Weaver Consultants Group

March 19, 2021

Mr. Adam Fann
TIF Infrastructure Project Supervisor
City of Elkhart
229 South Second Street
Elkhart, IN 46516-3112

Re: Remediation Work Plan
Remedial Program Evaluation (Contract Task 19)
Beardsley Avenue Site (Brownfield Site #4120904)
700 W. Beardsley Avenue
Elkhart, IN 46514
Project No. 0609-356-03-04

Dear Mr. Fann:

Weaver Consultants Group, LLC (WCG) has completed a remedial program evaluation and prepared this Remediation Work Plan (Work Plan) consistent with the scope of service listed under Task 19-FSI Work Plan/Remediation Options of the updated Resolution, Number 20-R-010, between the City of Elkhart (City) Redevelopment Commission and WCG, effective February 11, 2020. This Work Plan outlines the proposed remedial program to address chlorinated volatile organic compounds (CVOCs), specifically trichloroethene (TCE), within the groundwater and vadose zone soil at the Beardsley Avenue property located at 700 West Beardsley Avenue in Elkhart, Indiana (the Site, **Figure 1**).

WCG has been conducting ongoing site investigations and groundwater monitoring activities to further characterize the extent of impacts in groundwater conditions both on and off-Site (refer to **Figure 2 – Site Layout Map**). The fourth quarter (4Q) 2020 monitoring activities are summarized within the 4Q 2020 Quarterly Groundwater Monitoring Report dated February 26, 2021. Upon completion of the further site investigation activities in 2019, WCG recommended the preparation of an updated Remediation Work Plan to address remedial actions considering potential future re-development of the Site within the Further Site Investigation Report dated October 2, 2019.

Based on a review of site-specific data, a remediation pilot test program utilizing several remedial technologies to address concentrations of CVOCs within groundwater and soil in the vadose zone is proposed. Due to site geologic conditions (medium to coarse grained sands, associated high hydraulic conductivity, and the impacted unsaturated vadose zone), an in-situ chemical oxidation (ISCO) groundwater treatment pilot test is proposed to focus on the impacted groundwater in combination with soil vapor extraction (SVE) pilot test to focus on the impacted vadose soil at the Site. Should the pilot test be successful and demonstrate Site conditions amenable to the selected remedial actions, the ISCO injection program will continue and the SVE system will be expanded and operated continuously.

To implement the proposed remedial pilot test, and subsequent remediation program, the City in consultation with Indiana Department of Environmental Management (IDEM) is proposing the use of United States Environmental Protection Agency (US EPA) Brownfields Revolving Loan Fund (RFL) Subgrant monies managed by the Indiana Finance Authority and Indiana Brownfields Program. In support of utilizing these funds for Site cleanup, various Brownfields RLF programmatic activities must be completed, including, but not limited to, preparation of a community relations plan, public notice posting, public meeting, and responding to public comments, preparation of Quarterly Reports, establishment of an Administrative Record (AR), and preparation of an Analysis of Brownfields Cleanup Alternatives (ABCA), if required, and Record of Decision (ROD) Memorandum.

Based on the above, WCG has subdivided this Work Plan into three tasks:

- Task 1 – Brownfields Programmatic Activities;
- Task 2 – ISCO/SVE Pilot Test; and
- Task 3 – Remedial Program Implementation.

The following sections describe these tasks.

Task 1 – Brownfields Programmatic Activities

WCG will provide Brownfields Programmatic support to the City in accordance with the USEPA, Indiana Finance Authority, and Indiana Brownfields Program Brownfields RLF Subgrant requirements. The scope of work for Task 1 includes the following:

Preparation of an ABCA (if required):

- The ABCA will include information about the Site conditions and issues, applicable laws and cleanup standards (IDEM Remediation Closure Guide Industrial/Commercial Screening Levels), alternative cleanup methods considered, and a rough order of magnitude (ROM) cost evaluation.

Establish Community Involvement:

- Preparation of a site-specific Community Relations Plan including a public notice posted within a major local newspaper of general circulation or online to target the general community and targeted area of the availability of documents for public review;
- Opportunity for community involvement and comment for 30 days;
- Prepare a response to comments documented in a ROD memorandum with the selected remedy and supporting information;
- Maintain an AR; and
- Post signage at the Site.

Establish AR

- Collection of Site documents and reports explaining the historical activities, corrective actions taking place at a Site, etc. that is available to the public via posting at a public library or City Hall.

IDEM Voluntary Remediation Program (VRP)

- Enroll and participate in IDEM's VRP with IDEM providing regulatory oversight for the Site and cleanup activities.

Reporting

- Preparation of a Quality Assurance Project Plan (QAPP) and health and safety plan;
- Preparation of Quarterly Reports to USEPA, including progress made on performance objectives and project timeline, update on project milestones, use of/compliance with requirements related to use of disadvantaged business enterprises ("DBE"), property profile, budget recap summary, etc.;
- Documentation that all federal and state worker health and safety requirements are met;
- Documentation that RLF funds are used only for eligible activities at eligible Site; and
- Maintenance of records (related to expenditures and response activities) and provision of access to records for three (3) years after the submission of the financial status report, closeout of the cooperative agreement, completion of an ongoing audit, or completion of an ongoing Subgrant, whichever is the longest retention period.

RLF Grant Management and Support

- Provide program management support to the City associated with the Brownfields RLF grant requirements; and
- Provide support for development and execution of the Financial Assistance Agreement and Consultant Supplement.

Estimated costs associated with the implementation of Task 1 for a period of three years are included in **Table 1**.

Task 2 – ISCO/SVE Pilot Test Program

ISCO Pilot Test

The ISCO approach will focus on the treatment of groundwater impacted with CVOCs on the Site, while mitigating the potential for migration to areas located further downgradient. ISCO methods for the treatment of impacted groundwater entail injection of a strong oxidant into the groundwater to chemically remediate CVOCs. WCG has successfully utilized ISCO on a wide variety of projects throughout the country to remediate groundwater impacted with CVOCs.

With sufficient contact, chemical oxidants are capable of irreversibly converting CVOCs in groundwater to carbon dioxide, chloride, and water. Conditions in the groundwater and soil

matrix and the concentration of other oxidant-consuming substances (e.g., natural organic matter and reduced minerals) can affect the transport and effectiveness of the ISCO treatment process. Potassium permanganate ($KMnO_4$) and sodium permanganate ($NaMnO_4$) are two common forms of permanganate typically used for ISCO. $KMnO_4$ is a dry, crystalline solid from which aqueous solutions (up to 4%) can be prepared. $NaMnO_4$ is typically supplied as a concentrated liquid (40%) which can be diluted on site and applied at lower concentrations (ITRC 2005). Numerous laboratory and field tests have been conducted in recent years showing that permanganate is very effective in oxidizing a wide range of contaminants, including the chlorinated solvents which have been detected at the Site such as TCE, cis-1,2-dichloroethylene (DCE), and vinyl chloride (VC).

Permanganate application is generally found to result in the complete degradation of TCE, cis-1,2-dichloroethene and vinyl chloride under a wide range of conditions. Permanganate is inherently more persistent than other oxidants such as hydrogen peroxide, which tends to decompose rapidly to water and oxygen when it comes into contact with soil or groundwater. In addition, permanganate is effective in either naturally oxidizing or reducing environments. During application, contaminant destruction is accomplished via oxidation, but the environment will return to its natural oxidation state once the reaction process is complete. The effectiveness of permanganate is limited by the ability to distribute the oxidant throughout the impacted area as contact with the contaminant is required for oxidation to occur; therefore, multiple or continuous applications are generally required to achieve treatment goals.

$NaMnO_4$ is proposed as the preferred oxidant since it is supplied as a concentrated liquid (40%) which can be diluted on Site and applied at lower concentrations. The advantage of using $NaMnO_4$ over $KMnO_4$ is that the field mixing and handling requirements are reduced and higher oxidant solution concentrations can be maintained, providing more flexibility for injection design and reagent volume.

Pilot Test Scope of Work

Prior to the initiation of the remedial pilot test activities, WCG will prepare and submit a Permit By Rule (PBR) Rule Authorization Request to the USEPA Region 5 Underground Injection Control (UIC) Program detailing the specifics for the direct injection of $NaMnO_4$ at the Site.

Baseline groundwater sampling will be conducted to benchmark site conditions prior to initiating the pilot test program. WCG proposes to utilize existing Site infrastructure (i.e., monitoring wells) for the baseline and subsequent performance monitoring to assess the efficacy of the ISCO injection pilot test. Baseline sampling will be completed at seven monitoring wells (MW-2S, MW-3D, MW-4S, MW-4D, MW-5S, WBP-7R, and MW-8S) based on their locations within the focus area and their proximity to the proposed injection well locations. Groundwater samples will be analyzed for VOCs via EPA Method 8260; manganese via EPA Method 6010 or 6020. Water quality field parameters (i.e., pH, conductivity, turbidity, temperature, dissolved oxygen [DO] and oxidation-reduction potential [ORP]) will be recorded.

Low-flow sampling methodology will be used to collect the baseline samples. Samples will be submitted to an analytical laboratory for analyses. Groundwater samples, including Quality

Assurance/Quality Control (QA/QC) samples, will be collected in accordance with IDEM guidance and the QAPP for the Site. Results of the baseline sampling will be reviewed to refine the scope of the ISCO pilot test program.

Injection Well Installation

Five dedicated injection wells are planned to be installed at the Site to support the ISCO pilot test. The new injection wells will generally be located within the area with elevated CVOC concentrations and upgradient of existing monitoring wells to monitor the performance of the ISCO pilot test (refer to **Figure 3 – Proposed Injection Pilot Test Layout**). The proposed injection well locations were selected based on being upgradient of existing monitoring wells exhibiting elevated concentrations of dissolved-phase COC concentrations in the Shallow and Deep water-bearing zones (WBZs).

The injection wells will be installed by an Indiana licensed well driller using a Geoprobe® with hollow stem auger. Prior to drilling activities, the driller will contact Indiana 811 to locate public utilities at the Site. WCG will also coordinate with a private utility locate contractor to locate private utilities at the Site.

Injection wells will be screened from 15 to 30 feet bgs. The actual injection well depths may be adjusted in the field based on observations of the geology during drilling. The injection wells will be constructed of 2-inch diameter Schedule 40 carbon or stainless-steel casing with 15 feet of 2-inch diameter Schedule 304 continuous wire-wrapped stainless-steel, 0.020-inch slot well screen. A 2-foot sump will be installed beneath the screen to mitigate the potential for fouling of the well screen. The well annulus will be filled with 10/20 silica sand to a minimum of 1-foot above the well screen, 1-foot bentonite seal, and bentonite grout to 1-foot bgs, and completed with a flush-mount manway and concrete pad. Injection wells will be installed in accordance with IDEM guidance. Well development will occur after installation of the injection wells to promote hydraulic connection between the well filter-pack and the WBZ. Well development will begin no earlier than 48 hours after installation is complete. A minimum of three well volumes will be removed during development, development will proceed by surging and bailing or pumping until the water is clear, water quality parameters are stabilized, and turbidity units are stabilized and less than 150 NTUs. Thorough well development is integral to the overall performance of the injection program design; therefore, care will be taken in the field to ensure well development activities are conducted appropriately.

IDW Management

Investigation derived waste (IDW), including soil cuttings generated during soil boring advancement (drilling) and purge water generated during well development and sampling, will be containerized in 55-gallons steel drums with water-tight lids or other appropriate storage device stored at an onsite staging area. The drums will be labeled appropriately, identifying the date and activities generating the waste material. Waste characterization samples will be collected from the bin and submitted for laboratory analysis for waste pro-filing and disposal purposes.

Upon receipt of waste characterization analytical results, the IDW wastes generated will be profiled and transported by a licensed waste hauler under the appropriate manifest, Bill of Lading, and material shipping/tracking documentation to an appropriate disposal facility. Final disposition of IDW will be documented on waste disposal manifests and included as an appendix in the report summarizing these the pilot test activities.

Pilot ISCO Injection Test

Based on the review of the most recent groundwater monitoring results competed by WCG (4Q2020), TCE impacts in the target area range from approximately 210 micrograms per liter (ug/L) to 4.1 ug/L. An average TCE concentration of approximately 91 ug/L across the projected treatment zone (shallow and deep alluvial WBZs [15-30 feet bgs]) was used as the primary design basis for the initial ISCO injection scope.

The proposed ISCO remediation strategy will focus on implementation of an initial low-pressure chemical oxidation injection event. The initial ISCO injections will consist of injecting a 10% $NaMnO_4$ solution under low pressure (0-20 pounds per square inch) into the five dedicated injection wells (refer to **Figure 3**) to influence areas exhibiting higher concentrations of CVOCs. Application of the $NaMnO_4$ will be delivered directly into each injection well utilizing a specialized injection system and associated injection monitoring equipment. This initial injection is designed to provide the primary oxidant loading of on-site groundwater and to mitigate potential migration of CVOCs off-Site. Initial target volumes of up to 500 gallons of a 10% $NaMnO_4$ solution are projected for each injection well as part of this pilot test. The results of the ISCO injection test will be used to assess injection frequency, rate, and volume and concentration of substrate necessary to enhance and optimize the groundwater remediation program. The frequency, volume and concentration of subsequent injections will be refined based on performance monitoring data.

Performance Monitoring

Groundwater performance monitoring will include the sampling of seven existing monitoring wells located across the Site to evaluate the performance of the remedial pilot test activities (refer to **Figure 3**). The proposed performance monitoring wells include MW-2S, MW-3D, MW-4S, MW-4D, MW-5S, WBP-7R, and MW-8S. The pilot test performance monitoring will be conducted during the injection activities and for approximately three (3) months to characterize $NaMnO_4$ distribution and identify trends in CVOC concentration over time. With an estimated groundwater flow velocity at the Site of 6.8 feet/day, WCG proposes to conduct performance monitoring during the injection event, followed by a monitoring event two (2) weeks, one (1) month, and three (3) months after the injection event.

No-purge monitoring methods (i.e., HydraSleeves®, bailer) will be utilized to collect field parameters during the two (2) week and one (1) month post-injection performance monitoring events. Low-flow sampling methodology will be used to collect the three (3) month post-injection performance monitoring field parameters and groundwater samples. Samples will be submitted to an analytical laboratory for analyses. Groundwater samples will be analyzed for VOCs via EPA Method 8260 and manganese via EPA Method 6010 or 6020 as well as color comparison. When

small amounts of $NaMnO_4$ are added to water, the resulting color of the solution is a bright purple. The intensity of the color dissipates as the permanganate ion (MnO_4-) reacts and is consumed. The purple color can be used as a tool for qualitatively indicating the presence and concentration of MnO_4- in the groundwater. Other factors, such as dilution by influent groundwater, can also change the concentration of MnO_4- in the groundwater, which will affect the intensity of the color. Color in samples taken in a consistent manner over time can aid in the estimation of both the extent of distribution of MnO_4- at a particular site, as well as the rate of consumption of MnO_4- over time.

Water quality field parameters (i.e., pH, conductivity, turbidity, temperature, DO and ORP) will be recorded for each well during each sampling event. In addition, WCG proposed to deploy one (1) to three (3) water quality sondes within the performance monitoring wells to measure and record water quality one (1) to four (4) times per day for a duration of one (1) month. Field parameter changes resulting from the permanganate injections at nearby monitoring points may include:

- An increase in ORP as a result of the injection of the $NaMnO_4$ oxidant;
- A pink or purple color may appear in the event of temporary unreacted permanganate migration;
- A temporary increase in conductivity may be observed as a result of the by-product formation of inorganic ions (Cl^-, MnO_2^-); and
- A temporary increase in turbidity may be observed as a result of the by-product formation of manganese dioxide (MnO_2^-(s)).

These conditions are transient and will attenuate once the permanganate is consumed by chemical reaction and/or decomposition. Groundwater samples, including QA/QC samples, will be collected in accordance with IDEM guidance and the QAPP for the Site. Results of the performance monitoring will be reviewed to refine the scope of the ISCO pilot test program.

The current quarterly groundwater monitoring will continue during this time, with ORP and colorimetric evaluation performed to maintain and optimize ISCO injections. Overall, the monitoring data will be used to document mass removal rates, and reduction and/or stabilization of dissolved-phase chemical concentrations within groundwater. The monitoring data will also be evaluated to document conditions relative to the established regulatory standards for the Site.

The performance monitoring well network may be expanded to include wells located further down-gradient over time, as necessary. The performance monitoring data will be evaluated to determine applicability of subsequent ISCO injection events and expanding the injection well network to address residual CVOC impacts on-Site and/or off-Site.

SVE Pilot Test

The primary objective of the SVE pilot evaluation testing is to evaluate the efficacy of the application of SVE technology to remediate CVOCs in underlying unsaturated shallow soil. The application of SVE processes is targeted at establishing an area of lower pressure within the subsurface thereby inducing, capturing, and removing CVOC vapors in the subsurface soils above the groundwater table from within the impacted area. The data collected from the pilot test will

focus on providing a basis of design for: 1) providing an initial indication of the technical efficacy of SVE application at the Site to remediate VOCs in underlying shallow vadose zone soil; 2) providing an initial indication of the potential radius of influence (ROI) to further evaluate the potential implementation requirements of SVE technology at the Site; and 3) if applicable, collecting preliminary engineering information to develop a design basis for an expanded SVE remediation program, including the extraction blower(s) and electrical requirements; extraction conveyance piping; and evaluating air emission permitting requirements.

Pilot Test Scope of Work

The limited SVE pilot test approach will include the installation of two shallow SVE wells and up to ten (10) soil vapor monitoring points (SVPs). An SVE blower will induce a vacuum at each SVE well. Field performance monitoring data will be collected from the pilot SVE system and strategically located SVPs surrounding the SVE pilot test study area to evaluate the potential applicability of SVE to remediate CVOC impacted within the vadose zone.

SVE Well and Soil Vapor Monitoring Point Installation

The SVE wells will be installed by an Indiana licensed well driller using a Geoprobe® with hollow stem auger. Prior to drilling activities, the driller will contact Indiana 811 to locate public utilities at the Site. WCG will also coordinate with a private utility locate contractor to locate private utilities at the Site.

A WCG representative will be present during soil probing activities to observe and document field conditions and collect the soil samples. Soil samples will be obtained by the direct push of five-foot long, two-inch diameter probe rods into the undisturbed subsurface. Soil samples will be continuously collected via individual five-foot long, two-inch diameter acrylic liners. The driller will decontaminate the sampler between soil probe locations via an initial wash with a Liquinox™/water solution, followed by a clean water rinse.

Upon retrieval, each split sample will be placed into a zip-locked bag for field screening by a RAE Systems™ Mini-Rae 3000 photoionization detector (PID) with an 11.4 eV lamp. In addition to PID screening, visual and olfactory observations will be used to assess the presence of impacted soil and selection of the appropriate sample interval for laboratory analysis. Each soil probe location will be described and logged by a WCG representative. The color, soil type, moisture content, and other applicable characteristics for each location will be recorded and the data will then be used to construct a log of the subsurface conditions encountered.

Each SVE well will be installed to an approximate depth of twelve (12) ft bgs and completed with a 2-inch polyvinyl chloride (PVC) casing screened from two to twelve (12) or seven to twelve (12) ft bgs. The boring annular space will be backfilled with silica sand to approximately 1.5 or 6.5 ft bgs and sealed to the surface with hydrated bentonite crumbles. The SVPs will be installed using a hammer drill and auger kit or via Geoprobe®. Each vapor monitoring point will be installed to an approximate depth of six or nine ft bgs and completed with a ½-inch diameter, 1.5 ft long stainless-steel screen. The annular space will be backfilled with silica sand to approximately 2 ft

bgs and sealed to the surface with Portland cement grout. Groundwater is anticipated at depths of 11 to 14 ft bgs. The proposed locations of the pilot SVE wells and SVPs are depicted on **Figure 4 – Proposed SVE Pilot Test Layout**.

Pilot SVE Test

The temporary pilot SVE system will be equipped with a rotary vein blower, a moisture separator tank to remove any moisture in the air stream, a bleed valve to control the applied vacuum to the SVE wellhead, and sampling ports on the influent and effluent air streams to measure: vacuum; PID concentrations; air velocity; and to collect extracted vapor samples. The blower will be connected to each SVE well using 2-inch flex hose and quick disconnect fittings. The blower will be powered by a temporary electrical drop provided by a licensed electrician and housed within a portable enclosed trailer. WCG assumes the SVE equipment will be rented for the Pilot Test.

Prior to pilot test implementation, baseline PID readings will be collected at each SVP and at the respective SVE pilot test well location. In addition, groundwater elevations will be collected from wells within the immediate pilot test area to monitor groundwater elevation and confirm the amount of available unsaturated well screen. Upon pilot test startup, the blower will be energized with the bleed valve fully open and air velocity measurements will be collected at the influent and effluent side of the blower and the bleed valve adjusted (closed) to increase the applied vacuum at the test SVE well. A step test will be performed by incrementally increasing the applied vacuum (10 Inches Water Column [IWC], 15 IWC, 20 IWC, 25 IWC, 30 IWC) to determine the most effective vapor flow through the sub-surface at each location. Vacuum conditions applied to the wellhead will be increased every 15 to 60 minutes until adequate influence is observed at surrounding monitoring points. During the pilot testing period, SVE system influent and effluent parameters will be collected hourly including applied vacuum using a magnehelic gauge, air stream temperature, PID readings, and flow rate using a Velocicalc thermal anemometer. While conducting the pilot test, influence vacuum measurements will be collected periodically from the SVPs. Based on the subsurface lithology, high permeability conditions are expected, generating lower vacuums and higher vapor flow. While the SVE blower is running, ambient air in the vicinity of the SVE system will be monitored for VOCs to ensure a safe working environment.

Extracted vapor samples will be collected using a 6-liter summa canister and analyzed for VOCs by EPA Compendium Method TO-15 at each SVE well approximately 30 minutes following the start of each test and again at the point where the vacuum generates the most effective vapor flow prior to system shutdown. When the vapor samples are collected for analysis, the system will be temporarily shut down to remove the pressure differential and ensure the sample is not affected by the flow and applied system vacuum. Vapor sample data will be used to evaluate emissions monitoring and preliminarily assess necessary air permitting requirements associated with the interim SVE system following construction and startup.

Interim SVE System Construction

Assuming favorable pilot SVE test data demonstrating CVOC mass removal and a subsurface conducive to SVE, WCG will construct an interim SVE system using the two (2) SVE wells. The

system will include SVE well head assemblies equipped with sample ports, PVC conveyance piping and manifold system, and a moisture separator and blower housed within a portable enclosed trailer staged in the vicinity of the SVE wells. The blower will be powered by a temporary electrical drop provided by a licensed electrician. The SVE system exhaust air will be directed through a vent stack extending 12 feet or higher above the ground surface. The SVE system will operate continuously for a period of three months, to coincide with the ISCO pilot test performance monitoring.

Performance Monitoring

Performance monitoring will be conducted following construction and startup of the interim SVE system. SVE system influent and effluent parameters will be collected including applied vacuum using a magnehelic gauge, air stream temperature, PID measurements, and flow rate using a Velocicalc thermal anemometer. Influence vacuum and PID measurements will also be collected from the SVPs. In addition, extracted vapor samples will be collected upon startup operation and during each performance monitoring event using a 6-liter summa canister and analyzed for VOCs by EPA Compendium Method TO-15. Data from the vapor samples will be used to evaluate mass removal as well as emissions monitoring and necessary air permitting requirements.

The performance monitoring data will be evaluated to determine applicability and efficacy of SVE operations to remediate CVOC impacts within the vadose zone and expanding the interim SVE system on-Site. WCG will conduct performance monitoring one (1) week, one (1) month, and three (3) months after the SVE pilot test to coincide with the ISCO pilot test as well as during quarterly groundwater monitoring events.

Reporting

Following completion of the above Remedial Pilot Test activities, a Remedial Pilot Test Report will be prepared documenting the completed activities and associated performance monitoring. The pilot test will be evaluated following performance monitoring to confirm the efficacy, design criteria and performance monitoring parameters for full-scale implementation. This report will include recommendations for the Remedial Work Plan and provided to IDEM within 45 days following completion of the pilot test activities.

Estimated costs associated with Task 2 are included in **Table 2**.

Task 3 – Remedial Program Implementation

Following completion of the ISCO/SVE pilot test program demonstrating successful implementation of the remedial actions, the pilot test data will be used to confirm the efficacy, design criteria and performance monitoring parameters. Should the pilot test meet the performance criteria, full scale implementation of the remedial program will be conducted to address CVOC concentrations within groundwater and vadose zone soils.

The full-scale remedial action implementation will include continued ISCO injections utilizing the five newly installed injection wells consistent with the pilot test described above on a semi-annual

basis. Groundwater elevation and quality monitoring will be completed during the injection activities. Performance will be evaluated through the monitoring and sampling activities described in the ISCO Pilot Test section above and conducted approximately four to six weeks following each injection event.

In addition, WCG will expand the SVE system to address other portions of the Site exhibiting CVOC impacts vadose zone soils. The expansion will consist of the installation of three additional SVE extraction wells and ten (10) soil vapor monitoring points in the vicinity of the new extraction wells, consistent with the activities described within the SVE Pilot Test section above. This will include construction of a permanent SVE system operating continuously, acquisition of a 1 horsepower regenerative blower, air-water separator, electrical supply, and a Conex box/shipping container to house the SVE system components. Following installation and startup of the blower, the five extraction well SVE system will be rebalanced to optimize vapor flow and mass removal. Performance will be evaluated through the performance monitoring activities described above and conducted quarterly. Two quarterly events per year will be completed concurrently with the semi-annual ISCO injection activities, while the remaining two quarterly events will be completed as standalone events.

Following completion of the remediation activities or Brownfields RLF grant, WCG will prepare a Remedial Action Report documenting the remedial actions taken, plume mass analysis, CVOC concentration trend analysis, sampling showing cleanup levels were met, and the resources committed.

Estimated costs associated with the implementation of Task 3 for a period of three years are included in **Table 3**. In addition, the estimated total costs associated with the RLF Subgrant programmatic activities, ISCO/SVE pilot program, and three-year ISCO/SVE remediation program are summarized in **Table 4**.

Should you have any questions regarding the information presented or require additional information, please feel free to contact us at (312) 478-8972.

Sincerely,
Weaver Consultants Group

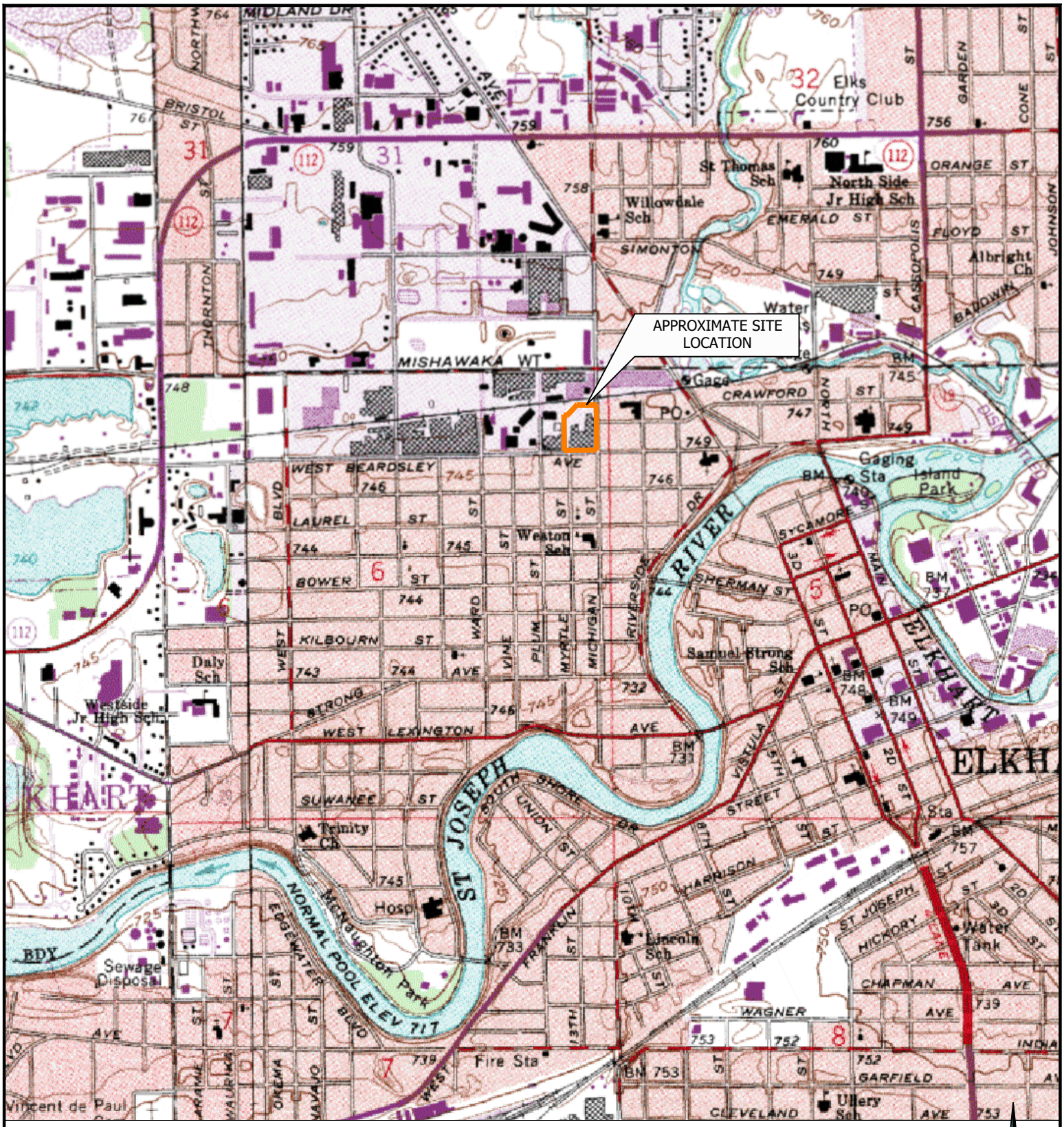
John Yerton, P.G.
Senior Project Director

Paul Gruca, CWP
Project Manager

Copies: Andrea Robertson – Indiana Finance Authority
Dawn Andershock – Indiana Finance Authority
File

Attachments: Figures 1-4
Tables 1-4

FIGURES



PREPARED FOR:

CITY OF ELKHART

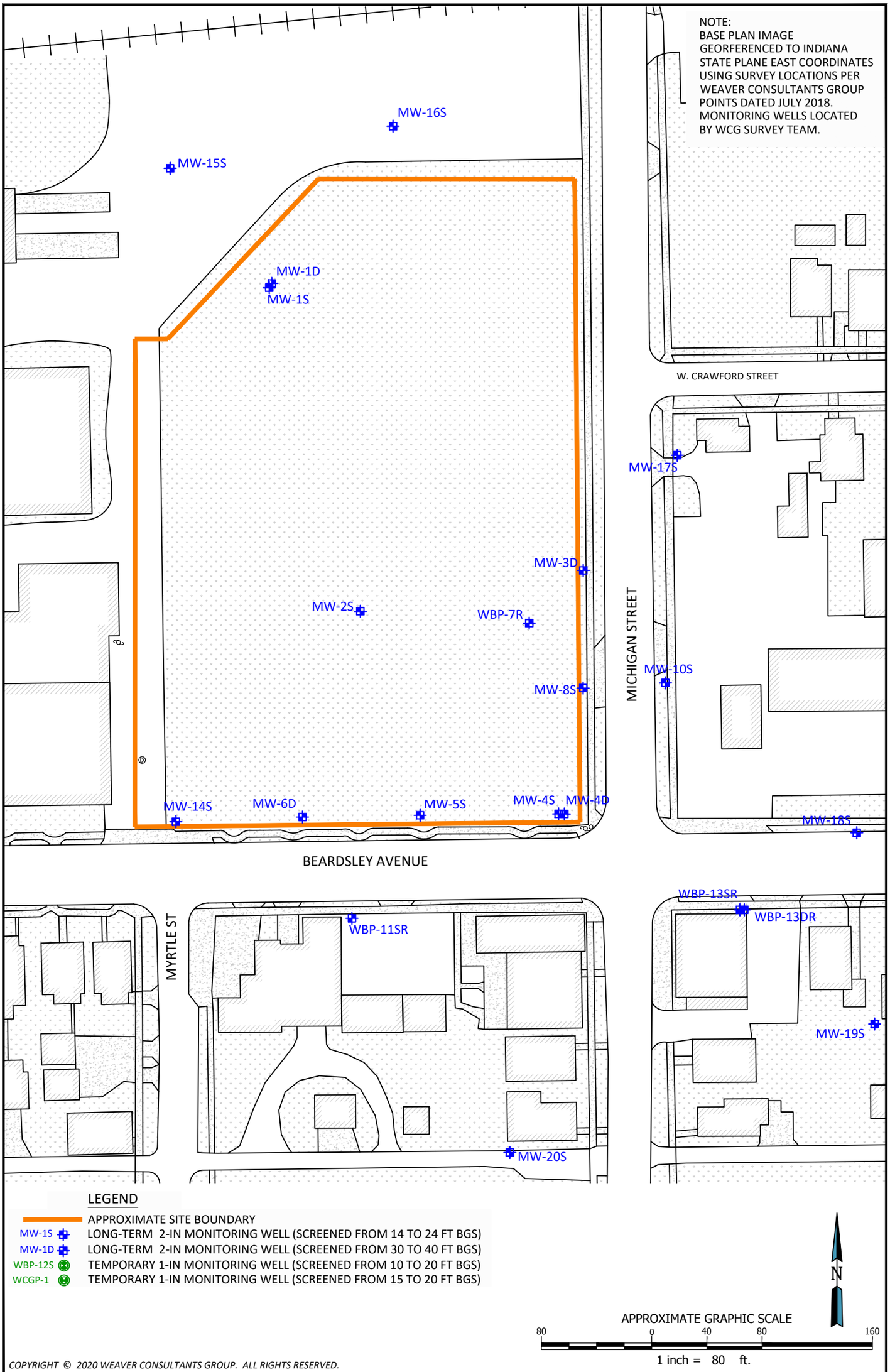
SITE LOCATION MAP

700 W. BEARDSLEY AVENUE
ELKHART, IN

Weaver Consultants Group
GRANGER, INDIANA
(574) 271-3447 www.wcgrp.com

DRAWN BY: RMD
REVIEWED BY: JLES
DATE: 10/28/2020
FILE: 0609-356-03
CAD: siteloc2020.dwg

FIGURE 1



PREPARED FOR:

CITY OF ELKHART

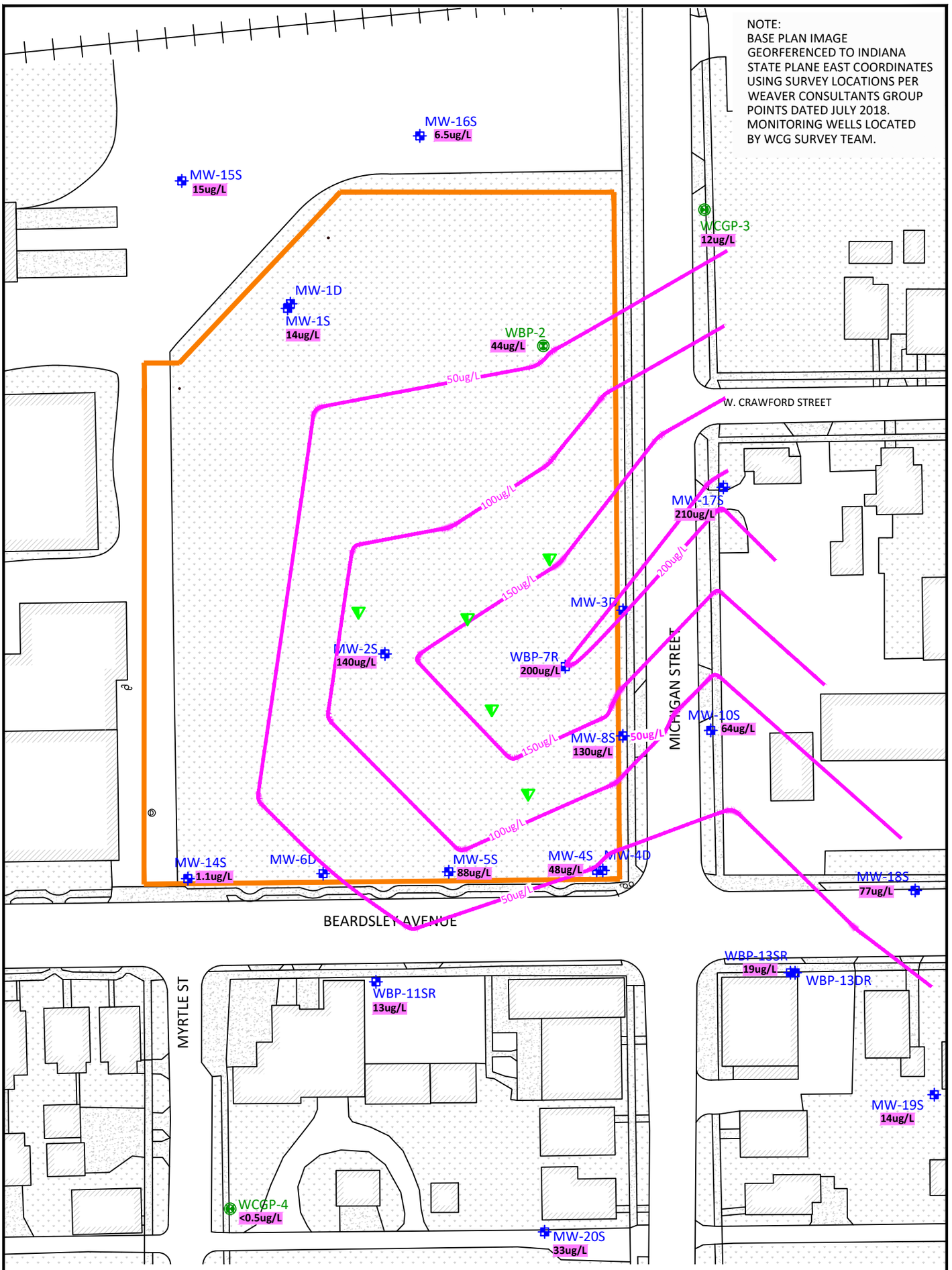
SITE LAYOUT MAP

700 W. BEARDSLEY AVENUE
ELKHART, IN

Weaver Consultants Group
GRANGER, INDIANA
(574) 271-3447 www.wcgrp.com

DRAWN BY:	RMD
REVIEWED BY:	JLES
DATE:	10/28/2020
FILE:	0609-356-03
CAD:	siteloc2020.dwg

FIGURE 2



LEGEND

- APPROXIMATE SITE BOUNDARY
- MW-1S — LONG-TERM 2-IN MONITORING WELL (SCREENED FROM 14 TO 24 FT BGS)
- MW-1D — LONG-TERM 2-IN MONITORING WELL (SCREENED FROM 30 TO 40 FT BGS)
- WBP-12S — TEMPORARY 1-IN MONITORING WELL (SCREENED FROM 10 TO 20 FT BGS)
- WCGP-1 — TEMPORARY 1-IN MONITORING WELL (SCREENED FROM 15 TO 20 FT BGS)
- 150ug/L — APPROXIMATE TCE ISOCONCENTRATION CONTOUR
- 150ug/L — CONCENTRATION OF TRICHLOROETHENE DETECTED IN THE GROUNDWATER SAMPLE COLLECTED FROM THE MONITORING WELL
- PROPOSED INJECTION WELL LOCATION

APPROXIMATE GRAPHIC SCALE

80 0 40 80 160

1 inch = 80 ft.

N

PREPARED FOR:

CITY OF ELKHART

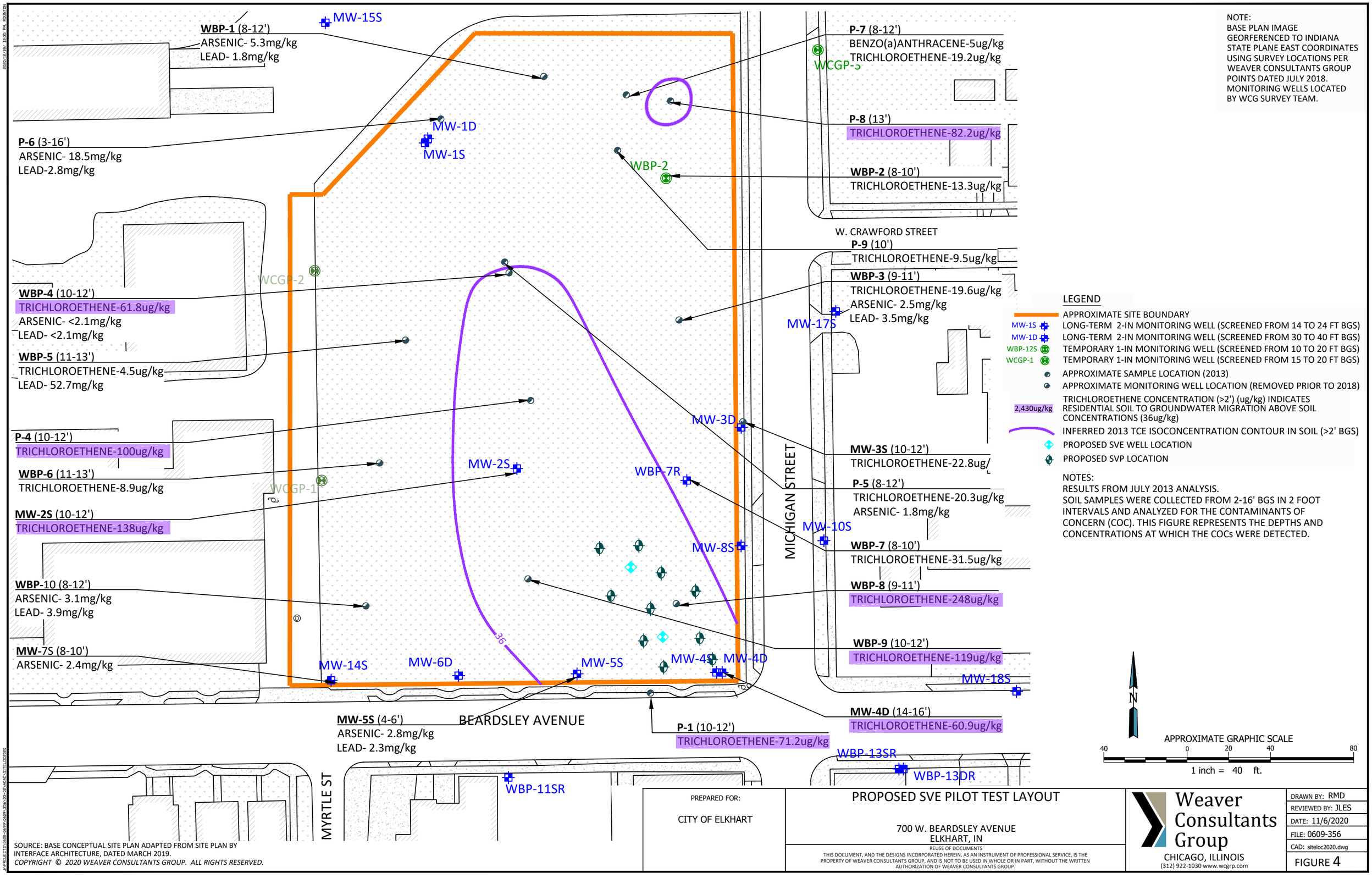
PROPOSED INJECTION PILOT TEST LAYOUT

700 W. BEARDSLEY AVENUE
ELKHART, IN

Weaver Consultants Group
GRANGER, INDIANA
(574) 271-3447 www.wcgrp.com

DRAWN BY:	RMD
REVIEWED BY:	JLES
DATE:	11/6/2020
FILE:	0609-356-03
CAD:	siteloc2020.dwg

FIGURE 3



NOTE:
BASE PLAN IMAGE GEORFERENCED TO INDIANA STATE PLANE EAST COORDINATES USING SURVEY LOCATIONS PER WEAVER CONSULTANTS GROUP POINTS DATED JULY 2018. MONITORING WELLS LOCATED BY WCG SURVEY TEAM.

LEGEND

- APPROXIMATE SITE BOUNDARY
- MW-1S — LONG-TERM 2-IN MONITORING WELL (SCREENED FROM 14 TO 24 FT BGS)
- MW-1D — LONG-TERM 2-IN MONITORING WELL (SCREENED FROM 30 TO 40 FT BGS)
- WBP-12S — TEMPORARY 1-IN MONITORING WELL (SCREENED FROM 10 TO 20 FT BGS)
- WCGP-1 — TEMPORARY 1-IN MONITORING WELL (SCREENED FROM 15 TO 20 FT BGS)
- APPROXIMATE SAMPLE LOCATION (2013)
- APPROXIMATE MONITORING WELL LOCATION (REMOVED PRIOR TO 2018)
- 2,430ug/kg — TRICHLOROETHENE CONCENTRATION (>2') (ug/kg) INDICATES RESIDENTIAL SOIL TO GROUNDWATER MIGRATION ABOVE SOIL CONCENTRATIONS (36ug/kg)
- INFERRED 2013 TCE ISOCONCENTRATION CONTOUR IN SOIL (>2' BGS)
- PROPOSED SVE WELL LOCATION
- PROPOSED SVP LOCATION

NOTES:
RESULTS FROM JULY 2013 ANALYSIS.
SOIL SAMPLES WERE COLLECTED FROM 2-16' BGS IN 2 FOOT INTERVALS AND ANALYZED FOR THE CONTAMINANTS OF CONCERN (COC). THIS FIGURE REPRESENTS THE DEPTHS AND CONCENTRATIONS AT WHICH THE COCs WERE DETECTED.

N

APPROXIMATE GRAPHIC SCALE
40 0 20 40 80
1 inch = 40 ft.

SOURCE: BASE CONCEPTUAL SITE PLAN ADAPTED FROM SITE PLAN BY INTERFACE ARCHITECTURE, DATED MARCH 2019.

PREPARED FOR:
CITY OF ELKHART

PROPOSED SVE PILOT TEST LAYOUT

700 W. BEARDSLEY AVENUE
ELKHART, IN

Weaver Consultants Group
CHICAGO, ILLINOIS
(312) 922-1030 www.wcgrp.com

DRAWN BY:	RMD
REVIEWED BY:	JLES
DATE:	11/6/2020
FILE:	0609-356
CAD:	siteloc2020.dwg

FIGURE 4

TABLES

TABLE 1
ESTIMATED COSTS FOR RLF SUBBGRANT PROGRAMMATIC ACTIVITIES (THREE YEARS)
700 WEST BEARDSLEY AVE
ELKHART, IN

Prepared for: City of Elkhart
Prepared By: Weaver Consultants Group, LLC

Task Description		Estimated Range Of Costs	
TASK 1: BROWNFIELDS RLF SUBGRANT PROGRAMMATIC ACTIVITIES		Low Range	High Range
A	**Community Relations Plan Preparation** Public notice posting, CRP prep	$2,600	$3,100
B	**Analysis of Brownfields Cleanup Alternatives Preparation** ABCA Prep for USEPA/IDEM and AR	$4,600	$5,500
C	**Community Meeting and Response to Comments** 30 day comment period, one public meeting, response to comments, signage	$3,300	$4,000
D	**Quarterly Reporting (Per Quarterly Report)** Performance objectives/project timeline progress, project milestones, use of/compliance with DBE, property profile, budget recap summary	$2,100	$2,500
	Annual Quarterly Reporting Subtotal	*$8,400*	*$10,000*
	Three Year Task 1D Total	*$25,200*	*$30,000*
E	**Preparation of Record of Decision Memorandum** Preparation of ROD outlining the selected ABCA remedy	$1,800	$2,200
F	**Establish Administrative Record** Publicly available AR for relevant documents	$2,900	$3,500
G	**IDEM Voluntary Remediation Program** Enrollment and IDEM VRP Management (IDEM review costs billed directly to City)	$1,200	$1,400
H	**Preparation of QAPP and HASP**	$2,700	$3,200
I	**Annual RLF Grant Management** Routine and Grant-Specific PM needs, Loan Agreement support	$6,600	$7,900
	Three Year Task 1I Total	*$19,800*	*$23,700*
	YEAR ONE ANNUAL TOTAL	*$34,100*	*$40,800*
	YEAR TWO ANNUAL TOTAL	*$15,000*	*$17,900*
	YEAR THREE ANNUAL TOTAL	*$15,000*	*$17,900*
OVERALL RLF SUBGRANT PROGRAMMATIC TOTAL (THREE YEARS)		**$64,100**	**$76,600**

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TABLE 2
ESTIMATED COSTS FOR ISCO/SVE REMEDIATION PILOT PROGRAM
700 WEST BEARDSLEY AVE
ELKHART, IN

Prepared for: City of Elkhart
Prepared By: Weaver Consultants Group, LLC

Task Description	Estimated Range Of Costs	
TASK 1: PREPARATION AND PLANNING	Low Range	High Range
A **Preparation and Coordination**	$3,900	$4,700
B **Preparation of UIC PBR Request**	$3,200	$3,800
Task 1 Subtotal	**$7,100**	**$8,500**
TASK 2: INJECTION AND SVE WELL INSTALLATION		
A **Preparation and Planning**	$4,400	$5,300
B **Baseline Sampling**	$4,500	$5,400
5 IWs (VOCs, Mn, GWQ)		
C **Drilling Activities**	$39,500	$47,400
5 Injection Wells, 2 SVE Wells, 10 SVPs		
D **Well Development**	$6,400	$7,700
E **Data Analysis / Management**	$2,800	$3,400
Task 2 Subtotal	**$57,600**	**$69,200**
TASK 3: INJECTION/SVE PILOT TESTING, INTERIM SVE SYSTEM		
A **Preparation and Planning**	$8,500	$10,200
B **Oxidant Injections**	$52,200	$62,600
4 Totes into 5 IWs		
C **SVE Pilot Testing**	$10,300	$12,400
D **Data Analysis / Management**	$21,100	$25,300
Task 3 Subtotal	**$97,000**	**$117,500**
TASK 4: PERFORMANCE MONITORING		
A **2 Week Post-Event**	$4,200	$5,000
Monitoring of 7 wells (GWQ)		
B **1 Month Post-Event**	$3,100	$3,700
Monitoring of 7 wells (GWQ)		
C **3 Month Post-Event**	$5,100	$6,100
Monitoring of 7 wells (VOCs, MnO4-, GWQS + QA/QC)		
D **Data Analysis / Management**	$5,000	$6,000
Task 4 Subtotal	**$17,400**	**$20,800**
TASK 5: REPORTING AND PROJECT MANAGEMENT		
A **Remedial Pilot Test Report Preparation**	$7,300	$8,800
B **Project Management**	$16,300	$19,600
Task 5 Subtotal	**$23,600**	**$28,400**
OVERALL REMEDIAL PILOT PROGRAM TOTAL	**$202,700**	**$244,400**

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TABLE 3
ESTIMATED COSTS FOR ISCO/SVE REMEDIATION PROGRAM (THREE YEARS)
700 WEST BEARDSLEY AVE
ELKHART, IN

Prepared for: City of Elkhart
Prepared By: Weaver Consultants Group, LLC

Task Description	Estimated Range Of Costs	
TASK 1: SVE SYSTEM EXPANSION	Low Range	High Range
A **Preparation and Planning**	$4,400	$5,300
Coordination and material procurement		
B **Drilling Activities / SVE System Construction**	$30,800	$37,000
Install 3 SVE Wells, 10 SVPs (includes capital and one year of utility costs for permanent SVE system)		
C **Data Analysis / Management**	$2,900	$3,500
D **Annual SVE Operation**	$2,100	$2,500
Capital and utility costs per year		
Task 1 Year One Annual Subtotal	*$40,200*	*$48,300*
Task 1 Year Two Annual Subtotal	*$2,100*	*$2,500*
Task 1 Year Three Annual Subtotal	*$2,100*	*$2,500*
Task 1: 3 Year Subtotal	**$44,400**	**$53,300**
TASK 2: INJECTION EVENTS / SVE PERFORMANCE MONITORING		
A **Preparation and Planning (Per Event)**	$4,500	$5,400
Coordination and material procurement		
B **Oxidant Injections (Per Event)**	$51,800	$62,200
Injection of 4 oxidant totes into 5 Injection Wells per Event		
C **SVE Performance Monitoring & OM&M w Injections (Per Event)**	$3,000	$3,600
OM&M (vapor sampling, system measurements and balancing) paired with injection events		
D **Data Analysis / Management (Per Event)**	$3,100	$3,700
Task 2A-D Per Injection Event Subtotal	*$62,400*	*$74,900*
Annual (Semi-Annual Injection and 2 of 4 Quarterly SVE Monitoring Events) Subtotal	*$124,800*	*$149,800*
E **SVE Performance Monitoring & OM&M w/out Injections (Per Event)**	$3,500	$4,200
OM&M (vapor sampling, system measurements and balancing), standalone event		
Task 2E Per Event Subtotal	*$3,500*	*$4,200*
Annual (2 of 4 Quarterly SVE Monitoring Events) Subtotal	*$7,000*	*$8,400*
Task 2: 3 Year Subtotal	**$395,400**	**$474,600**
TASK 3: POST-INJECTION PERFORMANCE MONITORING		
A **Post-Injection Performance Monitoring (Per Event)**	$4,900	$5,900
Monitoring of 7 wells (VOCs, MnO4-, GWQS + QA/QC)		
B **Data Analysis / Management (Per Event)**	$4,700	$5,600
Task 3 Per Event Subtotal	*$9,600*	*$11,500*
Annual (Semi-Annual Events) Subtotal	*$19,200*	*$23,000*
Task 3: 3 Year Subtotal	**$57,600**	**$69,000**
TASK 4: REPORTING AND PROJECT MANAGEMENT		
A **Remedial Action Report Preparation**	$18,400	$22,100
Task 4 Year Three Annual Subtotal	*$18,400*	*$22,100*
B **Project Management**	$49,500	$59,400
Task 4B Annual Subtotal	*$16,500*	*$19,800*
Task 4: 3 Year Subtotal	**$67,900**	**$81,500**
Year One Annual Total	*$207,700*	*$249,300*
Year Two Annual Total	*$169,600*	*$203,500*
Year Three Annual Total	*$188,000*	*$225,600*
OVERALL REMEDIAL PROGRAM TOTAL (THREE YEARS)	**$565,300**	**$678,400**

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TABLE 4
SUMMARY OF ESTIMATED COSTS FOR REMEDIATION PROGRAM (THREE YEARS)
700 WEST BEARDSLEY AVE
ELKHART, IN

Prepared for: City of Elkhart
Prepared By: Weaver Consultants Group, LLC

		Estimated Range of Costs	
TABLE 1: RLF SUBGRANT PROGRAMMATIC ACTIVITIES (THREE YEARS)		Low Range	High Range
	Year One Annual Subtotal	$34,100	$40,800
	Year Two Annual Subtotal	$15,000	$17,900
	Year Three Annual Subtotal	$15,000	$17,900
	RLF SUBGRANT PROGRAMMATIC SUBTOTAL (THREE YEARS)	**$64,100**	**$76,600**
TABLE 2: ISCO/SVE PILOT PROGRAM		Low Range	High Range
	Year One Annual Subtotal	$202,700	$244,400
	Year Two Annual Subtotal	$0	$0
	Year Three Annual Subtotal	$0	$0
	PILOT PROGRAM SUBTOTAL	**$202,700**	**$244,400**
TABLE 3: ISCO/SVE REMEDIATION PROGRAM (THREE YEARS)		Low Range	High Range
	Year One Annual Subtotal	$207,700	$249,300
	Year Two Annual Subtotal	$169,600	$203,500
	Year Three Annual Subtotal	$188,000	$225,600
	REMEDIAL PROGRAM SUBTOTAL (THREE YEARS)	**$565,300**	**$678,400**
	Year One Annual Total	*$444,500*	*$534,500*
	Year Two Annual Total	*$184,600*	*$221,400*
	Year Three Annual Total	*$203,000*	*$243,500*
OVERALL REMEDIATION PROGRAM TOTAL (THREE YEARS)		**$832,100**	**$999,400**

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