INTERIM REMEDIAL ACTION PLAN AND ENGINEERING DESIGN REPORT

FORMER TIGER OIL SITE
2312 WEST NOB HILL BOULEVARD
YAKIMA, WASHINGTON

Prepared for
CITY OF YAKIMA
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Prepared by
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The material and data in this plan were prepared under the supervision and direction of the undersigned.

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ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
CAP	cleanup action plan
the City	City of Yakima, Washington
COC	chemical of concern
CUL	cleanup level
DID	drainage improvement district
Ecology	Washington State Department of Ecology
EO	enforcement order
GAC	granular activated carbon
GWE	groundwater extraction
HASP	health and safety plan
IHS	indicator hazardous substance
IRA	interim remedial action
MFA	Maul Foster & Alongi, Inc.
MTCA	Model Toxics Control Act
New Tiger	Tiger Oil Corporation
ORCa	Regenesis Oxygen Release Compound Advanced
OWTS	on-site water treatment system
PCS	petroleum-contaminated soil
Plan	remedial action plan and engineering design report
the Property	2312 West Nob Hill Boulevard, Yakima, Washington
PVC	polyvinyl chloride
QA/QC	quality assurance and quality control
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
the Site	Ecology Facility Site No. 469, Cleanup Site No. 4919
SVE	soil vapor extraction
TPH	total petroleum hydrocarbons
UST	underground storage tank
VOC	volatile organic compound

1 INTRODUCTION

On behalf of the City of Yakima (City), Maul Foster & Alongi, Inc. (MFA) has prepared this interim remedial action (IRA) plan and engineering design report (Plan) for cleanup actions to be conducted at the former Tiger Oil facility at 2312 West Nob Hill Boulevard, Yakima, Washington, Washington State Department of Ecology (Ecology) Facility Site No. 469, Cleanup Site No. 4919. Throughout this report and consistent with Ecology definition, the term "Property" is used specific to the real property located at 2312 West Nob Hill Boulevard, and "Site" is used specific to where contamination resulting from former operations at the Tiger Oil facility has come to lie, irrespective of property boundaries. The Property operated as a retail gasoline station from 1978 until 2001, when operations ceased. Several fuel releases at the Property, including a leaking product line to a gasoline dispenser identified in 1981 and a leak in a riser leading to a gasoline dispenser identified in 1983, resulted in adverse impacts to soil and groundwater at the Property and adjoining parcels to the east, south, and southeast. This Plan has been developed to provide details for the preferred IRA to address ongoing impacted soil and groundwater, and to ensure that IRA work is conducted consistent with Ecology requirements. Supplemental remedial action is anticipated to complete site cleanup.

For efficiency, the two elements of this Plan (i.e., the IRA plan and the engineering design report) have been combined to address the requirements of both documents, thereby removing redundancies where the requirements are the same. The Plan defines the approach for implementation of the preferred alternative described in the Amended Cleanup Action Plan (CAP) (Ecology, 2014) and includes the following Ecology-required elements, consistent with the requirements of Washington Administrative Code 173-340-400 and 173-303-410:

- A brief site operation history and site characterization (Sections 1 and 2), including attached maps and figures identifying existing site conditions as well as locations of the proposed cleanup actions.
- Contaminants and contaminated-media characteristics, as well as sampling specifications (Section 3).
- Project organization and schedule (Section 4).
- Proposed IRA tasks consisting of excavation and removal of petroleum-contaminated soil (PCS), including from the smear zone at accessible areas; dewatering the excavation pit to access and overexcavate PCS; in situ bioremediation; installation of an infiltration gallery for future groundwater treatment, if needed; backfilling/compacting the excavation pit; and final grading tasks (Section 5).
- Institutional controls required for soil, groundwater, and soil gas (Section 6).
- Construction plans and specifications detailing the work to be performed; a health and safety plan (HASP); and a sampling and analysis plan (SAP) that incorporates quality assurance project plan elements. These documents are provided as appendices to this Plan.

2 SITE DESCRIPTION AND OVERVIEW

2.1 Location and Background

The physical address for the Property is 2312 West Nob Hill Boulevard in Yakima, Washington (see Figure 1). The Property, a 0.52-acre, rectangular parcel (tax assessor parcel number 18132642051), is bordered by West Nob Hill Boulevard to the north, a Safeway Shopping Center parking lot to the east and southeast, the Xochimilco Mexican Restaurant to the east, the One Love Smoke Shop to the south, and South 24th Avenue to the west (see Figure 2). The Property is zoned Local Business District (B-2) and is located in section 26 of township 13 north and range 18 east of the Willamette Meridian. The former gas station's three pump islands and its associated canopy were removed by 2001. The only remaining structures at the Property are the former convenience store and the base of the former attendant booth for self-service payments. The ground surface is asphalt paved, with little vegetation present. The Property is currently vacant.

2.2 Overview of Historical Operations and Impacts

The Property was operated by the Tiger Oil Company as a retail fuel station until it was purchased by Tiger Oil Corporation (New Tiger) in 1987. New Tiger operated the Property as an Exxon-branded fuel station and convenience store from 1987 until 2001. All commercial operations ceased in 2001 and the Property has since remained vacant (TerraGraphics, 2013). The fuel station comprised four underground storage tanks (USTs) (one 20,000-gallon, two 10,000-gallon, and one 8,000-gallon tank) and associated product lines. The system was used for bulk petroleum storage and distribution. Figure 2 shows the layout of remaining features of the former fuel station including the former attendant booth and convenience store as well as current adjoining businesses.

In April 1981, volatilization of petroleum products in a drainage improvement district (DID) storm drain line adjacent to the Property resulted in an explosion and triggered an investigation by the City and Ecology to test the Property's UST system (Ecology, 2014). During the investigation, it was determined that a leak in the product line of the UST system had impacted the surrounding soil and groundwater at the Property and adjoining properties. The leak in the UST line was determined to be the source of the petroleum products found in the nearby DID line. Ecology issued a Notice of Violation and Enforcement Order (EO), No. DE 82-517, to Tiger Oil Company, requiring recovery of free product from the Site (Ecology, 2014).

It was estimated that approximately 20,000 gallons[1] of petroleum-related product was released from the Property's UST system in the early 1980s (Ecology, 2014). Several recovery wells were installed by early 1983 at the Property and on adjacent parcels to the east and south. By March 1984, approximately 16,000 gallons of free product had been extracted from the recovery wells (Kleinfelder, 1994).

[1] Based on remedial actions, Ecology staff believe actual volume of release may have been greater.

In March 1990, Ecology issued EO No. DE 90-C140 to New Tiger and Federated Insurance, requiring site stabilization and a remedial investigation and feasibility study for the Site (Ecology, 2014). In 1991, a site hazard assessment was conducted, resulting in a hazard ranking of 1 (with 1 as the highest risk and 5 the lowest risk).

In August 1995, soil vapor extraction (SVE) and groundwater extraction (GWE) systems began operation to collect free product, impacted groundwater, and soil vapor on the Site as well as to mitigate off-site migration of dissolved-phase gasoline-range total petroleum hydrocarbons (TPH) and free product. However, the SVE and GWE systems were limited in scope and did not adequately target areas of free product present on the Site. Ecology concluded that the SVE and GWE systems were not representative of final cleanup actions for the Site (Ecology, 2014). Figure 3 presents the layout of several SVE piping systems at the Site.

In October 2004, New Tiger and Federated Insurance entered into a Consent Decree with Ecology requiring implementation of Ecology's 2004 Amended CAP. In December 2004, the USTs and their associated piping, along with approximately 650 cubic yards of impacted soil around the UST system, were removed from the Site. Two trenches were dug in the vicinity of the USTs to determine the amount of free product, if present, at the top of the water table at the Site. Free product was encountered, and an additional SVE system was installed to treat the impacted soil vapor at the Site. Appreciable free product was encountered at monitoring wells MW-7 (at 2.34 feet thick, located adjacent east of the Property on the Xochimilco restaurant parking lot) and MW-11 (at 1.46 feet thick, located adjacent southeast of the former USTs on the Property) during the groundwater monitoring event in June 2013 (TerraGraphics, 2013). An approximate delineation of the extent of free product and dissolved-phase gasoline-range petroleum hydrocarbons in groundwater based on the June 2013 sampling event is presented in Figure 3.

The City purchased the Property in 2014 and entered into an Amended Consent Decree with Ecology to implement an Amended CAP at the Site (Ecology, 2014). The Site is currently on the Washington State Confirmed and Suspected Contaminated Sites list.

3 SITE CONDITIONS

Geology, hydrogeology, and environmental conditions of the Site are summarized below.

3.1 Geology and Hydrogeology

The Site and vicinity have been mapped as eolian (windblown sediment) deposits. These deposits, approximately 20 feet thick, are underlain by the Thorp gravel, a moderately to highly weathered sand and gravel deposit, which has been logged to a depth of approximately 135 feet below ground surface (bgs) (Kleinfelder, 1992). Kleinfelder reported that the Site is underlain by fill to approximately 9 to 12 feet bgs, and by sandy clay to silty gravel below the fill to about 16 feet bgs where gravel is present.

The matrix of the unconfined shallow aquifer appears to be interbedded sands and silts. The depth to groundwater is variable at the Site, ranging approximately from 9 to 13 feet bgs, and is influenced

by seasonal fluctuations in the groundwater table due to local irrigation practices. The annual irrigation schedule is from April through September, which may impact the groundwater table, causing it to rise between 2 and 4 feet during that general period (Kleinfelder, 1992).

The direction of groundwater flow at the Site, based on professionally surveyed elevations of monitoring wells at the Site and at adjoining parcels, is generally to the east-southeast.

3.2 Environmental Conditions

Historical subsurface investigations and remedial investigations conducted between 1982 and 1994 identified the following chemicals of concern (COC) in soil and groundwater at the Site: gasoline-range petroleum hydrocarbons and petroleum-fuel-associated volatile organic compounds (VOCs). These COC are also confirmed as indicator hazardous substances (IHS), which are defined as chemicals exceeding a cleanup level (CUL) at one or more locations.

Soil and groundwater IHSs confirmed at the Site include:

- Gasoline-range TPH
- Benzene
- Ethylbenzene
- Toluene
- Xylenes

Note: Selected confirmation soil samples will also be submitted for total lead. Lead is not an IHS at the Site.

4 PROJECT ORGANIZATION AND SCHEDULE

4.1 Project Organization

The following organization shall apply to the project:

- Regulator—Ecology
- Owner—City
- Engineer—MFA
- Surveyor—PLSA, Inc.
- Site work Contractor—to be determined through public, competitive bid

4.2 Schedule

Project design and permitting activities are anticipated to be completed by January 2015, with construction bid and mobilization completed by March 2015.

5 INTERIM REMEDIAL ACTION ENGINEERING DESIGN

The IRA components described in this section will be implemented to meet the cleanup standards described in the Amended CAP (Ecology, 2014). The selected IRA involves demolition of existing structures and foundations; removal of soil exceeding the Model Toxics Control Act (MTCA) Method A CULs for unrestricted land use; dewatering and removal of the shallow groundwater to provide access for overexcavation of the smear zone; enhanced aerobic biodegradation to expedite the biodegradation of TPH and VOCs in soil and groundwater by adding oxygen (as an electron acceptor); monitored natural attenuation of groundwater; and implementation of institutional controls.

Stormwater controls will be implemented during demolition and excavation activities to ensure on-site retention and infiltration of stormwater. The soil remedial action involves excavation and removal of PCS to depths of approximately 9 to 14 feet bgs, as depicted in Figure 4 and construction plan set (Appendix C). The vertical and lateral extent of excavation will be based on field observations, field screening results, and expedited laboratory analytical results of soil samples (including confirmation soil samples) collected throughout the soil remedial action. Additionally, excavation activities will be conducted so that the integrity of adjoining buildings to the east (Xochimilco Mexican Restaurant) and south (One Love Smoke Shop) will not be adversely impacted. The excavation pit will have a sidewall slope ratio of not greater than 1:1.5 near these building structures. It is anticipated that the excavation extent will be offset a minimum of approximately one foot from each building foundation.

Non-impacted soils will be segregated and stockpiled on site to be used as backfill material pending laboratory analytical results. PCS will be excavated and loaded directly onto lined and covered haul trucks for disposal at a Resource Conservation and Recovery Act (RCRA) Subtitle D landfill or other appropriately permitted facility.

The second phase of IRA involves in situ bioremediation, which comprises two components: (1) in situ chemical oxidation using Regenesis RegenOx® or an industry equivalent oxidizer and activator to reduce sorbed and soil-matrix-bound petroleum hydrocarbon in the vadose zone and saturated zone, as well as the dissolved phase in groundwater; and (2) use of enhanced aerobic biodegradation to expedite the biodegradation of TPH and VOCs in soil and groundwater by adding Regenesis Oxygen Release Compound Advanced (ORCa®) or an industry equivalent bioremediation product containing oxygen (as an electron acceptor) to accelerate the microbial degradation of remaining petroleum-hydrocarbon-impacted vadose zone and groundwater. The addition of a controlled-release supplemental source of oxygen enables the indigenous microorganisms (bacteria) to expedite the biodegradation process.

Bioremediation products for both components of in situ bioremediation will be added as a soil amendment (as dry powder or as a slurry) to the backfill material and applied to the excavation area in the smear zone (anticipated between depths of 9 and 14 feet bgs). Installation of clean backfill soil mixed with oxygen release material will target the anticipated groundwater smear zone. Application of this bioremediation product releases oxygen in the dissolved phase when it is hydrated, which will provide terminal electron acceptors to support the oxidative biodegradation of petroleum

hydrocarbons and VOCs. It is anticipated that application of a bioremediation product throughout the smear zone in the area of remedial action will remediate both residual saturated soil and groundwater contamination. Groundwater will subsequently be monitored for natural attenuation by assessment of the presence of electron acceptors during the biodegradation process and an evaluation of the biodegradation of TPH and petroleum-related VOCs.

The Amended CAP determined that a standard point of compliance is appropriate for use at the Site (Ecology, 2014). This will involve the installation of, potentially, up to three monitoring wells at the Site after completion of the combined soil remedial action and in situ bioremediation at the Site.

Institutional controls for the Site may include the following: an assessment of risk from soil vapor intrusion associated with any future development of the Site; a restrictive covenant for groundwater use beneath the Site; a groundwater monitoring plan; and restriction of stormwater infiltration facilities at the Site.

The selected IRA will address the following objectives:

- Prevention or minimization of direct contact with or ingestion of contaminated soil by humans and ecological receptors
- Prevention or minimization of direct contact with or ingestion of contaminated groundwater by humans and ecological receptors
- Prevention or minimization of the potential for migration of contaminants from soil to groundwater
- Prevention or minimization of the potential for migration of contaminants to nearby surface water
- Prevention or minimization of direct contact, inhalation, or ingestion of harmful vapors by human and ecological receptors

Design elements of the remedial actions are described below. Institutional controls are described in Section 6. The sampling and analysis plan presents sampling and analytical protocols for the remedial action (see Appendix A).

5.1 Mobilization and Site Preparation

The Site will be surveyed by a registered land surveyor before construction activities begin to accurately define preexisting conditions. The initial extents of excavation will be located, staked, and painted by the contractor and will be verified by the engineer. The final extent of the excavations will be dictated by a combination of factors, including visual observations and laboratory analytical results of excavation and confirmation soil samples, as well as thorough tracking of the quantity of soil removed to ensure that budgetary constraints are not exceeded. Before excavation activities, the "One Call" public notification and a private utility locating company will identify underground utilities at the Site and within approximately 15 to 25 feet of the anticipated extents of excavation at areas off-property adjacent east and southeast of the Property.

Exclusion zones using temporary fencing, as well as any additional appropriate and/or necessary site controls, will be established in accordance with the site HASP (Appendix B) and Construction Plan Set (Appendix C). The Site will be secured and locked in the absence of the engineer and/or the contractor.

Equipment will be mobilized to the Site and is expected to include, but not be limited to, the following:

- Trackhoe excavator
- Front-end loader
- Skid-steer loader
- Dump trucks
- Water truck
- Tank for containing water pumped from excavation pit
- Water pumps
- Granular activated carbon treatment systems
- Sediment filters
- Support vehicles and equipment

5.2 Erosion and Sediment Control

Erosion-control measures will be installed by the contractor and are shown in the erosion and sediment control plan (Appendix C) and the site-specific stormwater pollution prevention plan. The erosion- and sediment-control plan will require that a silt fence, or other applicable erosion control measures be maintained on site and that soil stockpiles be covered when not in use and at night and that they be protected during rain and wind events. All erosion-control measures will be installed before excavation activities begin and will be maintained throughout construction.

5.3 Stormwater System Modifications

Based on available information, there are no known stormwater management systems on-site. However, should any stormwater-related infrastructure be encountered during the remedial action, the infrastructure will be removed, if within the excavation footprint, and the remaining access grouted in-place.

5.4 Demolition

The former convenience store structure remains on the Property. In order to gain access to impacted soil and groundwater below this building, the structure and its foundation will be demolished, as well as former fueling-related structures (e.g., pump islands). Impacts to soil and groundwater likely extend below the building's foundation. A hazardous building materials inspection was completed by Fulcrum Environmental Consulting, Inc. (Fulcrum) in November 2014. The inspection confirmed the presence of asbestos containing materials consisting of approximately 2,400 square feet of adhesive associated with non-asbestos containing floor tiles, and presumed the presence of fluorescent lighting with polychlorinated biphenyl-containing ballasts

(Fulcrum, 2014). These materials will be removed in accordance with applicable rules and regulations prior to building demolition.

Demolished materials will be crushed and used as inert fill materials or will be exported from the Site for appropriate re-use or disposal.

5.5 Soil Excavation and Management

The soil IRA includes the excavation of soils exceeding MTCA Method A CULs. The approximate area of soil remedial action is presented in Figure 4 and in the construction plan set (Appendix C).

IRA oversight and monitoring for consistency with this Plan will be performed under the direction of an engineer or geologist registered in the State of Washington. Field screening will be performed throughout excavation activities, and soil sampling will be conducted when apparent contaminant boundaries are reached. Field screening and sampling techniques for petroleum hydrocarbons and fuel-associated VOCs may include but are not limited to:

- Visual
- Olfactory
- Photoionization detector
- Sheen testing
- Expedited laboratory analytical results
- Solution test kit (e.g., OilScreenSoil™ by Cheiron Resources)—optional

Analytical testing will be performed on confirmation soil samples in accordance with the procedure outlined in the SAP.

5.5.1 Excavation

The following section provides the components of the excavation plan. Excavation of contaminated areas will be staged as follows:

- Asphalt covering excavation areas will be saw cut, removed and disposed at an appropriate landfill and/or recycled.
- The contractor will begin excavation in the southeast area of the proposed excavation and will progressively excavate toward the north and west areas as presented in Figure 4.
- Shallow soil, from ground surface to approximately 2 feet bgs, will be excavated, segregated, and stockpiled on site for characterization to ensure eligibility for re-use as backfill.
- Soils excavated between approximately 2 to 5 feet bgs will be continually assessed as potential PCS. If screening indicates that it is not PCS, it will be segregated and stockpiled on site for characterization to ensure eligibility for re-use as backfill. If field screening indicates that it is PCS, it will be deposited directly into awaiting haul trucks and transported off site to a selected RCRA Subtitle D landfill other appropriately permitted disposal facility.

- Soil excavated from approximately 5 to 14 feet bgs will be deposited directly into awaiting haul trucks and transported off site to a selected RCRA Subtitle D landfill or other appropriately permitted disposal facility.
- MFA will collect soil samples (i.e., characterization and confirmation samples, as applicable) from the base of the excavation (in cases where the soil is not saturated with groundwater) and sidewalls, and will submit the samples for laboratory analysis of the COC.

Excavation activities will proceed in the manner presented above until field screening results and/or preliminary laboratory analytical results indicate that the maximum possible extent of impacted soil has been reached, or to the extent presented on Figure 4, whichever is less. The base of the excavation will range from approximately 9 to 14 feet bgs, dependent on areas of known and confirmed contamination (including presence of free product), field observations, and field screening results. It is anticipated that overexcavation of the smear zone, at the proposed depths, will be necessary to remove residual saturated PCS.

The estimated excavation boundaries were developed as part of the Amended CAP and in coordination with Ecology (Ecology, 2014), and are expected to result in the removal of soils exceeding MTCA Method A CULs. It is anticipated that limited PCS will be removed near the building footprints of the Xochimilco Mexican Restaurant and the One Love Smoke Shop (adjacent east and south of the Property, respectively) in order to protect building foundation integrity. Additionally, a daily tally of the volume of PCS removal will be completed by recording the weight of the disposal tickets at the landfill. A continual assessment of the total volume of PCS removed is necessary to guide the overall lateral and vertical extent of excavation activities and compare it to the estimated budgetary allowance for this task. Primary areas of known free product (in the vicinity of MW-7, MW-8, MW-11, MW-15, KMW-20, and KMW-22) will be targeted for deeper excavation, to approximately 14 feet bgs. A shallower targeted depth of approximately 9 feet bgs is proposed for the central and northern area of the proposed excavation based on findings from Kleinfelder's investigations.

The estimated volume of soil to be removed is approximately 5,700 tons. Because of the uncertainty associated with estimating the true dimensions of the excavation, a 20 percent volume contingency above the estimated volume has been assumed for the purposes of cost estimating. Monitoring wells located in the proposed area of soil remedial action will be decommissioned and removed in accordance with applicable regulations. These wells include MW-7, MW-8, MW-11, MW-15, KMW-20, and KMW-22 (see Figure 4).

During excavation activities, a pump will be placed at the bottom of the excavation pit to dewater the excavation pit. The contractor will handle contaminated materials in conformance with federal, state, and local regulations, and will provide for the health and safety of personnel and visitors who may work with or be exposed to contaminated materials.

Upon removal of all soil as described above, confirmation sampling will be completed as outlined in the SAP. Prior to backfilling, the results of the initial excavation sampling will be compiled and reviewed with Ecology to determine the appropriate additional management. This could include removal, further evaluation of risk, and/or management through institutional controls.

Excavation will be conducted using track-mounted excavators. MFA will be on site, at designated areas, to visually screen excavated material for signs of contamination and to characterize soil for disposal or reuse.

5.5.2 Soil Loading/Transporting/Vehicle Decontamination

Truck loading will be staged outside the excavation area to prevent contamination of truck tires by impacted soil at the Site. Any trucks that enter the excavation will be inspected before they exit the Site to prevent tracking of contaminated soil off site. All trucks hauling contaminated soil will be lined with 10-mil or thicker visqueen liners or an equivalent, and will be covered during transport. The liners will be disposed of as contaminated waste along with the soil.

Before exiting the Site, trucks used to transport excavated materials for off-site disposal, and any other vehicles that may enter areas containing impacted soil, will require monitoring and decontamination. The primary method of decontamination will be to remove clinging soil by using shovels, brooms, and brushes. Vehicle decontamination may also involve a rinse using a hand-held pressure washer to remove large pieces of soil. The equipment decontamination will be conducted on a surface with secondary containment to prevent releasing decontamination fluid into the surrounding surface. The decontamination fluid will be collected and placed in on-site tanks for storage and subsequent treatment and discharge.

5.5.3 Dust Control

The excavation process will disturb soil and has the potential to generate dust. Appropriate dust-control methods will be employed during excavation to prevent the generation of airborne contaminants. These control methods will include soil wetting and misting, at a minimum. The excavation area may be wetted before the start of excavation activities during dry weather by spraying the area immediately around the excavation so that visible dust emissions are controlled.

A City fire hydrant is located in the northwest corner of the Property and will be available to the contractor during construction. The contractor will use the hydrant to fill a water tank/truck, or will directly attach a hose to keep water readily available during all construction activities. Additionally, if site conditions warrant it, the use or a street-sweeper on-site may be necessary to control track-outs from disposal trucks.

Soil will be kept wet during handling until the soil is either (1) placed in haul trucks and covered pending transport to an off-site permitted landfill, or (2) placed on site in stockpiles and covered (as described in Section 5.5.3).

5.5.4 Stockpiling

All soils excavated from the ground surface up to approximately 2 feet bgs will be segregated and stockpiled on the former Tiger Oil Property, unless an alternative location nearby is identified. Soil excavated from approximately 2 feet to 5 feet bgs will be field screened and evaluated for the potential presence of petroleum hydrocarbons and/or VOCs. If the soil is determined to be potentially contaminated, it will be placed immediately into waiting dump trucks for off-site disposal;

however, if it appears that the soil is not impacted, it will be stockpiled on-site for further characterization to determine if re-usable as backfill.

Stockpiled soils will be placed on top of a chemically resistant polyethylene sheet or geomembrane. The minimum thickness of the sheet or geomembrane will be 10 mil. Stockpiles will be covered by chemically resistant polyethylene sheeting or geomembrane with a minimum thickness of 10 mil. Soil stockpiles will be covered with plastic sheeting at the end of each workday to minimize erosion, dust generation, and direct contact by humans. The plastic sheeting that covers the pile must be regularly inspected to ensure that it remains functional and protective of human health and the environment. All drainage will be directed away from the stockpiles. Temporary stockpiles of soil determined to be contaminated must be capped or properly disposed of off site within 60 days of completion of excavation work.

Soil stockpiles will be located on site in an area approved by the engineer. Should elevated levels of petroleum products become identified in the stockpiled soil, the stockpile will be characterized for proper disposal.

5.5.5 Waste Characterization

Overburden material from ground surface to approximately 2 feet bgs will be stockpiled on site and used in combination with imported clean material to backfill the excavation if it is determined through waste characterization processes defined in this section to be eligible for on-site re-use.

MFA will conduct field screening of excavated soil. Soil will be assessed for indications of petroleum contamination, based on odor, appearance, and the presence of VOCs, using an appropriate field screening instrument. MFA will classify soils as contaminated or uncontaminated to facilitate contractor management of soils.

If applicable, the stockpiled soil will be measured and delineated to estimate 100-cubic-yard sections. Five-point composite samples will be obtained from each 100-cubic-yard stockpile section that is to be disposed of off site. In order to develop a representative sample of the stockpile, five discrete subsamples will be composited. The 100-cubic-yard sections will be divided into four quadrants, with one additional subsample obtained from a random location in one of the quadrants.

The five-point composite sample methodology is intended to result in data that are representative of the contaminants in the pile while accounting for the variability of the waste that is generated from the different excavation locations. The soil in each stockpile is anticipated to be homogenized through on-site handling procedures (i.e., excavation and stockpiling). Composite sampling, combined with homogenization gained through soil handling, is expected to result in a sample that is representative of the specific stockpile. Variability of the soil from different excavation areas will be addressed by collecting one composite per every 100 cubic yards of excavated soil; field precision will be evaluated by obtaining one field duplicate sample for every 20 composite samples. Laboratory quality assurance and quality control (QA/QC) data, along with sample results, will be validated before handling procedures are determined for any soil. This review will be conducted as laboratory reports are received so that soil management may proceed efficiently. Specifics regarding soil sampling, handling, and QA/QC requirements are provided in the SAP (Appendix A).

5.5.6 Excavation Limit Sampling and Analysis

Soil will be excavated to the extent shown in Figure 4 and in the construction plan set (Appendix C), and soil samples collected from the excavation sidewalls and base (in cases where the base is not saturated with groundwater) of the excavation pit, where applicable. These soil samples will be analyzed for IHSs at a certified laboratory. The results of the excavation confirmation sampling will be compiled and reviewed with Ecology.

5.5.7 Excavation Dewatering

During excavation, and prior to backfilling, accumulated groundwater from the excavation will be removed using a pump or other means. Construction dewatering will be required to control groundwater inflow. The depth to groundwater at the Site ranges from approximately 9 to 13 feet bgs across the Site, depending on seasonal fluctuations. Groundwater will be maintained below the bottom of the temporary excavation during soil removal and ground improvement work.

The Site's dewatering system will be capable of pumping groundwater from the excavation at up to 200 gallons per minute. The rates should decrease over time as the saturated thickness of the water-bearing soils decreases as a result of dewatering. Based on the information reviewed and presented by the City and Ecology, it is anticipated that all dewatering fluid will be retained on site for storage and treatment, with final discharge to a designated sanitary sewer system.

Contaminated groundwater will be temporarily stored in an appropriately sized tank with a capacity of up to 21,000 gallons. MFA will provide the contractor with laboratory analytical results for petroleum-contaminated groundwater requiring on-site treatment. The contractor will obtain all permits for the on-site treatment and disposal of contaminated groundwater. The contractor will also provide a copy of all discharge permits a minimum of one week before the start of site work. MFA will provide oversight to remediate all impacted groundwater generated during remedial action and discharge it into the City's sanitary system after confirmation that groundwater laboratory analytical results meet the discharge requirement. A water treatment system will be set up or available for use during the startup of the excavation work.

It is anticipated that contaminated water will not be disposed of off site because of the availability of a water treatment system. However, in the event that this is necessary, dewatering fluid to be disposed of off site will also be contained in a system similar to the above setup. Impacted groundwater above respective CULs/remediation levels will be contained for later disposal at a licensed disposal facility.

5.5.8 Excavation Water Treatment

Groundwater at the Site is contaminated by gasoline-range TPH and petroleum-fuel-associated VOCs. These contaminants are associated with historical uses and operations at the Property.

Water will be treated using a multi-unit system. The on-site water treatment system (OWTS) will include an appropriately sized tank (up to 21,000 gallons in capacity), particulate filter units, and granular activated carbon (GAC) vessels connected in series. The individual system units are

summarized below. Figure 5 presents the process flow diagram depicting the components of the OWTS. Specifications for example units are included in Figure 5.

Water-containing tank: The tank will be equipped with over and under weirs for removal of settleable solids and separated-phase hydrocarbons (i.e., free product). The tanks will also be equipped with a sorbent boom at the inlet to remove any floating free product. MFA will inspect the tanks daily for floating free product, which will be skimmed from the water surface and placed in state Department of Transportation-approved 55-gallon metal drums. MFA will determine, as the water quality and conditions change in the tanks, when the tank bottom will be drained to remove free product that settles out of the waste stream. The free product and settleable solids removed from the tank will be sampled and disposed of at a RCRA Subtitle D landfill or other appropriately permitted facility, depending on the concentration of the waste.

The tank will also be fitted with a 10-foot-by-50-foot containment berm system in order to provide secondary containment in the event of a fittings leakage or other leakage issues.

Filter Unit: A bag filter/cartridge filter unit will follow the OWTS unit. The filter unit will remove fine suspended solids that could clog the GAC vessels in the water treatment process. The filter unit may be composed of one bag filter and two cartridge filters capable of removing particulates as small as 5 microns. A pump will be installed at the inlet of the filter unit in the event that gravity flow may not be sufficient to maintain a steady flow through the unit.

GAC Vessels: The final step in the OWTS will be two in-line reactivated carbon filters for removal of dissolved COCs from the water. The carbon vessels will be piped with two sets of two 2,000-pound GAC vessels in an interchangeable lead-lag formation. The influent water will enter the first GAC vessel (the lead), which will treat the influent to the discharge criteria. The secondary GAC vessel, the lag, will also assist in this process, if necessary. MFA will determine whether one or both GAC vessels are necessary for treatment of the dewatering fluid in order to meet the discharge criteria. The system will be piped and valved in such a way that the two vessels can be switched if contaminant breakthrough occurs in one of the vessels. Monitoring ports will be installed after each vessel so that the post-treated water can be sampled for potential presence of COCs. Groundwater analytical results will be the primary factor determining the point at which the carbon in the lead vessel requires changing out. The volume of treated water will also be a factor. At that time, the influent will be piped temporarily through just the lag vessel while the carbon in the lead vessel is changed out. The system valves will then be adjusted so that the two GAC vessels are interchangeable.

5.5.9 Water Discharge

The contractor will treat all impacted groundwater generated during the remedial action activities on site and discharge it into the City's sanitary sewer system. MFA will collect post-treatment water samples for laboratory analysis to demonstrate discharge compliance. If necessary, impacted groundwater above respective CULs will be contained separately for later disposal at a licensed disposal facility.

5.5.10 Infiltration Gallery

Prior to backfill of the excavation pit, the contractor will install two infiltration galleries (schedule 40 polyvinyl chloride [PVC], 0.030-inch slotted manifold) in designated areas at the Site to provide potential avenues for injecting additional bioremediation products as an additional in situ bioremediation option. Figure 4 presents a layout of the locations of the infiltration galleries. Detail 4 of Plan Sheet C6.1 provides a cross section and specifications of the slotted PVC manifolds.

5.6 Backfill, Compaction, and Final Grade

Following confirmation sampling, authorization to proceed with backfill operations will be provided by the engineer. Excavations will be backfilled using clean materials from a local source or clean overburden from on-site excavations. Before imported soil is accepted and placed, verification will be required documenting that the soil does not contain concentrations of COCs, including petroleum hydrocarbons, fuel-associated VOCs, and arsenic, at levels exceeding MTCA Method A CULs. (Note: verification of the potential presence and concentration of arsenic in imported backfill soil may be necessary due to elevated background concentrations of arsenic in soil in eastern Washington). Verification will be in the form of laboratory analysis following applicable U.S. Environmental Protection Agency test methods.

Imported clean soil will be mixed with clean overburden stockpiled soil from the excavation area (pending characterization) and compacted in accordance with project specifications (Appendix C). The final grade will be placed in accordance with the engineered drawings following this Plan. Grades will be leveled, sloped, and protected with gravel in portions of the excavation footprint on the former Tiger Oil Property to guard against runoff (see Plan Sheet in Appendix C); portions of the excavation footprint overlying adjacent properties will be returned to pre-remedial action conditions (e.g., parking lots repaved and striped).

5.6.1 In Situ Bioremediation/Enhanced Aerobic Biodegradation

Excavation and removal of PCS in conjunction with in situ bioremediation will expedite the biodegradation of TPH and VOCs in soil and groundwater and is the most feasible and expeditious cleanup option for the Site.

The primary components of the in situ bioremediation and enhanced aerobic biodegradation are as follows:

- In situ chemical oxidation using Regenesis RegenOx® or an industry equivalent oxidizer and activator to reduce sorbed and soil-matrix-bound petroleum hydrocarbons in the vadose zone and saturated zone, as well as the dissolved phase in groundwater.
- Use of enhanced aerobic biodegradation to expedite the biodegradation of TPH and VOCs in soil and groundwater by adding Regenesis ORCa® or an industry equivalent bioremediation product containing oxygen (as an electron acceptor) to accelerate the microbial degradation of remaining petroleum-hydrocarbon-impacted vadose zone and groundwater.

Chemical oxidation involving Regenesis RegenOx® or an industry equivalent oxidizer and activator will be the first component of in situ bioremediation where the oxidizer and activator will be mixed with the backfill soil and applied directly into the excavation pit in a dry powder form or as a slurry at approximately 12 to 14 feet bgs. The oxidant chemicals react with the contaminants, producing innocuous substances such as carbon dioxide, water, and inorganic chloride.

The secondary component of in situ bioremediation will involve use of Regenesis ORCa® or an industry equivalent phosphate-intercalated magnesium peroxide that, when hydrated, produces a controlled release of oxygen for up to 12 months on a single application. This controlled release of oxygen assists in accelerating the naturally occurring aerobic contaminant biodegradation in groundwater and saturated soils. Regenesis ORCa® will be applied directly into the excavation pit in a dry powder form or as a slurry at approximately 8 to 12 feet bgs.

It is anticipated that approximately 11,000 pounds of Regenesis RegenOx® and 2,500 pounds of Regenesis ORCa® will be applied to the excavation pit.

This combined in situ bioremediation technology is effective in gross reduction of the contaminant mass by oxidizing the sorbed contamination and changing the contaminant mass equilibrium (by increasing its solubility), which result in a shift from a sorbed phase to a dissolved phase. Application of the phosphate-intercalated magnesium peroxide to the more soluble partially oxidized contaminants (as a result of chemical oxidation) would expedite the rate of aerobic biodegradation. Because of the changes in the contaminants and the soil matrix chemistry, it is likely that, after applications of bioremediation, a temporary increase in the dissolved phase of gasoline-range TPH and associated VOCs will be noted in groundwater quality.

5.7 Groundwater

Groundwater impacts will be addressed by the combination of excavation and removal of PCS in conjunction with in situ bioremediation followed by monitored natural attenuation through groundwater monitoring events. It is anticipated that the proposed soil excavation remediation will remove up to six monitoring wells (see Figure 4). Up to three new monitoring wells will be installed after remediation activities have concluded.

5.8 Soil Gas

Soil gas contaminant levels likely will be reduced through removal of PCS followed by in situ bioremediation activities. In addition, institutional controls may be implemented, if appropriate, given the future development of the Site.

6 INSTITUTIONAL CONTROLS

Institutional controls are measures undertaken to limit or prohibit activities that may interfere with the integrity of a cleanup action or result in exposure to hazardous substances at a property. Such measures are required in order to attempt to achieve both the continued protection of human health

and the environment and the integrity of the cleanup action whenever hazardous substances remain at a property at concentrations exceeding applicable CULs. Institutional controls can include both physical measures and legal and administrative mechanisms.

6.1 Soil

Soil that exceeds CULs likely will remain upon completion of the remedial activities; therefore, institutional controls associated with future use of the site (e.g., restrictive covenants) may be implemented. Analytical results for the excavation limit soil samples will allow definition of appropriate institutional controls. If all soils exceeding CULs are removed, restrictive covenants specific to soil contamination will not be required. Should contamination exceeding associated soil CULs remain, a soil management plan will be developed for site soil excavation and handling associated with future development.

6.2 Groundwater

A restrictive covenant regarding the use of groundwater at the Property is already in place. The restrictive covenant prohibits the use of groundwater beneath the Property as potable water unless a documented change in conditions demonstrates that the covenant is unnecessary.

A groundwater monitoring plan will be included with the construction completion report. Groundwater monitoring will be completed until four consecutive quarters of monitoring results indicating compliance with CULs is demonstrated, which is anticipated to be completed within two-years of the remedial action. Access to all monitoring wells on the Site should be maintained and the wells protected from damage. If any damage to any monitoring device on the Site is discovered, Ecology will be notified within 48 hours. All damage will be repaired promptly and a report documenting the work will be submitted to Ecology within 30 days of the completion of repair work.

6.3 Soil Gas

Any building constructed on Site will be required to have vapor mitigation or a soil gas assessment to document that vapor mitigation is not necessary.

6.4 Stormwater

In order to minimize the potential for mobilization of contaminants remaining in the groundwater on the Site, no stormwater infiltration facilities or ponds shall be constructed on the Site. All stormwater catch basins, conveyance systems, and other appurtenances located at the Site shall be of watertight construction.

LIMITATIONS

The services undertaken in completing this Plan were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This Plan is solely for the use and information of our client unless otherwise noted. Any reliance on this Plan by a third party is at such party's sole risk.

Opinions and recommendations contained in this Plan apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this Plan.

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Ecology. 2014. Amended cleanup action plan, Tiger Oil facility, 2312 West Nob Hill Boulevard, Yakima, Washington. Washington State Department of Ecology. June.

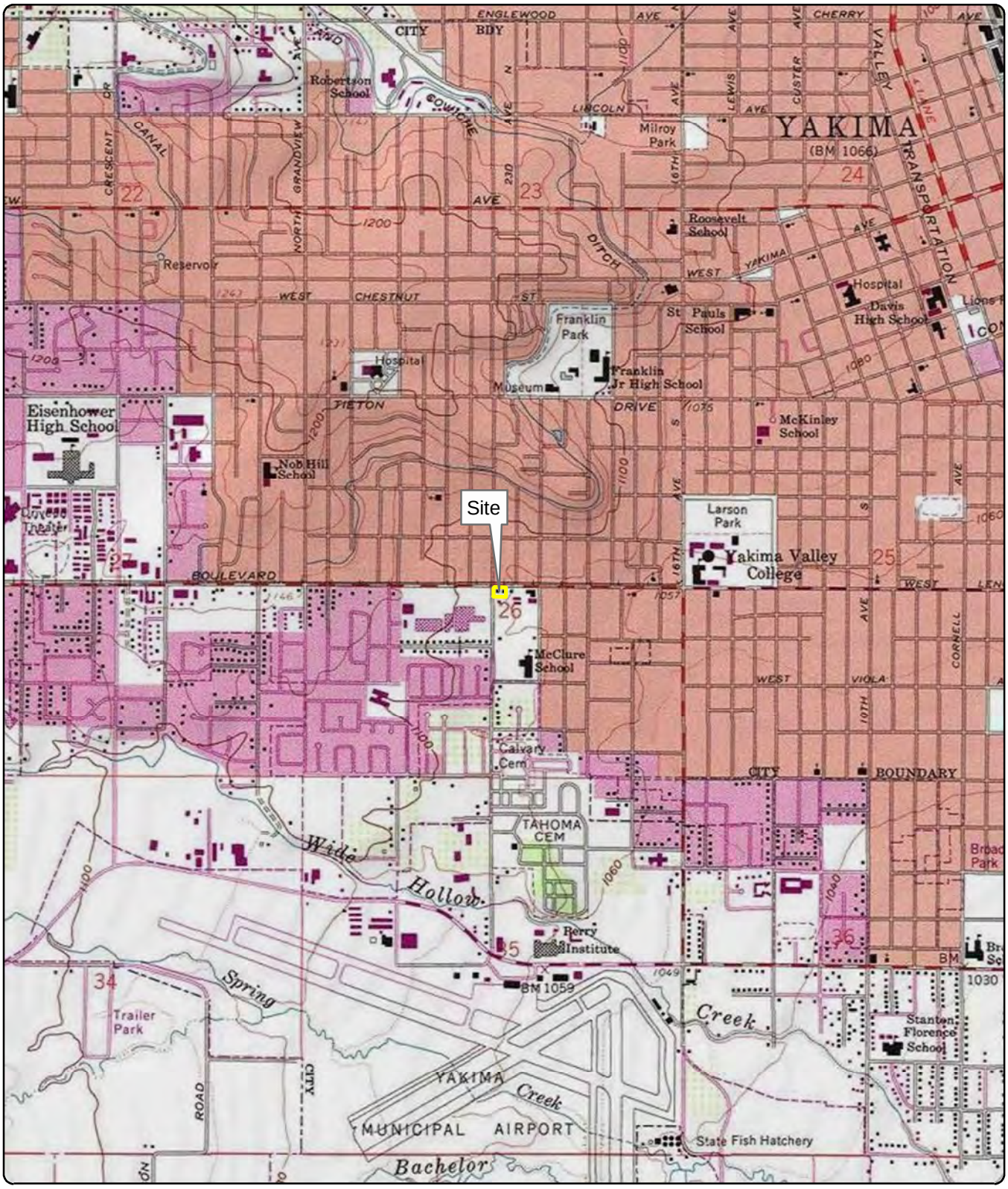
Fulcrum. 2014. Hazardous material inspection report, Former Tiger Mart, 2312 West Nob Hill Boulevard, Yakima, Washington. Fulcrum Environmental Consulting, Inc., Yakima, Washington. November 20.

Kleinfelder. 1992. RI/FS work plan, Tiger Oil facility, West Nob Hill Boulevard and South 24th Avenue, Yakima, Washington. Kleinfelder, Inc., Bellevue, Washington. January 29.

Kleinfelder. 1994. Final draft RI/FS report MTCA enforcement order no. DE 90-C140, second amendment, Tiger Oil facility, West Nob Hill Boulevard and South 24th Avenue, Yakima, Washington. Kleinfelder, Inc., Bellevue, Washington. April 4.

TerraGraphics. 2013. Groundwater sampling report, Tiger Oil, Yakima, Washington. Prepared for State of Washington Department of Ecology. TerraGraphics Environmental Engineering, Inc., Boise, Idaho. June 12.

FIGURES



Site Address: 2312 West Nob Hill Boulevard, Yakima, Washington 98902
Source: Taxlots obtained from City of Yakima GIS,
US Geological Survey (1990) 7.5-minute
topographic quadrangle: Yakima West
Section 26, Township 13 North, Range 18 East

Legend

Site Taxlot

Figure 1
Site Location
Former Tiger Oil—
2312 West Nob Hill Boulevard

City of Yakima
Yakima, Washington

0 1,000 2,000
Feet

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Figure 2
Site Features
Former Tiger Oil—
2312 West Nob Hill Boulevard

City of Yakima
Yakima, Washington

NOB HILL BOULEVARD

SOUTH 24th AVENUE

MW-12
MW-08
MW-10
MW-15
KMW-20
KMW-07
MW-7
KMW-22
KMW-24
S-2
MW-11
MW-8
KMW-10
MWG-3
MW-13
MW-9
S-1

XOCHOMILCO MEXICAN RESTAURANT

FORMER TIGER OIL CONVENIENCE STORE

ONE LOVE SMOKE SHOP

SAFEWAY SHOPPING CENTER PARKING LOT

Legend

- Monitoring Well
- Area/Yard Light
- Street Light
- Power Pole
- Sewer Manhole
- Drywell Manhole
- Fire Hydrant
- Water Valve
- Water Meter
- Stormwater Line
- Sanitary Sewer Line
- Water Line
- Overhead Telephone Line
- Natural Gas Line
- Overhead Power Line
- Underground Power Line
- Fence
- Site Taxlot Boundary
- Adjacent Taxlot Boundaries

0 20 40
Feet

Source: Aerial photograph obtained from Esri ArcGIS Online; all other features except storm-water line and taxlot boundaries (City of Yakima) obtained from PLSA and are approximate.

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Project: 0818.02.01-01

Figure 3
LNAPL and Dissolved-Phase Plumes
Former Tiger Oil—
2312 West Nob Hill Boulevard

City of Yakima
Yakima, Washington

NOB HILL BOULEVARD

SOUTH 24th AVENUE

MW-12
MW-08
MW-10
MW-15
KMW-20
KMW-07
MW-7
KMW-22
MW-11
MW-8
KMW-10
MW-13
MW-9
S-1
KMW-24
S-2
MWG-3

New Tiger SVE Expansion

Treatment Compound

XOCHOMILCO MEXICAN RESTAURANT

FORMER TIGER OIL CONVENIENCE STORE

ONE LOVE SMOKE SHOP

SAFEWAY SHOPPING CENTER PARKING LOT

Mercy KMW-8 to Nob Hill SVE Extension

Mercy MW9/MW-13 Extension

Trench A GWE/SVE System

Trench B GWE/SVE System

Legend

- Monitoring Well
- 4-inch PVC SVE Pipe (non-Slotted)
- 4-inch PVC SVE Pipe (Slotted)
- Approximate LNAPL Plume
- Approximate Dissolved-Phase Plume
- Site Taxlot Boundary
- Adjacent Taxlot Boundaries

Notes:
1. All features are approximate.
2. GWE = groundwater extraction.
3. LNAPL = light nonaqueous-phase liquid.
4. PVC = polyvinyl chloride.
5. SVE = soil vapor extraction.

0 20 40
Feet

Source: Aerial photograph obtained from Esri ArcGIS Online; monitoring wells obtained from PLSA; plumes obtained from TerraGraphics; taxlot boundaries obtained from City of Yakima.

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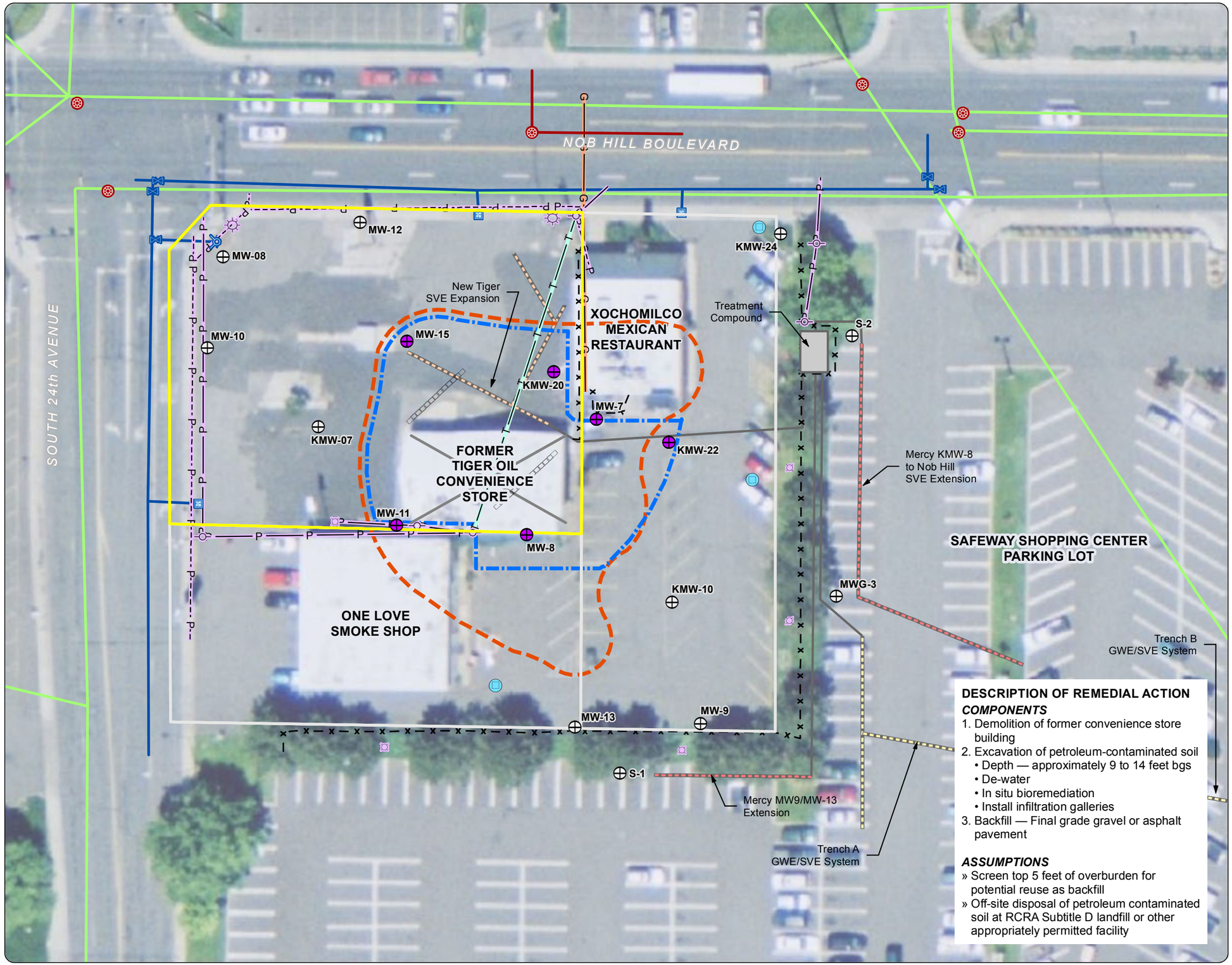
Produced By: rmaronn
Project: 0818.02.01-01

Figure 4
Proposed Interim Remedial Action Elements
Former Tiger Oil—
2312 West Nob Hill Boulevard

City of Yakima
Yakima, Washington



Legend

- Monitoring Well (To Be Removed)
- Monitoring Well (Existing)
- Area/Yard Light
- Street Light
- Power Pole
- Sewer Manhole
- Drywell Manhole
- Fire Hydrant
- Water Valve
- Water Meter
- Stormwater Line
- Sanitary Sewer Line
- Water Line
- Overhead Telephone Line
- Natural Gas Line
- Overhead Power Line
- Underground Power Line
- Fence
- 4-inch PVC SVE Pipe (non-Slotted)
- 4-inch PVC SVE Pipe (Slotted)
- Infiltration Gallery for Supplemental Bioremediation
- Approximate Extent of Petroleum-Contaminated Soil Excavation
- Approximate LNAPL Plume
- Former Tiger Oil Property Boundary
- Adjacent Taxlot Boundaries
- Building to Be Demolished

DESCRIPTION OF REMEDIAL ACTION

COMPONENTS

1. Demolition of former convenience store building
2. Excavation of petroleum-contaminated soil
   - Depth — approximately 9 to 14 feet bgs
   - De-water
   - In situ bioremediation
   - Install infiltration galleries
3. Backfill — Final grade gravel or asphalt pavement

ASSUMPTIONS

» Screen top 5 feet of overburden for potential reuse as backfill
» Off-site disposal of petroleum contaminated soil at RCRA Subtitle D landfill or other appropriately permitted facility

Notes:
1. All features are approximate.
2. bgs = below ground surface.
3. LNAPL = light nonaqueous-phase liquid.

0 20 40
Feet

Source: Aerial photograph obtained from Esri ArcGIS Online; Infiltration Gallery delineated by Maul Foster & Alongi, Inc.; stormwater line and taxlot boundaries obtained from City of Yakima; all other features obtained from PLSA.

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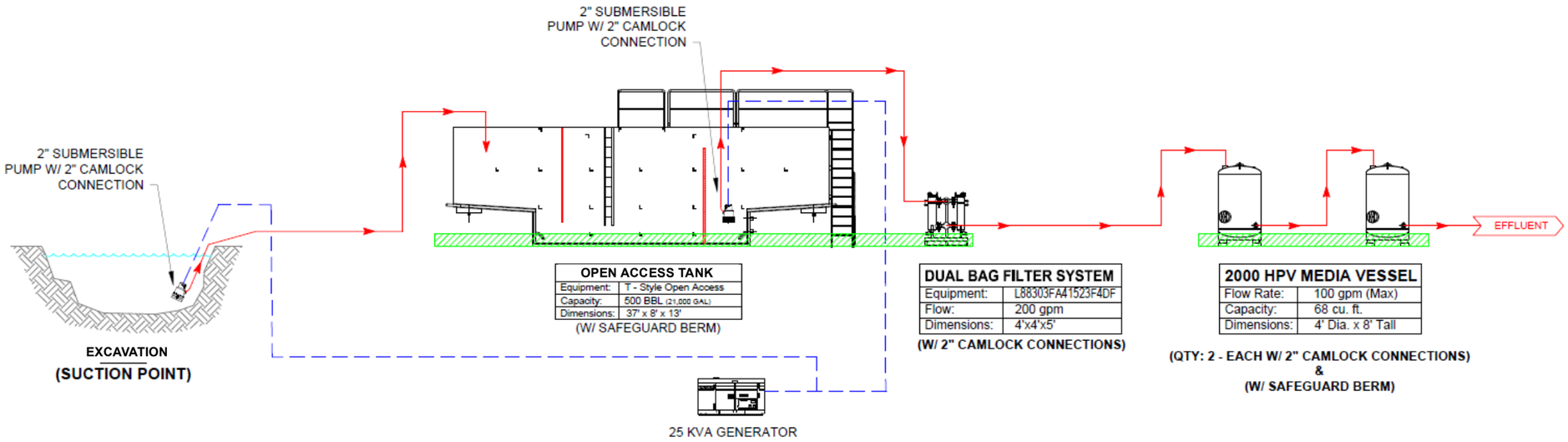
Print Date: 1/22/2015
Approved By: mstringer
Produced By: apadilla
Project: 0818.02.01-01

Figure 5
Water Treatment System Process Flow Diagram
Former Tiger Oil—
2312 West Nob Hill Boulevard

City of Yakima
Yakima, Washington



Source: Diagram prepared by Baker Corp.

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Produced By: rmaronn
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