gradient	6	12	D	01/27/15	128.77
600 E Main	Sidewalk	Gradient	12	18	D	01/27/15	66.90
600 E Main	Sidewalk	Gradient	0	6	D	01/27/15	165.70
600 E Main	Sidewalk	Gradient	6	12	D	01/27/15	73.81
600 E Main	Sidewalk	Gradient	12	18	D	01/27/15	53.09
600 W Main	Sidewalk	Gradient	0	6	D	01/27/15	240.93
600 W Main	Sidewalk	Gradient	6	12	D	01/27/15	363.08
600 W Main	Sidewalk	Gradient	12	18	D	01/27/15	95.67
600 W Main	Sidewalk	Gradient	0	6	D	01/27/15	101.16
600 W Main	Sidewalk	Gradient	6	12	D	01/27/15	336.50
600 W Main	Sidewalk	Gradient	12	18	D	01/27/15	319.42
600 W Main	Sidewalk	Gradient	0	6	D	01/27/15	108.76
600 W Main	Sidewalk	Gradient	6	12	D	01/27/15	135.67
600 W Main	Sidewalk	Gradient	12	18	D	01/27/15	88.33
603 E 4th	Residential	Yard	0	6	B-Fill	01/27/15	494.35
603 E 4th	Residential	Yard	6	12	B-Fill	01/27/15	193.93
603 E 4th	Residential	Yard	12	18	B-Fill	01/27/15	192.21
603 E 4th	Residential	Yard	0	6	B-Fill	01/27/15	572.98
603 E 4th	Residential	Yard	6	12	B-Fill	01/27/15	243.26
603 E 4th	Residential	Yard	12	18	B-Fill	01/27/15	199.45
603 E 4th	Residential	Yard	0	6	B-Fill	01/27/15	308.20
603 E 4th	Residential	Yard	6	12	B-Fill	01/27/15	868.60
603 E 4th	Residential	Yard	12	18	B-Fill	01/27/15	297.20
603 E 4th	Sidewalk	Gradient	0	6	B	01/27/15	238.14
603 E 4th	Sidewalk	Gradient	6	12	B	01/27/15	93.94
603 E 4th	Sidewalk	Gradient	12	18	B	01/27/15	109.30
603 E 4th	Sidewalk	Gradient	0	6	B	01/27/15	268.09

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
603 E 4th	Sidewalk	Gradient	6	12	B	01/27/15	113.49
603 E 4th	Sidewalk	Gradient	12	18	B	01/27/15	99.74
603 E 4th	Sidewalk	Gradient	0	6	B	01/27/15	259.92
603 E 4th	Sidewalk	Gradient	6	12	B	01/27/15	131.74
603 E 4th	Sidewalk	Gradient	12	18	B	01/27/15	101.34
613 E 3rd	Residential	Yard	0	6	C	01/27/15	249.52
613 E 3rd	Residential	Yard	6	12	C	01/27/15	109.11
613 E 3rd	Residential	Yard	12	18	C	01/27/15	107.41
613 E 3rd	Residential	Yard	0	6	C	01/27/15	611.96
613 E 3rd	Residential	Yard	6	12	C	01/27/15	461.18
613 E 3rd	Residential	Yard	12	18	C	01/27/15	188.54
620 N Labette	Residential	Yard	0	6	B	01/27/15	793.32
620 N Labette	Residential	Yard	6	12	B	01/27/15	458.46
620 N Labette	Residential	Yard	12	18	B	01/27/15	192.04
620 N Labette	Residential	Yard	0	6	B	01/27/15	460.20
620 N Labette	Residential	Yard	6	12	B	01/27/15	333.96
620 N Labette	Residential	Yard	12	18	B	01/27/15	204.84
620 N Labette	Residential	Garden	0	6	B	01/27/15	392.47
620 N Labette	Residential	Garden	6	12	B	01/27/15	376.06
620 N Labette	Residential	Garden	12	18	B	01/27/15	394.09
620 N Labette	Residential	Garden	0	6	B	01/27/15	369.14
620 N Labette	Residential	Garden	6	12	B	01/27/15	540.21
620 N Labette	Residential	Garden	12	18	B	01/27/15	231.04
620 W 3rd	Residential	Yard	0	6	C	01/27/15	285.10
620 W 3rd	Residential	Yard	6	12	C	01/27/15	483.86
620 W 3rd	Residential	Yard	12	18	C	01/27/15	223.04
620 W 3rd	Residential	Yard	0	6	C	01/27/15	251.29
620 W 3rd	Residential	Yard	6	12	C	01/27/15	306.47
620 W 3rd	Residential	Yard	12	18	C	01/27/15	131.58
620 W 3rd	Residential	Yard	0	6	C	01/27/15	238.38
620 W 3rd	Residential	Yard	6	12	C	01/27/15	195.15
620 W 3rd	Residential	Yard	12	18	C	01/27/15	96.32
620 W 3rd	Residential	Yard	0	6	C	01/27/15	453.85
620 W 3rd	Residential	Yard	6	12	C	01/27/15	237.99
620 W 3rd	Residential	Yard	12	18	C	01/27/15	133.14
E 1st Park	Park		0	6	B	01/27/15	1016.86
E 1st Park	Park		6	12	B	01/27/15	779.82
E 1st Park	Park		12	18	B	01/27/15	152.52
E 1st Park	Park		0	6	B	01/27/15	2466.43
E 1st Park	Park		6	12	B	01/27/15	3884.63
E 1st Park	Park		12	18	B	01/27/15	3399.95
714 E 7th	Ditch	Bottom	0	6	A	01/27/15	1626.29
714 E 7th	Ditch	Bottom	6	12	A	01/27/15	843.54
714 E 7th	Ditch	Bottom	12	18	A	01/27/15	392.93
725 W Main	Residential	Yard	0	6	B	01/27/15	100.56
725 W Main	Residential	Yard	6	12	B	01/27/15	132.36
725 W Main	Residential	Yard	12	18	B	01/27/15	91.66
725 W Main	Residential	Yard	0	6	B	01/27/15	144.87
725 W Main	Residential	Yard	6	12	B	01/27/15	165.81

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
725 W Main	Residential	Yard	12	18	B	01/27/15	176.44
735 E 2nd	Ditch	Bottom	0	6	A	01/27/15	222.91
735 E 2nd	Ditch	Bottom	6	12	A	01/27/15	125.70
735 E 2nd	Ditch	Bottom	12	18	A	01/27/15	230.62
735 W Main	Residential	Yard	0	6	C	01/27/15	122.73
735 W Main	Residential	Yard	6	12	C	01/27/15	169.23
735 W Main	Residential	Yard	12	18	C	01/27/15	398.56
735 W Main	Residential	Yard	0	6	C	01/27/15	142.06
735 W Main	Residential	Yard	6	12	C	01/27/15	138.14
735 W Main	Residential	Yard	12	18	C	01/27/15	151.41
735 W Main	Ditch	Bottom	0	6	A	01/27/15	211.13
735 W Main	Ditch	Bottom	6	12	A	01/27/15	236.90
735 W Main	Ditch	Bottom	12	18	A	01/27/15	237.17
816 E 8th	Residential	Yard	0	6	B	01/27/15	92.50
816 E 8th	Residential	Yard	6	12	B	01/27/15	87.57
816 E 8th	Residential	Yard	12	18	B	01/27/15	76.77
816 E 8th	Residential	Yard	0	6	B	01/27/15	225.54
816 E 8th	Residential	Yard	6	12	B	01/27/15	171.81
816 E 8th	Residential	Yard	12	18	B	01/27/15	158.08
902 W Main	Residential	Daycare	0	6	B-Fill	01/28/15	309.84
902 W Main	Residential	Daycare	6	12	B-Fill	01/28/15	221.92
902 W Main	Residential	Daycare	12	18	B-Fill	01/28/15	45.67
902 W Main	Residential	Daycare	0	6	B-Fill	01/28/15	1174.81
902 W Main	Residential	Daycare	6	12	B-Fill	01/28/15	744.27
902 W Main	Residential	Daycare	12	18	B-Fill	01/28/15	160.15
902 W Main	Residential	Daycare	0	6	B-Fill	01/28/15	364.43
902 W Main	Residential	Daycare	6	12	B-Fill	01/28/15	128.24
902 W Main	Residential	Daycare	12	18	B-Fill	01/28/15	60.37
902 W Main	Residential	Daycare	0	6	B-Fill	01/28/15	344.87
902 W Main	Residential	Daycare	6	12	B-Fill	01/28/15	233.83
902 W Main	Residential	Daycare	12	18	B-Fill	01/28/15	156.42
Park W at Commercial	Alley	Gradient	0	6	A	01/28/15	145.51
Park W at Commercial	Alley	Gradient	6	12	A	01/28/15	60.84
Park W at Commercial	Alley	Gradient	12	18	A	01/28/15	40.30
Park W at Commercial	Alley	Gradient	0	6	A	01/28/15	191.82
Park W at Commercial	Alley	Gradient	6	12	A	01/28/15	75.42
Park W at Commercial	Alley	Gradient	12	18	A	01/28/15	48.35
Park W at Commercial	Alley	Gradient	0	6	A	01/28/15	157.78
Park W at Commercial	Alley	Gradient	6	12	A	01/28/15	138.59
Park W at Commercial	Alley	Gradient	12	18	A	01/28/15	123.52
Park W at Commercial	Ditch	Bottom	0	6	D	01/28/15	38.05
Park W at Commercial	Ditch	Bottom	6	12	D	01/28/15	36.82
Park W at Commercial	Ditch	Bottom	12	18	D	01/28/15	53.21
Park W at Commercial	Alley		0	6	A	01/28/15	397.46
Park W at Commercial	Alley		6	12	A	01/28/15	382.66
Park W at Commercial	Alley		12	18	A	01/28/15	233.83
N of 3rd E of School	Alley		0	6	A	01/28/15	2685.58
N of 3rd E of School	Alley		6	12	A	01/28/15	366.19
N of 3rd E of School	Alley		12	18	A	01/28/15	132.73

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
N of 3rd E of School	Alley		0	6	A	01/28/15	16297.44
N of 3rd E of School	Alley		6	12	A	01/28/15	6246.39
N of 3rd E of School	Alley		12	18	A	01/28/15	967.54
N of 1st E of School	Alley		0	6	C	01/28/15	158.05
N of 1st E of School	Alley		6	12	C	01/28/15	202.07
N of 1st E of School	Alley		12	18	C	01/28/15	89.41
N of 5th E of Carson	Alley		0	6	C	01/28/15	233.86
N of 5th E of Carson	Alley		6	12	C	01/28/15	167.22
N of 5th E of Carson	Alley		12	18	C	01/28/15	96.76
N of 4th E of Liberty	Alley		0	6	A	01/28/15	1271.23
N of 4th E of Liberty	Alley		6	12	A	01/28/15	1591.33
N of 4th E of Liberty	Alley		12	18	A	01/28/15	3357.34
N of Front E of School	Alley		0	6	D	01/28/15	1109.97
N of Front E of School	Alley		6	12	D	01/28/15	476.57
N of Front E of School	Alley		12	18	D	01/28/15	468.80
N of 4th E of Oak	Alley		0	6	B	01/28/15	131.37
N of 4th E of Oak	Alley		6	12	B	01/28/15	306.47
N of 4th E of Oak	Alley		12	18	B	01/28/15	323.10
N of Main E of Summit	Alley		0	6	C	01/28/15	395.30
N of Main E of Summit	Alley		6	12	C	01/28/15	937.28
N of Main E of Summit	Alley		12	18	C	01/28/15	89.83
N of Main W of Olive	Alley		0	6	B	01/28/15	256.39
N of Main W of Olive	Alley		6	12	B	01/28/15	89.38
N of Main W of Olive	Alley		12	18	B	01/28/15	72.57
S Galveston Ball Field	Ball Field		0	6	C	01/29/15	57.57
S Galveston Ball Field	Ball Field		6	12	C	01/29/15	57.20
S Galveston Ball Field	Ball Field		12	18	C	01/29/15	30.18
S Galveston Ball Field	Ball Field		0	6	C	01/29/15	38.87
S Galveston Ball Field	Ball Field		6	12	C	01/29/15	36.38
S Galveston Ball Field	Ball Field		12	18	C	01/29/15	--
S Galveston Ball Field	Ball Field		0	6	C	01/29/15	40.08
S Galveston Ball Field	Ball Field		6	12	C	01/29/15	34.23
S Galveston Ball Field	Ball Field		12	18	C	01/29/15	33.83
S Galveston Ball Field	Ball Field		0	6	C	01/29/15	43.20
S Galveston Ball Field	Ball Field		6	12	C	01/29/15	32.22
S Galveston Ball Field	Ball Field		12	18	C	01/29/15	--
S Galveston Ball Field	Ball Field		0	6	C	01/29/15	37.91
S Galveston Ball Field	Ball Field		6	12	C	01/29/15	40.32
S Galveston Ball Field	Ball Field		12	18	C	01/29/15	32.95
S Galveston Ball Field	Ball Field		0	6	C	01/29/15	47.31
S Galveston Ball Field	Ball Field		6	12	C	01/29/15	32.41
S Galveston Ball Field	Ball Field		12	18	C	01/29/15	29.83
S Galveston Ball Field	Ball Field		0	6	C	01/29/15	36.99
S Galveston Ball Field	Ball Field		6	12	C	01/29/15	38.02
S Galveston Ball Field	Ball Field		12	18	C	01/29/15	--
312 W Front	Residential	Yard	0	6	B	01/29/15	385.20
312 W Front	Residential	Yard	6	12	B	01/29/15	332.24
312 W Front	Residential	Yard	12	18	B	01/29/15	153.33
312 W Front	Residential	Yard	0	6	B	01/29/15	312.91

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
312 W Front	Residential	Yard	6	12	B	01/29/15	186.16
312 W Front	Residential	Yard	12	18	B	01/29/15	103.17
312 W Front	Residential	Yard	0	6	B	01/29/15	368.61
312 W Front	Residential	Yard	6	12	B	01/29/15	188.40
312 W Front	Residential	Yard	12	18	B	01/29/15	114.08
Logan Park	Park		0	6	C	01/29/15	121.68
Logan Park	Park		6	12	C	01/29/15	95.71
Logan Park	Park		12	18	C	01/29/15	69.81
Logan Park	Park		0	6	D	01/29/15	44.88
Logan Park	Park		6	12	D	01/29/15	52.86
Logan Park	Park		12	18	D	01/29/15	71.94
Logan Park	Park		0	6	B	01/29/15	180.79
Logan Park	Park		6	12	B	01/29/15	487.87
Logan Park	Park		12	18	B	01/29/15	258.41
N of 3rd E of Maple	Ditch	Bottom	0	6	A	01/29/15	208.72
N of 3rd E of Maple	Ditch	Bottom	6	12	A	01/29/15	152.63
N of 3rd E of Maple	Ditch	Bottom	12	18	A	01/29/15	147.39
Logan Park	Park		0	6	D	01/29/15	177.14
Logan Park	Park		6	12	D	01/29/15	68.95
Logan Park	Park		12	18	D	01/29/15	22.80
Logan Park	Park		0	6	D	01/29/15	210.24
Logan Park	Park		6	12	D	01/29/15	110.81
Logan Park	Park		12	18	D	01/29/15	40.46
Logan Park	Park		0	6	D	01/29/15	150.82
Logan Park	Park		6	12	D	01/29/15	140.48
Logan Park	Park		12	18	D	01/29/15	72.17
Logan Park	Park		0	6	D	01/29/15	243.67
Logan Park	Park		6	12	D	01/29/15	231.44
Logan Park	Park		12	18	D	01/29/15	81.83
Logan Park	Park		0	6	D	01/29/15	306.50
Logan Park	Park		6	12	D	01/29/15	110.69
Logan Park	Park		12	18	D	01/29/15	385.77

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
2702 std						01/28/16	143.97
2702 std						01/28/16	144.27
RCRA std						01/28/16	620.02
RCRA std						01/28/16	609.43
N of 7th E of Walnut G-1-A	Alley	Gradient	0	6	B	01/28/16	73.03
N of 7th E of Walnut G-1-A	Alley	Gradient	0	6	B	01/28/16	88.00
N of 7th E of Walnut G-1-B	Alley	Gradient	6	12	B	01/28/16	84.39
N of 7th E of Walnut G-1-B	Alley	Gradient	6	12	B	01/28/16	86.28
N of 7th E of Walnut G-1-B	Alley	Gradient	6	12	B	01/28/16	25.61
N of 7th E of Walnut G-1-C	Alley	Gradient	12	18	B	01/28/16	51.40
N of 7th E of Walnut G-1-C	Alley	Gradient	12	18	B	01/28/16	52.89
N of 7th E of Walnut G-2-A	Alley	Gradient	0	6	B	01/28/16	112.91
N of 7th E of Walnut G-2-A	Alley	Gradient	0	6	B	01/28/16	87.12
N of 7th E of Walnut G-2-B	Alley	Gradient	6	12	B	01/28/16	120.70
N of 7th E of Walnut G-2-B	Alley	Gradient	6	12	B	01/28/16	129.89
N of 7th E of Walnut G-2-C	Alley	Gradient	12	18	B	01/28/16	93.73
N of 7th E of Walnut G-2-C	Alley	Gradient	12	18	B	01/28/16	76.05
N of 7th E of Walnut G-3-A	Alley	Gradient	0	6	B	01/28/16	52.58
N of 7th E of Walnut G-3-A	Alley	Gradient	0	6	B	01/28/16	75.16
N of 7th E of Walnut G-3-B	Alley	Gradient	6	12	B	01/28/16	78.34
N of 7th E of Walnut G-3-B	Alley	Gradient	6	12	B	01/28/16	72.82
N of 7th E of Walnut G-3-C	Alley	Gradient	12	18	B	01/28/16	32.91
N of 7th E of Walnut G-3-C	Alley	Gradient	12	18	B	01/28/16	28.80
827 E 6th G-1-A	Alley	Gradient	0	6	D	01/28/16	118.54
827 E 6th G-1-A	Alley	Gradient	0	6	D	01/28/16	135.61
827 E 6th G-1-B	Alley	Gradient	6	12	D	01/28/16	261.48
827 E 6th G-1-B	Alley	Gradient	6	12	D	01/28/16	302.57
827 E 6th G-1-C	Alley	Gradient	12	18	D	01/28/16	611.48
827 E 6th G-1-C	Alley	Gradient	12	18	D	01/28/16	485.62
827 E 6th G-2-A	Alley	Gradient	0	6	D	01/28/16	120.15
827 E 6th G-2-A	Alley	Gradient	0	6	D	01/28/16	108.64
827 E 6th G-2-B	Alley	Gradient	6	12	D	01/28/16	736.31
827 E 6th G-2-B	Alley	Gradient	6	12	D	01/28/16	693.86
827 E 6th G-2-C	Alley	Gradient	12	18	D	01/28/16	201.93
827 E 6th G-2-C	Alley	Gradient	12	18	D	01/28/16	474.52
827 E 6th G-3-A	Alley	Gradient	0	6	D	01/28/16	736.16
827 E 6th G-3-A	Alley	Gradient	0	6	D	01/28/16	789.99
827 E 6th G-3-B	Alley	Gradient	6	12	D	01/28/16	655.68
827 E 6th G-3-B	Alley	Gradient	6	12	D	01/28/16	538.51
827 E 6th G-3-C	Alley	Gradient	12	18	D	01/28/16	326.04
827 E 6th G-3-C	Alley	Gradient	12	18	D	01/28/16	697.68
N of Main E of Montgomery G-1-A	Alley	Gradient	0	6	B?	01/28/16	357.98
N of Main E of Montgomery G-1-A	Alley	Gradient	0	6	B?	01/28/16	345.45
N of Main E of Montgomery G-1-B	Alley	Gradient	6	12	B?	01/28/16	260.12
N of Main E of Montgomery G-1-B	Alley	Gradient	6	12	B?	01/28/16	247.97
N of Main E of Montgomery G-1-C	Alley	Gradient	12	18	B?	01/28/16	296.60
N of Main E of Montgomery G-1-C	Alley	Gradient	12	18	B?	01/28/16	210.85
N of Main E of Montgomery G-2-A	Alley	Gradient	0	6	B?	01/28/16	564.82
N of Main E of Montgomery G-2-A	Alley	Gradient	0	6	B?	01/28/16	467.42

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
N of Main E of Montgomery G-2-B	Alley	Gradient	6	12	B?	01/28/16	405.52
N of Main E of Montgomery G-2-B	Alley	Gradient	6	12	B?	01/28/16	468.29
N of Main E of Montgomery G-2-C	Alley	Gradient	12	18	B?	01/28/16	220.45
N of Main E of Montgomery G-2-C	Alley	Gradient	12	18	B?	01/28/16	257.67
N of Main E of Montgomery G-3-A	Alley	Gradient	0	6	B?	01/28/16	687.06
N of Main E of Montgomery G-3-A	Alley	Gradient	0	6	B?	01/28/16	593.00
N of Main E of Montgomery G-3-B	Alley	Gradient	6	12	B?	01/28/16	397.27
N of Main E of Montgomery G-3-B	Alley	Gradient	6	12	B?	01/28/16	297.49
N of Main E of Montgomery G-3-C	Alley	Gradient	12	18	B?	01/28/16	100.01
N of Main E of Montgomery G-3-C	Alley	Gradient	12	18	B?	01/28/16	90.46
419 E 3rd G-1-A	Alley	Gradient	0	6	B	01/28/16	332.53
419 E 3rd G-1-A	Alley	Gradient	0	6	B	01/28/16	325.59
419 E 3rd G-1-B	Alley	Gradient	6	12	B	01/28/16	310.17
419 E 3rd G-1-B	Alley	Gradient	6	12	B	01/28/16	443.01
419 E 3rd G-1-C	Alley	Gradient	12	18	B	01/28/16	198.51
419 E 3rd G-1-C	Alley	Gradient	12	18	B	01/28/16	189.84
419 E 3rd G-2-A	Alley	Gradient	0	6	B	01/28/16	300.56
419 E 3rd G-2-A	Alley	Gradient	0	6	B	01/28/16	255.04
419 E 3rd G-2-B	Alley	Gradient	6	12	B	01/28/16	539.03
419 E 3rd G-2-B	Alley	Gradient	6	12	B	01/28/16	232.42
419 E 3rd G-2-C	Alley	Gradient	12	18	B	01/28/16	292.65
419 E 3rd G-2-C	Alley	Gradient	12	18	B	01/28/16	287.50
419 E 3rd G-3-A	Alley	Gradient	0	6	B	01/28/16	221.08
419 E 3rd G-3-A	Alley	Gradient	0	6	B	01/28/16	315.18
419 E 3rd G-3-B	Alley	Gradient	6	12	B	01/28/16	375.92
419 E 3rd G-3-B	Alley	Gradient	6	12	B	01/28/16	378.47
419 E 3rd G-3-C	Alley	Gradient	12	18	B	01/28/16	189.27
419 E 3rd G-3-C	Alley	Gradient	12	18	B	01/28/16	132.11
N of 5th E of Montgomery G-1-A	Alley	Gradient	0	6	B	01/28/16	297.77
N of 5th E of Montgomery G-1-A	Alley	Gradient	0	6	B	01/28/16	284.67
N of 5th E of Montgomery G-1-B	Alley	Gradient	6	12	B	01/28/16	283.47
N of 5th E of Montgomery G-1-B	Alley	Gradient	6	12	B	01/28/16	212.50
N of 5th E of Montgomery G-1-C	Alley	Gradient	12	18	B	01/28/16	93.60
N of 5th E of Montgomery G-1-C	Alley	Gradient	12	18	B	01/28/16	121.95
N of 5th E of Montgomery G-2-A	Alley	Gradient	0	6	B	01/28/16	455.43
N of 5th E of Montgomery G-2-A	Alley	Gradient	0	6	B	01/28/16	390.60
N of 5th E of Montgomery G-2-B	Alley	Gradient	6	12	B	01/28/16	500.62
N of 5th E of Montgomery G-2-B	Alley	Gradient	6	12	B	01/28/16	610.97
N of 5th E of Montgomery G-2-C	Alley	Gradient	12	18	B	01/28/16	418.42
N of 5th E of Montgomery G-2-C	Alley	Gradient	12	18	B	01/28/16	489.05
N of 5th E of Montgomery G-3-A	Alley	Gradient	0	6	B	01/28/16	542.91
N of 5th E of Montgomery G-3-A	Alley	Gradient	0	6	B	01/28/16	511.81
N of 5th E of Montgomery G-3-B	Alley	Gradient	6	12	B	01/28/16	401.64
N of 5th E of Montgomery G-3-B	Alley	Gradient	6	12	B	01/28/16	405.92
N of 5th E of Montgomery G-3-C	Alley	Gradient	12	18	B	01/28/16	666.55
N of 5th E of Montgomery G-3-C	Alley	Gradient	12	18	B	01/28/16	231.54
0 E 4th G-1-A	Alley	Gradient	0	6	?	01/28/16	258.44
0 E 4th G-1-A	Alley	Gradient	0	6	?	01/28/16	245.78
0 E 4th G-1-B	Alley	Gradient	6	12	?	01/28/16	87.22

Physical Address	Sample Type	Subtype	Upper Depth (inches)	Lower Depth (inches)	SRM Class	Sample date	Lead
0 E 4th G-1-B	Alley	Gradient	6	12	?	01/28/16	83.83
0 E 4th G-1-C	Alley	Gradient	12	18	?	01/28/16	73.06
0 E 4th G-1-C	Alley	Gradient	12	18	?	01/28/16	58.27
0 E 4th G-2-A	Alley	Gradient	0	6	?	01/28/16	770.30
0 E 4th G-2-A	Alley	Gradient	0	6	?	01/28/16	429.65
0 E 4th G-2-B	Alley	Gradient	6	12	?	01/28/16	561.75
0 E 4th G-2-B	Alley	Gradient	6	12	?	01/28/16	1077.14
0 E 4th G-2-C	Alley	Gradient	12	18	?	01/28/16	202.32
0 E 4th G-2-C	Alley	Gradient	12	18	?	01/28/16	249.72
0 E 4th G-3-A	Alley	Gradient	0	6	?	01/28/16	149.85
0 E 4th G-3-A	Alley	Gradient	0	6	?	01/28/16	302.76
0 E 4th G-3-B	Alley	Gradient	6	12	?	01/28/16	248.30
0 E 4th G-3-B	Alley	Gradient	6	12	?	01/28/16	257.43
0 E 4th G-3-C	Alley	Gradient	12	18	?	01/28/16	94.67
0 E 4th G-3-C	Alley	Gradient	12	18	?	01/28/16	89.60
2702 std						01/28/16	126.91
2702 std						01/28/16	132.08
RCRA std						01/28/16	547.05
RCRA std						01/28/16	561.61

Note:

-- - not sampled

Appendix B

Laboratory Reports

C3-063-00026 (3)

Kansas Health & Environmental Laboratories
6810 SE Dwight Street
Topeka, KS 66620
Phone (785) 296-1620
Fax (785) 296-1641

Kansas Department of Health and Environment
Health and Environmental Laboratories

ANALYTICAL RESULTS

Submitter: BER Remedial Section

Report to: Ryan Weiser
BER Remedial Section
1000 SW Jackson Suite 410
Topeka, KS 66612

Client ID: BER001
State ID:

Location Code: C3-063-00026
Location Desc: National Zinc Site

Collector: Holly Burke

Lab ID:	**227998**	Matrix:	Soil
Sample ID:	**416 N. Maple DC 2A**	Date Collected:	11/6/2014 11:04
Description	**1104**	Date Received:	11/7/2014 10:13

Parameters	Results	Units	RDL	DF	Prep	By	Analyzed	By	Qual	RegLmt
Comments										
AMENDED REPORT:: Zn values were added to report. BLS 12/3/14.										
Analysis Desc: Percent Solids			Preparation Method: Percent Solids							
			Analytical Method: Percent Solids							
Percent Solids	94	%		1	11/20/2014 13:01	EAP	11/20/2014 13:01	EAP		
Metals by EPA 200.7										
Analysis Desc: EPA 6010			Analytical Method: EPA 6010							
Zinc	2000	mg/kg	0.50	1			11/24/2014 14:07	EAP		
Metals by EPA 6010										
Analysis Desc: EPA 6010			Preparation Method: Percent Solids							
			Analytical Method: EPA 6010							
Arsenic	21	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:08	EAP		
Barium	160	mg/kg	2.0	1	11/20/2014 13:01	EAP	11/24/2014 14:08	EAP		
Cadmium	8.9	mg/kg	0.50	1	11/20/2014 13:01	EAP	11/24/2014 14:08	EAP		
Chromium	25	mg/kg	1.0	1	11/20/2014 13:01	EAP	11/24/2014 14:08	EAP		
Lead	240	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:08	EAP		
Selenium	<5.0	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:08	EAP		
Silver	1.1	mg/kg	1.0	1	11/20/2014 13:01	EAP	11/24/2014 14:08	EAP		

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Kansas Health & Environmental Laboratories
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Phone (785) 296-1620
Fax (785) 296-1641

ANALYTICAL RESULTS

Submitter: BER Remedial Section

Report to: Ryan Weiser
BER Remedial Section
1000 SW Jackson Suite 410
Topeka, KS 66612

Client ID: BER001
State ID:

Location Code: C3-063-00026
Location Desc: National Zinc Site

Collector: Holly Burke

Lab ID:	**227999**	Matrix:	Soil
Sample ID:	**219 W. 1st 1A**	Date Collected:	11/6/2014 11:07
Description	**1107**	Date Received:	11/7/2014 10:13

Parameters	Results	Units	RDL	DF	Prep	By	Analyzed	By	Qual	RegLmt
Comments										
AMENDED REPORT:: Zn values were added to report. BLS 12/3/14.										
Analysis Desc: Percent Solids			Preparation Method: Percent Solids							
			Analytical Method: Percent Solids							
Percent Solids	81	%		1	11/20/2014 13:01	EAP	11/20/2014 13:01	EAP		
Metals by EPA 200.7										
Analysis Desc: EPA 6010			Analytical Method: EPA 6010							
Zinc	23000	mg/kg	0.50	1			11/24/2014 14:19	EAP		
Metals by EPA 6010										
Analysis Desc: EPA 6010			Preparation Method: Percent Solids							
			Analytical Method: EPA 6010							
Arsenic	31	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:20	EAP		
Barium	1100	mg/kg	2.0	1	11/20/2014 13:01	EAP	11/24/2014 14:20	EAP		
Cadmium	37	mg/kg	0.50	1	11/20/2014 13:01	EAP	11/24/2014 14:20	EAP		
Chromium	49	mg/kg	1.0	1	11/20/2014 13:01	EAP	11/24/2014 14:20	EAP		
Lead	4900	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:20	EAP		
Selenium	<5.0	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:20	EAP		
Silver	<1.0	mg/kg	1.0	1	11/20/2014 13:01	EAP	11/24/2014 14:20	EAP		

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ANALYTICAL RESULTS

Submitter: BER Remedial Section

Report to: Ryan Weiser
BER Remedial Section
1000 SW Jackson Suite 410
Topeka, KS 66612

Client ID: BER001
State ID:

Location Code: C3-063-00026
Collector: Holly Burke
Location Desc: National Zinc Site

Lab ID:	**228000**	Matrix:	Soil
Sample ID:	**000 E. 1st (Park) 2A**	Date Collected:	11/6/2014 11:10
Description	**1110**	Date Received:	11/7/2014 10:13

Parameters	Results	Units	RDL	DF	Prep	By	Analyzed	By	Qual	RegLmt
Comments										
AMENDED REPORT:: Zn values were added to report. BLS 12/3/14.										
Analysis Desc: Percent Solids			Preparation Method: Percent Solids							
			Analytical Method: Percent Solids							
Percent Solids	93	%		1	11/20/2014 13:01	EAP	11/20/2014 13:01	EAP		
Metals by EPA 200.7										
Analysis Desc: EPA 6010			Analytical Method: EPA 6010							
Zinc	25000	mg/kg	0.50	1			11/24/2014 14:24	EAP		
Metals by EPA 6010										
Analysis Desc: EPA 6010			Preparation Method: Percent Solids							
			Analytical Method: EPA 6010							
Arsenic	37	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:26	EAP		
Barium	700	mg/kg	2.0	1	11/20/2014 13:01	EAP	11/24/2014 14:26	EAP		
Cadmium	44	mg/kg	0.50	1	11/20/2014 13:01	EAP	11/24/2014 14:26	EAP		
Chromium	28	mg/kg	1.0	1	11/20/2014 13:01	EAP	11/24/2014 14:26	EAP		
Lead	1600	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:26	EAP		
Selenium	<5.0	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:26	EAP		
Silver	2.1	mg/kg	1.0	1	11/20/2014 13:01	EAP	11/24/2014 14:26	EAP		

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ANALYTICAL RESULTS

Submitter: BER Remedial Section

Report to: Ryan Weiser
BER Remedial Section
1000 SW Jackson Suite 410
Topeka, KS 66612

Client ID: BER001
State ID:

Location Code: C3-063-00026
Location Desc: National Zinc Site

Collector: Holly Burke

Lab ID:	**228001**	Matrix:	Soil
Sample ID:	**W. 3rd/N. School Alley A**	Date Collected:	11/6/2014 11:15
Description	**1115**	Date Received:	11/7/2014 10:13

Parameters	Results	Units	RDL	DF	Prep	By	Analyzed	By	Qual	RegLmt
Comments										
AMENDED REPORT:: Zn values were added to report. BLS 12/3/14.										
Analysis Desc: Percent Solids			Preparation Method: Percent Solids							
			Analytical Method: Percent Solids							
Percent Solids	85	%		1	11/20/2014 13:01	EAP	11/20/2014 13:01	EAP		
Metals by EPA 200.7										
Analysis Desc: EPA 6010			Analytical Method: EPA 6010							
Zinc	17000	mg/kg	0.50	1			11/24/2014 14:31	EAP		
Metals by EPA 6010										
Analysis Desc: EPA 6010			Preparation Method: Percent Solids							
			Analytical Method: EPA 6010							
Arsenic	39	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:32	EAP		
Barium	370	mg/kg	2.0	1	11/20/2014 13:01	EAP	11/24/2014 14:32	EAP		
Cadmium	62	mg/kg	0.50	1	11/20/2014 13:01	EAP	11/24/2014 14:32	EAP		
Chromium	35	mg/kg	1.0	1	11/20/2014 13:01	EAP	11/24/2014 14:32	EAP		
Lead	1900	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:32	EAP		
Selenium	<5.0	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:32	EAP		
Silver	2.6	mg/kg	1.0	1	11/20/2014 13:01	EAP	11/24/2014 14:32	EAP		

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ANALYTICAL RESULTS

Submitter: BER Remedial Section

Report to: Ryan Weiser
BER Remedial Section
1000 SW Jackson Suite 410
Topeka, KS 66612

Client ID: BER001
State ID:

Location Code: C3-063-00026
Location Desc: National Zinc Site

Collector: Holly Burke

Lab ID:	**228002**	Matrix:	Soil
Sample ID:	**714 E. 7th Ditch A**	Date Collected:	11/6/2014 11:17
Description	**1117**	Date Received:	11/7/2014 10:13

Parameters	Results	Units	RDL	DF	Prep	By	Analyzed	By	Qual	RegLmt
Comments										
AMENDED REPORT:: Zn values were added to report. BLS 12/3/14.										
Analysis Desc: Percent Solids			Preparation Method: Percent Solids							
			Analytical Method: Percent Solids							
Percent Solids	86	%		1	11/20/2014 13:01	EAP	11/20/2014 13:01	EAP		
Metals by EPA 200.7										
Analysis Desc: EPA 6010			Analytical Method: EPA 6010							
Zinc	6200	mg/kg	0.50	1			11/24/2014 14:37	EAP		
Metals by EPA 6010										
Analysis Desc: EPA 6010			Preparation Method: Percent Solids							
			Analytical Method: EPA 6010							
Arsenic	47	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:38	EAP		
Barium	400	mg/kg	2.0	1	11/20/2014 13:01	EAP	11/24/2014 14:38	EAP		
Cadmium	9.1	mg/kg	0.50	1	11/20/2014 13:01	EAP	11/24/2014 14:38	EAP		
Chromium	31	mg/kg	1.0	1	11/20/2014 13:01	EAP	11/24/2014 14:38	EAP		
Lead	1800	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:38	EAP		
Selenium	<5.0	mg/kg	5.0	1	11/20/2014 13:01	EAP	11/24/2014 14:38	EAP		
Silver	10	mg/kg	1.0	1	11/20/2014 13:01	EAP	11/24/2014 14:38	EAP		

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Kansas Department of Health and Environment
Health and Environmental Laboratories

Environmental Chain of Custody Form

7374

7374

Additional Report Recipients			
To	Ryan Weiser	To	
Address	1000 SW. Jackson St. 410 Topeka, KS 66612	Address	

Client:	BER001: BER REMEDIAL	Location Name:	National Zinc Site	Notes:	RCRA metals (6010) plus Zinc -No Hg.
Profile:	SITE REMEDIATION	Collector:	Holly Burke		
Location Code:	C3-063-00026	Event Desc:			

Known Hazards			
Flammable		Poison	
Radiological		Other	

Matrix Codes: DW=Drinking Water W=Water WW=Waste Water SO=Soil SL=Solid SD=Sediment

#	Sample ID, Description	Matrix	Collection: Actual Collection Date	Collection: Actual Collection Time	Sample Comments	Analyses: RCRA metals + Zinc (no Hg)	Total number of containers	Field Test Results: Sample Depth	Field Filtered	DO	Temp	pH	Conductivity
1	416 N. Maple DC 2A	SO	11/6/14	11:04		X	1		HSN:227998 SAMPID:416 N. Ma				
2	219 W. 1st 1A	SO	11/6/14	11:07		X	1		HSN:227999 SAMPID:219 W. 1s				
3	000 E. 1st (PARK) 2A	SO	11/6/14	11:10		X	1		HSN:228000 SAMPID:000 E. 1				
4	W. 3rd/N. School Alley A	SO	11/6/14	11:15		X	1		HSN:228001 SAMPID:W. 3rd/N.				
5	714 E. 7th Ditch A	SO	11/6/14	11:17		X	1		HSN:228002 SAMPID:714 E. 7t				

Transfers	Released By	Date/Time	Received By	Date/Time
1	Holly Burke/KDHE BER	11/7/14 9:30am		
2				
3				

Sample Condition			
Received on Ice		Samples Intact	
Y	N	Y	N
Y	N	Y	N
Y	N	Y	N

Receipt
Temperature:

DIV. OF H&E
LABOR. TORIES
2014 NOV -7 AM 10:16

Heather Lucas

CHEMWARE 2001.1.0.0

Pace Analytical Services, Inc.
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Lenexa, KS 66219
(913)599-5665

December 30, 2014

Mark Landress
Project Navigator, Ltd.
10497 Town and Country Way
Suite 830
Houston, TX 77024

RE: Project: NATIONAL ZINC
Pace Project No.: 60184533

Dear Mark Landress:
Enclosed are the analytical results for sample(s) received by the laboratory on December 13, 2014. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Mary Jane Walls for
Jamie Church
jamie.church@pacelabs.com
Project Manager

Enclosures

cc: Philip Jen, Project Navigator, Ltd.

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CERTIFICATIONS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Minnesota Certification IDs
1700 Elm Street SE Suite 200, Minneapolis, MN 55414
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Alabama Certification #40770
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: 8TMS-L
Florida/NELAP Certification #: E87605
Guam Certification #:14-008r
Georgia Certification #: 959
Georgia EPD #: Pace
Idaho Certification #: MN00064
Hawaii Certification #MN00064
Illinois Certification #: 200011
Indiana Certification#C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky Dept of Envi. Protection - DW #90062
Kentucky Dept of Envi. Protection - WW #:90062
Louisiana DEQ Certification #: 3086
Louisiana DHH #: LA140001
Maine Certification #: 2013011
Maryland Certification #: 322
Michigan DEPH Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Carolina State Public Health #: 27700
North Dakota Certification #: R-036
Ohio EPA #: 4150
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Saipan (CNMI) #:MP0003
South Carolina #:74003001
Texas Certification #: T104704192
Tennessee Certification #: 02818
Utah Certification #: MN000642013-4
Virginia DGS Certification #: 251
Virginia/VELAP Certification #: Pace
Washington Certification #: C486
West Virginia Certification #: 382
West Virginia DHHR #:9952C
Wisconsin Certification #: 999407970

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SAMPLE SUMMARY

Project: NATIONAL ZINC
Pace Project No.: 60184533

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60184533001	**600 E MAIN G-2-C**	Solid	12/11/14 16:30	12/13/14 08:10
60184533002	**000 E 1ST PARK 2-A**	Solid	12/11/14 16:35	12/13/14 08:10
60184533003	**334 W FRONT 6-A**	Solid	12/11/14 16:40	12/13/14 08:10
60184533004	**416 N MAPLE 2-A**	Solid	12/11/14 16:45	12/13/14 08:10
60184533005	**519 N NEOSHO DW-A**	Solid	12/11/14 16:50	12/13/14 08:10
60184533006	**714 E 7TH DT-A BO**	Solid	12/11/14 16:55	12/13/14 08:10
60184533007	**219 W 1ST 1-A**	Solid	12/11/14 17:00	12/13/14 08:10
60184533008	**902 W MAIN 2-B**	Solid	12/11/14 17:05	12/13/14 08:10
60184533009	**600 W MAIN G-3-C**	Solid	12/11/14 17:10	12/13/14 08:10
60184533010	**620 W 3RD 4-A**	Solid	12/11/14 17:15	12/13/14 08:10
60184533011	**516 W 3RD 3-A**	Solid	12/11/14 17:20	12/13/14 08:10
60184533012	**W 3RD-N SCHOOL-A**	Solid	12/11/14 17:25	12/13/14 08:10
60184533013	**326 W 4TH 3-B**	Solid	12/11/14 17:30	12/13/14 08:10
60184533014	**603 E 4TH 2-A**	Solid	12/11/14 17:35	12/13/14 08:10
60184533015	**PARK WEST DITCH B**	Solid	12/11/14 17:40	12/13/14 08:10
60184533016	**PARK WEST G-3-A**	Solid	12/11/14 17:45	12/13/14 08:10
60184533017	**117 N NEOSHO 3-C**	Solid	12/11/14 17:50	12/13/14 08:10
60184533018	**305 W 3RD 2-B**	Solid	12/11/14 17:55	12/13/14 08:10
60184533019	**431 W INDY 2-A**	Solid	12/11/14 18:00	12/13/14 08:10
60184533020	**725 W MAIN DW-C**	Solid	12/11/14 18:05	12/13/14 08:10

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SAMPLE ANALYTE COUNT

Project: NATIONAL ZINC
Pace Project No.: 60184533

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60184533001	**600 E MAIN G-2-C**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533002	**000 E 1ST PARK 2-A**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533003	**334 W FRONT 6-A**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533004	**416 N MAPLE 2-A**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533005	**519 N NEOSHO DW-A**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533006	**714 E 7TH DT-A BO**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533007	**219 W 1ST 1-A**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533008	**902 W MAIN 2-B**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533009	**600 W MAIN G-3-C**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533010	**620 W 3RD 4-A**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533011	**516 W 3RD 3-A**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533012	**W 3RD-N SCHOOL-A**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533013	**326 W 4TH 3-B**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533014	**603 E 4TH 2-A**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533015	**PARK WEST DITCH B**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533016	**PARK WEST G-3-A**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533017	**117 N NEOSHO 3-C**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533018	**305 W 3RD 2-B**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60184533019	**431 W INDY 2-A**	EPA 6020	TT3	4	PASI-M

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SAMPLE ANALYTE COUNT

Project: NATIONAL ZINC
Pace Project No.: 60184533

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		ASTM D2974	JDL	1	PASI-M
60184533020	**725 W MAIN DW-C**	EPA 6020	TT3	4	PASI-M
		ASTM D2974	JDL	1	PASI-M

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 600 E MAIN G-2-C **Lab ID: 60184533001** Collected: 12/11/14 16:30 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**7.6**	mg/kg	0.71	20	12/17/14 18:56	12/18/14 11:33	7440-38-2	
Cadmium	**0.82**	mg/kg	0.11	20	12/17/14 18:56	12/18/14 11:33	7440-43-9	
Lead	**49.5**	mg/kg	0.14	20	12/17/14 18:56	12/18/14 11:33	7439-92-1	M6,R1
Zinc	**225**	mg/kg	7.1	20	12/17/14 18:56	12/18/14 11:33	7440-66-6	M6
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**34.9**	%	0.10	1		12/26/14 09:28		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 000 E 1ST PARK 2-A **Lab ID: 60184533002** Collected: 12/11/14 16:35 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**33.5**	mg/kg	0.61	20	12/17/14 18:56	12/18/14 11:52	7440-38-2	
Cadmium	**42.2**	mg/kg	0.098	20	12/17/14 18:56	12/18/14 11:52	7440-43-9	
Lead	**1650**	mg/kg	12.2	2000	12/17/14 18:56	12/18/14 12:08	7439-92-1	
Zinc	**29100**	mg/kg	611	2000	12/17/14 18:56	12/18/14 12:08	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**35.5**	%	0.10	1		12/26/14 09:28		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 334 W FRONT 6-A **Lab ID: 60184533003** Collected: 12/11/14 16:40 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**12.4**	mg/kg	0.51	20	12/17/14 18:56	12/18/14 11:27	7440-38-2	
Cadmium	**7.2**	mg/kg	0.081	20	12/17/14 18:56	12/18/14 11:27	7440-43-9	
Lead	**212**	mg/kg	1.0	200	12/17/14 18:56	12/18/14 12:11	7439-92-1	
Zinc	**1430**	mg/kg	50.9	200	12/17/14 18:56	12/18/14 12:11	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**9.0**	%	0.10	1		12/26/14 09:29		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 416 N MAPLE 2-A **Lab ID: 60184533004** Collected: 12/11/14 16:45 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**15.2**	mg/kg	0.48	20	12/17/14 18:56	12/18/14 11:30	7440-38-2	
Cadmium	**8.4**	mg/kg	0.077	20	12/17/14 18:56	12/18/14 11:30	7440-43-9	
Lead	**253**	mg/kg	0.96	200	12/17/14 18:56	12/18/14 12:15	7439-92-1	
Zinc	**2180**	mg/kg	48.1	200	12/17/14 18:56	12/18/14 12:15	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**6.3**	%	0.10	1		12/26/14 09:29		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 519 N NEOSHO DW-A **Lab ID: 60184533005** Collected: 12/11/14 16:50 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**378**	mg/kg	0.45	20	12/17/14 18:56	12/18/14 11:57	7440-38-2	
Cadmium	**3.0**	mg/kg	0.072	20	12/17/14 18:56	12/18/14 11:57	7440-43-9	
Lead	**616**	mg/kg	2.3	500	12/17/14 18:56	12/18/14 12:18	7439-92-1	
Zinc	**3460**	mg/kg	113	500	12/17/14 18:56	12/18/14 12:18	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**4.3**	%	0.10	1		12/26/14 09:29		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 714 E 7TH DT-A BO **Lab ID: 60184533006** Collected: 12/11/14 16:55 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**45.5**	mg/kg	0.46	20	12/17/14 18:56	12/18/14 12:00	7440-38-2	
Cadmium	**9.2**	mg/kg	0.074	20	12/17/14 18:56	12/18/14 12:00	7440-43-9	
Lead	**1920**	mg/kg	2.3	500	12/17/14 18:56	12/18/14 12:21	7439-92-1	
Zinc	**6080**	mg/kg	116	500	12/17/14 18:56	12/18/14 12:21	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**14.3**	%	0.10	1		12/26/14 09:29		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 219 W 1ST 1-A **Lab ID: 60184533007** Collected: 12/11/14 17:00 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**23.5**	mg/kg	0.43	20	12/17/14 18:56	12/18/14 12:02	7440-38-2	
Cadmium	**33.2**	mg/kg	0.069	20	12/17/14 18:56	12/18/14 12:02	7440-43-9	
Lead	**4730**	mg/kg	8.7	2000	12/17/14 18:56	12/18/14 12:46	7439-92-1	
Zinc	**28300**	mg/kg	434	2000	12/17/14 18:56	12/18/14 12:46	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**18.8**	%	0.10	1		12/26/14 09:30		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 902 W MAIN 2-B **Lab ID: 60184533008** Collected: 12/11/14 17:05 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**13.6**	mg/kg	0.47	20	12/17/14 18:56	12/18/14 12:05	7440-38-2	
Cadmium	**8.8**	mg/kg	0.076	20	12/17/14 18:56	12/18/14 12:05	7440-43-9	
Lead	**641**	mg/kg	2.4	500	12/17/14 18:56	12/18/14 12:49	7439-92-1	
Zinc	**2900**	mg/kg	118	500	12/17/14 18:56	12/18/14 12:49	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**11.3**	%	0.10	1		12/26/14 09:30		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 600 W MAIN G-3-C **Lab ID: 60184533009** Collected: 12/11/14 17:10 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**7.2**	mg/kg	0.59	20	12/17/14 18:56	12/18/14 12:32	7440-38-2	
Cadmium	**8.5**	mg/kg	0.094	20	12/17/14 18:56	12/18/14 12:32	7440-43-9	
Lead	**101**	mg/kg	0.12	20	12/17/14 18:56	12/18/14 12:32	7439-92-1	
Zinc	**1840**	mg/kg	585	2000	12/17/14 18:56	12/18/14 12:52	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**14.6**	%	0.10	1		12/26/14 09:30		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 620 W 3RD 4-A **Lab ID: 60184533010** Collected: 12/11/14 17:15 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**12.0**	mg/kg	0.60	20	12/17/14 18:56	12/18/14 12:35	7440-38-2	
Cadmium	**14.3**	mg/kg	0.096	20	12/17/14 18:56	12/18/14 12:35	7440-43-9	
Lead	**548**	mg/kg	12.0	2000	12/17/14 18:56	12/18/14 12:54	7439-92-1	
Zinc	**6160**	mg/kg	602	2000	12/17/14 18:56	12/18/14 12:54	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**17.8**	%	0.10	1		12/26/14 09:31		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 516 W 3RD 3-A **Lab ID: 60184533011** Collected: 12/11/14 17:20 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**16.9**	mg/kg	0.59	20	12/17/14 18:56	12/18/14 12:38	7440-38-2	
Cadmium	**3.7**	mg/kg	0.095	20	12/17/14 18:56	12/18/14 12:38	7440-43-9	
Lead	**144**	mg/kg	0.12	20	12/17/14 18:56	12/18/14 12:38	7439-92-1	
Zinc	**791**	mg/kg	59.4	200	12/17/14 18:56	12/18/14 12:57	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**15.9**	%	0.10	1		12/26/14 09:31		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: W 3RD-N SCHOOL-A **Lab ID: 60184533012** Collected: 12/11/14 17:25 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**66.6**	mg/kg	0.59	20	12/17/14 18:56	12/18/14 12:41	7440-38-2	
Cadmium	**67.1**	mg/kg	0.094	20	12/17/14 18:56	12/18/14 12:41	7440-43-9	
Lead	**1930**	mg/kg	11.8	2000	12/17/14 18:56	12/18/14 13:23	7439-92-1	
Zinc	**18500**	mg/kg	588	2000	12/17/14 18:56	12/18/14 13:23	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**15.9**	%	0.10	1		12/26/14 09:31		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 326 W 4TH 3-B **Lab ID: 60184533013** Collected: 12/11/14 17:30 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**16.3**	mg/kg	0.50	20	12/17/14 18:56	12/18/14 12:43	7440-38-2	
Cadmium	**9.7**	mg/kg	0.080	20	12/17/14 18:56	12/18/14 12:43	7440-43-9	
Lead	**2610**	mg/kg	10.0	2000	12/17/14 18:56	12/18/14 13:26	7439-92-1	
Zinc	**3680**	mg/kg	500	2000	12/17/14 18:56	12/18/14 13:26	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**20.0**	%	0.10	1		12/26/14 09:31		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 603 E 4TH 2-A **Lab ID: 60184533014** Collected: 12/11/14 17:35 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**14.7**	mg/kg	0.50	20	12/17/14 18:56	12/18/14 13:10	7440-38-2	
Cadmium	**5.1**	mg/kg	0.081	20	12/17/14 18:56	12/18/14 13:10	7440-43-9	
Lead	**554**	mg/kg	10.1	2000	12/17/14 18:56	12/18/14 13:29	7439-92-1	
Zinc	**1330**	mg/kg	505	2000	12/17/14 18:56	12/18/14 13:29	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**18.1**	%	0.10	1		12/26/14 09:32		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: PARK WEST DITCH B **Lab ID: 60184533015** Collected: 12/11/14 17:40 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**11.2**	mg/kg	0.55	20	12/17/14 18:56	12/18/14 13:12	7440-38-2	
Cadmium	**0.86**	mg/kg	0.087	20	12/17/14 18:56	12/18/14 13:12	7440-43-9	
Lead	**54.3**	mg/kg	0.11	20	12/17/14 18:56	12/18/14 13:12	7439-92-1	
Zinc	**271**	mg/kg	5.5	20	12/17/14 18:56	12/18/14 13:12	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**10.2**	%	0.10	1		12/26/14 09:32		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: PARK WEST G-3-A **Lab ID: 60184533016** Collected: 12/11/14 17:45 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**20.4**	mg/kg	0.41	20	12/17/14 18:56	12/18/14 13:15	7440-38-2	
Cadmium	**4.4**	mg/kg	0.065	20	12/17/14 18:56	12/18/14 13:15	7440-43-9	
Lead	**175**	mg/kg	0.81	200	12/17/14 18:56	12/18/14 13:32	7439-92-1	
Zinc	**1020**	mg/kg	40.6	200	12/17/14 18:56	12/18/14 13:32	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**14.5**	%	0.10	1		12/26/14 09:32		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 117 N NEOSHO 3-C **Lab ID: 60184533017** Collected: 12/11/14 17:50 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**43.6**	mg/kg	0.49	20	12/17/14 18:56	12/18/14 13:18	7440-38-2	
Cadmium	**38.5**	mg/kg	0.079	20	12/17/14 18:56	12/18/14 13:18	7440-43-9	
Lead	**2560**	mg/kg	9.8	2000	12/17/14 18:56	12/18/14 13:34	7439-92-1	
Zinc	**20200**	mg/kg	491	2000	12/17/14 18:56	12/18/14 13:34	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**17.3**	%	0.10	1		12/26/14 09:33		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 305 W 3RD 2-B **Lab ID: 60184533018** Collected: 12/11/14 17:55 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**15.7**	mg/kg	0.47	20	12/17/14 18:56	12/18/14 13:20	7440-38-2	
Cadmium	**3.9**	mg/kg	0.076	20	12/17/14 18:56	12/18/14 13:20	7440-43-9	
Lead	**268**	mg/kg	9.4	2000	12/17/14 18:56	12/18/14 14:07	7439-92-1	
Zinc	**1380**	mg/kg	472	2000	12/17/14 18:56	12/18/14 14:07	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**12.5**	%	0.10	1		12/26/14 09:33		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 431 W INDY 2-A **Lab ID: 60184533019** Collected: 12/11/14 18:00 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**13.9**	mg/kg	0.48	20	12/17/14 18:56	12/18/14 13:56	7440-38-2	
Cadmium	**7.3**	mg/kg	0.077	20	12/17/14 18:56	12/18/14 13:56	7440-43-9	
Lead	**501**	mg/kg	9.7	2000	12/17/14 18:56	12/18/14 14:09	7439-92-1	
Zinc	**1960**	mg/kg	483	2000	12/17/14 18:56	12/18/14 14:09	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**15.8**	%	0.10	1		12/26/14 09:33		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60184533

Sample: 725 W MAIN DW-C **Lab ID: 60184533020** Collected: 12/11/14 18:05 Received: 12/13/14 08:10 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**11.3**	mg/kg	0.43	20	12/17/14 18:56	12/18/14 13:58	7440-38-2	
Cadmium	**4.6**	mg/kg	0.068	20	12/17/14 18:56	12/18/14 13:58	7440-43-9	
Lead	**400**	mg/kg	8.5	2000	12/17/14 18:56	12/18/14 14:12	7439-92-1	
Zinc	**1360**	mg/kg	426	2000	12/17/14 18:56	12/18/14 14:12	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**13.0**	%	0.10	1		12/26/14 10:39		

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QUALITY CONTROL DATA

Project: NATIONAL ZINC
Pace Project No.: 60184533

QC Batch: MPRP/51311 | Analysis Method: EPA 6020
QC Batch Method: EPA 3050 | Analysis Description: 6020 MET
Associated Lab Samples: 60184533001, 60184533002, 60184533003, 60184533004, 60184533005, 60184533006, 60184533007, 60184533008, 60184533009, 60184533010, 60184533011, 60184533012, 60184533013, 60184533014, 60184533015, 60184533016, 60184533017, 60184533018, 60184533019, 60184533020

METHOD BLANK: 1866852 | Matrix: Solid
Associated Lab Samples: 60184533001, 60184533002, 60184533003, 60184533004, 60184533005, 60184533006, 60184533007, 60184533008, 60184533009, 60184533010, 60184533011, 60184533012, 60184533013, 60184533014, 60184533015, 60184533016, 60184533017, 60184533018, 60184533019, 60184533020

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/kg	ND	0.48	12/18/14 11:19	
Cadmium	mg/kg	ND	0.076	12/18/14 11:19	
Lead	mg/kg	ND	0.095	12/18/14 11:19	
Zinc	mg/kg	ND	4.8	12/18/14 11:19	

LABORATORY CONTROL SAMPLE: 1866853

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	20	17.5	88	80-120	
Cadmium	mg/kg	20	18.3	92	80-120	
Lead	mg/kg	20	18.1	90	80-120	
Zinc	mg/kg	20	18.2	91	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1866854 1866855

Parameter	Units	60184533001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	7.6	28.1	28.7	32.6	37.5	89	104	75-125	14	20	
Cadmium	mg/kg	0.82	28.1	28.7	27.3	31.1	94	106	75-125	13	20	
Lead	mg/kg	49.5	28.1	28.7	75.2	93.3	91	152	75-125	22	20	M6,R1
Zinc	mg/kg	225	28.1	28.7	318	332	332	373	75-125	4	20	M6

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: NATIONAL ZINC
Pace Project No.: 60184533

QC Batch: MPRP/51528 | Analysis Method: ASTM D2974
QC Batch Method: ASTM D2974 | Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 60184533001, 60184533002, 60184533003, 60184533004, 60184533005, 60184533006, 60184533007, 60184533008, 60184533009, 60184533010, 60184533011, 60184533012, 60184533013, 60184533014, 60184533015, 60184533016, 60184533017, 60184533018, 60184533019

SAMPLE DUPLICATE: 1874014

Parameter	Units	60184533001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	34.9	35.9	3	30	

SAMPLE DUPLICATE: 1874015

Parameter	Units	10292780004 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	8.8	8.9	1	30	

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QUALITY CONTROL DATA

Project: NATIONAL ZINC
Pace Project No.: 60184533

QC Batch: MPRP/51529
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 60184533020

SAMPLE DUPLICATE: 1874050

Parameter	Units	10291025001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	25.5	24.0	6	30	

SAMPLE DUPLICATE: 1874051

Parameter	Units	10291921009 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	10.5	11.8	12	30	

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QUALIFIERS

Project: NATIONAL ZINC
Pace Project No.: 60184533

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

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TNI - The NELAC Institute.

LABORATORIES

PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

M6	Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.
R1	RPD value was outside control limits.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: NATIONAL ZINC
Pace Project No.: 60184533

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60184533001	**600 E MAIN G-2-C**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533002	**000 E 1ST PARK 2-A**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533003	**334 W FRONT 6-A**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533004	**416 N MAPLE 2-A**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533005	**519 N NEOSHO DW-A**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533006	**714 E 7TH DT-A BO**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533007	**219 W 1ST 1-A**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533008	**902 W MAIN 2-B**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533009	**600 W MAIN G-3-C**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533010	**620 W 3RD 4-A**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533011	**516 W 3RD 3-A**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533012	**W 3RD-N SCHOOL-A**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533013	**326 W 4TH 3-B**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533014	**603 E 4TH 2-A**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533015	**PARK WEST DITCH B**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533016	**PARK WEST G-3-A**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533017	**117 N NEOSHO 3-C**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533018	**305 W 3RD 2-B**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533019	**431 W INDY 2-A**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533020	**725 W MAIN DW-C**	EPA 3050	MPRP/51311	EPA 6020	ICPM/22806
60184533001	**600 E MAIN G-2-C**	ASTM D2974	MPRP/51528		
60184533002	**000 E 1ST PARK 2-A**	ASTM D2974	MPRP/51528		
60184533003	**334 W FRONT 6-A**	ASTM D2974	MPRP/51528		
60184533004	**416 N MAPLE 2-A**	ASTM D2974	MPRP/51528		
60184533005	**519 N NEOSHO DW-A**	ASTM D2974	MPRP/51528		
60184533006	**714 E 7TH DT-A BO**	ASTM D2974	MPRP/51528		
60184533007	**219 W 1ST 1-A**	ASTM D2974	MPRP/51528		
60184533008	**902 W MAIN 2-B**	ASTM D2974	MPRP/51528		
60184533009	**600 W MAIN G-3-C**	ASTM D2974	MPRP/51528		
60184533010	**620 W 3RD 4-A**	ASTM D2974	MPRP/51528		
60184533011	**516 W 3RD 3-A**	ASTM D2974	MPRP/51528		
60184533012	**W 3RD-N SCHOOL-A**	ASTM D2974	MPRP/51528		
60184533013	**326 W 4TH 3-B**	ASTM D2974	MPRP/51528		
60184533014	**603 E 4TH 2-A**	ASTM D2974	MPRP/51528		
60184533015	**PARK WEST DITCH B**	ASTM D2974	MPRP/51528		
60184533016	**PARK WEST G-3-A**	ASTM D2974	MPRP/51528		
60184533017	**117 N NEOSHO 3-C**	ASTM D2974	MPRP/51528		
60184533018	**305 W 3RD 2-B**	ASTM D2974	MPRP/51528		
60184533019	**431 W INDY 2-A**	ASTM D2974	MPRP/51528		
60184533020	**725 W MAIN DW-C**	ASTM D2974	MPRP/51529		

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Sample Condition Upon Receipt

WO#: 60184533
60184533

Client Name: Project Navigator

Optional
Proj Due Date:
Proj Name:

Courier: Fed Ex ☑ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ Other ☐

Tracking #: 8540 7504 5429 Pace Shipping Label Used? Yes ☐ No ☐

Custody Seal on Cooler/Box Present: Yes ☑ No ☐ Seals intact: Yes ☑ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☑ Foam ☐ None ☐ Other ☐

Thermometer Used: T-239 / T-194 **Type of Ice:** Wet Blue None (circle one) ☐ Samples received on ice, cooling process has begun.

Cooler Temperature: 8.1

Temperature should be above freezing to 6°C

Date and initials of person examining contents: 12/13/14

Chain of Custody present:	☑Yes	☐No	☐N/A	1.
Chain of Custody filled out:	☑Yes	☐No	☐N/A	2.
Chain of Custody relinquished:	☑Yes	☐No	☐N/A	3.
Sampler name & signature on COC:	☑Yes	☐No	☐N/A	4.
Samples arrived within holding time:	☑Yes	☐No	☐N/A	5.
Short Hold Time analyses (<72hr):	☐Yes	☑No	☐N/A	6.
Rush Turn Around Time requested:	☐Yes	☑No	☐N/A	7.
Sufficient volume:	☑Yes	☐No	☐N/A	8.
Correct containers used:	☑Yes	☐No	☐N/A	
Pace containers used:	☑Yes	☐No	☐N/A	9.
Containers intact:	☑Yes	☐No	☐N/A	10.
Unpreserved 5035A soils frozen w/in 48hrs?	☐Yes	☐No	☑N/A	11.
Filtered volume received for dissolved tests?	☐Yes	☑No	☐N/A	12.
Sample labels match COC:	☑Yes	☐No	☐N/A	
Includes date/time/ID/analyses Matrix: SL				13.
All containers needing preservation have been checked.	☐Yes	☐No	☑N/A	
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes	☐No	☑N/A	14.
Exceptions: VOA, coliform, TOC, O&G, WI-DRO (water), Phenolics	☐Yes	☑No		Initial when completed / Lot # of added preservative
Trip Blank present:	☐Yes	☑No	☐N/A	
Pace Trip Blank lot # (if purchased):				15.
Headspace in VOA vials (>6mm):	☐Yes	☐No	☑N/A	16.
Project sampled in USDA Regulated Area:	☐Yes	☑No	☐N/A	17. List State: KS

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: Jami Church Date: 12/15/14

F-KS-C-003-Rev 7, 04December2012

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Project Navigator, LTD.
Address:	10497 Town & Country Way, Ste 830
	Houston, TX 77024
Email To:	pjen@projectnavigator.com
Phone: 832-215-5589	Fax: 713-468-4515
Requested Due Date/TAT:	Standard TAT

Section B Required Project Information:

Report To:	Philip Jen
Copy To:	
Purchase Order No.:	
Project Name:	National Zinc
Project Number:	

Section C Invoice Information:

Attention:	Same as Client
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Jamie Church
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: KS

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED Composite Start DATE	COLLECTED Composite Start TIME	COLLECTED Composite End/Grab DATE	COLLECTED Composite End/Grab TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	6020 Metals: Lead, Cd, Zn, As	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D. 60184533
1	600 E Main G-2-C	SL	C			12/11/14	16:30		1	X								X		WEFU	01
2	000 E 1st Park 2-A	↓	↓			↓	16:35		1	X								X		↓	02
3	334 W Front 6-A						16:40		1	X								X			03
4	416 N Maple 2-A						16:45		1	X								X			04
5	519 N Neosho DW-A						16:50		1	X								X			05
6	714 E 7th DT-A BO						16:55		1	X								X			06
7	219 W 1st 1-A						17:00		1	X								X			07
8	902 W Main 2-B						17:05		1	X								X			08
9	600 W Main G-3-C						17:10		1	X								X			09
10	620 W 3rd 4-A						17:15		1	X								X			010
11	516 W 3rd 3-A						17:20		1	X								X			011
12	W 3rd - N School - A	↓	↓			↓	17:25		1	X								X		↓	012

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	[signature] PNL	12/12/14	8:00	[signature] PASI	12/13/14	0810	8.11	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Philip Jen

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 12/11/14

Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

F-ALL-Q-020rev 08, 12-Oct-2007

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CHAIN-OF-CUSTODY / Analytical Request Document

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Address:	10497 Town & Country Way, Ste 830
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Phone: 832-215-5589	Fax: 713-466-4575
Requested Due Date/TAT:	Standard TAT

Section B Required Project Information:

Report To:	Philip Jen
Copy To:	
Purchase Order No.:	
Project Name:	National Zinc
Project Number:	

Section C Invoice Information:

Attention:	Same as Client
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Jamie Church
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: KS

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N): N

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED Composite Start DATE	COLLECTED Composite Start TIME	COLLECTED Composite End/Grab DATE	COLLECTED Composite End/Grab TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test: 6020 Metals: Lead, Cd, As, Zn	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	326 W 4th 3-B	SL	C			12/11/14	17:30		1	X								X		WGFU 013
2	603 E 4th 2-A	↓	↓			↓	17:35		1	X								X		014
3	Park West Ditch B						17:40		1	X								X		015
4	Park West G-3-A						17:45		1	X								X		016
5	117 N Neosho 3-C						17:50		1	X								X		017
6	305 W 3rd 2-B						17:55		1	X								X		018
7	431 W INDY 2-A						18:00		1	X								X		019
8	725 W Main DW-C	↓	↓			↓	18:05		1	X								X		020
9																				
10																				
11																				
12																				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
	[signature] PNL	12/12/14	8:00	[signature] PASI	12/13/14	0810	8.1	Y	Y	Y

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Philip Jen

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 12/11/14

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days

F-ALL-Q-020rev.08, 12-Oct-2007

Pace Analytical Services, Inc.
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

February 11, 2015

Mark Landress
Project Navigator, Ltd.
10497 Town and Country Way
Suite 830
Houston, TX 77024

RE: Project: NATIONAL ZINC
Pace Project No.: 60187259

Dear Mark Landress:
Enclosed are the analytical results for sample(s) received by the laboratory on January 31, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jamie Church
jamie.church@pacelabs.com
Project Manager

Enclosures

cc: Philip Jen, Project Navigator, Ltd.

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CERTIFICATIONS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Minnesota Certification IDs
1700 Elm Street SE Suite 200, Minneapolis, MN 55414
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Alabama Certification #40770
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: 8TMS-L
Florida/NELAP Certification #: E87605
Guam Certification #:14-008r
Georgia Certification #: 959
Georgia EPD #: Pace
Idaho Certification #: MN00064
Hawaii Certification #MN00064
Illinois Certification #: 200011
Indiana Certification#C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky Dept of Envi. Protection - DW #90062
Kentucky Dept of Envi. Protection - WW #:90062
Louisiana DEQ Certification #: 3086
Louisiana DHH #: LA140001
Maine Certification #: 2013011
Maryland Certification #: 322
Michigan DEPH Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Carolina State Public Health #: 27700
North Dakota Certification #: R-036
Ohio EPA #: 4150
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Saipan (CNMI) #:MP0003
South Carolina #:74003001
Texas Certification #: T104704192
Tennessee Certification #: 02818
Utah Certification #: MN000642013-4
Virginia DGS Certification #: 251
Virginia/VELAP Certification #: Pace
Washington Certification #: C486
West Virginia Certification #: 382
West Virginia DHHR #:9952C
Wisconsin Certification #: 999407970

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SAMPLE SUMMARY

Project: NATIONAL ZINC
Pace Project No.: 60187259

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60187259001	**529 W 1ST G-3-A**	Solid	01/29/15 16:45	01/31/15 08:20
60187259002	**500 W 1ST 1-A**	Solid	01/29/15 16:50	01/31/15 08:20
60187259003	**516 W 3RD G-2-B**	Solid	01/29/15 16:55	01/31/15 08:20
60187259004	**529 W 1ST 2-A**	Solid	01/29/15 17:00	01/31/15 08:20
60187259005	**117 N NEOSHO 1-B**	Solid	01/29/15 17:05	01/31/15 08:20
60187259006	**516 W 3RD G-1-A**	Solid	01/29/15 17:10	01/31/15 08:20
60187259007	**FOOTBALL FIELD 3-B**	Solid	01/29/15 17:15	01/31/15 08:20
60187259008	**724 E 10TH G-1-B**	Solid	01/29/15 17:20	01/31/15 08:20
60187259009	**500 W 1ST DW-A**	Solid	01/29/15 17:25	01/31/15 08:20
60187259010	**2ND-CATHERINE G-1-B**	Solid	01/29/15 17:30	01/31/15 08:20
60187259011	**316 N MONTGOMERY G-2-A**	Solid	01/29/15 17:35	01/31/15 08:20
60187259012	**625 W INDEPENDENCE DW-G-1-C**	Solid	01/29/15 17:40	01/31/15 08:20
60187259013	**620 N LABETTE GA-2-A**	Solid	01/29/15 17:45	01/31/15 08:20
60187259014	**312 W 4TH G-2-A**	Solid	01/29/15 17:50	01/31/15 08:20
60187259015	**334 W FRONT 2-A**	Solid	01/29/15 17:55	01/31/15 08:20
60187259016	**117 N NEOSHO 1-B DUP**	Solid	01/29/15 18:00	01/31/15 08:20
60187259017	**316 N MONTGOMERY G-2-A DUP**	Solid	01/29/15 18:05	01/31/15 08:20

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SAMPLE ANALYTE COUNT

Project: NATIONAL ZINC
Pace Project No.: 60187259

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60187259001	**529 W 1ST G-3-A**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259002	**500 W 1ST 1-A**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259003	**516 W 3RD G-2-B**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259004	**529 W 1ST 2-A**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259005	**117 N NEOSHO 1-B**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259006	**516 W 3RD G-1-A**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259007	**FOOTBALL FIELD 3-B**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259008	**724 E 10TH G-1-B**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259009	**500 W 1ST DW-A**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259010	**2ND-CATHERINE G-1-B**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259011	**316 N MONTGOMERY G-2-A**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259012	**625 W INDEPENDENCE DW-G-1-C**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259013	**620 N LABETTE GA-2-A**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259014	**312 W 4TH G-2-A**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259015	**334 W FRONT 2-A**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259016	**117 N NEOSHO 1-B DUP**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M
60187259017	**316 N MONTGOMERY G-2-A DUP**	EPA 6020	RJS	4	PASI-M
		ASTM D2974	JDL	1	PASI-M

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 529 W 1ST G-3-A **Lab ID: 60187259001** Collected: 01/29/15 16:45 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**58.6**	mg/kg	0.62	20	02/08/15 12:34	02/09/15 19:13	7440-38-2	
Cadmium	**25.5**	mg/kg	0.099	20	02/08/15 12:34	02/09/15 19:13	7440-43-9	
Lead	**1190**	mg/kg	1.2	200	02/08/15 12:34	02/10/15 14:20	7439-92-1	
Zinc	**6840**	mg/kg	618	2000	02/08/15 12:34	02/10/15 14:25	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**25.1**	%	0.10	1		02/05/15 10:03		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 500 W 1ST 1-A **Lab ID: 60187259002** Collected: 01/29/15 16:50 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**33.0**	mg/kg	0.56	20	02/08/15 12:34	02/09/15 19:17	7440-38-2	
Cadmium	**14.6**	mg/kg	0.089	20	02/08/15 12:34	02/09/15 19:17	7440-43-9	
Lead	**485**	mg/kg	1.1	200	02/08/15 12:34	02/10/15 14:45	7439-92-1	
Zinc	**2210**	mg/kg	55.8	200	02/08/15 12:34	02/10/15 14:45	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**20.0**	%	0.10	1		02/05/15 12:40		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 516 W 3RD G-2-B **Lab ID: 60187259003** Collected: 01/29/15 16:55 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**22.4**	mg/kg	0.52	20	02/08/15 12:34	02/09/15 19:22	7440-38-2	
Cadmium	**15.5**	mg/kg	0.084	20	02/08/15 12:34	02/09/15 19:22	7440-43-9	
Lead	**867**	mg/kg	1.0	200	02/08/15 12:34	02/10/15 14:50	7439-92-1	
Zinc	**3540**	mg/kg	52.5	200	02/08/15 12:34	02/10/15 14:50	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**18.5**	%	0.10	1		02/05/15 12:40		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 529 W 1ST 2-A **Lab ID: 60187259004** Collected: 01/29/15 17:00 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**13.9**	mg/kg	0.59	20	02/08/15 12:34	02/09/15 19:27	7440-38-2	R1
Cadmium	**13.7**	mg/kg	0.095	20	02/08/15 12:34	02/09/15 19:27	7440-43-9	R1
Lead	**793**	mg/kg	1.2	200	02/08/15 12:34	02/10/15 14:54	7439-92-1	M6,R1
Zinc	**2290**	mg/kg	59.2	200	02/08/15 12:34	02/10/15 14:54	7440-66-6	M6,R1
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**17.2**	%	0.10	1		02/05/15 12:40		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 117 N NEOSHO 1-B **Lab ID: 60187259005** Collected: 01/29/15 17:05 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**24.6**	mg/kg	0.37	20	02/08/15 12:34	02/09/15 20:06	7440-38-2	
Cadmium	**4.8**	mg/kg	0.060	20	02/08/15 12:34	02/09/15 20:06	7440-43-9	
Lead	**589**	mg/kg	0.75	200	02/08/15 12:34	02/10/15 15:09	7439-92-1	
Zinc	**1260**	mg/kg	37.4	200	02/08/15 12:34	02/10/15 15:09	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**10.9**	%	0.10	1		02/05/15 12:41		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 516 W 3RD G-1-A **Lab ID: 60187259006** Collected: 01/29/15 17:10 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**23.5**	mg/kg	0.56	20	02/08/15 12:34	02/09/15 20:11	7440-38-2	
Cadmium	**16.1**	mg/kg	0.090	20	02/08/15 12:34	02/09/15 20:11	7440-43-9	
Lead	**487**	mg/kg	0.11	20	02/08/15 12:34	02/09/15 20:11	7439-92-1	
Zinc	**3520**	mg/kg	56.4	200	02/08/15 12:34	02/10/15 15:14	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**18.7**	%	0.10	1		02/05/15 12:41		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: FOOTBALL FIELD 3-B **Lab ID: 60187259007** Collected: 01/29/15 17:15 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**34.8**	mg/kg	0.58	20	02/08/15 12:34	02/09/15 20:16	7440-38-2	
Cadmium	**66.7**	mg/kg	0.093	20	02/08/15 12:34	02/09/15 20:16	7440-43-9	
Lead	**844**	mg/kg	1.2	200	02/08/15 12:34	02/11/15 07:53	7439-92-1	
Zinc	**18500**	mg/kg	578	2000	02/08/15 12:34	02/11/15 07:58	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**15.2**	%	0.10	1		02/05/15 12:41		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 724 E 10TH G-1-B **Lab ID: 60187259008** Collected: 01/29/15 17:20 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**27.6**	mg/kg	0.50	20	02/08/15 12:34	02/09/15 20:21	7440-38-2	
Cadmium	**4.4**	mg/kg	0.080	20	02/08/15 12:34	02/09/15 20:21	7440-43-9	
Lead	**332**	mg/kg	0.10	20	02/08/15 12:34	02/09/15 20:21	7439-92-1	
Zinc	**4430**	mg/kg	50.3	200	02/08/15 12:34	02/10/15 15:18	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**7.0**	%	0.10	1		02/05/15 12:42		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 500 W 1ST DW-A **Lab ID: 60187259009** Collected: 01/29/15 17:25 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**31.8**	mg/kg	0.50	20	02/08/15 12:34	02/09/15 20:30	7440-38-2	M6,R1
Cadmium	**8.4**	mg/kg	0.080	20	02/08/15 12:34	02/09/15 20:30	7440-43-9	R1
Lead	**756**	mg/kg	1.0	200	02/08/15 12:34	02/11/15 08:03	7439-92-1	M6
Zinc	**2570**	mg/kg	49.8	200	02/08/15 12:34	02/11/15 08:03	7440-66-6	M6,R1
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**9.5**	%	0.10	1		02/05/15 12:42		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 2ND-CATHERINE G-1-B **Lab ID: 60187259010** Collected: 01/29/15 17:30 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**62.9**	mg/kg	0.50	20	02/08/15 12:34	02/09/15 20:26	7440-38-2	
Cadmium	**10.5**	mg/kg	0.080	20	02/08/15 12:34	02/09/15 20:26	7440-43-9	
Lead	**401**	mg/kg	0.10	20	02/08/15 12:34	02/09/15 20:26	7439-92-1	
Zinc	**1630**	mg/kg	49.9	200	02/08/15 12:34	02/10/15 16:02	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**18.6**	%	0.10	1		02/05/15 12:42		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 316 N MONTGOMERY G-2-A **Lab ID: 60187259011** Collected: 01/29/15 17:35 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**34.2**	mg/kg	0.50	20	02/08/15 12:34	02/09/15 21:10	7440-38-2	
Cadmium	**4.6**	mg/kg	0.080	20	02/08/15 12:34	02/09/15 21:10	7440-43-9	
Lead	**298**	mg/kg	0.10	20	02/08/15 12:34	02/09/15 21:10	7439-92-1	
Zinc	**2310**	mg/kg	50.2	200	02/08/15 12:34	02/11/15 08:17	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**12.6**	%	0.10	1		02/05/15 12:43		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 625 W INDEPENDENCE DW-G-1-C **Lab ID: 60187259012** Collected: 01/29/15 17:40 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**11.2**	mg/kg	0.55	20	02/08/15 12:34	02/09/15 21:15	7440-38-2	
Cadmium	**8.0**	mg/kg	0.088	20	02/08/15 12:34	02/09/15 21:15	7440-43-9	
Lead	**410**	mg/kg	0.11	20	02/08/15 12:34	02/09/15 21:15	7439-92-1	
Zinc	**1270**	mg/kg	55.0	200	02/08/15 12:34	02/10/15 16:11	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**10.9**	%	0.10	1		02/05/15 12:43		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 620 N LABETTE GA-2-A **Lab ID: 60187259013** Collected: 01/29/15 17:45 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**17.0**	mg/kg	0.53	20	02/08/15 12:34	02/09/15 21:20	7440-38-2	
Cadmium	**11.0**	mg/kg	0.085	20	02/08/15 12:34	02/09/15 21:20	7440-43-9	
Lead	**328**	mg/kg	0.11	20	02/08/15 12:34	02/09/15 21:20	7439-92-1	
Zinc	**3010**	mg/kg	53.2	200	02/08/15 12:34	02/10/15 16:16	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**21.7**	%	0.10	1		02/05/15 12:43		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 312 W 4TH G-2-A **Lab ID: 60187259014** Collected: 01/29/15 17:50 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**13.2**	mg/kg	0.47	20	02/08/15 12:34	02/09/15 21:25	7440-38-2	
Cadmium	**8.9**	mg/kg	0.075	20	02/08/15 12:34	02/09/15 21:25	7440-43-9	
Lead	**349**	mg/kg	0.093	20	02/08/15 12:34	02/09/15 21:25	7439-92-1	
Zinc	**1490**	mg/kg	46.6	200	02/08/15 12:34	02/10/15 16:21	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**16.2**	%	0.10	1		02/05/15 12:43		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 334 W FRONT 2-A **Lab ID: 60187259015** Collected: 01/29/15 17:55 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**19.3**	mg/kg	0.57	20	02/08/15 12:34	02/09/15 21:29	7440-38-2	
Cadmium	**8.7**	mg/kg	0.091	20	02/08/15 12:34	02/09/15 21:29	7440-43-9	
Lead	**278**	mg/kg	0.11	20	02/08/15 12:34	02/09/15 21:29	7439-92-1	
Zinc	**1570**	mg/kg	56.9	200	02/08/15 12:34	02/11/15 08:22	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**15.5**	%	0.10	1		02/05/15 12:43		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 117 N NEOSHO 1-B DUP **Lab ID: 60187259016** Collected: 01/29/15 18:00 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**19.8**	mg/kg	0.52	20	02/08/15 12:34	02/09/15 21:34	7440-38-2	
Cadmium	**3.3**	mg/kg	0.084	20	02/08/15 12:34	02/09/15 21:34	7440-43-9	
Lead	**423**	mg/kg	0.10	20	02/08/15 12:34	02/09/15 21:34	7439-92-1	
Zinc	**1280**	mg/kg	52.5	200	02/08/15 12:34	02/11/15 08:27	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**11.0**	%	0.10	1		02/05/15 12:44		

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ANALYTICAL RESULTS

Project: NATIONAL ZINC
Pace Project No.: 60187259

Sample: 316 N MONTGOMERY G-2-A DUP **Lab ID: 60187259017** Collected: 01/29/15 18:05 Received: 01/31/15 08:20 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3050							
Arsenic	**14.6**	mg/kg	0.40	20	02/08/15 12:34	02/09/15 21:39	7440-38-2	
Cadmium	**2.1**	mg/kg	0.064	20	02/08/15 12:34	02/09/15 21:39	7440-43-9	
Lead	**129**	mg/kg	0.080	20	02/08/15 12:34	02/09/15 21:39	7439-92-1	
Zinc	**864**	mg/kg	20.1	100	02/08/15 12:34	02/09/15 21:44	7440-66-6	
Dry Weight	Analytical Method: ASTM D2974							
Percent Moisture	**12.4**	%	0.10	1		02/05/15 12:44		

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QUALITY CONTROL DATA

Project: NATIONAL ZINC
Pace Project No.: 60187259

QC Batch: MPRP/52213 — Analysis Method: EPA 6020
QC Batch Method: EPA 3050 — Analysis Description: 6020 MET
Associated Lab Samples: 60187259001, 60187259002, 60187259003, 60187259004, 60187259005, 60187259006, 60187259007, 60187259008, 60187259009, 60187259010, 60187259011, 60187259012, 60187259013, 60187259014, 60187259015, 60187259016, 60187259017

METHOD BLANK: 1893844 — Matrix: Solid
Associated Lab Samples: 60187259001, 60187259002, 60187259003, 60187259004, 60187259005, 60187259006, 60187259007, 60187259008, 60187259009, 60187259010, 60187259011, 60187259012, 60187259013, 60187259014, 60187259015, 60187259016, 60187259017

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/kg	ND	0.46	02/09/15 19:03	
Cadmium	mg/kg	ND	0.073	02/09/15 19:03	
Lead	mg/kg	ND	0.092	02/09/15 19:03	
Zinc	mg/kg	ND	4.6	02/09/15 19:03	

LABORATORY CONTROL SAMPLE: 1893845

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	16.9	16.0	95	80-120	
Cadmium	mg/kg	16.9	17.0	100	80-120	
Lead	mg/kg	16.9	17.3	102	80-120	
Zinc	mg/kg	16.9	16.6	98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1893846 1893847

Parameter	Units	60187259004 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	13.9	24.2	21.7	41.5	31.6	115	81	75-125	27	20	R1
Cadmium	mg/kg	13.7	24.2	21.7	40.8	31.5	113	82	75-125	26	20	R1
Lead	mg/kg	793	24.2	21.7	637	474	-644	-1470	75-125	29	20	M6,R1
Zinc	mg/kg	2290	24.2	21.7	2180	1720	-467	-2650	75-125	24	20	E,M6, R1

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1893848 1893849

Parameter	Units	60187259009 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	31.8	20.4	16.9	48.3	38.8	81	42	75-125	22	20	M6,R1
Cadmium	mg/kg	8.4	20.4	16.9	32.5	25.7	118	102	75-125	24	20	R1
Lead	mg/kg	756	20.4	16.9	781	705	118	-308	75-125	10	20	M6
Zinc	mg/kg	2570	20.4	16.9	3590	2340	4970	-1360	75-125	42	20	E,M6, R1

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: NATIONAL ZINC
Pace Project No.: 60187259

QC Batch: MPRP/52246
QC Batch Method: ASTM D2974
Analysis Method: ASTM D2974
Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 60187259001

SAMPLE DUPLICATE: 1894699

Parameter	Units	10295839001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	1.9	1.9	3	30	

SAMPLE DUPLICATE: 1894726

Parameter	Units	60187259001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	25.1	25.3	1	30	

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QUALITY CONTROL DATA

Project: NATIONAL ZINC
Pace Project No.: 60187259

QC Batch: MPRP/52250 | Analysis Method: ASTM D2974
QC Batch Method: ASTM D2974 | Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 60187259002, 60187259003, 60187259004, 60187259005, 60187259006, 60187259007, 60187259008, 60187259009, 60187259010, 60187259011, 60187259012, 60187259013, 60187259014, 60187259015, 60187259016, 60187259017

SAMPLE DUPLICATE: 1894814

Parameter	Units	60187259004 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	17.2	17.4	1	30	

SAMPLE DUPLICATE: 1894815

Parameter	Units	60187259009 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	9.5	9.6	1	30	

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QUALIFIERS

Project: NATIONAL ZINC
Pace Project No.: 60187259

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

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TNI - The NELAC Institute.

LABORATORIES

PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

E	Analyte concentration exceeded the calibration range. The reported result is estimated.
M6	Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.
R1	RPD value was outside control limits.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: NATIONAL ZINC
Pace Project No.: 60187259

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60187259001	**529 W 1ST G-3-A**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259002	**500 W 1ST 1-A**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259003	**516 W 3RD G-2-B**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259004	**529 W 1ST 2-A**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259005	**117 N NEOSHO 1-B**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259006	**516 W 3RD G-1-A**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259007	**FOOTBALL FIELD 3-B**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259008	**724 E 10TH G-1-B**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259009	**500 W 1ST DW-A**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259010	**2ND-CATHERINE G-1-B**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259011	**316 N MONTGOMERY G-2-A**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259012	**625 W INDEPENDENCE DW-G-1-C**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259013	**620 N LABETTE GA-2-A**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259014	**312 W 4TH G-2-A**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259015	**334 W FRONT 2-A**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259016	**117 N NEOSHO 1-B DUP**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259017	**316 N MONTGOMERY G-2-A DUP**	EPA 3050	MPRP/52213	EPA 6020	ICPM/23177
60187259001	**529 W 1ST G-3-A**	ASTM D2974	MPRP/52246		
60187259002	**500 W 1ST 1-A**	ASTM D2974	MPRP/52250		
60187259003	**516 W 3RD G-2-B**	ASTM D2974	MPRP/52250		
60187259004	**529 W 1ST 2-A**	ASTM D2974	MPRP/52250		
60187259005	**117 N NEOSHO 1-B**	ASTM D2974	MPRP/52250		
60187259006	**516 W 3RD G-1-A**	ASTM D2974	MPRP/52250		
60187259007	**FOOTBALL FIELD 3-B**	ASTM D2974	MPRP/52250		
60187259008	**724 E 10TH G-1-B**	ASTM D2974	MPRP/52250		
60187259009	**500 W 1ST DW-A**	ASTM D2974	MPRP/52250		
60187259010	**2ND-CATHERINE G-1-B**	ASTM D2974	MPRP/52250		
60187259011	**316 N MONTGOMERY G-2-A**	ASTM D2974	MPRP/52250		
60187259012	**625 W INDEPENDENCE DW-G-1-C**	ASTM D2974	MPRP/52250		
60187259013	**620 N LABETTE GA-2-A**	ASTM D2974	MPRP/52250		
60187259014	**312 W 4TH G-2-A**	ASTM D2974	MPRP/52250		
60187259015	**334 W FRONT 2-A**	ASTM D2974	MPRP/52250		
60187259016	**117 N NEOSHO 1-B DUP**	ASTM D2974	MPRP/52250		
60187259017	**316 N MONTGOMERY G-2-A DUP**	ASTM D2974	MPRP/52250		

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Sample Condition Upon Receipt

WO#: 60187259

60187259

Client Name: Project Navigator

Optional
Proj Due Date:
Proj Name:

Courier: Fed Ex ☒ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace ☐ Other ☐

Tracking #: 8540 7504 5418 Pace Shipping Label Used? Yes ☐ No ☐

Custody Seal on Cooler/Box Present: Yes ☒ No ☐ Seals intact: Yes ☒ No ☐

Packing Material: Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☐ Other ☒ ZIPLOC

Thermometer Used: T-239 T-194 **Type of Ice:** Wet Blue None ☐ Samples received on ice, cooling process has begun.
(circle one)

Cooler Temperature: 2.3

Date and initials of person examining contents: JB 1/31

Temperature should be above freezing to 6°C

Chain of Custody present:	☒Yes ☐No ☐N/A	1.
Chain of Custody filled out:	☒Yes ☐No ☐N/A	2.
Chain of Custody relinquished:	☒Yes ☐No ☐N/A	3.
Sampler name & signature on COC:	☒Yes ☐No ☐N/A	4.
Samples arrived within holding time:	☒Yes ☐No ☐N/A	5.
Short Hold Time analyses (<72hr):	☐Yes ☒No ☐N/A	6.
Rush Turn Around Time requested:	☐Yes ☒No ☐N/A	7.
Sufficient volume:	☒Yes ☐No ☐N/A	8.
Correct containers used:	☒Yes ☐No ☐N/A	
Pace containers used:	☒Yes ☐No ☐N/A	9.
Containers intact:	☒Yes ☐No ☐N/A	10.
Unpreserved 5035A soils frozen w/in 48hrs?	☐Yes ☐No ☒N/A	11.
Filtered volume received for dissolved tests?	☐Yes ☐No ☒N/A	12.
Sample labels match COC:	☒Yes ☐No ☐N/A	
Includes date/time/ID/analyses Matrix: SL		13.
All containers needing preservation have been checked.	☐Yes ☐No ☒N/A	
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☒N/A	14.
Exceptions: VOA, coliform, TOC, O&G, WI-DRO (water), Phenolics	☐Yes ☒No	Initial when completed / Lot # of added preservative
Trip Blank present:	☐Yes ☐No ☒N/A	
Pace Trip Blank lot # (if purchased):		15.
Headspace in VOA vials (>6mm):	☐Yes ☐No ☒N/A	16.
Project sampled in USDA Regulated Area:	☐Yes ☒No ☐N/A	17. List State: KS

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: Jami Church 2/2/15 Date: _____

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately

Section A Required Client Information:

Company:	Project Navigator, LTD.
Address:	10497 Town & Country Way, Ste 830
	Houston, TX 77024
Email To:	pjen@projectnavigator.com
Phone: 832-215-5589	Fax: 713-466-4545
Requested Due Date/TAT:	Standard TAT

Section B Required Project Information:

Report To:	Philip Jen
Copy To:	
Purchase Order No.:	
Project Name:	National Zinc
Project Number:	

Section C Invoice Information:

Attention:	Same as Client
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Jamie Church
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: KS

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	6020 Metals (Pb, Zn, Ag, Cd)	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D. 60187259
1	529 W 1st G-3-A	SL	C			1/29/15	1645		1	X								X		BPU	001
2	500 W 1st 1-A						1650		1	X								X			002
3	516 W 3rd G-2-B						1655		1	X								X			003
4	529 W 1st 2-A						1700		1	X								X			004
5	117 N Neosho 1-B						1705		1	X								X			005
6	516 W 3rd G-1-A						1710		1	X								X			006
7	Football Field 3-B						1715		1	X								X			007
8	724 E 10th G-1-B						1720		1	X								X			008
9	500 W 1st DW-A						1725		1	X								X			009
10	2nd - Catherine G-1-B						1730		1	X								X			010
11	316 N Montgomery G-2-A						1735		1	X								X			011
12	625 W Independence DW-G-1-C						1740		1	X								X			012

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
MS/MSD for Sample: 529 W 1st 2-A	[signature] PNC	1/30/15	900	[signature] Pace	1/31	0820	2.3	Y	Y	Y
MS/MSD for Sample: 500 W 1st DW-A										

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Philip Jen

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 1/29/15

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days.

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Project Navigator, LTD.
Address:	10497 Town & Country Way, Ste 830
	Houston, TX 77024
Email To:	pjen@projectnavigator.com
Phone:	832-215-5589
Fax:	713 468 4512
Requested Due Date/TAT:	Standard TAT

Section B Required Project Information:

Report To:	Philip Jen
Copy To:	
Purchase Order No.:	
Project Name:	National Zinc
Project Number:	

Section C Invoice Information:

Attention:	Same as Client
Company Name:	
Address:	
Pace Quote Reference:	
Pace Project Manager:	Jamie Church
Pace Profile #:	

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER _____

Site Location STATE: KS

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED Composite Start Date	COLLECTED Composite Start Time	COLLECTED Composite End/Grab Date	COLLECTED Composite End/Grab Time	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N): 6020 Metals (Pb, Zn, Fe, Cd)	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D. 60187259
1	620 N Labette G-A-2-A	SL	C			1/29/15	1745		1	X								X		BP8U 013
2	312 W 4th G-2-A	↓	↓			↓	1750		1	X								X		014
3	334 W Front 2-A	↓	↓			↓	1755		1	X								X		015
4	117 N Neosho 1-B DUP	↓	↓			↓	1800		1	X								X		016
5	316 N Montgomery G-2-A DUP	↓	↓			↓	1805		1	X								X		017
6																				
7																				
8																				
9																				
10																				
11																				
12																				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	[signature] PNL	1/30/15	9:00	[signature] Pace	1/31	0800	2.3	Y	Y	Y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Philip Jen

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 1/29/15

*Important Note: By signing this form you are accepting Pace's NET 30 day payment terms and agreeing to late charges of 1.5% per month for any invoices not paid within 30 days

F-ALL-Q-020rev.08, 12-Oct-2007

Appendix C

Photos of SRM Class Examples

Photos of SRM Class Examples

Photo 1 – Yard, A Class

Photo 2 – Yard, A Class

Photos of SRM Class Examples

Photo 3 – Yard, B Class

Photo 4 – Yard, B Class

Photos of SRM Class Examples

Photo 5 – Yard, C Class

Photo 6 – Yard, D Class

Photos of SRM Class Examples

Photo 7 – Yard, D Class

Photo 8 – Yard, D Class

Photos of SRM Class Examples

Photo 9 – Yard, B Class-Fill

Photo 10 – Dripline, A Class

Photos of SRM Class Examples

Photo 11 – Dripline, A Class

Photo 12 – Dripline, A Class

Photos of SRM Class Examples

Photo 13 – Dripline, A Class

Photo 14 – Dripline, B Class

Photos of SRM Class Examples

Photo 15 – Dripline, C Class

Photo 16 – Dripline, C Class

Photos of SRM Class Examples

Photo 17 – Driveway, A Class

Photo 18 – Driveway, A Class

Photos of SRM Class Examples

Photo 19 – Driveway, B Class

Photo 20 – Driveway, B Class

Photos of SRM Class Examples

Photo 21 – Driveway, C Class

Photo 22 – Driveway, C Class

Photos of SRM Class Examples

Photo 23 – Driveway, D Class

Photo 24 – City Ditch, A Class

Photos of SRM Class Examples

Photo 25 – City Ditch, A Class

Photo 26 – City Ditch, B Class

Photos of SRM Class Examples

Photo 27 – City Ditch, C Class

Photo 28 – City Ditch, D Class

Photos of SRM Class Examples

Photo 29 – Walkway, A Class

Photo 30 – Brick Walkway, A Class

Photos of SRM Class Examples

Photo 31 – Brick Walkway, B Class

Photo 32 – Brick Walkway, C Class

Photos of SRM Class Examples

Photo 33 – Brick Walkway, C Class

Photo 34 – Walkway, D Class

Photos of SRM Class Examples

Photo 35 – Brick Walkway, D Class

Photo 36 – City Alley, A Class

Photos of SRM Class Examples

Photo 37 – City Alley, A Class

Photo 38 – City Alley, B Class

Photos of SRM Class Examples

Photo 39 – City Alley, C Class

Photo 40 – City Alley, D Class

Photos of SRM Class Examples

Photo 41 – City Alley, D Class

Appendix D

Field Notebooks, Inspection Forms, Parcel Maps, and Photos

Please note: The content in Appendix D is too large to be uploaded to the KDHE website at this time. It is available (on several CDs) through a Kansas Open Records Act request.