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May 1, 2019

Andrea Robertson Habeck
Indiana Brownfields Program
100 North Senate Avenue, Room 1275
Indianapolis, Indiana 46204

RE: Remediation Work Plan
Former Central Siding Property
129 West Main Street
Elwood, Madison County, Indiana
Indiana Brownfield Site ID No. 4171102
State Cleanup ID No. 0000600
EPA ACRES ID #205001

Dear Ms. Robertson Habeck:

Industrial Waste Management Consulting Group, LLC (IWM Consulting) is pleased to submit this Remediation Work Plan (RWP) for the Former Central Siding Property located at 129 West Main Street, Elwood, Madison County, Indiana (Site) to the Indiana Brownfields Program (IBP). **Figure 1** displays a topographic map illustrating the location of the Site.

This RWP details the planned maximum 18 feet deep excavation (conducted in lifts) to remove soil impacted with chlorinated volatile organic compounds (cVOCs). For each lift, soils will be segregated based on historical analytical results into overburden (to be stockpiled on-site), non-hazardous impacted soils (to be direct loaded and hauled for disposal), and soils which need to be conditioned in-situ prior to excavation and non-hazardous disposal. IWM Consulting anticipates about 1,000 tons of overburden will be stockpiled for re-use, and about 2,500 tons of non-hazardous impacted soil will be hauled for off-site landfill disposal. In addition, approximately 20 tons of non-hazardous lead-impacted soil will be excavated from a separate on-site location and will also be hauled for off-site landfill disposal.

The Site background and the tasks to be completed as part of this RWP are described in more detail in the following sections. The RWP will be modified accordingly if it is determined that Site conditions are different than originally assumed.

Site History Summary

The Site is located at 129 West Main Street, Elwood, Indiana on the southwest corner of the intersection of West Main Street and North Second Street (see **Figures 1** and **2**). Additionally, the Site is located in the northwest ¼ of Section 16, T21N, R6E in Madison County, Indiana. The Site is rectangular in shape and consists of five (5) parcels, which contain a total of approximately 0.64 acres. The Site is situated in a mixed commercial/residential area on the west side of Elwood, Indiana. IWM Consulting performed a Phase I Environmental Site Assessment (ESA) at the Site in October 2015. The Phase I ESA was conducted in accordance with American Society for Testing and Materials (ASTM) E1527-13 “Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process” and the

standards and practices set forth in 40 CFR Part 312. An additional Phase I ESA was conducted by Morgan Clark Associates, LLC in August 2018.

Based on standard historical sources, the previous Phase I ESAs discovered the property was used for residential purposes in the 1930s; for metal coating, casting and manufacturing in the 1940s through the 1950s; as a home improvement center in the 1950s; for Central Siding from the 1980s to 1990s, and for a daycare in the 2000s. In 2014 the manufacturing/warehouse building was razed, leaving only a storage building on the Site and the concrete pads associated with a previous building(s). The remainder of the Site supports vegetative cover (weeds, bushes, and grass).

Limited subsurface investigations were performed at the Site in April and November-December 2016. Thirteen (13) soil borings (CS-GP-1 through CS-GP-13) were advanced and one-time soil and groundwater samples were collected. In addition, one permanent monitoring well (MW-1D) was installed to the bedrock interface and paired crawlspace and indoor air samples were collected from three (3) nearby residential structures.

Soil and groundwater analytical results indicate both the soil and groundwater have been adversely impacted with metals (lead, arsenic and hexavalent chromium) and cVOCs, including trichloroethene (TCE), tetrachloroethene (PCE), 1,2 dichloroethane (1,2-DCA), and cis 1,2-dichloroethene (cis-DCE). The highest metals (lead) concentrations were located north of the existing storage building and near the Pit sample location. Concentrations of cVOCs in soil and groundwater exceeded the Remediation Closure Guide (RCG) Commercial/Industrial Direct Contact Screening Levels (IDCSLs) around the entire investigated perimeter of the Site. Lead is the only metal detected in the soil at concentrations in excess of the RCG IDCSL and this was detected in a small localized area north of the existing storage building. A more detailed description of the 2016 work activities and associated results were summarized in the *Phase II Environmental Site Assessment Report* dated September 23, 2016 and the *Further Site Investigation Report* dated January 30, 2017.

From May to June, 2018, IWM Consulting supervised the installation of forty-one (41) soil borings (CS-WC1 through CS-WC41) and five (5) exterior soil gas probes (CS-ESG1 through CS-ESG5) in order to better characterize the hazardous potential of waste which may be generated during future remedial activities and to further assess the potential vapor intrusion (VI) pathway at the Site. In addition, a low-flow groundwater sample was collected from the existing Site monitoring well. A total of one hundred fifty-four (154) soil samples for cVOC analysis, twenty (20) soil samples for lead analysis, five (5) soil gas samples for cVOC analysis and one (1) groundwater sample for cVOC analysis (not counting Quality Assurance/Quality Control samples) were obtained during the 2018 Further Site Investigation (FSI) activities and were submitted for laboratory analysis of cVOCs or lead.

Concentrations of TCE were detected in excess of the RCG Excavation Direct Contact Screening Level (EXDCSL) in forty-seven (47) samples at concentrations up to 2,910 mg/kg. Concentrations of PCE were detected in excess of the RCG EXDCSL in two (2) samples. Concentrations of 1,1-dichloroethene (1,1-DCE), cis-DCE, 1,1,2-trichloroethane (1,1,2-TCA) and vinyl chloride (VC) were detected in excess of the RCG Residential Soil Migration to Groundwater Screening Levels (MTGSLs) in numerous samples.

Following receipt of the initial laboratory results for soil, IWM Consulting preliminarily divided the cVOC impacted area into "High" and "Lower" concentration zones. Composite samples were then generated for each impacted two-foot increment in each zone and were submitted to the laboratory for Toxicity Characteristic Leaching Procedure (TCLP) analysis. Based on the TCLP results, concentrations of TCE in Site soils are high enough such that the soil would be considered a characteristic Hazardous Waste (as per the EPA D List for the Toxicity Characteristic) if removed from the ground without prior treatment/conditioning. The southern and eastern extent of hazardous soil concentrations is not delineated. In addition, the southern and eastern extent of TCE concentrations in excess of RCG EXDCSLs is also not delineated.

The historical lead concentration at CS-GP1 exceeded the RCG EXDCSL. Lead was detected in all current soil samples, but concentrations from all ten (10) waste characterization borings installed in the CS-GP1 vicinity did not exceed the most stringent screening level. As such, the historical lead impact at CS-GP1 appears to be de minimis in size.

A more detailed description of the 2018 work activities and associated results were summarized in the *Further Site Investigation Report* dated August 30, 2018. Historical soil sample locations at, or neighboring, the site are depicted on **Figure 2**.

Based upon the results of the Site investigations, the Indiana Finance Authority (IFA) issued a Request for Proposal (RFP) on October 25, 2018 to excavate accessible on-site cVOC and metal impacted soils. Due to elevated concentrations, some of the cVOC impacted soil will be conditioned in-situ to reduce concentrations to below hazardous levels prior to removal of the soil from the pit and non-hazardous disposal in a permitted landfill.

Remediation Goals

IWM Consulting understands the goal of the project is to complete environmental remediation activities at the Site (up to 18 feet in depth) for its intended future commercial use. Consequently, all of the soil and any groundwater samples will be compared to the applicable (residential and commercial/industrial) Indiana Department of Environmental Management (IDEM) RCG Screening Levels. Based upon the online IDEM Wellhead Proximity Determinator, the Site is located within a wellhead protection area and private/municipal wells are located within approximately 750 feet of the Site.

It should be noted cVOC impacted media (soil and groundwater) is also located at depths greater than the maximum excavation depth (anticipated to be 18 feet) and in areas off-site to the south and east. All off-site concentrations, and on-site concentrations in excess of 18 feet in depth, will remain in place and will not be addressed during this targeted remediation event. The off-site and deeper residual cVOCs may require further assessment and separate remediation in the future using alternative remedial technologies.

Remediation Activities

IWM Consulting has reviewed the existing Site data and an evaluation of this data has allowed us to sub divide the targeted cVOC remediation zone into areas that exhibit concentrations less than RCG IDCSLs,

concentrations greater than RCG IDCSLs but are characteristically non-hazardous (based upon TCLP sampling results), and concentrations that are both greater than RCG IDCSLs and characteristically hazardous (based upon TCLP sampling results). This approach, coupled with an in-situ remedial program for the characteristically hazardous soil, allows for the most cost-effective remedial approach to be developed and implemented. Additionally, since the impacted soil is from an unknown source, IWM Consulting does not anticipate having to prepare and submit a Contained-In Request letter to IDEM prior to implementing the work activities. Appropriate documentation (through laboratory analysis) just has to be provided to the landfill documenting the soil is characteristically non-hazardous prior to transportation and disposal off-site at the landfill.

The cVOC remediation activities at the Site will consist of excavation in lifts to 18 feet depth. For each lift, soils will be segregated based on historical analytical results into overburden (to be stockpiled on-site), non-hazardous impacted soils (to be direct loaded and hauled for disposal), and soils which need to be conditioned in-situ prior to excavation and non-hazardous disposal. IWM Consulting anticipates about 1,000 to 1,100 tons of overburden will be stockpiled for re-use, about 1,000 tons of non-hazardous impacted soil will be direct loaded and hauled for disposal, and about 1,500 tons of soil will be conditioned in-situ, re-sampled to confirm non-hazardous concentrations, and will then be excavated and hauled for disposal. These tonnages are an estimate which may vary depending on actual density, moisture content, and the volume of oxidants and soil stabilizers which will be added to achieve non-hazardous concentrations.

In addition, for lead remediation, approximately 20 tons of non-hazardous soil will be excavated from a separate location centered around CS-GP1. The lead excavation will extend to two (2) feet depth. A more detailed description of the forthcoming remedial activities is provided in the following sections.

IWM Consulting will subcontract with Innovative Environmental Technologies, Inc. (IET) to condition, excavate, transport, and dispose of the cVOC and lead impacted soil from the excavation areas. IWM Consulting will prepare and submit a Remediation Completion Report, including a summary of the soil excavation/remediation activities.

A copy of the Site-specific Health and Safety Plan (HASP) is included in **Appendix A**.

Soil and Groundwater Analytical Parameters

Based upon the extensive previous assessment experience with this Site, the following analytical suites will be utilized for this remediation project:

Lead Impacted Remediation Area

- Total lead using SW-846 Method 6010B
- Percent moisture

VOC Impacted Remediation Area

- Shortlist total VOCs (PCE, TCE, cis and trans DCE, and vinyl chloride) using SW-846 Method 8260
- Shortlist TCLP VOCs (PCE, TCE, cis and trans DCE, and vinyl chloride) using SW-846 Method 1311/8260
- Percent moisture

The soil and any groundwater samples will be obtained in accordance with the approved Quality Assurance Project Plan (QAPP) submitted April 18, 2019 and approved April 18, 2019. It should be noted that all of the soil samples obtained for VOC analysis will be obtained in general accordance with EPA Sampling Method 5035.

Targeted Source Removal (Soil Excavation) Activities

Based upon the historical results obtained at the Site and the RFP dated October 25, 2018, the following information summarizes the forthcoming remediation activities.

- Prior to initiation of the Site activities, on-site and off-site underground utilities will be located and marked as previously discussed. Additionally, the work area will be secured with a temporary chain link fence prior to initiating the work activities.

- IWM Consulting will contract with a local, licensed well driller to properly abandon existing monitoring well MW-1D. The well will be abandoned with a grout slurry mixture from the bottom up using a grout pump and tremie pipe. A well abandonment log will also be generated and submitted to the Indiana Department of Natural Resources (IDNR), Division of Water documenting the well abandonment activities.

- Based upon the analytical data obtained in 2018, IWM Consulting proposes to initially excavate and temporarily stockpile the top 4-feet of soil within the footprint of the irregularly shaped cVOC excavation area (see **Figure 3**). All of the soil samples obtained from the 0-4 feet below ground surface (BGS) interval exhibited adsorbed cVOC concentrations less than the corresponding RCG IDCSLs, therefore it will remain on-site and will not be disposed off-site at a landfill. The excavated soil will be temporarily stockpiled on-site, covered with plastic, and used for backfilling purposes at the conclusion of the excavation/remediation activities. This process will be repeated at deeper depths when feasible, but it is understood that this scenario will apply to smaller sections of the total excavation footprint with depth, since the cVOC contamination varies in concentration with depth. Taking all things into consideration, IWM Consulting estimates that approximately 1,000 to 1,100 tons of soil can be excavated, temporarily stockpiled on-site, and then be used as backfill at the conclusion of the remediation activities. IWM Consulting will work with representatives from the IBP regarding the

placement depth of the temporarily stockpiled soil once the backfilling activities have been initiated.

- Based upon the 2018 results, only a small section (centered around CS-WC22) of the 4-6 foot BGS interval requires excavation, removal, and disposal off-site. The corresponding concentration for this area exceeds the RCG IDCSL, but is characteristically non-hazardous. Thus, no in-situ soil conditioning is required for the 4-6 foot BGS (**Figure 3**) interval prior to transportation and disposal off-site. The remaining soil from this interval will be segregated, excavated, and temporarily stockpiled on-site for subsequent use as backfill.

- The characteristically non-hazardous soil footprint which requires off-site disposal expands in size between 6-8 feet BGS (see **Figure 4**), but a similar process as previously described will be used for the 6-8 feet BGS interval in order to segregate cleaner overburden soil from the characteristically non-hazardous soil requiring off-site disposal.

- The majority of the soil within the 8-10 feet BGS interval, and all of the soil within the 10-12 feet BGS interval (see **Figures 5** and **6**), is characteristically hazardous (failed TCLP TCE) and requires in-situ conditioning prior to excavation, removal, transportation, and disposal off-site at a landfill.

- The overall excavation footprint begins to shrink in size beginning at 12 feet BGS (see **Figure 7**), but all of the soil which requires removal from 12-14 feet BGS is characteristically hazardous (failed TCLP TCE) and requires in-situ conditioning prior to excavation, removal, transportation, and disposal off-site at a landfill.

- The excavation footprint becomes even smaller between 14-18 feet BGS (see **Figures 8** and **9)** and only a portion of each interval requires in-situ conditioning prior to excavation, transportation, and disposal off-site at a landfill. The remaining portions are documented to be characteristically non-hazardous and can be disposed off-site without in-situ conditioning.

- Considering all of the above assumptions, IWM Consulting anticipates being able to stockpile and reuse approximately 1,000 to 1,100 tons of clean (i.e. less than RCG IDCSLs) overburden and dispose of approximately 2,500 tons of characteristically non-hazardous soil. Of the non-hazardous tonnage, IWM Consulting anticipates having to condition approximately 1,450 to 1,500 tons of soil in-situ prior to removal and off-site disposal and the remaining approximately 1,000 tons of soil can be directly loaded and transported to the landfill without having to condition the soil in-situ. These volumes are estimates only and are dependent upon the moisture content of the soil and the actual limits of the excavation. The in-situ conditioning activities will occur at depths between 8 – 18 feet BGS.

- IWM Consulting will subcontract with IET to condition, excavate, transport, and dispose of the cVOC impacted soil from the excavation area. The soil will be conditioned with a chemical oxidant to oxidize the cVOCs in-situ. Initially, a grid system (estimated to be ~10' x ~10' x ~4') will be utilized in order to both track the sampling locations and to determine the stoichiometric demand. The soil will initially be conditioned with an oxidant (sodium persulfate, hydrogen peroxide, and water) to oxidize the cVOCs, and then agricultural lime (used to reduce the pH and dry out the conditioned soil) will be applied to the soil after the confirmation sampling has been completed and the results have been received. The soil, oxidant, and lime will be mixed in-situ, below grade, with a hydraulic excavator.

- Since an extensive amount of pre-sampling has already been completed by IWM Consulting, no additional pre-sampling is required prior to determining the stoichiometric demand and initiating the in-situ conditioning activities. Based on the results from the pre-sampling activities completed in 2018, a calculated dosage of oxidant will be applied to one cell at a time and will be mixed with an excavator equipped with the appropriate attachments/equipment until the oxidant and soil are thoroughly blended together within the treatment cell. No material will be conditioned above the ground surface or in stockpiles outside of the excavation footprint. This process will be repeated across the entire footprint of the proposed excavation area for that particular 4-foot interval. The thickness of each treatment cell may become only 2 feet in thickness the deeper the excavation extends, since the excavation footprint shrinks in size and does not necessarily overlay exactly from one 2-foot interval into the next deeper 2-foot interval.

- Conditioned soil will remain in the excavation area until laboratory analysis of a representative portion of soil from that treatment interval confirms concentrations of all contaminants-of-concern (COCs) are below the nonhazardous disposal criteria.

- Post-conditioning confirmatory soil samples will be obtained at a sufficient rate to satisfy the landfill requirements and analyzed for appropriate shortlist cVOCs (both totals and TCLP). For estimating purposes, IWM Consulting assumes that a total of five (5) confirmation samples will be obtained from the 8-12 feet treatment interval, three (3) will be obtained from the 12-14 feet treatment interval, and one (1) to two (2) samples will be obtained for the 14-18 feet treatment interval. IWM Consulting personnel will note the location of each sample in order to accurately document the area that was sampled. The samples will be submitted to Pace Analytical Services, LLC (Pace) and will be analyzed with an expedited turnaround time (48-hours).

- Once the analytical data has been received, and analysis confirms the soil meets the nonhazardous threshold criteria, a copy of the analytical data will be provided to the selected landfill and the soil will be directly loaded into tri-axle trucks and will be transported to the landfill. IWM Consulting anticipates that Wabash Valley Landfill in Wabash County will be utilized as the disposal facility for the non-hazardous soil. A

non-hazardous waste manifest will accompany each load to the landfill. All disposal volumes and manifests will be included in the Remediation Completion Report.

- If initial confirmation analytical results indicate the nonhazardous threshold criteria have not been met, then additional in-situ conditioning of the soil will occur and the soil will be retested. This process will be repeated until the soil meets the nonhazardous threshold criteria.

- After the non-hazardous soils have been excavated and disposed, the process will be repeated for each subsequent deeper treatment interval.

- Targeted excavation activities will also occur in the vicinity of soil boring CS-GP1 since the lead concentration for this sampling point exceeds the RCG EXDCSL. The proposed excavation area is rectangular in shape and is located in the central portion of the Site, just north of the existing storage building. The volume of soil within this area, assuming an excavation depth of 2 feet, is estimated to be approximately 20 tons, depending upon the moisture content of the soil and the final dimensions of the excavation. For estimating purposes, IWM Consulting has assumed the total volume of soil is 20 tons. IWM Consulting has also assumed that the soil will be characteristically non-hazardous based upon the 2018 FSI sampling results and will not require in-situ treatment, stabilization, or conditioning prior to excavation and removal. This soil will be directly loaded from the lead excavation area into tri-axle trucks and will be transported to the landfill for non-hazardous disposal. The proposed lead excavation area is displayed on **Figure 10**.

- At the conclusion of the excavation activities, confirmation soil samples will be obtained from the base and sidewalls of both the cVOC and lead excavations in order to document the condition of the soil post excavation activities. The confirmation soil samples will be obtained from the sidewalls at a rate of one (1) sample per 20 linear feet and along the floor at a rate of one (1) sample per every 400 square feet. For the lead excavation, a minimum of one (1) sample from each sidewall and one (1) floor sample will be obtained. The cVOC excavation samples will be submitted for laboratory analysis of shortlist cVOCs using SW-846 Method 8260 and percent moisture, and the lead excavation samples will be submitted for total lead using SW-846 Method 6010 and percent moisture. One (1) duplicate soil sample and one (1) matrix spike/matrix spike duplicate (MS/MSD) soil sample will be obtained during the over-excavation sampling activities at a rate of one (1) sample per every twenty (20) confirmatory soil samples and will be analyzed for the same analytical parameters.

- In an effort to remediate deeper impact which will remain below the base of the cVOC excavation, IWM Consulting proposes to place approximately 4,000-lbs of Provect-Ox, a proprietary oxidant mixture of persulfate and ferric iron. This is consistent with the oxidation approach being utilized to condition the soil prior to excavation and should assist in oxidizing any cVOCs located immediately beneath or adjacent to the base of the

cVOC excavation, provided the remedial amendment comes in contact with the underlying saturated interval. The material will be applied and thoroughly mixed with the soil at the base of the excavation using the bucket of the excavator. A technical specification sheet summarizing the key aspects of Provect-Ox product is provided as **Appendix B**.

- Per the RFP, post excavation activities, the excavation areas will be brought to grade using a compactable granular fill material and any temporarily stockpiled "clean" overburden material (cVOC excavation only). The fill material will be compacted with a vibratory roller during the backfilling process and the excavation will be topped with 4-inches of crushed stone.

- The cVOC impacted media (soil and groundwater) located at depths greater than the maximum excavation depth (anticipated to be 18 feet) and in areas off-site to the south and east will remain in place and will not be addressed during this targeted remediation event. The off-site and deeper residual cVOCs may require remediation in the future using alternative remedial technologies.

- In accordance with the anticipated QAPP Requirements, IWM Consulting has also included the cost to conduct a field audit during the sampling activities to document the sampling activities are being conducted in accordance with the approved QAPP and Site-specific RWP. If deficiencies are observed during the audit, the observed deficiencies will immediately be discussed with the field personnel and deficiencies will be rectified prior to concluding the audit. A Field Audit checklist will be utilized during the audit and a copy of the checklist will be provided as an attachment to the Site-specific Remediation Completion Report.

- The soil sample analytical results will be compared to the most recent version of the IDEM RCG Screening Levels for soil exposure, using both residential and commercial/industrial direct contact screening levels, with the understanding that the primary goal is to remediate the soil to levels at or below the corresponding RCG IDCSLs.

- A Remediation Completion Report will be generated summarizing the soil remediation activities/results and will be submitted to the IBP. The report will also include a site-specific data evaluation report, which evaluates the usability of the analytical data obtained during the remediation activities.

Sidewall Stability and Pit Water Abatement

The RFP and this RWP assumes that no sheet piling or other type of supports are needed for the adjacent roads/alleys and that excessive groundwater is not encountered during the excavation activities. In the event of suspected sidewall instability, a portion of the soil from each lift may be temporarily placed against the subject sidewall to improve stability of the base of slope. This stabilizing soil volume would

be left in place as long as possible, and would then be removed for disposal and quickly replaced with backfill at the end of the in-situ conditioning activities. However, if excessive sidewall slumping occurs at deeper depths, then the total depth and/or areal extent of the excavation may need to be reduced for safety reasons.

As per IET, any soils conditioned in-situ will typically need 20-30% water content by volume in order to achieve a better mix (greater contact) with oxidizers. So, some moisture (precipitation or influx from the sidewalls/underlying soil) is necessary. Lacking optimum moisture, IET will have to add moisture to the mix. However, if sidewall influx and/or precipitation events contribute more fluid to the excavation area than can be utilized for the active lift, then treatment, extraction, and disposal of the excess water may be necessary.

Pit water management and disposal/discharge costs are outside the scope of the approved work. As such, if pit water management is critical to allow completion of the current remedial scope of work, then expedited IBP approval will be requested in order to mobilize a suitably sized storage tank to the Site. An estimate of the volume of water (and associated costs) which could potentially be treated and/or discharged and/or disposed will also be supplied. In this event, a representative sample of any water pumped from the pit will be analyzed, and the water will be treated and discharged/disposed based on the analytical results. As excess precipitation would be detrimental to the project, the field work may be postponed if the long-term weather forecast predicts significant precipitation.

IWM Consulting will obtain approval from the IBP Project Manager (PM) for this RWP prior to initiating the field work. The remediation activities are anticipated to start on, or about, June 26, 2019 depending upon the approval and public comment timeframe and a favorable weather forecast. At the conclusion of the field work, a Remediation Completion Report will be submitted to the IBP PM.

Quality Assurance/Quality Control Sampling

One (1) duplicate soil sample and one (1) MS/MSD soil sample will be obtained during the over-excavation sampling activities at a rate of one (1) sample per every twenty (20) confirmatory soil samples and will analyzed for the same analytical parameters. Trip blanks will also be submitted with any water VOC analyses.

Post Remediation Assessment and Monitoring

Post-remediation assessment and monitoring is not included as part of this scope of work. However, soil and groundwater TCE concentrations are not delineated to commercial/industrial screening levels south and east of the Site. Also, TCE soil gas concentrations exceeded the calculated RCG Commercial/Industrial sub-slab/exterior soil gas VE screening level for TCE at all five (5) on-site sample points, with the highest concentrations being present near the north property line. Additional cVOC concentrations exceeded residential and/or leaching screening levels. As such, additional assessment, monitoring and/or remediation may be necessary for the soil gas and off-site soil and groundwater concentrations which will remain following the implementation of this RWP which targets the highest on-site soil concentrations.

Proposed Timeline

IWM Consulting anticipates the following timeline in relationship to completing this project:

Proposed Timeline Former Central Siding Property Elwood, Indiana		
Task	***Estimated Timeline***	***Comments***
Submittal of QAPP/RWP/HASP	May 1, 2019	Anticipate 30-45 days total for the IBP and USEPA to review and approve all Site documents and for IWM Consulting to address any comments received during the required public comment period
Implementation of the approved Remediation Field Work	June 26, 2019	Anticipate that the work activities will take approximately 4-5 weeks to complete. Start date dependent upon receipt of RWP approval, when the mandatory public comment period is completed and comments addressed, and a suitable window of good weather.
Remediation Implementation/Completion Report	August 26, 2019	Remediation Completion Report submitted within 30-45-days of receiving soil confirmation analytical results
Submittal of Final Invoice	September 9, 2019	

IWM Consulting understands that two (2) paper copies and two (2) electronic pdf format copies (on compact disc) of the report will be prepared with one (1) copy submitted to the IBP PM and one (1) copy to the City of Elwood. One (1) electronic copy will also be submitted to the U.S. EPA, if requested. The report will be printed on recycled paper and will be double sided. Additionally, all maps (non-aerials) and tables will be printed legibly in black and white.

IWM Consulting appreciates the opportunity to provide the Indiana Brownfields Program with this RWP. If you have any questions regarding this transmittal, please contact the undersigned at 317-347-1111.

Sincerely,

IWM CONSULTING GROUP, LLC

William E. Ackland, LPG #2526
Project Manager

Bradley E. Gentry, LPG #2165
Vice President/Brownfield Coordinator

cc: Ms. Patricia Polston, USEPA Region 5 Project Manager

FIGURES

iWM CONSULTING GROUP

7428 Rockville Road, Indianapolis, Indiana 46214
(317) 347-1111 Fax: (317) 347-9326

Project	Task	Size	Date
IN19017	02	A	7/20/2018

FIGURE 1 **Site Location Map**
Former Central Siding Property
129 West Main Street
Elwood, Indiana

CLIENT

Madison County Council of Governments

MAIN ST

CS-ESG5

CS-GP11

CS-ESG4

CONCRETE/FILL

CS-ESG3

CS-ESG2

EXISTING DRAINS FOR FORMER BATHROOM

PIT

CS-ESG1

CS-WC3

CS-WC1

CS-WC2

GRAVEL/GRASS

2ND ST

FIRST PRESBYTERIAN CHURCH PROPERTY

CS-WC4

CS-WC5

CS-WC32

CS-WC33 CS-WC34 CS-WC35

CS-WC36 CS-WC37 CS-WC38 CS-WC39 CS-WC40

CS-GP10

CS-WC41

STORAGE BUILDING

CS-WC6 CS-WC7 CS-WC8 CS-WC9 CS-WC10 CS-WC11

CS-WC12 CS-WC13 CS-WC14 CS-WC15 CS-WC16 CS-WC17

CS-GP12

CS-WC18 CS-WC19 CS-WC20 CS-WC21 CS-WC22 CS-WC23 CS-WC24

CONCRETE

MW-1D

CS-WC25 CS-WC26 CS-WC27 CS-WC28 CS-WC30

ALLEY

CS-WC31 CS-WC29

FORMER VECTREN GAS DELIVERY BUILDING

RESIDENTIAL (120 S. A ST.)

RESIDENTIAL (124 S. A ST.)

RESIDENTIAL (126 S. A ST.)

NORTH

LEGEND

- IWM Soil Boring
- IWM Monitoring Well
- Overhead Utility Pole
- Fence Line
- Unknown Utility
- Overhead Utility
- Underground Electric
- Water Line
- Gas Line
- Sewer Line
- Telephone Line

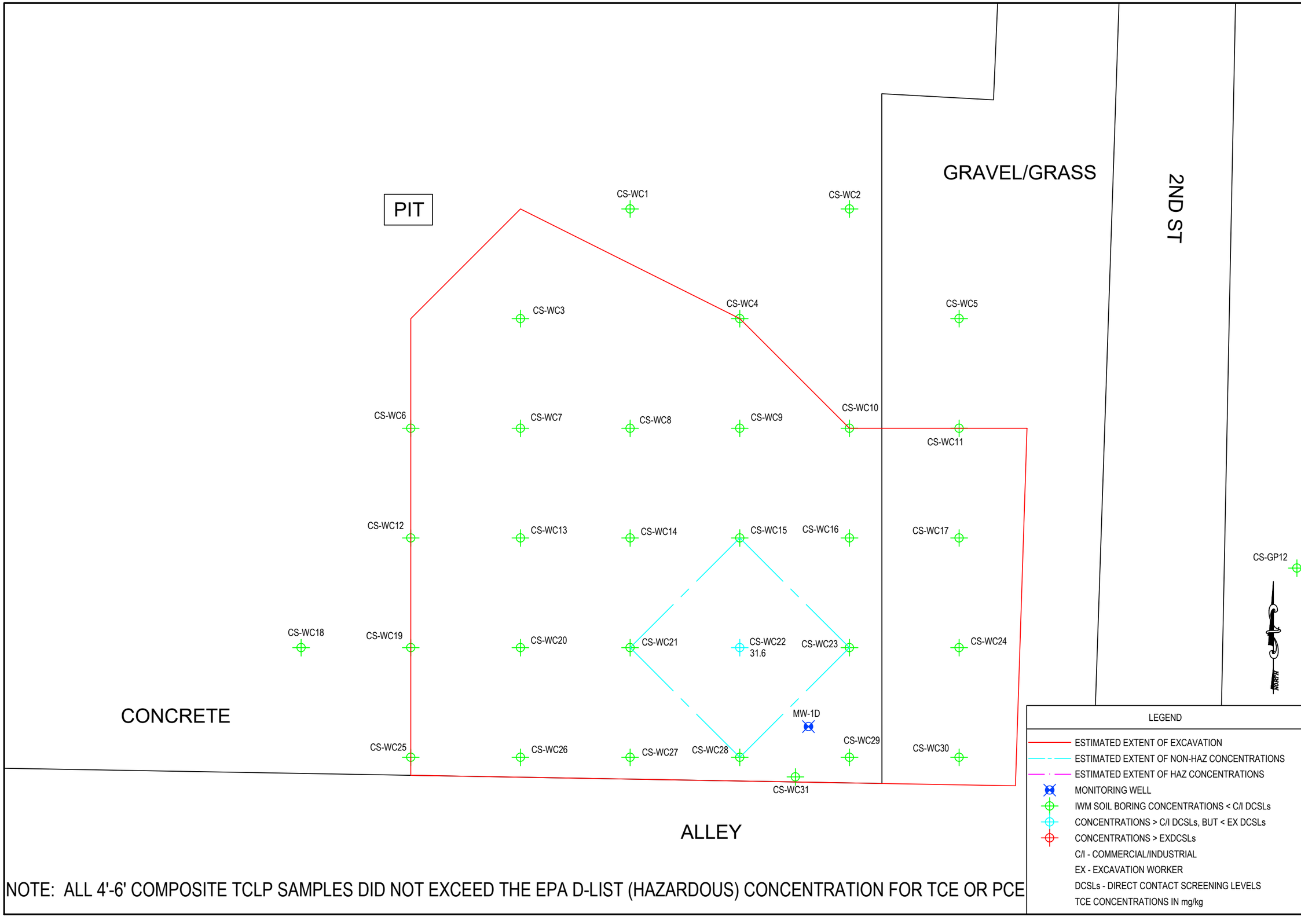
0 20' 40'

IWM CONSULTING GROUP

FORMER CENTRAL SIDING PROPERTY
129 WEST MAIN STREET (IN-28)
ELWOOD, INDIANA

DRAWN BY: WEA
DATE: 7/8/16
REVISED: 8/30/18
IN19017.02
#Haz..Site Map.DWG

FIGURE 2
SITE MAP



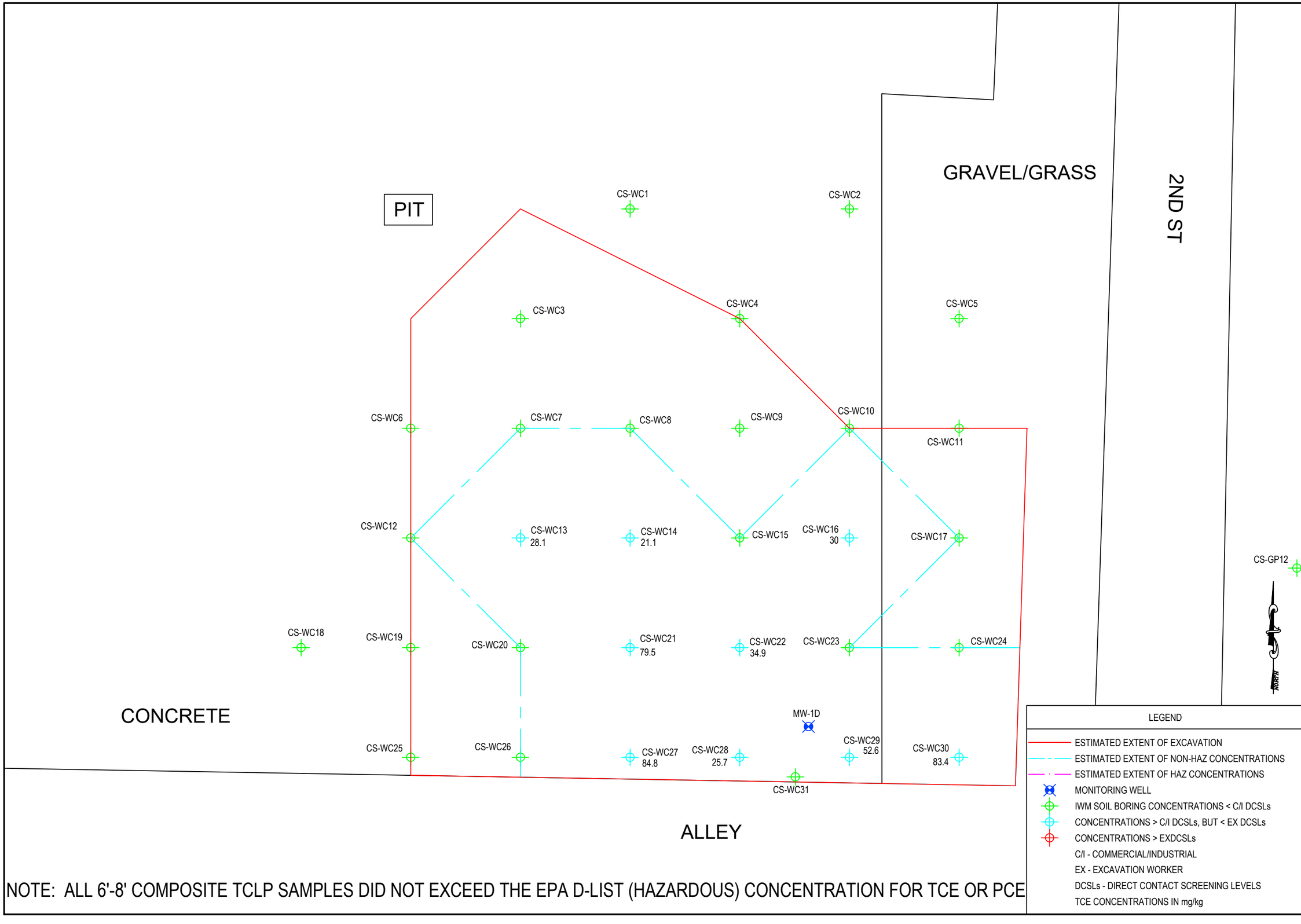
NOTE: ALL 4'-6' COMPOSITE TCLP SAMPLES DID NOT EXCEED THE EPA D-LIST (HAZARDOUS) CONCENTRATION FOR TCE OR PCE

IWM CONSULTING GROUP

FORMER CENTRAL SIDING PROPERTY
129 WEST MAIN STREET (IN-28)
ELWOOD, INDIANA

DRAWN BY: WEA
DATE: 10/09/2018
REVISED:
IN19017.02
#EXCAVATION 4-6.DWG

FIGURE 3
EXCAVATION 4'-6'



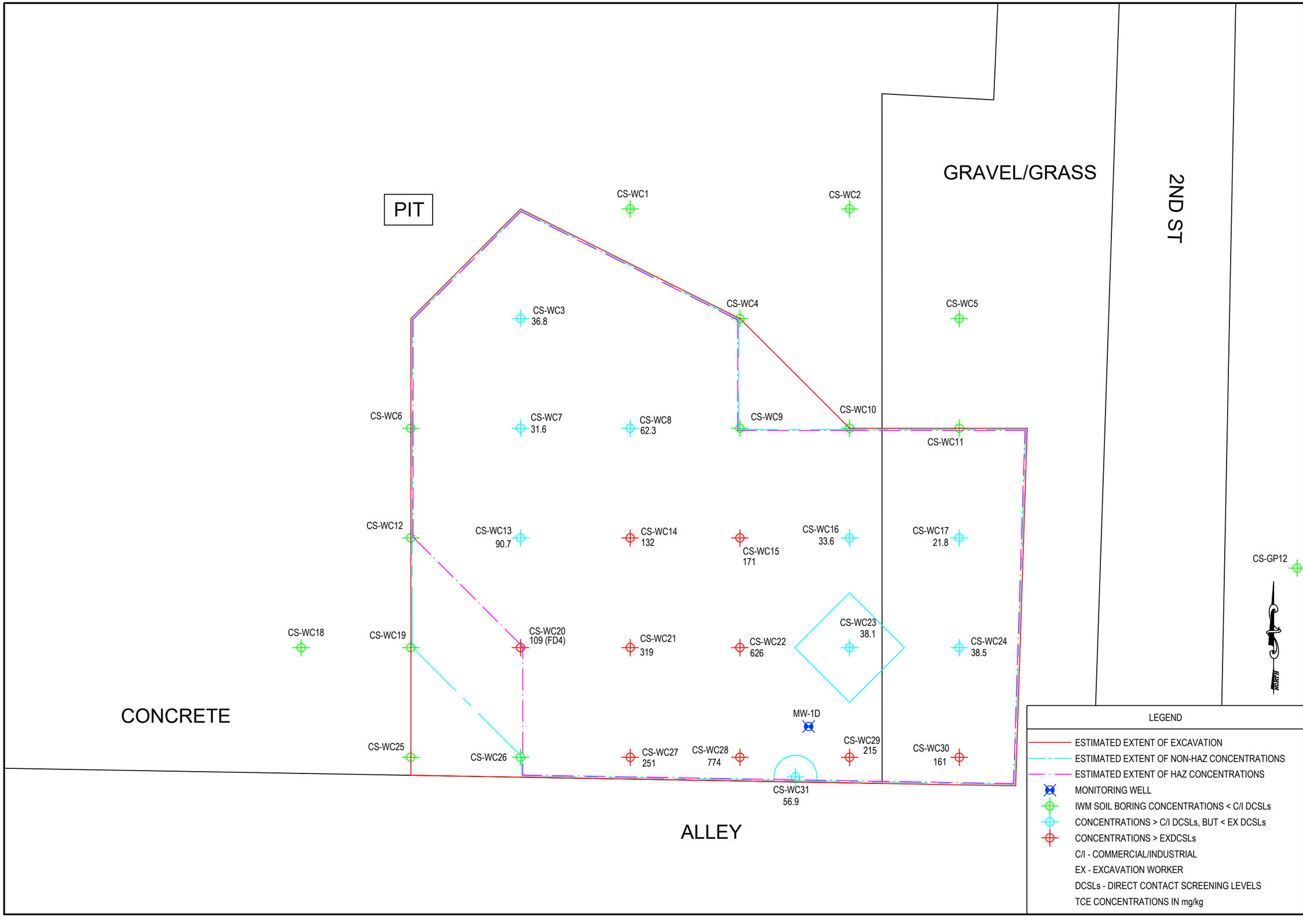
NOTE: ALL 6'-8' COMPOSITE TCLP SAMPLES DID NOT EXCEED THE EPA D-LIST (HAZARDOUS) CONCENTRATION FOR TCE OR PCE

IWM CONSULTING GROUP

FORMER CENTRAL SIDING PROPERTY
129 WEST MAIN STREET (IN-28)
ELWOOD, INDIANA

DRAWN BY: WEA
DATE: 10/09/2018
REVISED:
IN19017.02
#EXCAVATION 6-8.DWG

FIGURE 4
EXCAVATION 6'-8'



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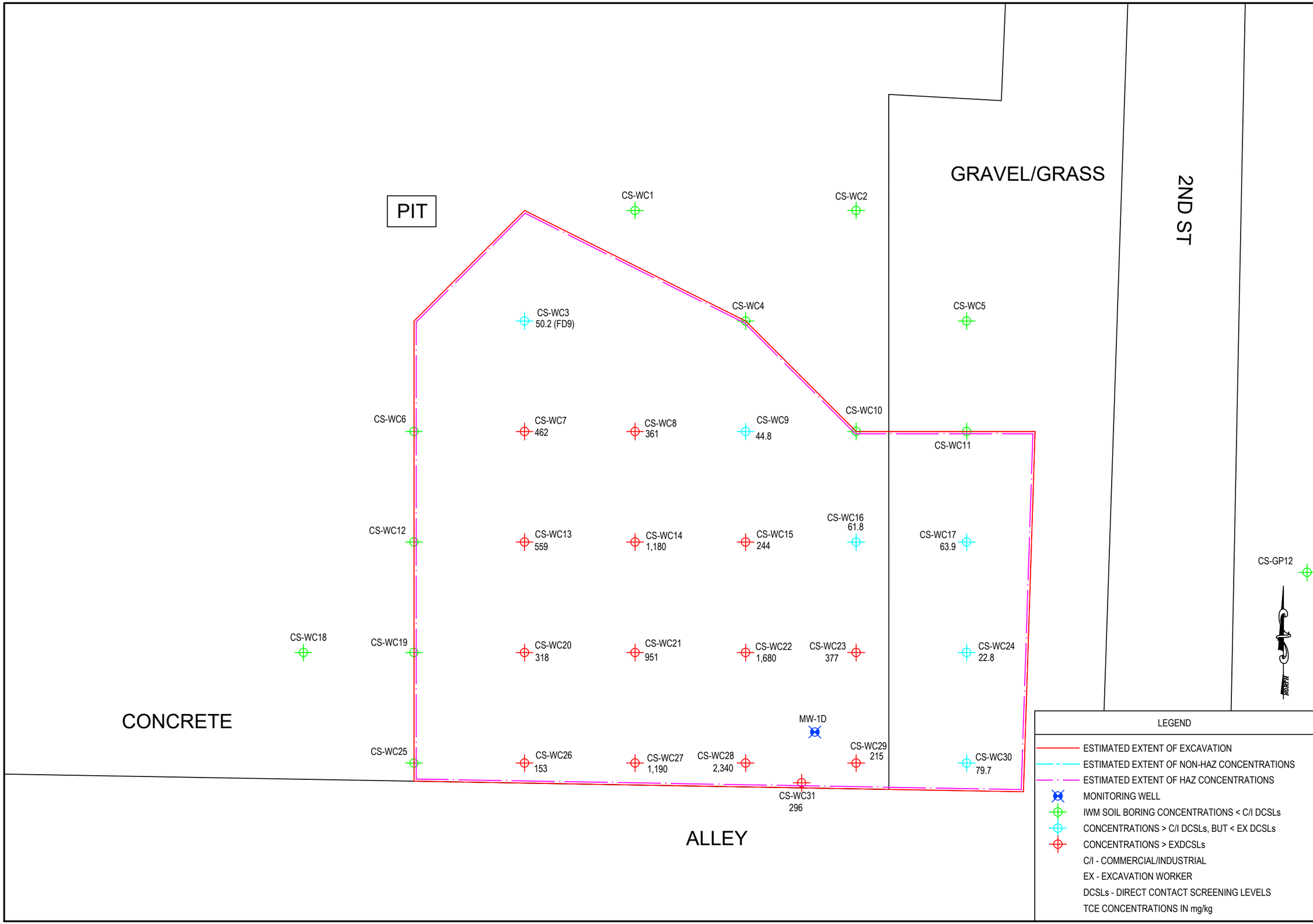
IN19017.02	
#EXCAVATION 8-10.DWG	

FIGURE 5
EXCAVATION 8'-10'



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129 WEST MAIN STREET (IN-28)
ELWOOD, INDIANA

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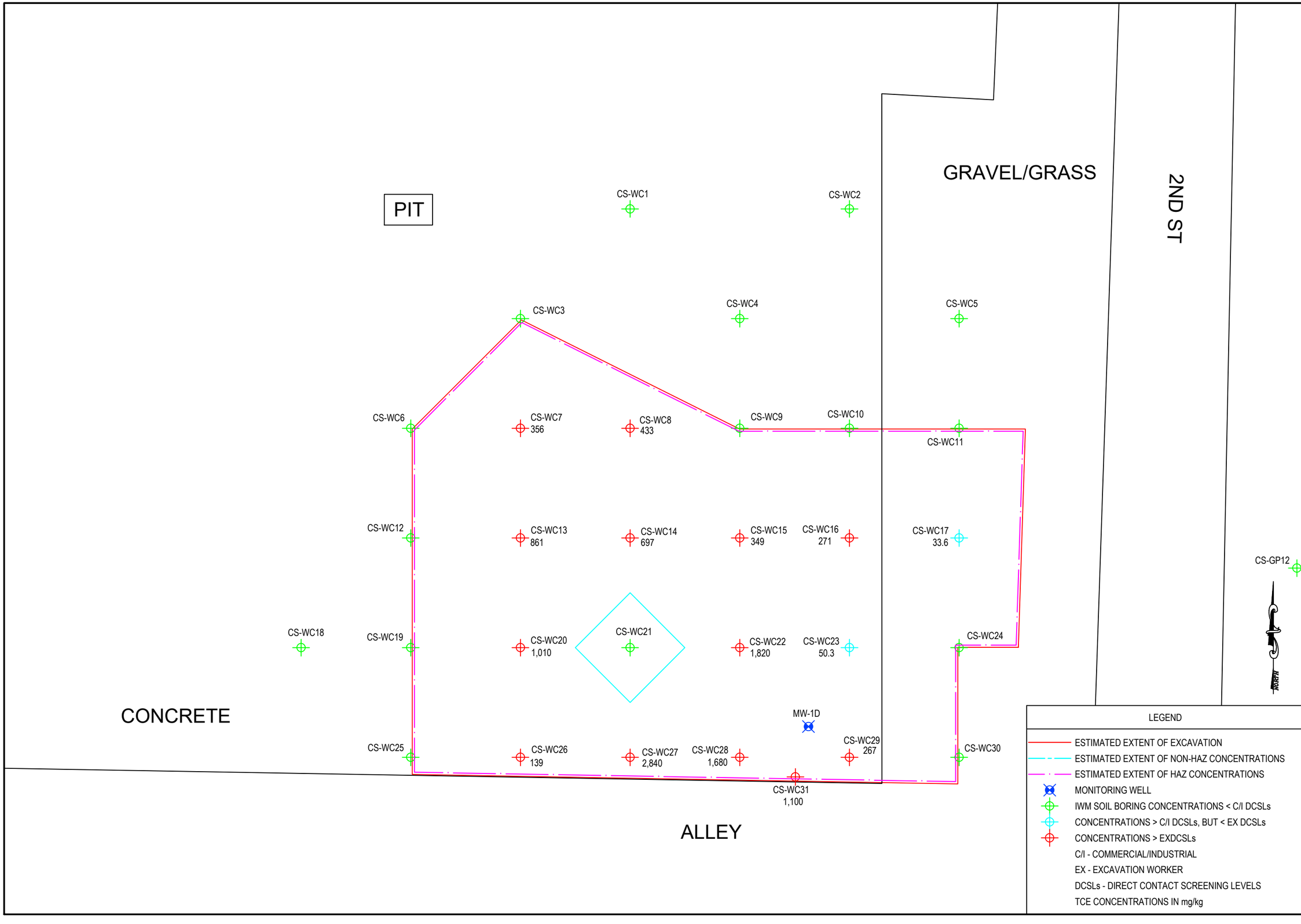
DATE: 10/09/2018
REVISED:
IN19017.02
#EXCAVATION 10-12.DWG

FIGURE 6
EXCAVATION 10'-12'



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FORMER CENTRAL SIDING PROPERTY
129 WEST MAIN STREET (IN-28)
ELWOOD, INDIANA

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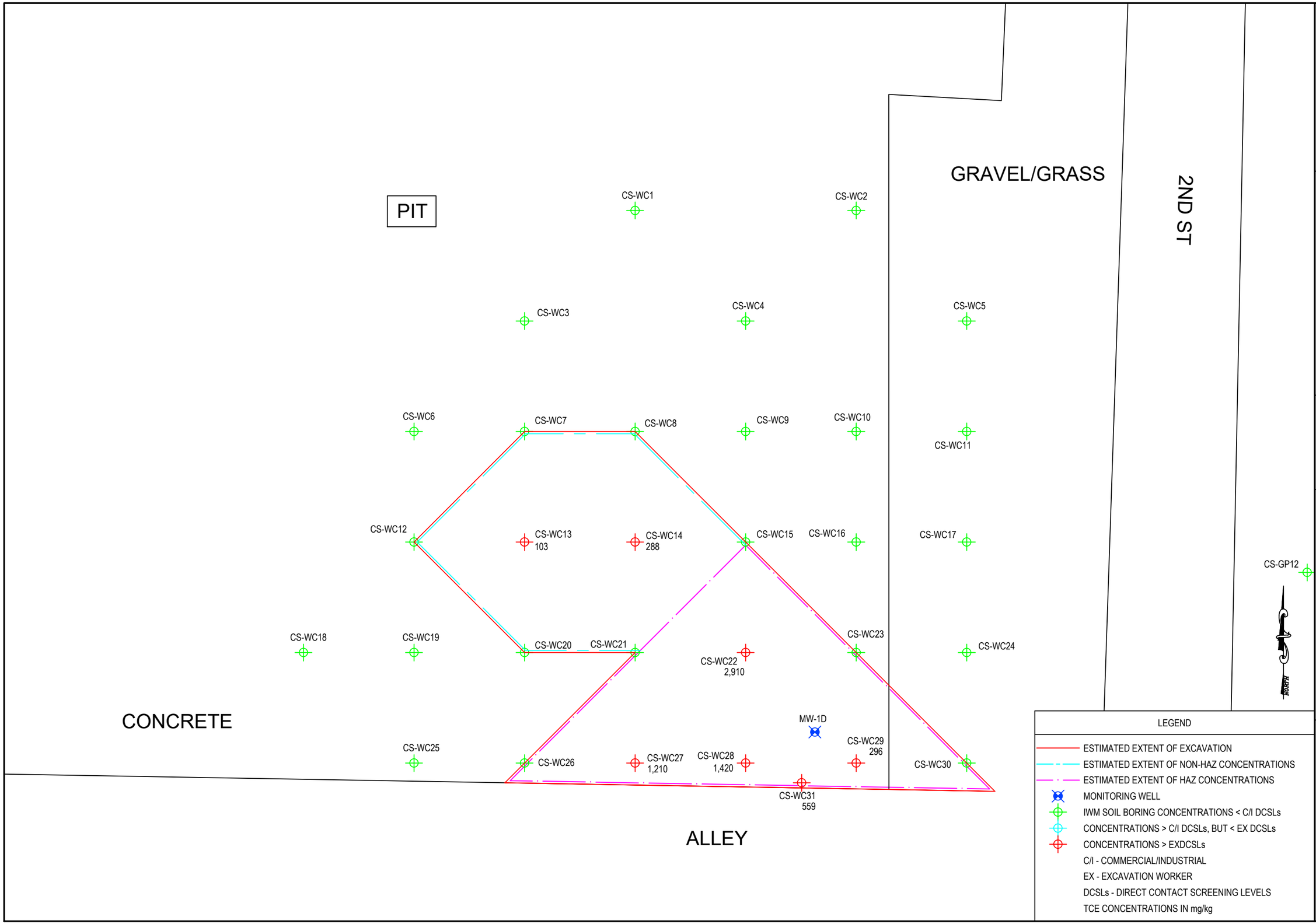
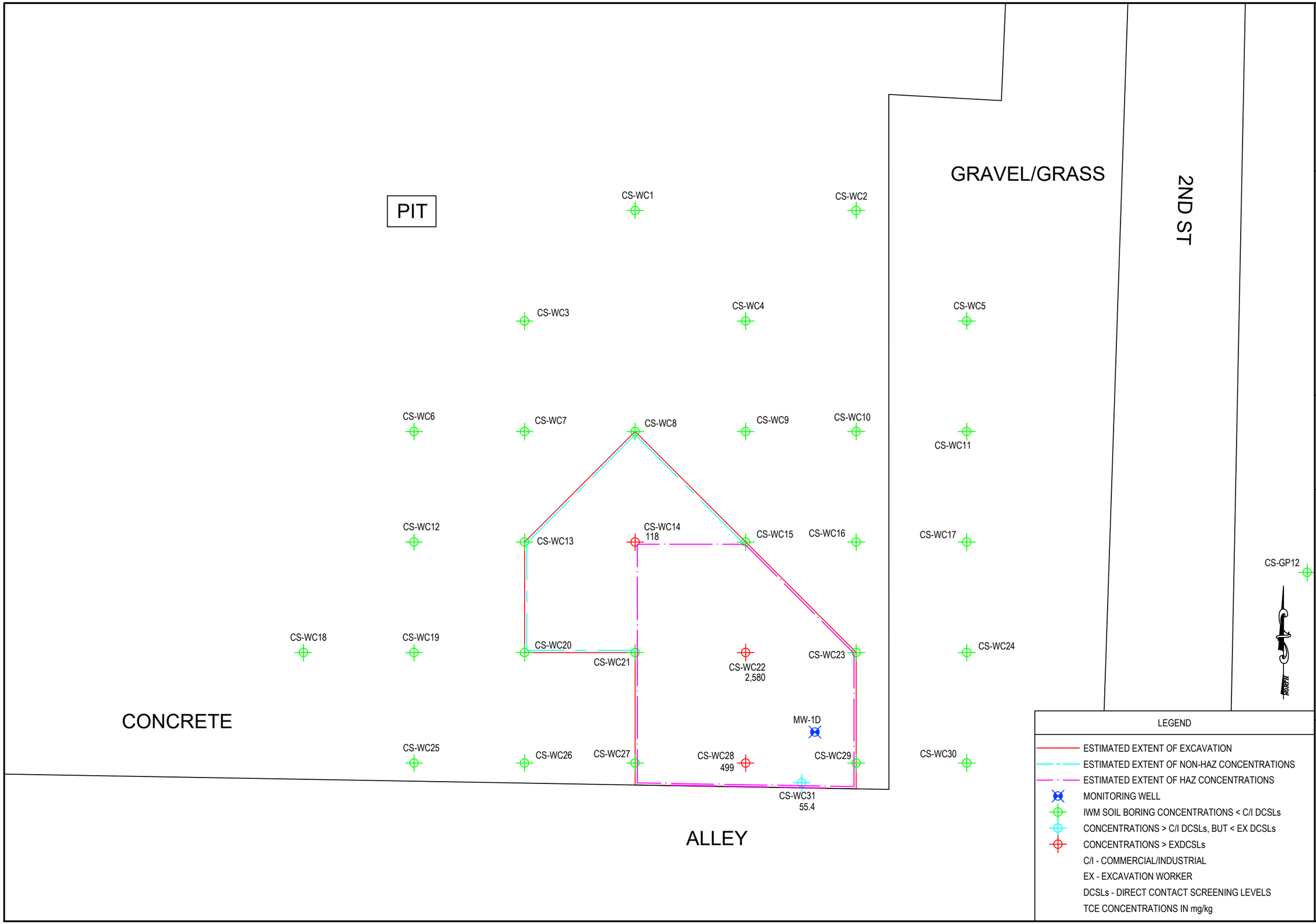
DATE: 10/09/2018	
REVISED:	
IN19017.02	
#EXCAVATION 12-14.DWG	

FIGURE 7
EXCAVATION 12'-14'


PIT
GRAVEL/GRASS
2ND ST
CS-WC1
CS-WC2
CS-WC3
CS-WC4
CS-WC5
CS-WC6
CS-WC7
CS-WC8
CS-WC9
CS-WC10
CS-WC11
CS-WC12
CS-WC13
103
CS-WC14
288
CS-WC15
CS-WC16
CS-WC17
CS-GP12
CS-WC18
CS-WC19
CS-WC20
CS-WC21
CS-WC22
2,910
CS-WC23
CS-WC24
CONCRETE
MW-1D
CS-WC25
CS-WC26
CS-WC27
1,210
CS-WC28
1,420
CS-WC29
296
CS-WC30
CS-WC31
559
ALLEY
LEGEND
ESTIMATED EXTENT OF EXCAVATION
ESTIMATED EXTENT OF NON-HAZ CONCENTRATIONS
ESTIMATED EXTENT OF HAZ CONCENTRATIONS
MONITORING WELL
IWM SOIL BORING CONCENTRATIONS < C/I DCSLs
CONCENTRATIONS > C/I DCSLs, BUT < EX DCSLs
CONCENTRATIONS > EXDCSLs
C/I - COMMERCIAL/INDUSTRIAL
EX - EXCAVATION WORKER
DCSLs - DIRECT CONTACT SCREENING LEVELS
TCE CONCENTRATIONS IN mg/kg
0
10'
20'
IWM CONSULTING GROUP
FORMER CENTRAL SIDING PROPERTY
129 WEST MAIN STREET (IN-28)
ELWOOD, INDIANA
DRAWN BY: WEA
DATE: 10/09/2018
REVISED:
IN19017.02
#EXCAVATION 14-16.DWG
FIGURE 8
EXCAVATION 14'-16'



IWM CONSULTING GROUP

FORMER CENTRAL SIDING PROPERTY
129 WEST MAIN STREET (IN-28)
ELWOOD, INDIANA

DRAWN BY: WEA	
DATE: 10/09/2018	
REVISED:	
IN19017.02	
#EXCAVATION 16-18.DWG	

FIGURE 9
EXCAVATION 16'-18'

GRASS

SIDEWALK

DRIVEWAY

GRASS

CS-WC32

GRAVEL/ASPHALT/CONCRETE

CS-WC33 CS-WC34 CS-WC35

CS-WC36 CS-WC37 CS-WC38 CS-WC40

CS-GP1

CS-WC39

GARAGE

CS-GP10

CS-WC41

STORAGE BUILDING

NORTH

LEGEND

IWM SOIL BORING

PROPOSED LEAD EXCAVATION AREA

0 10' 20'

IWM CONSULTING GROUP

FORMER CENTRAL SIDING PROPERTY
129 WEST MAIN STREET (IN-28)
ELWOOD, INDIANA

DRAWN BY: C. NEWELL
DATE: 07/08/2016
REVISED: 08/11/16
IN19017.02
#Lead Excavation.DWG

FIGURE 10
PROPOSED LEAD EXCAVATION AREA

APPENDIX A

HEALTH AND SAFETY PLAN

SITE HEALTH AND SAFETY PLAN

PREPARED FOR:

Former Central Siding Property
129 West Main Street
Elwood, Madison County, Indiana

PREPARED BY:

IWM Consulting Group, LLC
7428 Rockville Road
Indianapolis, Indiana

Project No. IN 19017

May 2019	Ongoing
(Project Start Date)	(Project End Date)

Approved By:

Mandy Hall	Office H&S Coordinator	Mandy Hall	4/22/2019
(Print Name)	(Title)	(Signature)	(Date)
Brad Gentry	Project Manager		4/22/2019
(Print Name)	(Title)	(Signature)	(Date)

Purpose: This document defines the Health and Safety considerations for the on-site management activities by IWM personnel and contractors. This document is required by IWM policies and programs and OSHA 29 CFR 1910.120. The basic requirements for the health and safety of the project workers are delineated in the IWM Health and Safety procedures. All personnel on-site will be informed about the pertinent sections of the Health and Safety Plan.

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APPENDICES

APPENDIX A **SITE MAP(S)**

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APPENDIX G **HOSPITAL AND/OR LOCAL MEDICAL PROVIDER MAPS**

I. TYPE OF PROJECT

Check appropriate categories (more than one may apply):

- □ Tank Decontamination
- □ Tank Excavation and Removal
- ■ Soil Excavation
- □ Filter Press Operation/Dewatering
- □ Drum Sampling & Management
- ■ Other – oxidant will be used to treat soil
- ■ Geophysical/GPR Survey/Utility Locating
- □ ORC Application
- □ Drilling/Soil Sampling
- □ Groundwater Gauging/Sampling
- ■ Well Abandonment
- □ Other – System Operation and Maintenance

A. Scope of Work

(Detailed description of project, including types of major equipment to be used, quantities of material to be managed, contaminants, number of specific job locations, (i.e., number of tanks, number of wells, sumps, etc.).

1) Abandon monitoring well MW-1D using a licensed well driller
2) Excavate, stockpile, and reuse 1,000 to 1,100 tons of soil where chlorinated volatile organic compound (cVOC) concentrations are less than the Remediation Closure Guide (RCG) Commercial/Industrial Direct Contact Screening Levels (IDCSLs))
3) Excavate and dispose of approximately 2,500 tons of soil of which 1,400 to 1,500 tons will need to be pre-treated prior to disposal
4) A chemical oxidant will be used to treat the impacted soil prior to disposal
5) Excavate and dispose of approximately 20 tons of lead impacted soil
6) Confirmation soil samples will be collected every 20 linear feet for laboratory analyses of cVOCs or lead, and percent moisture

The work activities will be completed on-site. Off-site work is not applicable for this project.

Appendix A contains a site map(s), which indicates the subject site location, facility layout, work zones, evacuation routes, and other pertinent information for this HASP.

B. Site Location Information

The former Central Siding property is a 0.64-acre site that is vacant except for one unattended, metal storage building positioned on the southwest portion of the subject site. Concrete pads associated with previous building(s) are present on the southern and central portions of the subject site. The remainder of the subject site supports gravel or paved drives and parking areas with the remainder of the subject site supporting vegetative cover (weeds, bushes, and grass). The site is located at 129 West Main Street on the southwest corner of the intersection of West Main Street and Second Street, Elwood, Indiana (Madison County).

Access is from the north from West Main Street and from the east from South Second Street. The subject site is owned by the City of Elwood.

Site History

The subject site is situated in a mixed commercial/residential area on the west side of Elwood, Indiana. IWM Consulting performed a Phase I ESA at the Site in October 2015. Based on standard historical sources, the Phase I ESA discovered that the subject property was unimproved from prior to 1927 until circa 1930, when it was developed with a residence and a second building that was identified on the city directory listing as vacant in 1935. By the 1940s, the subject property was utilized for manufacturing activities by Metalco Metal Coatings & Manufacturing and Metal Casting and Manufacturing. In the late 1950s, the subject property became occupied by Hoosier Home Products and Hoosier Home Improvement of Goshen. Central Siding occupied the subject property from the early 1980s until the early1990s. A day care center occupied the subject property in the early or mid-2000s. In 2014, the manufacturing/warehouse building was razed, leaving the site vacant except for one unattended, metal storage building on the subject site. The subject site is owned by the City of Elwood.

The Phase I ESA identified Recognized Environmental Conditions (RECs) in connection with the subject property and recommended that soil and groundwater investigations should be conducted to further evaluate the aforementioned RECs. No subsurface investigations are known to have been performed at the subject site.

Area of Concern

The Phase I ESA identified the following recognized environmental conditions (RECs) in connection with the subject property:

- The subject property was utilized for metal finishing and possible metal casting operations from circa 1940 until the early 1950s. Oils, solvents, metals, and plating chemicals may have been utilized in these operations. Concrete filled floor drains and a possible sump were observed on the concrete pad. Rectangular floor repairs may indicate filled pits. Materials utilized in metal finishing operations may have been discharged to on site soil and groundwater from leaks in the drains or pits.

- Historical metal finishing operations were reportedly conducted on the subject property. Materials containing volatile organic compounds (VOCs), such as degreasers, typically utilized in metal finishing may have been used and released on the subject property. Based on historical operations on the subject property, a Vapor Encroachment Condition (VEC) cannot be ruled out.

- Staining around the base of a used oil drum in the storage building appears to have migrated below the door of the storage building and may have impacted soil outside of the building.

The Phase I ESA recommended that soil and groundwater investigations should be conducted to further evaluate the aforementioned RECs.

Limited subsurface investigations were performed at the Site in April and November-December 2016. Thirteen (13) soil borings (CS-GP-1 through CS-GP-13) were advanced and one-time soil and groundwater samples were collected. In addition, one permanent monitoring well (MW-1D) was installed to the bedrock interface and paired crawlspace and indoor air samples were collected from three (3) nearby residential structures.

Soil and groundwater analytical results indicate both the soil and groundwater have been adversely impacted with metals (lead, arsenic and hexavalent chromium) and chlorinated volatile organic compounds (cVOCs), including trichloroethene (TCE), tetrachloroethene (PCE), 1,2 dichloroethane (1,2-DCA), and cis 1,2-dichloroethene (cis-DCE). The highest metals (lead) concentrations were located north of the existing storage building and near the Pit sample location. Concentrations of cVOCs in soil and groundwater exceeded RCG Commercial/Industrial Direct Contact Screening Levels (IDCSLs) or Vapor Exposure Groundwater Screening Levels around the entire investigated perimeter of the Site. Lead is the only metal detected in the soil at concentrations in excess of the RCG IDCSL and this was detected in a small localized area north of the existing storage building.

IWM Consulting supervised the installation of forty-one (41) soil borings (CS-WC1 through CS-WC41) and five (5) exterior soil gas probes (CS-ESG1 through CS-ESG5) in order to better characterize the hazardous potential of waste which may be generated during future remedial activities and to further assess the potential vapor intrusion (VI) pathway at the Site. In addition, a low-flow groundwater sample was collected from the existing Site monitoring well. A total of one hundred fifty-four (154) soil samples for cVOC analysis, twenty (20) soil samples for lead analysis, five (5) soil gas samples for cVOC analysis and one (1) groundwater sample for cVOC analysis (not counting Quality Assurance/Quality Control samples) were obtained during the FSI activities and were submitted for laboratory analysis of cVOCs or lead.

Concentrations of TCE were detected in excess of the RCG Excavation Direct Contact Screening Level (EXDCSL) in forty-seven (47) samples at concentrations up to 2,910 mg/kg. Concentrations of PCE were detected in excess of the RCG EXDCSL in two (2) samples. Concentrations of 1,1-dichloroethene (1,1-DCE), cis-DCE, 1,1,2-trichloroethane (1,1,2-TCA) and vinyl chloride (VC) were detected in excess of the RCG Residential Soil Migration to Groundwater Screening Levels (MTGSLs) in numerous samples. Following receipt of the initial laboratory results for soil, IWM Consulting preliminarily divided the cVOC impacted area into “High” and “Lower” concentration zones. Composite samples were then generated for each impacted two-foot increment in each zone and were submitted to the laboratory for Toxicity Characteristic Leaching Procedure (TCLP) analysis. Based on the TCLP results, concentrations of TCE in Site soils are high enough such that the soil would be considered a characteristic Hazardous Waste (as per the EPA D List for the Toxicity Characteristic) if removed from the ground without prior treatment/conditioning. The southern and eastern extent of hazardous soil concentrations is not delineated. In addition, the southern and eastern extent of TCE concentrations in excess of RCG EXDCSLs is also not delineated.

The historical lead concentration at CS-GP1 exceeded the RCG EXDCSL. Lead was detected in all current soil samples, but concentrations from all ten (10) waste characterization borings installed in the CS-GP1 vicinity did not exceed the most stringent screening level. As such, the historical lead impact at CS-GP1 appears to be de minimis in size.

Neighborhood Description

The area surrounding the subject site can be characterized as a mixed commercial and residential setting.

North of site:	Casey’s General Store and gasoline station located on the north side of West Main Street.
East of site:	A grass covered lot with the First Presbyterian Church located farther east.
South of site:	Residential properties south of the alley.

West of site:	Taxidermist shop and/or residential property.

Topography and Site Access

The Site and surrounding area are relatively flat. The primary access point to access the Site is from the north from West Main Street and from the east from South Second Street.

Additional Information

The following key documents are available for the subject site:

- *Phase I Environmental Site Assessment Report*, IWM Consulting Group, LLC, October 19, 2015
- *Phase II Environmental Site Assessment Report,* IWM Consulting Group, LLC, September 23, 2016
- *Further Site Investigation Report,* IWM Consulting Group, LLC, January 30, 2017
- *Phase I Environmental Site Assessment Report*, Morgan Clark Associates, LLC, August 27, 2018
- *Further Site Investigation Report,* IWM Consulting Group, LLC, Augsut 30, 2018

II. HAZARD EVALUATION

A. Physical Hazards (trenches, utilities, noise, biological, etc.) Check appropriate categories (more than one may apply):

- ■ Auto and Plant Traffic
- ■ Slip and Fall
- ■ Overhead Utilities
- ■ Underground Utilities
- □ Biological
- □ Other: (Describe below)
- □ Uneven Terrain
- □ Trenches
- ■ Noise
- □ Explosion
- ■ Drilling Equipment

Appendix B contains copies a hazard evaluation for each task that summarizes work tasks, associated risks and hazards, and control measures.

B. Chemical Hazards

Based upon the site history and site investigations onsite, the contaminants to be present on-site will be cVOCs and lead. Based upon investigations of sites with similar histories the most likely chemicals to be encountered from this group of contaminants are listed below along with the primary hazards of each chemical. The primary hazard of each are identified below.

Tasks: Soil and Ground-Water Sampling, Well Installation, And Similar Tasks					
Potential Chemicals of Concern	**Possible Affected Media**	**Exposure Routes[1]**	**PELs[2] (ppm)**	**IDLHs[3] (ppm)**	**Simple Risk Analysis**
Common cVOCs					
Benzene	Soil, Groundwater	Inh, Ing, Con	1	500	Low
Ethylbenzene	Soil, Groundwater	Inh, Ing, Con	100	800	Low
Toluene	Soil, Groundwater	Inh, Ing, Con	200	500	Low
Xylenes (Total)	Soil, Groundwater	Inh, Ing, Con	100	900	Low
Methyl-tert-butyl ether (MTBE)	Soil, Groundwater	Inh, Ing, Con	50	NE	Low
sec-Butylbenzene	Soil, Groundwater	Inh, Ing, Con	NE	NE	Low
n-Propylbenzene	Soil, Groundwater	Inh, Ing, Con	NE	NE	Low
1,2,4-Trimethylbenzene	Soil, Groundwater	Inh, Ing, Con	25	NE	Low
1,3,5-Trimethylbenzene	Soil, Groundwater	Inh, Ing, Con	25	NE	Low
1,1,1-Trichloroethane	Soil, Groundwater	Inh, Ing, Con	350	700	Low
Tetrachloroethene (PCE)	Soil, Groundwater		100	150	Low
Trichloroethene (TCE)	Soil, Groundwater		100	1,000	Low
1,2-Dichloroethene	Soil, Groundwater	Inh, Ing, Con	200	4,000	Low
cis-1,2-Dichloroethene	Soil, Groundwater	Inh, Ing, Con	200	4,000	Low
trans-1,2-Dichloroethene	Soil, Groundwater	Inh, Ing, Con	200	4,000	Low
Vinyl Chloride	Soil, Groundwater	Inh, Ing, Con	1	NE	Low

Tasks: Soil and Ground-Water Sampling, Well Installation, And Similar Tasks					
Potential Chemicals of Concern	**Possible Affected Media**	**Exposure Routes[1]**	**PELs[2] (ppm)**	**IDLHs[3] (ppm)**	**Simple Risk Analysis**
Heavy Metals					
Lead	Soil, Groundwater	Inh, Ing, Con	0.05[4]	100[4]	Low

NE denotes not established/not available.

1 Inhalation (Inh), ingestion (Ing), and dermal and/or eye contact (Con).

2 OSHA Permissible Exposure Limits (PELs) in ambient air per 8-hour work day per 40-hour week, unless otherwise noted. PELs obtained from MSDS and/or online sources. Recommended Exposure Limits (REL), or Threshold Limit Value (TLV) values used where noted.

3 NIOSH Immediately Dangerous to Life or Health Concentration (IDLH).

4 TWA in mg/m^3.

Common Symptoms of exposure include: Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; and/or liver injury.

First aid step following exposure include: irrigate and/or water flush immediately, soap wash immediately, seek medical attention immediately, move to fresh air and/or artificial respiration (as applicable).

Appendix C contains copies of Material Safety Data Sheets (MSDSs) and/or other public health statements for the expected Contaminants of Concern (COC).

C. Medical Monitoring

Has the entire crew received baseline physicals? ■ YES □ NO

If No, why not? Not applicable.

List any special tests required and frequency: None required.

III. MANPOWER

A. IWM Personnel Requirements

Crew Personnel	Crew Size	Names
Project Manager	1	Bradley Gentry
H&S Officer	1	Mandy Hall
Geologist/Engineer	1	Bradley Gentry or Christopher Newell
Field Technicians	1-3	IWM - Various
Other	NA	

B. Subcontractor Requirements

Repeat section B as necessary for each subcontractor to be utilized.

Subcontractor Information:

Name: Innovative Environmental Technologies, Inc. (IET)
Address: 3958 North Street, Route 3, Suite B, Sunbury, OH 43074
Contact Info: Wade Meese (740-965-6100)

Scope of Work: Excavate, treat, transport, and dispose of soil
Training Required: 40-Hour HAZWOPER; Annual 8-Hour Refreshers

Each subcontractor must provide documentation of training at a minimum.

Has the contractor been pre-qualified? ■ YES □ NO □ N/A

If the subcontractor is not pre-qualified, has a pre-qualification package and contract approval been submitted to the regional manager? □ Yes □ No ■ N/A

If NO, who has authorized the use of the subcontractor? Not Applicable

Has subcontractor received training? ■ Yes □ No □ N/A

Has training been documented? ■ Yes □ No □ N/A

If NO, why? Not Applicable

Subcontractor Information:

Name:	SCS Environmental Contracting
Address:	7120 Venture Lane, Fort Wayne, Indiana 46818
Contact Info:	Mark Matson (260-497-9006)
Scope of Work:	Geoprobe drilling, well abandonment
Training Required:	40-Hour HAZWOPER; Annual 8-Hour Refreshers

Each subcontractor must provide documentation of training at a minimum.

Has the contractor been pre-qualified? ■ YES □ NO □ N/A

If the subcontractor is not pre-qualified, has a pre-qualification package and contract approval been submitted to the regional manager? □ Yes □ No ■ N/A

If NO, who has authorized the use of the subcontractor? Not Applicable

Has subcontractor received training? ■ Yes □ No □ N/A

Has training been documented? ■ Yes □ No □ N/A

If NO, why? Not Applicable

Subcontractor Information:

Name:	Strata Environmental Contractors
Address:	3445 West 250 North, Anderson, Indiana 46011
Contact Info:	Michael Todd (765-602-3334)
Scope of Work:	Geoprobe drilling, well abandonment
Training Required:	40-Hour HAZWOPER; Annual 8-Hour Refreshers

Each subcontractor must provide documentation of training at a minimum.

Has the contractor been pre-qualified? ■ YES □ NO □ N/A

If the subcontractor is not pre-qualified, has a pre-qualification package and contract approval been submitted to the regional manager? □ Yes □ No ■ N/A

If NO, who has authorized the use of the subcontractor? Not Applicable

Has subcontractor received training? ■ Yes □ No □ N/A

Has training been documented? ■ Yes □ No □ N/A

If NO, why? Not Applicable

IV. EQUIPMENT

A. Check Equipment Needed Below. More than one may apply.

- □ Drill Rig
- ■ Excavators
- ■ Skid Loaders
- □ Vacuum Tanker
- □ Torches
- ■ Jackhammer
- ■ Pumps
- □ Other: (Describe below)
- □ Geoprobe Rig
- ■ Dump Trucks
- □ Fork Trucks
- □ Man Lift
- □ Chop Saws/Chain Saws
- □ Compressor/Compressed Air

_____

_____

Is any special training required? 40-Hour OSHA

Is any task being performed for which an SOP is in place? ■ Yes □ No □ N/A

If YES, list SOP training below:

Task	Applicable?	Training Required?	Training Completed?
Locating Utilities	Yes	Yes	Yes
Trenching & Excavating	Yes	Yes	Yes
Confined Space Entry	No		
Grounding & Bonding	No		
Line Breaking	No		
Lockout/Tagout/Tryout	No		
Labelling	No		
Pressure Washer Operation	No		
Container Management	No		
Heavy Equipment Decontamination	No		
Scrap Metal Decontamination	No		
PCB Wipe Sampling	No		
Manifesting Procedures	No		

Task	Applicable?	Training Required?	Training Completed?
Vacuum Truck Operation	No		
Operation of Squeeze Filter Presses	No		
Project File Management	No		
Scaffolding	No		
Mundutank Setup	No		

V. LEVELS OF PERSONAL PROTECTION

A. Special protective equipment for each level of protection is as follows:

Level A

- Fully-encapsulating chemical resistant suit
- Pressure demand atmosphere supplying respirator
- Inner chemical resistant gloves
- Radio communications
- Chemical resistant safety boots/shoes
- Disposable gloves and boot covers
- Cooling Unit[1]
- Coveralls[1]
- Hard hat[1]

Level B

- Chemical resistant, protective clothing
- Pressure demand atmosphere supplying respirator
- Inner and outer chemical resistant gloves
- Radio communications
- Chemical resistant safety boots/shoes
- Disposable and boot covers[1]
- Long cotton underwear[1]
- Coveralls[1]
- Hard hat, face shield[1]

Level C

- Chemical resistant, protective clothing
- Full face piece air purifying respirator
- Inner and outer chemical resistant gloves
- Chemical resistant safety boots/shoes
- Disposable gloves and boot covers[1]
- Escape mask[1]
- Long cotton underwear[1]
- Coveralls[1]
- Hard hat, Face shield[1]

Level D

- Inner and outer chemical resistant gloves
- Chemical resistant safety boots/shoes
- Safety glasses or goggles
- Hard hat
- Ear plugs[1]
- Escape mask[1]
- Coveralls[1]
- Face shield[1]
-

[1] Optional.

Safety boots are required on all sites, without respect to the work being performed. Hardhats are required during well installation, excavation, construction, drilling and when other overhead hazards are present. Earplugs are required during drilling, jackhammering, and during other such loud activities. In addition, safety glasses and safety vests are advised (and may be required) during gauging and/or sampling activities.

B. Check equipment needed below.

Complete the following form for each work task. Note: this page may be duplicated for separate work tasks.

1. Task Description: Excavation

2. Level of Protecting Required: □ Level A □ Level B □ Level C ■ Level D

3. Respiratory Protection Required:

Air Purifying		**Supplied Air**	
□	Full/Half Mask (circle one if applicable)	□	SCBA
	Cartridge Type (e.g., magenta for asbestos)	□	Airline
□	Dust Mask	□	Escape Bottle
■	Respiratory Protection Not Required For This Task		

Breathing air certificate on file? □ Yes □ No ■ N/A
If No, breathing air tested? □ Yes □ No ■ N/A Explain: _____

4. Protective Clothing Required:

□	Tyvek	□	Hooded	□	Sewn Seam
□	Polytyvek	□	Hooded	□	Sealed Seam
□	Saranex/CPF	□	Hooded	□	Strapped Seam
□	Proshield (polypropylene)	□	Rain Gear (PVC)	□	Reflective Safety Vest[1]
□	Chemical Resistant Goggles	□	Face Shield	■	Safety Glasses[1]
□	Tyvek Booties	□	PVC Booties	□	Poly Booties
□	Latex (Nuke) Booties	□	Rubber Slush Booties	□	Leather Boots[1]
■	Steel Toed Footwear[1]	□	Silvershield Gloves	□	Viton Gloves
□	Butyl Rubber Gloves	□	PVC Gloves	□	Neoprene Gloves
■	Nitrile Gloves	□	Latex Gloves	□	Cotton Gloves
■	Leather Gloves (For Manual Handling of Equipment)			■	Ear Plugs/Ear Muffs[1]
■	Other (e.g., Outer Gloves):	Hardhat should be worn onsite at all times during excavation activities			

[1] Item may be required by facility.

VI. CONTAMINATION REDUCTION AND DECONTAMINATION

A. Work Zones

Describe how work zone will be set up and maintained. In high traffic areas traffic cones, caution tap, and/or work vehicle will be used to delineate the work area. The work area for well abandonment activities will be defined as the immediate area in the vicinity of the well location.

B. Decontamination Procedures

Personnel and equipment leaving an identified Exclusion Zone (see section VI. A. above), shall be thoroughly decontaminated.

The standard Level "C" decontamination protocol shall be used with the following decontamination approach:

a. Wash equipment, gloves, and/or boot covers using decon wash and water rinse
b. Remove securing tape from wrists and ankles
c. Remove disposable Tyvek/or coverall (without boots)
d. Remove boot covers and/or outer gloves
e. Remove respirator face mask
f. Remove inner gloves

For Level "D" dress-down, follow steps a, d, and f (as applicable to the equipment used/worn).

Describe personnel/equipment decontamination procedures if the procedures described above are not used or do not apply. Disposable sampling equipment and/or gloves will be removed and disposed of in a plastic trash bag.

Describe equipment decontamination procedure. Non-disposable equipment will be cleaned with an alconox wash, followed by a water rinse and/or followed by a DI water rinse (if applicable).

Describe how contaminated equipment is disposed. Disposable sampling equipment and/or gloves will be removed and disposed of in a plastic trash bag.

Describe storage of usable protective equipment. Stored in gear bags.

Describe laundering procedure for uniforms. Not Applicable.

Is a locker room facility provided? □ Yes ■ No

Will a decon trailer be on-site? □ Yes ■ No If NO, how will crew change clothing and shower? At home after shift.

Describe provisions for drinking water. Available locally or brought on-site in a cooler.

Describe provisions for restrooms. If not available on-site, will use local vendors.

Note: Respirator cleaning and inspection procedures may be found in the Respiratory Protection Program.

VII. SAFETY EQUIPMENT

Check the safety equipment items that will be available for, or on, the project.

□ Safety Showers	□ Emergency Oxygen Mask	□ Portable Eyewash
■ First Aid Kit	■ Barriers/Cones	□ Fume Hood
□ Warning Signs	□ Air Horns	□ Barrier Tape
□ Lifeline/Harness	□ Decon Trailer	■ Decon Equipment
□ Extraction Devise	□ Portable Lighting	□ Ladders
□ Portable Ventilation Units	□ Air Horns	□ Ground/Bonding Cables

□ Spill Control Supplies (list):

■ Fire Extinguishers (types & sizes): 5 – 10 lb. ABC (In Vehicle)

□ Other (list):

VIII. COMMUNICATION SYSTEMS

Describe on-site communication systems. Telephone and/or beeper, verbal communications and hand signals.

IX. AMBIENT AIR MONITORING

The following equipment will be used on-site for air monitoring.

□ Radiation Meter	□ Combustible Gas	□ Oxygen Meter
□ Colorimetric Tubes	□ Photo-Ionization Detector	□ Flame-Ionization Detector
□ OVA/FID	□ H_2S Monitor	□ CO Monitor

□ Dust Monitor (type):

□ Personal Monitors (describe):

■ Ambient Air Monitoring Not Required For This Task

Frequency of air monitoring. □ Continuously □ Hourly □ Twice daily ■ N/A

Describe methodology and frequency of air monitoring. Not applicable

Calibration. Daily as per manufacturer

List of air permits required. Not applicable

Guidelines for Air Monitoring Hazards			
Monitoring Instrument	**Potential Hazards**	**Measurement Level**	**Action**
GCI[1] - % LEL[2] of Combustible Gases	Explosive atmosphere in immediate work area	< 10% LEL	Investigate with caution
		> 10% LEL	Explosion hazard, leave area immediately
GCI[1] - % Oxygen	Oxygen Concentration	< 19.5% [3]	Monitor while wearing SCBA [3]
		19.5% - 23.0%	Continue investigation with caution
		> 23.0%	Discontinue investigation monitoring, fire hazard potential, consult H&S Coordinator
Photo-ionization (Hnu)/ Flame-ionization (OVA) meter readings of breathing zone	Volatile Contaminants	Background to 100 ppm	Level D protection [4, 5]
		100 to 300 ppm over background	Level C protection [4, 5]
		300 to 500 ppm over background	Level B protection [4, 5]
		> 500 ppm over background	Evaluate exposure source, consult H&S Coordinator [4, 5]

[1] GCI denotes Combustible Gas Indicator.
[2] LEL denotes Lower Explosive Limit.
[3] Note: combustible gas readings are not valid in atmospheres with < 19.5% oxygen.
[4] Meter readings are not the sole criteria for selecting the level of protection. These are only generalized guidelines and are project specific.
[5] Action taken are based upon sustained and/or frequent readings.

Appendix D contains site specific monitoring results (if applicable).

X. HAZARDOUS WASTE OPERATION CONTINGENCY PLAN

Generator's/Site Name: Former Central Siding Property

Location, description, and route to the site: Lot with metal storage building located at 129 West Main Street, Elwood, IN

From Interstate I-69 take exit 245 and proceed west on State Road 28 for 16 miles to the site. The site is on the southwest corner of the intersection of West Main Street (Hwy 28) and Second Street on the west side of Elwood.

Site Contact/Phone: Chad Pigg (Groundbreaking Development, LLC 317-605-6897)

Client Project Manager: Andrea Robertson Habeck IBP (317-234-0968)

A. Emergency Information

Police: 911 Alternate Number: Not applicable
Fire: 911 Alternate Number: Not applicable
Ambulance: 911 Alternate Number: Not applicable

Hospital Name: **St. Vincent Mercy Hospital**
Hospital Address: **1331 South A Street, Elwood, Indiana 46036**
Hospital Phone: **(765-552-4600)**

Route to Hospital: From the Former Central Siding site:

Proceed east (right) on West Main Street for approximately 0.7 miles.
Turn right (south) on South 12th Street and proceed for 351 feet.
Turn left (east) onto South A Street and proceed for 0.1 mile.

Destination will be on the right.

Appendix G depicts a map to the local hospital and/or local medical providers.

Office Resources: Key Personnel Phone Numbers		
Name	**Position**	**Phone**
IWM Fort Wayne Office		260-497-9620
IWM Indianapolis Office		317-347-1111
Bradley Gentry	IWM Project Manager	Ext.: 123 Direct: 317-968-9256 Cell: 317-435-8877
Mandy Hall	H&S Coordinator	Ext.: 136 Direct: 317-565-1618 Cell: 317-441-7839
Greg Scarpone	Operations Manager	Ext.: 125 Direct: 317-968-9258 Cell: 317-431-0051
Chad Pigg	Groundbreaking Development President	317-605-6897
Fred Bartman	EPA Project Manager	312-886-0776
IDEM Emergency Response	24 Hour Action Hotline	317-233-7745
Poison Information Center		(800) 962-1253

Has a copy of the contingency plan been received by the hospital? □ Yes ■ No ■ NA

If NO, explain. Not required for the proposed work activities.

Is receipt of the contingency plan by local authorities documented? □ Yes ■ No ■ NA

If NO, explain. Not required for the proposed work activities.

Has the hospital been notified of job site activities and chemical hazards? □ Yes ■ No ■ NA

If NO, explain. Not required for the proposed work activities.

B. Evacuation Route/Emergency Procedures

See attached map in **Appendix A.**

Describe evacuation alarm procedure. Verbal warning to all immediate personnel. Follow with phone call(s) to key personnel.

Evacuation route description. Away from area of danger. Evacuation route map in **Appendix A**.

Assembly Area description. Assemble at the Casey's General Store parking lot north of the Site.

C. Safety Plan Amendments

Amendments to this HASP and Contingency Plan are maintained in **Appendix E.**

D. HASP and Contingency Plan Sign-Off

All site personnel (employees and their subcontractors) will review this HASP and Contingency Plan. This plan provides site personnel with an orientation to the job task including:

- ■ Site Overview
- ■ Emergency Response Procedures
- ■ Potential Physical & Health Hazards of on-site hazardous materials
- ■ PPE Requirements
- ■ Site Security
- □ Hazards of Confined Spaces
- □ Site-specific environmental regulatory requirements

Appendix F contains a plan sign-off sheet.

APPENDIX A

SITE MAP(S)

MAIN ST

CS-ESG5

CS-GP11

CS-ESG4

CONCRETE/FILL

CS-ESG3

CS-GP7

CS-ESG2

EXISTING DRAINS FOR FORMER BATHROOM

PIT

CS-GP6

CS-ESG1

CS-WC3

CS-WC1

CS-WC2

GRAVEL/GRASS

2ND ST

FIRST PRESBYTERIAN CHURCH PROPERTY

CS-WC4

CS-WC5

CS-WC32

CS-WC33 CS-WC34 CS-WC35

CS-WC36 CS-WC37 CS-WC38 CS-WC40

CS-GP1

CS-WC39

CS-GP10

CS-WC41

STORAGE BUILDING

CS-GP8

CS-WC6 CS-WC7 CS-WC8 CS-WC9 CS-WC10 CS-WC11

CS-WC12 CS-WC13 CS-GP5 CS-WC15 CS-WC16 CS-WC17

CS-WC14

CS-GP12

CS-WC18 CS-WC19 CS-WC20 CS-WC21 CS-WC22 CS-WC23 CS-WC24

CS-GP3

CONCRETE

CS-WC25 CS-GP9 CS-GP4 CS-WC28 MW-1D CS-GP2 CS-WC30

CS-WC26 CS-WC27 CS-WC31 CS-WC29

ALLEY

FORMER VECTREN GAS DELIVERY BUILDING

RESIDENTIAL (120 S. A ST.)

RESIDENTIAL (124 S. A ST.)

RESIDENTIAL (126 S. A ST.)

NORTH

LEGEND

- IWM Soil Boring
- IWM Monitoring Well
- Overhead Utility Pole
- Fence Line
- U — Unknown Utility
- OH — Overhead Utility
- E — Underground Electric
- W — Water Line
- G — Gas Line
- S — Sewer Line
- T — Telephone Line

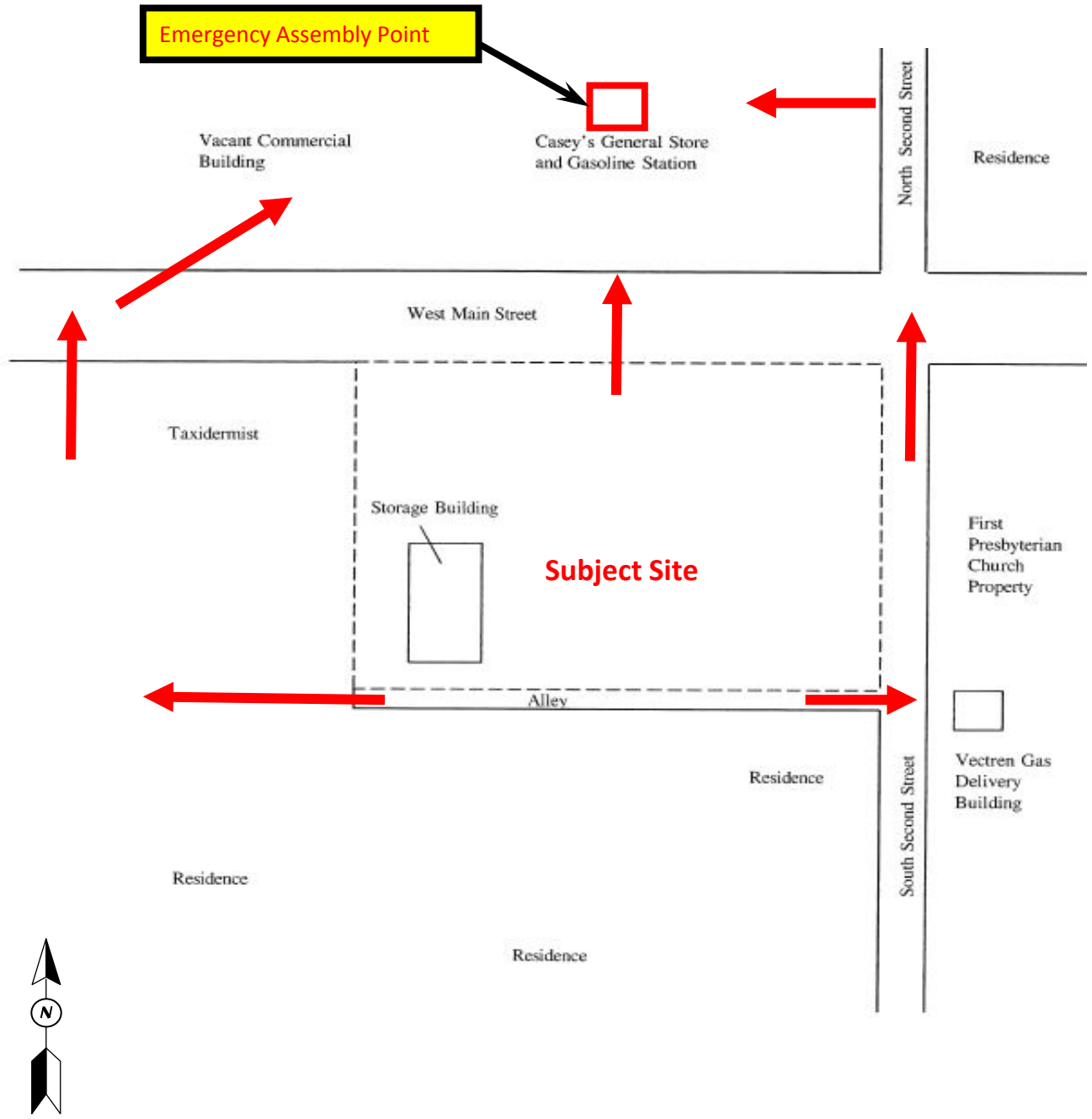
IWM CONSULTING GROUP

FORMER CENTRAL SIDING PROPERTY
129 WEST MAIN STREET (IN-28)
ELWOOD, INDIANA

DRAWN BY: WEA
DATE: 7/8/16
REVISED: 8/30/18
IN18005.09
#Haz...Site Map.DWG

FIGURE 2
SITE MAP

0 20' 40'



Not To Scale

LEGEND

Emergency Evacuation Routes

Title:

Site Location Map & Evacuation Routes
Former Central Siding Site
129 West Main Street
Elwood, Madison County, Indiana

iWM CONSULTING GROUP

3640-C New Vision Drive, Fort Wayne, IN 46845
(260) 497-9620, Fax (260) 471-7071 www.iwmconsult.com

Project	Task	Date
IN-19017	01	5/2/2019

Client: Indiana Brownfields Program
Indianapolis, Indiana

APPENDIX B

HAZARD ASSESSMENT/ATTACHMENTS

HAZARD ASSESSMENT/ATTACHMENTS

Former Central Siding Property 129 West Main Street Elwood, Madison County, Indiana		
Major Tasks/Activities	**Hazards**	**Precautionary Measures/ Controls**
Excavation	See Attached JSA	See Attached JSA
Soil Sampling	See Attached JSA	See Attached JSA

Job Safety Analysis
Trenching and Excavating

Principal Steps	Potential Hazards	Recommended Controls
Preparing to Trench and/or Excavate	Underground Utilities	Mark-out must be called for and performed prior to breaking ground
	Overhead Utilities	Work area must be assessed before moving heavy machinery, if overhead utilities present a hazard, operator will plan the work to avoid the lines
	Machine malfunction	Heavy machinery will be inspected before and after each use to prevent malfunction
Excavating and/or Trenching	Personal injury	Employees are to wear proper PPE at all times, including ANSI approved steel toe boots, hard hat, gloves, safety vest, and safety glasses. Operator must wear seat belt when operating heavy equipment. Operator must be trained and certified No employee may enter a trench greater than foot in depth without notifying the HSO, obtaining a confined space permit, and obeying the confined space permit
	Working with and near heavy machinery	Spotter required to stay in the operator's field of vision at all times when digging or moving soil (spotter wearing reflective safety vest) Universal hand signals are to be agreed upon by operator and spotter prior to work commencing Work area needs to be barricaded or employee needs to be stationed to keep all other employees, pedestrians, and vehicles out of the work area

	Trench collapse	Keep all equipment and spoil piles at least 4 feet from the excavation Use planks for walking/working surfaces around the excavation to distribute the weight of equipment and employees No employee may enter a trench greater than foot in depth without notifying the HSO, obtaining a confined space permit, and obeying the confined space permit Before any work is performed in a trench (after proper CSE permit is obtained, see above), the soil must be analyzed by a competent person and the trench must be sloped or shored to OSHA specifications The Competent Person will make the determination if additional protective measures such as shoring or trench box will be required prior to start of work. Employees not working directly next to the trench should keep their work area away from the open hole
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
Excavator	Prior to start of each day	Certification
Shoring/Trench box	Regularly throughout the day and after every change in weather	Engineer approval
Hand tools	Inspect all parts of tool prior to each use	

Job Safety Analysis

Soil Sampling

Principal Steps	Potential Hazards	Recommended Controls
Work Zone Set-Up	Traffic	Traffic control (barricades and/ or cones) Face flow of traffic and use appropriate cones, flags, and/or tape per client and/or Handex protocols. Block off designated sampling area.
	Overhead utilities	Look up before setting up equipment, spotter
	Sharp debris in sample	Wear thick gloves
Excavation	Overhead, underground utilities	Look up/hand clear holes
	Noise	Ear plugs or ear muffs
	Debris	Hard hat, safety glasses, steel toes
Sample collection	Chemical contact with skin	Nitrile gloves
Clean Up	Traffic, slip trip fall,	See above. Be aware of surroundings and use good housekeeping methods.
	Weather	Pay attention to predicted and current weather conditions
	Hot weather	Drink plenty of fluids (preferably water and/or sports drinks) wear light colored clothing, take rest breaks when necessary
	Cold weather	Wear plenty of clothing, take breaks when necessary
	Severe weather Thunderstorms	Take shelter, lower any raised equipment,
	Tornado	Move inside building or vehicle, take appropriate shelter in building or ditch
Equipment to be Used	**Inspection Requirements**	**Training Requirements**

APPENDIX C

MATERIAL SAFETY DATA SHEETS

And/Or

PUBLIC HEALTH STATEMENTS FOR COMPOUNDS OF INTEREST

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the NIOSH Pocket Guide

SEARCH

Enter search terms separated by spaces.

Methyl chloroform

Synonyms & Trade Names Chlorothene; 1,1,1-Trichloroethane; 1,1,1-Trichloroethane (stabilized)

CAS No. 71-55-6	**RTECS No.** KJ2975000 (/niosh-rtecs/KJ2D6518.html)	**DOT ID & Guide** 2831 160 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide160/) (http://www.cdc.gov/Other/disclaimer.html)
Formula CH_3CCl_3	**Conversion** 1 ppm = 5.46 mg/m3	**IDLH** 700 ppm See: 71556 (/niosh/idlh/71556.html)
Exposure Limits **NIOSH REL** : C 350 ppm (1900 mg/m3) [15-minute] See Appendix C (nengapdxc.html) (Chloroethanes) **OSHA PEL** † (nengapdxg.html) : TWA 350 ppm (1900 mg/m3)		**Measurement Methods** **NIOSH** 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a mild, chloroform-like odor.

MW: 133.4	**BP:** 165°F	**FRZ:** -23° F	**Sol:** 0.4%	**VP:** 100 mmHg	**IP:** 11.00 eV
Sp.Gr: 1.34	**Fl.P:** ?	**UEL:** 12.5%	**LEL:** 7.5%		

Combustible Liquid, but burns with difficulty.

Incompatibilities & Reactivities Strong caustics; strong oxidizers; chemically-active metals such as zinc, aluminum, magnesium powders, sodium & potassium; water [Note: Reacts slowly with water to form hydrochloric acid.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage

Target Organs Eyes, skin, central nervous system, cardiovascular system, liver

Personal Protection/Sanitation (See protection codes (protect.html))
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: No recommendation

First Aid (See procedures (firstaid.html))
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
NIOSH/OSHA

Up to 700 ppm:
(APF = 10) Any supplied-air respirator*
(APF = 50) Any self-contained breathing apparatus with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0079 (/niosh/ipcsneng/neng0079.html) See MEDICAL TESTS: 0141 (/niosh/docs/2005-110/nmed0141.html)

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Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Road Atlanta, GA 30329-4027, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

CHEM SERVICE INC -- 0-659 CIS 1,2-DICHLOROETHENE -- 6550-00F037480

========== Product Identification ==========

Product ID:0-659 CIS 1,2-DICHLOROETHENE
MSDS Date:06/02/1992
FSC:6550
NIIN:00F037480
MSDS Number: BWJDT
=== Responsible Party ===
Company Name:CHEM SERVICE INC
Address:660 TOWER LN
Box:3108
City:WEST CHESTER
State:PA
ZIP:19381-3108
Country:US
Info Phone Num:215-692-3026/800-452-9994
Emergency Phone Num:215-692-3026/800-452-9994
CAGE:84898
=== Contractor Identification ===
Company Name:CHEM SERVICE INC
Box:3108
City:WEST CHESTER
State:PA
ZIP:19381
Country:US
Phone:215-692-3026
CAGE:84898
Company Name:CHEM SERVICE, INC
Address:660 TOWER LN
Box:599
City:WEST CHESTER
State:PA
ZIP:19301-9650
Country:US
Phone:610-692-3026
CAGE:8Y898

========== Composition/Information on Ingredients ==========

Ingred Name:DICHLOROETHENE
CAS:156-59-2
RTECS #:KV9420000

========== Hazards Identification ==========

Routes of Entry: Inhalation:YES Skin:YES Ingestion:YES
Reports of Carcinogenicity:NTP:NO IARC:NO OSHA:NO
Health Hazards Acute and Chronic:SKIN: MAY BE HARMFUL IF ABSORBED. CAN CAUSE IRRITATION. INHALATION: MAY BE HARMFUL. DUST &/VAPORS CAN CAUSE RESPIRATORY TRACT IRRITATION. CAN BE IRRITATING TO MUCOUS MEMBRANCES. INGESTION: MAY BE HARM FUL. EYES: IRRITATION. EXPOSURE CAN CAUSE LIVER DAMAGE. NARCOTIC AT HIGH CONCENTRATIONS.
Explanation of Carcinogenicity:NONE
Effects of Overexposure:IRRITATION, NARCOTIC.

========== First Aid Measures ==========

First Aid:EYES: FLUSH CONTINUOUSLY W/WATER FOR 15-20 MINS. SKIN: FLUSH W/WATER FOR 15-20 MINS. IF NOT BURNED, WASH W/SOAP & WATER TO CLEANSE. INHALATION: REMOVE TO FRESH AIR. GIVE CPR/OXYGEN IF NEEDED & CONTINU E LIFE SUPPORT UNTIL MEDICAL ASSISTANCEARRIVES. INGESTION: RINSE MOUTH OUT W/WATER, IF CONSCIOUS. OBTAIN MEDICAL ATTENTION IN ALL CASES.

========== Fire Fighting Measures ==========

Flash Point:42.8F
Extinguishing Media:CO2, DRY CHEMICAL POWDER/SPRAY.
Unusual Fire/Explosion Hazard:FLAMMABLE CHEMICAL. VAPORS MAY TRAVEL CONSIDERABLE DISTANCE TO IGNITION SOURCE & FLASH BACK. DECOMPOSITION PRODUCTS ARE CORROSIVE.

========== Accidental Release Measures ==========

Spill Release Procedures:EVACUATE AREA. WEAR APPRORPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE/SIMILAR MATERIAL. SWEEP UP & PLACE IN APPROPRIATE CONTAINER/HOLD FOR DISPOSAL. WASH CONTAMINATED SURFAC ES TO REMOVE ANY RESIDUES.

========== Handling and Storage ==========

Handling and Storage Precautions:STORE IN A COOL DRY PLACE ONLY W/COMPATIBLE CHEMICALS. KEEP TIGHTLY CLOSED. STORE UNDER REFRIGERATION.
Other Precautions:AVOID CONTACT W/SKIN, EYES & CLOTHING. DON'T BREATH VAPORS. CONTACT LENSES SHOULDN'T BE WORN IN THE LABORATORY. ALL CHEMICALS SHOULD BE CONSIDERED HAZARDOUS. AVOID DIRECT PHYSICAL CONTACT.

========== Exposure Controls/Personal Protection ==========

Respiratory Protection:WEAR APPROPRIATE OSHA/MSHA APPROVED SAFETY EQUIPMENT.
Ventilation:CHEMICAL SHOULD BE HANDLED ONLY IN A HOOD.
Eye Protection:EYE SHIELDS
Supplemental Safety and Health

========== Physical/Chemical Properties ==========

Boiling Pt:B.P. Text:140F
Melt/Freeze Pt:M.P/F.P Text:-112F
Solubility in Water:INSOLUBLE
Appearance and Odor:COLORLESS LIQUID

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
STRONG OXIDIZING AGENTS, MAGNESIUM, ALUMINUM.
Stability Condition to Avoid:MOISTURE, AIR, LIGHT, HEAT & OTHER IGNITION SOURCES.
Hazardous Decomposition Products:TOXIC FUMES

========== Disposal Considerations ==========

Waste Disposal Methods:BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AN AFTERBURNER & SCRUBBER IAW/FEDERAL, STATE & LOCAL REGULATIONS.

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™

Search the NIOSH Pocket Guide

SEARCH

Enter search terms separated by spaces.

Tetrachloroethylene

Synonyms & Trade Names Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene

CAS No. 127-18-4	**RTECS No.** KX3850000 (/niosh-rtecs/KX3ABF10.html)	**DOT ID & Guide** 1897 160 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide160/) (http://www.cdc.gov/Other/disclaimer.html)
Formula $Cl_2C=CCl_2$	**Conversion** 1 ppm = 6.78 mg/m3	**IDLH** Ca [150 ppm] See: 127184 (/niosh/idlh/127184.html)
Exposure Limits **NIOSH REL** : Ca Minimize workplace exposure concentrations. See Appendix A (nengapdxa.html) **OSHA PEL** † (nengapdxg.html) : TWA 100 ppm C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm		**Measurement Methods** **NIOSH** 1003 (/niosh/docs/2003-154/pdfs/1003.pdf) ; **OSHA** 1001 (http://www.osha.gov/dts/sltc/methods/mdt/mdt1001/1001.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid with a mild, chloroform-like odor.

MW:	BP:	FRZ:	Sol:	VP:	IP:
165.8	250°F	-2°F	0.02%	14 mmHg	9.32 eV

Sp.Gr:	Fl.P:	UEL:	LEL:
1.62	NA	NA	NA

Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.

Incompatibilities & Reactivities Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]

Target Organs Eyes, skin, respiratory system, liver, kidneys, central nervous system

Cancer Site [in animals: liver tumors]

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Soap wash promptly

Eyes: Prevent eye contact **Wash skin:** When contaminated **Remove:** When wet or contaminated **Change:** No recommendation **Provide:** Eyewash, Quick drench	**Breathing:** Respiratory support **Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0076 (/niosh/ipcsneng/neng0076.html) See MEDICAL TESTS: 0179 (/niosh/docs/2005-110/nmed0179.html)

Page last reviewed: April 4, 2011
Page last updated: February 13, 2015
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Road Atlanta, GA 30329-4027, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

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SEARCH

Enter search terms separated by spaces.

Trichloroethylene

Synonyms & Trade Names Ethylene trichloride, TCE, Trichloroethene, Trilene		
CAS No. 79-01-6	**RTECS No.** KX4550000 (/niosh-rtecs/KX456D70.html)	**DOT ID & Guide** 1710 160 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx/guide160/) (http://www.cdc.gov/Other/disclaimer.html)
Formula $ClCH=CCl_2$	**Conversion** 1 ppm = 5.37 mg/m^3	**IDLH** Ca [1000 ppm] See: 79016 (/niosh/idlh/79016.html)
Exposure Limits **NIOSH REL** : Ca See Appendix A (nengapdxa.html) See Appendix C (nengapdxc.html) **OSHA PEL** † (nengapdxg.html) : TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)		**Measurement Methods** **NIOSH** 1022 (/niosh/docs/2003-154/pdfs/1022.pdf) , 3800 (/niosh/docs/2003-154/pdfs/3800.pdf) ; **OSHA** 1001 (http://www.osha.gov/dts/sltc/methods/mdt/mdt1001/1001.html) (http://www.cdc.gov/Other/disclaimer.html) See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html) (http://www.cdc.gov/Other/disclaimer.html)

Physical Description Colorless liquid (unless dyed blue) with a chloroform-like odor.					
MW: 131.4	**BP:** 189°F	**FRZ:** -99° F	**Sol:** 0.1%	**VP:** 58 mmHg	**IP:** 9.45 eV
Sp.Gr: 1.46	**Fl.P:** ?	UEL(77° F): 10.5%	LEL(77° F): 8%		
Combustible Liquid, but burns with difficulty.					
Incompatibilities & Reactivities Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)					
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact					
Symptoms irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]					
Target Organs Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system					
Cancer Site [in animals: liver & kidney cancer]					

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Soap wash promptly

Wash skin: When contaminated **Remove:** When wet or contaminated **Change:** No recommendation **Provide:** Eyewash, Quick drench	**Breathing:** Respiratory support **Swallow:** Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 0081 (/niosh/ipcsneng/neng0081.html) See MEDICAL TESTS: 0236 (/niosh/docs/2005-110/nmed0236.html)

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Centers for Disease Control and Prevention 1600 Clifton Road Atlanta, GA 30329-4027, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC–INFO

Material Safety Data Sheet
Poly(vinyl chloride), high molecular weight

ACC# 76785

Section 1 - Chemical Product and Company Identification

MSDS Name: Poly(vinyl chloride), high molecular weight
Catalog Numbers: AC183320000, AC183320010, AC183320250, AC183325000
Synonyms: PVC; Ethylene, chloro-, polymer; Chlorethene homopolymer; Chlorethylene polymer; Vinyl chloride polymer; Poly(chlorethylene)
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
9002-86-2	Poly(vinyl chloride)	100	206-625-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: Off - White Powder.
Caution! May cause eye and skin irritation. May cause respiratory and digestive tract irritation. Cancer suspect agent. The toxicological properties of this material have not been fully investigated.
Target Organs: None.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin irritation.
Ingestion: May cause irritation of the digestive tract.
Inhalation: May cause respiratory tract irritation.
Chronic: Experimental carcinogen. Chronic inhalation of dust can cause pulmonary damage, blood effects, and abnormal liver function.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing

contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Use agent most appropriate to extinguish fire. Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not available.
Autoignition Temperature: 435 deg C (815.00 deg F)
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation. Cover with dry earth, dry sand, or other non-combustible material followed with plastic sheet to minimize spreading and contact with water.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Keep away from heat and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Store protected from light.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Poly(vinyl chloride)	1 mg/m3 TWA (respirable fraction)	none listed	none listed

OSHA Vacated PELs: Poly(vinyl chloride): No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Powder
Appearance: Off - White Powder
Odor: None reported.
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point: Not available.
Decomposition Temperature: Not available.
Solubility: Not available.
Specific Gravity/Density:1.4000g/cm3
Molecular Formula: Not available.
Molecular Weight: Not available.

Section 10 - Stability and Reactivity

Chemical Stability: Reacts violently with F2. Ordinary temperatures cause slow dehalogenation producing hydrogen chloride.
Conditions to Avoid: Incompatible materials, light, dust generation, excess heat, strong oxidants.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.
Hazardous Polymerization: May occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 9002-86-2: KV0350000
LD50/LC50:
Not available.

Carcinogenicity:

CAS# 9002-86-2: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.
Teratogenicity: Equivocal tumorigenic agent: Oral, rat: TDLo = 210g/kg/30W-C.; Implant, rat: TDLo = 75 mg/kg.
Reproductive Effects: No information available.
Mutagenicity: No information available.
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 9002-86-2 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

Section 313 No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 9002-86-2 can be found on the following state right to know lists: New Jersey.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

Safety Phrases:

S 24/25 Avoid contact with skin and eyes.
S 37 Wear suitable gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 28A After contact with skin, wash immediately with plenty of water
.

WGK (Water Danger/Protection)

CAS# 9002-86-2: 0

Canada - DSL/NDSL

CAS# 9002-86-2 is listed on Canada's DSL List.

Canada - WHMIS

WHMIS: Not available.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

Section 16 - Additional Information

MSDS Creation Date: 12/01/1998
Revision #5 Date: 11/20/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

APPENDIX D

SITE SPECIFIC MONITORING RESULTS

SITE SPECIFIC MONITORING RESULTS

Former Central Siding Property 129 West Main Street Elwood, Madison County, Indiana			
Instruments	**Date/Time**	**Reading**	**Location**
Not required for proposed work Activities			

APPENDIX E

SAFETY PLAN AMENDMENTS

SAFETY PLAN AMENDMENTS

Site Name:	Former Central Siding Property	**Date of Plan Amendment:**	
Scope of Work Change/Amendment/Update/Modification Made to the Plan:			
Reason For Change:			
Hazard Evaluation:			
Level of Protection:			
Air Monitoring:			
Person Requesting Change:			
Person Approving Change:			
Title:			
Printed Name:			
Signature & Date:			
Date Approved:			

SAFETY PLAN AMENDMENTS

Site Name:	Former Central Siding Property	**Date of Plan Amendment:**	
Scope of Work Change/Amendment/Update/Modification Made to the Plan:			
Reason For Change:			
Hazard Evaluation:			
Level of Protection:			
Air Monitoring:			
Person Requesting Change:			
Person Approving Change:			
Title:			
Printed Name:			
Signature & Date:			
Date Approved:			

SAFETY PLAN AMENDMENTS

Site Name:	Former Central Siding Property	**Date of Plan Amendment:**	
Scope of Work Change/Amendment/Update/Modification Made to the Plan:			
Reason For Change:			
Hazard Evaluation:			
Level of Protection:			
Air Monitoring:			
Person Requesting Change:			
Person Approving Change:			
Title:			
Printed Name:			
Signature & Date:			
Date Approved:			

APPENDIX F

HEALTH AND SAFETY PLAN SIGN-OFF LOG

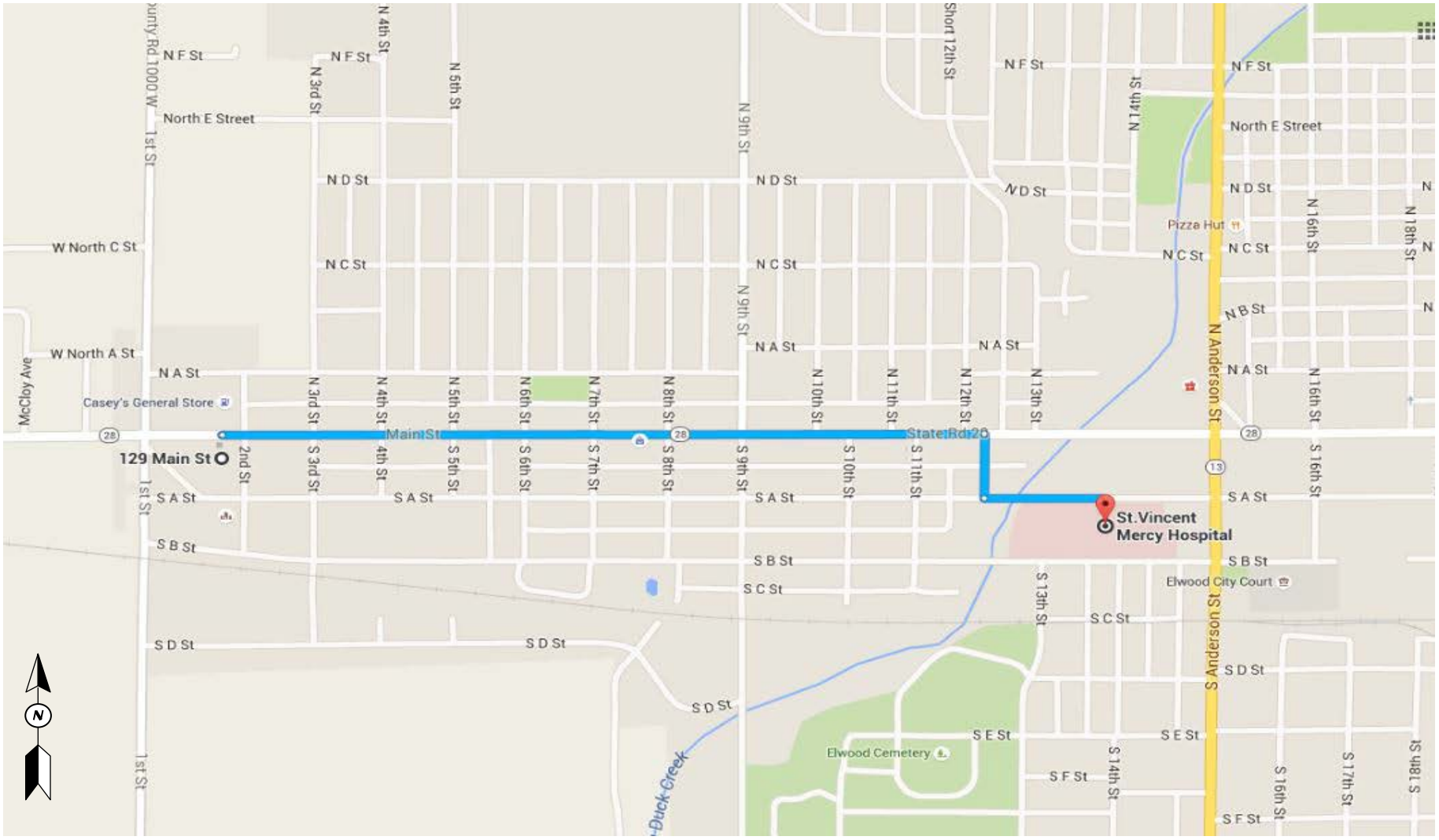
HEALTH AND SAFETY PLAN SIGN-OFF LOG

I have read this Site Health and Safety Plan and understand it. I agree, to the best of my ability, to conduct activities as specified, giving health and safety concerns the highest priority.

PRINTED NAME	SIGNATURE	COMPANY NAME	DATE

APPENDIX G

HOSPITAL AND/OR LOCAL MEDICAL PROVIDER MAPS



Hospital Information:
St. Vincent Mercy Hospital
1331 South A Street
Elwood, Indiana 46036
(765) 552-4600

Title: Map to Hospital
Former Central Siding Property
129 West Main Street
Elwood, Madison County, Indiana

Client: Indiana Brownfields Program
Indianapolis, Indiana

IWM CONSULTING GROUP
3640-C New Vision Drive, Fort Wayne, Indiana 46845
(260) 497-9260 Fax: (260) 471-7071 www.iwmconsult.com

APPENDIX B

PROVECT-OX TECHNICAL SPECIFICATION SHEET

Provect-OX™

Self-Activating ISCO / Enhanced Bioremediation Reagent

TECHNOLOGY DESCRIPTION

Provect-OX is an *in situ* chemical oxidation (ISCO) / enhanced bioremediation reagent that uses ferric iron (Fe III) as a safe and effective means of activating persulfate (Patents Pending). Provect-OX oxidizes a wide variety of organic compounds present in impacted soil, sediment and groundwater, including chlorinated solvents, petroleum hydrocarbons, and pesticides. Rodriquez *et al., (*2014) recently reported that 2 mM Fe(III) and 6 mM persulfate was very effective in rapidly mineralizing even recalcitrant organic compounds such as the synthetic azo dye Orange G ($C_{16}H_{10}N_2Na_2O_7S_2$).

This advanced activation catalyst is further unique considering its ability to enhance bioremediation processes. This is accomplished via the subsequent utilization of sulfate and iron as terminal electron acceptors for facultative reductive processes. Degradation intermediates generated during pollutant oxidation may act as electron shuttles, allowing the reduction of Fe(III) to Fe(II) in the redox cycling of iron and continued activation of persulfate. This combined remedy provides supplemental treatment mechanisms thereby allowing for more cost-efficient dosing of the product.

Like all **Provectus** products, Provect-OX was developed by experienced practitioners who understand real-world field applications. For example, persulfate oxidant and its activator are conveniently packaged in a single, pre-mixed bag for ease of use and safe handling. Moreover, due to its safe and non-extreme activation chemistry, Provect-OX will not generate excessive heat / off-gases, nor will it mobilize heavy metals or lead to the generation of secondary impact issues, such as elevated arsenic, chromium, or pH.

TRADITIONAL ACTIVATION CHEMISTRIES

Heretofore, sodium persulfate has been activated via heat, chelated metals, hydrogen peroxide, ZVI/surface catalysis and/or pH extremes in order to generate sulfate radicals, hydroxyl radicals, etc. (Tsitonaki *et al.,* 2010). Not only do these systems require the addition of other products or energy, they tend to disregard the many biologically mediated processes possible as a consequence of the decomposition products of persulfate.

Divalent metal activation: The utilization of ferrous iron, usually as a chelated cation consumes the oxidant (persulfate) in a conversion of the ferrous iron to ferric iron. Additionally, the presence of the chelant inhibits biological utilization of the generated ferric species as a biological terminal electron acceptor and consumes oxidant. Over dosing of the chelated ferrous iron further consumes the oxidant.

Caustic Activation: The utilization of caustic (high pH) activation of persulfate presents inherit health and safety issues while creating an unsuitably high pH environment for biological attenuation. Further, within this activation mechanism is a self-limiting biological attenuation process once the pH returns to suitable levels. The sulfate, when used as a biological terminal electron acceptor, transitions to sulfite and finally sulfide. This final product forms hydrogen sulfide which inhibits further biological activity.

Heat Activation: The utilization of heat as an activation mechanism is generally difficult to implement, and it incurs high implementation costs while not addressing the hydrogen sulfide issue.

Hydrogen Peroxide Activation: The use of peroxide as an activating mechanism again does not address the hydrogen sulfide generation problem while having limited efficacy on many targeted compounds.

MODE OF ACTION

ISCO: Under the **Provectus** approach, persulfate is activated by Fe III (pre-mixed formulation) which requires a lower activation energy than alternative mechanisms while not consuming the persulfate oxidant. The mechanism is believed to elevate the oxidation state of the iron transiently to a supercharged iron ion which in itself may act as an oxidant. As this supercharged iron cation is consumed, the resulting ferric species can act as a terminal electron acceptor for biological attenuation. Coincidentally, the generated sulfate ion from the decomposition of the persulfate provides a terminal electron acceptor for sulfate reducers which may further remediate the targeted compounds in the groundwater and soils. The reactions that occur in the chemical oxidation can be seen below (Equation 1):

$$S_2O_8^{-2} + Fe^{+3} \text{ ---------> } Fe^{(+4 \text{ to} +6)} + SO_4^{2-} + SO_4^{2-\bullet} \quad \text{(Eq. 1)}$$

Only Persulfate Based Remedial Option Generating Ferrate Species

With STRONG Biological Component

SECONDARY ATTENUATION PROCESS (Biologically Mediated)

1) Sulfate Residual

After dissolved oxygen has been depleted in the treatment area, sulfate (a by-product of the persulfate oxidation) may be used as an electron acceptor for anaerobic biodegradation by indigenous microbes. This process is termed sulfidogenesis and results in the production of sulfide. Stoichiometrically, each 1.0 mg/L of sulfate consumed by microbes results in the destruction of approximately 0.21 mg/L of BTEX compounds. Sulfate can play an important role in bioremediation of petroleum products, acting as an electron acceptor in co-metabolic processes as well. For example, the basic reactions for the mineralization of benzene and toluene under sulfate reducing conditions are presented in equations 2 and 3:

$$C_6H_6 + 3.75\ SO_4^{2-} + 3\ H_2O \text{ --> } 0.37\ H^+ + 6\ HCO_3^- + 1.87\ HS^- + 1.88\ H_2S^- \quad \text{(Eq. 2)}$$

$$C_7H_8 + 4.5\ SO_4^{2-} + 3\ H_2O \text{ --> } 0.25\ H^+ + 7\ HCO_3^- + 2.25\ HS^- + 2.25\ H_2S^- \quad \text{(Eq. 3)}$$

2) Ferric Iron:

Ferric iron is also used as an electron acceptor during anaerobic biodegradation of many contaminants, sometimes in conjunction with sulfate. During this process, ferric iron is reduced to ferrous iron, which is soluble in water. Hence, ferrous iron may be used as an indicator of anaerobic activity. As an example, Stoichiometrically, the degradation of 1 mg/L of BTEX results in the average consumption of approximately 22 mg/L of ferric iron (or “production” of ferrous iron) as shown below (equations 4-6).

$$C_6H_6 + 18\ H_2O + 30\ Fe^{3+} \text{-------> } 6\ HCO_3^- + 30\ Fe^{2+} + 36\ H^+ \quad \text{(Eq. 4)}$$

$$C_7H_8 + 21\ H_2O + 36\ Fe^{3+} \text{-------> } 7\ HCO_3^- + 36\ Fe^{2+} + 43\ H^+ \quad \text{(Eq. 5)}$$

$$C_8H_{10} + 24\ H_2O + 42\ Fe^{3+} \text{-------> } 8\ HCO_3^- + 42\ Fe^{2+} + 50\ H^+ \quad \text{(Eq. 6)}$$

3) Pyrite Formation:

While ferrous iron is formed as a result of the use of the ferric species as a terminal electron acceptor, residual sulfate is utilized as a terminal electron acceptor by facultative organisms thereby generating sulfide under these same conditions. Together, the ferrous iron and the sulfide promote the formation of pyrite as a remedial byproduct (equation 7). This reaction combats the toxic effects of sulfide and hydrogen sulfide accumulation on the facultative bacteria, while also providing a means of removing targeted organic and inorganic COIs via precipitation reactions. Moreover, pyrite possesses a high number of reactive sites that are directly proportional to both its reductive capacity and the rate of decay for the target organics.

$$Fe^{2+} + 2S^{2-} \text{-------> } FeS_2 + 2e \quad \text{(Eq. 7)}$$

PRIMARY FEATURES:

This technique maximizes the synergy between persulfate and iron for coupled oxidation and enhanced bioremediation: i) sulfate is generated from persulfate, i) Ferric iron (Fe III) is microbiologically reduced to ferrous iron (Fe II) readily supplying electrons to exchange and react with sulfide. Together, sulfide and iron form pyrite, an iron bearing soil mineral with a favorable reductive capacity.

- Effective: Promotes free radical based *in situ* oxidation of a wide-range of organic contaminants. Also provides a unique microbiological component for multiple accelerated attenuation processes.
- Efficient: Significantly lower costs as a result of sub-stoichiometric dosing requirements.
- Safe: Fewer health and safety concerns as compared with use of traditional activation methods such as heat, chelated metals, hydrogen peroxide or pH extremes. Contains built-in activation which eliminates the need for additional and potentially hazardous chemicals required to achieve traditional persulfate activation.
- Ease of Use: Single component product with integrated activator results in simplified logistics and application. No additional containers or multi-step mixing ratios required prior to application. Fewer material compatibility issues.
- Improved Performance: Combined remedy prevents “rebound” which is often seen in other oxidation processes. Maximizes the inherent geochemistry of a “post-oxidation” environment for biologically based attenuation.

LITERATURE CITED:

Rodriguez S, L. Vasquez, D. Costa D, A. Romero and A. Santos. 2014. Oxidation of Orange G by Persulfate activated by Fe(II), Fe(III) and zero valent iron (ZVI). Chemosphere 101:86-92.

Scalzi, M. and A. Karachalios. 2013. Chemical Oxidation and Biological Attenuation Process for the Treatment of Contaminated Media. US PTO 13/891,934. May, 2013.

Tsitonaki, A., B.Petri, M. Crimi, H.Mosbaek, R. Siegrist and P. Berg. 2010. *In Situ* Chemical Oxidation of Contaminated Soil and Groundwater using Persulfate: A Review. Critical Rev. Environ. Sci and Technol. 40: 55-91.

CONTACT US FOR A COMPLIMENTARY SITE EVALUATION

PROVECTUS ENVIRONMENTAL PRODUCTS, INC.

2871 West Forest Road, Suite 2 | Freeport, IL 61032

Tel: (815) 650-2230 | Fax: (815) 650-2232 | Email: info@ProvectusEnv.com

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