



REVIEW DRAFT

May 13, 2020

Mr. John Patricki
Project Manager
ADEQ, Voluntary Remediation Program
1110 West Washington Street
Phoenix, AZ 85007

**Subject: Remedial Action Work Plan
USPS Campbell Avenue Site, Tucson, AZ
VRP Site Code 100233-00
USPS Contract No. 072382-15-J-0027
USPS Work Order No. 86
Louis Berger Project No. 2004425.0093**

Dear Mr. Patricki:

Louis Berger U.S. Inc. – A WSP Company (Louis Berger), on behalf of the United States Postal Service (USPS), has prepared this Remedial Action Work Plan (RAWP) for the USPS Campbell Avenue Site located in Tucson, AZ (the Site). Recent and historic investigations at the Site have thoroughly delineated both the horizontal and vertical extent of heavy metals contamination found in debris piles onsite and have demonstrated that leaching of heavy metals from the debris piles does not pose a threat to underlying groundwater. The proposed remedial approach includes engineering and institutional controls to prevent residential land use and exposure to metals contaminated soil, the debris piles are to be capped, and a Deed Environmental Use Restriction (DEUR) is to be put in place. The following RAWP describes the remediation activities to be completed as aligned with the Voluntary Remediation Program (VRP), and Arizona Department of Environmental Quality (ADEQ) regulations. A copy of the Work Plan Checklist is provided in Appendix A.

EXPLANATION OF THE PROJECT OBJECTIVE

The project objectives as introduced to the ADEQ and its VRP in February of 2018 are the following:

- 1) Prevent exposure to heavy metals (cadmium and lead) contained in soil within the debris pile at the Site via installation of an impermeable engineered cap system.
- 2) Limit land use to commercial purposes.
- 3) Promote subsequent use for independent solar power development.

Following installation of the debris pile engineered cap, the USPS intends to offer the remaining usable site land for solar power development. This intended solar development may or may not be used as supplemental power for the neighboring USPS Tucson Main Post Office (MPO).

BACKGROUND

The USPS purchased the Campbell Avenue Site from Southern Pacific Transportation Company through a Grant Deed dated 7 March 1985. A copy of the Grant Deed is included in the Chen-Northern Phase I Environmental Site Assessment (ESA) report (Chen 1992). The Site is an approximately 8.3 acre parcel of undeveloped land (industrial zoning) bordered by the Tucson MPO to the west and the Union Pacific Railroad fueling facility to the east (Figure



1, Site Location). From approximately 1973 to 1985, the Site was used by the railroad to store debris from the disassembly and demolition of box cars and the cleaning of mining cars on the adjacent property. Soil and rock material account for approximately 70 percent of the debris, and approximately 30 percent of the debris material consists of metal, plastic, glass, wood, hoses, tires, roofing, fiberglass, and other miscellaneous material. Soil in the debris piles consists of dark brown silty sand with rock fragments, pieces of metal slag, and other debris, while native soil is a lighter brown and contains no debris (Dames & Moore 1998). In 2014, the total quantity of soil/debris present at the Site was estimated to be approximately 15,700 tons (Louis Berger 2018). Following an Interim Corrective Measures Study completed in January 2014 (HDR 2014), the remaining debris pile was estimated to be about 14,000 tons (see photolog provided and Figure 2). Potential receptors include surface water on the west edge of the property, native flora and fauna, and though unlikely, potential migration off-site through airborne dust transport. Groundwater is located approximately 100 feet below ground surface (bgs) as determined in a Remedial Investigation Report for the neighboring Union Pacific fuel yard (CH2MHill 2012) and is unlikely to have been impacted. All receptors are addressed by the proposed engineered cap, DEUR, and short-term monitoring to confirm effectiveness of the remedy and integrity of the cap.

The Site is listed by the Pima County Assessor's Office as Parcel No. 002B, Book 130, Map 1, and is currently regulated by the ADEQ as VRP site code 100233-00. The detailed site history and prior ownership/use of the property is documented in the *Summary of Site History Report* (HDR 2013). Several site investigative studies and interim corrective measures work activities were conducted at the Site by the USPS over the past 25 years, since 1992. The findings of the investigation studies determined that samples collected from waste debris piles exceeded Toxicity Characteristic Leaching Procedure (TCLP) limits for both cadmium and lead in approximately 70 percent of sample analyses completed.

In 2019, Louis Berger completed a limited phase II ESA to support the design of a geomembrane cap proposed as the remediation strategy (Louis Berger, 2019). A total of 48 soil samples were collected and analyzed for Resource Conservation and Recovery Act (RCRA) 8 metals using TCLP and Synthetic Precipitation Leaching Procedure (SPLP) analytical methods. Analytical results from 2019 were used to fully delineate the extent of the proposed geomembrane cap, and further conclude that heavy metal impacts to soil is limited to the waste debris piles. Site investigations found that the area warranting remediation generally corresponds to visually discolored soil found on and adjacent to the debris piles. Based on soil sampling results, Figure 3 depicts the extent of soil contamination that exceeds non-residential soil remediation levels (SRL). Due to the significant number of soil samples collected at the Site since 1992, Figure 3 shows a limited subset of critical samples that characterize the debris piles and define the limit of impact warranting remediation. Full soil data sets and related figures from the various individual investigations are included as Appendix B. In general, soil samples collected from the debris piles generally exhibited the highest concentrations of lead or cadmium that exceed the ADEQ non-residential SRLs and TCLP standards as represented by samples B-06, C-09, E-09, F-08, TU-09, TU-13, TU-15, and TU-17. Soil samples collected from outside the debris piles generally exhibited lower concentrations of metals. Soil samples TU-10, TU-13, TU-17, and TU-20, collected outside the debris piles but within the zone of stained soil, also exceeded ADEQ non-residential SRLs. Metal concentrations in soil samples collected outside the areas of soil discoloration remained below the SRLs. No samples collected outside the area of stained soil at 0-6" or 6-12" below ground surface (bgs) in 2019 exhibited concentrations of lead or cadmium above the ADEQ SRLs or Groundwater Protection Levels (GPL) (Louis Berger, 2019). Tables 1-5 from Dames & Moore 1998 provide analytical results for all soil borings collected at the Site from 1992 to 1998.

The interim corrective measures study conducted in 2012-2013 by HDR (HDR 2014) and implemented by Clean Harbors Environmental of Las Vegas, NV determined the effectiveness of *in situ* chemical stabilization and offsite disposal of the waste debris with an estimated cost in the range of \$120 to \$140 per ton (\$1.7 to \$2 million) to complete this type of remediation approach. In addition, several soil samples beneath the debris pile hot spots were



collected in native soil. None of these native soil samples were found to exceed site remediation limit standards for total metals.

Due to this high cost of waste stabilization and disposal, USPS proposed an alternative conceptual remedy utilizing an engineered cap and a DEUR to address the metals impacted soil and fulfill the ADEQ requirements under the VRP. Louis Berger presented a regulatory review of similar approaches in Arizona, along with a solar feasibility analysis to ADEQ in Phoenix on 23 February 2018. The ADEQ VRP program participants and ADEQ representative from the Hazardous Waste program agreed with the conceptual approach and followed up with a letter stating as such dated 14 March 2018.

GENERAL DESCRIPTION OF PROPOSED REMEDIATION

The proposed remedy applies engineering and institutional controls to prevent direct contact exposure to soil contaminants and prevent residential land use. The remedial approach includes construction of an engineered cap as an engineering control to prevent exposure to contaminated soil and implementation of a DEUR as an institutional control to limit land use. The construction work will be completed by a remediation contractor with appropriately licensed and 40 Hr HAZWOPER trained workers. The DEUR also includes annual inspection of the cap to ensure the integrity remains intact. Proposed remediation design and engineering controls are detailed in the scaled drawings (Cover Sheet, Existing Conditions, Proposed Conditions, and Construction Details) and in a Draft Construction Specification Document all included as Appendix C.

As established in past sampling of native soils beneath the debris piles, leaching of the metals from the piles has shown to not be occurring even with an impermeable cap on the debris piles. The addition of the cap will further eliminate leaching potential as well as other erosion through wind or water that may cause the contaminated debris to migrate from the piles. An alternate GPL is not determined to be necessary for the Site.

REMEDICATION ACTIVITIES

This proposed remediation includes the following to be completed by the selected USPS contractor. Essential elements of the remedy include:

- 1) Surveying the limits of the cap and the extent of contaminated soil to be moved to the capped area.
- 2) Installation of erosion controls, soil tracking pad, and additional controls (e.g. fence) to control site access.
- 3) The Contractor shall clear any remaining vegetation from the capping area (a few small trees and bushes).
- 4) The Contractor shall level the capping area as shown on the contract drawings. Bulky waste over 24 inches in length, (tires, scrap metal, wood, etc.) shall be disposed off-site following cleaning with brushes and rinse water over poly or within the debris pile area. Non-bulky waste less than 24 inches in length will be buried within the capping area.
- 5) The Contractor shall limit heavy equipment traffic in the debris pile area to backhoe and bobcat; and when exiting the debris pile areas, equipment will exist over a trackout pad to remove debris.
- 6) The top 1-2 inches of discolored soil area just west of the debris pile will be scraped into the larger pile without lifting the material and moved onto the waste pile prior to cap installation. Confirmation soil samples will be collected to confirm removal of any residual lead or cadmium in these areas (Figure 4).
- 7) Leveling of the debris pile and construction of the engineered impermeable cap.
- 8) The Contractor shall construct the engineered impermeable cap. The cap includes 6" of imported common fill to be installed over subgrade, and liner consisting of Closure Turf by AgruAmerica or approved equivalent. During installation, a storm water construction permit and erosion controls and dust control measures will be implemented.
- 9) Equipment decontamination and demobilization. Site demobilization shall include removal of soil erosion controls, removal of all construction equipment and restoration of impacted areas (stockpile, construction trailer etc.) to prior condition.
- 10) Preparation of remedial action report.



- 11) Recording of DEUR on land records, including as-built design of cap and long-term monitoring plan.

Following construction of the cap and recording of the DEUR, annual inspection of the Site and engineered control will be performed. The inspection will focus on identifying areas of erosion, damage, or excessive weed growth that may reduce the integrity of the cap and expose underlying contaminated soil. Such damaged areas will be repaired. Details concerning the annual inspection will be provided in a monitoring plan that will be part of the DEUR.

COMMUNITY INVOLVEMENT REQUIREMENTS

A community involvement plan will be implemented prior to beginning of construction work at the Site. The elements of this plan will include the following:

- 1) Public comment period for the draft RAWP.
- 2) Site signage to include the following language “As approved by the ADEQ VRP, the USPS will be constructing an engineering control system that includes an engineered cap covering the waste debris piles on this Site. Following construction of this engineered design cap system, the remaining of the useable land will be solicited for solar power development. Reports and records corresponding to this proposed work can be found in the information repository established by the ADEQ VRP office and located at
- 3) Direct mailing to neighboring businesses and residents.
- 4) Public meeting in coordination with the ADEQ VRP if required.
- 5) Information Repository established by ADEQ VRP

PERMITS AND OTHER LEGAL DOCUMENT REQUIREMENTS

The following permits are anticipated for the proposed construction activities:

- 1) Storm water pollution prevention plan and permit (ADEQ)
- 2) City of Tucson Erosion control plan
- 3) Site easement for access – Union Pacific Railroad
- 4) DEUR – legal document post-construction requiring a 45-day comment period.

SCHEDULE FOR COMPLETION

It is anticipated that construction of the engineered cap can be completed within approximately 8 months from receipt of ADEQ approval of the RAWP. An itemized schedule from ADEQ approval date is provided below. Remediation progress reports will be submitted to ADEQ on a monthly basis from the approval of the RAWP until equipment is demobilized from the site. A schedule for completion of cap inspections will be provided in the monitoring plan submitted with the DEUR.



REMEDIATION ITEM	COMPLETION FROM ADEQ APPROVAL OF RAWP (WEEKS)
Installation of remediation sign	1
Submittal of SWPPP, Erosion Control Plan	4
Contractor Bid Release	5
Bid Award	7
Health and Safety Plan Preparation	8
Mobilization	9
Install Erosion Controls, Clear Brush and Small Trees	10
Remove Bulky Waste	11
Transfer Discolored Soil and Smooth Waste Pile	12
Construct Impermeable Cap	16
Demobilization	17
Submit Project Completion Report (includes as-built drawings)	20
Submit DEUR (includes as-built and monitoring plan)	21
Complete DEUR Public Comment Period	27
Record DEUR	29
Request No Further Action	30



REFERENCES

- Chen Northern, Inc. (Chen), 1992. *Phase I Environmental Site Assessment Report*. USPS, Tucson Campbell Avenue Site.
- Dames & Moore, 1998. *Debris Characterization Report*. USPS, Campbell Avenue WQARF Voluntary Site, Tucson, Arizona, July 8.
- CH2MHILL, 2012. *Revised Remedial Investigation Report*. Union Pacific Railroad 22nd Street Site, Tucson Arizona.
- HDR, 2013. *Summary of Site History, United States Postal Service, Campbell Avenue Site*, Tucson, Arizona, September.
- HDR, 2014. *Interim Corrective Measures and Limited Site Characterization Report, Campbell Avenue Site*, January.
- Louis Berger, 2018. *Executive Summary, Site Conceptual Engineering Design and Feasibility Study, Campbell avenue Site, Tucson, Arizona*. February 26.
- Louis Berger, 2019. *Limited Phase II Environmental Assessment*. USPS, Tucson Campbell Avenue Site. September 10.



ACROYNMNS

ADEQ	Arizona Department of Environmental Quality
bgs	Below Ground Surface
DEUR	Deed Environmental Use Restriction
ESA	Environmental Site Assessment
GPL	Groundwater Protection Level
MPO	Main Post Office
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation Reauthorization Act
SPLP	Synthetic Precipitation Leaching Procedure
SRL	Soil Remediation Level
TCLP	Toxicity Characteristic Leaching Procedure
USPS	United States Postal Service
VRP	Voluntary Remediation Program



PHOTOLOG

Remedial Action Work Plan
USPS Campbell Avenue Site – Tucson, AZ
Photo Log



Photograph 1: Photo of debris pile.



Photograph 2: Phot of debris pile showing some typical bulky wood items.



Photograph 3: Photo of debris pile looking southeast.



Photograph 4: Photo of debris pile with scrap metal and tire bulky items.



Photograph 5: Photo of bulky items onsite away from debris pile.



Photograph 6: Photo of debris pile looking northwest.



Photograph 7: Additional photo looking northwest.



Photograph 8: Photo looking south.



FIGURES



USPS Tuscon MPO

USPS CAMPBELL AVENUE SITE

Union Pacific Rail Road

Figure 1
 Site Location
 USPS CAMPBELL AVENUE SITE
 TUCSON, ARIZONA



B

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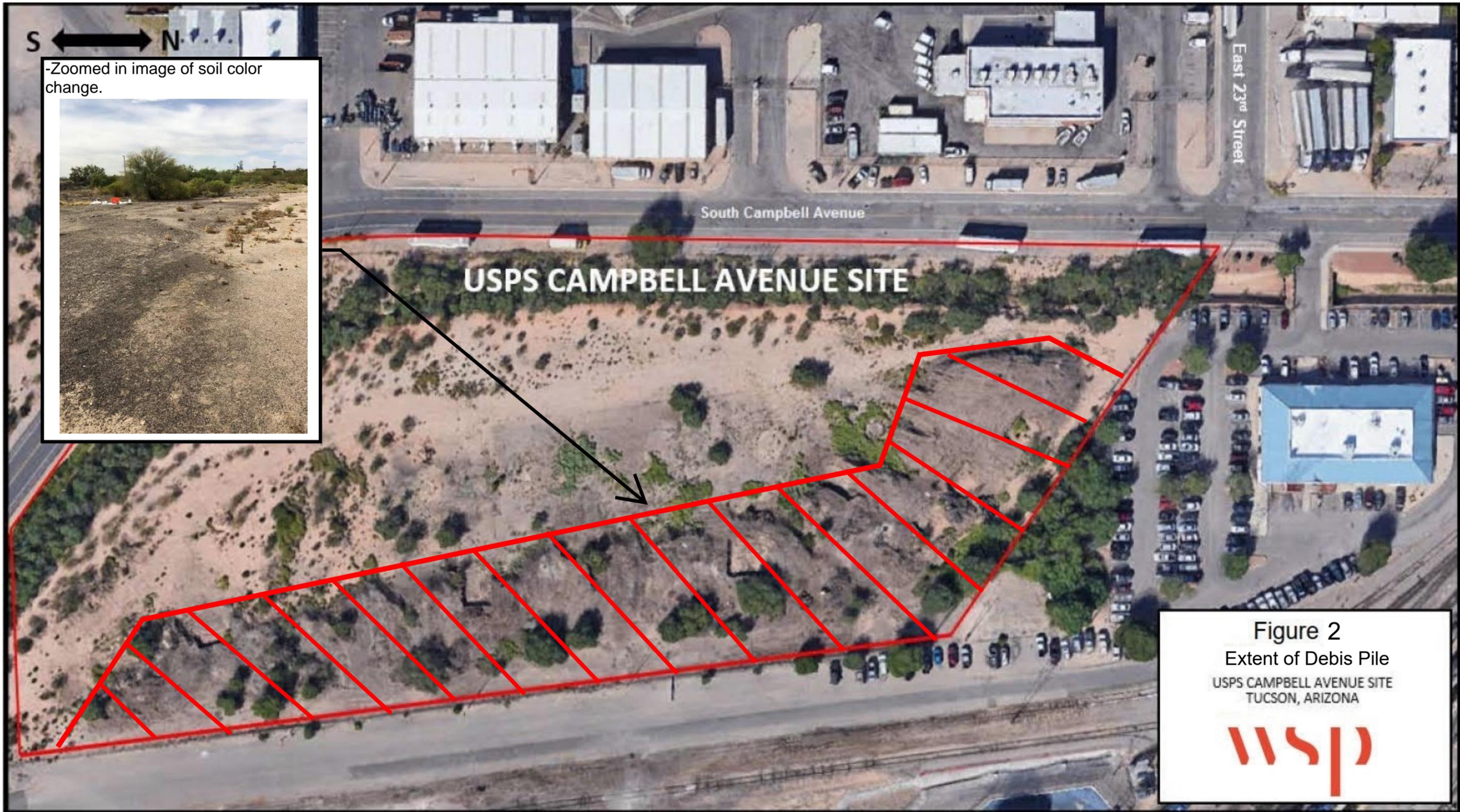
Drawn by: ARK
Checked: ARK
Approved: BW
PUB Name:

United States Postal Service
 Campbell Avenue Site
 Tucson, Arizona.

FIGURE 1
 Site Location



WSP USA INC. TECHNOLOGY DR
 13530 DOLLERS SUITE 300
 HERNDON, VA 20171
 TEL: +1 703.708.6500



-Zoomed in image of soil color change.



B

Drawn by: ARK
Checked: ARK
Approved: BW
PUB Name:

United States Postal Service
Campbell Avenue Site
Tucson, Arizona.

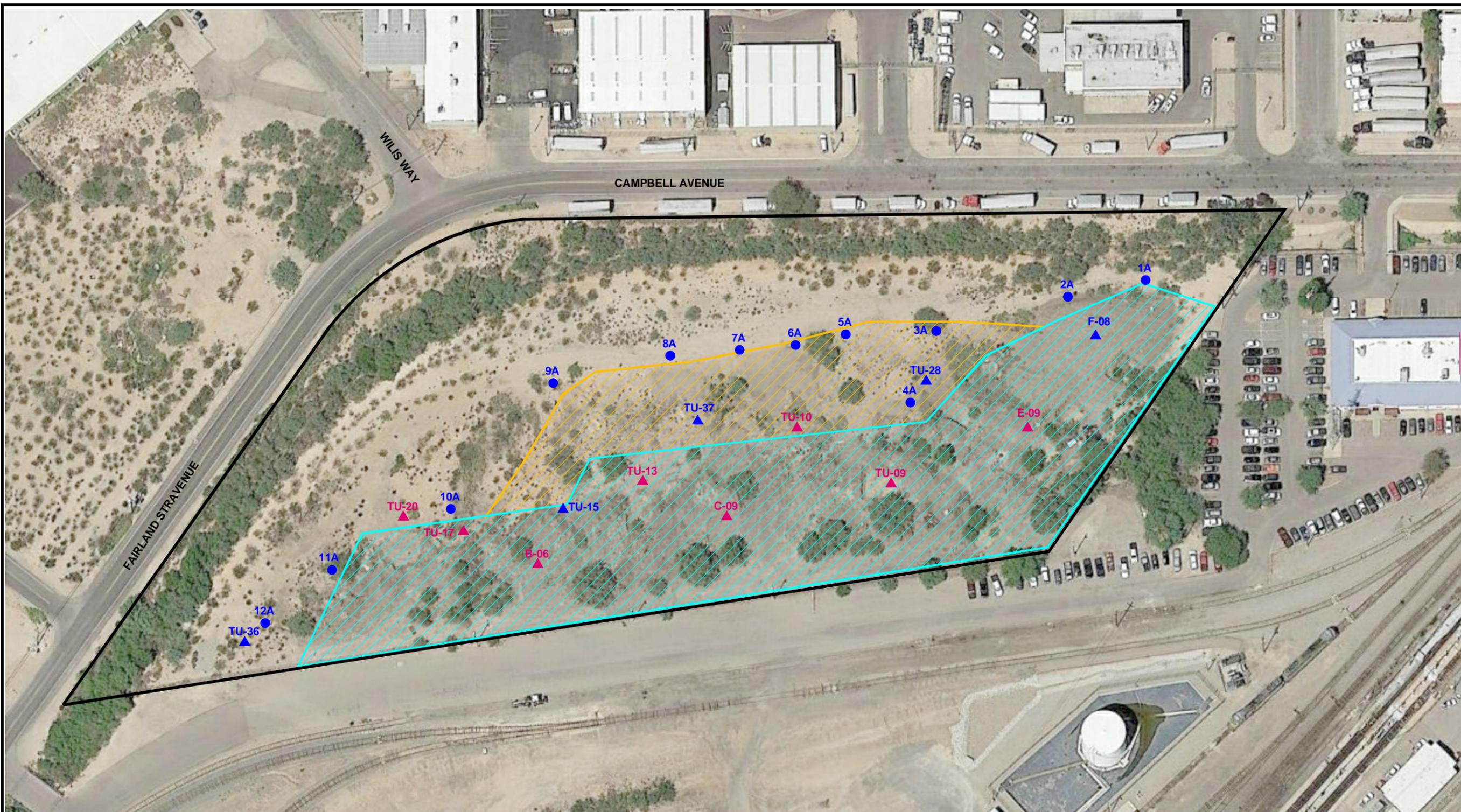
FIGURE 2
Extent of Debris Pile

WSP USA INC. TECHNOLOGY DR
13530 DULLES
SUITE 300
HERNDON, VA 20171
TEL: +1 703.708.6500



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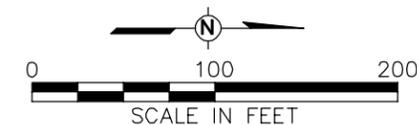
LEGEND

- ▲ SOIL SAMPLE (DAMES & MOORE 1998) (EXCEEDS SRL)
- ▲ SOIL SAMPLE (DAMES & MOORE 1998) (NO SRL EXCEEDANCES)
- SOIL SAMPLE (WSP 2019) (NO SRL EXCEEDANCES)
- ▨ EXTENT OF STAINED SOIL
- ▨ EXTENT OF DEBRIS PILES
- SITE BOUNDARY

NOTE:
 GREATER THAN 100 SOIL SAMPLES HAVE BEEN COLLECTED AT THE SITE, ONLY A REPRESENTATIVE SUBSET HAVE BEEN INCLUDED TO ILLUSTRATE DELINEATION IN THIS FIGURE.

R

DRAFT



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REFERENCE: AERIAL FROM GOOGLE EARTH, 8/18/2018.

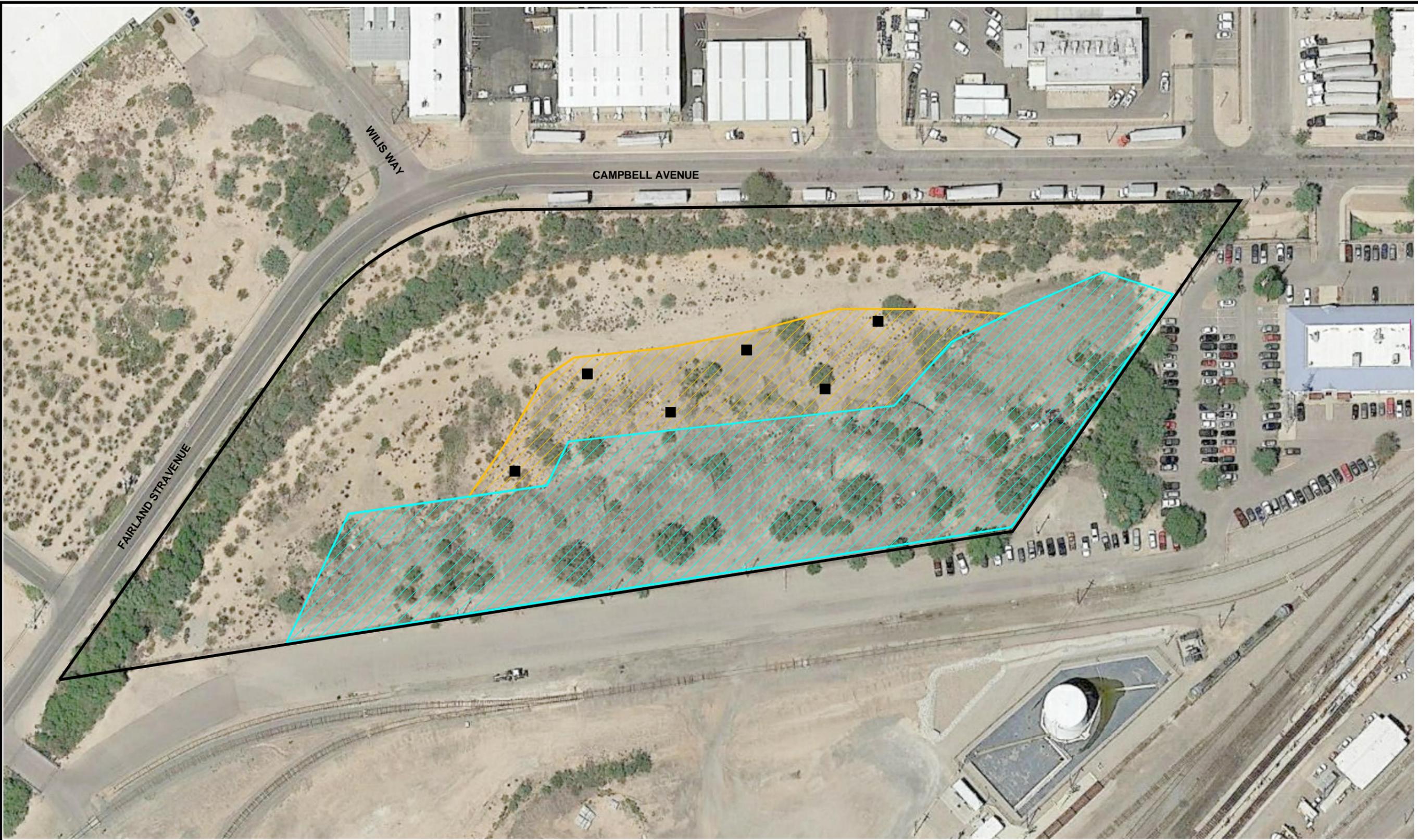
Drawn By: LS 4/20/2020
 Checked: ARK
 Approved:
 DWG Name: LF2004425.0093-001

CAMPBELL AVENUE SITE
 TUCSON, ARIZONA
 PREPARED FOR
 USPS

Figure 3
 HISTORICAL SITE DELINEATION

WSP USA, Inc.
 5615 DTC PARKWAY
 SUITE 500
 GREENWOOD VILLAGE, CO 80111
 TEL: +1 303.850.9200

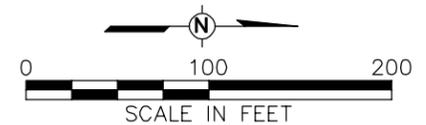
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LEGEND

- PROPOSED CONFIRMATION SOIL SAMPLING LOCATIONS (0-6" BGS)
- ▨ EXTENT OF STAINED SOIL
- ▨ EXTENT OF DEBRIS PILES
- SITE BOUNDARY

R



SCALE IN FEET
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REFERENCE: AERIAL FROM GOOGLE EARTH, 8/18/2018.

Drawn By: LS	4/21/2020
Checked: ARK	4/21/2020
Approved:	
DWG Name: LF2004425.00993-002	

CAMPBELL AVENUE SITE
TUCSON, ARIZONA
PREPARED FOR
USPS

Figure 4

PROPOSED CONFIRMATION SOIL SAMPLING

WSP USA, Inc.
5615 DTC PARKWAY
SUITE 500
GREENWOOD VILLAGE, CO 80111
TEL: +1 303.850.9200





APPENDIX A - WORK PLAN CHECKLIST

Voluntary Remediation Program Work Plan Checklist

Complete Shaded Areas and Submit with Work Plan

Site Name:		VRP Site Code:	
Volunteer/Applicant Name:			
Volunteer/Applicant Email Address and Phone:			
Authorized Agent (AA)/Consulting Company:			
AA/Consultant Email Address and Phone:			

Reference	Summary of Statutory Requirement	Page(s) Where Addressed in Work Plan	VRP Use Only
	<small>(please review all statutes in their entirety to ensure compliance)</small>	<small>(write N/A if not applicable)</small>	
§49-175A.1	Summary of existing site characterization and assessment information; information regarding any remediation previously conducted; copies of referenced reports not previously submitted;		<input type="checkbox"/>
§49-175A.2	If the site has not been characterized, a plan to conduct site characterization and a schedule for completion.		<input type="checkbox"/>
§49-175A.3.a	If site characterization is completed, a description of how the remediation will comply with §49-175B ("Work Plans") and how the completion of remediation will be verified. A schedule for completion must be included.		<input type="checkbox"/>
§49-175A.3.b	If site characterization is completed, the work plan may provide for the remediation to be conducted in phases or tasks. A schedule for completion must be included.		<input type="checkbox"/>
§49-175A.4	Schedule for submission of progress reports.		<input type="checkbox"/>
§49-175A.5	A proposal for community involvement as prescribed by §49-176 ("Community Involvement Requirements")		<input type="checkbox"/>
§49-175A.6	If known, a list of institutional or engineering controls necessary during remediation and after completion of the proposed remediation to control exposure to contaminants.		<input type="checkbox"/>
§49-175A.7	A proposal for monitoring during remediation and after the remediation if necessary to verify whether the approved remediation levels or controls have been attained and will be maintained.		<input type="checkbox"/>
§49-175A.8	A list of any permits or legal requirements known to apply to the work or already performed by the applicant.		<input type="checkbox"/>
§49-175A.9	If requested by the department, information regarding the financial capability of the applicant to conduct the work identified in the application. <i>(IF APPLICABLE)</i>		<input type="checkbox"/>

Voluntary Remediation Program Work Plan Checklist

Complete Shaded Areas and Submit with Work Plan

Site Name: _____ VRP Site Code: _____

Reference	Summary of Statutory Requirement	Page(s) Where Addressed in Work Plan	VRP Use Only
	(please review all statutes in their entirety to ensure compliance)	(write N/A if not applicable)	
§49-175B	Remediation levels or controls for remediation conducted pursuant to this article shall be established in accordance with rules adopted pursuant to §49-282.06 unless one or more of the following applies: see §49-175B.1 through §49-175B.4, below.		<input type="checkbox"/>
§49-175B.1	The applicant demonstrates that remediation levels, institutional controls, or engineering controls for remediation of contaminated soil comply with §49-152 and the rules adopted.		<input type="checkbox"/>
§49-175B.2	The applicant demonstrates that remediation levels, institutional controls, or engineering controls for remediation of landfills or other facilities that contain materials that are not subject to §49-152 (i.e.: asbestos) do not exceed a cumulative excess lifetime cancer risk between 1×10^{-4} to 1×10^{-6} , and a hazard index of no greater than 1.		<input type="checkbox"/>
§49-175B.3	The applicant demonstrates that on achieving remediation levels or controls for a source or potential source of contamination to a navigable water, the source of contamination will not cause or contribute to an exceedance of surface water quality standards, or if a permit is required pursuant to 33 United States Code §1342 for any discharge from the source, that any discharges from the source will comply with the permit.		<input type="checkbox"/>
§49-175B.4	The applicant demonstrates that, on achieving remediation levels or controls for a source of contamination to an aquifer, the source will not cause or contribute to an exceedance of aquifer water quality standards (AWQS) beyond the boundary of the facility where the source is located.		<input type="checkbox"/>
§49-175C	The VRP may waive any work plan requirement under this section that it determines to be unnecessary to make any of the determinations required under §49-177 . <i>If any waivers are requested in the Work Plan or have been previously requested and approved by the VRP, cite them in the Work Plan, including a citation of the statute for which the waiver applies.</i>		<input type="checkbox"/>

Voluntary Remediation Program Work Plan Checklist

Complete Shaded Areas and Submit with Work Plan

Site Name: _____

VRP Site Code: _____

To support the prerequisites established by A.R.S. §49-177 and §49-180, the VRP expects certain documentation to accompany a Work Plan. The following provides a list of attachments/exhibits which are recommended for submittal with a Work Plan to provide the information required by the statutes.

Work Plan Information	Title of Figure/Table/Attachment/Exhibit Where Requested Information is Cited <small>(write N/A if not applicable)</small>	Figure/Table/ Attachment or Report Page Number <small>(write N/A if not applicable)</small>	VRP Use Only
Site Location Map <i>(topographic or aerial)</i>			<input type="checkbox"/>
Site Map <i>(to scale)</i>			<input type="checkbox"/>
Historical Sampling Data Table			<input type="checkbox"/>
Historical Sample Location Map <i>(to scale)</i>			<input type="checkbox"/>
Proposed Sample Location Map <i>(to scale)</i>			<input type="checkbox"/>
Sampling and Analysis Plan <i>(includes Field Sampling Plan & Quality Assurance Plan)</i>			<input type="checkbox"/>
Proposed Remediation System Location Map			<input type="checkbox"/>
Proposed Remediation System Layout <i>(Design Drawings)</i>			<input type="checkbox"/>
Schedule for Implementation of Project Activities* <i>(Gantt Style Chart)</i>			<input type="checkbox"/>
<small>*Project Activities are defined in A.R.S. §§49-175A.2 through 49-175A.4, and 49-176A.2 (Community Involvement).</small>			
Proposed Language for Public Notification of Remediation <i>(i.e.: example signage)</i>			<input type="checkbox"/>
Plan for Investigative Derived Waste (IDW)			<input type="checkbox"/>
Evaluation of Remedial Alternatives <i>(i.e: for Feasibility Study Work Plan)</i>			<input type="checkbox"/>

DOES THE WORK PLAN PROPOSE IMPLEMENTING SITE-SPECIFIC REMEDIATION LEVELS?

Yes No

DOES THE WORK PLAN PROPOSE EVALUATION OF BACKGROUND LEVELS?

Yes No

NOTE: When reports are submitted which document any type of sampling activity, the submittal of Electronic Data per ADEQ's [Groundwater Data Submittal Guidance \(V3.4\)](#) is strongly recommended.



APPENDIX B – COMPREHENSIVE SOIL DATA SETS AND FIGURES

TABLES

-1998 Dames and Moore

**Table 1
Analytical Methods and Minimum Reporting Limits**

Analytes	Soil (Debris)			Water		
	Analytical Method	Minimum Reporting Limit	Units	Analytical Method	Minimum Reporting Limit	Units
Metals						
TCLP Cadmium	EPA 1311/6010A	0.050	mg/L	N/A	N/A	N/A
TCLP Chromium		0.050			N/A	
TCLP Lead		0.50			N/A	
Total Cadmium	EPA 6010A	0.50	mg/Kg	EPA 6010A	0.005	mg/L
Total Chromium		2.0			0.005	
Total Lead		2.5			0.05	
Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX)						
Benzene	EPA 8021A	0.050	mg/Kg	EPA 602	0.50	ug/L
Toluene		0.10			0.50	
Ethyl Benzene		0.10			0.50	
Total Xylenes		0.15			1.50	
Polychlorinated Biphenyls (PCBs)						
PCB-1016	EPA 8081	50	ug/Kg	EPA 8081	1.0	ug/L
PCB-1221		50			1.0	
PCB-1232		50			1.0	
PCB-1242		50			1.0	
PCB-1248		50			1.0	
PCB-1254		50			1.0	
PCB-1260		50			1.0	
Polynuclear Aromatic Hydrocarbons (PAHs)						
Acenaphthene	EPA 8310	50	ug/Kg	EPA 8310	0.50	ug/L
Acenaphthylene		50			0.50	
Anthracene		2			0.020	
Benz(a)anthracene		2			0.020	
Benzo(a)pyrene		2			0.020	
Benzo(b)fluoranthene		2			0.020	
Benzo(g,h,i)perylene		5			0.050	
Benzo(k)fluoranthene		2			0.020	
Chrysene		5			0.050	
Dibenz(a,h)anthracene		5			0.050	
Fluoranthene		5			0.050	
Fluorene		20			0.50	
Indeno(1,2,3-cd)pyrene		5			0.20	
Naphthalene		20			0.50	
Phenanthrene		5			0.050	
Pyrene		5			0.050	

NOTES:

mg/L = milligrams per liter

ug/L = micrograms per liter

mg/Kg = milligrams per kilogram

ug/Kg = micrograms per kilogram

Table 2
Analytical Results for TCLP Metals in Debris Samples

Sample Zone	Sample ID	Sample Depth (ft)	Sample Type	Sample Date	Analyte	Cadmium (TCLP) mg/L	Chromium (TCLP) mg/L	Lead (TCLP) mg/L
					Units	1.0	5.0	5.0
					TCLP Level			
A	A-01	0 - 1.0	P0	04/23/98		< 0.050	< 0.050	< 0.50
	A-02	0 - 1.5	P0	04/23/98		0.3	< 0.050	1.1 U,x
	A-03	0 - 1.0	P0	04/23/98		< 0.050	< 0.050	< 0.50
	A-04	0 - 2.0	P0	04/23/98		< 0.050	< 0.050	< 0.50
	A-05	0 - 1.5	P0	04/23/98		0.51	< 0.050	6.6
	A-06	0 - 1.0	P0	04/23/98		0.61	< 0.050	8.3
	A-07	0 - 3.0	P0	04/23/98		1.4	< 0.50	22
	A-08	0 - 2.0	P0	04/23/98		2.2	< 0.50	11
	A-09	0 - 3.5	P0	04/23/98		0.95	< 0.050	5.9
	A-10	0 - 5.5	P0	04/23/98		1.7	< 0.050	9.5
	A-10	0 - 5.5	D1	04/23/98		1.6	< 0.050	12
B	B-01	0 - 4.5	P0	04/23/98		11	< 0.050	9.9
	B-02	0 - 4.0	P0	04/23/98		4.3	< 0.050	25
	B-03	0 - 5.5	P0	04/23/98		1.9	< 0.050	44
	B-04	0 - 1.5	P0	04/23/98		0.59	< 0.050	7.6
	B-05	0 - 1.0	P0	04/23/98		0.57	< 0.050	5.8
	B-06	0 - 3.3	P0	04/23/98		0.65	< 0.050	8.1
	B-07	0 - 3.5	P0	04/23/98		0.71	< 0.050	4.8
	B-08	0 - 4.0	P0	04/23/98		1.2	< 0.050	15
	B-08	0 - 4.0	D1	04/23/98		0.73	< 0.050	7.3
	B-09	0 - 4.0	P0	04/23/98		2.7	< 0.050	27
	B-10	0 - 1.5	P0	04/23/98		< 0.050	< 0.050	15
C	C-01	0 - 4.0	P0	04/24/98		0.72	< 0.050	11
	C-02	0 - 2.0	P0	04/24/98		0.83	< 0.050	5.9
	C-02	0 - 2.0	D1	04/24/98		0.77	< 0.050	6.9
	C-03	0 - 5.3	P0	04/24/98		1.4	< 0.050	29
	C-04	0 - 2.8	P0	04/24/98		0.41	< 0.050	0.92 U,x
	C-05	0 - 1.5	P0	04/24/98		0.25	< 0.050	1.4 U,x
	C-06	0 - 2.0	P0	04/24/98		0.59	< 0.050	14
	C-07	0 - 2.8	P0	04/24/98		0.34	< 0.050	1.6 U,x
	C-08	0 - 4.0	P0	04/24/98		1.3	< 0.050	8.1
	C-09	0 - 2.7	P0	04/24/98		1.4	< 0.050	13
	C-10	0 - 2.0	P0	04/24/98		2	< 0.050	21
D	D-01	0 - 3.5	P0	04/24/98		1.2	< 0.050	23
	D-01	0 - 3.5	D1	04/24/98		0.96	< 0.050	15
	D-02	0 - 1.5	P0	04/24/98		2.1	< 0.050	21
	D-03	0 - 1.5	P0	04/24/98		0.3	< 0.050	5.8 U,x
	D-04	0 - 4.0	P0	04/24/98		0.46	< 0.050	14
	D-05	0 - 3.5	P0	04/24/98		2.7	< 0.050	36
	D-06	0 - 2.0	P0	04/24/98		0.67	< 0.050	12
	D-07	0 - 4.5	P0	04/24/98		0.57	< 0.050	3.7 U,x
	D-08	0 - 3.0	P0	04/24/98		0.37	< 0.050	9.5
	D-09	0 - 1.5	P0	04/24/98		1.2	< 0.050	15
	D-10	0 - 1.5	P0	04/24/98		1.3	< 0.050	17

Table 2
Analytical Results for TCLP Metals in Debris Samples

Sample Zone	Sample ID	Sample Depth (ft)	Sample Type	Sample Date	Analyte Units TCLP Level	Cadmium (TCLP)	Chromium (TCLP)	Lead (TCLP)
						mg/L 1.0	mg/L 5.0	mg/L 5.0
E	E-01	0 - 1.0	P0	04/24/98		3.4	< 0.050	19
	E-02	0 - 5.0	P0	04/24/98		1.4	< 0.050	24
	E-03	0 - 7.0	P0	04/24/98		0.92	< 0.050	13
	E-04	0 - 3.3	P0	04/24/98		1.5	< 0.050	16
	E-05	0 - 1.5	P0	04/27/98		0.87	< 0.050	18
	E-06	0 - 3.5	P0	04/27/98		< 0.050	< 0.050	< 0.50
	E-07	0 - 4.5	P0	04/24/98		1.5	< 0.050	6.4
	E-07	0 - 4.5	D1	04/24/98		1.1	< 0.050	6.2
	E-08	0 - 4.0	P0	04/27/98		0.95	< 0.050	16
	E-09	0 - 3.5	P0	04/27/98		0.3	< 0.050	16
	E-10	0 - 3.0	P0	04/27/98		1.8	< 0.050	7.8
F	F-01	0 - 5.0	P0	04/27/98		1.8	< 0.050	14
	F-02	0 - 1.5	P0	04/27/98		1.2	< 0.050	8.8
	F-03	0 - 3.0	P0	04/27/98		1.2	< 0.050	11
	F-04	0 - 4.0	P0	04/27/98		0.76	< 0.050	12
	F-05	0 - 4.5	P0	04/27/98		1.2	< 0.050	13
	F-05	0 - 4.5	D1	04/27/98		1.4	< 0.050	15
	F-06	0 - 4.5	P0	04/27/98		0.5	< 0.050	4.6
	F-07	0 - 5.5	P0	04/27/98		1.8	< 0.050	8.6
	F-08	0 - 5.1	P0	04/27/98		0.66	< 0.050	4
	F-09	0 - 5.0	P0	04/27/98		1.1	< 0.050	6.1
	F-10	0 - 6.5	P0	04/27/98		0.48	< 0.050	4
G	G-01	0 - 0.3	P0	04/27/98		< 0.050	< 0.050	< 0.50
	G-01	0 - 0.3	D1	04/27/98		< 0.050	< 0.050	< 0.50
	G-02	0 - 0.3	P0	04/27/98		< 0.050	< 0.050	< 0.50
	G-03	0 - 0.3	P0	04/27/98		< 0.050	< 0.050	< 0.50
	G-04	0 - 0.3	P0	04/27/98		< 0.050	< 0.050	< 0.50

NOTES:

Sample Type: P0 = Field Original; D1 = Field Duplicate

TCLP = Toxicity Characteristic Leaching Procedure

mg/L = milligrams per liter

Values that exceed the TCLP level are indicated by boldface type and bold outline.

U,x = Analyte not detected above the reported sample quantitation limit due to equipment blank contamination

Table 3
Analytical Results for Total Metals in Debris Samples (Zone G)

Sample Zone	Sample ID	Sample Depth (ft)	Sample Type	Sample Date	Analyte Units SRL	Cadmium (Total) mg/Kg 38	Chromium (Total) mg/Kg 2100	Lead (Total) mg/Kg 400
G	G-01	0 - 0.5	P0	04/27/98		2.8	11	160
	G-01	0 - 0.5	D1	04/27/98		2.5	10	150
	G-02	0 - 0.5	P0	04/27/98		1.9	7.4	77
	G-03	0 - 0.5	P0	04/27/98		3.1	7.5	130
	G-04	0 - 0.5	P0	04/27/98		2.1	5.9	78

NOTES:

Sample Type: P0 = Field Original; D1 = Field Duplicate

SRL = Arizona Soil Remediation Level (residential)

mg/Kg = milligrams per kilogram

Table 4
Analytical Results for TCLP Metals and Total Lead in Debris Samples (1994)

Analyte			Arsenic (TCLP)	Barium (TCLP)	Cadmium (TCLP)	Chromium (TCLP)	Lead (TCLP)	Lead (Total)	Mercury (TCLP)	Selenium (TCLP)	Silver (TCLP)
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/Kg	mg/L	mg/L	mg/L
Regulatory Level (TCLP/SRL)			5	100	1	5	5	400	0.2	1	5
Sample ID	Sample Depth (ft)	Sample Date									
TU-05	2.5 - 3.0	2/28/94	--	--	--	--	--	1,900	--	--	--
TU-06A	0.6 - 1.0	2/28/94	--	--	--	--	--	23,600	--	--	--
TU-07	2.0 - 2.5	2/28/94	--	--	--	--	--	990	--	--	--
TU-08	1.5 - 3.0	2/28/94	<0.01	<0.1	0.554	0.02	0.75	--	<0.0010	<0.005	0.06
TU-09	2.0 - 3.0	2/28/94	--	--	--	--	--	50,300	--	--	--
TU-10A	2.0 - 2.5	2/28/94	0.022	<0.1	7.16	0.03	13.8	--	0.0012	<0.005	0.07
TU-11	1.5 - 2.0	2/28/94	--	--	--	--	--	357	--	--	--
TU-12A	2	2/28/94	0.016	0.3	0.723	0.03	3.53	--	<0.0010	<0.010	0.04
TU-13A	2	2/28/94	--	--	--	--	--	5,580	--	--	--
TU-14A	1.0 - 1.3	2/28/94	0.01	0.7	1.14	0.04	19	--	<0.0010	<0.005	0.04
TU-16	0 - 1.0	3/1/94	<0.01	0.4	1.36	0.02	2.4	--	<0.0010	<0.010	0.05
TU-17A	1.5 - 3.0	3/1/94	<0.01	<0.1	1.09	0.03	1.34 J,f	--	<0.0010	<0.010	0.06
TU-17B (dup)	1.5 - 3.0	3/1/94	<0.01	<0.1	2.26	0.03	4.64 J,f	--	<0.0010	<0.010	0.07
TU-18	1.5 - 3.0	3/1/94	<0.01	0.1	0.527	0.03	3.89	--	<0.0010	<0.010	0.07
TU-19	0.2 - 0.5	3/1/94	--	--	--	--	--	2,810	--	--	--
TU-20A	2.0 - 2.5	3/1/94	--	--	--	--	--	3,140	--	--	--
TU-20B (dup)	2.0 - 2.5	3/1/94	--	--	--	--	--	3,060	--	--	--
TU-21	0.5 - 1.0	3/1/94	--	--	--	--	--	1,960	--	--	--
TU-22A	0.2 - 0.6	3/1/94	0.018	0.2	1.4	0.03	4.04	--	<0.0010	<0.010	0.06
TU-23A	0.8 - 1.2	3/1/94	<0.01	0.3	0.096	0.02	0.14	--	<0.0010	<0.010	0.04
TU-25A	2.0 - 2.5	3/1/94	0.01	0.1	1.87	0.03	7.24	--	<0.0010	<0.010	0.06
TU-25B	4.5 - 6.0	3/1/94	--	--	--	--	--	1,640	--	--	--

NOTES:

Debris samples collected, analyzed and reported by Huntington Engineering and Environmental, Inc. (Huntingdon, 1994).

Laboratory data validated by Dames & Moore (1998).

TCLP = Toxicity Characteristic Leaching Procedure

SRL = Arizona Soil Remediation Level (residential)

mg/L = milligrams per liter

mg/Kg = milligrams per kilogram

Values that exceed the regulatory level are indicated by boldface type and bold outline.

J,f = Value estimated due to field duplicate imprecision

Table 5
Analytical Results for Organic Compounds in Composite Debris Samples

Sample ID	A-01 to A-10	B-01 to B-10	C-01 to C-10	D-01 to D-10	E-01 to E-10	F-01 to F-10	Residential	
Sample Date	04/23/98	04/23/98	04/24/98	04/24/98	04/27/98	04/27/98	SRL	
Sample Type	P0	P0	P0	P0	P0	P0		
Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX)								
Benzene	mg/Kg	< 0.050	< 0.050	0.09	< 0.050	< 0.050	< 0.050	0.62
Toluene	mg/Kg	< 0.10	< 0.10	0.14	< 0.10	< 0.10	< 0.10	790.0
Ethyl Benzene	mg/Kg	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1500.0
Total Xylenes	mg/Kg	< 0.15	< 0.15	0.24	< 0.15	< 0.15	< 0.15	2800.0
Polychlorinated Biphenyls (PCBs)								
PCB-1016	ug/Kg	< 500	< 1,000	< 1,000	< 500	< 1,000	< 50	N/A
PCB-1221	ug/Kg	< 500	< 1,000	< 1,000	< 500	< 1,000	< 50	N/A
PCB-1232	ug/Kg	< 500	< 1,000	< 1,000	< 500	< 1,000	< 50	N/A
PCB-1242	ug/Kg	< 500	< 1,000	< 1,000	< 500	< 1,000	< 50	N/A
PCB-1248	ug/Kg	520	< 1,000	< 1,000	< 500	< 1,000	200	N/A
PCB-1254	ug/Kg	< 500	1,500 J,l	1,500 J,l	590 J,l	1,300 J,l	< 50	N/A
PCB-1260	ug/Kg	< 500	< 1,000	< 1,000	< 500	< 1,000	460	N/A
Polynuclear Aromatic Hydrocarbons (PAHs)								
Acenaphthene	ug/Kg	< 1,300	< 1,300	< 2,000	< 2,000	< 10,000	< 2,500	3,900,000
Acenaphthylene	ug/Kg	< 1,300	< 1,300	< 2,000	< 2,000	< 10,000	< 2,500	N/A
Anthracene	ug/Kg	< 50	< 50	< 80	< 80	< 400	< 100	20,000,000
Benz(a)anthracene	ug/Kg	190	230	460	340 U,x	870 U,x	160 U,x	6,100
Benzo(a)pyrene	ug/Kg	200	230	410	340	2,400 U,x	240 U,x	610
Benzo(b)fluoranthene	ug/Kg	140	170	320	220 U,x	690 U,x	130 U,x	6,100
Benzo(g,h,i)perylene	ug/Kg	260	300	570	430	2,000 U,x	360	N/A
Benzo(k)fluoranthene	ug/Kg	91	100	180	160	780 U,x	110	61,000
Chrysene	ug/Kg	370	780	970	580	< 1,000	< 250	610,000
Dibenz(a,h)anthracene	ug/Kg	320	310	530	510	< 1,000	380	610
Fluoranthene	ug/Kg	430	910	860	960	1,400	390	2,600,000
Fluorene	ug/Kg	< 500	< 500	< 800	< 800	< 4,000	< 1,000	2,600,000
Indeno(1,2,3-cd)pyrene	ug/Kg	140	260	440	360	2,100	< 250	6,100
Naphthalene	ug/Kg	< 500	< 500	< 800	< 800	< 4,000	< 1,000	2,600,000
Phenanthrene	ug/Kg	180	240	410 U,x	400 U,x	< 1,000	< 250	N/A
Pyrene	ug/Kg	320	490	570	540 U,x	1,700 U,x	340 U,x	2,000,000

NOTES:

Sample Type: P0 = Field Original; D1 - Field Duplicate

mg/Kg = milligrams per kilogram

ug/Kg = micrograms per kilogram

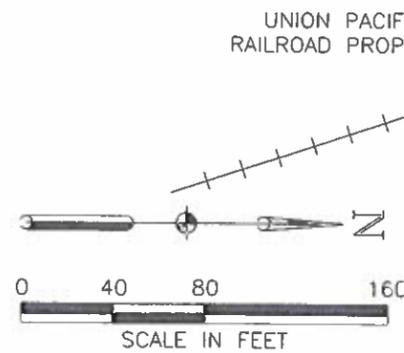
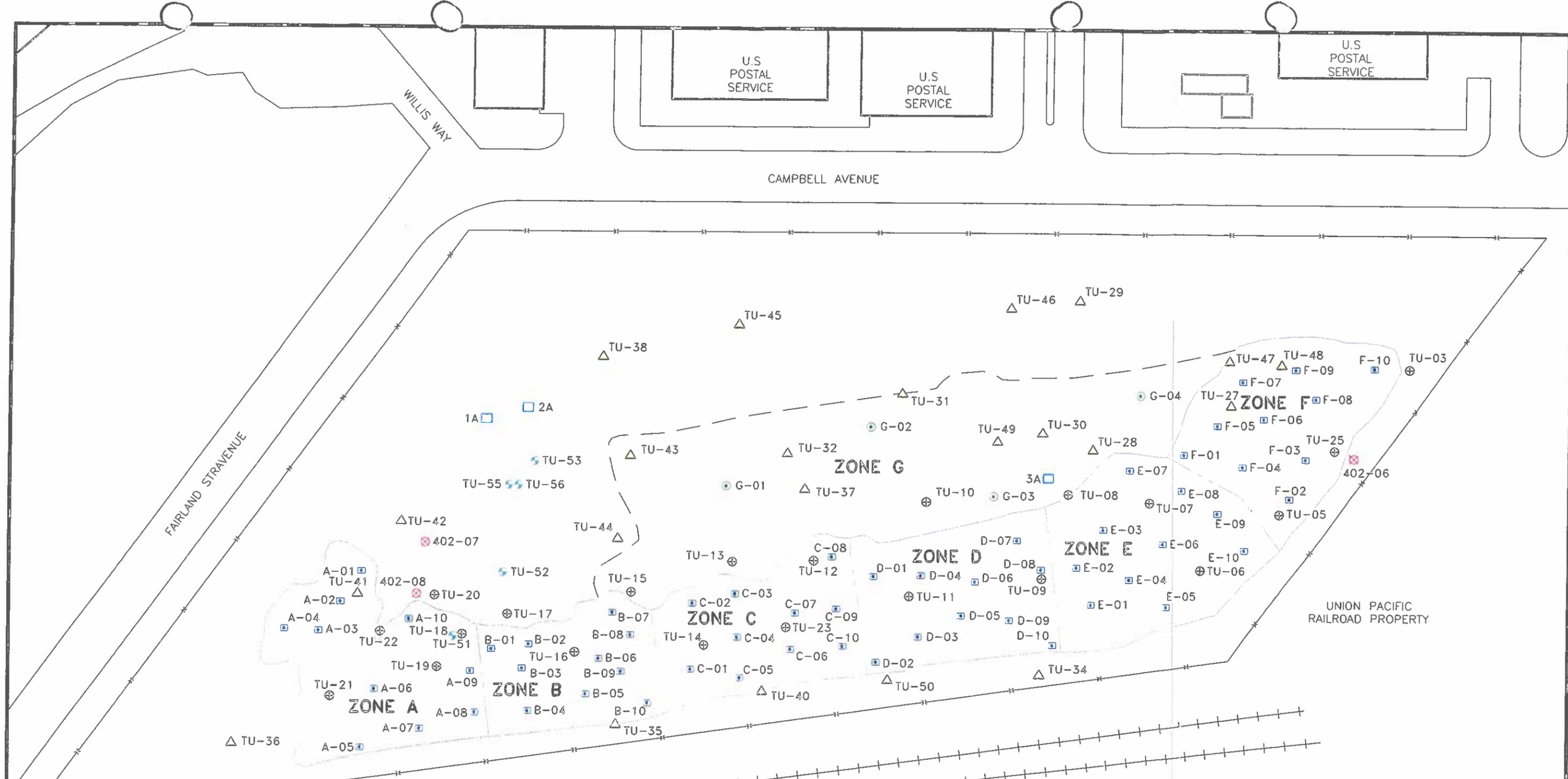
J,l = Value estimated due to laboratory control sample recovery failure.

U,x = Analyte not detected above the reported sample quantitation limit due to equipment blank contamination.

SRL = Arizona Soil Remediation Level

N/A = not applicable (SRL has not been established)

CAMPBELL_AVE-01.DWG



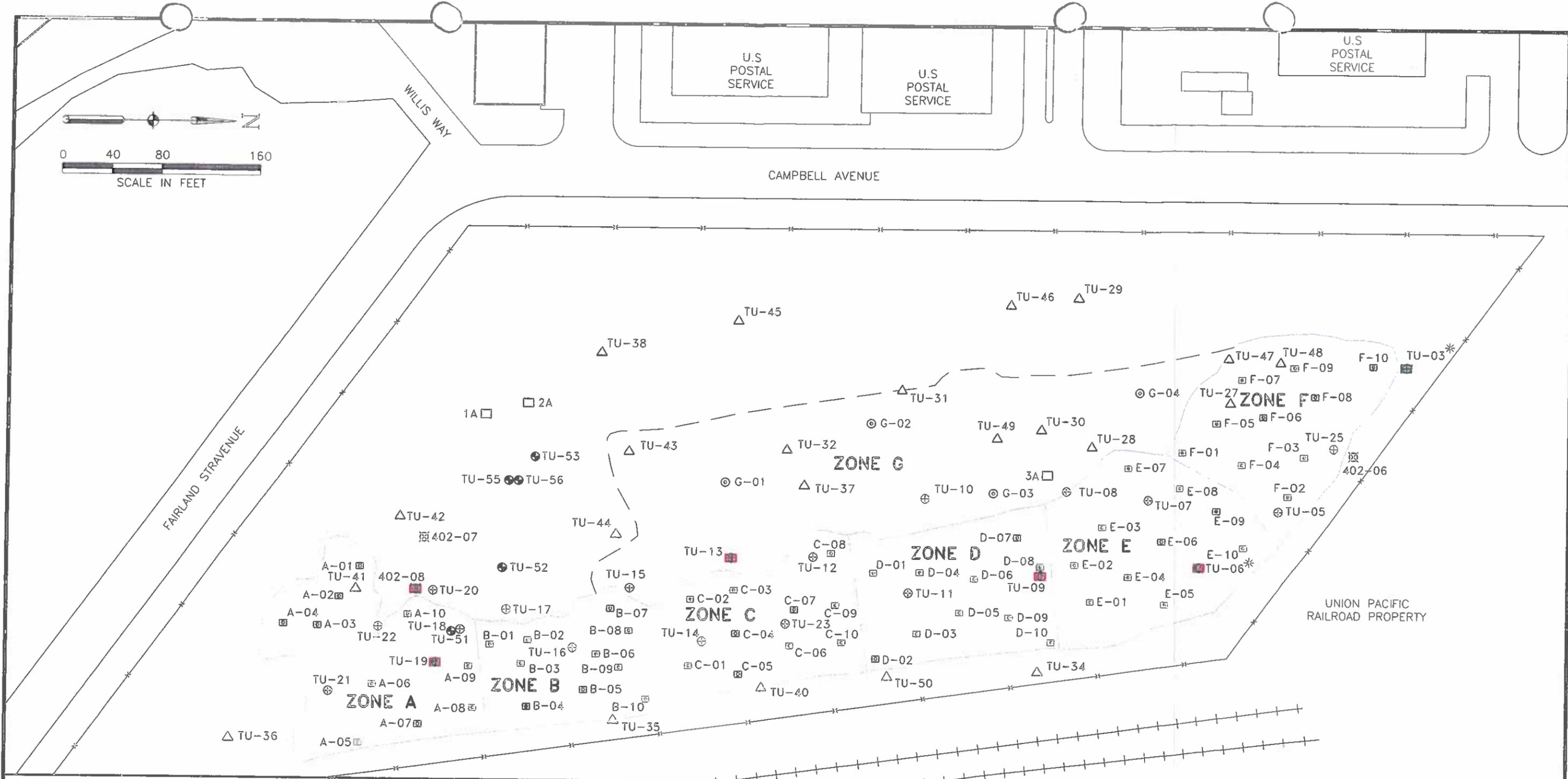
LEGEND

- TU-31 Δ SOIL BORING SAMPLE LOCATION (HUNTINGDON, 1994)
- TU-10 \oplus DEBRIS AND SOIL BORING SAMPLE LOCATION (HUNTINGDON, 1994)
- TU-55 ⚡ MATERIAL SAMPLE LOCATION (HUNTINGDON, 1994)
- 1A \square HAZARD MITIGATION AND DEBRIS INVENTORY SOIL SAMPLE LOCATION (HUNTINGDON CHEN NORTHERN INC., 1993)
- 402-07 \otimes PHASE I SOIL SAMPLE LOCATION (CHEN NORTHERN, INC., 1992)
- B-03 ⊞ DEBRIS SAMPLE (DAMES AND MOORE, 1998)
- G-01 \odot DEBRIS SURFACE SAMPLE (DAMES AND MOORE, 1998)
- ZONE A** DEBRIS CHARACTERIZATION ZONE BOUNDARY (DAMES AND MOORE 1998)
- $\text{---}\times\text{---}$ FENCE LINE
- $\text{---}\text{---}\text{---}$ BOUNDARY OF MAIN DEBRIS STOCKPILE
- $\text{---}\text{---}\text{---}$ BOUNDARY OF AREA COVERED BY <0.5-FT. OF DEBRIS
- $\text{---}\text{---}\text{---}$ ZONE BOUNDARY

FIGURE 1
SAMPLE LOCATIONS

CAMPBELL AVENUE SITE
TUCSON, ARIZONA

URS 8181 East Tufts Avenue
Denver, CO 80237-2637
(303) 694-2770



LEGEND

TU-31 △ SOIL BORING SAMPLE LOCATION (HUNTINGDON, 1994)

TU-10 ⊕ DEBRIS AND SOIL BORING SAMPLE LOCATION (HUNTINGDON, 1994)

TU-55 ⊙ MATERIAL SAMPLE LOCATION (HUNTINGDON, 1994)

1A □ HAZARD MITIGATION AND DEBRIS INVENTORY SOIL SAMPLE LOCATION (HUNTINGDON CHEN NORTHERN INC., 1993)

402-07 ▨ PHASE I SOIL SAMPLE LOCATION (CHEN NORTHERN, INC., 1992)

B-03 ▨ DEBRIS SAMPLE (DAMES AND MOORE, 1998)

G-01 ⊙ DEBRIS SURFACE SAMPLE (DAMES AND MOORE, 1998)

—*—*— FENCE LINE

--- BOUNDARY OF MAIN DEBRIS STOCKPILE

— BOUNDARY OF AREA COVERED BY <0.5-FT. OF DEBRIS

--- ZONE BOUNDARY

ZONE A DEBRIS CHARACTERIZATION ZONE BOUNDARY (DAMES AND MOORE 1998)

GPL GROUNDWATER PROTECTION LEVEL

SRL ARIZONA SOIL REMEDIATION LEVEL

TCLP TOXICITY CHARACTERISTIC LEACHING PROCEDURE

* SOIL EXCEEDS GPL FOR LEAD

DEBRIS

▨ EXCEEDS NON-RESIDENTIAL SRL FOR LEAD

□ EXCEEDS TCLP FOR LEAD AND/OR CADMIUM

NATIVE SOIL

▨ EXCEEDS NON-RESIDENTIAL SRL FOR LEAD

FIGURE 2

LOCATIONS EXCEEDING STANDARDS FOR LEAD AND CADMIUM

CAMPBELL AVENUE SITE
TUCSON, ARIZONA

URS 8181 East Tufts Avenue
Denver, CO 80237-2637
(303) 694-2770

CAMPBELL_AVE-02.DWG

-2013 HDR Environmental

Table 3. Confirmation Soil Sample Results- Native Soil Beneath Treated Hotspots

Analyte	AZDEQ Residential SRLs	HDR-TU7-001	HDR-TU7-002	HDR-TU6-001	HDR-TU6-002	HDR-TU5-001	HDR-TU5-002	HDR-TU25-001	HDR-TU25-002	HDR-TU9-001
Total Lead (mg/kg)	400	25	110	6.6	8.9	11	15	6.0	14	32
Total Cadmium (mg/kg)	39	0.89	1.9	ND	ND	ND	ND	ND	ND	0.95
Notes: AZDEQ = Arizona Department of Environmental Quality Native surface soil samples collected by HDR at 3 to 6" below ground surface. J = result estimated ND = not detected mg/kg = milligrams per kilogram										

Table 3 (continued). Confirmation Soil Sample Results- Native Soil Beneath Treated Hotspots

Analyte and Sample Type	AZDEQ Residential SRLs	HDR-TU9-002	HDR-TU13-001	HDR-TU13-002	HDR-TU21-001	HDR-TU21-002	HDR-TU20-001	HDR-TU20-002	HDR-TU19-001	HDR-TU19-002
Total Lead (mg/kg)	400	120	21	17	32	5.5	7.0	7.3	150	6.8
Total Cadmium (mg/kg)	39	16	ND	ND	0.71	ND	ND	ND	6.3	ND
Notes: AZDEQ = Arizona Department of Environmental Quality Native surface soil samples collected by HDR at 3 to 6" below ground surface. J = result estimated ND = not detected mg/kg = milligrams per kilogram * = HDR-TU13-002 duplicate sample results – Total Lead 10 mg/kg; Total Cadmium ND.										

- 2019 WSP

Sample ID:	1A-1	1A-2	2A-1	2A-2	3A-1	3A-2	4A-1	4A-2	5A-1	5A-2	6A-1	6A-2	7A-1	7A-2	8A-1	8A-2	9A-1	9A-2	10A-1	10A-2	11A-1	11A-2	12A-1	12A-2	
ANAYLYE (ADEQ Residential SRLs) (mg/kg)																									
Arsenic (10)	4.6	4.6	4.3	3.7	4.1	ND	ND	ND	5	ND	-	ND	ND	ND	4.1	4.9	ND	ND							
Barium (15,000)	150	160	190	150	96	98	140	140	70	88	-	75	59	86	98	85	160	84	89	84	120	100	90	80	
Cadmium (39)	0.72	0.76	0.94	0.74	ND	ND	ND	0.68	ND	ND	-	ND	ND	ND	ND	ND	0.68	ND	ND	ND	ND	ND	ND	ND	
Chromium (30)	11	12	12	10	12	11	13	10	5	7.1	-	8.5	3.5	6.8	11	11	10	11	11	10	9.8	9.3	11	9.2	
Lead (400)	36	57	55	38	14	20	23	21	13	25	-	21	27	23	94	37	70	34	12	12	24	20	18	13	
Mercury (23)	ND	-	ND	ND	ND	ND	ND	ND																	
Selenium (390)	ND	-	ND	ND	ND	ND	ND	ND																	
Silver (390)	ND	-	ND	ND	ND	ND	ND	ND																	
ANAYLYE (ADEQ Non-Residential SRLs) (mg/kg)																									
Arsenic (10)	4.6	4.6	4.3	3.7	4.1	ND	ND	ND	5	ND	-	ND	ND	ND	4.1	4.9	ND	ND							
Barium (170,000)	150	160	190	150	96	98	140	140	70	88	-	75	59	86	98	85	160	84	89	84	120	100	90	80	
Cadmium (510)	0.72	0.76	0.94	0.74	ND	ND	ND	0.68	ND	ND	-	ND	ND	ND	ND	ND	0.68	ND	ND	ND	ND	ND	ND	ND	
Chromium (65)	11	12	12	10	12	11	13	10	5	7.1	-	8.5	3.5	6.8	11	11	10	11	11	10	9.8	9.3	11	9.2	
Lead (800)	36	57	55	38	14	20	23	21	13	25	-	21	27	23	94	37	70	34	12	12	24	20	18	13	
Mercury (310)	ND	-	ND	ND	ND	ND	ND	ND																	
Selenium (5,100)	ND	-	ND	ND	ND	ND	ND	ND																	
Silver (5,100)	ND	-	ND	ND	ND	ND	ND	ND																	
ANAYLYE (ADEQ GPL) (mg/kg)																									
Arsenic (290)	4.6	4.6	4.3	3.7	4.1	ND	ND	ND	5	ND	-	ND	ND	ND	4.1	4.9	ND	ND							
Barium (NA)	150	160	190	150	96	98	140	140	70	88	-	75	59	86	98	85	160	84	89	84	120	100	90	80	
Cadmium (29)	0.72	0.76	0.94	0.74	ND	ND	ND	0.68	ND	ND	-	ND	ND	ND	ND	ND	0.68	ND	ND	ND	ND	ND	ND	ND	
Chromium (590)	11	12	12	10	12	11	13	10	5	7.1	-	8.5	3.5	6.8	11	11	10	11	11	10	9.8	9.3	11	9.2	
Lead (290)	36	57	55	38	14	20	23	21	13	25	-	21	27	23	94	37	70	34	12	12	24	20	18	13	
Mercury (12)	ND	-	ND	ND	ND	ND	ND	ND																	
Selenium (290)	ND	-	ND	ND	ND	ND	ND	ND																	
Silver (NA)	ND	-	ND	ND	ND	ND	ND	ND																	
ANAYLYE (ADEQ SPLP) (mg/l)																									
Arsenic	x	ND	ND	ND	x	x	x	x	ND	x	x	x	x	x	ND	x	ND	ND	x	x	x	ND	x	x	
Barium	x	ND	ND	ND	x	x	x	x	ND	x	x	x	x	x	ND	x	ND	ND	x	x	x	ND	x	x	
Cadmium	x	ND	ND	ND	x	x	x	x	ND	x	x	x	x	x	ND	x	ND	ND	x	x	x	ND	x	x	
Chromium	x	ND	ND	ND	x	x	x	x	ND	x	x	x	x	x	ND	x	ND	ND	x	x	x	ND	x	x	
Lead	x	ND	ND	ND	x	x	x	x	ND	x	x	x	x	x	ND	x	ND	ND	x	x	x	ND	x	x	
Mercury	x	ND	ND	ND	x	x	x	x	ND	x	x	x	x	x	ND	x	ND	ND	x	x	x	ND	x	x	
Selenium	x	ND	ND	ND	x	x	x	x	ND	x	x	x	x	x	ND	x	ND	ND	x	x	x	ND	x	x	
Silver	x	ND	ND	ND	x	x	x	x	ND	x	x	x	x	x	ND	x	ND	ND	x	x	x	ND	x	x	



APPENDIX C – ENGINEERING DESIGN AND DRAFT CONSTRUCTION SPECIFICATION

UNITED STATES POSTAL SERVICE TUCSON CAMPBELL AVENUE SITE SITE REMEDIATION



SOURCE: U.S.C.S. TUCSON AZ QUADRANGLE

LOCATION PLAN

SCALE: 1" = 2000'

SITE LOCATION

LIST OF DRAWINGS	
DRAWING NUMBER	DRAWING TITLE
1	COVER SHEET
2	EXISTING CONDITIONS
3	PROPOSED CONDITIONS
4	CONSTRUCTION DETAILS

No.	DATE	REVISION
C		
B		
A		



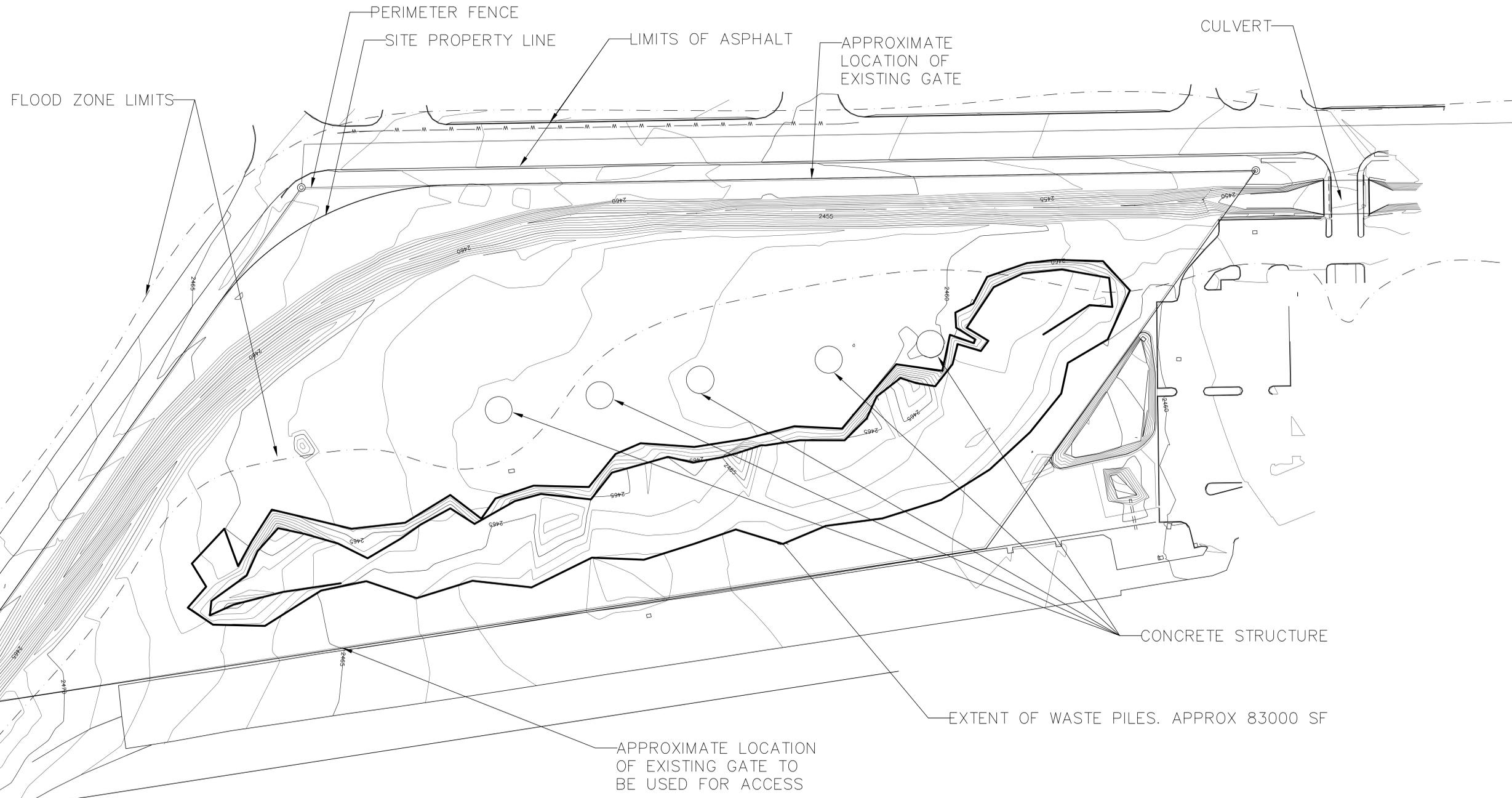
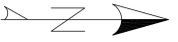
TUCSON CAMPBELL AVENUE SITE
SITE REMEDIATION

COVER SHEET

wsp WSP
5163 DTC PARKWAY, SUITE 500
GREENWOOD VILLAGE, CO 80111-3033

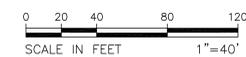
DRAWN BY: HA
CHECKED BY: DM
APPROVED BY:

SCALE: AS SHOWN DATE: APRIL 9, 2020 PROJECT NO.: 2004425.0093 SHEET NO.: 1 OF 4



NOTES:

1. BASE MAP BASED ON "ALTA/ACSM LAND TITLE SURVEY" CONDUCTED IN AUGUST, 2011.
2. THE CONTOUR INTERVAL FOR THE TOPOGRAPHY SHOWN IS 1' BASED ON CITY OF TUCSON (NAVD88) DATUM.
3. NO GUARANTEE CAN BE MADE AS TO THE EXISTENCE OR LOCATION OF UNDERGROUND OR HIDDEN UTILITIES.
4. ALTHOUGH NO EARTH MOVING OR BUILDING CONSTRUCTION WAS OBSERVED DURING THE COURSE OF THE SURVEY, NO GUARANTEE CAN BE MADE THAT NONE HAS OCCURRED OR IS OCCURRING.



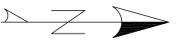
No.	DATE	REVISION
C		
B		
A		



**TUCSON CAMPBELL AVENUE SITE
SITE REMEDIATION**

EXISTING CONDITIONS

	WSP 5613 DTC PARKWAY, SUITE 500 GREENWOOD VILLAGE, CO 80111-3033	DRAWN BY: HA CHECKED BY: DM APPROVED BY: CC
	SCALE: AS SHOWN	DATE: APRIL 9, 2020



FUTURE DEVELOPER/SITE USER TO CONSTRUCT BRIDGE OVER CHANNEL

TEMPORARY SOIL STOCKPILE INCLUDING SILT FENCE (D-2). CONTRACTOR MAY PROPOSE ALTERNATE SIZE AND LOCATIONS.

SPREAD BULKY WASTE AT BASE OF WASTE PILES PRIOR TO STARTING GRADING OPERATIONS

APPROXIMATE LOCATION OF EXISTING GATE

CAP LIMITS (D-4 THROUGH D-6). APPROX 180000 SF

LIMIT OF DISTURBANCE AND SILT FENCE (D-1). APPROX 2500 LF.

EXISTING GRADES

BURY CONCRETE

PROPOSED SITE ACCESS ROUTE. REQUIRES EASEMENT AGREEMENT WITH OWNER

STABILIZED CONSTRUCTION ACCESS (D-3). SIZE AND LAYOUT MAY VARY. BUILD 2'-4" TO 2'-6" ABOVE FINAL TOP OF CAP AND TRANSITION TO SURROUNDING CAP GRADES (DASHED LINE).

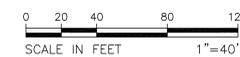
GATE SHALL BE IN ACCORDANCE WITH ARIZONA DOT DETAIL FOR DOUBLE GATE SHOWN ON DRAWING NO. C-12.20. GATE OPENING SHALL BE 25 FEET.

PROPOSED CAP GRADES

SWALE CENTERLINE (D-4)

SITE PROPERTY FENCE

LEGEND
-2464- PROPOSED CONTOUR



C		
B		
A		
No.	DATE	REVISION

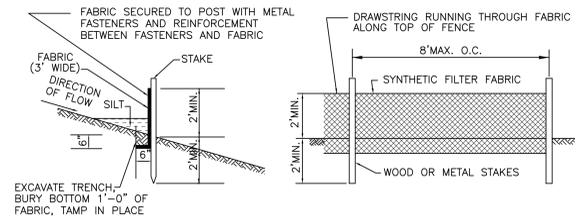


TUCSON CAMPBELL AVENUE SITE
SITE REMEDIATION

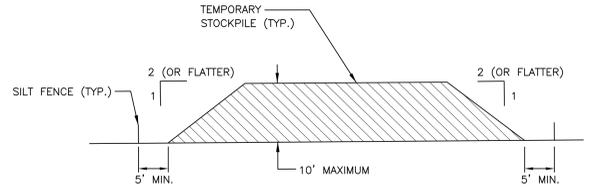
PROPOSED CONDITIONS

	WSP 5613 DTC PARKWAY, SUITE 500 GREENWOOD VILLAGE, CO 80111-3033	DRAWN BY: HA
		CHECKED BY: DM
		APPROVED BY: CC

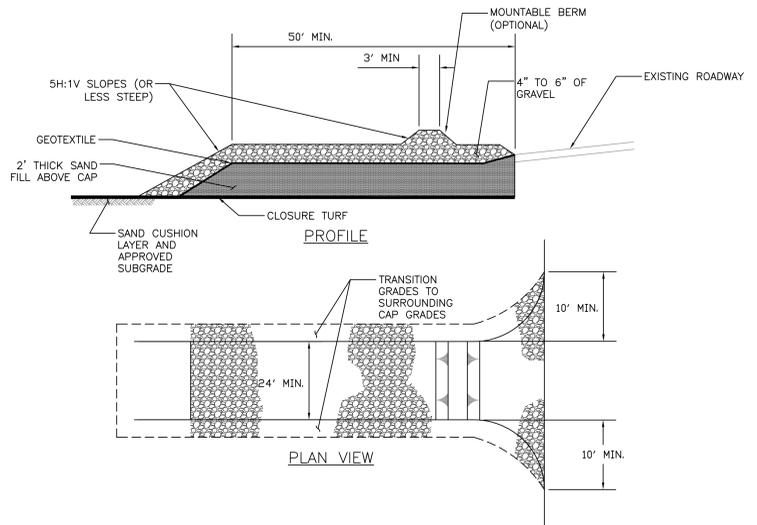
SCALE: AS SHOWN	DATE: APRIL 9, 2020	PROJECT NO.: 2004425.0093	SHEET NO.: 3 OF 4
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D1 SILT FENCE
- N.T.S.



D2 SOIL STOCK PILE
- N.T.S.



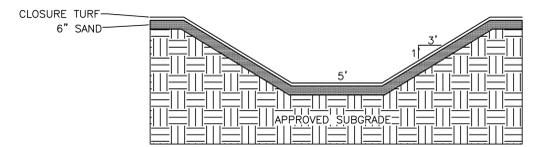
NOTES:

1. MAINTENANCE: STABILIZED CONSTRUCTION ACCESS THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY, EXTEND LENGTH OF STABILIZED CONSTRUCTION ACCESS BY 50 FOOT INCREMENTS UNTIL CONDITION IS ALLEVIATED OR INSTALL WASH RACK. WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.
2. OVERLAP EDGES OF GEOTEXTILE 2 FT. EXTEND GEOTEXTILE 2 FT BEYOND EDGE OF SAND.
3. TRANSITION FROM ROADWAY TO CAP GRADES WITH SLOPES NO STEEPER THAN 5H:1V.

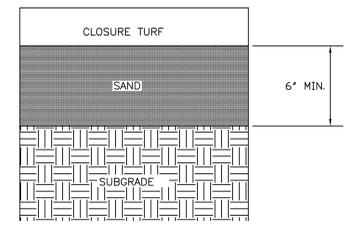
D3 STABILIZED CONSTRUCTION ACCESS
- N.T.S.

SOIL EROSION AND SEDIMENT CONTROL NOTES

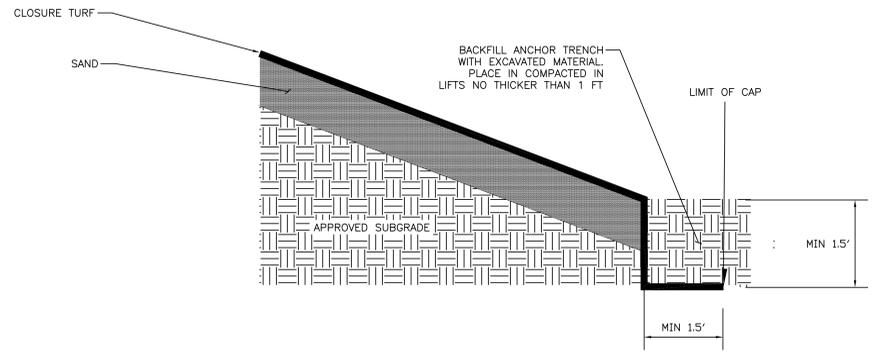
1. ALL SOIL EROSION AND SEDIMENT CONTROL (SESC) PRACTICES WILL BE INSTALLED PRIOR TO ANY MAJOR SOIL DISTURBANCE OR IN THEIR PROPER SEQUENCE, AND MAINTAINED UNTIL PERMANENT PROTECTION IS ESTABLISHED.
2. SHOULD THE CONTROL OF DUST AT THE SITE BE NECESSARY, THE SITE WILL BE SPRINKLED UNTIL THE SURFACE IS WET, IN ACCORDANCE WITH THE STATE STANDARDS FOR EROSION CONTROL.
3. ALL SOIL WASHED, DROPPED, SPILLED OR TRACKED OUTSIDE THE LIMIT OF DISTURBANCE OR ONTO PUBLIC RIGHTS-OF-WAYS WILL BE REMOVED IMMEDIATELY.
4. THE CONTRACTOR WILL BE RESPONSIBLE FOR ANY EROSION OR SEDIMENTATION THAT MAY OCCUR OFFSITE AS A RESULT OF CONSTRUCTION OF THE PROJECT.
5. STOCKPILE LOCATIONS DETERMINED IN THE FIELD WILL BE PLACED WITHIN THE PROJECT SITE LIMITS.



D4 BOUNDARY SWALE
- N.T.S.



D5 CAPPING DETAIL
- N.T.S.



D6 CAPPING TERMINATION DETAIL
- N.T.S.



TUCSON CAMPBELL AVENUE SITE
SITE REMEDIATION

CONSTRUCTION DETAILS

wsp	WSP 5613 DTC PARKWAY, SUITE 500 GREENWOOD VILLAGE, CO 80111-3033	DRAWN BY: HA
		CHECKED BY: DM
		APPROVED BY:
SCALE: AS SHOWN	DATE: APRIL 9, 2020	PROJECT NO.: 2004425.0093
		SHEET NO.: 4 OF 4

No.	DATE	REVISION
C		
B		
A		

TECHNICAL SPECIFICATIONS
CAMPBELL AVENUE SOIL CAPPING PROJECT

Table of Contents

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2.0 SITE CLEARING AND GRUBBING	2-1
3.0 GRADING AND MATERIAL DISPOSAL	3-1
4.0 COMMON FILL	4-1
5.0 CAPPING	5-1
6.0 EROSION AND SEDIMENTATION CONTROL	6-1

THE CONTRACT PRICE The USPS agrees to pay the Contractor at the time and in the manner provided in this Contract, and in accordance with the price bid in the **SCHEDULE OF PRICES**.

NOTE: The amount for Mobilization / Demobilization at the site shall not be more than 10% of the total bid price.

SCHEDULE OF PRICES

ITEM	DESCRIPTION	UNIT MEAS.	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
1.0	Mobilization/Demobilization	E.A.	1		
2.0	Site Clearing and Grubbing	L.S.	1		
3.1	Grading	CY	2,500		
3.2	Bulky Waste Removal and Disposal	TON	100		
4.1	Common Fill	S.Y.	18,900		
5.1	ClosureTurf	S.Y.	18,900		
6.0	Erosion & Sedimentation Control	L.S.	1		

TOTAL BID PRICE (ITEMS 1.0-6.0) _____

WRITE OUT TOTAL BID PRICE

1.0 General Construction

1.1 Background and Project Overview

This contract is for capping contaminated soils and waste debris at the United States Postal Service (USPS) Tucson Campbell Avenue Site (Site).

The Site is an 8.3 acre undeveloped parcel of land near the southeast corner of 23rd Street and Campbell Ave. in Tucson, Arizona. The Site abuts a Union Pacific Railroad fueling facility to the east and a Union Pacific Railroad office and parking lot to the north.

The Site was purchased by the USPS from the Southern Pacific Transportation Company (now the Union Pacific Railroad) in March of 1985. From approximately 1973 to 1985, the site was used to store debris from the disassembly and demolition of box cars and the cleaning of mining cars on the adjacent railroad property. In addition to soil and rock, the debris material consists of metal, plastic, glass, wood, hoses, tires, roofing and fiberglass. In 2014, the total quantity of soil/debris present at the site was estimated to be approximately 15,700 tons.

The Site is currently regulated under the Arizona Department of Environmental Quality (ADEQ) Voluntary Remediation Program (VRP). Previous background investigations are summarized in the Limited Phase II Environmental Site Assessment – Final Report by WSP, dated September 10, 2019.

The remedial approach is for construction of a cap as engineering control and implementation of institutional controls (Deed Environmental Use Restriction – DEUR, and monitoring). This contract is for capping of the contaminated soils. The work includes:

- The Contractor shall install soil erosion controls, which shall be maintained for the duration of the work.
- The Contractor shall clear vegetation from the capping area.
- The Contractor shall grade the capping area as shown on the contract drawings. Bulky waste shall be disposed off-site. Non-bulky waste shall be buried within the capping area.
- The Contractor shall install the engineered cap. The cap includes 6” of imported common fill to be installed over subgrade, and liner consisting of Closure Turf by AgruAmerica or approved equivalent.
- Site demobilization shall include removal of soil erosion controls, removal of all construction equipment and restoration of impacted areas (stockpile, construction trailer etc) to prior condition.

1.2 Definitions

Wherever the words defined in this Section or pronouns used in their stead occur in the Specifications and Drawings, they shall have the meanings herein given.

Elevation

The figures given on the Drawings or in the other Contract Documents after the word "elevation" or abbreviation of it shall mean the distance in feet above the National Geodetic Vertical Datum 1988.

The elevations indicated on the Drawings and other locations pertaining to design and construction (unless noted otherwise) indicate the finish grade/elevation. Contractor shall adjust subgrade elevations, bottom of trenches, etc., accordingly

1.3 Abbreviations

Where any of the following abbreviations are used in the Contract Documents, they shall have the meaning set forth.

AASHTO	American Association of State Highway and Transportation Officials
AZDEQ	Arizona Department of Environmental Quality
AZDOT	Arizona Department of Transportation
AMRL	American Material Reference Laboratory
ANS	American National Standard
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
NDB	National Bureau of Standards
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
UL	Underwriters' Laboratories
USACE	United States Army Corps of Engineers
USPS	United States Postal Service

1.4 Handling and Distribution of Materials

The Contractor shall handle, haul, and distribute all materials and all surplus materials on the different portions of the work; shall provide suitable and adequate storage room for materials and equipment during the progress of the work, and be responsible for the protection, loss of, or damage to materials and equipment furnished by them, throughout the duration of the contract.

Storage, transport, and demurrage charges by transportation companies and vendors shall be borne by the Contractor.

1.5 Materials - Samples - Inspection

All costs for the storage, handling, and inspection of all materials shall be furnished by the Contractor. Defective materials shall be removed immediately from the site of the work.

Tucson Campbell Avenue Site

Either prior to or after commencement of the work, the Contractor shall submit samples of materials for such tests as the Engineer deems necessary to demonstrate that they conform to the Specifications. Such samples, including but not limited to pipe and soil samples, shall be furnished, taken, stored, packed, and shipped by the Contractor as directed by the Engineer.

All samples shall be packed so as to reach their destination in good condition, and shall be labeled to indicate the material represented, the name of the work and location for which the materials are intended, and the name of the Contractor submitting the sample. To ensure consideration of samples, the Contractor shall notify the Engineer by letter that the samples have been shipped and shall properly describe the samples in the letter. The letter of notification shall be sent separate from and should not be enclosed with the samples.

The Contractor shall submit data and samples, or place their orders, sufficiently early to permit consideration, inspection and testing before the materials and equipment are needed for incorporation in the work. The consequences of their failure to do so shall be solely the Contractor's responsibility.

To demonstrate the proficiency of workmen, or to facilitate the choice among several textures, types, finishes, surfaces, etc., the Contractor shall provide such samples of workmanship as may be required.

When required, the Contractor shall furnish to the Engineer five sworn copies of manufacturer's shop or mill tests (or reports from independent testing laboratories) relative to materials and equipment performance ratings and test data.

After review of the samples, data, etc., the materials and equipment used on the work shall in all respects conform therewith.

All acceptance testing shall be performed in the presence of the Engineer and State.

1.6 Contractor's Shop and Working Drawings

When shop and working drawings are required as specified below, the Contractor shall submit data in sufficient detail to enable the Engineer to determine whether the manufacturer and/or the supplier have the ability to furnish a product meeting the Specifications. The Contractor shall submit data relating to the materials and equipment they propose to incorporate into the work in sufficient detail to enable the Engineer to identify and evaluate the particular product and to determine whether it conforms to the design concept and Contract requirements. Such data shall be submitted as specified for submission of shop and working drawings.

When so specified or if considered by the Engineer to be acceptable, manufacturer's specifications, catalog data, descriptive matter, illustrations, sieve charts, etc., may be submitted. Five copies shall be submitted, one of which shall be an original, two of which shall be returned to the Contractor.

The Contractor shall be responsible for the prompt and timely submittal of all shop and working drawings so that there shall be no delay to the work due to the absence of such drawings.

Tucson Campbell Avenue Site

The Engineer shall review all critical shop and working drawings within 10 working days of their receipt and return marked up prints to the Contractor indicating approval, conditional approval or disapproval. Review time shall start upon receipt of the submittal by the Engineer. Until the necessary review has been made, the Contractor shall not order any materials nor proceed with any portion of the work, the design or details which are dependent upon the design or details of work, materials, equipment or other features for which review is required.

The marked-up reproducible of the shop and working drawings or two marked-up copies of catalog cuts will be returned to the Contractor. The Contractor shall furnish additional copies of such drawings or catalog cuts when so requested.

1.7 Occupying Private Land

The Contractor shall not (except after written consent from the proper parties) enter or occupy with persons, tools, materials, or equipment, any properties outside of which USPS has secured access to for the Contractor or property of the Owner. A copy of the written consent shall be given to the Engineer.

1.8 Interference with and Protection of Streets/Roadways

The Contractor shall not close or obstruct any portion of a street, road, or private way without obtaining permits and/or approvals from the proper authorities and property owners. If any street, road or private way shall be rendered unsafe by the Contractor's operations, they shall make such repairs or provide such temporary ways or guards as shall be acceptable to the proper authorities.

Streets, roads, private ways, and walks not closed shall be maintained passable and safe by the Contractor, who shall assume and have full responsibility for the adequacy and safety of provisions made therefore.

The Contractor shall, at least two weeks in advance, notify The City of Tucson in writing, with a copy to the Engineer, if the closure of a street or road is necessary. The Contractor shall cooperate with the Police Department in the establishment of alternate routes and shall provide adequate detour signs, plainly marked and well lighted, to minimize confusion.

1.9 Storage of Materials and Equipment

All materials and equipment to be incorporated in the work shall be placed so as not to injure any part of the work or existing facilities and so that free access can be had at all times to all parts of the work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such locations as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.

1.10 Sanitary Regulations

The Contractor shall provide adequate sanitary facilities for the use of those employed or involved on the work. Such facilities shall be made available when the first employees arrive on the site of the

work, shall be properly secluded from public observation, and shall be constructed and maintained during the progress of the work in suitable numbers and at such points and in such manner as may be required.

The Contractor shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. The Contractor shall rigorously prohibit the committing of nuisances on the site of the work, on the lands of the State, or on adjacent property.

1.11 Lines, Grades and Measurements

The Contractor shall employ a competent surveyor to establish all lines, elevations, reference marks, etc., needed by the Contractor during the progress of the work, and to verify such marks by instruments or other appropriate means.

The Contractor shall have a licensed surveyor survey the post-excavation areas, as well as the post restoration areas. The surveyor shall be permitted at all times to check the lines, elevations, reference marks, etc. set by the Contractor, who shall correct any errors in lines, elevations, reference marks, etc., disclosed by such check.

The Contractor shall make, check, and be responsible for all measurements and dimensions necessary for the proper construction of and the prevention of errors in the work.

Separate payment will not be made for layout, measurement for payment, checking lines, grades, and measurements. The Contractor shall include such costs in individual line items.

1.12 Dimensions of Existing Structures

Where the dimensions and locations of existing structures are of importance in the installation or connection of any part of the work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment, which is dependent on the correctness of such information. Such dimensions and locations shall be indicated on the Record Drawings.

1.13 Work to Conform

During its progress and on its completion, the work shall conform truly to the lines, levels, and grades indicated on the Drawings or given by the Engineer and shall be built in a thoroughly substantial and workmanlike manner, in strict accordance with the Drawings, Specifications, and other Contract Documents, including approved change orders or field orders.

All work done without proper lines or levels, or performed during the absence of the Engineer, will not be estimated or paid for except when such work is authorized by the Engineer in writing. Work so done may be ordered uncovered or taken down, removed, and replaced at the Contractor's expense.

1.14 Computation of Quantities

Measurements for payment will be made in accordance with United States standard measure (National Bureau of Standards). The method of measurement and computations to be used in determination of quantities of work performed under the Contract are those methods generally recognized as conforming to good engineering practice. The methods of weight and measurement listed below may be used as an alternate method.

- The method of measurement and computations to be used in determination of quantities of Work performed under the Contract are those methods generally recognized as conforming to good engineering practice.
- Longitudinal measurements for area computations are made horizontally and deductions are not made for individual fixtures having an area of 9 square feet or less. Transverse measurements for area computations are the neat dimensions shown on the Plans or ordered in writing by the Engineer.
- In computing volumes of excavation and backfill, the average end area method is used.
- When requested by the Contractor and approved by the Engineer, in writing, material specified to be measured by the cubic yard may be weighed and such weights converted to cubic yard for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.
- Net certified scale weights or weights based on certified volumes will be used as a basis of measurement, subject to correction when material has been lost, wasted, or otherwise not incorporated in the Work.
- The term "lump sum" when used as a basis of payment means complete payment for the Work of that item, and that item will not be measured.
- When the quantity in the Proposal is specified to be the pay quantity, either the Engineer or the Contractor may request that the quantity be measured. If such a request is made by the Contractor, it shall be accompanied by drawings, calculations, or other information indicating that the quantity in the Proposal is not correct.
- Defined volumes of fill items shall be calculated as in-situ volume as placed at the specified density or unit weight. When requested by the Contractor and approved by the Engineer in writing, materials specified to be measured by cubic yard may be weighed and such weights converted to cubic yards for payment.
- For estimating quantities in which the computation of areas by geometric methods would be comparatively laborious, it is agreed that the planimeter shall be considered an instrument of precision adapted to the measurement of such areas.

1.15 Precautions During Adverse Weather

During adverse weather and against the possibility thereof, the Contractor shall take all necessary precautions so that the work may be properly done and satisfactory in all respects at no additional cost to the USPS. When required, protection shall be provided by use of tarpaulins, wood and building-paper shelters, or other suitable means.

During cold weather, materials shall be preheated, if required, and the materials and adjacent structure into which they are to be incorporated shall be made and kept sufficiently warm so that a proper bond will take place and a proper curing, aging, or drying will result. Protected spaces shall be artificially heated by suitable means which will result in a moist or a dry atmosphere according to the particular requirements of the work being protected.

1.16 Temporary Heat

If temporary heat is required for the protection of the work, the Contractor shall provide and install suitable heating apparatus, shall provide adequate and proper fuel, and shall maintain heat as required and/or directed by the Engineer.

Temporary heating apparatus shall be installed and operated in such manner that finished work will not be damaged thereby.

After the heating system has been installed, tested, and made ready for operation, the Contractor may, at their own risk and expense, use it for providing heat for protection of the work. They shall provide and pay for all fuel and care necessary, and when the work is ready for acceptance, they shall, at their own expense, put the system into first-class condition, even to the extent of replacing worn or damaged parts as directed. Separate payment will not be made for temporary heating.

1.17 Permits, Access Agreements and Easements

The Contractor shall take out and maintain all necessary permits from the state, county, township or other public authorities; shall give all notices required by law; and shall post all bonds and pay all fees and charges incidental to the due and lawful prosecution of the work. The following is one of the known permits which may be required to be obtained by the Contractor in the execution of the project.

- All appropriate permits for transportation and disposal of wastes (solid or liquid), including transportation licenses, transfer station licenses, and Treatment, Storage and Disposal Facilities Permits.

The Contractor is required to comply with the following permits which have been obtained.

- XX

The Contractor is required to comply with the easement obtained to access the site through the Union Pacific Railroad office and parking lot to the north. Prior to mobilizing to the Site the Contractor shall record a video showing the conditions of the access route through private property. Separate copies of the video shall be sent to the USPS, the Engineer and retained by the Contractor. Should the Contractor identify any damage along the access route during the project they shall make record of the damage and notify the USPS and Engineer.

- Private property access agreement.

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1.18 Record Drawings

The Contractor shall keep one record copy of all Contract Documents, at the site in good order and annotated to show all revisions made during construction. Such annotations shall be kept current and may be inspected by the USPS or Engineer monthly or more frequently. Failure to maintain current record drawings will be cause to delay progress payments. Record drawings shall be available to the Engineer at all times during the life of the Contract.

Prior to pre-final inspection, furnish a reproducible of the record drawings. At the completion of the Contract and before final payment is made, furnish the Engineer one set of reproducibles and the corresponding AutoCAD Version 2000i (or compatible) files of the finally approved record drawings reflecting all revisions herein described below:

Record drawings shall be based on the construction design drawings and shall include, at a minimum:

- Notations of material changes, if other than that specified
- Incorporation of Field Order Details
- Incorporation of Approved Change Orders
- Specific horizontal and vertical surveyed locations of all items constructed and any existing items that were found in discrepancy of the design plans and
- Notations of pay item quantity changes and or adjustments.

Record drawings shall contain a copy of all drawings included in the construction documents. Drawings warranting “no changes made or noted during construction” shall be so noted and included in the set of record drawings. Record drawings shall be signed and sealed by the Professional Licensed Engineer retained by the Contractor, and by the Contractor’s responsible representative. Record drawings will undergo a review and approval process with the USPS before they finalized and accepted.

1.19 Other Contracts

The Contractor shall coordinate their work to eliminate conflicts with any other on-site contractors retained by the USPS.

1.20 Water Service

The attention of the bidders is directed to the fact that there is no water service on the Site. The Contractor will be required to provide any water to the site necessary for completion of the work and for sanitary facilities and trailers. There is no separate pay item for this task.

1.21 Cleaning Up

During its progress the work and the adjacent areas affected thereby shall be kept cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.

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Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes structures, work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.

On or before the completion of the work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by them; shall remove all temporary works, tools, and machinery or other construction equipment furnished by them; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around toilet facilities, houses, and other buildings used by them; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by their operations, including temporary roads, staging and support areas, in a neat and satisfactory condition.

The Contractor shall thoroughly clean all materials and equipment installed by them and their subcontractors, and on completion of the work shall deliver it undamaged and in fresh and new-appearing condition.

The Contractor shall restore or replace any public or private property damaged by their work, equipment, or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall perform all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.

1.22 Construction Schedule

The Contractor shall provide a schedule for the tasks needed to complete the remedial construction. The Construction Schedule shall be submitted within 14 days of Notice to Proceed. Separate payment for this task will not be made.

1.23 Project Meetings

Pre-Construction and Construction Conferences

Before construction is started, preconstruction conferences shall be held. During the first conference the USPS, the Engineer, and the Contractor will discuss the procedures to be followed by the Contractor during the construction process.

A second conference, if necessary, may include representatives of the USPS, Engineer, Contractor, State and Local Authorities and would concern compliance with State and Federal regulations and the environmental plans and specifications.

Job Meetings

During the construction, job meetings shall be held to review construction and restoration progress and to resolve difficulties, which might delay completion of the work. Attendees at these meetings shall include representatives of the USPS, the Engineer and the Contractor.

The Engineer may schedule regular job meetings at least weekly during the life of the Contract. The time and location of meetings is to be set by the Engineer. The Contractor, unless otherwise notified by the Engineer, is to have an authorized representative attend each meeting.

The purpose of these meetings is for maintaining communication between the USPS, Engineer and Contractor, including the Contractor's subcontractors and suppliers. The meetings are to be used to coordinate various parts of the work, update construction schedules, prepare progress estimates and respond to questions that may be raised by the various participants.

1.24 Mobilization

Mobilization shall be in accordance with Arizona Department of Transportation (AZDOT) Standard Specifications (2008) Section 901.

1.25 Measurement and Payment

Payment shall be made under:

<u>Pay Item No.</u>	<u>Pay Item</u>	<u>Unit</u>
1	Mobilization	Lump Sum

The Contractor shall be paid the lump sum bid price for Bid Item 1, Mobilization, as described in the specifications. Partial payments will be made as described in the AZDOT Standard Specifications (2008) Section 901.

2.0 Site Clearing and Grubbing

2.1 General Description

This work shall consist of clearing the Site area of vegetation, debris and above-ground site improvements as indicated on the plans and in these specifications in preparation for construction operations. As a part of this contract, the following work items may be necessary to upgrade the existing path conditions to accommodate trucks and equipment.

- Contractor shall install stone construction entrance.
- The contractor shall only use the access road between the hours of 7:00 am and 6:00 pm Monday through Friday for heavy equipment.
- The contractor shall restore the disturbed areas to the pre-construction condition.

2.2 Existing Conditions

Site Examination: The contractor shall visit the site and carefully examine and study existing conditions, difficulties and utilities affecting execution of Work.

Conditions existing at time of inspection for bidding purposes will be maintained by Owner in so far as practical.

Variations to conditions or discrepancy in actual conditions as they apply to site preparation operations are to be brought to the attention of the Owner prior to the commencement of any site work.

The Contractor shall familiarize themselves with the existing conditions prior to the start of work. The Contractor shall anticipate difficulties with equipment maneuvering, material delivery, material installation, and all other items that may be encountered due to the site conditions.

Later claims for additional compensation due to additional labor, equipment or material required on account of difficulties encountered or underground water conditions will not be considered.

2.3 Protection

Notify the Arizona One Call System (Arizona811.com) between 5 and 10 days prior to any excavation. Call 811 from anywhere in Arizona.

Conduct operations with minimum interference to public or private accesses and facilities. Maintain access and egress at all times and clean or sweep any roadways daily or as required by the governing authority.

Protect bench marks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed, it shall be referenced by a Licensed Land Surveyor and replaced, as

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necessary, by the same.

2.4 Materials

Protection Materials: May be new or used, suitable and adequate for the intended purpose.

2.5 Erosion and Sedimentation Control

Contractor shall refer to the contract drawings for staging of construction activities.

If Contractor may propose modifications to the staging activities. Modifications shall be submitted to the USPS and Engineer for approval.

2.6 Preparation

Verify that existing plant life and clearing limits are clearly tagged, identified and marked in such a manner as to insure their safety throughout construction operations.

2.7 Clearing

Clear areas required for access to site and execution of work.

Unless otherwise indicated on the drawings, remove trees, shrubs, grass, other vegetation, improvements, fencing, or obstructions interfering with installation of new construction. Removal includes digging out all stumps, root material, and other items listed above to existing grade.

Depressions caused by clearing and grubbing operations are to be filled with Common Fill to existing elevation to avoid water ponding. There is no separate payment item for materials and installation of common fill for this work. This cost shall be incorporated into the Site Clearing and Grubbing line item.

Fill material shall be placed accordance with Section 4.0, Common Fill.

All vegetation, including trees, shrubs, and grass removed from above and below ground level during clearing activities shall be chipped or shredded and spread within the capping area. Within the excavation and bulky waste areas roots and other vegetation removed from below grade shall be considered waste and capped with the bulky material and soil.

All slopes of cuts, embankments, ditches, channels, waterways and all structures, both old and new, shall be cleared of all brush, hedge, weeds, heavy vegetation and other objectionable material growth. Clearing shall extend to a maximum of 5 feet beyond the edge of cap limits. Clearing shall not be done outside of the limits of disturbance as indicated on the plans.

The Contractor has the option of removing trees, stumps and other debris that is above grade from the site if they are to be recycled or processed for use. Any roots or stumps that are removed from below grade shall be considered waste and capped with contaminated soils and other foreign debris. There

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is no separate payment item for this work. The costs for this item shall be paid for under the various items bid.

2.8 Pruning

When pruning is required, prune tree branches injured during clearing operations, or when directed by Engineer by making clean cuts, free from splinters, flush with parent branch or trunk.

Do not disturb branches or roots of any trees which are to remain.

2.9 Chain Link Gate

The Contractor shall install a new chain link gate for site access in location shown on the Drawings. Gate shall be 6' in height and will be used for construction access. Construction of the Gate shall be in accordance with Arizona Department of Transportation Standard Specifications (2008) Section 902.

This work additionally includes removal of existing fence in the location where the gate is to be constructed. Removal of Fence shall be conducted in accordance with Arizona Department of Transportation Standard Specifications (2008) Section 202-3.08.

2.10 Measurement and Payment

Payment shall be made under:

<u>Pay Item No.</u>	<u>Pay Item</u>	<u>Unit</u>
2	Site Clearing and Grubbing	Lump Sum

The Contractor shall be paid the lump sum bid price for Bid Item 2, Site Clearing and Grubbing, upon completion of clearing the capping area. The cost shall include all work described in this section including clearing and grubbing and installation of Chain Link Gate (including removal of existing fence).

3.0 Grading and Material Disposal

3.1 General Description

Grading consists of moving earth and non-bulky waste debris within the capping area to meet the lines shown on the Drawings. The Contractor shall be responsible for interim surveying of the pre-grading and post-grading cross sections. The cost for surveying shall be spread across the various unit prices bid, there will be no separate payment made for survey.

Existing material is to be used as fill, and only as such, under the Cap.

Grading does not include excavation for temporary erosion and sediment control structures. Grading for temporary erosion and sediment control structures shall be incidental to the erosion and sedimentation control.

Waste debris includes all non-earth / vegetation materials on the site. Waste debris have been documented to include, but is not limited to, metal, plastic, glass, wood, hoses, tires, roofing and fiberglass.

Bulky Waste is defined as all waste materials larger than 24 inches in any dimension. All wood bulky waste shall be cut with a chain saw to dimensions that are small enough (largest dimension to be less than 24 inches) to be buried in areas shown on the drawings. All other bulky waste that is on the surface of the site shall be disposed of off-site as scrap or waste. Disposal shall be in accordance with all local, state and federal rules. Bulky waste designated for disposal shall be cleaned (brushed, washed or other means) to remove all soils prior to disposal.

Non bulky waste is waste material that does not meet the definition of bulky waste (non-earth material that is not bulky waste). Surficial non-bulky waste debris shall be gathered and buried in the areas designated on the plans. The non-bulky waste debris shall be buried using the sandy soil on-site cut from other areas within the cap area. Filling around the waste debris shall be done in such a manner to fill any void spaces generated by the irregular shapes of materials.

3.2 Construction

The Contractor will not be compensated for grading beyond the lines shown on the drawings, without prior approval granted by the USPS.

Bulky waste shall be stockpiled and disposed of off-site. Disposal shall be in accordance with all local, state and federal regulations. Contractor shall provide letter from proposed disposal facility indicating that the bulky waste can be accepted by that facility. Bulky waste shall be disposed of off-site prior to capping of the site.

Cross sections at the excavation shall be surveyed by the Contractor, in accordance with these Specifications. The information on the record drawings shall show excavation grades and any field adjustments.

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Material shall be placed in compacted lifts no thicker than 12". Compaction for the subgrade material shall be performed using a non-rubber tire, variable weight roller with a maximum weight of 10 tons. Subgrade shall be compacted with at least 4 passes of the roller.

The Contractor shall employ appropriate health and safety procedures during the excavation, in accordance with OSHA standards. Excavated material shall be contained and prevented from spilling onto cleaned or capped areas prior to disposal.

3.3 Measurement and Payment

Payment will be made under:

<u>Pay Item No.</u>	<u>Pay Item</u>	<u>Unit</u>
3.1	Grading	CY
3.2	Bulky Waste Removal and Disposal	Ton

Bid Item 3.1 shall be measured by the Cubic Yard of cut to meet the grade lines as shown on the drawings. Measurement of cut shall be by survey as described. Any double handling or reuse of the material is incidental to the work. Separate payment will not be made for excavations for channels, for temporary channels, for excavations below the grade lines or limits of excavation shown on the Contract Drawings, for excavation for installation of temporary erosion and sediment control structures.

Bid Item 3.2 shall be measured by the Ton of bulky waste stockpiled, removed and disposed as documented from the certified weigh disposal tickets, and paid according to the bid unit price per Ton. It is assumed that all bulky waste can be disposed of as non-hazardous waste. Debris believed to be hazardous shall be buried on-site.

4.0 Common Fill

4.1 General Description

Common fill shall be used to as bedding layer for the cap. This item shall include purchase, excavation, stockpiling, hauling, placement, and compaction of pre-qualified material from the off-site borrow area.

4.2 Material

Soil aggregate imported to the site as Common Fill shall be natural or prepared mixtures consisting predominantly of hard particles or fragments of stone, slag, gravel, or sand, and containing some silt-clay or stone dust. The composite mixture of any type of soil aggregate shall be free of organic matter, wood, garbage, metal, debris, or lumps of clay.

Soil aggregates from a single source shall be used in any one construction item, unless otherwise submitted and approved by the Engineer. Soil aggregates from different sources may be considered, if they are of the same geological classification and have similar specific gravities and color.

The Common Fill soil aggregate to be used as backfill material shall meet the requirements indicated below.

Required Physical Properties of Common Fill

Property	Test Value	Test Method
Common Fill		
Soil classification (USCS)	Silty Sand (SM), Well Graded Sand (SW), Poorly Graded Sand (SP), Silty Gravel (GM), or any combination of these	ASTM D 2487
Max. particle size (inches)	3/8	ASTM D 422

All soil material brought from off-site (including Common Fill, Soil Infill, Gravel etc) must meet the following requirements:

1. Documentation shall be provided by certification stating that it is virgin material from a commercial or noncommercial source or decontaminated recycled soil.
2. All proposed sources of fill must be pre-approved by the Engineer. Bills of lading shall be provided to the Engineer to document the source(s) of fill. The documentation shall include: (1) the name and relationship of the source of the fill, (2) location where the fill was obtained, including the street, town, lot, block, county and state and a brief history of the site which is the source of fill, and (3) a statement that to the best of the affiant's knowledge and belief the fill being provided is not contaminated pursuant to #1 above and a description of the steps taken to confirm such.

4.3 Submittals

Submittals shall be according to Section 1.6 and shall include the source location, copy of the borrow area permits, and results of analysis indicating material meets the criteria of these Technical Specifications.

4.4 Placement and Compaction

Wet areas shall be stabilized by removing water prior to fill placement and compaction. This can be accomplished by either removing the water, or by placement of Coarse Aggregate (3/4" stone) fill material, and as determined by the Engineer. Backfill material in wet areas shall be end dumped. The manner of filling and advancing the backfill wedge shall be such as to force all wet material laterally to the sides of the excavation and not to trap it under the fill. Accumulation of wet material at the sides of the embankment shall be removed as the embankment wedge advances, mixed with dry embankment material as necessary for drying, and spread in a thin lift over dry areas to be filled.

Common Fill material shall be provided and installed over the subgrade and as required to meet the thickness shown on the Drawings. The material should be placed in maximum 6" lifts and compaction shall be performed using a non-rubber tire, variable weight roller with a maximum weight of 10 tons in four overlapping passes.

4.5 Measurement and Payment

Payment will be made under:

<u>Pay Item No.</u>	<u>Pay Item</u>	<u>Unit</u>
4.1	Common Fill	SY

The Contractor will be paid the bid price per SY for Pay Item 4.1 for the purchase, excavation, stockpiling, handling, placement, and compaction of Common Fill soil aggregate fill materials at the specified thickness as measured in place after compaction in the excavation areas. Costs for obtaining off-site material shall be included in the Contractor's unit price. Measurement will be based on survey of material in place after compaction. Grade stakes shall be used to confirm that Common Fill is installed at the correct thickness. The area shall be measured based on the horizontal plane.

5.0 Capping

5.1 General Description

Cap shall be installed over the waste material / contaminated soils as shown on the contract drawings. The cap shall be ClosureTurf as manufactured by Watershed Geosynthetics, LLC, or approved equivalent.

5.2 Submittal Requirements

The following shall be submitted to the Engineer for acceptance.

Materials - Manufacturer's certified raw material and sheet material data sheets along with a copy of quality control certificates and the manufacturer's Quality Control/Quality Assurance Manual/Procedures.

Layout and Detail Drawings - Cap panel layout and detail drawings a minimum of 30 days prior to delivery of geomembrane to the site.

Record Drawings - Final record drawings of geomembrane installation showing panel/sheet numbers, seam numbers, and location of patches, destructive seam samples, and penetrations. A reference to manufacturer roll/sheet number per panel/sheet shall also be required.

Instructions - Test, Inspections, and Verifications; Manufacturer's quality control manual. Fabricator's quality control manual.

Field Seaming - Installer's quality control manual.

Statements of Qualifications - Manufacturer's, fabricator's, installer's, inspection personnel, and independent testing agency/laboratory qualification statements including resumes of key personnel involved in the project.

Warranty - Written warranties for Cap materials and installation workmanship.

Tests, Inspections, and Verifications - Certified laboratory interface friction test results including description of equipment and test method. Manufacturer's certified quality control test results. Fabricator's certified quality control test results. Installer's certified quality control test results.

Samples - Tests, Inspections, and Verifications - One 12 by 12 inch minimum size Cap sample cut from each destructive seam sample shall be supplied to the Engineer for QA testing. This testing will be independent and in addition to Contractor's required testing.

Contractor shall submit the proposed quality assurance testing program they will use to check the field seams. This program shall be subject to Engineer's approval, and shall consist of air lance, ultrasonic, and/or vacuum testing of every inch of field seam.

5.3 Qualifications

5.3.1 Geomembrane Layer

This Specification is written for use of 40-mil LLDPE (Linear Low Density Poly Ethylene) geomembrane, engineered turf, and sand component which meets the performance criteria as specified. The LLDPE material shall be textured on the bottom side (side that will be closest to the subgrade) and coextruded.

5.3.1.1 Geosynthetics Manufacturers: The Geosynthetics Manufacturers shall be able to provide sufficient production capacity and qualified personnel to meet the demands of the project.

The Geosynthetics Manufacturer in particular shall be pre-qualified and approved by the Engineer, and the USPS. The qualifications presented by the Geosynthetics Manufacturer shall, at a minimum, include:

a. Manufacturing Capabilities

1. Daily production quantity available for this contract
2. Quality control manual for manufacturing
3. List of material properties including certified test results, to which are attached geomembrane samples.

b. A list of at least 10 completed facilities totaling a minimum of 2,000,000 ft², for which the Manufacturer has manufactured a Cap of the same material to be used for this project. For each facility, the following information will be provided:

1. Name and purpose of facility, its location and date of installation.
2. Name of owner, project manager, engineer, fabricator (if any) and installer.
3. Thickness of Cap and each of its components, surface area of Cap manufactured.

5.3.1.2 Geosynthetics Fabricator: The Geosynthetics Fabricator shall be trained and qualified to fabricate panels from rolls. The Geosynthetics Fabricator shall be a well-established firm able to provide sufficient fabrication capacity and qualified personnel to meet the demands of the project.

The Geosynthetics Fabricator, in particular, will be approved and/or licensed by the Geosynthetics Manufacturer. A copy of the approval letter or license shall be submitted by the Geosynthetics Fabricator to the Engineer and USPS.

Prior to the confirmation of any contractual agreements, the Geosynthetics Fabricator shall provide the Engineer and USPS with the following written information:

- a. Fabrication Capabilities
 1. Daily fabrication quantity available for this contract.
 2. Quality control manual for fabrication.
 3. Certified test results and samples of fabricated seams.

- b. A list of at least 10 completed facilities for which the Geosynthetics Fabricator has fabricated geomembrane panels of the same material to be used for this project, totaling a minimum of 2,000,000 ft². For each fabrication, the following information will be provided:
 1. Name and purpose of facility, its location and date of installation.
 2. Name of owner, project manager, engineer, manufacturer, and installer.
 3. Thickness of Cap and each of its components, and surface area of Cap fabricated.
 4. Type of seams and type of seaming apparatus used.

5.3.1.3 Geosynthetics Installer: The Geomembrane Installer shall have current Approved Installation Contractor (AIC) status issued by the International Association of Geosynthetic Installers. A copy of the approval letter / license will be submitted by the Geosynthetics Installer to the Engineer and USPS.

Prior to confirmation by any contractual agreements, the Geosynthetics Installer shall provide the Engineer and NJDEP with the following written information:

- a. Installation Capabilities
 1. Information on equipment and personnel.
 2. Anticipated daily production.
 3. Quality control manual for installation.
 4. Samples of field seams and certified test results.

- b. A list of previous projects providing justification that the Installer has installed at least 2,000,000 ft² of Cap of the same material to be used for this project. The experience shall be available, at a minimum, at the field crew foreman level. For each installation, the following information will be provided:
 1. Name and purpose of facility, its location and date of installation.
 2. Name of owner, project manager, engineer, manufacturer, and fabricator (if any).
 3. Name and qualifications of the supervisor of the Installer's crew.
 4. Thickness of geomembrane, surface area of installed geomembrane.

5. Type of seams and type of seaming apparatus used.
6. Duration of installation.

The Geosynthetics Installer shall provide the Engineer and USPS with a list of proposed seaming personnel and their professional records. This document will be reviewed by the USPS and the Engineer. Any proposed seaming personnel deemed insufficiently experienced shall not be accepted, or will be required to pass a seaming test.

The Geosynthetics Installer will designate one representative as his Superintendent, who will represent the Installer at all site meetings and be responsible for acting as the Installer's spokesman on site. The Superintendent will be qualified by experience. The Superintendent must have supervised the installation of a minimum of 2,000,000 ft² of geomembrane. His appointment must be approved by the USPS.

- c. In addition, the Superintendent should have minimum training consisting of:
 1. Brief instructions on purpose of lining installation.
 2. Brief instructions on placement procedures.
 3. Knowledge of safety procedures to be observed during liner development and placement including:
 - a) Safe methods of removing lining materials from packaging.
 - b) Awareness of techniques to use to avoid over-stressing of arms, legs and back during placement operations.

During installation and field seaming, the Installation Superintendent shall complete report forms detailing the liner installation activities.

5.3.1.4 Transporter: All personnel responsible for the loading, transport and unloading of the Cap must be fully aware of the consequences of damage to the geosynthetics, and familiar with handling and transport constraints required by the Manufacturer. The Transporter will ensure that all rolls of Cap are shipped on open trailers (no enclosed vans) for ease and safety of unloading the material.

5.3.2 Materials

The Cap shall include the following materials.

- A. Six Inches of Common Fill over the prepared subgrade (Section 4.0).
- B. ClosureTurf 40-mil LLDPE (Linear Low Density Poly-Ethylene) MicroSpike as manufactured by Watershed Geosynthetics LLC, or approved equal.
- C. Engineered Turf and Sand InFill:
- D. Where the construction entrance is constructed 4 to 6 inches of gravel covered by 8 oz. Non-woven geotextile shall be installed over the infill.

5.3.2.1 Geomembrane Physical Properties

Geomembrane shall be, at least 40-mil in thickness, Linear-Low Density Polyethylene (LLDPE) Geomembrane. Geomembrane shall be textured on the bottom side. Manufactured Geomembrane shall meet or exceed the minimum, maximum, or range of physical, mechanical and endurance properties as listed under the ClosureTurf® w/ 40 mil MicroSpike®, or approved equivalent.

A sheet is defined as a manufactured seamless geomembrane unit. Sheets shall be at least 5' in both length or width and coextruded. Textured geomembrane sheets shall be non-reinforced and uniform in color, thickness, and surface texture. The sheets shall also be free of and resistant to fungal or bacterial attack and they shall be free of cuts, abrasions, holes, blisters, contaminants and other imperfections.

Manufacturer's property specifications shall be submitted for approval of the Engineer a minimum of 30 days prior to use and approved by the Engineer prior to delivery of textured geomembrane to the site.

Geomembrane shall meet the following properties

Product Data	Test Method	Values
Thickness (nominal)	ASTM D5994	40 mil
Thickness (min. avg)	ASTM D5994	38 mil
Thickness (lowest individual)	ASTM D5994	34 mil
Asperity Height (min avg)	ASTM D7466	20 mil
Density (max)	ASTM D792 Method B	0.94 g/cc
Strength at break (min avg)	ASTM 6693 Type IV	112 lb/in
Elongation at break (min avg, GL=2.0 in)	ASTM 6693 Type IV	400%
Tear resistance (min avg)	ASTM D1004	25 lb
Puncture resistance (min avg)	ASTM D4833	50 lb
Carbon Black Content	ASTM D4218	2 to 3%
Carbon Black Dispersion (agglomerates for 10 views in categories 1 and 2)	ASTM D5596	Near Spherical Only
Oxidative Induction Time	ASTM D3895, 200 Celsius, 1 atm O ₂	At least 140 min

5.3.2.2 Engineered Turf and Sand Infill Physical Properties

Engineered Turf shall be Tan color to blend with the surrounding landscape. The Engineered Turf component of the Cap shall meet or exceed the following properties:

Product Data	Test Method	Values
CBR Puncture	ASTM D6241	1500 lb. (MARV)

Tensile Product (MD/XD)	ASTM D4595	2,100 MD/ 1,600 XD lb/ft (MARV)
Rainfall Induced Erosion	ASTM D6459	Infill Loss 0.05% 6 in/hr Rainfall
Aerodynamic Evaluation	GTRI Wind Tunnel	120 mph with max uplift of 0.12 lb/sf
Engineered Turf Fiber Tuft UV Stability	ASTM G147	>60% retained tensile strength at 100 yrs (projected)
Backing System UV Stability Index Test (single fully exposed)	ASTM G1545 Modified Cycle 1.UVA340	110 lb/ft retained tensile strength at 6500 hrs (projected)
ArmorFill™ Infill	ASTM D6913	ASTM C-33 Fine Aggregates w/ Pozzolanic Binder
Yarn Weight (Total Product Weight)	ASTM D5261	20 oz/sq yard min
Tensile Strength of Yarn	ASTM D2256	15 lb min

The Sand Component gradation be between ASTM C33 Minimum Parameter and ASTM #9 as tested by ASTM D6460. The Sand Component shall be at least ½ in thick and demonstrate less than 0.1 in during flow conditions with a shear stress at least 0.80 psf. The Sand Component shall interlock into the Engineered Turf.

5.3.3 Execution

5.3.3.1 Seams

Textured geomembrane sheets shall be manufactured as wide as possible to minimize factory and field seams. The textured geomembrane material shall be manufactured or factory fabricated using special factory bonded seams utilizing dielectric fusion welding or as approved by the manufacturer, into the minimum number of large panels required to fit the jobsite. Factory seams shall have a tensile yield strength of at least 60 percent of the parent material tensile yield strength as determined by peel testing with failure in the Film Tearing Bond (FTB) Mode and 90% as determined by shear testing. After fabrication the geomembrane shall be packed for minimum handling in the field.

Solvent or other materials for cleaning contact surfaces of field joints and for quality assurance testing shall be as recommended by the manufacturer or fabricator of the geomembrane material. Material Safety Data Sheets shall accompany all such materials as delivered to site. Contractor shall be responsible for the storage and handling of any such materials on-site. Copies of all MSDS shall be provided to Engineer.

All field seaming and sealing of the geomembrane shall be as recommended by the manufacturer or accepted fabricator and approved by the Engineer. Seaming items shall be delivered to the site with an indelible label bearing the name and complete directions on their proper use and application.

Panels of Engineered Turf Component shall be stitched to each other, and installed in the manner as recommended by the Cap manufacturer.

5.3.3.2 Shipping and Storage

Each factory sheet/panel or roll (fabricated and manufactured) shall be given prominent, unique, indelible identity markings indicating the thickness, length, width, manufacturer's mark number, and proper direction of unrolling and/or unfolding to facilitate layout and positioning in the field. Each factory sheet/panel or roll shall be individually packaged, fully enclosed and protected to prevent damage to it during shipment, prominently identified in the same fashion as the sheet/roll within, and showing the date of shipment.

Until installed, materials shall be stored in their original unopened packages; if outdoors, they shall be stored on pallets and shall be protected from direct sunlight under a light-colored, heat reflective opaque cover in a manner that provides a free-flowing air space between the package and cover. Material packages opened for inspection and sampling shall be re-covered and protected by the Contractor. The Cap shall be packaged for minimum handling in the field.

Cap shall be stored in a designated area approved by the Engineer and shall not be off-loaded unless the Engineer is present. Damaged Cap shall be removed from site.

5.3.3.3 Preparation

5.3.3.3.1 Surface Preparation

Material larger than 3/8 inch in diameter and any other debris which could damage the Cap shall be removed from the surfaces to be covered with the geomembrane. The subgrade surface shall be observed daily by the Installer to evaluate the surface condition. Any damage to the subgrade caused by the Contractor's operations shall be repaired at no additional cost. Immediately prior to geomembrane placement, the Installer shall certify in writing that the surface on which the geomembrane is to be placed is acceptable.

5.3.3.3.2 Anchor/Drainage Trenches

Trench corners shall be slightly rounded to avoid sharp bends in the geomembrane. Loose soil, rock larger than 3/8 inch in diameter, and any other debris which could damage the geomembrane shall be removed from the surface of the trench.

5.3.3.3.3 Panel/Sheet Deployment

The Cap shall be placed so the geomembrane is spike side down. The procedures and equipment used shall not damage the geomembrane. Cap damaged during installation shall be removed or repaired, at the Engineer's discretion and as specified in paragraph Defects and Repairs, at no additional cost to USPS. Only those panels/sheets that can be anchored and seamed together the same day shall be deployed. Adequate ballast (e.g., sand bags) shall be placed on the Cap to prevent uplift by wind without damaging the geomembrane, prior to backfill of the anchor trenches. No vehicular traffic will be allowed directly on the Cap. The method used to unroll the panels/sheets shall not scratch, crimp or excessively elongate the Cap and shall not detrimentally rut the subgrade soil as

determined by the Engineer. Seams shall be oriented parallel to the line of maximum slope. Where seams can only be oriented across the slope, the upper panel shall be lapped over the lower panel a minimum of 5 feet.

5.3.3.3.4 Field Seaming

All panel/sheets shall be overlapped a minimum of 4 inches. In corners and odd-shaped geometric locations, the number of field seams shall be minimized. Seaming shall extend to the outside edge of panels/sheets to be placed in anchor and/or drainage trenches. Seaming shall not be conducted in the presence of standing water and/or soft subgrades as determined by the Engineer. Wet surfaces shall be thoroughly dried and soft subgrades compacted and approved by the Installer and Engineer prior to seaming. The seam area shall be cleaned of all dust, dirt, and foreign material prior to and during seaming.

Polyethylene Seams

Polyethylene geomembrane shall be seamed by hot wedge methods. Extrusion welding shall only be allowed for patching and seaming around appurtenances unless otherwise approved by the Engineer. If seam overlap grinding is required, the procedure used shall not damage the geomembrane. Grinding marks shall be oriented perpendicular to the seam direction and no marks shall extend more than 1/8 inch beyond the extrudate after placement. The depth of the grinding marks shall be no greater than 10% of the sheet thickness. Where extrusion fillet welds are temporarily terminated long enough to cool, they shall be ground prior to applying new extrudate over the existing seam.

The method used to place the panels/sheets shall minimize wrinkles; the geomembrane manufacturer and installer shall coordinate efforts to provide the proper amount of slack in the deployed geomembrane so as to compensate for contraction due to local temperature extremes.

5.4 Installation

The textured Cap shall be placed over the prepared surface in such a manner as to minimize handling.

A field seaming method recommended by the manufacturer shall be used to seal the joint between factory sheets. The contact surfaces of the sheets shall be wiped clean to remove all dirt, dust, moisture, or other foreign materials. Any wrinkles shall be smoothed out prior to seaming.

Individual panels of Cap material shall be laid out and overlapped by a minimum of 4 inches prior to welding. All sheets shall be bonded together by means recommended by the manufacturer.

Field seams shall have a tensile yield strength of at least 60 percent of the parent material tensile yield strength as determined by peel and FTB testing and 90% as determined by shear testing.

No "fish mouths" (a wrinkle where the geomembrane does not lay flat) shall be allowed within the seam area. Where "fish mouths" occur, the material shall be cut, overlapped and an overlap bonded seam shall be applied.

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Any necessary repairs to the geomembrane shall be patched with a piece of the geomembrane itself in a fashion recommended by the manufacturer, and approved by the Engineer.

Any geomembrane surfaces showing injury due to scuffing, penetration by foreign objects, or distress from other causes, shall be replaced or repaired with an additional piece of geomembrane of the proper size at no additional cost to USPS.

On completion of project, Contractor shall dispose of all trash, waste, scrap geomembrane material, and equipment used in connection with the work hereunder and shall leave the premises in a neat and acceptable condition.

Textured geomembrane shall be deployed and field-seamed only when the geomembrane is dry and winds are low. In marginal conditions, seaming shall cease unless tests confirm that satisfactory seam strengths are being obtained.

Any textured geomembrane that may be exposed to sunlight longer than recommended by the manufacturer or than stated in the approved manufacturer's QA Manual shall be removed from site and replaced by the Contractor.

Contractor shall protect the Cap from vehicle damage by enforcing a site speed limit of no higher than 15 mph for protection, and selecting a Cap that shall be able to withstand vehicle ground pressures of at least 30 psi.

5.5 Quality Control

During the construction phase, the Cap shall be continuously inspected for uniformity, damage, and imperfections (for example, holes, cracks, thin spots, or foreign materials). Immediately after installation, the Cap shall be inspected to ensure tight seams and joints. Additionally, the Cap shall be inspected to ensure the absence of tears, punctures, or blisters. Any imperfections shall be immediately repaired and reinspected.

All field seams upon completion of work shall be tightly bonded. Contractor shall test every inch of field seaming by a physical nondestructive method acceptable to the Engineer. Any seams that fail shall be resealed and re-tested until they pass. This testing and reworking of unacceptable seams shall be at no additional cost to the State.

Test Seams

Test seams shall be made on test strips of geomembrane to verify that seaming conditions are adequate. They shall be made under the same conditions that exist for seaming and be witnessed by the Engineer. Test seams shall be made each day prior to production seaming, whenever there is a change in seaming personnel or seaming equipment and at least once every four hours, by each seamer and each piece of seaming equipment used that day. One sample shall be obtained from each test seam. This sample shall be at least 36 inches long by 11 inches wide with the seam centered lengthwise. Ten random specimens 1 inch wide shall be cut from the sample. Five (5) seam specimens shall be field tested for shear strength and 5 specimens for peel adhesion using an approved

tensiometer. Field testing shall be witnessed by the Engineer. Jaw separation speed shall be 20 inches per minute. Where necessary, accelerated curing of test strip seams made by chemical fusion methods, shall be conducted in accordance with GRI GM-7. To be acceptable, four out of five replicate test specimens must meet specified seam strength requirements of these Specifications. If the field tests fail to meet these requirements, the entire operation shall be repeated. If the additional test seam fails, the seaming apparatus or seamer shall not be accepted or used for seaming until the deficiencies are corrected by the Installer and two consecutive successful test seams are achieved.

Non-Destructive Seam Testing

All field seams shall be quality tested after they have been allowed to develop to full strength. Such testing shall be carried out through the use of an air lance with 50 pounds per square inch of air directed through a 3/16-inch nozzle or equivalent device. The lance shall be held no more than six inches from the seam edge and shall be utilized to detect any imperfections, tunnels or fishmouths. Any such imperfections in a seam shall be repaired and quality tested until a proper seam is achieved.

The Contractor shall non-destructively test all field seams over their full length using visual observation of seaming, air lance, vacuum testing, air pressure testing (for double fusion seams), or other methods in accordance to the fabricator's approved manual. Continual visual observation shall be performed on seams during the seaming process. Continuity testing shall be carried out as seaming work progresses. Non-destructive testing will not be permitted before sunrise or after sunset.

Where non-destructive testing cannot physically be performed such seams shall be extrudated with the same geomembrane. Extrudate operations shall be observed by the Engineer or appointed QA representative. All test equipment will be furnished by the Contractor.

Destructive Seam Testing

A minimum of one destructive test sample per 500 feet of field seam shall be obtained at locations specified by the Engineer. Sample locations shall not be identified prior to seaming. Samples shall be a minimum of 12 inches wide by 36 inches long with the seam centered lengthwise. Each sample shall be cut into three equal pieces with one piece retained by the Installer, one piece given to the Independent QA Laboratory for quality assurance testing, and the remaining piece given to the Engineer for permanent record. Destructive seam tests shall meet requirements listed in Table 5.3.2-1.

Each sample shall be numbered and cross referenced to a field log which identifies: (1) panel/sheet number; (2) seam number; (3) top sheet; (4) date and time cut; (5) ambient temperature; (6) seaming unit designation; (7) name of seamer; and (8) seaming apparatus temperature and pressures (where applicable). A minimum of four 1 inch wide replicate specimens shall be cut from the Installer's sample. A minimum of 2 specimens shall be tested for shear strength and 2 for peel adhesion using an approved field tensiometer. Jaw separation speed shall be 20 inches per minute. To be acceptable, all replicate test specimens must meet the specified seam strength requirements. If the field tests pass, 5 specimens shall be tested at the Contractor's Independent Laboratory for shear strength and 5 for peel adhesion in accordance with ASTM D 4437. To be acceptable, 4 out of 5 replicate test specimens

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must meet specified seam strength requirements. If the field or laboratory tests fail, the seam shall be repaired in accordance with the Procedure for Destructive Test Failure described below.

Destructive seam sample holes shall be repaired the same day as cut. Certified test results on field seams shall be submitted to and approved by the Engineer prior to acceptance of the seam. The State reserves the right to perform additional testing.

MINIMUM STANDARDS AND VALUES

Property	Test Method (Note 1)	Minimum Test Value	Number of Replicates	Frequency of Tests
Seam Shear Strength, (ppi) Note 1	ASTM D6392	90% of yield strength of parent material	5	Lab: 1/500' of seam or minimum of one test/seam Field Trial Seams •morning start •afternoon start
Seam Peel Adhesion, (ppi) (minimum) Note 2	ASTM D6392	60% of yield strength of parent material	5	Lab: 1/500' of seam or minimum of one test/seam Field Trial Seams •morning start •afternoon start

Note 1: Test results shall be considered passing if the minimum shear strength value is reached or the geomembrane elongates greater than 30.5 cm without failing regardless of the shear strength value.

Note 2: Seams tested for peel adhesion must fail in the Film Tear Bond (FTB) mode. This is a failure in the ductile mode of one of the bonded sheets by tearing or breaking prior to complete separation of the bonded area. Where applicable, both tracks of a double hot wedge seam shall be tested for peel adhesion.

5.5.1 Procedures for Destructive Test Failure

The following procedures shall apply whenever a sample fails the field destructive test:

- A. Contractor shall cap strip the seam between the failed location and any passed test location. geomembrane strips shall have a minimum of 4" overlap in all directions from repair point or as recommended by the manufacturer and approved by the engineer.
- B. Contractor can retrace the welding path to an intermediate location (at a minimum of 10 feet from the location of the failed test), at Engineer's discretion, and take a small sample for an additional field test. If this test passes, then the seam shall be cap stripped between that location and the original location. If the test fails, then the process is repeated.
- C. Over the length of seam failure, Contractor shall either cut out the old seam, reposition the panel and re-seam, or add a cap strip, as required by Engineer.
- D. After re-seaming or placement of the geomembrane strip, additional destructive field test(s) shall be taken within the re-seamed area. The re-seamed sample shall be found acceptable if test results are approved by Engineer. If test results are not acceptable, this process shall be repeated until the re-seamed length is judged satisfactory by Engineer.

In the event that a sample fails a laboratory destructive test, then the above procedure shall be followed, considering laboratory tests exclusively.

5.5.2 Defects and Repairs

Identification

Immediately prior to covering the geomembrane, seams and non-seam areas shall be visually inspected by the Engineer for defects, holes, or damage due to weather conditions or construction activities. At the Engineer's discretion, the surface of the geomembrane shall be brushed, blown, or washed by the Installer if the amount of dust, mud, or foreign material inhibits inspection or functioning of the overlying material.

Evaluation

Each suspect location shall be non-destructively tested. Each location that fails non-destructive testing shall be repaired and re-tested by the Installer until it passes.

Repair Procedures

Defective seam areas and destructive testing sampling locations shall be overlaid with a strip of new material and seamed (cap stripped). Alternatively, the seam path shall be retraced to an intermediate location a minimum of 10 feet on each side of the failed seam location. Destructive tests sample location repairs shall have a minimum of 4" overlap. At each location 12 by 12 inch minimum size seam sample shall be taken for 2 additional shear strength and 2 additional peel adhesion tests using

an approved quantitative field tensiometer. If these tests pass, then the remaining seam sample portion shall be sent to the Independent Laboratory for 2 shear strength and 2 peel adhesion tests in accordance with ASTM D4437. If these laboratory tests pass, then the seam shall be cap stripped between that location and the original failed location. If field or laboratory tests fail, then the process is repeated. After cap stripping, the entire cap stripped seam shall be non-destructively tested. Destructive test sample repairs shall be nondestructively tested. Certified test results on all repaired seams shall be submitted and approved by the Engineer prior to covering the seamed areas.

5.6 Warranty

The manufacturer's warranty shall state that the installed material meets all requirements of the contract documents and that under typical local atmospheric conditions, and conditions set forth by this specification, the sheet material is warranted for 5 years. The Cap Installer (or Contractor) shall warranty that the Cap field seams will not fail within 5 years of installation.

Warranties shall cover the labor and material cost of repairs or replacement. Such costs shall be the responsibility of warrantor.

5.7 Measurement and Payment

Payment will be made under:

<u>Pay Item No.</u>	<u>Pay Item</u>	<u>Unit</u>
5.1	Cap	Square Yard

The Contractor shall be paid the Bid Item No. 5.1 at the unit price per square yard of cap installed, as measured in the horizontal plane, using closure turf above the anchor trench as the limits of the horizontal boundaries. Such price shall be considered full payment for delivery, stockpiling and installation of cap. Price shall include materials (geomembrane, turf and sand infill) as described in this section. Price to include construction of the anchor trenches.

6.0 Erosion and Sedimentation Control

6.1 General Description

The Contractor shall employ soil erosion and sediment control measures during the life of the project to control erosion and minimize sedimentation of rivers, streams, lakes, reservoirs, wetlands, floodplains, bays, and coastal waters. This work shall consist of the construction and maintenance of various temporary soil erosion and sediment control measures, including relocating them as required for stage construction.

The Contractor shall incorporate all permanent pollution control features into the project at the earliest practicable time. The Contractor shall install temporary sediment control devices in addition to those required to be installed in accordance with the Erosion and Sediment Control Plan, including but not limited to silt fence, hay or straw bales, and rock filters, if and where directed by the Engineer.

6.2 Materials

Hay bales shall be of timothy, redtop, or native grasses. Straw shall be stalks of oats, wheat, rye, or barley relatively free from seeds, noxious weeds, and other foreign matter, free from decay matter and from organic matter soluble in water and shall be bound with wire or baling twine. The twine shall be an ultraviolet light stabilized polypropylene which has a knot strength of 170 pounds and straight break strength of 300 pounds.

Wood stakes, posts and boards shall be solid, reasonably knot-free lumber conforming to the nominal size specified on the plans.

Welded steel wire mesh fabric shall conform to AASHTO M 55M/M55. Wire fabric shall be not less than 1.5 meters in width and shall be shipped in sheets and not rolls. Fabric for slope protection, gutters, and miscellaneous items may be shipped in rolls. Sheets shall be bent in the shop.

Temporary riprap stones shall consist of a designated median stone (D50) size in the range of 6 inches to 9 inches, unless otherwise designated on the Erosion & Sedimentation Control Plan.

Coarse aggregate shall consist of broken stone or washed gravel.

6.3 Silt Fence

Silt fence shall consist of geotextile fabric whose width shall be at least 3 feet to provide for a 2.5 foot high fence after 0.5 foot of fabric is buried in the existing soil. Sections of fabric shall be joined in such a manner that, when in operation, the sections work effectively as a continuous fence. Fence posts shall be installed at a slight angle toward the anticipated runoff source.

Heavy duty silt fence shall include a welded wire mesh backing for the geotextile fabric. This welded steel wire mesh shall be galvanized and contain 4 inch square openings. The geotextile fabric shall be secured to the welded wire mesh.

6.4 Hay bale Check Dams with Temporary Stone Outlets

Hay bales shall be embedded 4 inches into the ground and anchored in place with 2 wood stakes per bale. The temporary stone outlets, consisting of riprap stones conforming to the requirements for temporary riprap, shall be placed in the center of each flow line. Coarse aggregate, size No. 57, shall be placed immediately upgrade of each stone outlet.

Rock filters shall be constructed in channels and ditches to reduce flow velocity.

The rock filters shall consist of riprap stones conforming to the requirements for temporary riprap. Coarse aggregate, size No. 57, shall be placed immediately upgrade of each check dam.

6.5 Soil Erosion and Sediment Control Maintenance

Soil erosion and sediment control measures shall be maintained during the life of the project, to ensure that the measures function properly. Soil erosion and sediment controls shall be immediately inspected after each rain and any corrective work shall immediately be performed to return the soil erosion and sediment control measures to proper function, as directed. Coarse aggregate, silt fence, or hay bales damaged due to washouts or siltation shall be replaced as necessary or as directed by the Engineer.

The Contractor shall install erosion and sedimentation control devices in accordance with this Section and as shown on the Drawings.

6.6 Stabilized Construction Entrance

Stabilized Construction Entrance shall be installed at earliest possible time. Contractor shall phase the installation of the Stabilized Construction Entrance in order to install the geomembrane below. At the completion of construction the Stabilized Construction Entrance shall remain in place.

6.6.1 Stone

Use washed gravel with the following gradations specified: 100% shall pass the 1.5" sieve, 95 to 100% shall pass the 1" sieve, 25 to 60% shall pass the 0.5" sieve, 0 to 10% shall pass the No. 4 sieve, and 0 to 5% shall pass the No. 8 sieve. Broken stone shall be uniform in texture and quality and shall be free of organic matter, wood, garbage, metal, debris, or lumps of clay. Slag shall not be permitted.

Washed gravel shall meet the following properties:

Aggregate Property	Maximum Percent
Weathered and deleterious gravel	5
Sodium Sulfate Soundness, loss	10
Soft particles as determined by scratch hardness test	5
Absorption in cold water	1.8
Clay lumps, organic material, coal and other foreign deleterious material	0.5
Chloride content	0.06
Crushed gravel material with at least 1 fractured face	60

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Adherent HMA in coarse aggregate	1.5
Adherent Concrete in coarse aggregate	1.0

The gravel shall be placed in lifts no thicker than 6” and compacted by 10 overlapping passes of track bulldozer.

Construct the roadway with a crown of at least 9 inches.

At no cost to the USPS, contractor shall maintain the roadway; this includes surveying the roadway and surrounding areas upon completion of its construction. Add and replace gravel on the roadway to repair erosion and compaction from equipment driving on it; perform other tasks required to keep the roadway and its immediate surroundings at its surveyed condition.

6.6.2 Filter Geotextile

Non-woven filter geotextiles shall be utilized between the road gravel and the sand above the cap as otherwise indicated on the Drawings. Filter Geotextile shall meet the requirements in the below table:

COMPONENT	REQUIRED TEST/ TEST METHOD	SAMPLE SIZE	ACCEPTANCE/REJECTION CRITERIA (Minimum)
Grab Strength (lbs/percent elongation)	ASTM D4632	3' x Roll Width per roll sampled	320/50
Puncture Strength (lbs)	CBR Puncture ASTM D6241	3' x Roll Width per roll sampled	190
Trapazoidal Tear (lbs)	ASTM D4533	3' x Roll Width per roll sampled	125
Apparent Opening Size (Less than US sieve)	ASTM D4751	3' x Roll Width per roll sampled	#100
Permittivity (sec ⁻¹)	ASTM D4491	3' x Roll Width per roll sampled	0.8
Mass Per Unit Area (oz/yd ²)	ASTM D5261	3' x Roll Width per roll sampled	12

MD – Machine Direction (longitudinal to the roll)

TD – Transverse Direction (across roll width)

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Overlap edges of geotextile 2ft. Geotextile shall extend 2ft beyond the edge of sand. Trim all exposed geotextile so none is showing on the final grade.

6.7 Measurement and Payment

Payment shall be made under:

<u>Pay Item No.</u>	<u>Pay Item</u>	<u>Unit</u>
6	Erosion and Sedimentation Control	Lump Sum

The Contractor will be paid the bid unit price for materials, installation, maintenance and removal (where applicable) for erosion and sedimentation control as shown on the Drawings and described herein. All temporary and permanent sediment control devices, labor, and equipment shall be considered part of Pay Item 6. Separate payment will not be made for maintenance, repair or replacement of erosion and sedimentation control devices or for relocation.