TOEROEK
ASSOCIATES, INC.

September 15, 2021

Mr. Bradley Roberts
Task Order Contracting Officer Representative
U.S. Environmental Protection Agency, Region 7
11201 Renner Blvd.
Lenexa, Kansas 66219

Subject: Contract No. 68HERH19D0018; Task Order (TO) No. 68E0719F0190
Advanced Auto Parts and Former Fashions R Boutique
9844 and 9846 West Florissant Avenue, Dellwood, MO 63136
Analysis of Brownfields Cleanup Alternatives Report (ABCA)

Dear Mr. Roberts:

Toeroek Associates, Inc. (Toeroek) and our teaming subcontractor, Tetra Tech, Inc. (Tetra Tech), (hereafter "Toeroek Team") are pleased to present the Analysis of Brownfields Cleanup Alternatives (ABCA) report regarding the Advanced Auto Parts and Former Fashions R Boutique (the subject property) at 9844-9846 West Florissant Avenue in St. Louis, St. Louis County, Missouri.

This deliverable has been revised to reflect the U.S. Environmental Protection Agency comment on the draft report of the same name. After revision to reflect EPA's comments, this final report was reviewed internally as part of Tetra Tech's quality assurance program, as well as Toeroek's quality assurance program, and is consistent with Toeroek's Quality Management Plan for the Resource Conservation and Recovery Act (RCRA) Enforcement and Permitting Assistance (REPA) contract. Documentation of this review is retained in the Toeroek Team's project files.

If you have any questions or comments, please contact Greg Hanna at 720-898-4102 or Kaitlyn Mitchell at 816-412-1742.

Sincerely,

Greg Hanna
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Enclosure: ABCA

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ANALYSIS OF BROWNFIELDS CLEANUP ALTERNATIVES REPORT

ADVANCED AUTO PARTS AND FORMER FASHIONS R BOUTIQUE
9844-9846 WEST FLORISSANT AVENUE
DELLWOOD, ST. LOUIS COUNTY, MISSOURI

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 7

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CONTENTS

Section **Page**

1.0 INTRODUCTION 1
2.0 BACKGROUND AND DESCRIPTION 2
3.0 PREVIOUS INVESTIGATIONS 3
4.0 FUTURE USE 5
5.0 POTENTIAL CLEANUP ALTERNATIVES 6
5.1 EVALUATED CONTAMINATION 7
5.1.1 Subsurface Soil 7
5.1.2 Groundwater 8
5.1.3 Soil Gas 10
5.2 EVALUATION OF CLEANUP ALTERNATIVES 10
5.2.1 Alternative 1 – No Action (Baseline) 11
5.2.2 Alternative 2 – SMP and ICs 12
5.2.3 Alternative 3 – Soil Excavation with Off-Site Disposal 13
5.3 RECOMMENDED CLEANUP ALTERNATIVE 14
5.3.1 Subsurface Soil 15
5.3.2 Total Cleanup Cost 15
6.0 REFERENCES 16

APPENDICES

Appendix

A FIGURES

B REMEDIAL ALTERNATIVES COST ESTIMATES FOR SOIL

TABLES

Table **Page**

1 SUMMARY OF COSTS 15

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) tasked Toeroek Associates, Inc. (Toeroek) and its teaming subcontractor, Tetra Tech, Inc. (Tetra Tech), (hereafter "Toeroek Team") to provide technical support to the EPA Region 7 Brownfields Program under Contract 68HERH19D0018, Task Order (TO) 68E0719F0190. EPA Region 7 requested that the Toeroek Team conduct an Analysis of Brownfields Cleanup Alternatives (ABCA) of the adjoining properties at 9844 and 9846 West Florissant Avenue (the subject property) in Dellwood, St. Louis County, Missouri, previously occupied by the former Fashions R Boutique and Advanced Auto Parts, respectively (see Appendix A, Figures 1 and 2). The Toeroek Team has performed this ABCA based on results of the Targeted Brownfields Assessment (TBA) Phase II Environmental Site Assessment (ESA) by the Toeroek Team (Toeroek 2021). The current owner of the subject property, Urban League of St. Louis, has shown interest in developing the property with a commercial building (Urban League Plaza), depending on findings from the TBA.

The Phase II ESA report concluded that further investigation and/or remediation of environmental media appeared warranted. The current property owner is expected to enroll the subject property in the Missouri Department of Natural Resources (MDNR) Brownfields/Voluntary Cleanup Program (B/VCP); therefore, this ABCA considers cleanup alternatives that would be based on Missouri Risk-based Corrective Action (MRBCA) Tier 1 Risked-based Target Levels (RBTLs) for soil, groundwater, and soil gas (or MRBCA Lowest Default Target Levels [LDTLs] if RBTLs are not available). This ABCA will also compare metals concentrations in soil to U.S. Geological Survey (USGS) average background concentrations plus one standard deviation in St. Louis County. Additionally, this ABCA will include preliminary cost estimates of evaluated cleanup alternatives.

2.0 BACKGROUND AND DESCRIPTION

The subject property consists of two adjoining vacant lots at 9844 and 9846 West Florissant Avenue in Dellwood, St. Louis County, Missouri. The subject property is depicted on the Clayton, Missouri, USGS 7.5-minute topographic series map (USGS 1975), and is just south of the area shown on the Florissant, Missouri, USGS 7.5-minute topographic series map (USGS 1982) (see Appendix A, Figure 1). Coordinates at the approximate center of the subject property are 38.746860 degrees north latitude and 90.279024 degrees west longitude. The former Fashions R Boutique (9844 West Florissant Avenue) was on approximately 0.55 acre—now a partially paved vacant lot hosting no structures. The foundation of a former building is still present at the subject property. The former Advanced Auto Parts (9846 West Florissant Avenue) was on 0.75 acre, and more than half of the property is paved. Figure 2 in Appendix A illustrates the approximate footprint of the former buildings and the subject property boundaries.

Available historical documentation (the Historical Auto Service database) lists the 9844 West Florissant Avenue address at the subject property as Dellwood Automotive, a gasoline service station and motor vehicle supplies and parts store, from approximately 1986 to 1989. Subsequently, the building at that address hosted a clothing boutique, and burned down in 2014 (Terracon Consultants, Inc. [Terracon] 2017). Historical documentation regarding 9846 West Florissant Avenue indicates that an Advanced Auto Parts store operated there from about 2000 to 2014, when the building was demolished (SCS Engineers [SCS] 2019).

The subject property is in Dellwood, Missouri, a city of about 5,200 residents in northern St. Louis County, between the Cities of Ferguson and St. Louis, about 10 miles northwest of downtown St. Louis, Missouri. The subject property is along a commercial corridor with residential neighborhoods beyond. It is bounded north by Auto Spa Speedy Wash, a car wash; east by residential housing; south by a TitleMax Title Loans and Hunan Chop Suey restaurant; and west by West Florissant Avenue, with commercial and retail buildings beyond.

3.0 PREVIOUS INVESTIGATIONS

In June 2017, Terracon conducted a Phase I TBA of 9844 West Florissant Avenue on behalf of MDNR. The Phase I TBA identified a recognized environmental condition (REC) associated with historical use of the subject property as an auto service and machine shop (Terracon 2017). However, the property was not listed as a Resource Conservation and Recovery Act (RCRA) hazardous waste generator, and no registered underground storage tanks (USTs), spills, or releases were indicated at the property. The adjoining property to the north was listed in the UST and Leaking Underground Storage Tank (LUST) databases. USTs had been removed from that property in the 2000s, and impacts on soil and groundwater had been detected at the northern portion of the property (north of the subject property). Additional investigations occurred, and a No Further Action Letter was issued in 2016; therefore, this adjacent site did not pose a REC to the subject property (Terracon 2017).

In April 2018, the Superfund Technical Assessment and Response Team (START) conducted a Phase II TBA at 9844 West Florissant Avenue after identification of the REC during the Phase I TBA by Terracon in June 2017. The Phase II TBA included collection of subsurface soil samples from direct-push technology (DPT) borings, and groundwater samples from temporary wells. The objective was to characterize possible historical releases to the environment. Based on detections of analytes within the former building's footprint, a release of solvents, gasoline, and diesel may have occurred due to historical use of that building on the subject property as an auto service and machine shop (Tetra Tech 2018).

In 2019, SCS performed a Phase I ESA of 9846 West Florissant Avenue on behalf of MDNR. The Phase I did not identify any RECs (SCS 2019).

The Toeroek Team conducted a Phase II ESA at 9844 West Florissant Avenue in 2021 consisting of a ground penetrating radar (GPR) survey and collection of subsurface soil, groundwater, and soil-gas samples to confirm or eliminate RECs in areas not sampled during the previous Phase II ESA (Tetra Tech 2018). Additionally, the Phase II ESA investigated potential for vapor intrusion issues at the subject property despite absence of current concern, because no buildings are present at the subject property. Soil-gas data were compared to screening levels to determine if concentrations of volatile organic compounds (VOCs) were high enough to pose potential for vapor intrusion into potential future buildings on the subject property.

The GPR survey detected several utilities lines throughout 9846 West Florissant Avenue and some at the southwest corner area of 9844 West Florissant Avenue. Former or current uses of some of these detected underground lines were not discernable.

Sampling results during this Phase II ESA indicated presence of VOCs, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), and metals in soil and groundwater

, and VOCs in soil gas at the subject property.

Highest concentrations of SVOCs in groundwater and of TPH in soil were detected in samples collected at 9844 West Florissant Avenue. Results from soil and groundwater samples were compared to EPA Regional Screening Levels (RSLs) (soil) under residential and industrial scenarios, EPA Tapwater RSLs or Maximum Contaminant Levels (MCLs) (groundwater), and MRBCA LDTLs and MRBCA Tier I RBTLs for residential and non-residential soil in Type 3 (clayey) soils. During the 2021 Phase II ESA, soils observed in soil borings consisted primarily of clays and urban fill. Therefore, MRBCA Tier I RBTLs for soil Type 3 (clayey) were determined to be the most appropriate. Results from groundwater samples were compared with MRBCA Tier I RBTLs for the dermal contact scenario. This was determined to be the most likely exposure scenario since groundwater is not currently used for drinking water as described in Section 4.0. VOC results from soil-gas samples were compared to EPA Vapor Intrusion Screening Levels (VISLs) using a target hazard quotient of 0.1 and a target cancer risk of 1E-06 (EPA 2021), and to MRBCA Tier 1 RBTLs for Type 3 (clayey) residential soil vapor to determine if concentrations of VOCs are high enough to pose the potential for vapor intrusion into future buildings at the subject property. These comparisons for soil, groundwater, and soil-gas indicated elevated concentrations of petroleum constituents likely associated with historical operations. Some of these detections exceeded residential EPA RSLs, EPA MCLs, and Missouri RBTLs—indicating the likelihood of a release. Based on analytical results from subsurface soil and groundwater samples, further investigation and/or remediation appears warranted.

4.0 FUTURE USE

Future use of the subject property is unknown; however, the current property owner, Urban League of St. Louis, has shown interest in developing the property with a commercial building (Urban League Plaza) based on findings from the TBA.

The subject property is along a commercial corridor with residential neighborhoods beyond. It is bounded north by Auto Spa Speedy Wash, a car wash; east by residential housing; south by a TitleMax Title Loans and Hunan Chop Suey restaurant; and west by West Florissant Avenue, with commercial and retail buildings beyond. Groundwater is not currently used for drinking water at the subject property. The City of Dellwood derives its drinking water from a private utility supplier, Missouri American Water, which utilizes surface water consisting of approximately 80 percent from the Missouri River and 20 percent from the Meramec River. Additionally, Missouri American Water occasionally purchases water from the City of St. Louis Water Division, which sources drinking water from the Missouri and Mississippi Rivers (Missouri American Water 2020).

Based on analytical results from subsurface soil and groundwater samples, further investigation and/or remediation appears warranted. No remedial activities have occurred at the subject property to date.

5.0 POTENTIAL CLEANUP ALTERNATIVES

The overall goal of any Brownfields cleanup action is to address environmental conditions preventing or impeding the preferred type of subject property redevelopment, and to do so in a manner protective of human health and the environment. This ABCA considers cleanup alternatives that would conform to MRBCA RBTLs for soil, groundwater, and soil gas, or MRCBA LDTLs if RBTLs are not available.

The Toeroek Team evaluated Brownfields cleanup alternatives to address environmental impacts identified during the Phase II ESA (Toeroek 2021). The purpose of the ABCA is to present viable cleanup alternatives based on site-specific conditions, technical feasibility, and preliminary cost evaluations.

The following sections describe Brownfields cleanup alternatives for addressing contaminated media, including a "No Action" alternative. Following the description, each alternative is evaluated in terms of its effectiveness, implementability, and cost. The purpose of evaluating each alternative is to determine its advantages and disadvantages relative to the other alternatives in order to identify key tradeoffs that would affect selection of the preferred alternative.

Effectiveness of an alternative refers to its ability to meet objectives of the Brownfields cleanup. Criteria applied to assess effectiveness of an alternative include the following:

- Overall protection of human health and the environment;
- Long-term effectiveness;
- Reduction of toxicity, mobility, or volume through treatment/removal; and
- Short-term effectiveness.

Criteria applied to assess implementability of an alternative are:

- Technical feasibility;
- Administrative feasibility;
- Availability of services and materials required during implementation of the alternative;
- State acceptance; and
- Community acceptance.

Each alternative is evaluated to determine its estimated cost. The evaluations compare the alternatives' respective direct capital costs, which include equipment, services, and contingency allowances. Again, the

purpose of evaluating each alternative is to determine its advantages and disadvantages relative to the other alternatives in order to identify key tradeoffs that would affect selection of the preferred alternative.

5.1 EVALUATED CONTAMINATION

Media evaluated for contamination as part of this ABCA include subsurface soils, groundwater, and soil-gas. The sections below discuss contaminants/materials identified during the Phase II ESA at the subject property.

5.1.1 Subsurface Soil

Tetra Tech's 2018 Phase II ESA included collection of 17 subsurface soil samples (including one field duplicate) at eight locations (SB-1 through SB-8) across the 9844 West Florissant Avenue property (see Appendix A, Figure 2). Subsurface soil samples were collected within select intervals based on visual staining, detected odor, or elevated photoionization detector (PID) readings. If no staining/odor or elevated PID reading was noted, a sample was collected at a location determined by the field team, including intervals within the capillary fringe (if groundwater was encountered) or within the bottom portion of the boring (if refusal was encountered). Samples were analyzed for VOCs, polycyclic aromatic hydrocarbons (PAHs), TPH – gasoline range organics (GRO), TPH – diesel range organics (DRO), TPH – oil range organics (ORO), and RCRA metals, excludingmercury. Comparisons of analytical data to MRBCA Tier 1 RBTLs for Type 3 (clayey) subsurface soils, indoor inhalation of vapor emissions pathway (or MRBCA LDTLs if RBTLs were not available) and to USGS average background concentrations of metals in St. Louis County resulted in the following noteworthy findings:

- TPH-GRO was detected in one subsurface soil sample (SB-5 [16-18]) at 1,930 milligrams per kilogram (mg/kg), exceeding the MRBCA Tier 1 residential RBTL for subsurface soil, of 1,200 mg/kg.

- Arsenic was detected in 13 subsurface soil samples at concentrations exceeding the MRBCA LDTL. Of these, only three samples (including a field duplicate) contained arsenic concentrations exceeding the USGS average background concentration of 10.561 mg/kg in St. Louis County (USGS 2021): SB-4 (18-20) at 12.9 mg/kg, SB-4 (18-20)-FD at 11.6 mg/kg, and SB-5 (13-15) at 13.1 mg/kg. However, these concentrations were within one standard deviation (±3.307 mg/kg) of the USGS background concentration. Therefore, these arsenic concentrations are consistent with the background concentrations and do not appear to be from historical activities at the subject

property. No RBTL has been established for arsenic in subsurface soil. Cleanup alternatives will not address arsenic in subsurface soil at SB-4 and SB-5.

As part of the Phase II ESA completed by the Toeroek Team in 2021, 14 subsurface soil samples were collected (including two field duplicates) at 12 locations (9844-B1 through -B6 and 9846-B1 through -B6) across the subject property (see Appendix A, Figure 2). Subsurface soil samples were collected within select intervals based on visual staining, detected odor, or elevated PID readings. If no staining/odor or elevated PID reading was noted, a sample was collected from the bottom two feet of the soil core. Samples were analyzed for VOCs, SVOCs, TPH-GRO, TPH-DRO, TPH-ORO, and RCRA metals, including mercury. Comparisons of analytical data to MRBCA Tier 1 RBTLs for Type 3 (clayey) subsurface soils, indoor inhalation of vapor emissions pathway (or MRBCA LDTLs if RBTLs are not available) and to USGS average background concentrations of metals in St. Louis County resulted in the following noteworthy findings:

- Arsenic was detected at concentrations exceeding the MRBCA LDTL in 10 of the 14 subsurface soil samples collected. Of these, only two samples contained arsenic concentrations exceeding the USGS average background concentration of 10.561 mg/kg plus one standard deviation (±3.307 mg/kg) in St. Louis County (USGS 2021): 9844-B1 (24-26) with arsenic at 16 mg/kg and 9844-B3 (24-26) with arsenic at 80 mg/kg. Again, no RBTL has been established for arsenic in subsurface soil.

5.1.2 Groundwater

Tetra Tech's 2018 Phase II ESA included collection of seven groundwater samples (including one field duplicate) at six locations (SB-1 through SB-5 and SB-7) across the 9844 West Florissant Avenue property (see Appendix A, Figure 2). Samples were analyzed for VOCs, PAHs, TPH-GRO, TPH-DRO, TPH-ORO, and total and dissolved RCRA metals (excluding mercury). Comparisons of analytical data to MRBCA Tier 1 RBTLs for Type 3 (clayey) groundwater dermal contact (or MRBCA LDTLs if RBTLs were not available) resulted in the following noteworthy findings:

- Naphthalene was detected in one groundwater sample (SB-3 [GW3]) at 285 micrograms per liter (µg/L), exceeding the MRBCA Tier 1 RBTL of 20.6 µg/L for groundwater dermal contact for residential land use.

- TPH-GRO was detected in one groundwater sample (SB-3 [GW3]) at 104,000 µg/L, exceeding the MRBCA LDTL of 18,100 µg/L. No RBTL for groundwater dermal contact has been established.

- TPH-DRO was detected in two groundwater samples (SB-3 [GW3] and SB-5 [GW5]) at concentrations exceeding the MRBCA LDTL of 34,300 µg/L.

- Arsenic was detected in one groundwater sample (SB-4 [GW]) at 221 µg/L, exceeding the MRBCA RBTL of 158 µg/L.

- Lead was detected in five groundwater samples at concentrations exceeding the MRBCA LDTL of 15 µg/L. No RBTL for groundwater dermal contact has been established.

As part of the 2021 Phase II ESA by the Toeroek Team, nine groundwater samples were collected at locations collocated with nine of the subsurface soil samples (see Appendix A, Figure 2). Groundwater was not encountered at depths above the planned maximum boring depth of 30 feet below ground surface (bgs) in soil borings 9844-B2, 9846-B5, and 9846-B6. Samples were analyzed for VOCs, SVOCs, TPH-GRO, TPH-DRO, TPH-ORO, and total and dissolved RCRA metals. Volumes of groundwater in samples collected at 9844-B6 and 9846-B1 through -B4 were not sufficient for total or dissolved metals analyses. Comparisons of analytical data to MRBCA Tier 1 RBTLs for Type 3 (clayey) groundwater dermal contact (or MRBCA LDTLs if RBTLs were not available) resulted in the following noteworthy findings:

- Detected results for benzo(a)anthracene at 9844-B3 and -B6, and the reporting limit for non-detected results at 9844-B5 were at levels exceeding the MRBCA Tier 1 RBTL for groundwater dermal contact for residential land use.

- Detected results for benzo(a)pyrene at 9844-B3 and -B6, and reporting limits for the non-detected results at 9844-B1 and -B5 exceeded the MRBCA Tier 1 RBTL for groundwater dermal contact for residential land use.

- The detected result for benzo(b)fluoranthene at 9844-B3 and the reporting limits for the non-detected results at 9844-B5 and -B6 exceeded the MRBCA Tier 1 RBTL for groundwater dermal contact for residential land use.

- Regarding benzo(k)fluoranthene, the detected result at 9844-B3 and the reporting limits for the non-detected results at 9844-B5 and -B6 exceeded the MRBCA Tier 1 RBTL for groundwater dermal contact for residential land use.

- The detected result for indeno(1,2,3-cd)pyrene at 9844-B3 and the reporting limits for the non-detected results at 9844-B5 and -B6 exceeded the MRBCA Tier 1 RBTL for groundwater dermal contact for residential land use.

- Chromium was detected in 9844-B1, -B4, and -B5 at concentrations exceeding the MRBCA Tier 1 RBTL for groundwater dermal contact for residential land use.

Cleanup alternatives will not address groundwater because groundwater in the subject property vicinity is not known to be a source of drinking water, and no future use for this purpose is anticipated because the City of Dellwood derives its drinking water from a private utility supplier, Missouri American Water, which utilizes surface water consisting of approximately 80 percent from the Missouri River and 20 percent from the Meramec River. Additionally, Missouri American Water occasionally purchases water from the City of St. Louis Water Division, which sources drinking water from the Missouri and Mississippi Rivers (Missouri American Water 2020).

5.1.3 Soil Gas

During the 2021 Phase II ESA, the Toeroek Team collected 12 soil-gas samples collocated with the 12 soil samples (at 9844-B1 through B-6 and 9846-B1 through B-6) to investigate potential vapor contamination from historical activities at the subject property (see Appendix A, Figure 2). Samples were analyzed for VOCs. No detected VOC concentration exceeded an MRBCA Tier 1 RBTL for Type 3 (clayey) soil vapor. Therefore, vapor intrusion does not appear to be a concern at the subject property and cleanup alternatives will not address soil-gas.

Although petroleum hydrocarbons and VOCs were found in subsurface soil and groundwater at the subject property above the MRBCA Tier 1 RBTLs, when evaluating potential for vapor intrusion, soil-gas data supersedes soil and groundwater data.

5.2 EVALUATION OF CLEANUP ALTERNATIVES

Future use of the subject property is unknown; however, the current property owner has expressed interest in developing the parcel for commercial purposes. Evaluations of cleanup alternatives are based on the potential future use scenarios at the subject property—residential and/or commercial development. The Toeroek Team considered three alternatives for cleanup of soil. Because a risk assessment of the subject property has not been completed and the current property owner is expected to enroll the subject property in MDNR B/VCP, the cleanup level for TPH-GRO in soil will be based on the MRBCA Tier 1 RBTL for

residential land use. The cleanup level for arsenic in soil will be based on the USGS average background concentration plus one standard deviation in St. Louis County. Evaluations took into account MDNR B/VCP procedural requirements—because cleanup projects implemented with EPA Brownfields Cleanup funding require participation in the MDNR B/VCP. For reference, fees associated with enrollment in the MDNR B/VCP include a $200 application fee and refundable oversight deposit of $5,000. However, whether the subject property will be enrolled in the MDNR B/VCP program is unknown.

Three options were evaluated for residential and/or commercial reuse: (1) no action; (2) soil management plan (SMP) and institutional controls (ICs); and (3) soil excavation with off-site disposal. Each approach (excluding no action) can satisfy clearance criteria under the MDNR B/VCP.

Based on the analytical data discussed in Section 5.1 above, no analyte was detected at a concentration exceeding a cleanup level on the 9846 West Florissant Avenue property. Therefore, cleanup actions are unnecessary at 9846 West Florissant Avenue, and the alternatives discussed below apply only to 9844 West Florissant Avenue.

5.2.1 Alternative 1 – No Action (Baseline)

The no action alternative is included as a baseline for comparison to the other proposed alternatives. This alternative would involve no containment, treatment, removal, or monitoring of contaminants. All contaminated soil would be left in place, and no restrictions on future land use would be imposed.

Effectiveness

Because the no action alternative would not be protective of human health and the environment, it is not considered effective.

Implementation

Implementation of this alternative would require no effort because no containment, treatment, removal, or monitoring of contaminants would occur. Future redevelopment would have to consider the potential threat to human health and the environment.

Cost

This alternative would not involve any direct costs.

5.2.2 Alternative 2 – SMP and ICs

The alternative would leave contaminated soil in place in areas where TPH-GRO and arsenic have been detected at concentrations exceeding cleanup levels at 9844 West Florissant Avenue. Potential site receptors currently are protected from exposure to contaminated soil via dermal contact and incidental ingestion by the layer of soil or pavement over these contaminated areas. However, an SMP would be necessary to guide proper handling of soil at the subject property if the soil is disturbed (for example, during new structure construction). The SMP would present a tiered approach to soil management, regulatory approval, documentation, and record keeping to minimize administrative requirements.

ICs would be necessary to ensure that an SMP is in place to manage contaminated soils and maintain the existing pavement/soil cover. ICs would be implemented in the form of a deed restriction/environmental covenant disallowing excavation of site soil below eight feet bgs where TPH-GRO and arsenic have been detected at concentrations exceeding cleanup levels. In addition, groundwater restrictions would be needed that forbid installation of shallow groundwater wells.

Alternative 2 would allow redevelopment of the subject property as planned; however, ICs would be required in perpetuity.

Effectiveness

Alternative 2 would be effective in limiting exposure of affected soils to site occupants, and would allow residential and/or commercial redevelopment of the subject property. However, this alternative would leave affected soil in place and would require long-term stewardship to ensure continuation of all restrictive measures over the life of the ICs.

Implementation

An SMP and ICs would be easy to implement, as no physical remediation would be required. Implementation of ICs would include a restrictive covenant filed with the Register of Deeds to prohibit disturbance of contamination left in place under any future use scenario. In addition, a long-term stewardship plan would necessitate MDNR approval. This alternative would mandate annual inspections to ensure that site occupants comply with restrictive covenants.

Cost

Estimated total cost of Alternative 2 in 2021 dollars is $182,000: $38,000 for capital costs, $39,000 for ICs, and $105,000 for long-term stewardship over a 30-year time period or about $3,500 per year. Costs

were estimated by applications of selected functions of Remedial Action Cost Engineering and Requirements System® (RACER) Version 11.2.16.0 and professional judgment. Details of costs are in Appendix B.

5.2.3 Alternative 3 – Soil Excavation with Off-Site Disposal

Alternative 3 would involve excavation of soil in the areas where TPH-GRO and arsenic have been detected at concentrations exceeding cleanup levels at 9844 West Florissant Avenue. Disposal of excavated soil then would occur off site at a landfill facility. This alternative would allow unrestricted use of the subject property.

For cost estimating purposes, the Toeroek Team assumed the following:

- Soil Excavation around Sample Location SB-5 (16-18): The volume of soil to be excavated to cleanup levels is approximately 280 CY, assuming an area of 400 square feet and a depth of 19 feet bgs. Shoring would be needed because of the excavation depth. The approximate area for excavation is depicted on Figure 2.

- Soil Excavation around Sample Location 9844-B1 (24-26): The volume of soil to be excavated to cleanup levels is approximately 400 CY, assuming an area of 400 square feet and a depth of 27 feet bgs. Shoring would be needed because of the excavation depth. The approximate area for excavation is depicted on Figure 2.

- Soil Excavation around Sample Location 9844-B3 (24-26): The volume of soil to be excavated to cleanup levels is approximately 400 CY, assuming an area of 400 square feet and a depth of 27 feet bgs. Shoring would be needed because of the excavation depth. The approximate area for excavation is depicted on Figure 2.

- Confirmation Sampling: Confirmation soil sampling will require collection of 15 five-point composite samples, five from the walls and floor of each excavated area, to ensure contaminant concentrations in remaining soils are below cleanup levels.

- Backfill: Excavated areas will be backfilled with clean material from on site and off site, graded, and seeded as needed for redevelopment. Assumedly, 50% of the excavated material will be used as backfill.

- Waste Disposal: Presumably, all excavated soil will be accepted at a landfill facility as non-hazardous waste.
- Shoring or side sloping would be necessary because of depths of excavations.

Additional soil sampling is recommended to refine delineations of lateral and vertical extents of contamination and possibly reduce excavation volume.

Effectiveness

Soils with contaminant concentrations above MRBCA Tier 1 residential RBTLs and USGS average background concentrations plus one standard deviation would be removed from the subject property, thus allowing site redevelopment. This alternative would allow unrestricted use of the subject property.

Implementation

Alternative 3 would be difficult to implement based on the depths of excavations required. Soil excavation by qualified equipment operators would accord with applicable state and federal regulations. Excavation of approximately 1,080 cubic yards of soil is necessary to clean up the subject property. All waste soil excavated during this process would either be used as backfill or transported for disposal off site as either non-hazardous or hazardous waste, depending on results of toxicity characteristic leaching procedure (TCLP) analysis. For cost estimating purposes, assumptions are that 50 percent of excavated soil would be used as backfill and all excavated soil would be handled as non-hazardous waste. In addition, planning this process would require careful consideration of precautions concerning worker health and safety.

Cost

Estimated total cost of Alternative 3 in 2021 dollars is $261,000 for capital cost. Costs were estimated by applying selected functions of RACER Version 11.2.16.0 and RS Means. Details of costs are in Appendix B. Estimated costs for this alternative could be reduced if additional sampling occurs to further delineate lateral and vertical extents of contamination and thereby possibly reduce excavation volume.

5.3 RECOMMENDED CLEANUP ALTERNATIVE

This section recommends a cleanup alternative for subsurface soils at the subject property.

5.3.1 Subsurface Soil

Alternative 2 (SMP and ICs) is the recommended cleanup alternative for soils. This alternative would be an indirect approach, as soils containing contaminant concentrations above MRBCA Tier 1 residential RBTLs and USGS average background concentrations plus one standard deviation would be left in place. However, this alternative would achieve regulatory compliance and would allow residential and/or commercial redevelopment of the subject property. This alternative would be the more cost-effective option (excluding the no action alternative) to address contaminated subsurface soil. A restrictive covenant would be filed with the Register of Deeds to ensure no disturbance of contamination left in place during any future use scenario on the subject property. Although Alternative 3 (Soil Excavation with Off-Site Disposal) is a more direct approach that would allow for unrestricted use of the subject property, this alternative would be difficult to implement based on the depths of excavations required. In addition, the depths and areas defined for excavation for Alternative 3 may vary from actual site conditions and additional excavation may be needed.

5.3.2 Total Cleanup Cost

Table 1 below summarizes total cleanup costs. Assuming implementation of the recommended cleanup alternative, estimated total cleanup cost is $187,200, which includes site enrollment in the MDNR B/VCP and technical consulting fees. The fee for site enrollment in the MDNR B/VCP program is $5,200. Whether the subject property will be enrolled in the MDNR B/VCP program is unknown; however, fees associated with the program have been included for planning purposes.

TABLE 1

SUMMARY OF COSTS
SITE 6 – ADVANCED AUTO PARTS AND FORMER FASHIONS R BOUTIQUE
DELLWOOD, ST. LOUIS COUNTY, MISSOURI

Contaminant/Material	Recommended Alternative	Action - Cost	Total Cost
Soil	Alternative 2 – SMP and ICs	Capital Cost – $38,000	$182,000
		ICs – $39,000	
		Long-term Stewardship – $105,000	
MDNR B/VCP Fees			$5,200
Total Cost			**$187,200**

Notes:

B/VCP Brownfields/Voluntary Cleanup Program
IC Institutional control
MDNR Missouri Department of Natural Resources

6.0 REFERENCES

Missouri American Water. 2020. 2020 Water Quality Report, St. Louis County / St. Charles County, PWS ID: MO6010716. https://www.amwater.com/ccr/stlouisregion.pdf

SCS Engineers (SCS). 2019. Phase I Environmental Site Assessment. Auto Supply Company, 9846 West Florissant Avenue, St. Louis, Missouri. January.

Terracon Consultants, Inc. (Terracon). 2017. Phase I Targeted Brownfields Assessment. Fashions R Boutique, 9844 West Florissant Avenue, Dellwood, St. Louis County, MO. June 23.

Tetra Tech, Inc. (Tetra Tech). 2018. Phase II Targeted Brownfields Assessment. Fashions R Boutique Site, Dellwood, St. Louis County, Missouri. June 19.

Toeroek Associates, Inc. (Toeroek). 2021. Targeted Brownfields Assessment, Phase II Environmental Site Assessment, Advanced Auto Parts and Former Fashions R Boutique, 9844-9846 West Florissant Avenue, Dellwood, St. Louis County, Missouri. August 17.

U.S. Environmental Protection Agency (EPA). 2021. "Regional Screening Levels (RSLs) – Generic Tables." Accessed August 17. https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

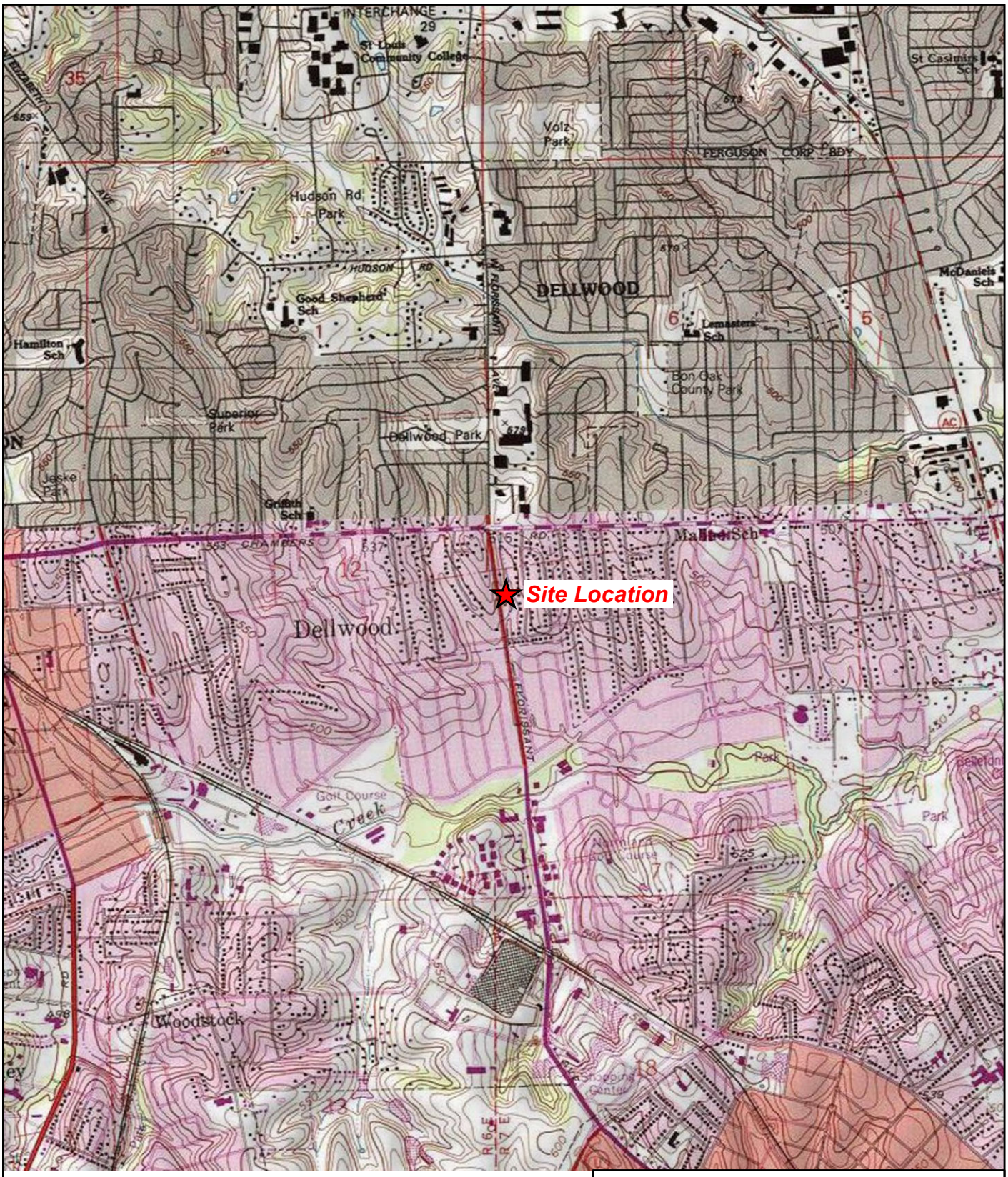
U.S. Geological Survey (USGS). 1975. Clayton, Missouri Quadrangle. 7.5-Minute Topographic Series.

U.S. Geological Survey (USGS). 1982. Florissant, Missouri Quadrangle. 7.5-Minute Topographic Series.

U.S. Geological Survey (USGS). 2021. Average Concentrations of Elements in St. Louis County, Missouri. Accessed August 17. https://mrdata.usgs.gov/geochem/county.php?place=f29189&el=Pb&rf=east-central

APPENDIX A

FIGURES



N

0 1,000 2,000

Feet

Source: USGS Clayton, MO 7.5 Minute Topo Quad, 1975;
USGS Florissant, MO 7.5 Minute Topo Quad, 1982

Advanced Auto Parts and Former Fashions R Boutique
9844 and 9846 West Florissant Avenue
St. Louis, Missouri 63136

Figure 1

Site Location Map

TETRA TECH

Date: 2/2/2021 Drawn By: Nick Wiederholt Project No: 103G65210190.06.03

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Legend

- 2018 Phase II ESA sample location
- Soil/groundwater/soil-gas sample location
- Soil/soil-gas sample location
- Storm catch basin
- Storm manhole
- Electrical box
- Electrical sign
- Irrigation control valve
- Sanitary cleanout
- Electrical line
- Water meter
- Water valve
- Electrical site light
- Storm line
- Unknown line
- Water line
- Irrigation
- Sanitary sewer
- Approximate subject property boundary
- Former pump island
- Former site building footprint
- Former tank pit area
- Approximate excavation area

ESA Environmental Site Assessment

N

0 40 80

Feet

Source: Esri, ArcGIS Online, Bing Maps Aerial; Terracon, Phase I Environmental Site Assessment, Fashions R Boutique, Site Diagram, 2017

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Advanced Auto Parts and Former Fashions R Boutique
9844 and 9846 West Florissant Avenue
St. Louis, Missouri 63136

Figure 2
Sampling Locations and
Proposed Excavation Areas Map

TETRA TECH

Date: 8/31/2021 Drawn By: Rose Micke Project No: 103G65210190.06.03

APPENDIX B

REMEDIAL ALTERNATIVES COST ESTIMATES FOR SOIL

Appendix B
Remedial Alternatives Cost Estimates for Soil
Site 6 - Advanced Auto Parts and Former Fashions R Boutique
Dellwood, St. Louis County, Missouri

TABLE B-1					
COST SUMMARY					
Alternative	**Description**	**Capital Cost**	**Institutional Controls**	**Operation & Maintenance**	**Total**
1	No Action	$0	$0	$0	$0
2	SMP and ICs	$ 38,000	$ 39,000	$ 105,000	$ 182,000
3	Soil Excavation with Off-Site Disposal	$ 261,000	$ -	$ -	$ 261,000

Appendix B
Remedial Alternatives Cost Estimates for Soil
Site 6 - Advanced Auto Parts and Former Fashions R Boutique
Dellwood, St. Louis County, Missouri

ALTERNATIVE 2
SMP AND ICs

Table B-2
Cost Summary
Alternative 2 - SMP and ICs

Source	Description	Subtotal	Contingency	Total (Rounded)
Table B-3	Capital Cost	$ 29,000	$ 8,700	$ 38,000
Table B-4	Institutional Controls	$ 30,193	$ 9,058	$ 39,000
Tables B-5, B-6	Long-term Stewardship	$ 81,102	$ 24,331	$ 105,000

Contingency	30%		$ 42,088.48

Total	**$ 182,000**

Appendix B
Remedial Alternatives Cost Estimates for Soil
Site 6 - Advanced Auto Parts and Former Fashions R Boutique
Dellwood, St. Louis County, Missouri

Overhead and Profit (O&P)		
Means	15%	
RACER	35%	Assumed markup for costing purposes
Contractor quote	15%	Assumed prime contractor markup for costing purposes
Professional judgment	0%	
Inflation	2.27%	Avg. annual inflation from 2015 to 2021

Table B-3
Capital Cost
Alternative 2 - SMP and ICs

Item	Description	Quantity	Unit	Source	Year	Unit Price	Unit Price (Incl. O&P and Inflation)	Total Cost
	Construction Subtotal							**$ 20,000**
	Soil Management Plan							**$ 20,000**
1	Soil Management Plan	1	ls	Professional judgment	2021	$ 20,000.00	$ 20,000.00	$ 20,000

Construction subtotal		$ 20,000
Construction management[1]	15%	$ 3,000
Remedial design[1,2]	20%	$ 4,000
Project management[1]	10%	$ 2,000
Capital Cost Subtotal		**$ 29,000**

Appendix B
Remedial Alternatives Cost Estimates for Soil
Site 6 - Advanced Auto Parts and Former Fashions R Boutique
Dellwood, St. Louis County, Missouri

Table B-4								
Institutional Controls								
Alternative 2 - SMP and ICs								
Item	**Description**	**Quantity**	**Unit**	**Source**	**Year**	**Unit Price**	**Unit Price (Incl. O&P and Inflation)**	**Periodic Cost**
	Institutional Controls Subtotal							**$ 30,193**
	Prepare LUC Implementation Plan							**$ 24,746**
2	Project manager	22	hrs	RACER	2015	$ 76.23	$ 117.72	$ 2,590
3	Project engineer	30	hrs	RACER	2015	$ 55.79	$ 86.15	$ 2,585
4	Staff engineer	45	hrs	RACER	2015	$ 67.62	$ 104.42	$ 4,699
5	QA/QC officer	11	hrs	RACER	2015	$ 63.57	$ 98.17	$ 1,080
6	Word processing/clerical	60	hrs	RACER	2015	$ 34.31	$ 52.98	$ 3,179
7	Draftsman/CADD	30	hrs	RACER	2015	$ 36.80	$ 56.83	$ 1,705
8	Attorney, partner, real estate	22	hrs	RACER	2015	$ 244.43	$ 377.46	$ 8,304
9	Other direct costs	1	ls	RACER	2015	$ 390.83	$ 603.55	$ 604
	Meetings with Agencies							**$ 4,017**
10	Per diem (per person)	1	day	RACER	2015	$ 174.00	$ 268.70	$ 269
11	Project manager	20	hrs	RACER	2015	$ 76.23	$ 117.72	$ 2,354
12	Word processing/clerical	16	hrs	RACER	2015	$ 34.31	$ 52.98	$ 848
13	Draftsman/CADD	8	hrs	RACER	2015	$ 36.80	$ 56.83	$ 455
14	Other direct costs	1	ls	RACER	2015	$ 59.20	$ 91.42	$ 91
	Restrictive Covenant							**$ 1,430**
15	Overnight deliver, 8 oz letter	3	ea	RACER	2015	$ 19.23	$ 29.70	$ 89
16	Project manager	1	hrs	RACER	2015	$ 76.23	$ 117.72	$ 118
17	Word processing/clerical	3	hrs	RACER	2015	$ 34.31	$ 52.98	$ 159
18	Attorney, associate, real estate	3	hrs	RACER	2015	$ 172.46	$ 266.32	$ 799
19	Paralegal, real estate	3	hrs	RACER	2015	$ 50.17	$ 77.48	$ 232
20	Other direct costs	1	ls	RACER	2015	$ 21.18	$ 32.71	$ 33

Appendix B
Remedial Alternatives Cost Estimates for Soil
Site 6 - Advanced Auto Parts and Former Fashions R Boutique
Dellwood, St. Louis County, Missouri

Table B-5								
Long-term Stewardship								
Alternative 2 - SMP and ICs								
Item	**Description**	**Quantity**	**Unit**	**Source**	**Year**	**Unit Price**	**Unit Price (Incl. O&P and Inflation)**	**Periodic Cost**
	Inspection and Monitoring (cost per year)							**$ 2,500**
21	LUC inspection and monitoring (annual drive-by inspection and restrictions enforcement)	1	ls	Professional judgment	2020	$ 1,500.00	$ 1,500.00	$ 1,500
22	Reporting	1	ls	Professional judgment	2020	$ 1,000.00	$ 1,000.00	$ 1,000

Notes:

Labor rates will be required to conform to the Davis-Bacon Act.

1	Based on "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 2000).
2	Remedial design includes developing plans and specifications, such as a remedial action work plan, design analysis, and construction cost estimating.
CADD	Computer-aided design
ea	Each
EPA	U.S. Environmental Protection Agency
hrs	Hours
IC	Institutional control
ls	Lump sum
LUC	Land use control
O&P	Overhead and profit
QA/QC	Quality assurance/quality control
RACER	Remedial Action Cost Engineering and Requirements System

Reference:

EPA. 2000. "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study." EPA 540-R-00-002, Office of Solid Waste and Emergency Response 9355.0-75. July.

Appendix B
Remedial Alternatives Cost Estimates for Soil
Site 6 - Advanced Auto Parts and Former Fashions R Boutique
Dellwood, St. Louis County, Missouri

Annual Discount Rate:

30-Yr -0.3%

Table B-6
Present Value Analysis

Year	Annual Discount Factor [1, 2]	Alternative 2 - SMP and ICs	
		Long-term Stewardship Costs	
	30-Yr	Long-term Stewardship Future Cost [3]	Present Value (2021)
0	1.000	$2,500	$2,500
1	1.003	$2,500	$2,508
2	1.006	$2,500	$2,515
3	1.009	$2,500	$2,523
4	1.012	$2,500	$2,530
5	1.015	$2,500	$2,538
6	1.018	$2,500	$2,545
7	1.021	$2,500	$2,553
8	1.024	$2,500	$2,561
9	1.027	$2,500	$2,569
10	1.031	$2,500	$2,576
11	1.034	$2,500	$2,584
12	1.037	$2,500	$2,592
13	1.040	$2,500	$2,600
14	1.043	$2,500	$2,607
15	1.046	$2,500	$2,615
16	1.049	$2,500	$2,623
17	1.052	$2,500	$2,631
18	1.056	$2,500	$2,639
19	1.059	$2,500	$2,647
20	1.062	$2,500	$2,655
21	1.065	$2,500	$2,663
22	1.068	$2,500	$2,671
23	1.072	$2,500	$2,679
24	1.075	$2,500	$2,687
25	1.078	$2,500	$2,695
26	1.081	$2,500	$2,703
27	1.085	$2,500	$2,711
28	1.088	$2,500	$2,719
29	1.091	$2,500	$2,728
30	1.094	$2,500	$2,736
Total Present Value of Periodic Cost			**$81,102**

Notes:

1	Based on an annual discount factor of -0.3 percent, OMB Circular A-94 (2020)
2	Annual discount factor = $1/(1+i)^t$, where i = discount rate (includes inflation and interest) and t = year
3	Current dollar cost of future event
IC	Institutional control
OMB	Office of Management and Budget
yr	Year

Reference:

OMB. 2020. OMB Circular No. A-94, Appendix C, Discount Rates for Cost-Effectiveness, Lease Purchase, and Related Analyses. November.

Appendix B
Remedial Alternatives Cost Estimates for Soil
Site 6 - Advanced Auto Parts and Former Fashions R Boutique
Dellwood, St. Louis County, Missouri

ALTERNATIVE 3
SOIL EXCAVATION WITH OFF-SITE DISPOSAL

Table B-7
Cost Summary
Alternative 3 - Soil Excavation with Off-Site Disposal

Source	Description	Subtotal	Contingency	Total (Rounded)
Table B-8	Capital Cost	$ 200,484	$ 60,145	$ 261,000
NA	Institutional Controls	$ -	$ -	$ -
NA	Operation and Maintenance	$ -	$ -	$ -

Contingency	30%	$ 60,145.26	
Total			**$ 261,000**

Appendix B
Remedial Alternatives Cost Estimates for Soil
Site 6 - Advanced Auto Parts and Former Fashions R Boutique
Dellwood, St. Louis County, Missouri

Overhead and Profit (O&P)		
Means	15%	
RACER	35%	Assumed markup for costing purposes
Contractor quote	15%	Assumed prime contractor markup for costing purposes
Professional judgment	0%	
Inflation	2.27%	Avg. annual inflation from 2015 to 2021

Table B-8
Capital Cost
Alternative 3 - Soil Excavation with Off-Site Disposal

Item	Description	Quantity	Unit	Source	Year	Unit Price	Unit Price (Incl. O&P and Inflation)	Total Cost
	Construction Subtotal							**$ 150,740**
	Soil Excavation (~1,080 cubic yards)							**$ 120,062**
1	Dump truck (12 cubic yards)	50	hrs	RACER	2015	$ 111.15	$ 171.65	$ 8,582
2	Excavate soil (2 cubic yard bucket, hydraulic excavator)	1,080	bcy	RACER	2015	$ 1.70	$ 2.63	$ 2,835
3	Steel sheeting for shoring (install, pull, and salvage)	5,840	square feet	RACER	2015	$ 8.45	$ 13.05	$ 76,206
4	Backfill (includes delivery, spreading, and compaction)	540	cy	RACER	2015	$ 28.47	$ 43.97	$ 23,741
5	Seeding, vegetative cover	0.03	ac	RACER	2015	$ 4,075.49	$ 6,293.64	$ 189
6	Disposable materials for sampling	15	ea	RACER	2015	$ 10.55	$ 16.29	$ 244
7	TCLP analysis	15	ea	RACER	2015	$ 199.98	$ 308.82	$ 4,632
8	TPH analysis	15	ea	RACER	2015	$ 125.83	$ 194.31	$ 2,915
9	Project scientist	6	hrs	RACER	2015	$ 77.53	$ 119.73	$ 718
	Concrete Demolition and Disposal							**$ 1,725**
10	Demolish rod reinforced concrete to 6-inches thick with power equipment	800	sf	Means	2021	$ 0.75	$ 0.86	$ 690
11	Dump charges	15	cy	RACER	2015	$ 15.00	$ 23.16	$ 347
12	Wheel loader (1.25 cubic yards)	1	hrs	RACER	2015	$ 103.42	$ 159.71	$ 160
13	Dump truck (8 cubic yards)	3	hrs	RACER	2015	$ 114.01	$ 176.06	$ 528
	Off-site Transportation and Disposal of Soil							**$ 28,953**
14	Transportation and disposal, non-hazardous waste	540	cy	RACER	2015	$ 34.72	$ 53.62	$ 28,953

Construction subtotal		$ 150,740
Construction management[1]	10%	$ 15,074
Remedial design[1,2]	15%	$ 22,611
Project management[1]	8%	$ 12,059
Capital Cost Subtotal		**$ 200,484**

Notes:
Labor rates will be required to conform to the Davis-Bacon Act.

1	Based on "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 2000).
2	Remedial design includes developing plans and specifications, such as a remedial action work plan, design analysis, and construction cost estimating.
bcy	Bank cubic yard
cy	Cubic yard
ea	Each
EPA	U.S. Environmental Protection Agency
hrs	Hours
ls	Lump sum
NA	Not applicable
O&P	Overhead and profit
RACER	Remedial Action Cost Engineering and Requirements System
sy	Square yard
TCLP	Toxicity characteristic leaching procedure
TPH	Total petroleum hydrocarbons

Reference:
EPA. 2000. "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study." EPA 540-R-00-002, Office of Solid Waste and Emergency Response 9355.0-75. July.