Tronox Navajo Area Uranium Mines
Northern Abandoned Uranium Mine Region

Draft
Cove Transfer Stations Group
Alternative Analysis Memorandum

September 30, 2021

TETRA TECH

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Submitted by
Tetra Tech, Inc.
1999 Harrison Street, Suite 500
Oakland, CA 94612

TETRA TECH

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ACRONYMS AND ABBREVIATIONS

§	Section
AAM	Alternative Analysis Memorandum
ABA	Acid-base accounting
AEA	Atomic Energy Act
amsl	Above mean seal level
ARAR	Applicable or relevant and appropriate requirement
ARARs Technical Memorandum	"Navajo Area Uranium Mines Applicable or Relevant and Appropriate Requirements Technical Memorandum"
ASPECT	Airborne spectral photometric environmental collection technology
AUM	Abandoned uranium mine
bgs	Below ground surface
BMP	Best management practice
BTV	Background threshold value
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
Characterization CSM	"Lukachukai Mountains Navajo Abandoned Uranium Mine Characterization Conceptual Site Model"
COC	Contaminant of concern
COEC	Contaminant of ecological concern
COPC	Contaminant of potential concern
COPEC	Contaminant of potential ecological concern
cpm	Counts per minute
CSM	Conceptual site model
CTS	Cove Transfer Stations
E&E	Ecology & Environment, Inc.
EE/CA	Engineering evaluation/cost analysis
EPC	Exposure point concentration
ERA	Ecological risk assessment
ET	Evapotranspiration
EU	Exposure unit
HDPE	high-density polyethylene
HELP	Hydrologic evaluation of landfill performance
HHRA	Human health risk assessment
HQ	Hazard quotient

ACRONYMS AND ABBREVIATIONS (CONTINUED)

Kerr-McGee	Kerr-McGee Corporation
LiDAR	Light detection and ranging
LLRW	Low-level radioactive waste
LOEC	Lowest observed effects concentration
MARSSIM	*Multi-Agency Radiation Survey and Site Investigation Manual*
MCAP	Mine category assessment protocol
mg/kg	Milligram per kilogram
NAMLRD	Navajo Nation Abandoned Mine Lands Reclamation Department
NAMLRP	Navajo Nation Abandoned Mine Lands Reclamation Program
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
Neptune	Neptune and Company, Inc.
NNEPA	Navajo Nation Environmental Protection Agency
NORM	Naturally occurring radioactive material
NRC	Nuclear Regulatory Commission
NTUA	Navajo Tribal Utility Authority
O&M	Operation and maintenance
OSHA	Occupational Safety and Health Administration
pCi/g	Picocurie per gram
pCi/m^2-sec	Picocurie per meter squared per second
Ra-226	Radium-226
RAG	Removal action goal
RAO	Removal action objective
RBSL	Risk-based screening level
RCRA	Resource Conservation and Recovery Act
Risk Assessment CSM	"Navajo Area Uranium Mines Risk Assessment Conceptual Site Model and Methodology"
RME	Reasonable maximum exposure
RSE	Removal site evaluation
site	Cove Transfer Stations Group
SPLP	Synthetic precipitation leaching procedure
SWPPP	Stormwater pollution prevention plan
TBC	To Be Considered

ACRONYMS AND ABBREVIATIONS (CONTINUED)

TCLP	Toxicity characteristic leaching procedure
Technology Technical Memorandum	"Navajo Area Uranium Mines Technology Evaluation and Alternative Development Technical Memorandum"
TENORM	Technologically enhanced naturally occurring radioactive material
Tetra Tech	Tetra Tech, Inc.
TSG	TerraSpectra Geomatics
UCL95	95 percent upper confidence limit
UMTRCA	Uranium Mill Tailings Radiation Control Act
USEPA	U.S. Environmental Protection Agency
UTL-95-95	95 percent upper tolerance limit with 95 percent coverage
Weston	Weston Solutions, Inc.
XRF	X-ray fluorescence

1.0 EXECUTIVE SUMMARY

1.1 PURPOSE OF THE ALTERNATIVES ANALYSIS MEMORANDUM

This Alternative Analysis Memorandum (AAM) recognizes that under the Fundamental Laws of the Diné, the four problem-solving stages are (1) thinking (*nitsahakees*), (2) planning (*nahat'a*), (3) implementation (*lina/jina'*), and (4) eventual results (*sihasin*). The stages of the problem-solving process flow in a circular direction from east to west with the eastern (*nitsahakees*) and southern (*nahat'a*) stages represented in this AAM (as shown on Figure 1). This AAM develops (*nitsahakees*) and evaluates (*nahat'a*) alternatives for addressing the risks to human health and the environment associated with the Cove Transfer Stations (CTS) Group (site) mine waste and contaminated soils in the context of the Fundamental Laws of the Diné and in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This AAM also presents the results of the thinking (*nitsahakees*) and planning (*nahat'a*) stages of the Fundamental Laws of the Diné for the CTS Group.

Input from the Navajo Nation and Cove community will be considered in the selection of a preferred alternative; therefore, this AAM does not identify a preferred alternative. The last two stages of problem solving, the implementation (*lina/jina'*) and results (*sihasin*), will occur after the U.S. Environmental Protection Agency (USEPA) solicits Navajo input on the AAM, presents the preferred alternative in the future engineering evaluation/cost analysis (EE/CA), and selects a response action in an action memorandum for the site. At that point, the response action will go through engineering design and implementation to achieve the removal action objectives (RAO) (*sihasin*).

1.2 NITSAHAKEES - SITE CHARACTERIZATION

The Cove Transfer Stations Group is located Cove, Arizona, on the Cove Chapter of the Navajo Nation, approximately 34 miles southwest of Shiprock, New Mexico (Figure 2). The **CTS Group** is a group of former uranium ore storage and transfer stations and associated areas in the Cove Valley region and is administered by the Cove Chapter of the Navajo Nation. From 1952 to 1968, ore from the Tronox abandoned uranium mines (AUM) in the Lukachukai Mountains, primarily the Mesa II Mine, was stockpiled at the site before transfer to a mill in Shiprock, New Mexico; no mining activities were conducted at the site. The site consists of two areas in Cove on Indian Route 33 about 2 miles apart: the Cove Transfer Stations Complex to the south and Cove Transfer Station (CTS) 2 to the north. The CTS Complex consists of CTS, CTS South, and non-AUM Target site CT-01.

The Navajo Nation Abandoned Mine Lands Reclamation Program (NAMLRP) conducted a removal action at CTS between July 2003 and July 2004. **A total of 2,150 cubic yards of waste was placed in a burial cell at AUM-related Target site NA-0344B located on Mesa V** approximately 2.9 miles southwest of the CTS Complex. In 2012, the USEPA Region 9 Emergency Response Section conducted a time-critical removal action at the Cove Transfer Stations Complex and CTS 2. **The excavated material from the Cove Transfer Stations Complex (approximately 11,800 cubic yards) and surface soil excavated at CTS 2 (approximately 570 cubic yards) was placed at a temporary stockpile at CTS 2.**

The CTS Group is located within the agricultural and residential community of Cove, Arizona, with a population of approximately 430 residents. Cove includes a chapter house, senior citizen center, day school, store, and gas station. The likely **future land use at the CTS Group is Kee'da'whíí tééh (full-time Navajo residential)**, including cultivation of field crops, homegrown produce, plant gathering, and livestock grazing. The relatively flat terrain of the CTS Group provides potential locations for the siting of houses, hogans, corrals, or stock-loading ramps.

The nature and extent of contamination at the CTS Group was characterized during the Removal Site Investigation (RSE) completed in October 2018. **Most waste at the site is associated with the reclaimed waste rock stockpile located at CTS 2 and an unreclaimed waste rock pit located at CTS South.** Areas with contamination outside the waste rock stockpiles are present because of historical activities and disturbance associated with uranium ore storage and transfer, as well as residual contamination from reclaimed waste piles at CTS and CTS South, a previous temporary stockpile at CTS 2, and other disturbed areas at the site.

USEPA contracted Tetra Tech, Inc. (Tetra Tech) to conduct risk assessments to evaluate the potential risk posed to human and ecological health by mine-related contamination at the CTS Group. The results of the human health risk assessment (HHRA) and ecological risk assessment (ERA) are used to assist in cleanup decisions at the site through the EE/CA process. The purpose of the risk assessment is to evaluate current and future human health risk under Navajo-specific reasonable maximum exposure (RME) scenarios and and regional ecological risk. **The results of the HHRA and ERA indicate that risks are present at the CTS Group for human and ecological receptors.** At the site, radium-226 (Ra-226) and uranium are contaminants of concern (COC), and Ra-226 is a contaminant of ecological concern (COEC) at the site. Removal action is recommended for contamination associated with COCs and COECs at the CTS Group.

Human health and ecological removal action goals (RAG) were derived for COCs and COECs recommended for removal action. The RAG is the lesser of the human health and the ecological risk-based screening levels (RBSL) is less than the background threshold value (BTV). If the BTV is higher than either RBSL, then the RAG is to address material that is distinguishable from background. For purposes of this AAM, the BTV is used to represent background for delineating contaminated areas.

Multiple lines of evidence were used to develop the removal action extent at the CTS Group, including the extent of Ra-226 in surface soil and sediment, extent of contamination of other COCs and COECs not colocated with Ra-226, and surface and subsurface waste areas. The removal action extent covers 5.4 acres at the Cove Transfer Stations Complex and 2.4 acres at CTS 2. **A total of 43,800 cubic yards of mine waste and contaminated soil will be addressed by removal action for the CTS Group**.

1.3 NAHAT'A - REMOVAL ACTION OBJECTIVES

The first step in developing removal alternatives is to establish RAOs. Taking current and potential future land use and Navajo cultural considerations into account, the RAOs are to:

- Prevent exposure to soil with contaminants that would pose an unacceptable risk to human health with residential use and traditional Diné Lifeways outside of any potential capped area
- Prevent exposure to soil with contaminants that would pose an unacceptable risk to human health with traditional Diné Lifeways on any potential capped area, which may include exposures that occur during activities such as livestock grazing, hunting, and plant gathering and use
- Prevent exposure to soil with contaminants that would pose an unacceptable risk to plants, animals, and other ecological receptors
- Prevent migration of contaminants to surface water or groundwater that pose an unacceptable risk to human health
- Prevent offsite migration of contaminants above background concentrations and at concentrations that could pose a risk to human health or the environment

The scope of the removal action will be to address all solid media contamination at the CTS Group and to be the final action for solid media at the site.

1.4 NAHAT'A - IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES

The following removal action alternatives were developed and evaluated as part of this AAM:

- **Alternative 1: No Action (this must always be evaluated)** – No treatment or removal action would occur at the site. Consequently, all threats would remain unchanged. Mine waste and contaminated soils would continue to threaten human and ecological receptors. Gamma radiation and physical hazards would still be present.
- **Alternative 2: Excavation, Transport, and Disposal in On-Mesa Repository** - Attains RAOs by excavating the temporary waste stockpile and contaminated soils at CTS 2 and the residual waste rock and contaminated soils at the Cove Transfer Stations Complex; hauling the waste 5.8 miles to a nearby on-Navajo Nation regional repository; consolidating the waste in the repository; and capping the repository. An evapotranspirative (ET) cap will be used, which is protective and will prevent contaminant migration. The burial cell will be maintained for 1,000 years.
- **Alternative 3: Excavation, Transport, and Disposal in On-Navajo Nation Regional Repository** - Attains RAOs by excavating the temporary waste stockpile and contaminated soils at CTS 2 and the residual waste rock and contaminated soils at the Cove Transfer Stations Complex; hauling the waste 21 miles to a nearby on-Navajo Nation regional repository; consolidating the waste in the repository; and capping the repository. An ET cap will be used, which is protective and will prevent contaminant migration. The repository will be maintained for 1,000 years.

- **Alternative 4: Excavation, Off-Navajo Nation Transport, and Disposal at White Mesa Mill** - Attains RAOs by excavating the temporary waste stockpile and contaminated soils at CTS 2 and the residual waste rock and contaminated soils at the Cove Transfer Stations Complex; hauling the waste 135 miles to the White Mesa Mill near Blanding, Utah, for uranium recovery; and disposing of the mill tailings in a tailing disposal facility. Off-Navajo Nation disposal is protective and does not require long-term maintenance.
- **Alternative 5: Excavation, Off-Navajo Nation Transport, and Disposal at Hazardous Waste or Low-Level Radioactive Waste (LLRW) Facility** - Attains RAOs by excavating the temporary waste stockpile and contaminated soils at CTS 2 and the residual waste rock and contaminated soils at the Cove Transfer Stations Complex; and hauling the waste 558 miles to and disposing of the waste in the Clean Harbors Deer Trail, Colorado, Resource Conservation and Recovery Act (RCRA) hazardous waste disposal facility. Off-Navajo Nation disposal is protective and does not require long-term maintenance.

Cleanup alternatives involving the physical removal of mine waste and the consolidation and capping of waste will address recontouring and revegetation of land to match natural landscape and removal of temporary access roads.

1.5 NAHAT'A - ANALYSIS OF REMOVAL ACTION ALTERNATIVES

The removal action alternatives were evaluated individually and in relation to each other using three broad criteria: effectiveness, implementability, and cost. An overview of the comparative analysis is presented below.

Removal Action Alternative		Effectiveness	Implementability	Estimated Costs
1	No Action	Very Poor	**Very Good**	**Very Good ($0)**
2	Excavation, Transport, and Disposal in On-Mesa Repository	**Good**	**Very Good**	Good ($13.2 Million)
3	Excavation, Transport, and Disposal in On-Navajo Nation Regional Repository	Average	Good	Good ($ 11 Million)
4	Excavation, Off-Navajo Nation Transport, and Disposal at White Mesa Mill	**Good**	Average	Poor ($14.8 Million)
5	Excavation, Off-Navajo Nation Transport, and Disposal at Hazardous Waste or LLRW Facility	Average	**Poor**	Very Poor ($24.4 Million)

Notes:
Bold indicates highest rating in category.
LLRW Low-level radioactive waste

This AAM was prepared without a preferred removal action alternative to provide an opportunity for tribal and public input on the removal action alternatives development and evaluation process. Following tribal and public input, a final EE/CA will be prepared, including a recommended removal action alternative, for public comment.

2.0 NITSAHAKEES - SITE CHARACTERIZATION

The CTS Group comprises two former uranium ore transfer stations in the Northern AUM Region: the Cove Transfer Stations Complex and CTS 2 (Figure 3). Additionally, the Cove Transfer Stations Complex contains three sites clustered near each other: CTS, CTS South (an extension of CTS), and non-AUM Target site CT-01. CTS 2 is approximately 2 miles northeast of the Cove Transfer Stations Complex.

This section presents the site description and background; previous reclamation and removal actions; previous site investigations; source, nature, and extent of contamination; risk assessment; and removal action extent for the Cove Transfer Stations Complex and CTS 2.

2.1 SITE DESCRIPTION AND BACKGROUND

CTS, CTS South, and CTS 2 are all former uranium ore transfer stations. CT-01 is a non-AUM related Target site that was identified as part of USEPA's airborne spectral and photometric environmental collection technology (ASPECT) aircraft flyover survey, which identified additional areas of concern (Targets) requiring further characterization based on elevated gamma activity. Appendix A presents site images showing the current condition of the former transfer stations. The following subsections describe the site location, operational status, regulatory history, site features and landscape, geology and hydrology, land use and populations, sensitive ecosystems and habitat, and meteorology and climate.

2.1.1 Site Location

The CTS Group is located within the in the Northern Abandoned Uranium Mine (AUM) Region of the Navajo Nation on Indian Route 33 in Cove, Apache County, Arizona (Figure 2 and Figure 3). The Cove Transfer Stations Complex is on the east and west side of Indian Route 33, across the road and north of the Cove Day School. A residential property is located immediately north of CTS. CTS 2 is approximately 2 miles northeast of the Cove Transfer Stations Complex on the northwest side of Indian Route 33 (Figure 4). CTS is at 36.561032 degrees latitude and -109.216712 degrees longitude with a mean elevation of 6,448 feet above mean seal level (amsl); CTS South is at 36.558167 degrees latitude and -109.217843 degrees longitude with a mean elevation of 6,484 feet amsl; CT-01 is at 36.56316 degrees latitude and -109.217109 degrees longitude with a mean elevation 6,406 amsl; and CTS 2 is at 36.584488 degrees latitude and -109.200236 degrees latitude with a mean elevation of 6,102 amsl.

2.1.2 Type of Target Sites and Operational Status

CTS and CTS South are AUM-related Target sites and former uranium ore transfer stations in the Cove Valley. CTS South is an extension of CTS. During operations from 1952 to 1968, CTS and CTS South were a mining operations field camp and uranium ore storage and transfer facility. Beginning in 1952, ore from the Tronox mines in the Lukachukai Mountains mining district, primarily from the Mesa No. 2 Mine in the Mesa II Complex, was brought down the mountain roads on tandem-drive trucks, temporarily stockpiled at the transfer stations, and then placed on larger trucks for transport to a mill in Shiprock, New Mexico, for uranium processing (Weston Solutions, Inc. [Weston] 2007). In 1954, the Kerr-McGee Corporation (Kerr-McGee) field camp was moved from the Mesa No. 1 Mine to CTS, at which point CTS began operating

as a field camp with miner housing, administrative structures, and vehicle maintenance facilities. Operations at CTS and CTS South concluded by the end of 1968 with the final shipments of ore out of the Lukachukai Mountains in May 1968.

Between September and November 2012, the USEPA Region 9 Emergency Response Section conducted a removal action at CTS and CTS South. During the removal action, approximately 11,800 cubic yards of material above the 2 picocuries per gram (pCi/g) cleanup level for Ra-226 were excavated from CTS and CTS South and transported to CTS 2, where the material was combined with 570 cubic yards of waste from CTS 2, for a total of 12,370 cubic yards of waste in a temporary above-ground waste stockpile at CTS 2 (Ecology & Environment, Inc. [E&E] 2013). No uranium tailings or waste piles are currently present at CTS and CTS South. Both sites are discussed in more detail in Appendix H40 of the "Northern Agency Tronox Mines Removal Site Evaluation Report" (Tetra Tech 2019). Site and reclamation features at CTS, CTS South, and CTS 2 are shown on Figure 5.

CTS 2 is an AUM-related Target site, a former uranium ore storage and transfer facility, and a temporary waste stockpile site that is located approximately 2 miles north of CTS on the northwest side of Indian Route 33. During operations from 1952 to 1968, ore from the Tronox mines in the Lukachukai Mountains, primarily the Mesa II Complex, was stockpiled at the site before being transported to a mill in Shiprock, New Mexico, for uranium processing. The waste removed during the 2012 removal action at CTS and CTS South is currently temporarily stockpiled at CTS 2. CTS 2 RSE field investigation activities only involved a gamma radiation survey on the temporary waste stockpile and overall site. Site features at CTS 2 are shown on Figure 5.

CT-01 is located northwest and across Indian Route 33 from CTS in the corner of an agricultural field. Because of its proximity to and likelihood of historical impact from windblown dust or potential overflow trucking parking from CTS or CTS South, CT-01 is being evaluated as a part of the CTS Complex in this AAM. No known historical information and no site features of interest are associated with CT-01. Technologically enhanced naturally occurring radioactive material (TENORM) and mining-related debris were not observed during the RSE field investigation; however, elevated measurements were detected during the gamma radiation survey.

2.1.3 Regulatory History

The CTS Group is part of the 2015 Kerr-McGee/Tronox Settlement Agreement (*In re Tronox Inc.*, No. 09-10156 (Bankr. S.D.N.Y. Nov. 23, 2010)). Multiple investigations of the CTS Group have been completed since 1989 as summarized in Section 2.3 and described in more detail in the "Lukachukai Mountains Navajo Area Uranium Mines Characterization Conceptual Site Model (CSM)" (Characterization CSM) (Tetra Tech, Forthcoming[a]). Between September and November 2012, the USEPA Region 9 Emergency Response Section conducted a removal action at CTS and CTS South, removing approximately 11,800 cubic yards of material and transporting the material to CTS 2, where the material was combined with 570 cubic yards of waste from CTS2, for a total of 12,370 cubic yards of waste in a temporary above-ground waste stockpile at CTS 2 (E&E 2013). Detailed information regarding reclamation activities is discussed in Section 2.2. CT-01 was identified in the mine category assessment protocol (MCAP) (Weston

2016a) as needing further investigation, but no known historical information is associated with this non-AUM Target site.

2.1.4 Site Features and Landscape

The CTS Group is located on the valley floor northeast of the Lukachukai Mountains in a generally flat area surrounded by agriculture, the community population, and public roadways as shown on Figure 3 and Figure 4. The Cove Transfer Stations Complex has a mean northeast slope of 4.2 degrees and is between two reaches of the Cove Wash drainage. The Cove Wash Middle drainage is located to the west and north of the site, and the Cove Wash South drainage is located to the east and drains into the ditches on both sides of Indian Route 33. The Cove Wash South drainage is located south-southeast of CTS 2. The Cove Transfer Stations Complex and CTS 2 are near irrigation channels for nearby agricultural fields.

The vegetation communities on site include Grassland-Shrub and Pinyon-Juniper Woodland. The Characterization CSM (Tetra Tech, Forthcoming[a]) discusses the types and distribution of vegetation and associated wildlife expected in each of these communities. Based on light detection and ranging (LiDAR) data from 2019, vegetation coverage at CTS and CTS is 18 and 31 percent, respectively. At CT-01 and CTS 2, the only vegetation cover consists of short grasses less than 2 feet high. Appendix A contains photographs showing the vegetation at the site.

Table 1 presents reclamation status, description, and dimensions for each AUM-related feature. Site features at the Cove Transfer Stations Complex include two reclaimed waste piles: Waste Pile 344A-1 at CTS and Waste Pile T37 with an unreclaimed waste rock pit beneath at CTS South (Figure 5). Site features at CTS 2 include a temporary waste stockpile containing excavated waste material from CTS, CTS South, and CTS 2 from the 2012 USEPA Region 9 Emergency Response Section removal action as described in Section 2.2 (Figure 5). While CTS 2 was not within the scope of the RSE investigation because it contained a temporary waste stockpile with known contamination, this AAM addresses the CTS 2 site. No known historical information or features are associated with CT-01, and no mine portals or underground workings exist within the CTS Group.

In 2012, CSWTA, Inc. conducted a cultural resources inventory survey on a total of 13.22 acres within the CTS Group area. CSWTA, Inc. examined all exposed ground surfaces using sub-parallel pedestrian transects spaced 10 to 12 meters apart but did not inventory any cultural resources, traditional cultural properties, or sacred places and made no collections.

An archaeological survey was completed at the site before the RSE investigation. Culturally sensitive areas were identified in and along the east and north boundary of the CTS survey area in the residential area, which was excluded from the RSE investigation as shown in Figure 5. Surrounding areas and any new access routes would require additional clearance before removal actions (Tetra Tech 2019).

2.1.5 Geology and Hydrology

The physical characteristics of the four sites within the CTS Group are similar with respect to geology, surface water drainage, and groundwater. Site hydrology and geology are presented in Figure 6 and Figure 7.

The site is entirely within the Chinle Formation (Figure 7), which consists of clay stones, shale, siltstone, sandstone, and conglomerate of varying thickness (Craigg 2001). The fluvial and lacustrine Chinle Formation is exposed in broad valleys around the mountains. Uranium minerals occur in bleached parts of the sandstone in the lower Chinle Formation, which is not exposed in the Lukachukai Mountains region (Nestler and Chenoweth 1958). Discussions of the geology, soils, and aquifers are presented in the Characterization CSM (Tetra Tech, Forthcoming[a]).

The Navajo Tribal Utility Authority (NTUA)-owned public water system of the Cove community with approximately 200 connections is supplied by groundwater from wells screened within the confined De Chelly Sandstone (C aquifer) (Neptune and Company, Inc. [Neptune] and TerraSpectra Geomatics [TSG] 2018). Two NTUA wells are located east and northeast of CTS 2 (Figure 8), and a non-NTUA well is located west of CTS South. Discharge from Crystal Spring (CW-45), located in the Chuska Formation approximately 2 miles upgradient on the mesa, is used to supplement the water supply at the Cove Day School via pipeline (Navajo Nation Environmental Protection Agency [NNEPA] 2019). Additional wells, seeps, springs, and surface water sources are shown on Figure 8. The public water system is tested annually for contaminants exceeding USEPA maximum contaminant levels and had no exceedances in 2017 (Neptune and TSG 2018). NTUA (2020) also reported no exceedances for the water contaminants tested at the Cove water source in 2019.

The Cove Wash is the only named waterbody in the Cove Wash Watershed. The Cove Wash Watershed Assessment (Weston 2018) included surface water and groundwater sampling over four events: 2015 and 2016 low-flow sampling, and 2016 and 2017 spring snowmelt sampling. Groundwater wells, seeps, and springs were also sampled and found the highest uranium concentrations in surface waters were during the low flow season. Two groundwater wells were sampled as part of the Cove Wash Watershed Assessment:

- Ellison Well: In 2015, uranium was detected at of 33 micrograms per liter, above the USEPA maximum contaminant level of 30 micrograms per liter.
- Red Point Dug Well: All uranium concentrations were below the USEPA maximum contaminant level.

According to the Preliminary CSM (Neptune 2018), some local well water is pumped from shallow aquifers in the valley, presumably lenses within the Chinle Formation. A summary of the regional aquifers is presented in the Characterization CSM (Tetra Tech, Forthcoming[a]).

The CTS Group sits between the Cove Wash Middle drainage and the Cove Wash South drainage within the Cove Wash watershed as shown on Figure 6. The Cove Wash Middle drainage receives water from drainages originating from Mesa I through Mesa V in the Lukachukai Mountains and, consequently, could receive contamination transported from many of the AUMs in the mountains. A summary of the occurrence, drainage pattern, and chemical characteristics of surface water is presented in Appendix J of the “Northern Agency Tronox Mines RSE Report” (Tetra Tech 2019) and the Characterization CSM (Tetra Tech, Forthcoming[a]).

2.1.6 Land Use and Populations

A summary of the land use planning documents that address the Cove community populations and the current and potential future land uses of the area is provided in the Characterization CSM (Tetra Tech, Forthcoming[a]).

The CTS Group is situated in the agricultural and residential community of Cove, which includes a chapter house, senior citizen center, day school, store, and gas station (Roux Associates 2011). CTS and CTS South occupy undeveloped land and are bordered to the north and northeast by an adjacent single-family residence with vacant land and a second single-family residence approximately 200 feet farther to the north, to the west by Indian Route 33 with agricultural fields beyond, to the south by vacant land, and to the east by an unpaved residential access road with vacant land beyond. CT-01 is located within an agricultural field adjacent to CTS on the opposite side of Indian Route 33. CTS 2 occupies undeveloped land bordered by Indian Route 33 to the immediate southeast and vacant land in all surrounding directions (Weston 2007).

The future land use identified at the CTS Group (Figure 9) is Kee'da'whíí téeh (full-time Navajo resident) as the site is easily accessible and relatively flat. This land use is further described in the "Navajo Area Uranium Mines Risk Assessment Conceptual Site Model and Methodology" (Risk Assessment CSM) (Tetra Tech, Forthcoming[b]).

2.1.7 Sensitive Ecosystems and Habitat

The CTS Group is within an Area 3 wildlife sensitive area as identified by the Navajo Nation Department of Fish and Wildlife (2008) and classified as having low, fragmented, or unknown concentrations of species of concern. Species in this area may be locally abundant on "islands" of habitat that are few and far between. Small-scale development to serve the needs of individuals, such as home sites and utilities, can proceed in Area 3 wildlife sensitive areas without concern for significant impacts to biological resources. For the purposes of this AAM, the proposed waste and soil removal at the CTS Group are assumed to be equivalent to acceptable small-scale development under Area 3.

Most of the habitat at the site is flat land, and the primary impacted environmental medium is soil. Two large ephemeral drainages lie approximately 0.25 mile to the west (Cove Wash Middle) and less than 1,000 feet to the northeast (Cove Wash South) of the Cove Transfer Stations Complex (Figure 4). At CTS 2, the nearest drainage is approximately 380 feet to the northwest and eventually ties into the Cove Wash Middle. The Cove Wash South drainage is approximately 0.25 mile south of CTS 2. No wetlands are located in the drainage downstream of the CTS Group.

The area occupied by the reclaimed waste piles at the site are disturbed with little vegetation. Vegetated areas at the site such as the area occupied by CTS South are expected to provide better habitat for terrestrial receptors because plants serve as a food source and provide areas of refuge. No threatened and endangered species were identified at the CTS Group, and the project area does not have habitat suitable for sensitive species (Tetra Tech 2019).

2.1.8 Meteorology and Climate

The climate in the Lukachukai Mountains and surrounding valleys is arid with low precipitation, high temperatures, and winds from the southwest. Annual evaporation far exceeds annual precipitation. Precipitation increases with elevation and temperature decrease. In the summer, seasonal monsoon rains can occur from mid-July until the end of August. A complete description of the climate is in the Characterization CSM (Tetra Tech, Forthcoming[a]).

2.2 PREVIOUS RECLAMATION AND REMOVAL ACTIONS

NAMLRP conducted a removal action at CTS between July 2003 and July 2004. A total of 2,150 cubic yards of waste was removed and placed in a burial cell at AUM-related Target site NA-0344B located on Mesa V, approximately 2.5 miles south of the Cove Transfer Stations Complex. Subsequent testing, which identified isolated elevated gamma radiation measurements, was completed as a post-removal activity at CTS (E&E 2013).

Between September and November 2012, USEPA Region 9 Emergency Response Section conducted a removal action at the CTS Group. During the removal action, approximately 11,800 cubic yards of material above the 2 pCi/g cleanup level for Ra-226 was excavated from CTS and CTS South and transported to CTS 2. The 2 pCi/g derived concentration guideline limit was established by adding the USEPA preliminary remediation goal for residential soil at a 1×10^{-4} excess risk level for Ra-226 of 1.21 pCi/g to the average detected background soil concentration of 0.79 pCi/g (E&E 2012). Approximately 5,500 cubic yards of clean backfill from a soil borrow source north of CTS 2 was used to backfill the CTS and CTS South excavation areas (E&E 2013). Additional removal activities conducted at CTS 2 include excavation of the existing waste pile at CTS 2 and construction of a waste stockpile designed to temporarily contain waste from CTS, CTS South, and CTS 2. A total of 570 cubic yards of contaminated soil material around the perimeter of the constructed stockpile was excavated to a depth of 12 inches below ground surface (bgs) and included in the temporary waste stockpile (E&E 2013).

Before capping the contaminated stockpile at CTS 2, vegetation was removed from the zone, washed to remove soils with elevated gamma activity, and shredded using a wood chipper. The chipping activities took place approximately 175 feet northeast of the CTS 2 excavation zone. Upon construction completion, the temporary waste stockpile was treated with a biodegradable, liquid copolymer (Gorilla-Snot) to stabilize and solidify soil for erosion control and dust suppression, and the area was fenced with barbed wire to prevent livestock access (E&E 2013).

At CTS South, a waste rock pit with a depth of 8 feet bgs beneath Waste Pile T37 was excavated and stockpiled at CTS 2. However, because of time and cost constraints during the removal action, the waste rock pit was left in place based on stability and cost considerations and refilled and covered with 2 feet of clean backfill (E&E 2013; USEPA 2016b).

Following completion of the site removal action in November 2012, sections of CTS and other adjoining areas became highly eroded because of the high-intensity rainstorms that periodically occur within this region. Because the loose surface soil at CTS lacks an adequate vegetative cover, rills and small gullies formed throughout much of the site. Between 2016 and 2017, USEPA Region 9 Emergency Response Section conducted a removal action consisting of restoration activities at CTS to prevent further surface erosion. The erosion repairs included

stabilizing slopes, installing water diversion channels, restoring a roadside ditch with rock material, removing dead vegetation, revegetating the slope, and installing an onsite water tank to drip-irrigate plants (Weston 2016b; USEPA 2018). The roadside ditch and water diversion channels were lined with rock material (riprap) and underlying erosion control fabric (USEPA 2018).

2.3 PREVIOUS SITE INVESTIGATIONS

The previous environmental investigations for the CTS Group include:

- Radiological scanning at CTS and CTS South in 1993 to identify areas with elevated radiation levels. Localized areas exceeded the Navajo Nation Abandoned Mine Lands Reclamation Department (NAMLRD) standards of 50 microroentgens per hour for gamma radiation (NAMLRD 1995).
- NNEPA pre- and post-NAMLRP removal action radiological surveys to identify areas with elevated radiation levels at the Cove Transfer Stations Complex in 2003 and 2004 (E&E 2013).
- Weston (2007) preliminary assessments at CTS in 2003 to verify the location and types of waste present.
- U.S. Department of Energy aerial gamma radiation surveys in 2000 to identify areas with elevated radiation levels (Bechtel Nevada 2001).
- E&E (2012) gamma scan survey and surface soil sampling at CTS 2 from November 2011 to August 2012 to determine pre-stockpile surface conditions.
- E&E (2013) investigations to evaluated conditions at CTS and CTS following the removal of mine waste and at CTS 2 following the placement of the stockpile and associated excavation in 2012. At CTS and CTS South, E&E a gamma scan survey and post-removal action confirmation surface soil sampling for Ra-226 to evaluate conditions and at CTS 2, E&E conducted a gamma scan survey at all impacted areas of the site, including the excavation zone, constructed stockpile, and vegetation chipping zone to identify any areas with elevated radiation levels.
- USEPA (2015) ASPECT surveys in 2014 and 2015 to identify areas with elevated radiation levels.
- Weston (2016a) MCAP investigation to conduct site mapping, verify waste pile extents, and conduct gamma radiation surveys.
- Tetra Tech (2019) RSE field investigations at the CTS Group in 2018 to conduct gamma radiation surveys, Xray fluorescence (XRF) field measurements, collect and analyze surface and subsurface soil samples, and evaluated cultural resources. Within the CTS survey area, 37 survey units were identified as culturally sensitive and not scanned or sampled. At CTS 2, a gamma scan was conducted of the stockpile and the area between Indian Route 33 and the stockpile.

A complete description of the previous investigations including summaries of the analytical data are in the “Northern Agency Tronox Mines RSE Report” (Tetra Tech 2019).

2.4 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

The source, nature, and extent of waste materials remaining at the Cove Transfer Stations Complex were characterized during the RSE investigations, and the source, nature, and extent of waste materials placed at CTS 2 were characterized during multiple investigations (E&E 2012, 2013; Tetra Tech 2019). The following subsections present the results of the background investigation and identification of contaminants of potential concern (COPC) and contaminants of potential ecological concern (COPEC), sources of contamination, nature of contamination, extent of contamination, and identification of exposure units (EU).

2.4.1 Contaminants of Potential Concern, Contaminants of Potential Ecological Concern, and Background Threshold Values

Regional COPCs and COPECs for the Northern AUM Region identified in the Risk Assessment CSM (Tetra Tech, Forthcoming[b]) are Ra-226, arsenic, selenium, uranium, and vanadium. Human health and ecological RBSLs were developed for various land uses (see Section 2.1.6) in the Navajo Nation using agreed-upon exposure parameters and published ecological risk-based lowest observed effects concentrations (LOEC). Geology-specific background concentrations for Ra-226 and metal COPCs and COPECs (arsenic, selenium, uranium, and vanadium) representing soils at AUMs within the Lukachukai Mountains and Cove Valley have been evaluated at regional scales, and provisional BTVs for the single geological unit present at the CTS Group (Chinle Formation) have been determined. For purposes of the AAM, the BTV is based on the 95 percent upper tolerance limit with 95 percent coverage of the background dataset (UTL-95-95).

Table 2 presents a screening of the maximum detected site concentrations for the geological formation at the CTS Complex with the RBSLs and the geology-specific 95 percent upper confidence limit (UCL95) concentrations and provisional regional BTVs. Maximum concentrations of Ra-226, arsenic, uranium, and vanadium exceed the human health RBSL, and maximum concentrations of selenium and vanadium exceed the ecological RBSL. Maximum concentrations of all analytes exceed the provisional regional BTVs for the Chinle Formation. Risk to human and ecological receptors from these contaminants is evaluated in Section 2.5.

Analytical data reflecting current conditions at CTS 2 are not available; however, historical soil sampling indicates that Ra-226 concentrations range from 1.1 to 93 pCi/g within and below the stockpile and are above the Ra-226 human health RBSL and BTV at CTS 2 (E&E 2012). No historical metals data have been collected at CTS 2.

2.4.2 Source and Nature of Contamination

Data characterizing the source and nature of contamination is used to define site characteristics, identify migration pathways, and support the risk assessment at a site. Data at the Cove Transfer Stations Complex were collected through the measurement of gamma radiation and total and leachable metals and radionuclides concentrations during the RSE investigation. Data on waste characteristics are used during the selection and design of removal action alternatives. Data at CTS 2 were collected through the measurement of gamma radiation during the RSE and historical investigations, and the measurement of radionuclides concentrations during historical sampling events (E&E 2013; Tetra Tech 2019).

No mine portals or underground workings exist at the CTS Group. Previous investigations identified and evaluated the former waste piles at the Cove Transfer Stations Complex, and removal activities have been performed at CTS and CTS South. Waste Pile 344A-1 at CTS was removed in 2003, and Waste Pile T37 at CTS South was removed in 2012. During the RSE investigation, both waste rock piles were confirmed removed; however, the waste rock pit at depth beneath reclaimed Waste Pile T37 at CTS South remains in place.

The main sources of contamination at the Cove Transfer Stations Complex are residual contamination from the reclaimed waste piles at CTS and CTS South, the waste rock pit at CTS South, background sources, and other disturbed areas at the site. The CSM wire diagram presented on Figure 10 shows the primary and secondary sources of contamination, primary and secondary release mechanisms, and exposure media, as well as the potential human health and ecological receptors and exposure pathways (discussed in Section 2.5). The primary contaminant transport pathways are fluvial and aeolian transport of contaminated soil (Figure 11). The 2007 preliminary assessment report identified that overland sheet flow at CTS is to the west, across Indian Route 33, and into an agricultural field (Weston 2007). As discussed in Section 2.2, USEPA Region 9 Emergency Response Section conducted a removal action in 2016 and 2017 that consisted of restoration activities at CTS to prevent further surface erosion. The transport pathway model on Figure 11 shows the erosion control features and the transport pathways present at the Cove Transfer Stations Complex. USEPA plans to conduct a future erosion control action to repair erosion control features placed on site. Offsite transport to nearby drainages is likely limited as the gamma radiation levels are generally low in the Cove Wash Middle and Cove Wash South drainages. The leaching and dissolution of metals and radionuclides from waste may also be from the existing waste rock pit. Radon is not expected to be a concern at the Cove Transfer Stations Complex based on the non-detect result for radon of a Rapidos alpha track detector deployed near the location of the reclaimed Waste Pile 03441-A at CTS during the RSE investigation (Tetra Tech 2019).

The main source of contamination at CTS 2 is the temporary stockpile. Although a soil stabilizer agent was applied to the stockpile area, soil from the stockpile may have migrated into surrounding soils and drainages through erosion. The CSM wire diagram presented on Figure 12 shows the primary and secondary sources of contamination, primary and secondary release mechanisms, and exposure media, as well as the potential human health and ecological receptors and exposure pathways (discussed in Section 2.5). Similar to the Cove Transfer Stations Complex, the primary contaminant transport pathways at CTS 2 are fluvial and aeolian erosion of contaminated soil. Radon gas emanation and the leaching and dissolution of metals and radionuclides from waste may also occur. The terrain around CTS 2 is flat and, therefore, a transport model figure was not prepared.

2.4.3 Extent of Contamination

Data characterizing the extent of contamination (collected through the measurement of radiation intensity through gamma scan surveys and total metals and radionuclides concentrations during the RSE investigation) is used to support the risk assessment and removal decisions.

Gamma Radiation in Surface Soils

Figure 13 presents the RSE gamma survey data for the Cove Transfer Stations Complex compared to the UCL95 of the background dataset, BTV, and multiples of the UCL95. Gamma scans were not conducted in the cultural exclusion area immediately around the residence and associated buildings during the RSE field investigation; however, gamma radiation activity above background levels was not detected by E&E (2013) in the area north and east of the residence (Figure 13). Gamma scans during the RSE investigation detected small areas with gamma radiation activity slightly elevated over background levels just south of reclaimed Waste Pile 344A-1 and along the southern portion of the roadside drainage at CTS, and in a small area south of the dirt road leading toward Mesa I at CTS South. In addition, a larger area of elevated gamma radiation activity is present on the opposite side of Indian Route 33 from CTS at the southeastern corner of CT-01.

At CTS 2, multiple gamma scans have detected gamma radiation activity exceeding background levels both within the stockpile and in areas to the west of the stockpile and to the south between the stockpile and Indian Route 33. E&E (2012) conducted a gamma scan survey during the removal assessment between November 2011 and August 2012 to determine pre-stockpile surface conditions. Figure 14 presents the results of the gamma survey and surface soil sampling. Following the placement of the stockpile and associated excavation, E&E (2013) also conducted a gamma scan survey at all impacted areas of the site, including the excavation zone, constructed stockpile (data not available), and vegetation chipping zone, and the survey results in counts per minute (cpm) are provided on Figure 15.

Although CTS 2 was not within the scope of the RSE investigation, a limited global positioning system-based gamma radiation survey was completed at CTS 2 in August 2018 at the request of USEPA. No data quality objectives were developed for the limited investigation, and no XRF in situ measurements or soil samples were collected. The primary objectives of the continuous gamma radiation survey were to confirm elevated levels of Ra-226 within the CTS 2 stockpile and along the road in front of the stockpile. The results of the gamma survey scan compared to the background gamma level for the Chinle Formation are presented on Figure 16.

Metals and Radionuclides in Surface Soils

The four primary sampling techniques used to evaluate metals and radionuclide concentrations and to assess risk to human health and ecological receptors at the CTS Complex were:

1. In situ XRF measurements (for a subset of metals)
2. XRF confirmation soil sampling
3. Surface soil sampling
4. Shallow subsurface soil sampling

Because of greater coverage and density, gamma scan data has been used as a surrogate to evaluate the extent of Ra-226 contamination. A Tronox correlation between gamma readings in cpm and Ra-226 activity in pCi/g has been developed for the CTS Group. The CTS Group are the only Tronox sites located in the Cove Valley region with three correlation plots available for

evaluation. RSE data from the three correlation plots in the Chinle Formation correlation study (Tetra Tech 2019) were combined with data derived from the discrete soil sample data and the nearby gamma scan data from CTS and CTS South to create a regression model. The coefficient of determination value between the Ra-226 laboratory analysis data and the field measured gamma activity counts was 0.718, indicating a positive correlation between the measurements (Tetra Tech, Forthcoming[e]). The gamma-radium correlation equation for the CTS Group is:

Equation 1: Estimated Ra-226 (pCi/g) = (0.000635 x [gamma (cpm)]) - 5.34962

Figure 17 presents the estimated Ra-226 surface soil concentrations compared to the UCL95, BTV, and multiples of the UCL95. Gamma survey data, converted to estimated Ra-266, were interpolated using ESRI's Geostatistical Wizard using the following model: Simple Kriging using a normal score transformation and the semivariogram variable and a smooth search neighborhood with a smoothing factor of 0.2. At CTS, the elevated estimated Ra-226 concentrations are mostly present in the southern and western portions of the surveyed area, including areas on the west side of Indian Route 33. Gamma scans were not conducted in the cultural exclusion area immediately around the residence and associated buildings during the RSE field investigation; however, gamma scan results converted to estimated Ra-226 concentrations from the area immediately north and east of the residential area were reported as being below 2 pCi/g (E&E 2013) (Figure 17). At CTS South, the elevated estimated Ra-226 concentrations are present just south of the dirt road leading to Mesa I and at the north portion of the RSE survey area close to the water tower. At CT-01, elevated estimated Ra-226 concentrations are present at the southeastern corner on the opposite side of Indian Route 33 from CTS (Figure 17).

Areas with elevated metals concentrations are generally colocated with areas where Ra-226 concentrations are highest. In an evaluation of Tronox AUM surface soil data within the Northern AUM Region, arsenic, selenium, uranium, and vanadium were found to occur at elevated concentrations more frequently than other metals outside the areas where Ra-226 concentrations exceed background levels (Tetra Tech, Forthcoming[b]). At the Cove Transfer Stations Complex, arsenic, selenium, uranium, and vanadium exceed the lowest RBSL and provisional regional BTV in multiple areas, including areas where estimated Ra-226 exceeds its provisional regional BTV in surface soil (Figure 18). Uranium concentrations at the Cove Transfer Stations Complex exceed the BTV of 2.4 milligrams per kilogram (mg/kg) in many areas (Tetra Tech 2019); the wide distribution of uranium concentrations above background may be associated with the source of the backfill used during the 2003 or 2012 removal actions described in Section 2.2 and the manner in which the backfill was spread out over the surface of the site during the 2016 erosion control action.

At CTS, arsenic, uranium, and vanadium also exceed the lowest RBSL and provisional regional BTV in subsurface soils (Figure 19). The highest concentrations exceeding the lower of the human health and ecological RBSLs and BTVs are located within the reclaimed waste pile and along the western portion of the site, but all samples with results exceeding the applicable BTV are bounded vertically by a sample with a result lower than the BTV. At CTS South, waste rock remains in place at the waste rock pit, where waste rock was observed to be present at 8 feet bgs during the USEPA 2012 removal action (E&E 2013; USEPA 2016b). Figure 20 presents a cross-

section of the waste rock pit observations during the RSE subsurface boring investigation that identified waste to a maximum depth of 3 feet bgs at the locations sampled.

No analytical laboratory data were collected during the RSE investigation at CTS 2. However, in 2011 and 2012, E&E (2012) conducted surface soil sampling to determine pre-stockpile surface conditions and collected 13 surface soil (0 to 6 inches bgs) samples and 15 shallow subsurface soil (12 to 36 inches bgs) samples primarily from within the footprint of the soil stockpile; the depth of these soil samples is estimated to be between 2.5 and 6 feet bgs based on an average stockpile height of 3 to 4 feet bgs (E&E 2013). Surface soil results ranged from 1.5 to 93 pCi/g with all but one of the sample results exceeding the 2 pCi/g action limit established in the removal assessment. Subsurface soil results ranged from 0.64 to 1.1 pCi/g with none of the results exceeding the action limit. Figure 14 presents the results of the surface soil sampling.

Following the placement of the stockpile and associated excavation at CTS 2, E&E (2013) developed a gamma-radium correlation to convert the 2012 gamma scan survey data and applied the gamma-radium correlation results to CTS, CTS South, and CTS 2. Figure 21 presents the results of the post-stockpile placement gamma survey at CTS 2 and identifies the estimated Ra-226 concentrations in surface soil around the stockpile. Current analytical data for the surface of the stockpile are not available. Additionally, the results from the gamma survey conducted by Tetra Tech (2019) in 2018 on the surface of the stockpile and on both sides of Indian Route 33 were used to estimate Ra-226 concentrations at CTS 2. These results are presented in Figure 22 and show that the stockpile surface and the area to the west of the stockpile exhibit Ra-226 levels above background.

During the RSE investigation, 309 soil and sediment samples across the Northern AUM Region within AUM sites and downgradient drainages were analyzed for uranium series isotopes to determine equilibrium conditions of uranium decay series radionuclides measured at Tronox AUM sites. A range of equilibrium conditions were observed, and results from the analysis support the assumption of secular equilibrium between Ra-226 and its decay products (Tetra Tech 2019).

TENORM and NORM Delineation

Naturally occurring radioactive materials (NORM) that have been concentrated or displaced because of human activities are considered TENORM. TENORM at the Cove Transfer Stations Complex includes the entirety of CTS and CTS South based on the past use of the site as an ore transfer station and includes reclaimed Waste Pile 344A-1, reclaimed Waste Pile T37, and elevated areas of Ra-226 within the more densely vegetated areas at CTS South. Additionally, the northern and eastern portions of CT-01 were mapped as TENORM because of elevated Ra-226 concentrations and proximity to CTS. The extent of TENORM at the Cove Transfer Stations Complex occupies 13 acres (570,052 square feet) and is shown on Figure 13. Table 3 presents summary statistics for Ra-226, arsenic, selenium, uranium, and vanadium for surface soil (0 to 12 inches bgs) in the Cove Transfer Stations Complex area.

At CTS 2 two gamma surveys were performed. The first survey was conducted by E&E (2013) which included the stockpile and areas around the stockpile that were impacted by its constructions. The second survey was conducted by Tetra Teach (2019) and included a low-density survey of the stockpile area as well as the area between the stockpile and IR-22. The

entire stockpile and stockpile construction area were mapped as TENORM. The extent of TENORM at CTS 2 occupies 7.4 acres (321,527 square feet) and is shown on Figure 15. Appendix B presents the lines of evidence for determining the TENORM boundaries.

The entire Cove Transfer Stations Complex lies within the Chinle Formation which is not considered a host rock unit. There were no mapped NORM areas within the Cove Transfer Stations Group.

2.4.4 Exposure Units

EUs for use in the risk assessment and future removal actions within the TENORM areas of the CTS Group were developed by identifying areas with a common location, land use, and geology to match areas with distinct cleanup goals. EUs do not have size restrictions for Navajo Nation AUMs. Figure 23 presents the single EUs identified at the CTS Group for full-time residential land use in the Chinle Formation, which include:

- EU 1 – Kee'da'whíí téeh (Full-time Navajo Resident) within the Chinle Formation at the Cove Transfer Stations Complex
- EU 2 - Kee'da'whíí téeh (Full-Time Navajo Resident) within the Chinle Formation at CTS 2

Within EU 1 at the Cove Transfer Stations Complex, sufficient data are available for both surface soil (0 to 12 inches bgs) and subsurface soil (12 to 72 inches bgs) to conduct an assessment of both the surface soil (0 to 12 inches bgs) and combined surface and subsurface soil (0 to 72 inches bgs) depth intervals. The combined surface and subsurface depth evaluation takes into account exposure from ingestion of homegrown produce and gathered plants, as well as sheep or cattle that eat plants. Table 4 presents the number of analytical samples available in the two depth intervals within EU 1.

Within EU 2 at CTS 2, no analytical data representing current conditions are available to evaluate risk within and adjacent to the interim stockpile; therefore, risk calculations are not presented for EU 2.

2.5 RISK ASSESSMENT

Risk assessments were completed to evaluate the potential risk posed to human and ecological health by Tronox mine-related contamination. The results of the HHRA and ERA are used to assist in cleanup decisions at the CTS Group through the EE/CA process. The compiled RSE investigation data were reviewed to ensure the appropriate data were used for the evaluation of each EU. Data compilation and management tasks included the selection of useable data, establishment of exposure areas, evaluation of sample depth intervals and selection of depth intervals to be evaluated, and calculation of the exposure point concentration (EPC) and other statistical values. Appendix C presents the data included in the HHRA and ERA. The compiled EPCs for EU 1 for surface soil and combined surface and subsurface soil are provided in Table 5.

2.5.1 Purpose

The purpose of the risk assessment is to evaluate current and future human health risk under Navajo-specific RME scenarios and ecological risk based on the known ecosystems for the region. The methodology used in the HHRA and ERA is provided in the Risk Assessment CSM (Tetra Tech, Forthcoming[b]). The risk assessment identifies human health COCs and COECs in each EU. In addition, the results of the risk assessment are used to determine RAGs and the extent of removal to meet the goals.

2.5.2 Human Health Risk Assessment

An HHRA is the process for evaluating how humans will be impacted as a result of exposure to one or more environmental stressors, such as chemicals or radiation. The objective of the HHRA is to evaluate whether COPCs detected at each EU pose unacceptable cancer risks or noncancer hazards to potential current and future human receptors under conditions at the time of the AAM (unremediated conditions) (USEPA 1989b, 1993). Consistent with Superfund methodology (USEPA 1989b), Tetra Tech assumes that the risks and hazards related to remedial work at the sites for AUM workers will be managed within acceptable levels using engineering controls and personal protective equipment. Therefore, potential exposures to AUM workers are not evaluated as part of the HHRA. The HHRA is intended to provide input for risk management decision-making for a site.

The HHRA includes the following components: data evaluation and selection of COPCs, exposure assessment, toxicity assessment, and risk characterization. The methodology used in the HHRA is provided in the Risk Assessment CSM (Tetra Tech, Forthcoming[b]).

For the CTS Group, a single Navajo-specific receptor (full-time resident) was identified as shown in the CSM (Figure 10 and Figure 12). A graphic depiction of other potential Diné Lifeways exposure pathways is also provided on Figure 24. The human health CSM identifies potentially complete exposure pathways by which receptors could come in contact with site-related contaminants. The CSM provides a description of the various RME scenarios or relevant activities that could occur at the site and the pathways in which a contaminant may be contacted, internalized, or ingested by an individual at a site. The CSM is used throughout the site investigation and removal processes to (1) provide a framework for addressing potential risks, (2) evaluate the need for additional data acquisition activities, and (3) evaluate health risks and the need for corrective measures. The following table provides the RME scenarios evaluated at the CTS Group and the complete exposure pathways included in each scenario.

Exposure Media	Exposure Pathways	Human Health Exposure Scenarios
		Kee'da'whíí téeh (Full-Time Navajo Resident)
Gamma Radiation	External Exposure (radioisotopes only)	●
Soil and Sediment	Incidental Ingestion Dermal (Metals only) Inhalation	●
Homegrown Produce	Ingestion	●
Gathered Plants	Ingestion Dermal (Metals only) Inhalation	●
Animal Products (raised and hunted)	Ingestion	●

Notes:
All receptors are assumed to obtain drinking water from offsite supplied sources and do not consume surface or groundwater at abandoned uranium mines.
● Potentially complete exposure route will be evaluated for the receptor

In the context of the regulatory risk assessment process, potential effects of contaminants are separated into two categories: cancer and noncancer effects. For carcinogens, such as radionuclides and arsenic, USEPA assumes that no dose is low enough to not cause a health effect and that some increased risk is at every dose level. Noncancer COPCs, such as uranium, are toxic above a threshold dose. Potential health risks for radionuclide COPCs are evaluated only for cancer risks while metals COPCs are evaluated for both cancer risk and noncancer hazard as appropriate. COPCs are limited to those determined to be regional COPCs or COPECs in the Risk Assessment CSM (Tetra Tech, Forthcoming[b]) and are Ra-226, arsenic, selenium, uranium, and vanadium.

Potential human exposure at the CTS Group is limited to radionuclides and metals in surface soil (0 to 12 inches bgs) and surface and subsurface soil (0 to 72 inches bgs). Samples are included in each depth interval dataset if the sample was collected entirely within the depth interval. Water exposure is not evaluated at the site because the RSE investigation focused on the characterization of soil only and surface water is not present.

RBSLs were developed for the Navajo-specific RME scenarios above using a target cancer risk of three in ten thousand (3×10^{-4}) and a target hazard quotient (HQ) of 1. These values were selected based on consultation with NNEPA. The process and inputs for the calculation of the RBSLs for each Navajo-specific scenario is provided in the Risk Assessment CSM (Tetra Tech, Forthcoming[b]). Table 6 presents the RBSLs calculated for cancer risk and noncancer hazard (child and adult). Human health RBSLs were derived for applicable receptors and radionuclide and metals COCs using all potentially complete soil-related exposure pathways. For Ra-226, the human health RBSL is the carcinogenic-based screening level assuming secular equilibrium of Ra-226 and its decay products.

In the HHRA, EU-specific EPCs were compared to RBSLs to determine whether site concentrations pose unacceptable risk or hazard. For analytes with EPCs exceeding the RBSL, EU-specific EPCs for each COPC were also compared with regional geological formation-

specific BTVs developed for use in the AAM. COCs were identified as those COPCs with total cancer risk greater than 3E-04 (radionuclides and metals) or a HQ greater than 1 (metals only), and EPCs greater than geologic formation-specific BTVs.

The cancer risk (age-adjusted adult and child) and non-cancer hazards for child and adult receptors for each EU and soil interval are provided in Table 7 for Cove Transfer Stations Complex. Table 8 compares the calculated EPCs for the Cove Transfer Stations Complex COCs to the calculated RBSL and BTV to identify the COCs that should be considered in the removal action.

For EU 2 at CTS 2, historical soil sampling indicates that Ra-226 concentrations within and below the stockpile are above the Ra-226 human health RBSL and BTV and range from 1.1 to 93 pCi/g (E&E 2012). Therefore, Ra-226 was identified as a COC for future full-time residential receptors at CTS 2 because detected results are above the human health RBSL of 0.11 pCi/g and provisional BTV of 2.4 pCi/g. Risk calculations for CTS 2 are not presented in Table 7 and Table 8 because the data are not based on current conditions. No analytical data have been collected at CTS 2 since the 2012 USEPA removal action interim repository was constructed. The determination of the removal action extent will take into account other lines of evidence. Gamma survey data converted to estimated Ra-226 concentrations will be used as a line of evidence to develop the removal action extent at CTS 2 as discussed in Section 2.6.

The following COCs were recommended for removal action for each EU:

Exposure Unit[a]	Matrix (Depth Interval, inches below ground surface)	Contaminant of Concern	
		Radium-226[b]	Uranium
1	Surface Soil (0-12)	--	X
1	Surface and Subsurface Soil (0-72)	--	X
2	NA	X[c]	--[d]

Notes:

[a] The exposure units (EU) include:
EU 1 - Kee'da'whíí téeh (Full-Time Navajo Resident) within the Chinle Formation at the Cove Transfer Stations Complex
EU 2 - Kee'da'whíí téeh (Full-Time Navajo Resident) within the Chinle Formation at Cove Transfer Stations 2

[b] Radium-226 is assumed to be in secular equilibrium for the human health risk assessment.

[c] Historical soil sampling indicates that radium-226 concentrations within and below the stockpile are above the radium-226 human health risk-based screening level and background threshold value at Cove Transfer Stations 2, and range from 1.1 to 93 picocuries per gram (Ecology & Environment, Inc. 2012).

[d] No analytical data are available.

NA Not applicable

-- Not recommended for removal action for the EU based on human health risk assessment results. [Note: Multiple lines of evidence are used in determining whether an EU will have a removal action. Identification of the contaminants of concern is one of these lines of evidence. Other lines of evidence include identification of contaminants of ecological concern, known contamination (such as a burial cell), or elevated gamma radiation readings.]

X Human health contaminant of concern recommended for removal action for the EU.

Tetra Tech compared subsurface soil (12 to 72 inches bgs) concentrations with the uranium RBSL (0.92 mg/kg) and BTV (1.7 mg/kg) to determine whether the uranium EPC for the combined surface and subsurface soil (0 to 72 inches bgs) depth interval was driven solely by

surface soil concentrations. Uranium was detected in all 42 subsurface samples collected from 10 borings widely distributed at CTS and 7 borings collected near the waste rock pit at CTS South. No subsurface data are available at CT-01. Table 9 presents the uranium concentrations in soil borings collected at the Cove Transfer Stations Complex. At the Cove Transfer Stations Complex, uranium concentrations in subsurface soil (12 to 72 inches bgs) range from 0.49 to 13 mg/kg with a mean of 2.1 mg/kg and an EPC of 4.1 mg/kg, exceeding the RBSL and BTV of 1.7 mg/kg. At CTS, samples from 5 out of 10 borings exceeded both the RBSL and BTV, and all exceedances except one (at 12 to 18 inches bgs) were vertically bounded by samples with concentrations lower than the BTV. The deepest subsurface exceedance of the RBSL and BTV at CTS was from 48 to 60 inches bgs and had a concentration of 11 mg/kg. At CTS South, samples from 2 out of 7 borings exceeded both the RBSL and BTV, and all exceedances were vertically bounded by samples with concentrations lower than the BTV. The deepest subsurface exceedance of the RBSL and BTV at CTS South was from 18 to 48 inches bgs and had a concentration of 1.9 mg/kg. Based on the distribution of uranium contamination in subsurface soil at the Cove Transfer Stations Complex, uranium remains a COC in EU 1 for the combined surface and subsurface soil depth interval.

Although Ra-226 was not identified as a COC in either depth interval at the Cove Transfer Stations Complex based on available analytical data, Ra-226 is a known contaminant at AUMs and AUM-related sites. The determination of the removal action extent will take into account other lines of evidence, including gamma survey data converted to estimated Ra-226 concentrations as discussed in Section 2.6.

2.5.3 Ecological Risk Assessment

An ERA is the process for evaluating how likely the environment will be impacted as a result of exposure to one or more environmental stressors, such as chemicals. The objective of the ERA is to evaluate whether ecological receptors may be adversely affected by exposure to site-related contaminants. The ERA is intended to provide input for risk management decision-making at each AAM group while maintaining a conservative approach protective of ecological populations and communities (USEPA 1992, 1997, 1998, 2001).

The ERA includes the following components: problem formulation, analysis of exposure and effects, and risk characterization. The methodology used in the ERA is provided in the Risk Assessment CSM (Tetra Tech, Forthcoming[b]). Ecological RAGs were identified based on the results of the risk characterization.

As discussed in Section 2.4.1, COPECs are limited to those determined to be COPCs or COPECs in the Northern AUM Region. The following representative feeding guilds are evaluated in the ERA, which are exposed to soil in the following depth intervals:

- Plants (0 to 72 inches bgs)
- Soil invertebrates (0 to 12 inches bgs)
- Avian herbivores (0 to 12 inches bgs)
- Avian ground insectivores (0 to 12 inches bgs)
- Avian carnivores (0 to 12 inches bgs)

- Mammalian herbivores (0 to 72 inches bgs)
- Mammalian ground insectivores (0 to 72 inches bgs)
- Mammalian carnivores (0 to 72 inches bgs)

Ecological receptors were evaluated using available data. Surface soil (0 to 12 inches bgs) and surface and subsurface soil (0 to 72 inches bgs) were used to evaluate exposure to ecological receptors in EU 1.

As indicated in the CSM (Figure 10 and Figure 12), the potentially complete ecological exposure pathways evaluated in the ERA were:

- Potential exposure of soil invertebrates and terrestrial plants to site-related contaminants present in soil and sediment via direct contact.
- Potential exposure of wildlife (birds and mammals) to site-related contaminants present in soil and sediment through the ingestion of site-related contaminants in soil, forage, and prey items.

Ecological RBSLs were selected for each feeding guild from the Los Alamos National Laboratory ECORISK database (Newport News Nuclear BWXT-Los Alamos, LLC. 2020). RBSLs are based on LOECs, the lowest concentration where an effect has been observed in chronic ecotoxicity studies.

In the ERA, EU-specific EPCs were compared to the ecological RBSLs to calculate a HQ. HQs greater than 1 indicate a potential for ecological risk because the LOEC is based on an observed adverse effect concentration. For analytes with HQs exceeding 1, EU-specific EPCs for each COPEC were also compared with regional geological formation-specific BTVs developed for use in the AAM.

The HQs for each EU and soil interval for each representative feeding guild are provided in Table 10 for the Cove Transfer Stations Complex. Table 11 compares the calculated EPCs for Cove Transfer Stations Complex for the COPECs with a maximum HQ exceeding 1 to the RBSL and BTV to identify the COPECs that should be considered in the removal action.

At the Cove Transfer Stations Complex, no COECs were identified based on available laboratory and XRF sample data. However, the determination of the removal action extent takes into account other lines of evidence. Therefore, although no COECs were identified in either depth interval at the Cove Transfer Stations Complex, Ra-226 is a known contaminant in AUMs. Gamma survey data converted to estimated Ra-226 concentrations will be used as a line of evidence to develop the removal action extent for each EU as discussed in Section 2.6.

At CTS 2, historical soil sampling indicates that Ra-226 concentrations within and below the stockpile are above the Ra-226 RBSL and BTV and ranged from 1.1 to 93 pCi/g (E&E 2012); therefore, Ra-226 was identified as a COEC. Risk calculations for CTS 2 are not presented in Table 10 and Table 11 because the data are not based on current conditions. No analytical data have been collected at CTS 2 since the 2012 USEPA removal action interim repository was constructed. Gamma survey data converted to estimated Ra-226 concentrations will also be used

as a line of evidence to develop the removal action extent for each EU as discussed in Section 2.6.

2.5.4 Risk Assessment Results Summary and Identification of Removal Action Goals

Human health and ecological RAGs were derived for each applicable receptor, EU, and COC or COEC recommended for removal action. Table 12 summarizes the surface and subsurface soil EPCs, human health and ecological RBSLs, provisional regional BTV for each EU, and RAG. The RAG is the lesser of the human health and the ecological RBSLs unless either RBSL is less than the BTV. If the BTV is higher than either RBSL, then the RAG is to address material that is distinguishable from background. For purposes of this AAM, the BTV is used to represent background for delineating contaminated areas. The following table provides the selected RAG for each COC and COEC for each EU.

COC or COEC	Units	Human Health RBSL[a]	Ecological RBSL[b]	BTV[c]	RAG[d]
EU 1 - Surface Soil (0-12 inches bgs)[e] and Surface and Subsurface Soil (0-72 inches bgs)[f]					
Uranium	mg/kg	0.92	--	1.7	1.7
EU 2 – Soil within and Adjacent to Interim Repository[g]					
Radium-226[h]	pCi/g	0.11	15	2.4	2.4

Notes:

a The human health RBSL is based on the full-time resident. For metals with both carcinogenic and noncarcinogenic effects, the human health RBSL is the lesser (more conservative) of the carcinogenic- and noncarcinogenic-based screening levels presented in Table 6.

b The ecological RBSL is based on the minimum LOEC for all feeding guilds evaluated for the depth interval. No ecological RBSL is provided because uranium is not a COEC.

c The BTV is for the identified geologic unit.

d The RAG is the lesser of the human health and the ecological RBSL unless either RBSL is less than the BTV. If the BTV is higher than either RBSL, then the RAG is to address material that is distinguishable from background. For purposes of this AAM, the BTV is used to represent background for delineating contaminated areas.

e Human health COCs are identified based on exposure to surface soil.

f Human health COCs are identified based on exposure to surface and subsurface soil.

g Human health COCs and COECs are identified based on historical soil sampling data representing concentrations within the interim repository.

h Secular equilibrium is assumed for radium-226 for calculation of human health risks.

-- Not a COEC
AAM Alternatives analysis memorandum
bgs Below ground surface
BTV Background threshold level
COC Contaminant of concern
COEC Contaminant of ecological concern
EU Exposure unit
LOEC Lowest observed effect concentration
mg/kg Milligram per kilogram
pCi/g Picocurie per gram
RAG Removal action goal
RBSL Risk-based screening level

COCs at the Cove Transfer Stations Complex were identified based on available laboratory and XRF sample data. The HHRA and ERA results indicate that removal action is recommended for surface and subsurface soils in EU 1 for uranium based on unacceptable risk for current and future full-time residents. Ra-226 was identified as a COC at CTS 2 based on available historical

data, and removal action is recommended in EU 2 based on unacceptable risk for current and future full-time residents and ecological receptors.

The determination of the removal action extent, described in the following section, takes into account other lines of evidence. Therefore, although Ra-226 was not identified as a COC or COEC at EU 1, Ra-226 is a known contaminant in AUMs and AUM-related sites, and gamma survey data converted to estimated Ra-226 concentrations will be used as a line of evidence to develop the removal action extent for each EU as discussed in Section 2.6. The RAG for Ra-226 in EU 1 based on the proposed land use and underlying geological unit is 2.4 pCi/g, which is used in the derivation of the Ra-226 removal action extent.

2.6 REMOVAL ACTION EXTENT

Multiple lines of evidence were considered to develop the removal action extent at the CTS Group, including the extent of Ra-226 in surface soil, extent of contamination of other COCs and COPECs not colocated with Ra-226, surface and subsurface waste areas, transport pathways, disturbed mineralized areas, accessibility considerations, and risk management considerations.

2.6.1 Ra-226 Removal Action Extent

At the CTS Group, gamma survey data was evaluated and converted to estimated Ra-226 concentrations to determine the Ra-226 removal action extent. A *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (USEPA 2020)-based approach using area averaging was employed that evaluated estimated Ra-226 concentrations against the EU-specific Ra-226 screening level within 2,000-square-meter survey units and the BTV. For purposes of the AAM, the BTV is based on the 95 percent upper tolerance limit with UTL-95-95. A hot spot evaluation was also conducted to identify 100-square-meter areas with average concentrations exceeding twice the RAG; these areas were added to the preliminary removal action footprint. Contiguous 100-square-meter areas with average concentrations below the RAG were removed from the survey unit designated for removal action.

The preliminary removal action extent for Ra-226 at the Cove Transfer Stations Complex is limited to the southeastern portion of CT-01 and the far northwestern portion of CTS on the opposite side of the road from CT-01 (Figure 25). The preliminary removal action extent for Ra-226 at CTS 2 includes the entire stockpile and one area west of the stockpile with elevated concentrations of estimated Ra-226 (Figure 26).

2.6.2 Removal Action Extents - Other Considerations

Additional lines of evidence were considered when modifying the preliminary removal action extent for the CTS Group; specifically:

- **Extent of contamination of other COCs and COPECs not colocated with Ra-226:** Areas outside the Ra-226 removal action extent with elevated concentrations of other COCs and COPECs were added iteratively to the preliminary removal action extent until the resulting EPC within each EU was less than the RAG.

- **Surface and subsurface waste areas:** Waste rock piles and subsurface reclamation mine features such as burial cells were added to the preliminary removal action extent.

The following additional lines of evidence were considered but found not applicable to the CTS Group:

- **Transport pathways:** Site features and areas (such as drainages and sediment deposits) with potential for future transport of waste material downgradient to other geologic units with lower RAGs.
- **Risk management considerations:** Areas within sensitive habitat, as well as areas where if disturbed, may result in destabilization of slopes (for example, by removing vegetation) and transport of material downgradient.
- **Cultural Exclusion Areas:** Concentrations near the cultural exclusion area generally appear to be below the RAGs.

Figure 25 presents the proposed removal action extent at the Cove Transfer Stations Complex. The removal action extent is driven by the distribution of uranium in surface soil. The total calculated surface area and volumes within the proposed removal action extent broken down by the waste rock pit (in CTS South) and other contaminated surface areas are:

- Waste rock pit: 1,669 square feet; 618 cubic yards
- Other surficial contamination: 230,988 square feet; 26,652 cubic yards

Figure 26 presents the proposed removal action extent at CTS 2. The total calculated surface area within the proposed removal action extent broken down by the stockpile and other contaminated surface areas are as follows:

- Stockpile: 81,272 square feet; 12,370 cubic yards
- Other surficial contamination: 24,860 square feet; 921 cubic yards

A description of the excavation area for the CTS Group, including excavation depths, is included in Section 4.2.1.1.

3.0 NAHAT'A - IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

3.1 REMOVAL ACTION OBJECTIVES

The first step in developing removal action alternatives is to establish RAOs. Under CERCLA, removal action alternatives may not require remediation of NORM or soil to concentrations below background levels. Taking current and potential future land use and Navajo cultural considerations into account, the RAOs are to:

- Prevent exposure to soil with contaminants that would pose an unacceptable risk to human health with residential use and traditional Diné Lifeways outside of any potential capped area.
- Prevent exposure to soil with contaminants that would pose an unacceptable risk to human health with traditional Diné Lifeways on any potential capped area, which may include exposures that occur during activities such as livestock grazing, hunting, and plant gathering and use.
- Prevent exposure to soil with contaminants that would pose an unacceptable risk to plants, animals, and other ecological receptors.
- Prevent migration of contaminants to surface water or groundwater that pose an unacceptable risk to human health.
- Prevent offsite migration of contaminants above background concentrations and at concentrations that could pose a risk to human health or the environment.

USEPA developed the "Navajo Area Uranium Mines Technology Evaluation and Alternative Development Technical Memorandum" (Technology Technical Memorandum) (Tetra Tech, Forthcoming[c]) to describe the general response actions that will satisfy the RAOs listed above. A summary of the technology screening and alternative development process addressed in the Technology Technical Memorandum is provided in Section 4.1. Section 4.2 describes the retained removal action alternatives for the CTS Group, and Section 4.3 presents a detailed analysis of the removal action alternatives with respect to National Oil and Hazardous Substances Pollution Contingency Plan (NCP) effectiveness, implementability, and cost criteria. Section 5.0 presents a comparative analysis of the removal action alternatives.

3.2 STATUTORY LIMITS ON REMOVAL ACTIONS

Pursuant to CERCLA Section (§) 104(c)(1), the normal statutory limits for CERCLA removal actions of $2 million and 12 months do not apply since the selected action will be funded by a responsible party and not by Superfund.

3.3 REMOVAL SCOPE

The scope of the removal action will be to address all solid media contamination at the CTS Group and to be the final action for solid media at the site. The removal action will also protect against potential future impacts to groundwater and surface water. Post-removal action site controls will be part of the analysis for an alternative that does not include the complete removal of contaminants off site.

3.4 REMOVAL SCHEDULE

This AAM was prepared without a preferred removal action alternative to provide an opportunity for public input on the removal action alternatives development and evaluation process. Following stakeholder input, a final EE/CA will be prepared, including a recommended removal action alternative for public comment.

NCP requires a minimum public comment period of 30 days following release of the proposed final EE/CA by USEPA. USEPA will respond to significant comments received during the public comment period and publish an action memorandum following the response to comments. USEPA will provide public notification of the removal action schedule upon issuance of the action memorandum.

During the implementation of the selected removal action alternative(s), several factors may affect the removal action schedule, including removal action planning and design, cultural and biological clearances and mitigation, seasonal weather-related restrictions, and access for construction equipment. Depending on the removal action alternative(s) selected in the final EE/CA, design and implementation of the construction activities will likely require between 6 and 7 months, depending on schedule-limiting factors such as truck availability, monsoon rains, and snowfall. Inspections and maintenance of graded and revegetated site surfaces will be required at the mine site for at least the first 10 years after restoration. Inspections and maintenance of the repository cap, if selected, will be conducted as specified in a site-specific long-term surveillance plan (10 *Code of Federal Regulations* [CFR] § 40.28) with inspection frequencies adjusted based on cap stability and inspection findings.

4.0 NAHAT'A - IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Section 4.1 summarizes the screening process for potential technologies and identifies the removal action alternatives that may be effective and implementable at the CTS Group; Section 4.2 provides a detailed description of the retained removal action alternatives; Section 4.3 provides a detailed analysis of the removal action alternatives based on NCP effectiveness, implementability, and cost criteria.

4.1 DEVELOPMENT AND SCREENING OF ALTERNATIVES

This subsection identifies general response actions, identifies and screens technologies, develops and describes potential removal action alternatives, and identifies the applicable or relevant and appropriate requirements (ARAR).

4.1.1 Summary of Technology Identification and Screening

The removal action alternative development process involves identifying general response actions, technology types, and process options that may satisfy RAOs. General response actions, technologies, and process options considered for all AUMs on the Navajo Nation have been identified, described, and initially screened in the Technology Technical Memorandum (Tetra Tech, Forthcoming[c]) and are presented in Table 13 along with any modifications necessary to address the CTS Group site conditions and local requirements. The initial screening eliminates from further consideration infeasible technologies and process options and retains potentially feasible technologies and process options.

A technology or process option can be eliminated from further consideration if it does not meet the effectiveness threshold criteria (protectiveness and compliance with ARARs) or substantive implementability criteria (technical, administrative, availability, and local acceptance), the details of which are described in Section 4.3. In addition, a technology or process option can be eliminated if its cost is substantially higher than other technologies or process options and at least one other technology or process option is retained that offers equal protectiveness.

Technologies or Process Options Screened from Consideration. The following process options identified in the Technology Technical Memorandum were removed from consideration as infeasible during development of this AAM for the CTS Group:

- **Excavation and Disposal at Uranium Mill Tailing Radiation Control Act (UMTRCA) Sites.** Several UMTRCA sites were assessed for the CTS Group waste and considered to be infeasible because sites were either closed, had insufficient capacity to receive the waste, or had groundwater contamination issues that could prohibit disposal under the CERCLA Off-Site Rule.
- **Excavation and Disposal Back into the Mine Adit and Workings**. No mine portals or underground workings exist at the CTS Group.
- **Disposal at a Local Municipal Solid Waste Landfill.** No municipal solid waste landfills are located on the Navajo Nation, but several landfills are located nearby in Arizona and

New Mexico. Local landfills were screened from consideration as disposal options because uranium mine waste is specifically exempted from the definition of solid waste in state regulations. Thus, the permits for local landfills do not allow for disposal of uranium mine waste.

Analysis of Whether Treatment to Reduce Toxicity or Volume Is Practicable. CERCLA and NCP express a preference for treatment of waste that significantly and permanently reduces the volume, toxicity, or mobility of contaminants, where such treatments are practicable. CERCLA § 121(b), 40 CFR § 300.430(a)(1)(iii), and "A Guide to Principal Threat and Low Level Threat Waste" (USEPA 1991) describe how to identify wastes that may be appropriate for treatment. Although the action at the CTS Group is a removal action, USEPA has nevertheless fully considered whether the site contained any principal threat waste, whether that waste could safely be contained using engineering controls, and whether any treatment options may be practicable for the waste at the site. As a result of its investigation and analysis, USEPA concluded that, while individual samples at the site contained higher levels of contaminants that might be considered principal threat waste, the waste at the site is extremely variable and heterogeneous in its radiological activity and found no areas of waste rock that were clearly distinguishable as principal threat waste. In addition, consistent with USEPA (1991) guidance, USEPA found that the wastes at the site can be safely and reliably contained by appropriate engineering controls. Potential treatment options were reviewed, and USEPA's analysis of the reasons why no currently available treatment options are practicable is presented below:

- **Phytoremediation** is a treatment process that uses plants to absorb radionuclides and other contaminants. This and similar alternative treatment methods were considered but screened as infeasible for the site. Most contamination at the site is located in close proximity to homes and requires removal rather than onsite treatment. In addition, plants used in phytoremediation need to be harvested and disposed of as a radioactive waste and human or animal consumption of the plants would need to be prevented. Because of the need for waste isolation and harvested material handling requirements, phytoremediation is determined not to be practicable.
- **Soil washing** is a treatment process that involves washing the contaminated medium (with water) in a heap, vat, or agitated vessel to dissolve water-soluble contaminants. Soil washing requires that contaminants be readily soluble in water and sized sufficiently small so that dissolution can be achieved within a practical retention time. The most common form of mineralization is tyuyamunite—$Ca(UO_2)_2(V_2O_8)\bullet(5\text{-}8)H_2O$— with other members of the carnotite group of minerals also present. Carnotite group minerals dissolve slowly in water, making soil washing likely ineffective for removal to remediation goals. Metals solubility depends on the valence state of the metal compounds in the waste rock and can range from highly soluble to insoluble. Because of the low concentrations of uranium in the waste rock and varying solubilities at different pH ranges for radionuclides and metals of concern, soil washing will likely not meet cleanup goals and is determined not to be practicable.
- **Acid extraction** is similar to soil washing except an acidic solution is applied to the waste rock or other contaminated media in a heap, vat, or agitated vessel instead of water. Depending on temperature, pressure, and acid concentration, varying quantities of metal constituents present in the contaminated medium would be solubilized. A broader

range of contaminants are expected to be acid soluble at ambient conditions via acid extraction than via application of soil washing. Because of the low concentrations of uranium in the waste rock and varying solubilities at different pH ranges for radionuclides and metals of concern, acid extraction will likely not meet cleanup goals and is determined not to be practicable.

- **Ablation** is a treatment technology that can be applied to sandstone-hosted uranium mineralization, where the uranium minerals form a crust on the sand grains. The ablation process mixes water and waste rock into a slurry that is injected into impact tank modules. The opposing slurry streams impact one another and collisions between the sandstone particles and fragments within each stream result in a disassociation of fine-grained, intergranular, and mineralized material (uranium minerals) from coarser-grained sands. Ablation technology has potential with some small commercial systems in operations and with pilot-scale studies planned to test the feasibility of the technology for treating waste rock with low uranium concentrations. However, ablation technologies have not proven capable of removing low concentration uranium from waste similar to the waste rock at the site and are not of sufficient throughput to address a large volume of waste rock in a timely manner. Therefore, ablation is determined not to be practicable.
- **Milling** is a commercial process that removes uranium by a combination of several methods including pulverization and acid extraction. The concentration of uranium in the waste rock at the site is very low, so any processing would therefore yield only a minimal amount of uranium. Additionally, milling does not remove radium and the resulting mill waste is neither less toxic nor less mobile than the source material. Thus, milling is determined not to be practicable for the treatment of uranium mine waste. However, milling may be considered as a pretreatment step for recovering an economic quantity of uranium before disposal in a tailings disposal facility and is, therefore, retained as a disposal process option.

If the treatments discussed above or any other treatment methods are shown to be effective and practicable before the selection of a remedy, USEPA will amend this analysis and consider such treatment.

Retained technologies and process options are combined into a range of potential removal action alternatives in Section 4.1.2.

4.1.2 Summary of Alternative Development

Excavation and disposal is the only technology identified as implementable and effective for the CTS Group. Removal action alternatives for AUMs on the Navajo Nation were developed as described in the Technology Technical Memorandum (Tetra Tech, Forthcoming[c]). Retained removal action alternatives for the CTS Group are drawn from the Technology Technical Memorandum and based on site-specific conditions and other local requirements. The removal action alternatives are:

- **Alternative 1: No Action** – No treatment or removal action would occur at the site. Consequently, all threats would remain unchanged. Contaminated soils and mine waste

would continue to threaten human and ecological receptors. Gamma radiation would still be present.

- **Alternative 2: Excavation, Transport, and Disposal in On-Mesa Repository** – Attains RAOs by excavating the temporary waste stockpile and contaminated soils at CTS 2 and the residual waste rock and contaminated soils at the Cove Transfer Stations Complex; hauling the waste 5.8 miles (one way) to a nearby on-mesa repository; consolidating the waste in the repository; and capping the repository.
- **Alternative 3: Excavation, Transport, and Disposal in On-Navajo Nation Regional Repository** – Attains RAOs by excavating the temporary waste stockpile and contaminated soils at CTS 2 and the residual waste rock and contaminated soils at the Cove Transfer Stations Complex; hauling the waste 21 miles (one way) to an on-Navajo Nation regional repository; consolidating the waste in the repository; and capping the repository.
- **Alternative 4: Excavation, Off-Navajo Nation Transport, and Disposal at White Mesa Mill** – Attains RAOs by excavating the temporary waste stockpile and contaminated soils at CTS 2 and the residual waste rock and contaminated soils at the Cove Transfer Stations Complex; hauling the waste 136 miles (one way) to the White Mesa Mill near Blanding, Utah, for uranium recovery; and disposing of the mill tailings in a tailing disposal facility.
- **Alternative 5: Excavation, Off-Navajo Nation Transport, and Disposal at Hazardous Waste or LLRW Facility** – Attains RAOs by excavating the temporary waste stockpile and contaminated soils at CTS 2 and the residual waste rock and contaminated soils at the Cove Transfer Stations Complex; and hauling the waste 559 miles (one way) to and disposing of the waste in the Clean Harbors RCRA hazardous waste disposal facility in Deer Trail, Colorado.

Retained removal action alternatives are fully described in Section 4.2.2 and will be carried through a detailed analysis in Section 4.3.

4.1.3 Applicable or Relevant and Appropriate Requirements

While CERCLA § 121(d) requires that remedial actions attain standards, requirements, criteria, or limitations that are determined to be ARARs, this section does not apply to removal actions and does not specifically require that removal actions attain ARARs. However, pursuant to NCP at 40 CFR § 300.415(j), USEPA has promulgated a requirement that removal actions attain federal and state ARARs to the extent practicable considering the exigencies of the situation. The ARARs evaluation completed for the CTS Group was a comprehensive and complete evaluation of ARARs, and no ARARs were rejected based on the exigencies of the situation. The CTS Group is located on Navajo Nation land. Pursuant to NCP at 40 CFR § 300.5, the term “state” includes American Indian tribes. Therefore, for purposes of evaluating potential ARARs, tribal requirements will be treated the same as state requirements. The identification of ARARs is an iterative process; therefore, ARARs are referred to as potential until the final determination is made by USEPA in the action memorandum.

NCP at 40 CFR § 300.5 identifies ARARs and other "To Be Considered" (TBC) as follows:

- **Applicable requirements** are defined as "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at a CERCLA site."
- **Relevant and appropriate requirements** are defined as "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitation promulgated under federal or state environmental or facility siting laws that, while not 'applicable' . . . address problems or situations sufficiently similar to those encountered at the CERCLA site and that . . . is well suited to the particular site."
- **TBC criteria** consist of advisories, criteria, or guidance that were developed by USEPA, other federal agencies, or states that may be useful in developing CERCLA remedies and include non-promulgated guidance or advisories that are not legally binding and that do not have the status of potential ARARs. TBCs generally fall within three categories: health effects information with a high degree of credibility, technical information on how to perform or evaluate site investigations or response actions, and policy.

Factors to be considered when determining if requirements meet the criteria for ARARs are discussed in the "Navajo Area Uranium Mines Applicable or Relevant and Appropriate Requirements Technical Memorandum" (ARARs Technical Memorandum) (USEPA, Forthcoming).

ARARs apply to onsite actions completed as part of the removal action. The onsite actions evaluated in this AAM will occur exclusively on Navajo Nation land. Therefore, the State of Arizona lacks regulatory jurisdiction, and State of Arizona statutory or regulatory requirements are not evaluated as potential ARARs (USEPA 1989a). Compliance with ARARs requires compliance only with the substantive requirements contained within the statute or regulation and, pursuant to CERCLA § 121(e)(1), does not require compliance with procedural requirements, such as permitting or recordkeeping. ARARs do not apply to offsite and off-Navajo Nation response actions. Instead, offsite and off-Navajo Nation response actions must only comply with independently applicable requirements (not relevant and appropriate) and must comply with both substantive and procedural components of the requirements.

USEPA, as the lead agency, is responsible for identifying potential federal ARARs and evaluating potential tribal ARARs identified by the Navajo Nation. For a tribal requirement to be identified as a potential ARAR, the requirement must be more stringent than federal ARARs.

USEPA has divided ARARs into three categories: chemical specific, location specific, and action specific. The three categories are described below:

- **Chemical-Specific ARARs** are usually health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.

- **Location-Specific ARARs** apply to the geographical or physical location of the site. These requirements limit where and how the response action can be implemented.
- **Action-Specific ARARs** include performance, design, or other controls on the specific activities to be performed as part of the response action for a site.

The potential ARARs for this response action are presented in Table 14, Table 15, and Table 16 by ARAR category and address site- and alternative-specific requirements specific to the CTS Group. A full description and analysis of potential ARARs is presented in the ARARs Technical Memorandum (USEPA, Forthcoming).

4.2 DESCRIPTION OF ALTERNATIVES

Retained removal action alternatives for the CTS Group are listed below along with a summary of common site construction and restoration elements applicable to all alternatives. A detailed description of removal action alternatives and associated costs, which focuses on the different waste disposal options, is presented in Section 4.2.2.

4.2.1 Summary of Alternatives and Common Elements

The removal action alternatives for the CTS Group are:

- Alternative 1: No Action
- Alternative 2: Excavation, Transport, and Disposal in On-Mesa Repository
- Alternative 3: Excavation, Transport, and Disposal in On-Navajo Nation Regional Repository
- Alternative 4: Excavation, Off-Navajo Nation Transport, and Disposal at White Mesa Mill
- Alternative 5: Excavation, Off-Navajo Nation Transport, and Disposal at a Hazardous Waste or LLRW Facility

4.2.1.1 Common Elements

To reduce repetitive discussion in the detailed alternative analyses, common removal action elements for Alternatives 2 through 5 are provided below.

Site Preparation. A laydown area will be established near the intersection of Indian Route 33 and the Mesa V access road west of Cove for all alternatives. Depending on the alternative chosen, a laydown area will also be established at the on-mesa or regional repository. Laydown areas may include port-a-potties, wash water, refuse pickup, decontamination station, temporary offices, temporary Wi-Fi and radio, and potentially a construction water well and tank stand. The laydown areas will also include security personnel and temporary fencing and signage for access controls. Laydown areas will remain until completion of the remedy.

No power is available at the CTS Group. A power drop may be possible at the laydown area west of Cove. Therefore, power for the project will be provided by diesel generators for the temporary work site (laydown) and well site location (if constructed). The diesel generators will require

bulk fuel storage at the laydown area, as well as daily storage on the project site. The generators will provide power for various types of construction equipment, lighting systems, and pumps.

A sufficient water supply is not available for construction at the CTS Group. Purchase of water from the NTUA or construction of a new construction supply well at the laydown area west of Cove will be needed to provide water for the project. Utility water could be obtained from NTUA hydrants in the Cove area depending upon existing infrastructure and the volume of water available. Well depths at the laydown area will be approximately 800 feet if utility water is not available. Generators for site power will be used to run the well pump. A water storage tank for the water trucks will also be required. If a well is constructed, it could be left for use by the Navajo community for irrigation or livestock.

Cultural and Biological Exclusion and Timing. Cultural resource investigations were completed within the CTS Group boundary in 2018 by Dinetahdoo Cultural Resources Management LLC. The presence of cultural and biological resources could impose limitations on removal actions. Culturally significant sites were observed in the northern and southeastern portions of the Cove Transfer Stations Complex investigation area and must be avoided during construction. No threatened and endangered species were identified at the CTS Group, and the project area does not have habitat suitable for sensitive species (Tetra Tech 2019).

Site Access. The CTS Group is located adjacent to Indian Route 33 on the valley floor in a generally flat area surrounded by agriculture, the Cove community, and public roadways. Figure 27 shows the CTS Group road access. Fencing would be required during removal activities because of the proximity to the community and the public road. Access to the work area will be marked and signed. Traffic controls will be required for ingress and egress at Indian Route 33.

Air Monitoring. A sampling and analysis plan would be prepared that describes the methods and procedures for collecting, analyzing, and evaluating air samples within and at the perimeter of work zones. A minimum of three air monitoring stations would be positioned and operated to monitor dust and airborne contaminant concentrations during grubbing, excavation, stockpiling, loading of trucks, and site restoration. Air monitoring results would be used to document that onsite and offsite migration of contaminants at unacceptable concentrations does not occur. Workers nearby dirt moving and loading activities would also wear real-time dust monitoring equipment to identify the need for respiratory protection upgrades.

Dust Control. Off-road haul routes and site excavation and restoration areas would be wetted so that dust generation is minimized. Frequent water spraying would be used during soil moving activities at all work zones for dust suppression. Further, rock fields and grating will be used to reduce track out of dirt onto paved surfaces. Water used for dust control and cleaning of paved surfaces will be imported or pumped from a new construction well as described above. Dust control will be used to maintain compliant air quality conditions and a safe working environment and will also protect the health of nearby residents, workers, the general public, and the environment.

Excavation Approach. The consolidated interim mining waste pile at CTS 2 and the waste rock pit capped under 2 feet of clean fill at CTS South in the Cove Transfer Stations Complex are the primary waste removal areas of concern (Figure 28 and Figure 30). The estimated 12,988 cubic

yards of waste (12,370 cubic yards from CTS 2 and 618 cubic yards from CTS South) is easily accessible. In addition to the mining waste, additional surface and near-surface soil removal will be completed at CTS 2 and at Cove Transfer Stations Complex. Waste excavation methods considered for the CTS Group include standard size excavators, scrapers, and loaders.

At CTS 2, the aboveground waste piles will be directly loaded for haul-out; and an additional 1 foot of soil will be removed from the waste pile footprint and other selected areas for a total of 16,301 cubic yards of waste removal from 106,132 square feet (Figure 28), consolidated in temporary onsite stockpiles, and then loaded for haul-out. At CTS South, the waste rock (estimated at 8 feet deep and below 2 feet of surface fill for a total depth of 10 feet to be excavated and removed) will be excavated and directly loaded for haul-out. Figure 28 shows the location, areas and dimensions of the CTS 2 mining waste and soil removal areas. Because no analytical data for the concentration of metals in surface and near-surface soils are available at CTS 2, CTS 2 will need to be evaluated at the remedial design stage to determine if additional soil removal is needed.

At the Cove Transfer Stations Complex, in addition to the buried waste rock removal at CTS South, surface soil and near-surface soil that exceed residential screening criteria for uranium at the Cove Transfer Stations Complex will be removed, for a total of 27,270 cubic yards of waste from 232,657 square feet (Figure 30), consolidated in temporary onsite stockpiles, and then loaded for haul-out. Figure 30 shows the location, areas and dimensions of the CTS Group mining waste and soil removal areas.

The total estimated volume of waste and soil to be removed from the CTS Group is 43,751 cubic yards - 27,270 cubic yards from the Cove Transfer Stations Complex and 16,301 cubic yards from CTS 2. The total excavation area is 338,789 square feet - 232,657 square feet at the Cove Transfer Stations Complex and 106,132 square feet at CTS 2. Borrow will be obtained from nearby areas to backfill the soil removal area at CTS 2 and the Cove Transfer Stations Complex to grade. Underground utilities will be checked at all subsurface excavation areas to avoid damage.

Waste Handling and Transfer. For Alternative 2 (on-mesa repository), waste will be loaded into 25-ton articulated dump trucks and hauled 5.8 miles to the Mesa V Central Repository. For Alternative 3 (on-Navajo Nation regional repository), waste will be loaded into covered 25-ton highway-legal haul trucks and hauled 21 miles to the regional repository. For Alternatives 4 and 5 (off-Navajo Nation disposal), waste will be loaded into covered 25-ton on-highway haul trucks and hauled to the off-Navajo Nation mill or hazardous waste facility. The haul trucks will use Indian Route 33, which is directly accessible to all CTS Group removal areas. No transfer station will be required because the site can be accessed with multiple types of trucks. Dry brushing of all truck bed and wheels will occur before each truck leaves the site.

Cap Design Assessment. Containment in an on-mesa or regional repository (Alternatives 2 and 3) would involve the construction of an engineered cap over the consolidated mine waste. Two types of engineered caps were evaluated through infiltration and radon flux modeling in the Technology Technical Memorandum (Tetra Tech, Forthcoming[c]) for waste containment: a soil ET cap and a soil cap containing an integral high-density polyethylene (HDPE) layer.

A total of 36 inches of cover is required for an ET cap to prevent infiltration of precipitation and snowmelt, control radon gas flux, and reduce gamma activity to background. A cap with an HDPE liner would require less soil cover; however, 24 inches of cover would still be needed to protect the liner from frost heave.

Both engineered cap types would minimize the vertical migration of precipitation and snowmelt to and contact with underlying mine waste. However, an ET cap would be stable on slopes less than 3:1 while a HDPE would be less stable because the smooth surface of the liner creates a slip plane. Also, since HDPE is impermeable, the potential for moisture to accumulate and drain along the slip plane is possible, thereby increasing instability. Furthermore, an ET cap would allow for slow dissemination and natural degradation of radon gas while a soil cap with an HDPE liner would tend to trap radon gas, which may find preferential pathways for a release at higher concentrations.

Because of the remoteness of the Navajo Nation and the Cove region, the cap material, trucking, and installation costs for the two different cap options should also be considered along with the impacts on construction schedule, transportation, and labor requirements. Overall, use of nearby borrow soil for cover material reduces trucking costs and the project schedule; however, if borrow soil is limited, a soil cap with HDPE liner may become more cost effective.

For the CTS Group, an ET cap would be preferable for the Alternative 2 on-mesa repository because the waste is not leachable and soil borrow material for the cover is readily available. An engineered cap with an integral HDPE liner may be considered for the regional repository if higher concentration or leachable waste from other sites is consolidated at the repository.

Site Restoration Activities. Areas disturbed by waste transfer and removal activities will require restoration. USEPA developed a matrix in the "Navajo Area Abandoned Uranium Mines Surficial Restoration Approaches Technical Memorandum" (Tetra Tech, Forthcoming[d]) to identify different features and areas of sites requiring restoration and the corresponding typical restoration approaches Table 17 identifies site features and areas present at the Cove Transfer Stations Group along with general restoration approaches. Further details regarding each feature and area requiring restoration are described below:

- *Waste Excavation Areas.* Excavated areas will be backfilled with soil from a local borrow area and contour graded to match adjacent topography (Figure 29 and Figure 31). Sloped areas will be covered with biodegradable matting and seeded using local grasses and forbs. Surface controls (such as berms), water control bars, and rock-lined drainage ditches will be installed where needed. Temporary 4-strand barbed wire fencing will be erected around the restored area, subject to local residential uses, to protect revegetation efforts from gazing over a period of up to 10 years.
- *Roadside Drainage Swale Excavation Areas.* Where excavation of roadside drainage features along Indian Route 33 are proposed at the CTS Group, drainage features will be repaired and reinstalled as necessary to restore proper surface water drainage, prevent erosion, and control run-off. The restored sites will be graded to match topography, and drainage swales will be armored with riprap material.

Short-Term Operation and Maintenance of Site Restoration Features. Operation and maintenance (O&M) will be performed for up to 10 years for restored areas of the site including excavation areas, removed roads, and borrow areas. Annual O&M will include:

- Vegetation survey in late spring
- Erosion control inspection and maintenance survey after the monsoon season
- Vegetation maintenance, which includes reseedings and removing weeds
- Repairs to range fencing, erosional features, and water control berms

At the end of site restoration period, accumulated soil in detention basins will be assessed to determine if material needs to be removed and placed in a repository or disposed of off site.

On-Mesa and Regional Repository Closure and Long-Term Operation and Maintenance. Activities common to Alternative 2 and 3 include:

- Final grading, surface erosion controls, and revegetation of the on-mesa or regional repository cap will be designed to limit visual impact by mimicking local terrain and using local soils and vegetation.
- Erosion controls on the cap may include biodegradable matting and wattles and using berms and ditches to direct run-on water around the on-mesa or regional repository and to collect runoff from the repository in a detention basin before discharge (Figure 32).
- Fencing will be installed around the on-mesa or regional repository to control or restrict grazing and access since overgrazing, livestock foot traffic, or vehicle traffic could damage the cap

Land use controls would be required for waste placed in a burial cell or repository to protect the remedy. The form of the land use controls would likely be a land withdrawal or an environmental covenant, such as an easement to restrict future residential use or activities that would disturb the cap.

Inspections and maintenance of the on-mesa or regional repository covers will be conducted as specified in an O&M plan with inspection frequencies adjusted based on the cover stability and inspection findings. The inspection would consist of checking for erosion and burrowing and verifying the integrity of erosion controls. Maintenance will consist of filling burrows, filling and grading eroded surfaces, clearing accumulated erosion materials, replanting vegetation, and repairing access roads. Periodically, accumulated soil in detention basins will be assessed to determine if material needs to be removed and placed in a repository or disposed of off site. O&M costs were developed based on a 1,000-year duration (required under UMTRCA 40 CFR § 192[d] Part A) for the earthen covers placed on top of radiological waste contained within a burial cell or repository.

4.2.1.2 Potential Unavoidable Impacts

Except for Alternative 1 (no action), each of the removal action alternatives would result in an overall improvement to the local environment. However, for Alternatives 2 through 5, unavoidable impacts are expected and include:

- Existing vegetation in the CTS Group is limited to scrub and grasses. Disturbed areas will be reclaimed after construction, but reestablishing vegetation will take time.
- Inconvenience to the Cove community, the Cove Day School, and rural residences in the Cove Valley using Indian Route 33 adjacent to the CTS Group will occur; general disturbance from heavy equipment activity will occur for the 6 to 7 month construction period; and truck traffic will increase on Indian Route 33 and Indian Route 36 to the on-mesa and regional repositories. Activities will be limited to normal work hours.
- Generation of dust at excavation areas and on repository access roads would be minimized through spraying with water during construction and hauling activities. Noise will be limited to normal work hours to avoid disturbing the Cove community, the Cove Day School, and rural residences in the Cove Valley.
- Disruption of sensitive species and habitat during construction activities is not anticipated at the CTS Group or on-mesa and regional repository locations. If sensitive species are subsequently identified during a biological survey, then the timing of construction activities will be adjusted to limit disturbance and biological monitoring will be conducted during construction activities.
- Cultural resources were potentially identified near the CTS Group. A cultural resource specialist will be consulted during removal design to ensure that any proposed construction activities will avoid sensitive areas. Cultural resource monitors will be on site during construction activities to ensure resources can be mitigated or are not disturbed.
- Disruption of livestock access to the restored sites will last for an estimated 10 years after completion of site work to establish and stabilize vegetation. Livestock access to on-mesa or repository covers may also be restricted, depending on cap design, to prevent damage to the cap.
- Increased risk of traffic accidents and fatalities and greenhouse gas emissions will result from the trucking of fill, cover material, and waste. As the haul distance increases, the potential risks also increase.

4.2.2 Description of Removal Action Alternatives

The following subsections present descriptions of the five removal action alternatives identified in Section 4.1.

4.2.2.1 Alternative 1: No Action

Under Alternative 1, radionuclide and metal COCs and COECs in the temporary waste stockpile and soils at CTS 2, waste rock pit at CTS South, and residual soil contamination at CTS and CT-01 would not be addressed. No land use controls, signage, range fencing, or barriers would be used to limit access at the sites. No removal or site stabilization activities would occur.

4.2.2.2 Alternative 2: Excavation, Transport, and Disposal in On-Mesa Repository

Under Alternative 2, RAOs would be accomplished through excavation, hauling, sorting, and consolidation of waste in a centralized repository located on Mesa V on lands that are already impacted by mining activities; containment of waste in the on-mesa repository; and implementation and short-term O&M of site restoration measures and land use and access controls to protect the repository and site restoration process (Figure 32). Site excavation and restoration elements common to alternatives are described in Section 4.2.1.1.

Approximately 43,800 cubic yards (about 3,300 truckloads) of waste from the CTS Group would be hauled 5.8 miles to the Mesa V repository (Figure 32). The Mesa V repository construction and O&M costs are based on the volume of waste contributed to the repository from the Tronox mines located on Mesa IV 1/2, Mesa V, and Mesa VI. The CTS Group cost share is based on approximately 20 percent of the total waste volume.

The proposed Mesa V repository location is in a mining-disturbed area (drilled and explored extensively) within a mine lease boundary and is considered on site under CERCLA. The proposed Mesa V repository would be located approximately 5.8 miles from the CTS Group in an accessible area where year-round access for maintenance, economy of scale, and lower overall O&M costs would be realized. The Mesa V repository location was selected to limit traffic through and visibility from the Cove community. Design considerations to limit visual impact include reduced height, grading to look like a low hill and contouring into an existing hillslope, and use of local soils and small rocks within the cover to better blend in with the surroundings. The repository cap will comprise native soil and a gravel admixture and will be revegetated using native plants to blend in with the landscape. Permanent range fencing will be constructed around the repository to control or restrict grazing and access since overgrazing, livestock foot traffic, or vehicle traffic could damage the cap. Post-removal visualizations of the on-mesa repository are included in Appendix D.

CTS Group restoration activities include backfilling and grading of waste excavation areas, grading of borrow areas and erosion controls, controlling runoff from the excavated areas, and armoring drainage ditches along Indian Route 33 (Figure 29 and Figure 31). Site restoration activities are described further in Section 4.2.1.1. Post-removal visualizations of the restored CTS Group are included in Appendix D.

Combined Actions under CERCLA - CERCLA § 104(d)(4) allows USEPA to treat noncontiguous facilities as one site for the purpose of taking actions when the facilities are related geographically, or on the basis of the threat or potential threat to the public health or welfare. This means waste from several Superfund sites can be managed in a coordinated fashion at one of the sites and still be an “onsite” action. For example, an alternative that involves consolidation of CTS Group waste at another Tronox mine or in a mining-disturbed area (drilled

and explored extensively) within a mine lease boundary would be a coordinated onsite action with other Tronox mines in the Cove region under CERCLA § 104(d)(4). The CTS Complex, CTS 2, and the other Tronox mines are related geographically, have the same potentially responsible party, and have similar waste and risk characteristics.

On-Mesa Repository Siting Assessment

An on-mesa repository containing unprocessed uranium mine waste may be constructed and used without obtaining a license from the Nuclear Regulatory Commission (NRC) as specified in the Atomic Energy Act (AEA) § 62. Inclusion of wastes from non-Tronox mines on Mesa V would require negotiation with USEPA, other potentially responsible parties, and the Navajo Nation.

The on-mesa repository location was selected based on ease of access and ability to service multiple nearby AUMs. The repository is adjacent to the main mesa road, and the road would require minor revisions, such as widening and grading, to accommodate the amount of haul traffic (Figure 32). The repository is also centrally located between the Mesa V, Mesa VI, and Mesa IV Mines.

AEA at 10 CFR Part 40, Appendix A, Criteria 1 and 4, identifies the uranium mill tailings disposal site selection and design criteria to be considered for the proposed on-mesa repository site. The AEA criteria and relevant Mesa V repository site and design considerations are provided below:

- ***Remoteness:*** The site would be located in a remote area away from the Cove community
- ***Natural conditions that contribute to continued immobilization and isolation of contaminants from groundwater sources:*** The site would be located approximately 1,800 feet above the local drinking water aquifer with two regional aquitards and the uranium ore-bearing Morrison Formation separating the proposed repository site from the drinking water aquifer.
- ***Potential for minimizing erosion, disturbance, and dispersion by natural forces:*** The site would be located on top of a large mesa with topography sloping away from the proposed repository.
- ***Disposal in a manner that no active maintenance is required to preserve site conditions:*** The site would be located where natural topography directs drainage away from the site, which would minimize the need for long-term maintenance after native vegetation is established.
- ***Topographic features that provide good wind protection:*** The site would be located on a mesa top; however, the waste would be inset into the ground and the top and side slopes would be graded to match the surrounding topography.
- ***Relatively flat cover slopes to minimize erosion:*** The site would be located on top of a mesa; however, cover soil would be excavated to make space for the waste and the waste would be inset into the mesa top to minimize the height of the side slopes.
- ***Full self-sustaining vegetative or rock cover to reduce wind and water erosion:*** Gravel admixture would be included in the upper 6 inches of soil in the cap, and native vegetation would be used to minimize erosion.

- ***Location away from a fault that could cause a maximum credible earthquake larger than what the impoundment could reasonably withstand:*** No major active faults are located near the site.
- ***Incorporation of features that promote deposition where feasible:*** Drainage swales and a downslope sediment detention basin would be used to minimize soil migration during establishment of vegetative cover on the cap.

The soil at the Mesa V repository site primarily comprises 20 inches of sandy clay loam over bedrock. Waste to be placed in the repository is typically a mix of cobbles and gravel in a fine sand matrix, is non-acid generating based on acid-base accounting (ABA) testing, and exhibits low metals leachability based on synthetic precipitation leaching procedure (SPLP) results. Based on SPLP testing of samples from the Cove Transfer Stations Complex, leachable concentrations of vanadium exceeded an ecological water quality criterion; however, vanadium was not identified as a COC or COEC. Leachable Ra-226 was not detected. No waste characterization sample analysis has been conducted at CTS 2.

Based on an assessment of depth to bedrock (approximately 4 feet), volume of waste, available area (approximately 360,000 square feet), low concentrations of radionuclides and metals in the waste, non-acid generating and low leachability properties of the waste, and minimum thickness of engineered cap from the hydrologic evaluation of landfill performance (HELP) and RADON models presented in the Technology Technical Memorandum (Tetra Tech, Forthcoming[c]), an ET cap would be the preferred cap for the Mesa V repository. A 36-inch-thick ET cap would require approximately 57,000 cubic yards of cover soil. Because of the available cover soil on site, approximately 9,800 cubic yards of additional cover soil will need to be hauled from off site.

The 360,000-square-foot repository would be constructed by excavating and stockpiling the top 6 inches of soil as topsoil, excavating and stockpiling the remaining soil to bedrock as borrow, and rough grading the base of the repository to allow vehicular traffic and receive waste (Figure 32). The top layer of the waste would be graded to achieve a 3 to 5 percent slope for surface drainage. Side slopes would be graded no steeper than a 5-foot-horizontal to 1-foot-vertical slope. The ET cap would then be constructed on top of 16 feet of waste with the topsoil cover and gravel admixture being used for the final 6 inches of the cap. Biodegradable matting and wattles would be placed on the cover top and side slopes to limit erosion. Surface controls would involve directing run-on water around the repository using berms and ditches. Ventilation is not required for radon-222 as the modeled flux within the waste is below 20 picocuries per meter squared per second (pCi/m^2-sec). Post-removal visualizations of the on-mesa repository are included in Appendix D.

Excavation and disposal of waste rock in an on-mesa repository and implementation of surficial restoration activities and land use controls would be performed as a single removal action. Figure 28 through Figure 31 show the proposed waste excavation and restoration areas at the CTS Group. For Alternative 2, waste will be transported to and disposed of at the Mesa V repository. Figure 32 shows the proposed 5.8-mile haul route from the CTS Group to the on-mesa repository. Implementation of Alternative 2 would involve the removal action components described below.

Removal Action Components

Information regarding common removal action elements for Alternatives 2 through 5 are provided in Section 4.2.1.1. Waste and soil excavation and loading methods considered for the CTS Group include standard size excavators, scrapers, and loaders. Removal action and restoration activities will be conducted on weekdays during normal working hours. All excavation locations are located adjacent Indian Route 33. To mitigate potential traffic congestion, truck loading areas for the CTS Complex will be located away from the main road as much as possible (Figure 30). At CTS 2, sufficient area is available adjacent the main road for loading without significant traffic impact (Figure 28). At both areas, traffic control measures will be implemented.

- At CTS 2, excavate above-ground waste stockpiles (12,370 cubic yards) and load and haul to the Mesa V repository.
- At CTS 2, excavate footprint of removed stockpile and other areas of soil exceeding cleanup goals to 1-foot below grade (3,931 cubic yards), and load and haul to the Mesa V repository.
- At CTS South, remove 2 feet of clean cover at waste rock pit, excavate waste rock to a depth of 10 feet below grade (618 cubic yards), and load and haul to the Mesa V repository.
- At CT-01, excavate east and west sides of Indian Route 33 to 2 feet below grade (1,927 cubic yards) and load and haul to the Mesa V repository.
- Remove surface soil and near-surface soil that exceed residential screening criteria for uranium at the CTS (18,972 cubic yards) and CTS South (5,753 cubic yards), and load and haul to the Mesa V repository.
- Backfill excavated areas with soil obtained locally from borrow areas nearby the CTS Group.
- Implement site restoration measures as shown on Figure 29 (CTS 2) and Figure 31 (CTS Complex), including grading, biodegradable matting, coir log placement, soil berm, rock-lined drainage, revegetation, etc.
- Perform O&M of surficial restoration areas.

On-Mesa Repository Construction Components

Additional information regarding individual components is provided in Section 4.2.1.1.

- Maintain the main haul road to the Mesa V repository (shared repository cost).
- Construct a water well at the Mesa V repository (shared repository cost).
- Construct and fill the repository (shared repository cost). Interim capping or filling of the repository by cell where filling does not occur in a single season.
- Close the repository with an ET cap (shared repository cost).

- Implement access controls, such as permanent range fencing to exclude grazing over the short term, to allow successful revegetation of the ET cap.
- Perform O&M of the ET cap.

Cost Estimate

The total net present value for consolidation and capping of approximately 43,800 cubic yards of waste from the CTS Group at the Mesa V repository is $13.2 million. This includes a capital cost of $11.4 million, annual O&M costs of $86,604 over 10 years for site restoration, and annual O&M costs of $33,510 over 1,000 years for the on-mesa repository and ET cap. A breakout by site within the CTS Group is provided below.

CTS Group	Capital Cost	Annual Site O&M Costs (10 year)	Annual Trunk Road O&M Costs (1,000 year)	Annual Cap O&M Costs (1,000 year)	Present Value (1,000 years) 3.5% discount rate
Cove Transfer Stations Complex	$6.9 MM	$59,999	$0	$20,972	$8.1 MM
CTS 2	$4.5 MM	$26,605	$0	$12,538	$5.1 MM
Totals	**$11.4 MM**	**$86,604**	**$0**	**$33,510**	**$13.2 MM**

Notes:
CTS Cove Transfer Station
MM Million
O&M Operation and maintenance

4.2.2.3 Alternative 3: Excavation, Transport, and Disposal in On-Navajo Nation Regional Repository

Under Alternative 3, RAOs would be accomplished through excavation, hauling, and consolidation of waste in a regional repository located north of Red Valley on lands already impacted by mining activities; containment of waste in the repository; and implementation and short-term O&M of site restoration measures and land use and access controls to protect the repository and site restoration process (Figure 33). Site excavation and restoration elements common to alternatives are described in Section 4.2.1.1.

Approximately 43,800 cubic yards (about 3,300 truckloads) of waste from the CTS Group would be hauled 21 miles to the regional repository (Figure 33). The regional repository will be in an accessible area where year-round access for maintenance, economy of scale, and lower overall O&M costs would be realized, which may be preferable to an on-mesa repository. CTS Group restoration activities include backfilling and grading of waste excavation areas, grading of borrow areas and erosion controls, controlling runoff from the excavated areas, and armoring drainage ditches along Indian Route 33 (Figure 33). Site restoration activities are described further in Section 4.2.1.1. Post-removal visualizations of the restored CTS Group are included in Appendix D.

The proposed regional repository location is in a mining-disturbed area (drilled and explored extensively) within a mine lease boundary and is considered on site under CERCLA. The proposed regional repository will be located at an existing AUM within the Red Valley Chapter.

The potential regional repository location was selected to limit visibility from the Cove and Red Valley communities and Indian Routes 33 and 36. Design considerations to limit visual impact include reduced height, grading to look like a low hill and contouring into an existing hillslope, and use of local soils and small rocks within the cover to better blend in with the surroundings. The repository cap will comprise native soil and a gravel admixture and will be revegetated to blend in with the landscape. Permanent range fencing will be constructed around the repository to control or restrict grazing and access since overgrazing, livestock foot traffic, or vehicle traffic could damage the cap. Post-removal visualizations of the restored CTS Group are included in Appendix D.

The regional repository construction and O&M costs are based on the volume of waste contributed to the repository from the CTS Group and the Tronox mines located in the Lukachukai Mountains region. The CTS Group cost share is 4.7 percent of the total repository volume based on a waste volume contribution of about 43,800 cubic yards. Waste from other Tronox and non-Tronox AUMs in the Lukachukai Mountains region could also be placed in the regional repository and would reduce the costs for construction borne by CTS Group waste.

Combined Actions under CERCLA - CERCLA § 104(d)(4) allows USEPA to treat noncontiguous facilities as on site for the purpose of taking actions when the facilities are related geographically, or on the basis of the threat or potential threat to the public health or welfare. This means waste from several Superfund sites can be managed in a coordinated fashion at one of the sites and still be an "onsite" action. For example, an alternative that involves consolidation of CTS Group waste at another Tronox mine or in a mining-disturbed area (drilled and explored extensively) within a mine lease boundary would be a coordinated onsite action with other Tronox mines in the Cove region under CERCLA § 104(d)(4). The CTS Group and the other Tronox mines are related geographically, have the same potentially responsible party, and have similar waste and risk characteristics.

Regional Repository Siting Assessment

An on-Navajo Nation regional repository containing unprocessed uranium mine waste may be constructed and used without obtaining a license from NRC as specified in AEA § 62. Inclusion of wastes from non-Tronox mines within the Cove Chapter would require negotiation with USEPA, other potentially responsible parties, and the Navajo Nation.

The regional repository location was selected based on ease of access and ability to service multiple nearby AUMs. A cluster of AUM sites located on an east-sloping ridge at an elevation of 5,600 feet amsl and 21 miles northeast of the Cove area was identified as the ideal location for the on-Navajo Nation regional repository. The repository is about 1 mile east of Indian Route 36 and is accessible by an existing dirt road that would require some widening, grading, and covering with gravel to accommodate the amount of haul traffic (Figure 33).

AEA at 10 CFR Part 40, Appendix A, Criteria 1 and 4, identifies the uranium mill tailings disposal site selection and design criteria to be considered for the proposed regional repository

site. The AEA criteria and relevant regional repository site and design considerations were evaluated by desktop study and are provided below:

- ***Remoteness:*** The site would be located in a remote area away from the Cove and Red Valley communities.
- ***Natural conditions that contribute to continued immobilization and isolation of contaminants from groundwater sources:*** The site would be located approximately 1,100 feet above the local drinking water aquifer with two regional aquitards and uranium ore-bearing Morrison Formation separating the proposed repository site from the drinking water aquifer. The site is also 2,400 feet above the regional drinking water aquifer (C aquifer in the DeChelly Formation) with an additional regional aquitard separating the proposed repository site from the regional drinking water aquifer (DeChelly Formation).
- ***Potential for minimizing erosion, disturbance, and dispersion by natural forces:*** The site would be located on top of a mesa with topography sloping away from the proposed repository.
- ***Disposal in a manner that no active maintenance is required to preserve site conditions:*** The site would be located where naturally topography and drainage away from the site would minimize the need for long term maintenance after native vegetation is established.
- ***Topographic features that provide good wind protection:*** The site would be located on a mesa top; however, the waste prism and cover top and side slopes would be graded to match the surrounding topography.
- ***Relatively flat cover slopes to minimize erosion:*** The site would be located on top of a mesa and waste prism, and cover would be graded to minimize the height of the side slopes.
- ***Full self-sustaining vegetative or rock cover to reduce wind and water erosion:*** Gravel admixture would be included in the upper 6 inches of the soil cap and native vegetation would be used to minimize erosion.
- ***Location away from a fault that could cause a maximum credible earthquake larger than what the impoundment could reasonably withstand:*** No major active faults are located near the site.
- ***Incorporation of features that promote deposition where feasible:*** Drainage swales and a downslope sediment detention basin would be used to minimize soil migration during the establishment of vegetative cover on the cap.

The soils at the regional repository area are fine sandy loam over bedrock. An ideal borrow soil source in sandy loam soils is located approximately 0.5 mile from the proposed repository site. Waste to be placed in the repository is typically a mix of cobbles and gravel in a silty sand to fine sand matrix, is non-acid generating based on ABA testing, and exhibits low metals leachability based on SPLP results. Based on SPLP testing of samples from the Cove Transfer Stations Complex, leachable concentrations of vanadium exceeded an ecological water quality criterion; however, vanadium was not identified as a COC or COEC. Leachable Ra-226 was not detected. No waste characterization sample analysis has been conducted at CTS 2.

Based on an assessment of depth to bedrock (approximately 16 inches), volume of waste, available area (1.7 million square feet), non-acid generating and low leachability properties of the waste, and minimum thickness of engineered cap determined using the HELP and RADON models presented in the Technology Technical Memorandum (Tetra Tech, Forthcoming[c]), an ET cap would be the preferred cap for the regional repository as the mine waste contains low total and leachable concentrations of radionuclides and metals. A 36-inch thick ET cap would require approximately 197,000 cubic yards of cover soil from a borrow source.

The 1.7-million-square-foot repository would be constructed by excavating and stockpiling the top 6 inches of soil as topsoil, excavating and stockpiling the remaining soil to bedrock as borrow, and rough grading the base of the repository to allow for vehicular traffic and receive waste (Figure 33). The top layer of the waste would be graded to achieve a 3 to 5 percent slope for surface drainage. Side slopes would be graded no steeper than a 5-foot horizontal to 1-foot-vertical slope. The 36-inch thick ET cap would then be constructed on top of 16 feet of waste with a topsoil and gravel admixture being used for the final 6 inches of the cap. Biodegradable matting and wattles would be placed on the cover top and side slopes to limit erosion. Surface controls would involve directing run-on water around the repository using berms and ditches. Ventilation is not required for radon-222 as the modeled flux within the waste is below 20 pCi/m^2-sec. Post-removal visualizations of the regional repository are included in Appendix D.

Excavation and disposal of waste rock in an on-Navajo Nation regional repository and implementation of surficial restoration activities and land use controls would be performed as a single removal action. Figure 28 through Figure 31 show the proposed waste excavation and restoration areas at the CTS Group. For Alternative 3, waste will be transported to and disposed of at the regional repository. Figure 33 shows the proposed 21-mile haul route from the CTS Group to the regional repository. Implementation of Alternative 3 would involve the removal action components described below.

Removal Action Components

Information regarding common removal action elements for Alternatives 2 through 5 are provided in Section 4.2.1.1. Waste and soil excavation and loading methods considered for the CTS Group include standard size excavators, scrapers, and loaders. Removal action and restoration activities will be conducted on weekdays during normal working hours. All excavation locations are located adjacent Indian Route 33. To mitigate potential traffic congestion, truck loading areas for the CTS Complex will be located away from the main road as much as possible (Figure 30). At CTS 2, sufficient area is available adjacent the main road for loading without significant traffic impact (Figure 28). At both areas, traffic control measures will be implemented.

- At CTS 2, excavate above-ground waste stockpiles (12,370 cubic yards) and load and haul to the regional repository.
- At CTS 2, excavate footprint of removed stockpile and other areas of soil exceeding cleanup goals to 1-foot below grade (3,931 cubic yards), and load and haul to the regional repository.

- At CTS South, remove 2 feet of clean cover at waste rock pit, excavate waste rock to a depth of 10 feet below grade (618 cubic yards), and load and haul to the regional repository.
- At CT-01, excavate east and west sides of Indian Route 33 to 2 feet below grade (1,927 cubic yards) and load and haul to the regional repository.
- Remove surface soil and near-surface soil that exceed residential screening criteria for uranium at the CTS (18,972 cubic yards) and CTS South (5,753 cubic yards) and, load and haul to the regional repository.
- Backfill excavated areas with soil obtained locally from borrow areas nearby the CTS Group.
- Implement site restoration measures as shown on Figure 29 (CTS 2) and Figure 31 (CTS Complex), including grading, biodegradable matting, coir log placement, soil berm, rock-lined drainage, revegetation, etc.
- Perform O&M of surficial restoration areas.

Regional Repository Construction Components

Additional information regarding individual components is provided in Section 4.2.1.1.

- Rehabilitate and widen the main haul road from Indian Route 36 to the regional repository.
- Construct a water well at the repository (shared repository cost) if NTUA water cannot be accessed.
- Construct and fill the repository (shared repository cost). Interim capping or filling of the repository by cell where filling does not occur in a single season.
- Close the repository with an ET cap (shared repository cost).
- Implement access controls, such as permanent range fencing to exclude grazing over the short term, to allow successful revegetation on the ET cap.
- Perform O&M of the ET cap.

Cost Estimate

The total net present value for transportation, consolidation, and capping of approximately 43,800 cubic yards of waste at the regional repository is $11 million. This includes a capital cost of $9.5 million, annual O&M costs of $86,604 over 10 years for site restoration, and annual O&M costs of $20,969 over 1,000 years for the regional repository and ET cap. A breakout by site within the CTS Group is provided below.

CTS Group	Capital Cost	Annual Site O&M Costs (10 year)	Annual Trunk Road O&M Costs (1,000 year)	Annual Cap O&M Costs (1,000 year)	Present Value (1,000 years) 3.5% discount rate
Cove Transfer Stations Complex	$5.9 MM	$59,999	$0	$13,125	$6.9 MM
CTS 2	$3.6 MM	$26,605	$0	$7,844	$4.1 MM
Totals	**$9.5 MM**	**$86,604**	**$0**	**$20,969**	**$11 MM**

Notes:
CTS Cove Transfer Station
MM Million
O&M Operation and maintenance

4.2.2.4 Alternative 4: Excavation, Off-Navajo Nation Transport, and Disposal at White Mesa Mill

Under Alternative 4, RAOs would be accomplished through excavation, transport, and milling of waste rock and uranium-contaminated soil for uranium recovery, and disposal of mill tailings in the off-Navajo Nation White Mesa Mill tailings disposal facility. The CTS Group would be reclaimed through implementation of site restoration measures followed by short-term O&M of restored features and use of access controls to protect the site restoration process. Site excavation and restoration elements common to alternatives are described in Section 4.2.1.1.

Approximately 43,800 cubic yards (about 3,300 truckloads) of waste from the CTS Group would be hauled off the Navajo Nation to an operating uranium mill and associated tailings disposal facility (Figure 34). The hauling of waste would comply with permitting requirements for the transport of radioactive materials. The facility is the Energy Fuels, Inc. White Mesa Mill located near Blanding, Utah, 136 miles from the CTS Group (Figure 34). The White Mesa Mill is regulated as a uranium mill and tailings disposal facility under NRC regulations in 10 CFR Part 40, Appendix A, by the State of Utah as an Agreement State under AEA.

Site restoration activities include backfilling and grading of waste excavation areas, grading of borrow areas and erosion controls, controlling runoff from the excavated areas, and armoring drainage ditches along Indian Route 33 (Figure 29 and Figure 31). Site restoration activities are described further in Section 4.2.1.1. Post-removal visualizations of the restored CTS Group are included in Appendix D.

The White Mesa Mill tailings disposal facility has a 3-million-ton capacity and is permitted for an additional 4 million tons. At the time of this AAM preparation, the facility is in compliance with its State of Utah operating license, bonding, and the CERCLA Off-Site Rule. A change to the disposal facility could be selected in the action memorandum if necessary. Coordination of waste batches for mill operations would require negotiation with USEPA, other potentially responsible parties, White Mesa Mill operators, and the Navajo Nation.

In general, the CERCLA Off-Site Rule requires that facilities that accept contaminated or hazardous wastes from a CERCLA site must follow all applicable regulations and laws (that is, they must be approved to take those wastes and be in compliance with the applicable federal, state, and local requirements to do so). The licensed disposal facilities considered for any

alternatives involving offsite disposal would be required to have existing regulatory approval under the Off-Site Rule.

Although AUM ore material is classified as TENORM by USEPA, the source material license issued by the State of Utah allows the White Mesa Mill to process natural uranium ores. NRC has determined that a material is considered to be ore if there is a reasonable expectation that uranium can be recovered from the material even if it is low grade and not profitable, and the mill would receive a fee to process the material (Energy Fuels, Inc. 2018). Contaminated debris associated with the ore has been regulated as ore (NRC 2000 as cited in Energy Fuels, Inc. 2018). Based on these determinations, the White Mesa Mill can accept overburden, waste rock, proto ore, and other ore-related waste materials for processing through the mill. Resulting wastes associated with processing then become 11e(2) byproduct material and can be disposed of in the mill tailings disposal facility. If and when the mill and associated tailings disposal facility source material license is terminated, ownership of the tailings disposal facility will be transferred to the U.S. Department of Energy, which will be responsible for long-term surveillance, care, and maintenance.

Excavation, milling, and disposal of waste rock in an off-Navajo Nation mill facility and implementation of surficial restoration activities would be performed as a single removal action. Figure 28 through Figure 31 show the proposed waste excavation and restoration areas at the CTS Group. For Alternative 4, waste will be transported to and disposed of at the White Mesa Mill near Blanding, Utah. Figure 34 shows the proposed 136-mile haul route from the CTS Group to the White Mesa Mill. Implementation of Alternative 4 would involve the removal action components described below.

Removal Action Components

Information regarding common removal action elements for Alternatives 2 through 5 are provided in Section 4.2.1.1. Waste and soil excavation and loading methods considered for the CTS Group include standard size excavators, scrapers, and loaders. Removal action and restoration activities will be conducted on weekdays during normal working hours. All excavation locations are located adjacent Indian Route 33. To mitigate potential traffic congestion, truck loading areas for the CTS Complex will be located away from the main road as much as possible (Figure 30). At CTS 2, sufficient area is available adjacent the main road for loading without significant traffic impact (Figure 28). At both areas, traffic control measures will be implemented.

- At CTS 2, excavate above-ground waste stockpiles (12,370 cubic yards) and load and haul to the White Mesa Mill.
- At CTS 2, excavate footprint of removed stockpile and other areas of soil exceeding cleanup goals to 1-foot below grade (3,931 cubic yards), and load and haul to the White Mesa Mill.
- At CTS South, remove 2 feet of clean cover at waste rock pit, excavate waste rock to a depth of 10 feet below grade (618 cubic yards), and load and haul to the White Mesa Mill.

- At CT-01, excavate east and west sides of Indian Route 33 to 2 feet below grade (1,927 cubic yards) and load and haul to the White Mesa Mill.
- Remove surface soil and near-surface soil that exceed residential screening criteria for uranium at the CTS (18,972 cubic yards) and CTS South (5,753 cubic yards) and, load and haul to the White Mesa Mill.
- Backfill excavated areas with soil obtained locally from borrow areas nearby the CTS Group.
- Implement site restoration measures as shown on Figure 29 (CTS 2) and Figure 31 (CTS Complex), including grading, biodegradable matting, coir log placement, soil berm, rock-lined drainage, revegetation, etc.
- Perform O&M of surficial restoration areas.

Cost Estimate

The total net present value for transportation and off-Navajo Nation milling and disposal of approximately 43,800 cubic yards of waste at the White Mesa Mill outside of Blanding, Utah, is $14.8 million. This includes a capital cost of $14.1 million and annual O&M costs of $86,604 over 10 years for site restoration. A breakout by site within the CTS Group is provided below.

CTS Group	Capital Cost	Annual Site O&M Costs (10 year)	Annual Trunk Road O&M Costs (1,000 year)	Annual Cap O&M Costs (1,000 year)	Present Value (1,000 years) 3.5% discount rate
Cove Transfer Stations Complex	$8.8 MM	$59,999	$0	$0	$9.3 MM
CTS 2	$5.3 MM	$26,605	$0	$0	$5.5 MM
Totals	**$14.1 MM**	**$86,604**	**$0**	**$0**	**$14.8 MM**

Notes:
CTS Cove Transfer Station
MM Million
O&M Operation and maintenance

4.2.2.5 Alternative 5: Excavation, Off-Navajo Nation Transport, and Disposal at Hazardous Waste or Low-Level Radioactive Waste Facility

Under Alternative 5, RAOs would be accomplished through excavation, transport, and off-Navajo Nation disposal of mine waste and contaminated soil at a hazardous waste or LLRW facility. The CTS Group would be reclaimed through implementation of site restoration measures followed by short-term O&M of restored features and use of access controls to protect the site restoration process. Site excavation and restoration elements common to alternatives are described in Section 4.2.1.1.

Approximately 43,800 cubic yards (about 3,300 truckloads) of waste from the CTS Group would be hauled off the Navajo Nation and disposed of at a RCRA Subtitle C hazardous waste or Class A LLRW facility (Figure 35). The hauling of waste would comply with applicable state permitting requirements for the transport of radioactive materials.

Site restoration activities include backfilling and grading of waste excavation areas, grading of borrow areas and erosion controls, controlling runoff from the excavated areas, and armoring the drainage ditches along Indian Route 33 (Figure 29 and Figure 31). Site restoration activities are described further in Section 4.2.1.1. Post-removal visualizations of the restored CTS Group are included in Appendix D.

The following facilities have licenses or permits that allow for acceptance of uranium mine waste:

- US Ecology, Grand View, Idaho: RCRA C hazardous waste disposal facility located 785 miles from the CTS Group.
- Clean Harbors, Deer Trail, Colorado: RCRA C hazardous waste disposal facility located 559 miles from the CTS Group.
- Energy Solutions, Inc., Clive, Utah: LLRW facility located 535 miles from the CTS Group.
- Waste Control Specialists, Andrews, Texas: LLRW facility located 600 miles from the CTS Group.

The Clean Harbors, Waste Control Specialists, and Energy Solutions RCRA C hazardous waste and LLRW disposal facilities are in compliance with NRC, Colorado, Texas, and Utah operating permits and the CERCLA Off-Site Rule. The Clean Harbors RCRA C hazardous waste disposal facility was identified as the most cost-effective disposal facility and is located near Deer Trail, Colorado, 558 miles from the CTS Group (Figure 35). A change to the disposal facility could be selected in the action memorandum if necessary. Alternative 5 mainly differs from Alternative 4 in that no treatment by milling is included and, therefore, requires different final disposal facility type and location.

In general, the CERCLA Off-Site Rule requires that facilities that accept contaminated or hazardous wastes from a CERCLA site must follow all applicable regulations and laws (that is, they must be approved to take those wastes and be in compliance with the applicable federal, state, and local requirements to do so). The licensed disposal facilities considered for any alternatives involving offsite disposal would be required to have existing approval under the Off-Site Rule.

Disposal at a licensed RCRA C hazardous waste or LLRW facility is a standard disposal method involving transport to and disposal at the applicable waste disposal facility. Licensed or permitted facilities are generally constructed to prevent the release of hazardous or radioactive materials and include engineered cells and liners that exceed requirements for municipal or commercial solid waste disposal facilities.

No toxicity characteristic leaching procedure (TCLP) metals results exceeded the toxicity characteristic levels at the Cove Transfer Stations Complex. TCLP analysis of samples from CTS 2 has not been conducted but are not expected to exceed toxicity characteristic levels based on results from source mine sites. Therefore, the waste from the CTS Group is assumed not to contain materials that would be designated as RCRA hazardous waste if disposed of at a

RCRA-permitted disposal facility, and no pretreatment of the waste would be required before disposal.

Excavation and disposal of waste rock in an off-Navajo Nation RCRA C hazardous waste or Class A LLRW facility and implementation of surficial restoration activities would be performed as a single removal action. Figure 28 through Figure 31 show the proposed waste excavation and restoration areas at the CTS Group. For Alternative 5, waste will be transported to and disposed of at the Clean Harbors RCRA C hazardous waste disposal facility in Deer Trail, Colorado. The selected disposal facility could be changed in the action memorandum if necessary. Figure 35 shows the proposed 558-mile haul route from the CTS Group to the Clean Harbors facility. Implementation of Alternative 5 would involve the removal action components described below.

Removal Action Components

Additional information regarding individual components is provided in Section 4.2.1.1. Waste and soil excavation and loading methods considered for the CTS Group include standard size excavators, scrapers, and loaders. Removal action and restoration activities will be conducted on weekdays during normal working hours. All excavation locations are located adjacent Indian Route 33. To mitigate potential traffic congestion, truck loading areas for the CTS Complex will be located away from the main road as much as possible (Figure 30). At CTS 2, sufficient area is available adjacent the main road for loading without significant traffic impact (Figure 28). At both areas, traffic control measures will be implemented.

- At CTS 2, excavate aboveground waste stockpiles (12,370 cubic yards) and load and haul to the Clean Harbors RCRA C hazardous waste disposal facility.
- At CTS 2, excavate footprint of removed stockpile and other areas of soil exceeding cleanup goals to 1-foot below grade (3,931 cubic yards) and load and haul to the Clean Harbors RCRA C hazardous waste disposal facility.
- At CTS South, remove 2 feet of clean cover at waste rock pit, excavate waste rock to a depth of 10 feet below grade (618 cubic yards), and load and haul to the Clean Harbors RCRA C hazardous waste disposal facility.
- At CT-01, excavate east and west sides of Indian Route 33 to 2 feet below grade (1,927 cubic yards) and load and haul to the Clean Harbors RCRA C hazardous waste disposal facility.
- Remove surface soil and near-surface soil that exceed residential screening criteria for uranium at the CTS (18,972 cubic yards) and CTS South (5,753 cubic yards) and load and haul to the Clean Harbors RCRA C hazardous waste disposal facility.
- Backfill excavated areas with soil obtained locally from borrow areas nearby the CTS Group.
- Implement site restoration measures as shown on Figure 29 (CTS 2) and Figure 31 (CTS Complex), including grading, biodegradable matting, coir log placement, soil berm, rock-lined drainage, revegetation, etc.
- Perform O&M of surficial restoration areas.

Cost Estimate

The total net present value for transportation and off-Navajo Nation disposal of approximately 43,800 cubic yards of waste at the Clean Harbors RCRA C hazardous waste disposal facility in Deer Trail, Colorado, is $24.4 million. This includes a capital cost of $23.7 million and annual O&M costs of $86,604 over 10 years for site restoration. A breakout by site within the CTS Group is provided below.

CTS Group	Capital Cost	Annual Site O&M Costs (10 year)	Annual Trunk Road O&M Costs (1,000 year)	Annual Cap O&M Costs (1,000 year)	Present Value (1,000 years) 3.5% discount rate
Cove Transfer Stations Complex	$14.8 MM	$59,999	$0	$0	$15.3 MM
CTS 2	$8.9 MM	$26,605	$0	$0	$9.1 MM
Totals	**$23.7 MM**	**$86,604**	**$0**	**$0**	**$24.4 MM**

Notes:
CTS Cove Transfer Station
MM Million
O&M Operation and maintenance

4.3 ANALYSIS OF ALTERNATIVES

As required by NCP and described in the "Guidance on Conducting Non-Time Critical Removal Actions under CERCLA" (USEPA 1993), retained removal action alternatives are evaluated individually against the following three broad criteria: effectiveness, implementability, and cost. The qualitative evaluation criteria and qualitative rating ranges are described below.

Effectiveness Criterion

This criterion evaluates protectiveness and compliance with ARARs, along with short- and long-term effectiveness and permanence, and reduction in toxicity, mobility, and volume of waste. Effectiveness was rated from very poor to very good.

- **Overall Protection of Human Health and the Environment** – This threshold criterion evaluates whether each alternative provides adequate protection of human health and the environment. The assessment of overall protection draws on the evaluation of long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

  Evaluation of the overall protectiveness focuses on whether a specific alternative achieves adequate protection and how site risks posed through each pathway addressed by the AAM are eliminated, reduced, or controlled through treatment, engineering, or land use controls. Based on effectiveness and ARAR compliance, alternatives are either considered protective or not protective.
- **Compliance with ARARs** – This threshold criterion evaluates whether each alternative would meet the identified ARARs. The evaluation determines which requirements are applicable or relevant and appropriate to an alternative and how the alternative meets these requirements. Alternatives are either in compliance with ARARs or not in compliance.

- **Short-Term Effectiveness** – This criterion evaluates the effects that the alternative would have on human health and the environment during its construction and implementation phase. The evaluation includes both radiation risks from exposure to the contaminated soils and risks to the workers and communities from construction work, pollution, and traffic during implementation, and also takes into account the time necessary to complete the action. A greener cleanups analysis was completed to evaluate energy requirements, emissions, water resources, materials management, land management, and ecosystem protection. Short-term effectiveness was rated from very poor to very good.
- **Long-Term Effectiveness and Permanence** – This criterion evaluates the results of the removal action in terms of the risk remaining at the site after response objectives have been met. The primary focus of this evaluation is on the extent and effectiveness of the controls that may be required to manage the risk posed by wastes remaining at the site. Long-term effectiveness and permanence was rated from very poor to very good.
- **Reduction of Toxicity, Mobility, or Volume through Treatment** – This criterion addresses the statutory preference for remedies that employ treatment as a principal element by assessing the relative performances of treatment technologies for reducing toxicity, mobility, or volume of the contaminated media. Specifically, the analysis should examine the magnitude, significance, and irreversibility of each estimated reduction. Reduction of toxicity, mobility, or volume through treatment was rated from very poor to very good.

Implementability Criterion

This criterion evaluates the technical and administrative feasibility of implementing an alternative and the availability of required services and materials. Implementability was rated from very poor to very good.

- **Technical Feasibility** – This criterion takes into account construction considerations, demonstrated performance, adaptability to environmental conditions, and timing. Technical feasibility was rated from very poor to very good.
- **Availability of Required Services and Materials** – This criterion evaluates whether staff, equipment services, disposal locations, etc., are available in the necessary time frames for construction and O&M activities. This criterion was combined with technical feasibility for this AAM.
- **Administrative Feasibility** – This criterion considers regulatory approval and scheduling constraints. Administrative feasibility was rated from very poor to very good.
- **Tribal, Supporting Agency, and Community Acceptance** – This criterion will not be addressed and a preferred alternative will not be selected in this AAM. These criteria will be addressed in the final EE/CA after initial input from tribal and supporting agencies. Community acceptance will be addressed in the action memorandum after the public review and comment period on the final EE/CA.

Cost Criterion

The types of costs assessed include the following:

- Capital costs, including both direct and indirect costs
- Annual post-removal site control costs (termed O&M within this AAM for brevity)
- Net present value of capital and O&M costs

In accordance with USEPA (1993, 2000) guidance, engineering costs are estimates within plus 50 to minus 30 percent of the actual project cost (based on year 2021 dollars). Costs were rated from very poor to very good.

Cost Estimating Process

Cost estimates were prepared in accordance with USEPA (2000) guidelines using engineer's estimates, RSMeans 2021 cost estimating software, and vendor quotes. Farmington, New Mexico, was used as the reference city in the RSMeans software (Gordian 2021) to estimate for labor, equipment, and supplies where applicable. In accordance with USEPA (1993, 2000) guidance, the engineering costs are estimates that are expected to be within plus 50 to minus 30 percent of the actual project cost (based on year 2021 dollars). Only the rolled up construction and capital costs, short-term O&M costs for site restoration, long-term O&M costs for repositories, and net present values are presented for each alternative. Cost details and assumptions are presented in Appendix E.

Cost estimating was conducted using a crew time and materials approach, which uses the time required for a crew to accomplish an activity based on a realistic production rate for site conditions. A unit cost approach uses RSMeans unit costs for construction based on cubic yard, linear feet, and square foot quantities, which would not be realistic because of the specific equipment needs and low production rates in remote, steep slope work areas. Other construction-related costs were identified and included in the cost approach, including mobilization and demobilization, contractor site overhead, travel and lodging, third party oversight, Navajo Nation tax for on-Navajo Nation activities, and a 20 percent contingency. Non-construction-related costs required before and during construction activities were also identified and included in the cost approach, including design, planning, resource surveys, confirmation sampling, and reporting.

Contingency costs for construction are based on the extra time, equipment, and personnel required to safely work with radioactive materials; remote location of the site; differences in labor pool costs between RSMeans estimating software reference cities and the project area; and potential for changes in material and transportation costs. Changes in the cost elements are likely as commodity prices change and new information and data are collected during the engineering design and construction pre-bid and walk-through meetings.

The need for short- and long-term post-removal site control or O&M costs were identified, including the short-term need for site restoration for a period of 10 years to address any erosion and revegetation efforts and the long-term need for cap maintenance for a period of 1,000 years for on-mesa repository and on-Navajo Nation repository alternatives. Project duration (10 years

versus 1,000 years) varies depending on the alternative and will be addressed in the cost discussion for each alternative.

The net present value of each removal action alternative provides the basis for the cost comparison. The net present value represents the amount of money that, if invested in the initial year of the removal action at a given interest rate, would provide the funds required to make future payments to cover all O&M costs associated with the removal action over its planned life.

To assess the required funds to be set aside for implementing O&M activities in the future, this AAM uses a 3.5 percent discount rate, which is the 30-year rolling average of the annual discount rates for varying streams of payments as provided by the Office of Management and Budget (2020). The 3.5 percent discount rate would require more money to be set aside for future O&M costs than the historic average of 7 percent referenced in USEPA (1993) guidance.

4.3.1 Alternative 1: No Action

Under Alternative 1, no actions would be performed at the CTS Group. The conditions that are currently found would remain unchanged.

4.3.1.1 Effectiveness

The effectiveness rating for Alternative 1 is **Very Poor** based on the following discussion.

Overall Protection of Public Health and the Environment (Rating: Not Protective) – The Alternative 1 would not achieve RAOs. This alternative would not minimize potential exposure to or transport of COCs or COECs from the site or control radiation and physical hazards at the site. This alternative would not reduce risk to human health or the environment. Therefore, protection of human health and the environment would not be achieved under Alternative 1.

Compliance with ARARs (Rating: Not Applicable) – Under Alternative 1, no ARARs would exist with which to comply per CERCLA § 121(d). ARARs provide specifications on the degree of cleanup and are, therefore, not pertinent if no cleanup occurs.

Short-Term Effectiveness (during Removal Action) (Rating: Very Good) – Alternative 1 has no action, so no short-term risks would exist for the community or workers from construction activities. However, threats to human and ecological receptors would persist in the short term. Because no construction activities would occur, no additional energy use, air pollution, water use, waste and materials management, and ecosystem protection requirements would be triggered. No additional traffic volume or potential accidents and fatalities associated with construction would occur.

Long-Term Effectiveness and Permanence (after Removal Action) (Rating: Very Poor) – No controls or long-term measures would be implemented to control COCs or COECs at the site under Alternative 1. Under this alternative, waste would continue to be accessible by humans and animals and subject to potential migration to uncontaminated or less contaminated areas. Risks at the site are currently unacceptable and would continue to be unacceptable under Alternative 1. Over time, site risks may increase or decrease or remain the same as exposure to and migration

of waste would not be controlled. Alternative 1 employs no treatment, so there are no reductions in toxicity, mobility, or volume through active treatment.

4.3.1.2 Implementability

The implementability rating for Alternative 1 is **Very Good** based on the following discussion.

Technical Feasibility and Availability of Services and Materials – (Rating - Very Good) - Alternative 1 is readily implementable because no construction is involved. Alternative 1 would not impact the ability to conduct removal or remedial actions in the future. No services or materials would be needed to implement Alternative 1.

Administrative Feasibility (Rating: Very Good) – Alternative 1 is administratively feasible as taking no action is always feasible.

4.3.1.3 Costs

Alternative 1 involves no removal activities and no legal or administrative activities. Therefore, Alternative 1 would incur no cost and would rate as **Very Good**.

4.3.2 Alternative 2: Excavation, Transport, and Disposal in On-Mesa Repository

Alternative 2 involves the excavation of mine waste and contaminated soil and transport and disposal of waste in an on-mesa repository.

4.3.2.1 Effectiveness

The effectiveness rating for Alternative 2 is **Good** based on the following discussion.

Overall Protection of Public Health and the Environment (Rating: Protective) – Under Alternative 2, overall protectiveness is considered good for achieving RAOs because soil and mine waste that contain radionuclide and metal COCs and COECs would be capped within an on-mesa repository. The potential for direct contact, ingestion, inhalation, and external irradiation of human and ecological receptors would be eliminated, and the risk to human and ecological receptors would be within acceptable levels with the proper maintenance of the cap. RAOs would be achieved in a short time frame because of waste isolation and containment. With proper cap maintenance, Alternative 2 would be protective of public health and the environment.

Compliance with ARARs (Rating: In Compliance) – Federal and tribal ARARs identified in Table 14, Table 15, and Table 16 would be met for the site under Alternative 2.

Short-Term Effectiveness (during Removal Action) (Rating: Good) – The short-term impacts to the community, workers, and environment under Alternative 2 are as described below.

- **Protection of the Community during Removal Action** – Dust control measures, such as water spraying, would be used during excavation, waste hauling, on-mesa repository construction, waste compaction, and capping of the waste. However, some dust generation is unavoidable. Air monitors would be placed around the construction zone at the site and repository to measure potential risks to the community.

The increased truck traffic required to transport equipment and construction materials to the site and the waste excavation, waste hauling, and consolidation activities at the on- -mesa repository would have a short-term impact on traffic safety within the Cove area and on air quality on dirt haul roads.

Over the short term, the estimated 9 in 100 risk of an additional accident and 2.8 in 1,000 risk of an additional fatality for the 188,400 miles traveled during construction and 10 years of site restoration from on-highway traffic accidents are greatly elevated in comparison to Alternative 1 (no action) but remain low because of the short on-highway travel distance (2.9 miles) between the site and the Mesa V access road.

- **Protection of Workers during Removal Action** – Onsite workers would require standard 40-hour Occupational Safety and Health Administration (OSHA) hazardous materials training and radiation awareness training and would be adequately protected by using appropriate personal protective equipment and following safe work practices and standards. Radiation exposure monitoring would be required. Short-term impacts to air quality in the surrounding environment may occur during excavation, on-mesa repository construction, and placement of waste in the on-mesa repository. Dust suppression and monitoring would be required to ensure that workers are not exposed to or inhale radionuclides in particulates. Decontamination of workers and equipment would be required before exiting the site.

  Short-term risks of physical injury would exist for site workers during construction, primarily related to operating equipment waste excavation, site restoration, and repository construction. All workers will be required to wear personal dosimeters to ensure that exposure does not exceed OSHA limits.

- **Environmental Impacts** – Even with control measures, short-term environmental impacts could occur from excavation and placement of waste in an on-mesa repository. These environmental impacts may include residual track-in and track-out effects of soil and mud, noise, disturbed vegetation, and dust generation. However, the threat to the environment is low because the waste rock could be readily cleaned up within 7 months. In addition, revegetation will expedite the return of native flora. The short-term threat posed by exposure to uranium and radionuclides would be minimal.

- **Greener Cleanups Analysis** – An analysis was completed that estimated the environmental footprint of the removal action for Alternative 2. The analysis determined the mass of different emissions generated by different construction activities, including greenhouse gases, nitrogen oxides, sulfur oxides, particulate matter, and listed air pollutants. For all categories, Alternative 2 was assessed as having a **small** environmental footprint.

  - *Energy and Emissions* – Alternative 2 has a **small** energy and emissions footprint because all waste hauling will be hauled to the on-mesa repository. Over the long term, Alternative 2 would have a relatively **small** footprint because of the number of onsite visits required to inspect and manage the repository cap over 1,000 years (see long-term effectiveness and permanence below). Use of local labor for inspections and reducing the number of inspections required per year would reduce the footprint. Use of electric, hybrid, ethanol, or compressed natural gas vehicles instead of conventional gasoline or diesel vehicles could reduce emissions.

- *Water Resources* – Alternative 2 requires use of NTUA water or groundwater for waste compaction and dust control during excavation, loading, backfill, grading, and hauling on the Mesa V trunk road. Overall, because of the relatively medium construction area and volume of waste being hauled, Alternative 3 would have a **medium** water resource footprint. Use of polymers could be considered to reduce water use for dust suppression.
- *Materials Management* – Alternative 2 requires import of rock for stabilization of the onsite drainages, as well as import of gravel for repository cap construction. Borrow soil for site restoration and capping will be from nearby. Alternative 2 would have a **small** material management footprint because of the relatively small repository size and limited amount of imported materials.
- *Land Management and Ecosystems Protection* – Alternative 2 has a **medium** footprint because future land use at the site would be limited by the repository footprint. Minimizing the repository aerial extent could be considered to reduce land use impacts. Use of geomorphic grading for repository closure would minimize visual impacts. No negative ecosystem impacts were identified.

- **Time until Removal Action Objectives Are Achieved** – Excavation, consolidation, and containment of waste in an on-mesa repository would meet preliminary RAOs in the short term. The construction time required to achieve preliminary RAOs for Alternative 2 would be accomplished within 7 months at the CTS Group and on-mesa repository site. Construction may be extended depending on schedule-limiting factors such as haul truck availability, monsoon rains, and snowfall.

Long-Term Effectiveness and Permanence (after Removal Action) (Rating: Average) – Alternative 2 would safely and reliably contain all waste in an on-mesa repository with an ET cap, and RAOs would be achieved at all areas at the CTS Group. Although the on-mesa repository and ET cap are expected to be fully protective in the short and long term, the cap would require long-term inspection and maintenance.

Over the long term, additional accidents and fatalities could also result from site inspections and repairs during long-term O&M of the on-mesa repository cap. Alternative 2 would have large energy and greenhouse gas footprints because of the high fuel consumption and emissions over the 1,000-year O&M duration. An estimated 2.3 in 10 risk of an additional accident and 7.1 in 1,000 risk of an additional fatality for the 480,000 miles traveled over 1,000 years from on-highway traffic accidents are possible in comparison to Alternative 1 (no action).

Land use controls would be necessary to limit access to and disturbance of the site and the on-mesa repository during restoration. A long-term surveillance plan (10 CFR § 40.28) would be implemented after repository construction to ensure cap integrity. For the areas at the site where all waste has been removed, short-term monitoring and repair of revegetation and erosion controls would also be required for up to 10 years.

Alternative 2 would not require replacement of components because their lifespan is indefinite under an inspection and maintenance regime as described above. Force majeure events, such as earthquakes, climate change, or large floods, could impact the remedy or waste left in place, but design criteria for the remedy would take these into account to the extent practicable.

Finally, the uncertainties of disposing of waste in an on-mesa repository under Alternative 2 are considered low because of the stable nature of the waste, design of the repository and ET cap, use of conventional materials and methods, and long track record of repositories as an accepted remedy.

Alternative 2 employs no onsite treatment, so no reductions in toxicity, mobility, or volume through active treatment would occur.

4.3.2.2 Implementability

The implementability rating for Alternative 2 is **Very Good** based on the following discussion.

Technical Feasibility and Availability of Services and Materials (Rating: Very Good) – Alternative 2 consists of simple earthwork and material hauling. Alternative 2 requires a contractor experienced in the excavation of mine waste, repository ET cap construction, biodegradable matting and wattles, stormwater diversion berms and ditches, hazardous substances, and traffic, dust, and stormwater management. The equipment required for the work is readily available and consists of scrapers, loaders, dozers, crushing/ screening plant for borrow materials, and articulated haul trucks. The transport of waste to the on-mesa repository will require a 0.5-hour cycle time for trucks.

Construction and environmental monitoring equipment and services are all readily available. Labor would be available both on the Navajo Nation and in the regional market. A sufficient volume of water for dust suppression may be obtained through construction of a water well at the repository or connection with a nearby NTUA water pipeline.

Sources of borrow material are enough to meet the needs for fill, topsoil, and gravel for capping options under all potential cap designs and for restoration after excavation. Riprap would need to be imported from Durango, Colorado, to meet engineering specifications for armoring drainage channels.

Alternative 2 would be completed as a single phase, and no future removal actions are anticipated. Long-term maintenance of the repository cap would be required. The expertise and equipment for long-term monitoring and maintenance of the on-mesa repository cap, erosional features and controls, and revegetation are and will be available. Run-on water control berms, drainage ditches, and sediment detention basins at the repository would be repaired as necessary. Permanent range fencing and warning signs around the repository would also be checked and repaired or replaced as necessary.

Administrative Feasibility (Rating: Very Good) – Implementation of Alternative 2 would require coordination with USEPA, NNEPA, and NAMLRD to address federal and tribal ARARs, but federal permits for onsite actions under CERCLA, such as the proposed on-mesa repository location in a mining-disturbed area (drilled and explored extensively) and within a mine lease boundary, are not required. General construction permits and environmental reviews may be required from the Navajo Nation. Finally, negotiations with the Navajo Nation or other landowners with potential offsite soil borrow sources and repository areas would need to be conducted and agreements crafted.

The entity responsible for the long-term surveillance plan would maintain various plans and conduct periodic inspections and reviews, including:

- A stormwater pollution prevention plan (SWPPP) overseen by NNEPA (to verify that restoration is protective of surface water quality)
- A long-term surveillance plan implemented after repository cap construction and overseen by NNEPA and USEPA

Land use controls for waste placed in the repository would require coordination with NNEPA, the Navajo Nation Lands Department, and the Cove Chapter because deed restrictions are not possible on the Navajo Nation.

4.3.2.3 Costs

Overall, Alternative 2 has one of the lower costs of all the alternatives because of local hauling and disposal in an on-mesa repository even after both short-term (10-year) site restoration O&M costs and long-term (1,000-year) on-mesa repository O&M costs are considered. Cost savings are realized by sharing repository costs with other mine sites. The overall effectiveness of Alternative 2 is rated **Good** (after the **Good** rating for short-term effectiveness is combined with the **Average** rating for long-term effectiveness and permanence). The low costs compared with the **Good** overall effectiveness rating means that Alternative 2 is cost effective, and the cost rating is **Good**.

The total net present value cost for Alternative 2 is estimated at $13,168,029 using a 3.5 percent discount rate. The net present value cost includes total capital costs ($11,423,403), annual O&M costs ($86,604) for site restoration inspection and maintenance costs over 10 years, and annual O&M costs ($33,510) for repository inspection and maintenance costs over 1,000 years.

A breakdown of the major cost categories associated with implementing Alternative 2 for each site within the CTS Group is presented below. Detailed cost estimates are provided in Appendix E and Table E-2.

Cost Component	Cove Transfer Stations Complex	CTS 2	CTS Group Totals
Excavated Surface Area (ft^2)	232,657	107,600	340,527
Excavated Volume (yd^3)	27,270	16,301	43,571
Capital Costs			
Waste Excavation and Hauling	$1,060,252	$765,737	$1,825,989
Site Restoration	$392,694	$126,950	$519,644
On-Mesa Repository Construction (shared)	$1,226,730	$733,235	$1,959,965
Other Construction	$0	$0	$0
Subtotal Construction Costs	**$2,679,676**	**$1,625,922**	**$4,305,598**
Non-Construction	$4,262,378	$2,855,426	$7,117,804
Total Capital Costs	**$6,942,054**	**$4,481,348**	**$11,423,402**
O&M Costs			
Annual Site Restoration (10 years)	$59,999	$26,605	$86,604
Annual Access Road Maintenance (1,000 years)	$5,862	$3,507	$9,369
Annual Burial Cell Cap Maintenance (1,000 years)	$15,110	$9,031	$24,141
Total Annual O&M Costs	**$80,971**	**$39,143**	**$120,114**
NPV Costs			
10-Year Site Restoration	$498,950	$221,246	$720,196
1,000-Year Trunk Road	$209,297	$125,110	$334,407
1,000 Year On-Mesa Repository	$431,831	$258,193	$690,024
Total NPV Costs	**$8,082,132**	**$5,085,897**	**$13,168,029**

Notes:
CTS Cove Transfer Station
ft^2 Square foot
NPV Net present value
O&M Operation and maintenance
yd^3 Cubic yard

4.3.3 Alternative 3: Excavation, Transport, and Disposal in On-Navajo Nation Regional Repository

Alternative 3 involves the excavation of mine waste and contaminated soil and transport and disposal of waste in a regional repository.

4.3.3.1 Effectiveness

The effectiveness rating for Alternative 3 is **Average** based on the following discussion.

Overall Protection of Public Health and the Environment (Rating: Protective) – Under Alternative 3, overall protectiveness is considered good for achieving RAOs because soil and mine waste that contain radionuclide and metal COCs and COECs would be capped within a regional repository. The potential for direct contact, ingestion, inhalation, and external irradiation by human and ecological receptors would be eliminated, and the risk to human and ecological receptors would be within acceptable levels with the proper maintenance of the repository cap. RAOs would be achieved in a short time frame because of waste isolation and containment. With proper cap maintenance, Alternative 3 would be protective of public health and the environment.

Compliance with ARARs (Rating: In Compliance) – Federal and tribal ARARs identified in Table 14, Table 15, and Table 16 would be met for the site under Alternative 3.

Short-Term Effectiveness (during Removal Action) (Rating: Average) – The short-term impacts to the community, workers, and environment under Alternative 3 are as described below.

- **Protection of the Community during Removal Action** – Dust control measures, such as water spraying, would be used during excavation, waste hauling, regional repository construction, waste compaction, and capping of the waste. However, some dust generation is unavoidable. Air monitors would be placed around the construction zone at the site and repository to measure potential risks to the community.

  The increased truck traffic required to transport equipment and construction materials to CTS Group sites and the waste excavation, waste hauling, and consolidation activities at the regional repository would have a short-term impact on traffic safety within the Cove and Red Valley Chapter communities and on air quality on dirt access roads.

  Over the short term, the estimated 1.4 in 10 risk of an additional accident and 4.1 in 1,000 risk of an additional fatality for the 280,400 miles traveled during construction and 10 years of site restoration from on-highway traffic accidents are slightly elevated in comparison to Alternative 2 (on-mesa repository) but remain relatively low because of the 21 mile on-highway travel distance between the site and the regional repository.

- **Protection of Workers during Removal Action** – Onsite workers would require standard 40-hour OSHA hazardous materials training and radiation awareness training and would be adequately protected by using appropriate personal protective equipment and following safe work practices and standards. Radiation exposure monitoring would be required. Short-term impacts to air quality in the surrounding environment may occur during excavation, repository construction, and placement of mine waste in the regional repository. Dust suppression and monitoring would be required to ensure that workers are not exposed to or inhale radionuclides in particulates. Decontamination of workers and equipment would be required before exiting the site.

  Short-term risks of physical injury would exist for site workers during construction, primarily related to operating equipment during waste excavation, site restoration, and repository construction. All workers will be required to wear personal dosimeters to ensure that exposure does not exceed OSHA limits.

- **Environmental Impacts** – Even with control measures, short-term environmental impacts could occur. These environmental impacts may include residual track-in and track-out effects of soil and mud, noise, disturbed vegetation, and dust generation. However, the threat to the environment is low because the mine waste could be cleaned up within 6 months. In addition, revegetation will expedite the return of native flora. The short-term threat posed by exposure to uranium and radionuclides would be minimal.

- **Greener Cleanups Analysis** –An analysis was completed that estimated the environmental footprint of the removal action for Alternative 3. The analysis determined the mass of different emissions generated by different construction activities, including greenhouse gases, nitrogen oxides, sulfur oxides, particulate matter, and listed air

pollutants. For all categories, Alternative 3 was assessed as having a **medium** environmental footprint.

- *Energy and Emissions* – Alternative 3 has a **medium** energy and emissions footprint because all waste will be hauled 21 miles to the regional repository. Over the long term, Alternative 3 would have a relatively **small** footprint because of the number of onsite visits required to inspect and manage the repository cap over 1,000 years (see long-term effectiveness and permanence below). Use of local labor for inspections and reducing the number of inspections required per year would reduce the footprint. Use of electric, hybrid, ethanol, or compressed natural gas vehicles instead of conventional gasoline or diesel vehicles could reduce emissions. Alternatives with shorter haul distances should also be considered.
- *Water Resources* – Alternative 3 requires use of NTUA water or groundwater for waste compaction and dust control during excavation, loading, backfill, grading, and hauling on haul roads. Overall, because of the relatively medium construction area and volume of waste being hauled, Alternative 3 would have a **medium** water resource footprint. Use of polymers could be considered to reduce water use for dust suppression.
- *Materials Management* – Alternative 3 requires hauling waste from the CTS Group sites to the repository and import of rock for stabilization of the onsite drainages, as well as import of gravel for repository cap construction. Borrow soil for site restoration and capping will be from nearby. Alternative 3 would have a **medium** material management footprint because of offsite waste hauling, the large repository size, and limited amount of imported materials.
- *Land Management and Ecosystems Protection* – Alternative 3 has a **medium** footprint because future land use would be limited by the repository footprint. Minimizing the repository aerial extent could be considered to reduce land use impacts. Use of geomorphic grading for repository closure would minimize visual impacts. No negative ecosystem impacts were identified.

- **Time until Removal Action Objectives Are Achieved** – Excavation, consolidation, and containment of waste in a new regional repository would meet preliminary RAOs in the short term. The construction time required to achieve preliminary RAOs for Alternative 3 would be accomplished within 6 months at the CTS Group and regional repository site. Construction may be extended depending on schedule-limiting factors such as haul truck availability, monsoon rains, and snowfall.

Long-Term Effectiveness and Permanence (after Removal Action) (Rating: Good) – Alternative 3 would safely and reliably contain all waste in a new regional repository with an ET cap, and RAOs would be achieved at all areas at the CTS Group. Although the regional repository and ET cap are expected to be fully protective in the short and long term, the cap would require long-term inspection and maintenance.

Over the long term, additional accidents and fatalities could also result from site inspections and repairs during long-term O&M of the regional repository cap. Alternative 3 would have large energy and greenhouse gas footprints because of the high fuel consumption and emissions over

the 1,000-year O&M duration. An estimated 2.3 in 10 risk of an additional accident and 7.1 in 1,000 risk of an additional fatality for the 480,000 miles traveled over 1,000 years from on--highway traffic accidents are possible in comparison to Alternative 2 (on-mesa repository).

Land use controls would be necessary to limit access to and disturbance of the site and the regional repository during restoration. A long-term surveillance plan (10 CFR § 40.28) would be implemented after repository construction to ensure cap integrity. For the areas at the site where all waste has been removed, short-term monitoring and repair of revegetation and erosion controls would also be required for up to 10 years.

Alternative 3 would not require replacement of components because their lifespan is indefinite under an inspection and maintenance regime as described above. Force majeure events, such as earthquakes, climate change, or large floods, could impact the remedy or waste left in place, but design criteria for the remedy would take these into account to the extent practicable.

Finally, the uncertainties of disposing of waste in a regional repository under Alternative 3 are considered low because of the stable nature of the waste, design of the repository and ET cap, use of conventional materials and methods, and long track record of repositories as an accepted remedy.

Alternative 3 employs no onsite treatment, so no reductions in toxicity, mobility, or volume through active treatment would occur.

4.3.3.2 Implementability

The implementability rating for Alternative 3 is **Good**, based on the following discussion.

Technical Feasibility and Availability of Services and Materials (Rating: Good) – Alternative 3 consists mainly of simple earthwork and material hauling. Alternative 3 requires a contractor experienced in the excavation of mine waste, repository ET cap construction, biodegradable matting and wattles, stormwater diversion berms and ditches, hazardous substances, and traffic, dust, and stormwater management. The equipment required for the work is readily available and consists of scrapers, loaders, dozers, crushing/screening plant for borrow materials, and articulated haul trucks. The transport of waste to the regional repository will require a 1-hour cycle time for trucks.

Construction and environmental monitoring equipment and services are all readily available. Labor would be available both on the Navajo Nation and in the regional market. A sufficient volume of water for dust suppression may be obtained through construction of a water well at the repository or connection with a nearby NTUA water pipeline.

Sources of borrow material are enough to meet the needs for fill, topsoil, and gravel for capping options under all potential cap designs and for restoration after excavation. Riprap would need to be imported from Durango, Colorado, to meet engineering specifications for armoring drainage channels.

Alternative 3 would be completed as a single phase, and no future removal actions are anticipated. Long-term maintenance of the repository cap would be required. The expertise and

equipment for long-term monitoring and maintenance of the repository cap, erosional features and controls, and revegetation are and will be available. Run-on water control berms, drainage ditches, and sediment detention basins at the repository would be repaired as necessary. Permanent range fencing and warning signs around the repository would also be checked and repaired or replaced as necessary.

Administrative Feasibility (Rating: Average) – Implementation of Alternative 3 would require coordination with USEPA, NNEPA, and NAMLRD to address federal and tribal ARARs, but federal permits for onsite actions under CERCLA, such as the proposed regional repository location in a mining-disturbed area (drilled and explored extensively) and within a mine lease boundary, are not required. General construction permits and environmental reviews may be required from the Navajo Nation. Finally, negotiations with the Navajo Nation or other landowners with potential offsite soil borrow sources and repository areas would need to be conducted and agreements crafted.

The entity responsible for the long-term surveillance plan would maintain various plans and conduct periodic inspections and reviews, including:

- A SWPPP overseen by NNEPA (to verify that restoration is protective of surface water quality)
- A long-term surveillance plan implemented after repository cap construction and overseen by NNEPA and USEPA

Land use controls for waste placed in the repository would require coordination with NNEPA, the Navajo Nation Lands Department, and the Cove Chapter because deed restrictions are not possible on the Navajo Nation.

4.3.3.3 Costs

Overall, Alternative 3 has the lowest costs of all the alternatives because of local hauling and disposal in a regional repository even after both short-term (10-year) site restoration O&M costs and long-term (1,000-year) regional repository O&M costs are considered. Cost savings are also realized by sharing repository costs with other mine sites. The overall effectiveness of Alternative 3 is rated **Average** (after the **Average** rating for short-term effectiveness is combined with the **Good** rating for long-term effectiveness and permanence). The low costs compared with the **Average** overall effectiveness rating Alternative 3 is cost effective, and the cost rating is **Good**.

The total net present value cost for Alternative 3 is estimated at $9,541,977 using a 3.5 percent discount rate. The net present value cost includes total capital costs ($8,105,469), annual O&M costs ($86,604) for site restoration inspection and maintenance costs over 10 years, and annual O&M costs ($20,969) for repository inspection and maintenance costs over 1,000 years.

A breakdown of the major cost categories associated with implementing Alternative 3 for each site within the CTS Group is presented below. Detailed cost estimates are provided in Appendix E and Table E-3.

Cost Component	Cove Transfer Stations Complex	CTS 2	CTS Group Totals
Excavated Surface Area (ft^2)	232,657	107,600	340,527
Excavated Volume (yd^3)	27,270	16,301	43,571
Capital Costs			
Waste Excavation and Loading	$373,080	$218,982	$592,062
Site Restoration	$392,694	$126,950	$519,644
Repository Access Road Construction (shared)	$438,032	$261,763	$699,795
Hauling to Regional Repository	$282,245	$168,715	$450,960
Regional Repository Construction (shared)	$981,465	$586,513	$1,567,978
Subtotal Construction Costs	**$2,467,516**	**$1,362,923**	**$3,830,439**
Non-Construction	$3,475,433	$2,219,094	$5,694,527
Total Capital Costs	**$5,942,949**	**$3,582,017**	**$9,524,966**
O&M Costs			
Annual Site Restoration (10 years)	$59,999	$26,605	$86,604
Annual Trunk Road Maintenance (1,000 years)	$1,127	$674	$1,801
Annual Regional Repository Maintenance (1,000 years)	$11,998	$7,170	$19,168
Total Annual O&M Costs	**$73,124**	**$34,449**	**$107,573**
NPV Costs			
10-Year Site Restoration	$498,950	$221,246	$720,196
1,000-Year Trunk Road	$149,637	$89,524	$239,161
1,000 Year Regional Repository	$347,402	$207,835	$555,237
Total NPV Costs	**$6,938,938**	**$4,100,622**	**$11,039,560**

Notes:
CTS Cove Transfer Station
ft^2 Square foot
NPV Net present value
O&M Operation and maintenance
yd^3 Cubic yard

4.3.4 Alternative 4: Excavation, Off-Navajo Nation Transport, and Disposal at White Mesa Mill

Alternative 4 involves the excavation of mine waste and contaminated soil and transport, milling, and disposal of waste at the White Mesa Mill.

4.3.4.1 Effectiveness

The effectiveness rating for Alternative 4 is **Good** based on the following discussion.

Overall Protection of Public Health and the Environment (Rating: Protective) – Under Alternative 4, overall protectiveness is considered good for achieving RAOs because soil and mine waste that contain radionuclide and metal COCs and COECs would be hauled off site, milled, and uranium recovered before placed in an tailings disposal facility. Therefore, potential direct contact, ingestion, inhalation, and external irradiation by human and ecological receptors would be eliminated. RAOs would be achieved in a short time frame because waste would be removed from the CTS Group and contained in an offsite tailings disposal facility. Alternative 4 would be protective of public health and the environment.

Compliance with ARARs (Rating: In Compliance) –Alternative 4 will meet ARARs identified in Table 14, Table 15, and Table 16. Most of the components of Alternative 4, including the ultimate disposition of the waste, will occur off site. ARARs do not apply to offsite actions, but offsite actions must comply with independently applicable requirements (not relevant and appropriate). Independently applicable requirements cannot be waived, and all components, both substantive and procedural, must be complied with at all times.

Short-Term Effectiveness (during Removal Action) (Rating: Poor) – The short-term impacts to the community, workers, and environment under Alternative 4 are as described below.

- **Protection of the Community during Removal Action** – Dust control measures, such as water spraying, would be used during waste excavation and loading for offsite transport. However, some dust generation is unavoidable. Air monitors would be placed around the construction zone to measure potential risks to the community.

  The increased truck traffic required to transport equipment and construction materials to the site and the local waste excavation and hauling activities would have a short-term impact on traffic safety within the Cove and Red Valley Chapter communities. Hauling waste from the site to the off-Navajo Nation White Mesa Mill located south of Blanding, Utah, would lead to increased traffic on Indian Route 33 and along the route to the mill facility for up to 6 months.

  Over the short term, the estimated 5 in 10 risk of an additional accident and 1.5 in 100 risk of an additional fatality for the 1 million miles traveled during construction and 10 years of site restoration from on-highway traffic accidents are elevated by a factor of 5 in comparison to Alternatives 2 and 3 (on-mesa and regional repositories) because of the 136-mile haul distance between the CTS Group and the White Mesa Mill.

- **Protection of Workers during Removal Action** – Onsite workers would require standard 40-hour OSHA hazardous materials training and radiation awareness training and would be adequately protected by using appropriate personal protective equipment and following safe work practices and standards. Radiation exposure monitoring would be required. Short-term impacts to air quality in the surrounding environment may occur during excavation and loading of waste for offsite transport. Dust suppression and monitoring would be required to ensure that workers are not exposed to or inhale radionuclides in particulates. Decontamination of workers and equipment would be required before exiting the site.

  Short-term risks of physical injury would exist for site workers during construction, primarily related to operating equipment during waste excavation and site restoration. All workers will be required to wear personal dosimeters to ensure that exposure does not exceed OSHA limits. The risk to truck drivers would be greater than that for Alternative 3 because of the increase in time and miles required for transport.

- **Environmental Impacts** – Even with control measures, short-term environmental impacts could occur. These environmental impacts may include residual track-in and track-out effects of soil and mud, noise, disturbed vegetation, and dust generation. However, the threat to the environment is low because the mine waste could be cleaned up within 6 months. In addition, revegetation will expedite the return of native flora. The short-term threat posed by exposure to uranium and radionuclides would be minimal.

- **Greener Cleanups Analysis** – An analysis was completed that estimated the environmental footprint of the removal action for Alternative 4. The analysis determined the mass of different emissions generated by different construction activities, including greenhouse gases, nitrogen oxides, sulfur oxides, particulate matter, and listed air pollutants. For all categories, Alternative 4 was assessed as having a **large** environmental footprint.
    - *Energy and Emissions* – Alternative 4 has a **large** energy and emissions footprint because all waste will be hauled 136 miles to the White Mesa Mill near Blanding, Utah for disposal. Use of electric, hybrid, ethanol, or compressed natural gas vehicles instead of conventional gasoline or diesel vehicles could reduce emissions. Alternatives with shorter haul distances should also be considered.
    - *Water Resources* – Alternative 4 does not involve repository construction and would not require water for waste compaction. Alternative 4 requires use of NTUA water or groundwater for dust control during excavation, loading, backfill, and grading. Overall, because of the volume of waste being hauled off the CTS Group sites, Alternative 4 would have a **small** water resource footprint. Use of polymers could be considered to reduce water use for dust suppression.
    - *Materials Management* – Alternative 4 requires hauling waste from the CTS Group sites to offsite disposal facilities and import of rock for stabilization of the onsite drainages. Borrow soil for site restoration will be from nearby. Alternative 4 would have a **medium** material management footprint because of offsite waste hauling and the limited amount of imported materials. Identification of an alternate disposal facility closer to the site could reduce fuel consumption and emissions.
    - *Land Management and Ecosystems Protection* – Alternative 4 has a **small** land management and ecosystems protection footprint as all the waste will be hauled off site. No negative ecosystem impacts or land use restrictions were identified. Land use would not be limited in the long-term after the sites have been restored.
- **Time until Removal Action Objectives Are Achieved** – Excavation, hauling off Navajo Nation, milling, and disposal of milled tailings in a tailings disposal facility would meet preliminary RAOs in the short term. The construction time required to achieve preliminary RAOs for Alternative 4 would be approximately 6 months at the CTS Group. Construction may be extended depending on schedule-limiting factors such as haul truck availability, monsoon rains, and snowfall.

Long-Term Effectiveness and Permanence (after Removal Action) (Rating: Very Good) – Alternative 4 would relocate and safely mill and dispose of all waste in a licensed uranium milling facility, and RAOs would be achieved at all areas on the site. No sources of mining-related residual risk would remain at the CTS Group.

No long-term O&M is required for Alternative 4 because no waste would remain on site. Therefore, Alternative 4 has a substantial advantage over on-Navajo Nation actions, which would require up to 1,000 years of on-mesa or regional repository cap inspections and maintenance.

Land use controls would be necessary to limit access to and disturbance of the site during restoration. Short-term monitoring of revegetation efforts and erosion controls would also be required. Replacement of components over the long term would not be required because no waste would remain on site. Inspection and maintenance of restoration features would only be required for a period up to 10 years.

Finally, the uncertainties of disposing of waste off site under Alternative 4 are considered low because of the use of conventional materials and methods and the long track record of uranium milling facilities as an accepted remedy.

Alternative 4 employs no onsite treatment, so no reductions in toxicity, mobility, or volume through active treatment would occur.

4.3.4.2 Implementability

The implementability rating for Alternative 4 is **Average** based on the following discussion.

Technical Feasibility and Availability of Services and Materials (Rating: Average) – Alternative 4 consists mainly of simple earthwork and material hauling. Alternative 4 requires a contractor experienced in the excavation of mine waste, coordinating long distance transport of waste, biodegradable matting and wattles, stormwater diversion berms and ditches, hazardous substances, and traffic, dust, and stormwater management. The equipment required for the work is readily available and consists of scrapers, loaders, dozers, crushing/screening plant for borrow materials, and on-highway haul trucks. The transport of waste to the White Mesa Mill will increase the cycle time for trucks to approximately 6 hours, resulting in the need for more trucks or increased construction time.

Construction and environmental monitoring equipment and services are all readily available. Labor would be available both on the Navajo Nation and in the regional market. Availability of on-highway haul trucks may be a limiting factor and increase project duration. Access to a sufficient volume of water for dust suppression is necessary, which would be obtained through connection with a nearby NTUA water pipeline.

Sources of borrow material are enough to meet the needs for fill and topsoil for restoration after excavation. Riprap would need to be imported from Durango, Colorado, to meet engineering specifications for armoring drainage channels.

Alternative 4 would be completed as a single phase, and no future removal actions are anticipated. Long-term monitoring and maintenance would not be required; however, short-term maintenance of erosional controls and revegetation efforts would be required. Run-on water control berms, drainage ditches, and sediment detention basins would be repaired as necessary. Temporary range fencing around the restored site would also be checked and repaired as necessary.

The White Mesa Mill facility is currently in compliance with its State of Utah operating permit and with the CERCLA Off-Site Rule. Because all waste would be disposed of off site, exclusive reliance on the operational capacity of the White Mesa Mill facility brings uncertainty to the availability of services at the time of the removal action. No other mill facilities are in operation

in the region; therefore, selection of an alternate method of disposal could be required in the action memorandum if necessary.

Administrative Feasibility (Rating: Good) – Implementation of Alternative 4 would require coordination with USEPA, NNEPA, and NAMLRD to address federal and tribal ARARs, but federal permits for onsite actions under CERCLA are not required. General construction permits and environmental reviews may be required from the Navajo Nation. Finally, negotiations with the Navajo Nation or other landowners with potential offsite soil borrow sources would need to be conducted and agreements crafted.

Offsite processing or disposal of materials from a CERCLA site must comply with the CERCLA Off-Site Rule. The White Mesa Mill currently has approval under the Off-Site Rule and would need to maintain such approval.

The entity responsible for the short-term surveillance of site restoration efforts would maintain various plans and conduct periodic inspections and reviews, including a SWPPP overseen by NNEPA (to verify that restoration is protective of surface water quality).

4.3.4.3 Costs

Overall, Alternative 4 has the second highest costs of all the alternatives despite the short-term (10-year) site restoration O&M costs, after trucking costs and White Mesa Mill processing and disposal fees are considered. The overall effectiveness of Alternative 4 is rated **Good** (after the **Poor** rating for short-term effectiveness is combined with the **Very Good** rating for long-term effectiveness and permanence). The higher costs relative to Alternatives 2 and 3 compared with the **Good** overall effectiveness rating means that Alternative 4 is cost effective, and the cost rating is **Poor**.

The total net present value cost for Alternative 4 is estimated at $14,761,394 using a 3.5 percent discount rate. The net present value cost includes total capital costs ($14,041,198), and annual O&M costs ($86,604) for site restoration inspection and maintenance costs over 10 years.

A breakdown of the major cost categories associated with implementing Alternative 4 for each site within the CTS Group is presented below. Detailed cost estimates are provided in Appendix E and Table E-4.

Cost Component	Cove Transfer Stations Complex	CTS 2	CTS Group Totals
Excavated Surface Area (ft^2)	232,657	107,600	340,527
Excavated Volume (yd^3)	27,270	16,301	43,571
Capital Costs			
Waste Excavation and Loading	$373,080	$218,982	$592,062
Site Restoration	$392,694	$126,950	$519,644
Waste Hauling to White Mesa Mill	$1,767,096	$1,056,305	$2,823,401
Disposal at White Mesa Mill	$2,761,088	$1,650,476	$4,411,564
Other Construction	$0	$0	$0
Subtotal Construction Costs	**$5,293,958**	**$3,052,713**	**$8,346,671**
Non-Construction	$3,475,433	$2,219,094	$5,694,527
Total Capital Costs	**$8,769,391**	**$5,271,807**	**$14,041,198**
O&M Costs			
Annual Site Restoration (10 years)	$59,999	$26,605	$86,604
Total Annual O&M Costs	**$59,999**	**$26,605**	**$86,604**
NPV Costs			
10-Year Site Restoration	$498,950	$221,246	$720,196
Total NPV Costs	**$9,268,341**	**$5,493,053**	**$14,761,394**

Notes:
CTS Cove Transfer Station
ft^2 Square foot
NPV Net present value
O&M Operation and maintenance
yd^3 Cubic yard

4.3.5 Alternative 5: Excavation, Off-Navajo Nation Transport, and Disposal at Hazardous Waste or Low-Level Radioactive Waste Facility

Alternative 5 involves the excavation of mine waste and contaminated soil and transport and disposal of waste in a hazardous waste or LLRW facility.

4.3.5.1 Effectiveness

The effectiveness rating for Alternative 5 is **Average** based on the following discussion.

Overall Protection of Public Health and the Environment (Rating: Protective) – Under Alternative 5, overall protectiveness is considered good for achieving RAOs because soil and mine waste that contain radionuclide and metal COCs and COECs would be disposed of at an off-Navajo Nation hazardous waste disposal facility. Therefore, potential direct contact, ingestion, inhalation, and external irradiation by human and ecological receptors would be eliminated. RAOs would be achieved in a short time frame because waste would be removed from the CTS Group and contained in an offsite disposal facility. Alternative 5 would be protective of public health and the environment.

Compliance with ARARs (Rating: In Compliance) – Alternative 5 will meet ARARs identified in Table 14, Table 15, and Table 16. Most of the components of Alternative 5, including the ultimate disposition of the waste, will occur off site. ARARs do not apply to offsite actions, but offsite actions must comply with independently applicable requirements (not

relevant and appropriate). Independently applicable requirements cannot be waived, and all components, both substantive and procedural, must be complied with at all times.

Short-Term Effectiveness (during Removal Action) (Rating: Very Poor) – The short-term impacts to the community, workers, and environment under Alternative 5 are as described below.

- **Protection of the Community during Removal Action** – Dust control measures, such as water spraying, would be used during waste excavation and loading for offsite transport. However, some dust generation is unavoidable. Air monitors would be placed around the construction zone to measure potential risks to the community.

  The increased truck traffic required to transport equipment and construction materials to the site and the local waste excavation and hauling activities would have a short-term impact on traffic safety within the Cove and Red Valley Chapter communities. Hauling waste from the site to the off-Navajo Nation Clean Harbors RCRA C hazardous waste disposal facility located near Deer Trail, Colorado, would lead to increased traffic on Indian Route 33 and along the route to the disposal facility for up to 6 months.

  Over the short term, the estimated 1.8 in 1 risk of an additional accident and 5.5 in 100 risk of an additional fatality for the 3.8 million miles traveled during construction and 10 years of site restoration from on-highway traffic accidents are elevated by a factor of 20 in comparison to Alternative 2 (on-mesa repository) because of the 558-mile haul distance between the CTS Group and the Clean Harbors RCRA C hazardous waste disposal facility.

- **Protection of Workers during Removal Action** – Onsite workers would require standard 40-hour OSHA hazardous materials training and radiation awareness training and would be adequately protected by using appropriate personal protective equipment and following safe work practices and standards. Radiation exposure monitoring would be required. Short-term impacts to air quality in the surrounding environment may occur during excavation and loading of waste for offsite transport. Dust suppression and monitoring would be required to ensure that workers are not exposed to or inhale radionuclides in particulates. Decontamination of workers and equipment would be required before exiting the site.

  Short-term risks of physical injury would exist for site workers during construction, primarily related to operating equipment during waste excavation and site restoration. All workers will be required to wear personal dosimeters to ensure that exposure does not exceed OSHA limits. The risk to truck drivers would be greater than that for Alternatives 3 and 4 because of the increase in time and miles required for transport.

- **Environmental Impacts** – Even with control measures, short-term environmental impacts could occur. These environmental impacts may include residual track-in and track-out effects of soil and mud, noise, disturbed vegetation, and dust generation. However, the threat to the environment is low because the waste removal and haul out could be completed within 6 month. In addition, revegetation will expedite the return of native flora. The short-term threat posed by exposure to uranium and radionuclides would be minimal.

- **Greener Cleanups Analysis** – An analysis was completed that estimated the environmental footprint of the removal action for Alternative 5. The analysis determined the mass of different emissions generated by different construction activities, including greenhouse gases, nitrogen oxides, sulfur oxides, particulate matter, and listed air pollutants. For all categories, Alternative 5 was assessed as having a **very large** environmental footprint.
    - *Energy and Emissions* – Alternative 5 has a **very large** energy and emissions footprint because all waste will be hauled 559 miles to the Clean Harbors RCRA C facility in Deer Trail, Colorado for disposal. Use of electric, hybrid, ethanol, or compressed natural gas vehicles instead of conventional gasoline or diesel vehicles could reduce emissions. Alternatives with shorter haul distances should also be considered.
    - *Water Resources* – Alternative 5 does not involve repository construction and would not require water for waste compaction. Alternative 5 requires use of NTUA water or groundwater for dust control during excavation, loading, backfill, and grading. Overall, because of the volume of waste being hauled off the CTS Group sites, Alternative 5 would have a **small** water resource footprint. Use of polymers could be considered to reduce water use for dust suppression.
    - *Materials Management* – Alternative 5 requires hauling waste from the CTS Group sites to an offsite disposal facility and import of rock for stabilization of the onsite drainages. Borrow soil for site restoration will be from nearby. Alternative 5 would have a **medium** material management footprint because of offsite waste hauling and the limited amount of imported materials. Identification of an alternate disposal facility closer to the site could reduce fuel consumption and emissions.
    - *Land Management and Ecosystems Protection* – Alternative 5 has a **small** land management and ecosystems protection footprint as all the waste will be hauled off site. No negative ecosystem impacts or land use restrictions were identified. Land use would not be limited in the long term after the sites have been restored.
- **Time Until Removal Action Objectives Are Achieved** – Excavation, hauling off Navajo Nation, and disposal of waste at the Clean Harbors RCRA C hazardous waste disposal facility would meet preliminary RAOs in the short term. The construction time required to achieve preliminary RAOs for Alternative 5 would be approximately 6 months at the CTS Group because of the 3-day truck cycle time. Construction may be extended depending on schedule-limiting factors such as truck availability, monsoon rains, and snowfall.

Long-Term Effectiveness and Permanence (after Removal Action) (Rating: Very Good) – Alternative 5 would relocate and safely dispose of all waste in a hazardous waste disposal facility, and RAOs would be achieved at all areas on site. No sources of mining-related residual risk would remain at the CTS Group.

No long-term O&M is required for Alternative 5 because no waste would remain on site. Therefore, Alternative 5 has a substantial advantage over on-Navajo Nation actions, which

would require up to 1,000 years of on-mesa or regional repository cap inspections and maintenance.

Land use controls would be necessary to limit access to and disturbance of the site during restoration. Short-term monitoring of revegetation efforts and erosion controls would also be required. Replacement of components over the long term would not be required because no waste would remain on site. Inspection and maintenance of restoration features would only be required for a period up to 10 years.

Finally, the uncertainties of disposing of waste off site under Alternative 5 are considered low because of the use of conventional materials and methods and the long track record of hazardous waste disposal facilities as an accepted remedy.

Alternative 5 employs no treatment, so no reductions in toxicity, mobility, or volume through treatment would occur.

4.3.5.2 Implementability

The implementability rating for Alternative 5 is **Poor** based on the following discussion.

Technical Feasibility and Availability of Services and Materials (Rating: Poor) – Alternative 5 consists mainly of simple earthwork and material hauling. Alternative 5 requires a contractor experienced in the excavation of mine waste, coordinating long distance transport of waste, biodegradable matting and wattles, stormwater diversion berms and ditches, hazardous substances, and traffic, dust, and stormwater management. The equipment required for the work is readily available and consists of scrapers, loaders, dozers, crushing/ screening plant for borrow materials, and on-highway haul trucks. The transport of waste to the hazardous waste landfill will increase the cycle time for trucks to approximately 3 days, resulting in the need for more trucks or increased construction time.

Construction and environmental monitoring equipment and services are all readily available. Labor would be available both on the Navajo Nation and in the regional market. Availability of on-highway haul trucks may be a limiting factor and increase project duration. Access to a sufficient volume of water for dust suppression is necessary, which would be obtained through connection with a nearby NTUA water pipeline.

Sources of borrow material are enough to meet the needs for fill and topsoil for restoration after excavation. Riprap would need to be imported from Durango, Colorado, to meet engineering specifications for armoring drainage channels.

Alternative 5 would be completed as a single phase, and no future removal actions are anticipated. Long-term monitoring and maintenance would not be required; however, short-term maintenance of erosional controls and revegetation efforts would be required. Run-on water control berms, drainage ditches, and sediment detention basins would be repaired as necessary. Temporary range fencing around the restored sites would also be checked and repaired as necessary.

The Clean Harbors RCRA C hazardous waste disposal facility is currently in compliance with its operating permit and with the CERCLA Off-Site Rule. Because all waste would be disposed of off site, reliance on the disposal capacity of the Clean Harbors facility brings uncertainty to the availability of services at the time of the removal action. A change to the disposal facility or additional disposal facilities could be selected in the action memorandum if necessary.

Administrative Feasibility (Rating: Good) – Implementation of Alternative 5 would require coordination with USEPA, NNEPA, and NAMLRD to address federal and tribal ARARs, but federal permits for onsite actions under CERCLA are not required. General construction permits and environmental reviews may be required from the Navajo Nation. Finally, negotiations with the Navajo Nation or other landowners with potential offsite soil borrow sources would need to be conducted and agreements crafted.

Offsite disposal of materials from a CERCLA site must comply with the CERCLA Off-Site Rule. The Clean Harbors RCRA C hazardous waste disposal facility currently has approval under the Off-Site Rule and would need to maintain such approval.

The entity responsible for the short-term surveillance of site restoration features would maintain various plans and conduct periodic inspections and reviews, including a SWPPP overseen by NNEPA (to verify that restoration is protective of surface water quality).

4.3.5.3 Costs

Overall, Alternative 5 has the highest costs of all the alternatives because of the trucking costs and Clean Harbors RCRA C hazardous waste facility disposal fees. The overall effectiveness of Alternative 5 is rated **Average** (after the **Very Poor** rating for short-term is combined with the **Very Good** rating for long-term effectiveness and permanence). The highest cost compared with the **Average** overall effectiveness rating means that Alternative 5 is not cost effective, and the cost rating is **Very Poor**.

The total net present value cost for Alternative 5 is estimated at $24,364,443 using a 3.5 percent discount rate. The net present value cost includes total capital costs ($23,644,247), and annual O&M costs ($86,604) for site restoration inspection and maintenance costs over 10 years.

A breakdown of the major cost categories associated with implementing Alternative 5 for each site within the CTS Group is presented below. Detailed cost estimates are provided in Appendix E and Table E-5.

Cost Component	Cove Transfer Stations Complex	CTS 2	CTS Group Totals
Excavated Surface Area (ft^2)	232,657	107,600	340,527
Excavated Volume (yd^3)	27,270	16,301	43,571
Capital Costs			
Waste Excavation and Loading	$373,080	$218,982	$592,062
Site Restoration	$392,694	$126,950	$519,644
Waste Hauling to RCRA C Facility	$6,959,304	$4,160,015	$11,119,319
Disposal at RCRA C Facility	$3,579,188	$2,139,506	$5,718,694
Other Construction	$0	$0	$0
Subtotal Construction Costs	**$11,304,266**	**$6,645,453**	**$17,949,719**
Non-Construction	$3,475,433	$2,219,094	$5,694,527
Total Capital Costs	**$14,779,699**	**$8,864,547**	**$23,644,246**
O&M Costs			
Annual Site Restoration (10 years)	$59,999	$26,605	$86,604
Total Annual O&M Costs	**$59,999**	**$26,605**	**$86,604**
NPV Costs			
10-Year Site Restoration	$498,950	$221,246	$720,196
Total NPV Costs	**$15,278,649**	**$9,085,794**	**$24,364,443**

Notes:
CTS Cove Transfer Station
ft^2 Square foot
NPV Net present value
O&M Operation and maintenance
yd^3 Cubic yard

5.0 NAHAT'A - COMPARATIVE ANALYSIS OF ALTERNATIVES

This section presents the approach for the comparative analysis of alternatives and a summary of the analysis. The comparative analysis includes the evaluation of the relative effectiveness, implementability, and cost between alternatives.

5.1 COMPARATIVE ANALYSIS APPROACH

The final step of this AAM is to conduct a comparative analysis of the removal action alternatives. This analysis evaluates each alternative's strengths and weaknesses relative to the other alternatives in achieving RAOs. The comparative analysis ranks the effectiveness, implementability, and cost of each alternatives as very poor, poor, average, good, or very good for each criterion. An explanation of the evaluation and ranking criteria are presented in Section 4.3. Once completed, the analysis will be used to support risk managers and stakeholders in the selection of a preferred removal action alternative for the CTS Group. Tribal, supporting agency, and public acceptance will be evaluated after stakeholder comments have been received on this AAM.

In addition, based on USEPA (2016a) guidance, five key elements in greener cleanup activities should be considered throughout the remedy selection process. USEPA's (2012) five key elements are to:

- Minimize total energy use and maximize renewable energy use
- Minimize air pollutants and carbon dioxide equivalent emissions
- Minimize water use and negative impacts to water resources
- Improve materials management and waste reduction efforts by reducing, reusing, or recycling whenever feasible
- Protect ecosystem services

5.2 SUMMARY OF ANALYSIS

All alternatives except for Alternative 1meet the threshold criterion of protectiveness of public health and the environment. Table 18 summarizes the comparative rating of alternatives.

5.2.1 Effectiveness

Effectiveness comprises two threshold criteria (protectiveness and compliance with ARARs) and includes short- and long-term effectiveness and permanence of the remedy. Overall effectiveness is rated **Very Poor** for Alternative 1, **Good** for Alternative 2, **Average** for Alternative 3, **Good** for Alternative 4, and **Average** for Alternative 5. Individual criteria and ratings contributing to the overall ratings are discussed below.

5.2.1.1 Overall Protectiveness of Human Health and the Environment

All alternatives except for Alternative 1 are protective of public health and the environment.

5.2.1.2 Compliance with ARARs

All alternatives except for Alternative 1 would be performed in compliance with federal and tribal ARARs identified in Table 14, Table 15, and Table 16.

5.2.1.3 Short-Term Effectiveness (during Removal Action)

Short-term effectiveness comprises the following criteria: protection of the community and workers during the removal action, environmental impacts, and time to meet RAOs. Overall short-term effectiveness is rated **Very Good** for Alternative 1, **Good** for Alternative 2, **Average** for Alternative 3, **Poor** for Alternative 4, and **Very Poor** for Alternative 5.

Protection of the Community during Removal Action

Alternative 2 (haul route through the Cove community) is rated **Good**. Excavated waste from the CTS Group and repository construction materials will be hauled on a 2.9-mile section of Indian Route 33, creating the least traffic impacts to the community. Dust impacts would be limited to the excavation and loading areas and the 2.9-mile dirt access road to the Mesa V repository. Fewer haul miles through the community would also result in less traffic accidents.

Alternative 3 (haul routes through Cove and Red Valley communities) is rated **Average**. Excavated waste from the CTS Group will be hauled on Indian Route 33 and 63. This alternative would lead to more traffic impacts to the communities than Alternative 2 because excavated waste would potentially be hauled a longer distance (21 miles) across the Cove and Red Valley Chapter communities. Dust impacts would be limited to the excavation and loading areas and the 2-mile dirt access road from Indian Route 36 to the regional repository. Increased haul miles through the community would also increase traffic accidents by a factor of 1.5 over Alternative 2.

Alternatives 4 and 5 (haul routes through Cove and Red Valley communities) have the highest impact on traffic, increased truck emissions, and increased possibility of traffic accidents. Dust impacts would be limited to the excavation and loading areas. Excavated waste from the CTS Group will be hauled on Indian Route 33 across the Cove and Red Valley Chapter communities and on state highways to off-Navajo Nation disposal facilities located 136 and 558 miles away. Compared to Alternative 2, the possibility of traffic accidents would be increased by a factor of 5.5 for Alternative 4 and a factor of 20 for Alternative 5. Therefore, Alternative 4 is rated **Poor** and Alternative 5 is rated **Very Poor** because of the longer roundtrip distance to the disposal facility.

Alternative 1 is rated **Very Good** as no removal activities would be conducted to impact the community.

Protection of Workers during Removal Action

Worker protection primarily involves radiation exposure, dust inhalation hazards, physical injury, and traffic accidents. All action alternatives involve the same degree of excavation work; therefore, all action alternatives have equal amounts of potential radiation exposure, potential dust inhalation hazards, and potential for injury to workers. However, Alternatives 2 and 3

involve construction of a repository, which introduces an additional level of threat to workers because of additional handling activities and duration of exposure during consolidation and capping.

Even though Alternatives 2 and 3 pose an additional hazard associated with additional handling and exposure to waste during consolidation and capping, the long haul distances for off-Navajo Nation disposal pose the greatest accident threat to truck drivers. Therefore, Alternative 4 with the shorter haul distance (136 miles one way) is rated **Poor** and Alternative 5 with a longer haul distance (558 miles one way) is rated **Very Poor**. Alternative 2 has a smaller repository footprint and a shorter haul distance (5.8 miles one way) than Alternative 3 and is rated **Good**. Alternative 3 is rated **Average** because of the construction of a larger repository and longer haul distance (21 miles one way) than Alternative 2. Alternative 1 is rated **Very Good** as no removal activities would be conducted to impact workers.

Environmental Impacts

Shorter haul distances and construction durations minimize the potential for construction-related environmental impacts to occur both on public roads and off road and in the construction areas that would require mitigation. These impacts may include residual track-in and track-out effects of soil and mud, noise, nuisance, soil spills during waste hauling, and harmful emissions. In addition, construction of an on-mesa or regional repository increases the amount of construction and, therefore, increases environmental impacts while offsite disposal increases fuel consumption and greenhouse gas emissions. Long-term O&M (1,000 years) is expected to have an impact on alternative footprints. An environmental footprint analysis was also conducted and is summarized below under greener cleanups analysis.

Greener Cleanups Analysis. An environmental footprint analysis was conducted for the removal action elements common to all alternatives and for implementation of the four disposal alternatives. The analysis focused on the environmental footprint associated with five main categories: energy use, air pollutants and greenhouse gas emissions, water use and impacts to water resources, materials management and waste reduction, and land management and ecosystems protection.

- *Energy and Emissions.* Among the common elements applicable to all action alternatives, waste excavation and site restoration activities resulted in a moderate amount of energy use and generated emissions. Alternative 5 has a **very large** footprint (621,000 gallons of fuel) because of the longest offsite haul distances even after the relatively short (10-year) site inspection visits for site restoration are considered. Alternative 4 has a **large** energy and emissions footprint (162,000 gallons of fuel) because of the moderate offsite haul distance even after the relatively short (10-year) site inspection visits for site restoration are considered. Alternative 3 has a **medium** energy and emissions footprint (83,000 gallons of fuel) because of the relatively short-haul distance to the regional repository, including consideration of cost sharing of onsite visits, required to inspect and manage the regional repository cap over 1,000 years with the other mines contributing waste to the repository. Alternative 2 has the **smallest** energy and emissions footprint (62,000 gallons of fuel) because of the very short on-highway haul distance before accessing the unpaved Mesa V trunk road to the on-mesa repository, including

consideration of cost sharing of onsite visits (required to inspect and manage the regional repository cap over 1,000 years) with the other mines contributing waste to the repository.

Best management practices (BMP) to consider include using local labor for inspections and reducing the number of inspections required per year to reduce the footprint, and using electric, hybrid, or hydrogen fuel cell vehicles instead of conventional gasoline or diesel vehicles to reduce emissions. Implementing an idle reduction plan could also reduce emissions.

- *Water Resources.* Among the common elements applicable to all alternatives, water use is required for dust control during waste excavation and loading, backfilling, and site restoration. Alternatives 2 and 3 require water for waste compaction at repositories, while Alternatives 4 and 5 do not because of offsite disposal and have a **small** water resource footprint. Alternatives 2 and 3 require additional water for dust control on haul roads and have a **medium** water resource footprint. All alternatives would require use of NTUA water or groundwater.

  BMPs to consider include using magnesium chloride and polymers for dust aggregation and suppression.

- *Materials Management.* Among the common elements applicable to all alternatives, long distance transportation of rock and gravel for site restoration resulted in the largest energy use and emissions generated related to materials import. Alternative 2 has a small materials management footprint, requiring hauling of waste locally to an on-mesa repository and import of gravel and use of nearby borrow soil for cap construction. Alternative 3 also requires of import of gravel for cap construction. Alternatives 3, 4, and 5 have a medium material management footprint because of the required hauling of waste off of the CTS Group sites for disposal. Identification of an alternate disposal facility closer to the site could reduce fuel consumption and emissions.

  BMPs to consider include reuse of clean site materials, selecting products that are local (borrow pits and quarries), use of alternate local materials with similar performance standards as import materials, and identification of an alternate disposal facility closer to the site to reduce fuel consumption and emissions.

- *Land Management and Ecosystems Protection.* Among the common elements applicable to all alternatives, noise and activity disturbance of sensitive biological species are the greatest ecosystem impacts. No alternatives would permanently impact the local ecosystem. Alternatives 4 and 5 have the **small** land management and ecosystems protection footprint because all waste will be hauled off site and land use would be unencumbered. Alternatives 2 and 3 have a **medium** land management and ecosystems protection footprint because future land use would be limited by repository footprints. Minimal loss of grazing land is expected over the long term.

  BMPs to consider include minimizing repository size; using geomorphic grading to reduce visual impacts; minimizing clearing of shrubs, grasses, and forbs; scheduling work to minimize impact on sensitive species; and using a suitable mix of shrubs, grasses, and forbs to improve biodiversity during restoration.

Greener Cleanups Summary. Under all alternatives, fuel consumption and emissions generation are the driving factors when evaluating energy and greenhouse gas footprint. Alternative 2 is rated **Good** and Alternative 3 **Average** for the short term because less fuel is used and emissions generated as a result of shorter on-Navajo haul distances than under Alternatives 4 and 5. Alternative 4 is rated **Poor** because of a longer haul distance to a disposal facility than Alternatives 2 or 3, but a much shorter haul distance than Alternative 5. Alternative 5 rated as **Very Poor** because of the longest haul distance to the disposal facility. Alternative 1 is rated **Very Good** as no removal action would be performed.

Over the long term, annual inspections and maintenance of the repository caps under Alternatives 2 and 3 would result in an increased energy and greenhouse gas footprint, but would be dwarfed by fuel consumption and greenhouse gas emissions during construction and short distance hauling. In addition, Alternatives 2 and 3 could limit future land uses because of the need to protect repository caps.

Time until Removal Action Objectives Are Achieved

All action alternatives could be completed in approximately 6 to 7 months, depending on schedule-limiting factors such as truck availability, monsoon rains, and snowfall.

5.2.1.4 Long-Term Effectiveness and Permanence (after Removal Action)

For all action alternatives, waste removal or containment from source areas would reduce the magnitude of residual risk to background levels for radionuclides. Noncancer hazards would be removed, and risk to ecological receptors would be reduced to levels below known effects concentrations and background levels. None of the alternatives reduce the toxicity, mobility, or volume through treatment.

Alternatives 4 and 5 are rated **Very Good** as sources of risk at the CTS Group would be removed and disposed of off the Navajo Nation. However, the off-Navajo Nation milling process increases the toxicity of the waste at the tailings disposal facility. The cap and liner at the tailings disposal facility would eliminate exposure pathways. Alternatives 4 and 5 would also allow for unrestricted future use of the site. Removing waste from the Navajo Nation eliminates the long-term surveillance requirements and long-term environmental footprints associated with the repositories under Alternatives 2 and 3. Neither Alternative 4 nor Alternative 5 would require long-term site inspections or repairs with the associated increased possibility of traffic accidents compared to Alternatives 2 and 3.

Alternatives 2 and 3 would consolidate all waste in a repository. Permanence of risk reduction would rely on the repository design standards to minimize long-term maintenance, but long-term surveillance of the repositories would still be required. Alternatives 2 and 3 are rated **Average** and **Good** because the repositories with the waste contained above ground will reduce potential infiltration from the sides. Alternative 2 is average due to the added complexity of maintaining multiple on-mesa repositories relative to Alternative 3 where only one repository would require maintenance.

Although the on-mesa and regional repositories (Alternatives 2 and 3) are expected to be fully protective in both the short and long term, the ET cap will require a long-term maintenance and

monitoring commitment. Replacement of repository components would not be required because their lifespan is indefinite, especially under a monitoring and maintenance regime. Over the long term, additional accidents and fatalities could also result from site inspections and repairs during long-term O&M of the on-mesa and regional repository caps. Alternatives 2 and 3 would have large energy and greenhouse gas footprints because of the high fuel consumption and emissions over the 1,000-year O&M duration. Alternative 3 would have an estimated 2.3 in 10 risk of an additional accident and 7.1 in 1,000 risk of an additional fatality for the 480,000 miles traveled over 1,000 years from on-highway traffic accidents, when compared to Alternative 2.

Alternative 1 is rated **Very Poor** because no removal action would be performed. Human health risk may be partially reduced through increased awareness of risks, but no reduction in risk to the ecosystem would occur. Uncontrolled and untreated waste would remain and continue to be accessible by humans and animals and subject to potential migration to uncontaminated or less contaminated areas.

5.2.2 Implementability

Implementability comprises two criteria: technical feasibility and availability of services and materials, and administrative feasibility. Overall implementability is rated **Very Good** for Alternative 1, **Very Good** for Alternative 2, **Good** for Alternative 3, **Average** for Alternative 4, and **Poor** for Alternative 5. Individual criteria and ratings contributing to the overall ratings are discussed below.

5.2.2.1 Technical Feasibility and Availability of Services and Materials

Action alternatives consist mainly of simple earthwork and material hauling. The alternatives are technically feasible with labor available through the local and regional market and equipment and materials located 1.5 to 2 hours away.

The action alternatives would be completed as a single phase, and no future remedial actions are anticipated. Short-term monitoring of site restoration features will occur under all action alternatives while long-term monitoring and maintenance (particularly the inspection and repair of erosional features, controls, and revegetation) would be required for on-mesa and regional repositories. Experienced contractors, construction equipment, and materials are available.

Among the action alternatives, Alternatives 4 and 5 are technically feasible to implement as all waste is removed from the CTS Group; however, milling and disposal is more technically complex than disposal in a hazardous waste disposal facility. The exclusive reliance on the operational capacity of the White Mesa Mill also brings uncertainty to the availability of services at the time of the removal action. No other mill facilities are in operation in the region. The availability of trucking resources will limit the amount of waste that can be transported off site. Therefore, Alternative 4 is rated **Average** while Alternative 5 is rated **Poor**.

Alternatives 2 and 3 are rated **Very Good** and **Good** respectively. Both alternatives are technically feasible as waste is consolidated in an on-mesa or regional repository. Design methods, construction practices, and engineering requirements are well documented and understood. Because all waste under the Alternatives 2 and 3 would be disposed of on the Navajo Nation, no reliance on the treatment, storage, or disposal capacity of contracted services

would be required. Alternative 2 would require less hauling and less complex construction than Alternative 3, but a regional repository would consolidate O&M activities in comparison to multiple onsite actions.

Alternative 1 is readily implementable with no construction is involved and is rated **Very Good**. Alternative 1 would not impact the ability to conduct removal or remedial actions in the future. No services or materials would be needed because no removal action would be performed.

5.2.2.2 Administrative Feasibility

Administratively, Alternatives 4 and 5 are rated **Good** as they require the least amount of design, permitting, and approvals from and coordination with agencies as no on-mesa or on-Navajo Nation regional repository would be involved. Post-remedy inspections, reviews, and land use controls would be limited in comparison to alternatives that involve constructed repositories. However, limitations and delays on waste acceptance at off-Navajo Nation facilities are possible because of the volume of waste or disposal facility permit limitations.

Alternative 2 is rated **Very Good** as less design, permitting, approvals, and coordination with agencies is required for a smaller on-mesa cap construction in comparison to Alternative 3, less O&M activities are required for a smaller volume of waste and footprint, and fewer potential challenges with future removal actions are expected than with a larger regional repository. The on-mesa repository under Alternative 2 is located away from the community whereas the regional repository under Alternative 3 is located closer to and waste must pass through the community. Alternative 3 would also involve waste haulage from other mine sites, requiring approval and coordination that would not be required under Alternative 2. For these reasons, Alternative 3 is rated **Average**.

Alternative 1 is rated **Very Good** as taking no action is always feasible. However, future removal or remedial actions could still occur under CERCLA or through other actions by the Navajo Nation or Tronox.

5.2.2.3 Tribal and Supporting Agency Acceptance

Acceptance by the Navajo Nation and supporting agencies is an additional criterion that will be addressed in the final EE/CA report and action memorandum after stakeholder comments have been received on this AAM.

5.2.2.4 Community Acceptance

Acceptance by the Cove and Red Valley Chapter communities is an additional criterion that will be addressed in the final EE/CA report and action memorandum after public comments have been received on this AAM.

5.2.3 Projected Costs

A summary of the cost for each alternative is presented below. Alternative costs are presented as a rating (comparing each alternative to the others) and as the total estimated cost based on 2021 price evaluations for each alternative.

Alternative	Cost Rating	Total Estimated Cost (2021 million dollars)
1	Very Good	$0
2	Good	$13.2 M
3	Good	$11 M
4	Poor	$14.8 M
5	Very Poor	$24.4 M

Note:
Higher cost alternatives rate lower in cost ratings, which is consistent with the rating scheme where low = less desirable.

Present values, including O&M costs, for each action alternative using a baseline 10-year project duration for site restoration and 1,000-year (required under UMTRCA 40 CFR § 192[d] Part A) project duration for consolidation and capping at an on-mesa or regional repository (Alternatives 2 and 3, respectively) at a 3.5 percent discount rate (30-year rolling average) (Office of Management and Budget 2020) are summarized below.

Alternative	Capital Cost	Yearly Site O&M Cost (10 years)	Present Value (10 years) 3.5% discount rate	Yearly Cap O&M Cost (1,000 years)	Present Value (1,000 years) 3.5% discount rate
1	$0	$0	$0	$0	$0
2	$11,423,403	$86,604	Not Applicable	$33,510	$13,168,029
3	$9,524,966	$86,604	Not Applicable	$20,969	$11,039,560
4	$14,041,198	$86,604	$14,761,394	Not Applicable	Not Applicable
5	$23,644,247	$86,604	$24,364,443	Not Applicable	Not Applicable

Note:
O&M Operation and maintenance

Alternative 1 is the least expensive because no construction and O&M costs are incurred and is rated **Very Good**. The total present values of Alternatives 2 and 3 are based on a volumetric share of the overall net present value for the on-mesa and regional repositories, respectively. Alternative 2 ($13.2 million) and Alternative 3 ($11 million) are similar. Alternative 4 has a net present value of 14.8 million that is 12 percent greater than Alternative 2 and 35 percent greater than Alternative 3. Alternative 4 has a greater cost because of a longer hauling distance at 272 miles round trip. Alternative 5 has a net present value of 24.4 million that is approximately 85 percent greater than Alternative 2, 122 percent greater than Alternative 3, and 65 percent greater than Alternative 4. Alternative 5 has a high capital cost because of the longest hauling distance at 1,118 miles round trip.

O&M costs include maintenance of site restoration, trunk road maintenance, and repository maintenance. Alternative 2 has the highest costs because there is an increased need for trunk road maintenance to reach the repository on Mesa V. Alternative 3 has the lowest costs due to the shared costs for trunk road as well as the shared costs for repository maintenance. Alternative 2 and 3 also include the present value of repository maintenance for 1,000 years. Alternatives 4 and 5 include costs for site restoration and shared trunk road maintenance. Therefore, Alternatives 2 and 3 are rated **Good**, Alternative 4 is rated **Poor**, and Alternative 5 is rated **Very Poor**.

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FIGURES

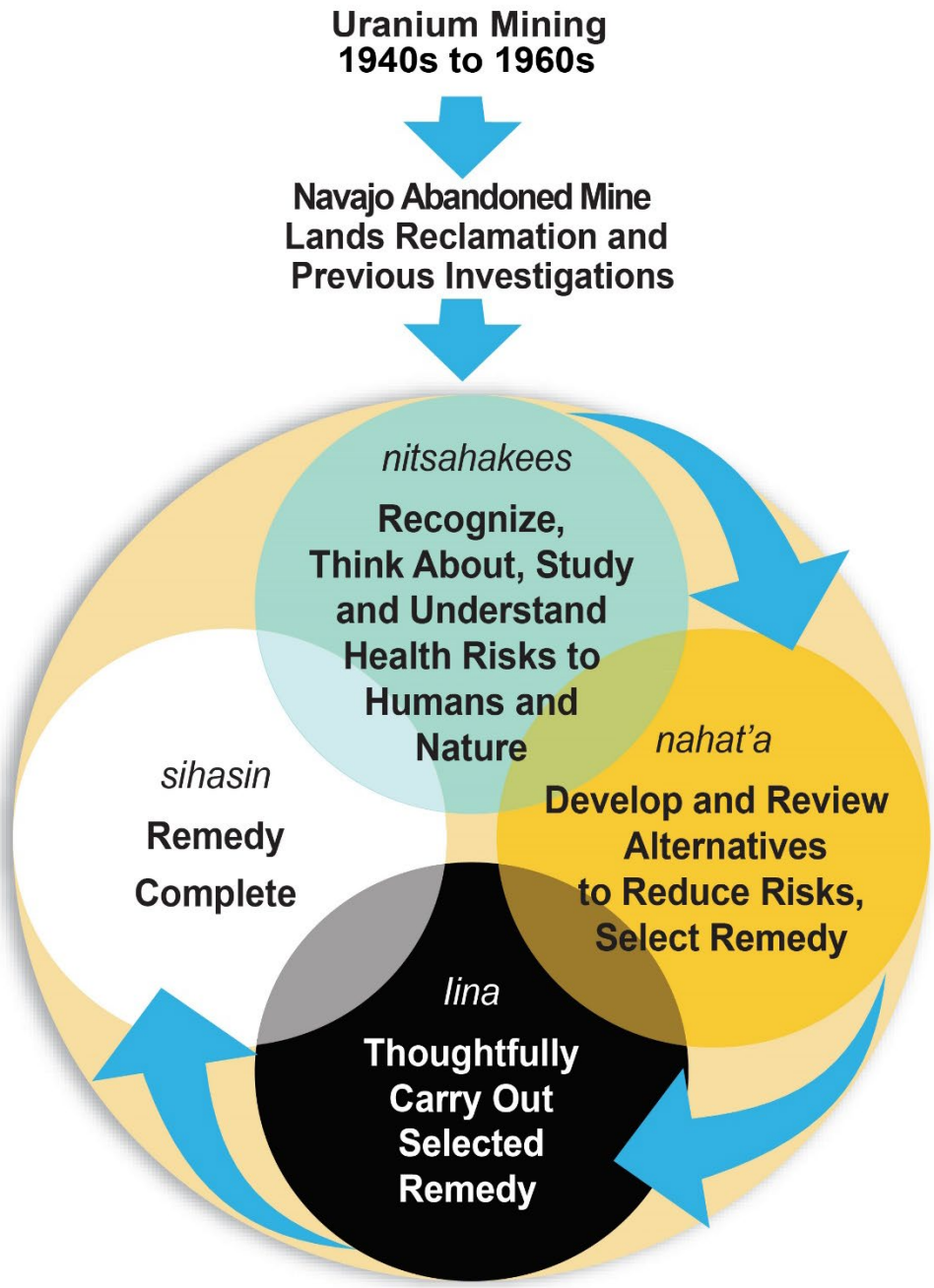
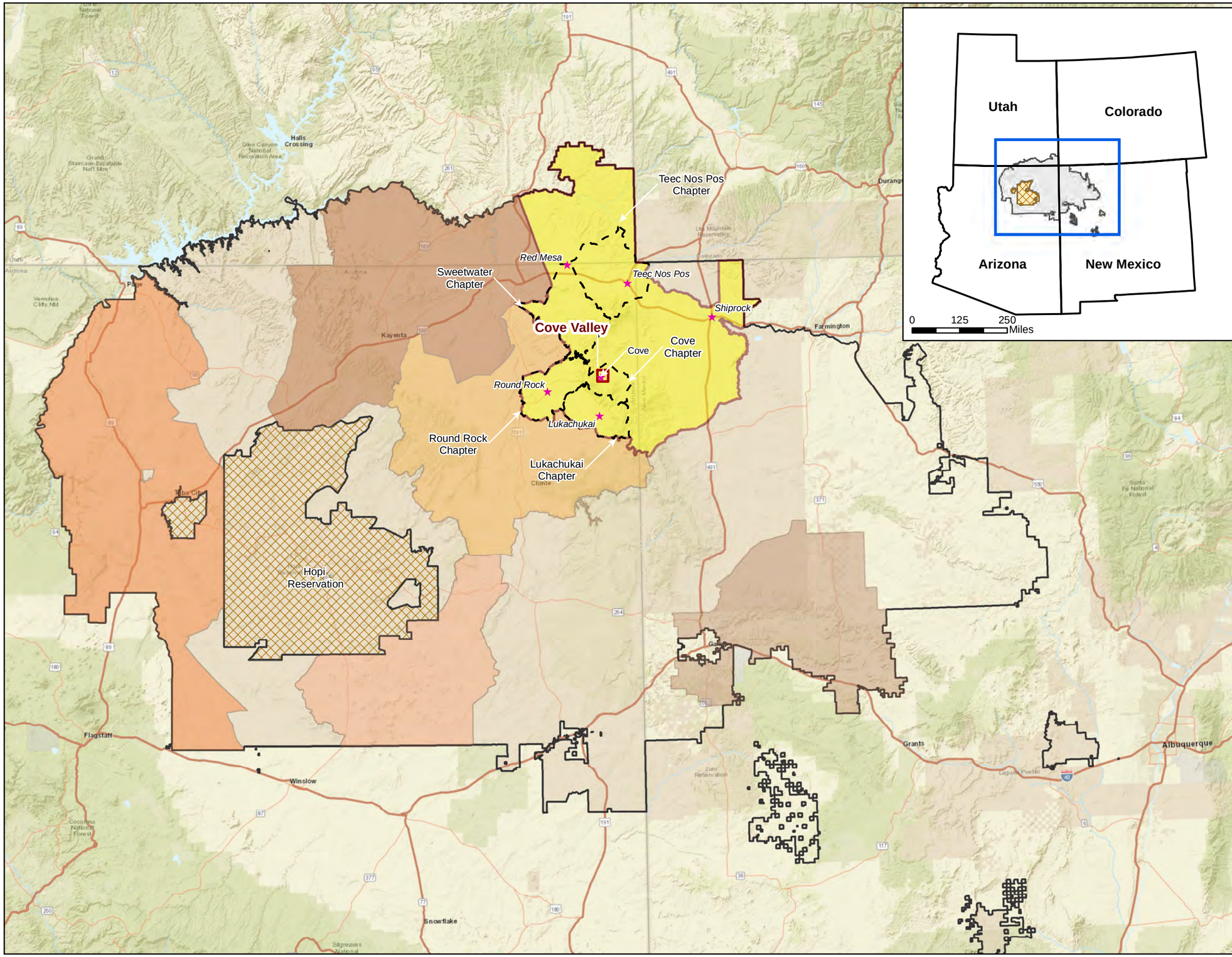


Figure 1. Navajo EE/CA Decision Process



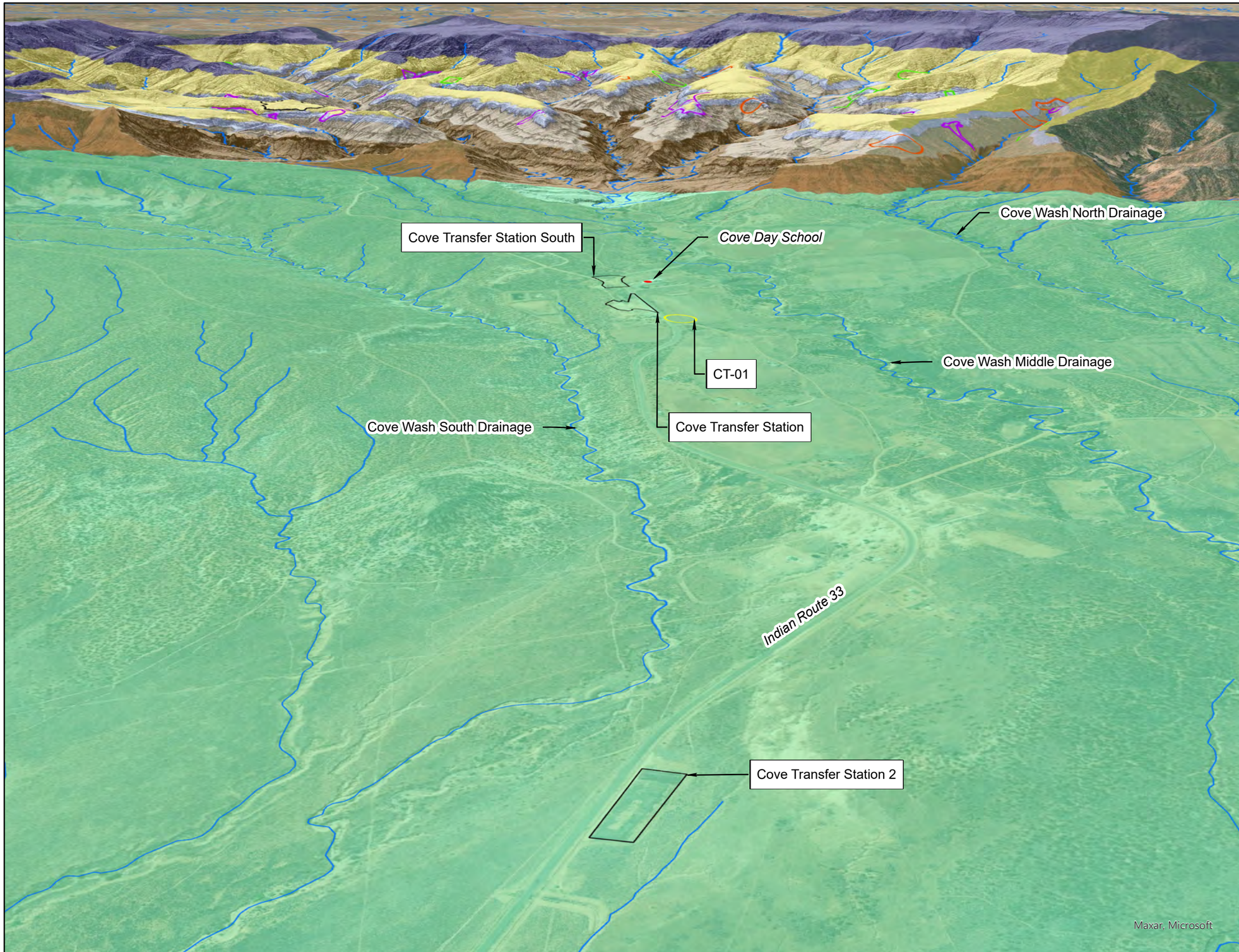
REGIONAL LOCATION

Prepared For: U.S. EPA Region 9

Prepared By:

TETRA TECH
1999 Harrison Street, Suite 500
Oakland, CA 94612

Task Order No.:	Contract No.:
0016	EP-S9-17-03
Location: NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 UTM Zone 12N Transverse Mercator	Figure No.: 2



AUM Site Boundaries

- Tronox AUM-Related[1]
- Tronox[1]
- Cyprus Amax[2]
- Other[2]
- Non-AUM Target
- Cove Day School
- Drainage

Geologic Units

- Chinle Formation - Trc
- Wingate Sandstone - Trw
- San Rafael Group - Jsr
- Salt Wash Member - Jms
- Recapture Member - Jmr
- Chuska Sandstone - Tc

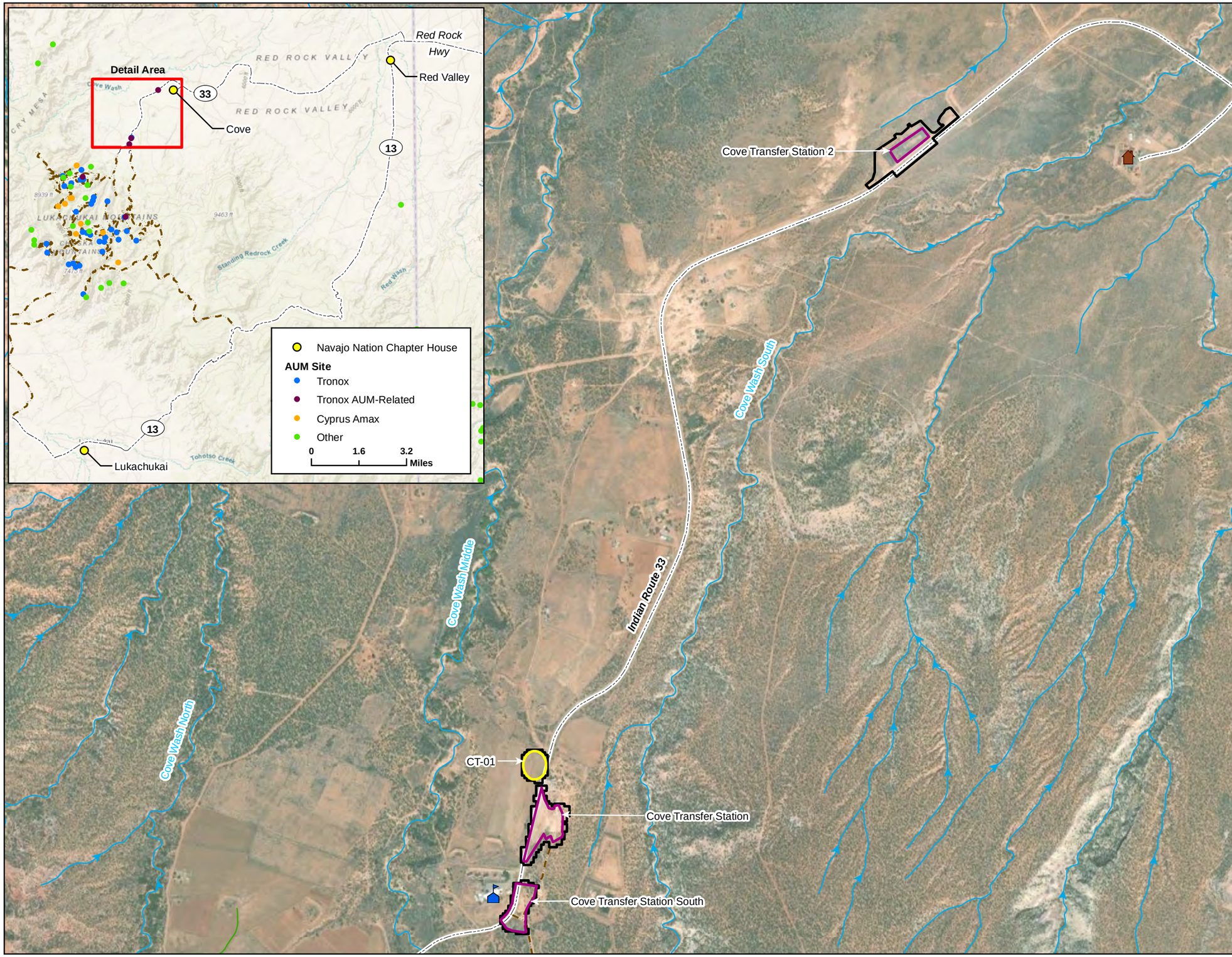
Notes:
[1]Boundary is from Neptune and TSG (2018).
[2]Boundary is from TSG (2007).

AUM	Abandoned uranium mine
Neptune	Neptune and Company, Inc.
TSG	TerraSpectra Geomatics

N

COVE TRANSFER STATIONS GROUP LOCATION

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane New Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 3



Cove Day School
Cove Chapter House
AUM-Related Site
Non-AUM Target Site
RSE Survey Area
Paved Route
Unpaved Route
Drainage
Irrigation Canal

Notes:
AUM Abandoned uranium mine
RSE Removal site evaluations

1 inch = 1,220 feet

1:14,640

1,220 610 0 1,220 Feet

N W E S

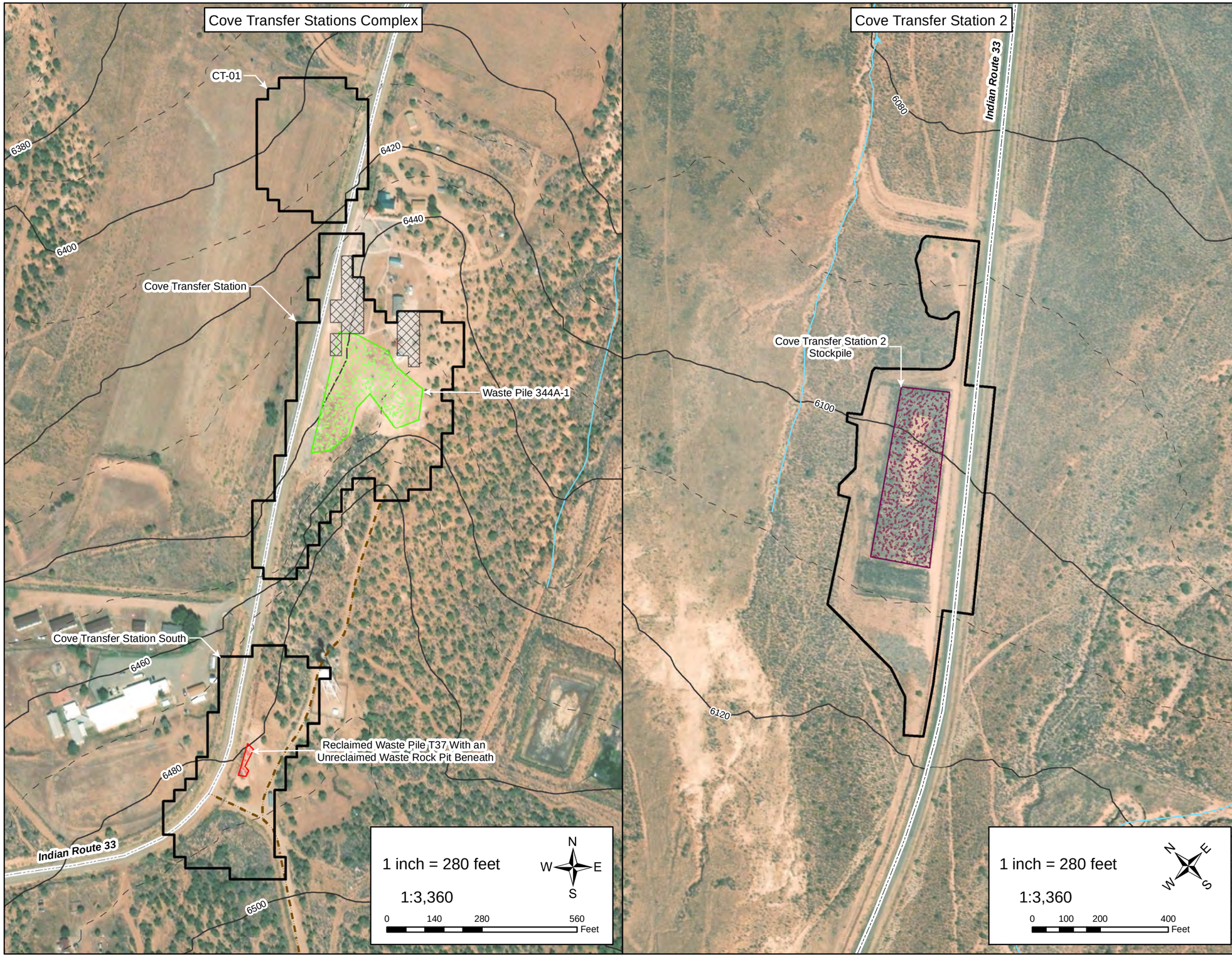
COVE TRANSFER STATIONS GROUP ACCESS

Prepared For: U.S. EPA Region 9

Prepared By:

TETRA TECH
1999 Harrison Street, Suite 500
Oakland, CA 94612

Task Order No.:	Contract No.:
0016	EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 4



RSE Survey Area

Site Features

- Cultural Exclusion Area
- Waste Pile - Reclaimed
- Stockpile - Unreclaimed
- Cove Transfer Station South Waste Rock Pit *Reclaimed Waste Pile T37*
- 20-Foot Contour
- 10-Foot Contour
- Paved Route
- Unpaved Route
- Drainage

Note:
RSE Removal site evaluation

COVE TRANSFER STATIONS GROUP
SITE FEATURES

Prepared For: U.S. EPA Region 9

Prepared By:
TETRA TECH
1999 Harrison Street, Suite 500
Oakland, CA 94612

Task Order No.:	Contract No.:
0016	EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/30/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 5

100-Foot Contour
20-Foot Contour
Drainage
Irrigation Canal
AUM-Related Site
Non-AUM Target Site
RSE Survey Area
Cove Day School
Cove Chapter House
Paved Route
Unpaved Route

Notes:
AUM Abandoned uranium mine
RSE Removal site evaluation

1 inch = 1,220 feet

1:14,640

N
W E
S

1,220 610 0 1,220 Feet

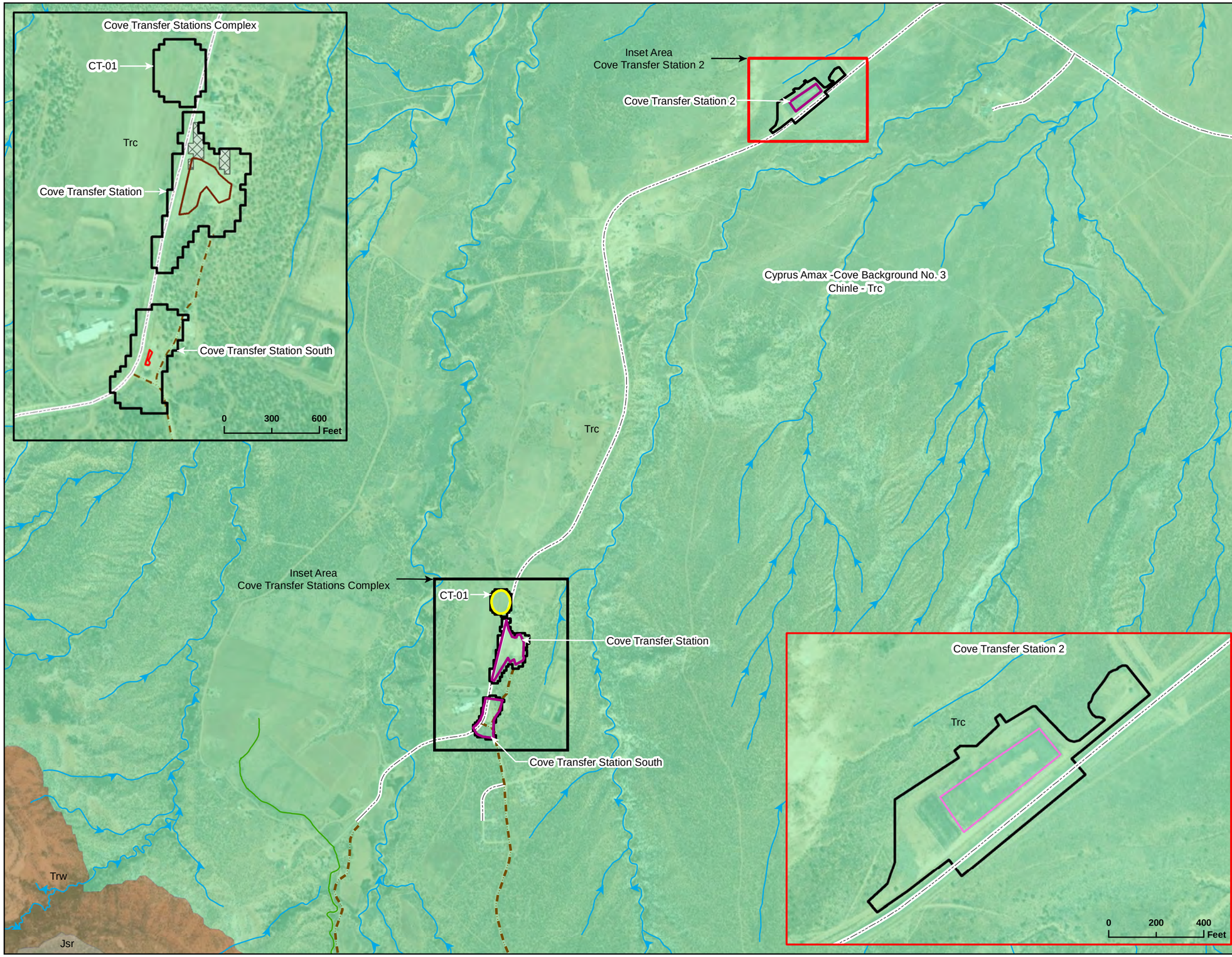
COVE TRANSFER STATIONS GROUP TOPOGRAPHY AND HYDROLOGY

Prepared For: U.S. EPA Region 9

Prepared By:

TETRA TECH
1999 Harrison Street, Suite 500
Oakland, CA 94612

Task Order No.:	Contract No.:
0016	EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 6



Geologic Units

- Chinle Formation - Trc
- Wingate Sandstone - Trw
- San Rafael Group - Jsr

Cove Transfer Stations Group Features

- AUM-Related Site
- RSE Survey Area

Site Features

- Waste Pile - Reclaimed
- Stockpile - Unreclaimed
- Cove Transfer Station South Waste Rock Pit *Reclaimed Waste Pile T37*
- Paved Route
- Unpaved Route
- Drainage
- Irrigation Canal

Notes:
AUM Abandoned uranium mine
RSE Removal site evaluation

1 inch = 1,500 feet

1:18,000

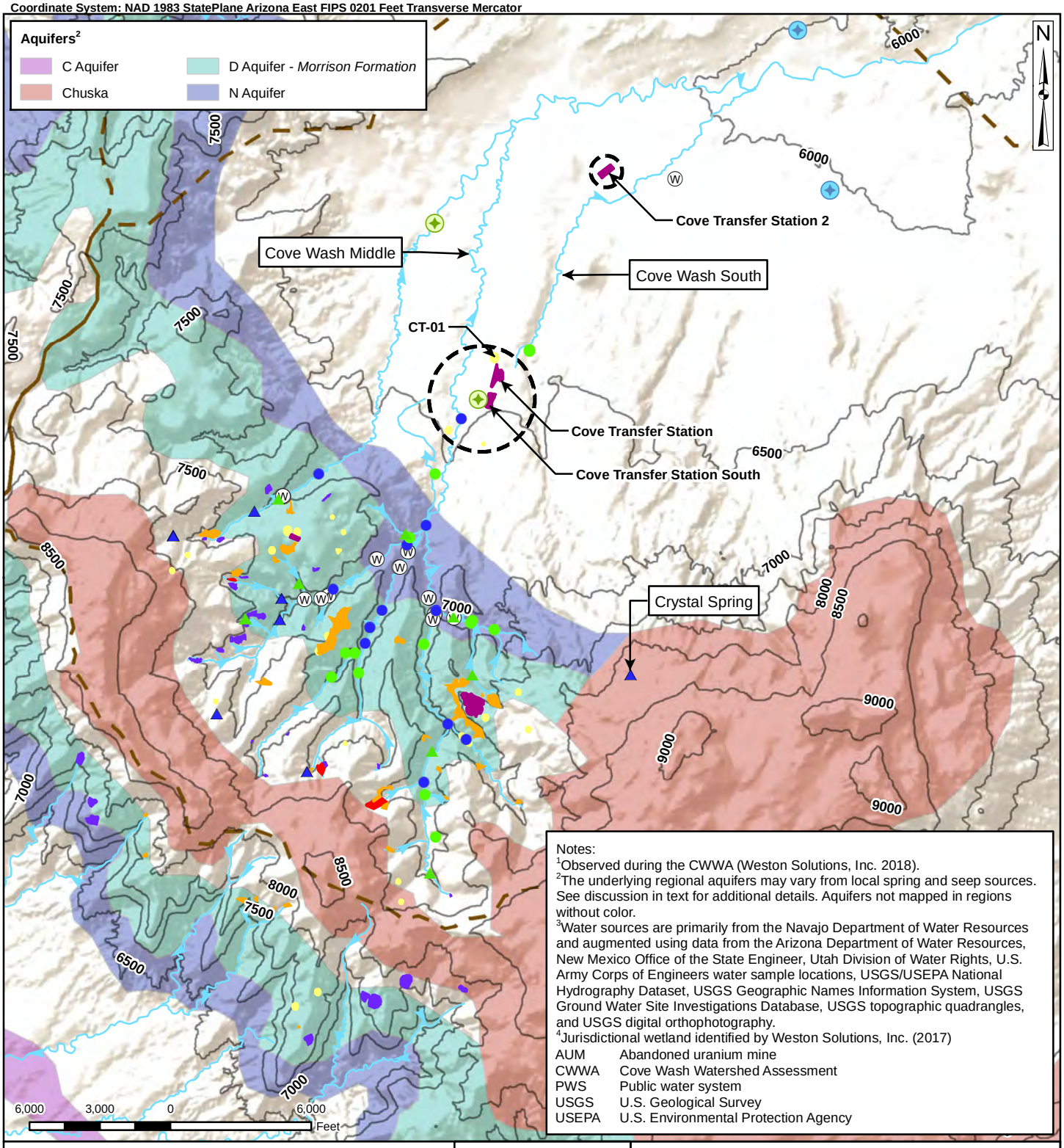
0 750 1,500 3,000 Feet

N W E S

COVE TRANSFER STATIONS GROUP GEOLOGY

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 7

Coordinate System: NAD 1983 StatePlane Arizona East FIPS 0201 Feet Transverse Mercator



Notes:
[1]Observed during the CWWA (Weston Solutions, Inc. 2018).
[2]The underlying regional aquifers may vary from local spring and seep sources. See discussion in text for additional details. Aquifers not mapped in regions without color.
[3]Water sources are primarily from the Navajo Department of Water Resources and augmented using data from the Arizona Department of Water Resources, New Mexico Office of the State Engineer, Utah Division of Water Rights, U.S. Army Corps of Engineers water sample locations, USGS/USEPA National Hydrography Dataset, USGS Geographic Names Information System, USGS Ground Water Site Investigations Database, USGS topographic quadrangles, and USGS digital orthophotography.
[4]Jurisdictional wetland identified by Weston Solutions, Inc. (2017)

AUM	Abandoned uranium mine
CWWA	Cove Wash Watershed Assessment
PWS	Public water system
USGS	U.S. Geological Survey
USEPA	U.S. Environmental Protection Agency

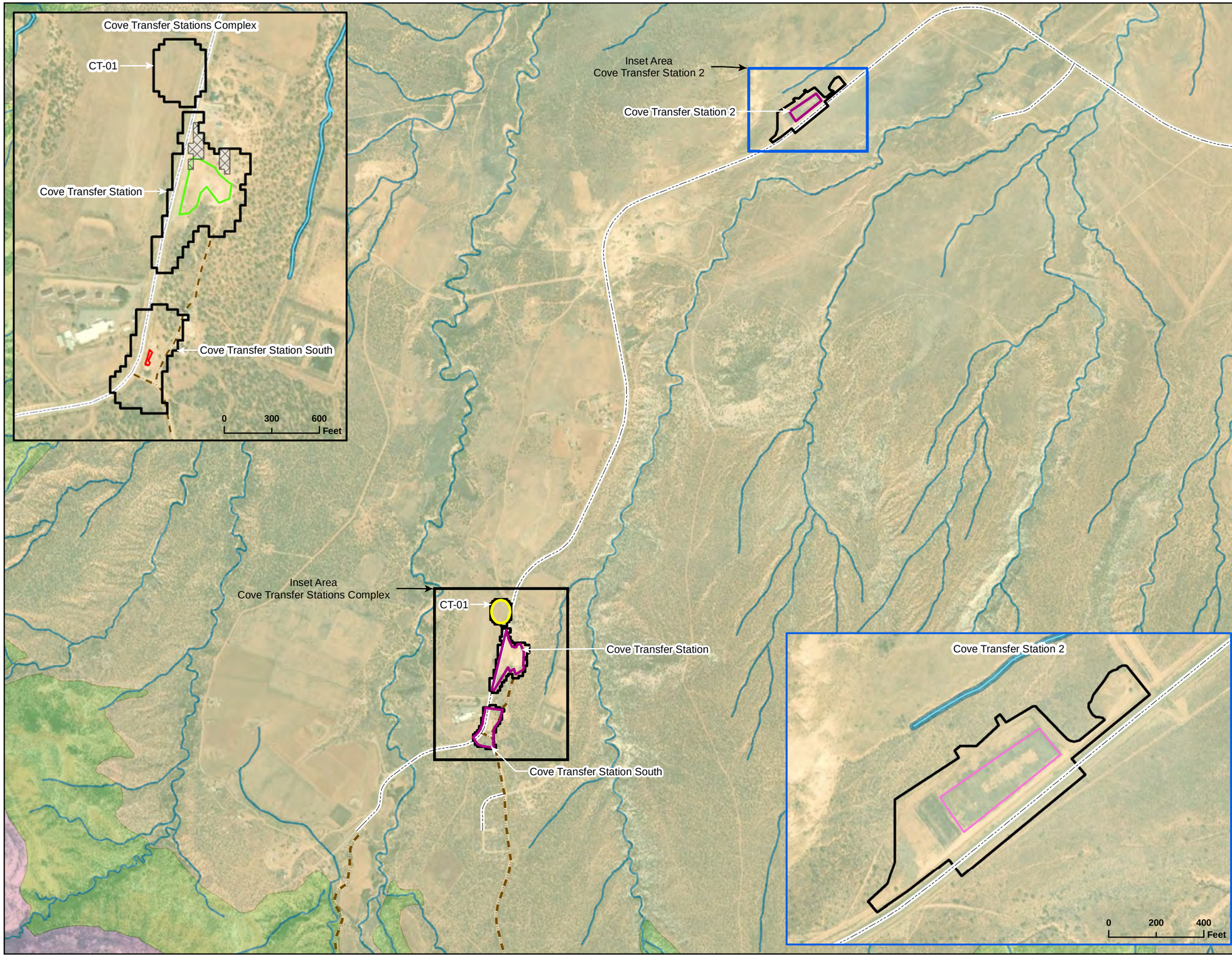
- Tronox AUM Site *Dry Mine*
- Tronox AUM Site *Wet Mine*[1]
- AUM-Related Area
- Non-AUM Target
- Non-Tronox AUM Site
- Cove Transfer Stations Group AUM Site Area
- Navajo Nation Chapter Boundary
- CWWA Surface Water *Perennial*
- CWWA Seep or Spring *Perennial*
- CWWA Surface Water *Non-perennial*
- CWWA Seep or Spring *Non-perennial*
- PWS Well Location[3] *Confined Aquifer*
- Non-PWS Well Location[3] *Confined Aquifer*
- Wetland[4]
- Intermittent Stream
- Contour Surface (500 Foot)

Prepared for: U.S. EPA Region 9

Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612

REGIONAL AQUIFERS, SURFACE WATER, AND WELLS

Task Order No.:	Contract No.:	Figure No.:
0016	EP-S9-17-03	8
Location: NAVAJO NATION	Date: 9/27/2021	



Land Use Types

- Full-Time Residential
- Easy Access Open Space Use
- Difficult Access Open Space Use
- Washes and Drainages

Cove Transfer Stations Group Features

- AUM-Related Site
- RSE Survey Area

Site Features

- Cultural Exclusion Area
- Waste Pile - Reclaimed
- Stockpile - Unreclaimed
- Cove Transfer Station South Waste Rock Pit *Reclaimed Waste Pile T37*
- Paved Route
- Unpaved Route
- Drainage

Notes:

AUM Abandoned uranium mine

RSE Removal site evaluation

1 inch = 1,500 feet

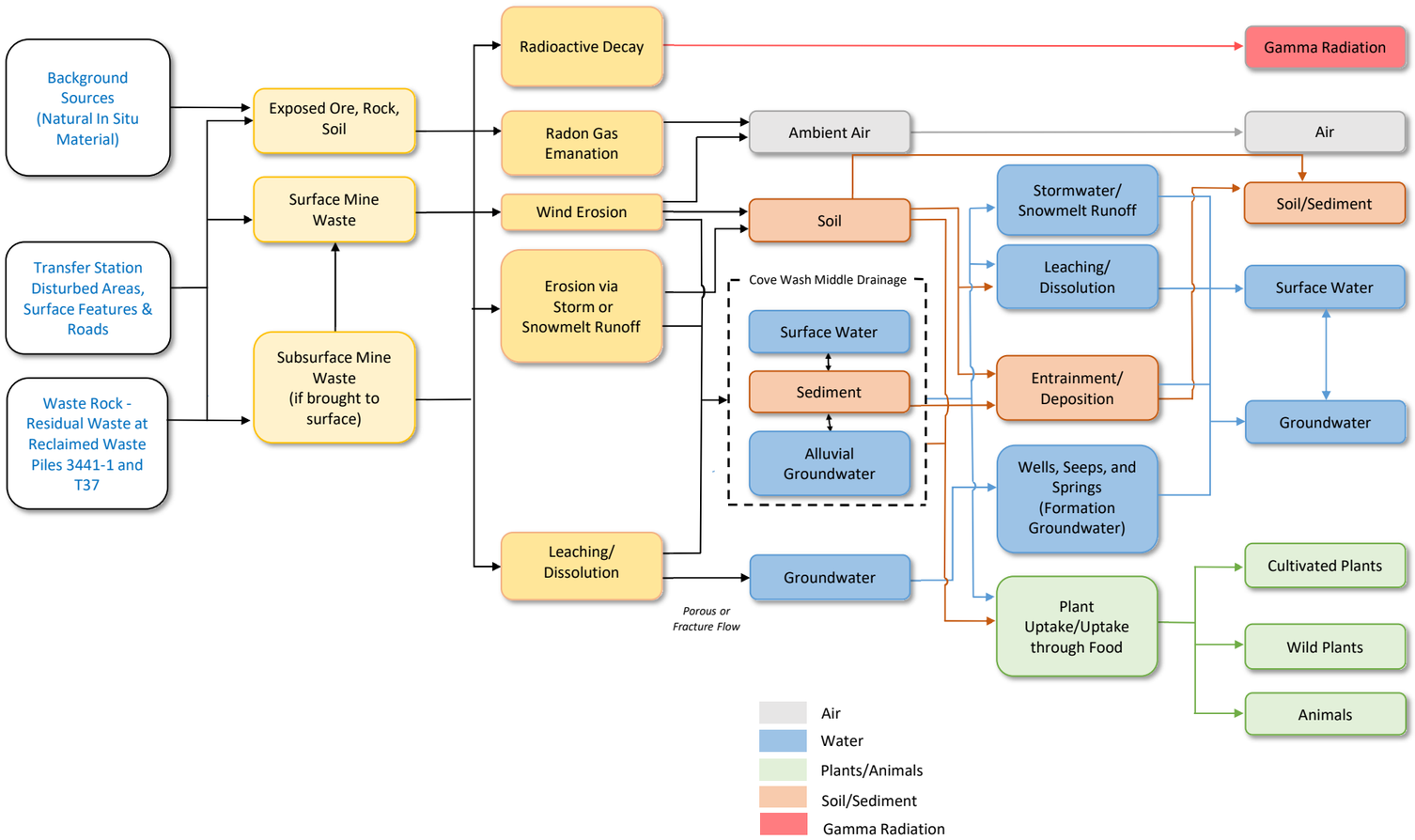
1:18,000

N W E S

0 750 1,500 3,000 Feet

COVE TRANSFER STATIONS GROUP
PROPOSED FUTURE LAND USE
AND CULTURAL RESOURCES

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 9



APPLICABLE HUMAN EXPOSURE SCENARIOS		ECOLOGICAL EXPOSURE SCENARIOS		
EXPOSURE ROUTES	Kee'da'whíí téeh (Full-Time Navajo Resident)	EXPOSURE ROUTES	Plants and Invertebrates	Birds and Mammals
External Exposure	X	External Exposure	X [5]	X [5]
Inhalation	X	Inhalation	X [6]	X [6]
Incidental Ingestion Dermal Inhalation	X	Dermal/Direct Contact Ingestion Trophic Transfer	X	X
Ingestion Dermal Inhalation	-- [1]	Dermal/Direct Contact Ingestion Trophic Transfer	X [7]	X [7]
Ingestion Dermal Inhalation	-- [1]			
Ingestion	X [2]			
Ingestion Dermal Inhalation	X [3]	Ingestion	--	X
Ingestion	X [4]	Ingestion Trophic Transfer	--	X

Notes:

Conceptual site model wire diagram was adapted from Neptune and Company, Inc. and TerraSpectra Geomatics. 2018. "Final Preliminary Conceptual Site Model." Cove Chapter Abandoned Uranium Mines Conceptual Site Model Development, Navajo Nation, Cove Chapter, Apache County, Arizona. July.

X Indicates the exposure pathway is potentially complete and evaluated in the risk assessment, except as noted.

-- Indicates the exposure pathway is not complete or *de minimus* and is not evaluated in the risk assessment

[1] The human health risk evaluation does not include ingestion of surface water or groundwater by humans or animals.

[2] The human health risk evaluation includes ingestion of select cultivated plants (crops) by this receptor. Scenario inputs provided by Navajo Nation Environmental Protection Agency.

[3] The human health risk evaluation includes ingestion, dermal (metals only), and inhalation of select wild (cultivated plants (crops) by this receptor. Scenario inputs provided by Navajo Nation Environmental Protection Agency.

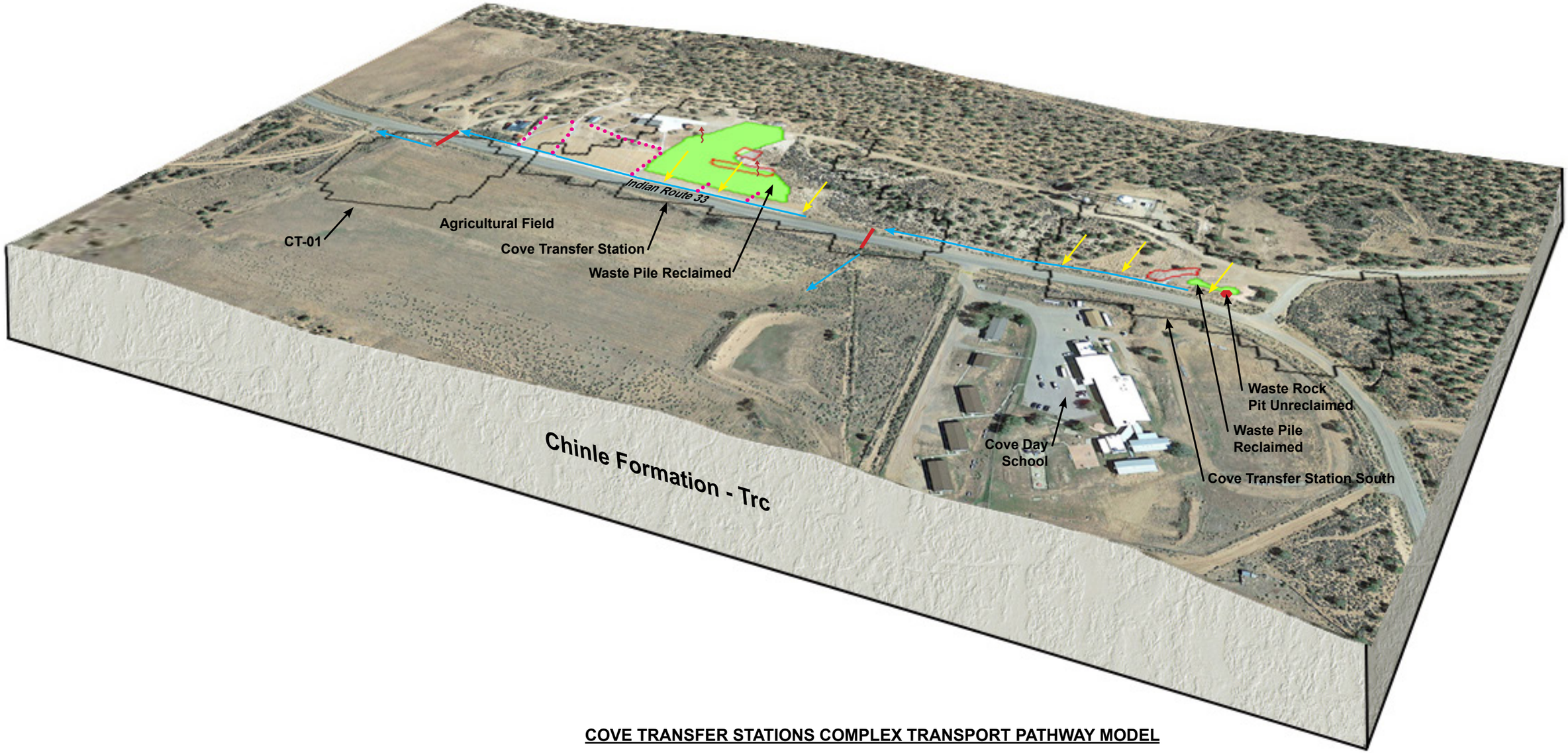
[4] The human health risk evaluation includes ingestion of home-raised animals (meat, milk, and eggs) and hunted animals (meat only) for this receptor. Scenario inputs provided by Navajo Nation Environmental Protection Agency.

[5] The ecological risk evaluation does not include evaluation of external exposure to gamma radiation.

[6] Potential exposures include inhalation of ambient air and air in burrows and underground mines. The ecological risk evaluation does not include evaluation of the inhalation pathway.

[7] The ecological risk evaluation does not include evaluation of direct contact with or ingestion of surface water.

Figure 10. Cove Transfer Stations Complex Conceptual Site Model Wire Diagram



COVE TRANSFER STATIONS COMPLEX TRANSPORT PATHWAY MODEL

Transport Pathways

- Surface Water Pathways
- Erosion Pathways
- Gamma Radiation

Site Features

- Waste Pile - Reclaimed
- Waste Rock Pit - Unreclaimed
- Cove Transfer Station Complex RSE Survey Area Boundary
- Culvert
- Current Erosional Area
- Current Erosion Control Features

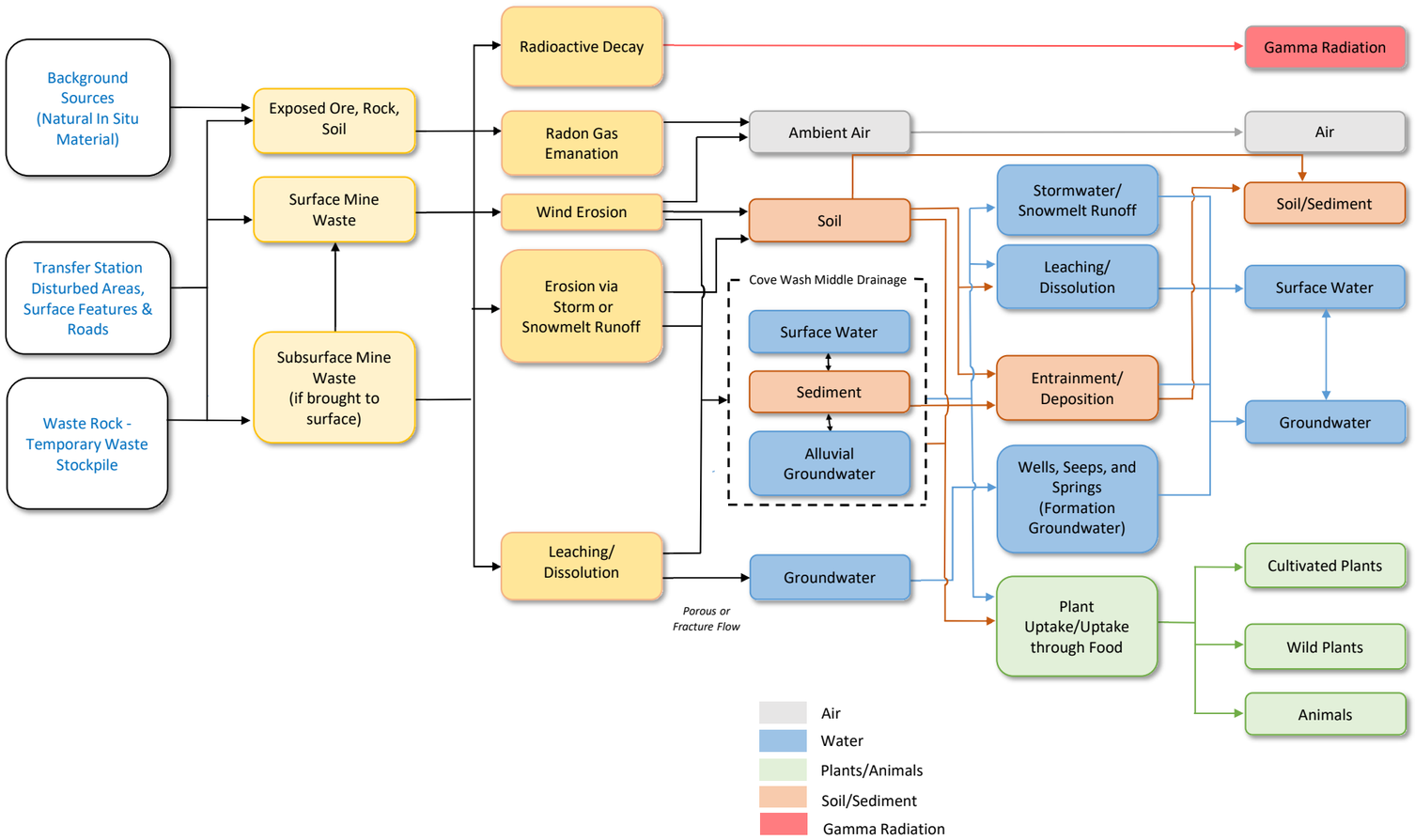
Notes:
RSE Removal site evaluation

Prepared for: U.S. EPA Region 9

Prepared by: TETRA TECH

COVE TRANSFER STATIONS COMPLEX TRANSPORT PATHWAYS

Task Order No.:	Contract No:	Figure No:
0016	EP-S9-17-03	11
Location.: NAVAJO NATION	Date: 9/29/2021	



APPLICABLE HUMAN EXPOSURE SCENARIOS		ECOLOGICAL EXPOSURE SCENARIOS		
EXPOSURE ROUTES	Kee'da'whíí téeh (Full-Time Navajo Resident)	EXPOSURE ROUTES	Plants and Invertebrates	Birds and Mammals
External Exposure	X	External Exposure	X [5]	X [5]
Inhalation	X	Inhalation	X [6]	X [6]
Incidental Ingestion Dermal Inhalation	X	Dermal/Direct Contact Ingestion Trophic Transfer	X	X
Ingestion Dermal Inhalation	-- [1]	Dermal/Direct Contact Ingestion Trophic Transfer	X [7]	X [7]
Ingestion Dermal Inhalation	-- [1]			
Ingestion	X [2]			
Ingestion Dermal Inhalation	X [3]	Ingestion	--	X
Ingestion	X [4]	Ingestion Trophic Transfer	--	X

Notes:

Conceptual site model wire diagram was adapted from Neptune and Company, Inc. and TerraSpectra Geomatics. 2018. "Final Preliminary Conceptual Site Model." Cove Chapter Abandoned Uranium Mines Conceptual Site Model Development, Navajo Nation, Cove Chapter, Apache County, Arizona. July.

X Indicates the exposure pathway is potentially complete and evaluated in the risk assessment, except as noted.

-- Indicates the exposure pathway is not complete or *de minimus* and is not evaluated in the risk assessment

[1] The human health risk evaluation does not include ingestion of surface water or groundwater by humans or animals.

[2] The human health risk evaluation includes ingestion of select cultivated plants (crops) by this receptor. Scenario inputs provided by Navajo Nation Environmental Protection Agency.

[3] The human health risk evaluation includes ingestion, dermal (metals only), and inhalation of select wild (cultivated plants (crops) by this receptor. Scenario inputs provided by Navajo Nation Environmental Protection Agency.

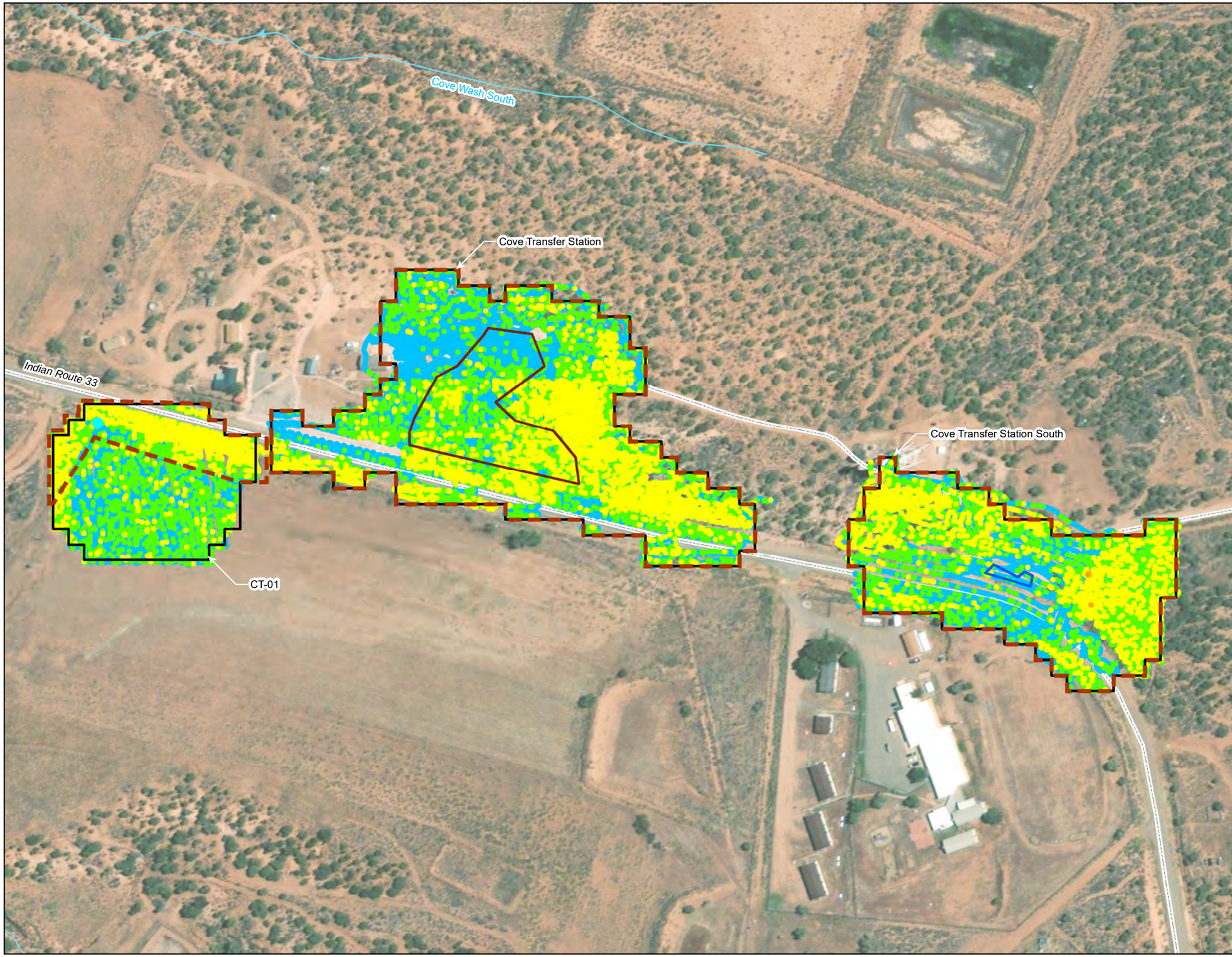
[4] The human health risk evaluation includes ingestion of home-raised animals (meat, milk, and eggs) and hunted animals (meat only) for this receptor. Scenario inputs provided by Navajo Nation Environmental Protection Agency.

[5] The ecological risk evaluation does not include evaluation of external exposure to gamma radiation.

[6] Potential exposures include inhalation of ambient air and air in burrows and underground mines. The ecological risk evaluation does not include evaluation of the inhalation pathway.

[7] The ecological risk evaluation does not include evaluation of direct contact with or ingestion of surface water.

Figure 12. Cove Transfer Station 2 Conceptual Site Model Wire Diagram



Gamma Survey Data (µR/hr)

Chinle Formation - Trc

≤ 14.3	≤ UCL
14.3 - 15.0	UCL - BTV[1]
15.0 - 21.5	BTV - 1.5 x UCL
21.5 - 28.6	1.5 x UCL - 2 x UCL
28.6 - 35.8	2 x UCL - 2.5 x UCL
35.8 - 42.9	2.5 x UCL - 3 x UCL
> 42.9	> 3 x UCL

RSE Survey Area

TENORM Boundary

Waste Pile - Reclaimed

Cove Transfer Station South Waste Rock Pit
Reclaimed Waste Pile T37

Access Route - Vehicular

Drainage

Notes:
[1]BTV is based on the 95 percent upper tolerance limit with 95 percent coverage of the background dataset.

µR/hr	Microroentgen per hour
BTV	Background threshold value
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL	95 percent upper confidence limit on the mean of the background dataset

1 inch = 200 feet

1:2,400

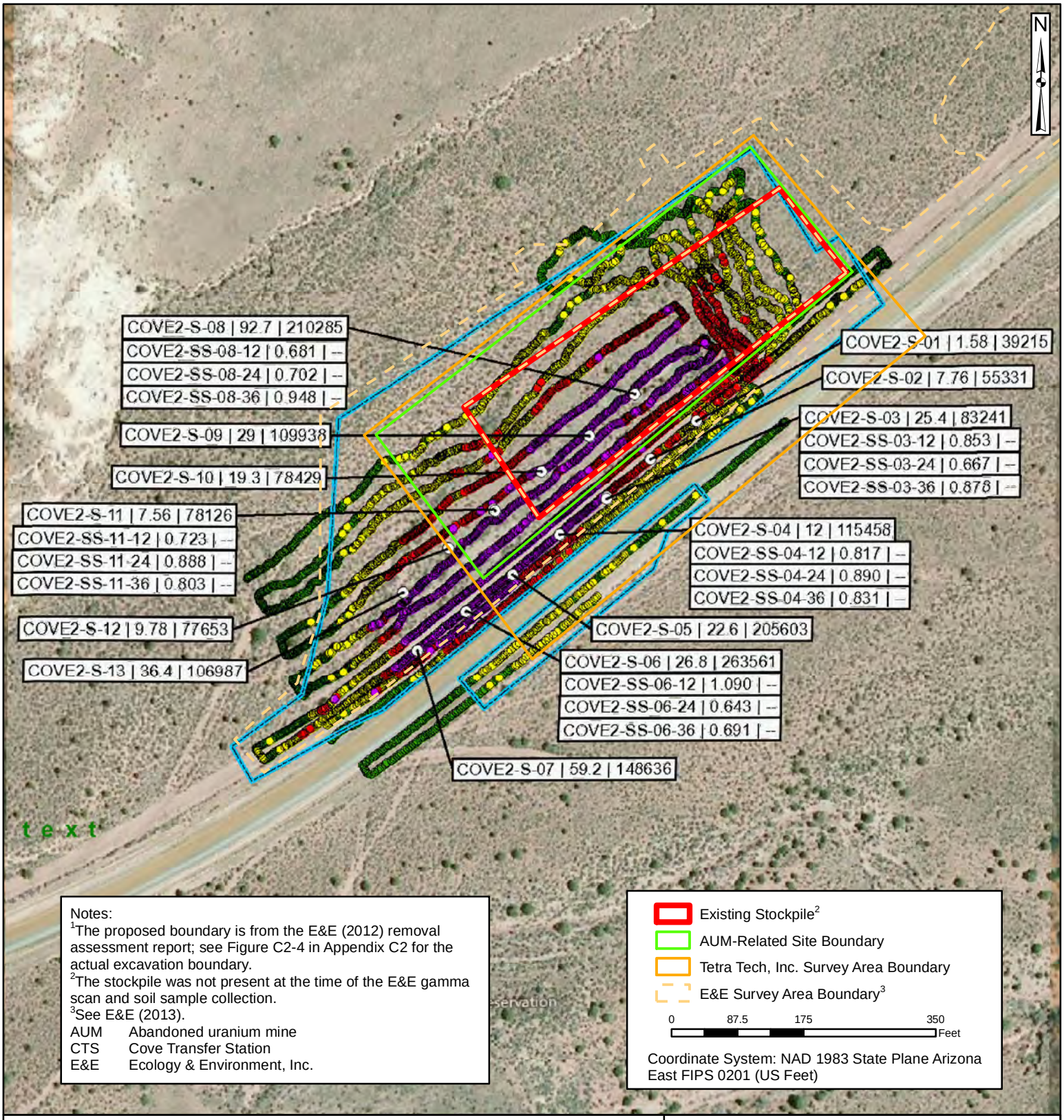
0 100 200 400 Feet

N E S W

COVE TRANSFER STATIONS COMPLEX

GAMMA RADIATION SURVEY

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 13



Notes:
[1]The proposed boundary is from the E&E (2012) removal assessment report; see Figure C2-4 in Appendix C2 for the actual excavation boundary.
[2]The stockpile was not present at the time of the E&E gamma scan and soil sample collection.
[3]See E&E (2013).
AUM Abandoned uranium mine
CTS Cove Transfer Station
E&E Ecology & Environment, Inc.

LEGEND

Proposed excavation boundary[1]

Ra-226 soil sample location

Gamma Activity (cpm)

- 0 - 36,043
- 36,044 - 46,907
- 46,908 - 79,499
- >79,500

ABBREVIATIONS

cpm	counts per minute
pCi/g	picocuries per gram
Ra-226	Radium-226

Gamma Activity (cpm)	Correlated Ra-226 Concentration (pCi/g)
0 - 36,043	0 - 2.0
36,044 - 46,907	2.1 - 4.0
46,908 - 79,499	4.1 - 10.0
>79,500	>10.1

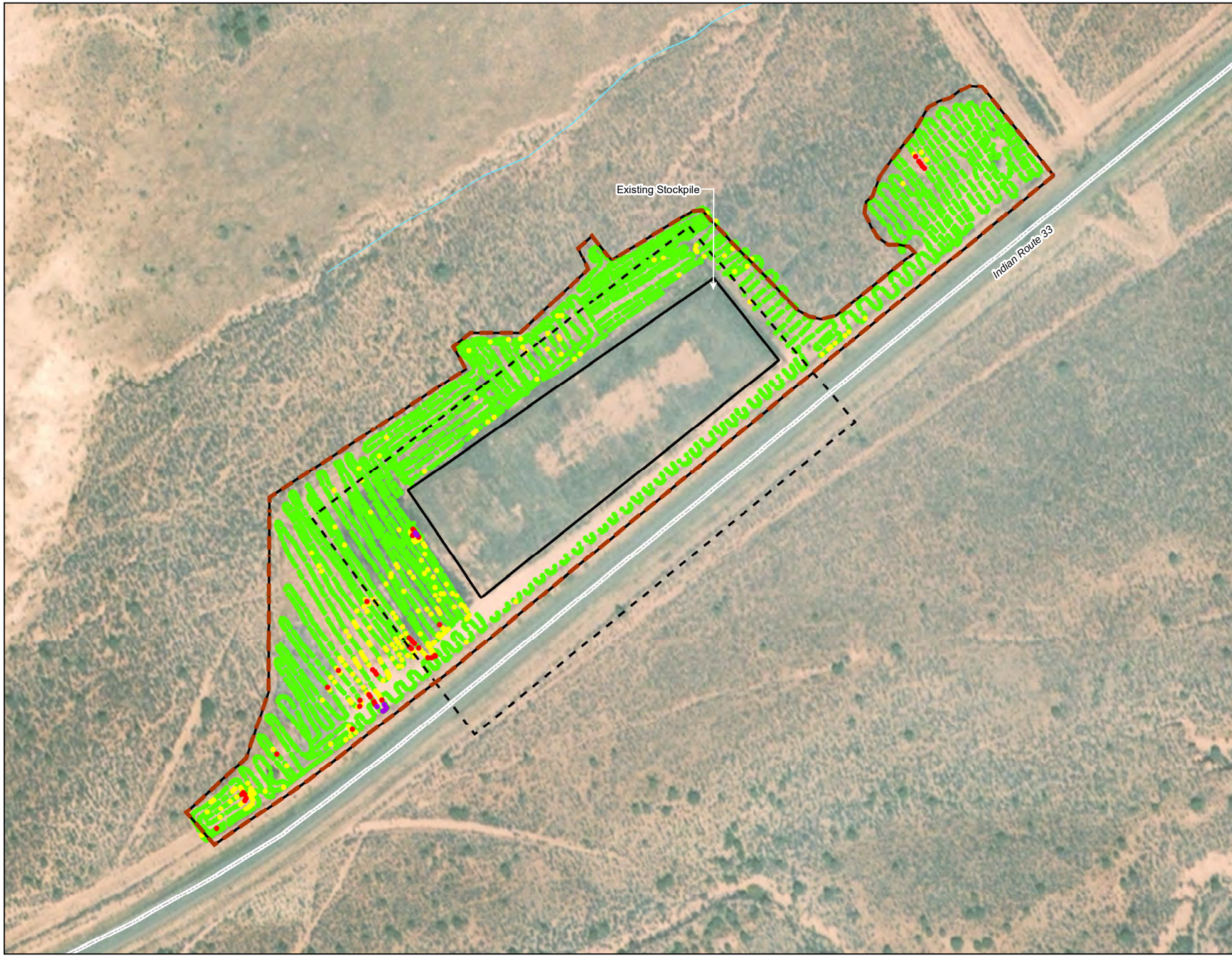
Depth	Sample ID	Ra - 226 (pCi/g)	One Minute Gamma Activity Count (cpm)
Surface	COVE2-S-08	92.7	210,285
Subsurface	COVE2-SS-08-24	0.702	

COVE TRANSFER STATION 2

E&E SURFACE GAMMA ACTIVITY AND RADIUM-226 SOIL SAMPLE LOCATIONS

Adapted from E&E 2012.

Task Order No.:	Prepared for:	Prepared by:	Date:
0016	USEPA Region 9	TETRA TECH	9/27/2021
Contract No.: EP-S9-17-03			Figure No.: 14



Gamma Reading (cpm)[1]

- ≤ 36,043
- 36,043 - 46,907
- 46,907 - 79,499
- > 79,499
- Tetra Tech, Inc. RSE Survey Area
- E&E Survey Area[2]
- TENORM Boundary
- Access Route - Vehicular
- Drainage

Note:
[1]See E&E (2013).

cpm	Counts per minute
CTS	Cove Transfer Station
E&E	Ecology & Environment, Inc.
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material

1 inch = 130 feet

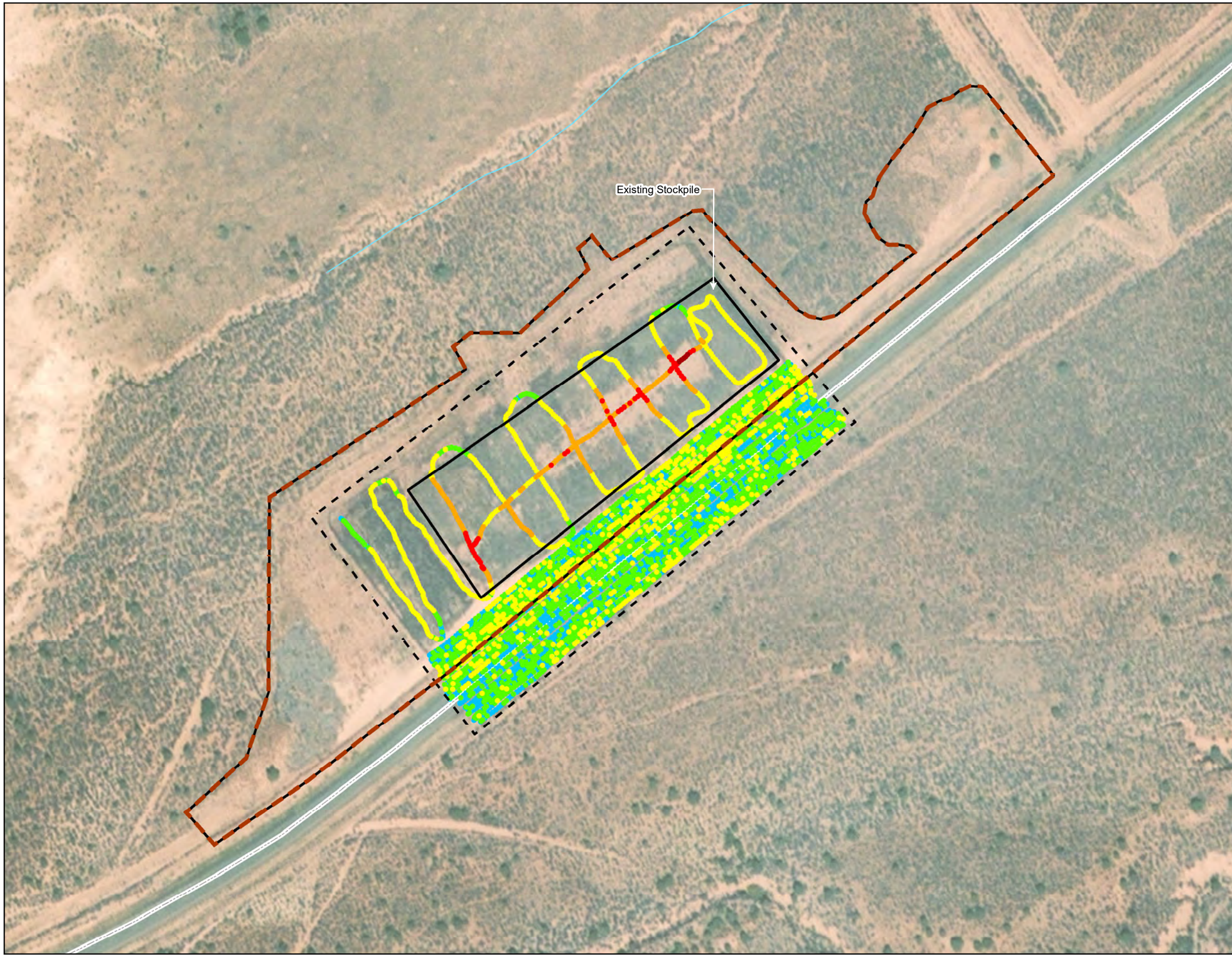
1:1,560

N W E S

0 65 130 260 Feet

COVE TRANSFER STATION 2
GAMMA RADIATION SURVEY
(ADAPTED FROM E&E 2013)

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/30/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 15



Gamma Survey Data (µR/hr)

Chinle Formation - Trc

≤ 14.3	≤ UCL
14.3 - 15.0	UCL - BTV[1]
15.0 - 21.5	BTV - 1.5 x UCL
21.5 - 28.6	1.5 x UCL - 2 x UCL
28.6 - 35.8	2 x UCL - 2.5 x UCL
35.8 - 42.9	2.5 x UCL - 3 x UCL
> 42.9	> 3 x UCL

Tetra Tech, Inc. RSE Survey Area

E&E Survey Area[2]

TENORM Boundary

Access Route - Vehicular

Drainage

Notes:

[1]BTV is based on the 95 percent upper tolerance limit with 95 percent coverage of the background dataset.

[2]See E&E (2013). Data are not available in microRoentgens per hour.

µR/hr	Microroentgen per hour
BTV	Background threshold value
E&E	Ecology & Environment, Inc.
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL	95 percent upper confidence limit on the mean of the background dataset

1 inch = 130 feet

1:1,560

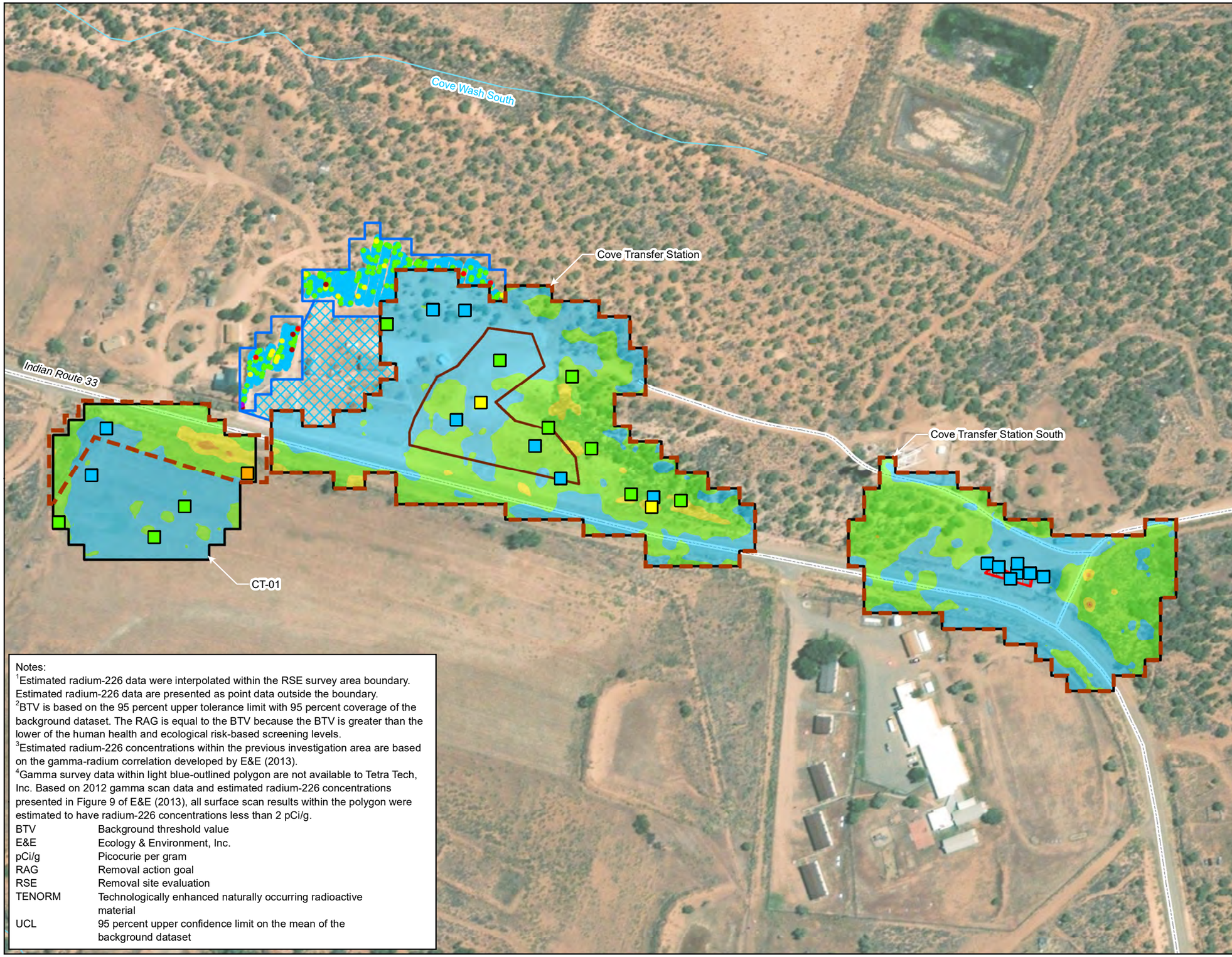
N W E S

0 65 130 260 Feet

COVE TRANSFER STATION 2

RSE GAMMA RADIATION SURVEY

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/29/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 16



Interpolated Estimated Radium-226 (pCi/g)[1]

Chinle Formation - Trc

≤ 1.3	≤ UCL
1.3 - 2.4	UCL - BTV (RAG)[2]
2.4 - 3.3	BTV - 2.5 x UCL
3.3 - 3.9	2.5 x UCL - 3 x UCL
3.9 - 5.2	3 x UCL - 4 x UCL
5.2 - 6.5	4 x UCL - 4 x UCL
> 6.5	> 5 x UCL

- Surface Soil Sample Location
- RSE Survey Area
- Previous Investigation Areas[3] *Outside of RSE Investigation Area*
- Previous Investigation Areas[4] *Outside of RSE Investigation Area*
- TENORM Boundary
- Cove Transfer Station South Waste Rock Pit *Reclaimed Waste Pile T37*
- Waste Pile - Reclaimed
- Access Route - Vehicular
- Drainage

1 inch = 200 feet

1:2,400

0 100 200 400 Feet

N E S W

Notes:

[1]Estimated radium-226 data were interpolated within the RSE survey area boundary. Estimated radium-226 data are presented as point data outside the boundary.

[2]BTV is based on the 95 percent upper tolerance limit with 95 percent coverage of the background dataset. The RAG is equal to the BTV because the BTV is greater than the lower of the human health and ecological risk-based screening levels.

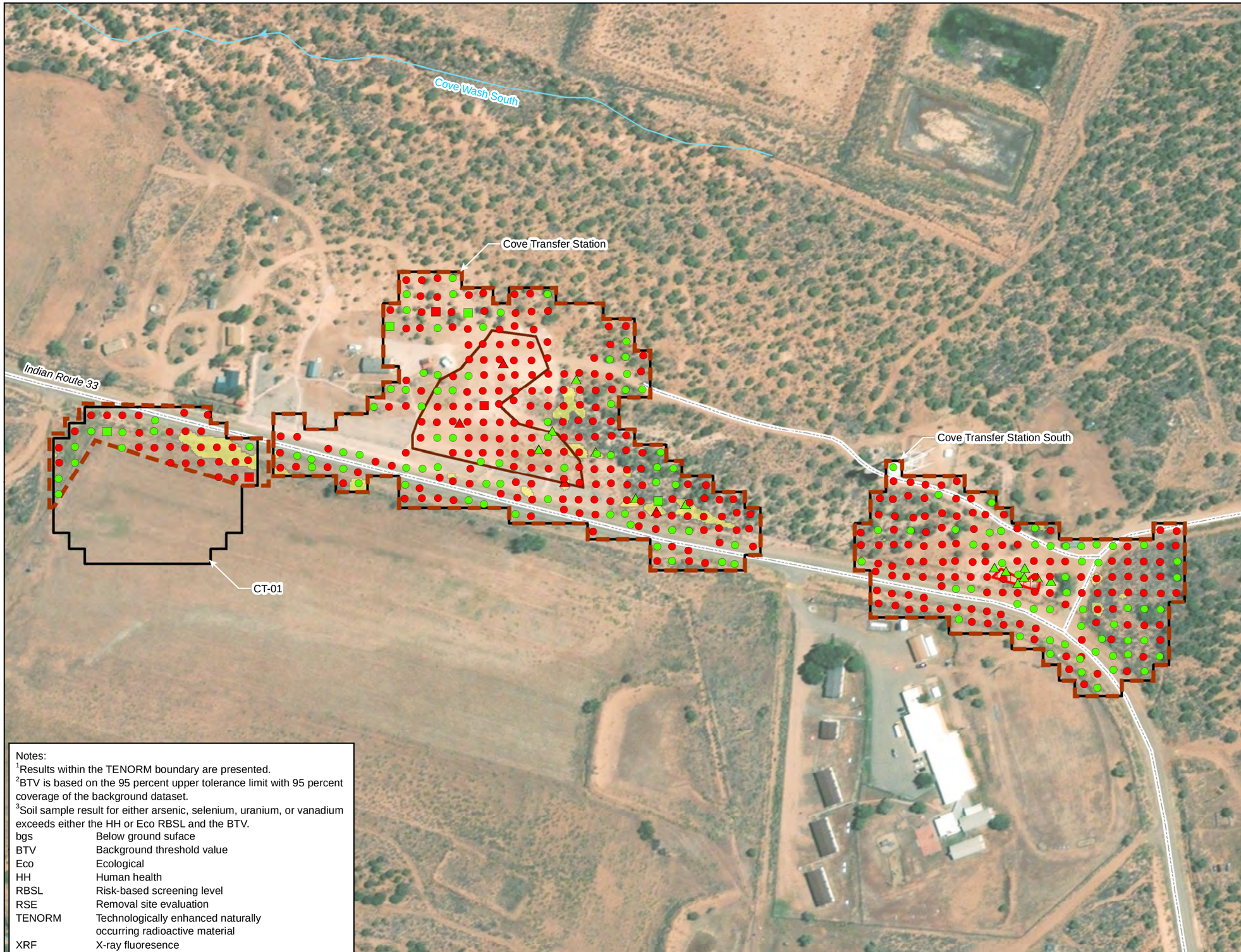
[3]Estimated radium-226 concentrations within the previous investigation area are based on the gamma-radium correlation developed by E&E (2013).

[4]Gamma survey data within light blue-outlined polygon are not available to Tetra Tech, Inc. Based on 2012 gamma scan data and estimated radium-226 concentrations presented in Figure 9 of E&E (2013), all surface scan results within the polygon were estimated to have radium-226 concentrations less than 2 pCi/g.

BTV	Background threshold value
E&E	Ecology & Environment, Inc.
pCi/g	Picocurie per gram
RAG	Removal action goal
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL	95 percent upper confidence limit on the mean of the background dataset

COVE TRANSFER STATIONS COMPLEX
INTERPOLATED ESTIMATED RADIUM-226
SURFACE SOIL CONCENTRATIONS

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 17



Metals RBSL and BTV Exceedance in Soil Sample[1,2]

- Exceeds for Arsenic, Selenium, Uranium, or Vanadium[3]
- Does Not Exceed for Arsenic, Selenium, Uranium, or Vanadium[3]

Soil Sample Type

- In Situ XRF Measurement (0-1 inches bgs)
- XRF Confirmation Soil Sample (0-3 inches bgs)
- Surface Soil Sample (0-6 inches bgs)
- Extent of Interpolated Radium-226 Exceeding BTV
- RSE Survey Area
- TENORM Boundary
- Cove Transfer Station South Waste Rock Pit *Reclaimed Waste Pile T37*
- Waste Pile - Reclaimed
- Access Route - Vehicular
- Drainage

1 inch = 200 feet

1:2,400

0 100 200 400 Feet

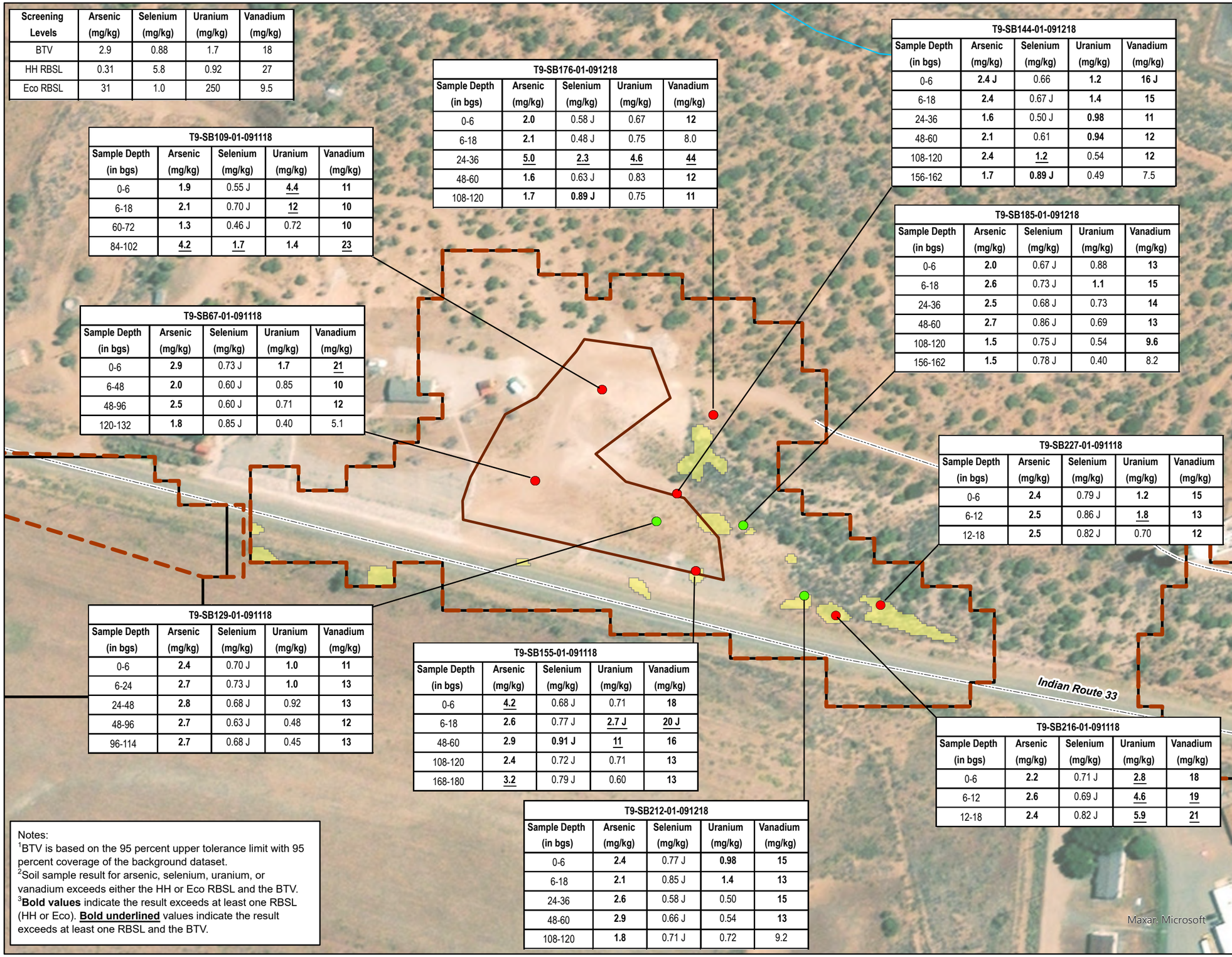
N E S W

Notes:
[1]Results within the TENORM boundary are presented.
[2]BTV is based on the 95 percent upper tolerance limit with 95 percent coverage of the background dataset.
[3]Soil sample result for either arsenic, selenium, uranium, or vanadium exceeds either the HH or Eco RBSL and the BTV.

bgs	Below ground suface
BTV	Background threshold value
Eco	Ecological
HH	Human health
RBSL	Risk-based screening level
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
XRF	X-ray fluoresence

COVE TRANSFER STATIONS COMPLEX
METALS DISTRIBUTION
IN SURFACE SOIL

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH 1999 Harrison Street, Suite 500 Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 18



Screening Levels	Arsenic (mg/kg)	Selenium (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)
BTV	2.9	0.88	1.7	18
HH RBSL	0.31	5.8	0.92	27
Eco RBSL	31	1.0	250	9.5

T9-SB109-01-091118

Sample Depth (in bgs)	Arsenic (mg/kg)	Selenium (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)
0-6	**1.9**	0.55 J	**4.4**	**11**
6-18	**2.1**	0.70 J	**12**	**10**
60-72	**1.3**	0.46 J	0.72	**10**
84-102	**4.2**	**1.7**	**1.4**	**23**

T9-SB67-01-091118

Sample Depth (in bgs)	Arsenic (mg/kg)	Selenium (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)
0-6	**2.9**	0.73 J	**1.7**	**21**
6-48	**2.0**	0.60 J	0.85	**10**
48-96	**2.5**	0.60 J	0.71	**12**
120-132	**1.8**	0.85 J	0.40	5.1

T9-SB129-01-091118

Sample Depth (in bgs)	Arsenic (mg/kg)	Selenium (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)
0-6	**2.4**	0.70 J	**1.0**	**11**
6-24	**2.7**	0.73 J	**1.0**	**13**
24-48	**2.8**	0.68 J	0.92	**13**
48-96	**2.7**	0.63 J	0.48	**12**
96-114	**2.7**	0.68 J	0.45	**13**

T9-SB176-01-091218

Sample Depth (in bgs)	Arsenic (mg/kg)	Selenium (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)
0-6	**2.0**	0.58 J	0.67	**12**
6-18	**2.1**	0.48 J	0.75	8.0
24-36	**5.0**	**2.3**	**4.6**	**44**
48-60	**1.6**	0.63 J	0.83	**12**
108-120	**1.7**	**0.89 J**	0.75	**11**

T9-SB155-01-091118

Sample Depth (in bgs)	Arsenic (mg/kg)	Selenium (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)
0-6	**4.2**	0.68 J	0.71	**18**
6-18	**2.6**	0.77 J	**2.7 J**	**20 J**
48-60	**2.9**	**0.91 J**	**11**	**16**
108-120	**2.4**	0.72 J	0.71	**13**
168-180	**3.2**	0.79 J	0.60	**13**

T9-SB212-01-091218

Sample Depth (in bgs)	Arsenic (mg/kg)	Selenium (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)
0-6	**2.4**	0.77 J	**0.98**	**15**
6-18	**2.1**	0.85 J	**1.4**	**13**
24-36	**2.6**	0.58 J	0.50	**15**
48-60	**2.9**	0.66 J	0.54	**13**
108-120	**1.8**	0.71 J	0.72	9.2

T9-SB144-01-091218

Sample Depth (in bgs)	Arsenic (mg/kg)	Selenium (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)
0-6	**2.4 J**	0.66	**1.2**	**16 J**
6-18	**2.4**	0.67 J	**1.4**	**15**
24-36	**1.6**	0.50 J	**0.98**	**11**
48-60	**2.1**	0.61	**0.94**	**12**
108-120	**2.4**	**1.2**	0.54	**12**
156-162	**1.7**	**0.89 J**	0.49	7.5

T9-SB185-01-091218

Sample Depth (in bgs)	Arsenic (mg/kg)	Selenium (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)
0-6	**2.0**	0.67 J	0.88	**13**
6-18	**2.6**	0.73 J	**1.1**	**15**
24-36	**2.5**	0.68 J	0.73	**14**
48-60	**2.7**	0.86 J	0.69	**13**
108-120	**1.5**	0.75 J	0.54	**9.6**
156-162	**1.5**	0.78 J	0.40	8.2

T9-SB227-01-091118

Sample Depth (in bgs)	Arsenic (mg/kg)	Selenium (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)
0-6	**2.4**	0.79 J	**1.2**	**15**
6-12	**2.5**	0.86 J	**1.8**	**13**
12-18	**2.5**	0.82 J	0.70	**12**

T9-SB216-01-091118

Sample Depth (in bgs)	Arsenic (mg/kg)	Selenium (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)
0-6	**2.2**	0.71 J	**2.8**	**18**
6-12	**2.6**	0.69 J	**4.6**	**19**
12-18	**2.4**	0.82 J	**5.9**	**21**

Notes:
[1]BTV is based on the 95 percent upper tolerance limit with 95 percent coverage of the background dataset.
[2]Soil sample result for arsenic, selenium, uranium, or vanadium exceeds either the HH or Eco RBSL and the BTV.
[3]**Bold values** indicate the result exceeds at least one RBSL (HH or Eco). **Bold underlined** values indicate the result exceeds at least one RBSL and the BTV.

Metals RBSL and BTV Exceedance in Soil Sample[1]

- Exceeds for Arsenic, Selenium, Uranium, or Vanadium[2,3]
- Does Not Exceed for Arsenic, Selenium, Uranium, or Vanadium
- Extent of Interpolated Radium-226 Exceeding BTV
- RSE Survey Area
- TENORM Boundary
- Waste Pile Boundary
- Access Route - Vehicular
- Drainage

Abbreviations:

bgs	Below ground surface
BTV	Background threshold value
Eco	Ecological
HH	Human health
in	Inch
mg/kg	Milligram per kilogram
RBSL	Risk-based screening level
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material

1 inch = 130 feet

1:1,560

0 65 130 260 Feet

N W E S

COVE TRANSFER STATION METALS DISTRIBUTION IN SURFACE AND SUBSURFACE SOIL BORINGS

Prepared For: U.S. EPA Region 9

Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612

Task Order No.: 0016

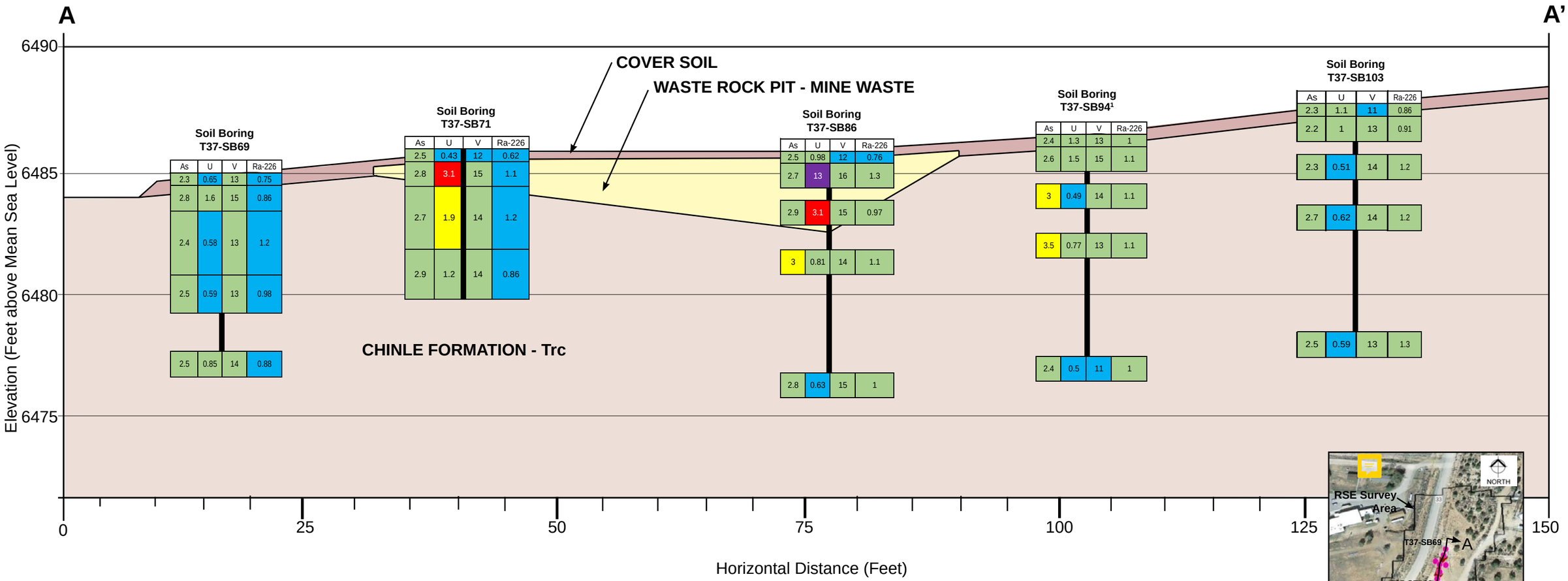
Contract No.: EP-S9-17-03

Location: COVE CHAPTER NAVAJO NATION

Date: 9/27/2021

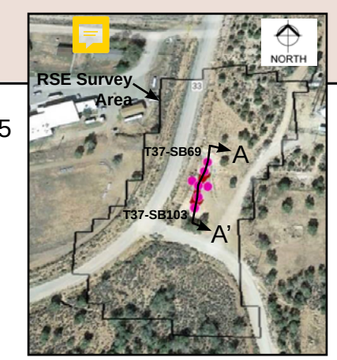
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator

Figure No.: 19



CROSS-SECTION A-A' THROUGH COVE TRANSFER STATION SOUTH WASTE ROCK PIT

Horizontal Scale: 1" = 10 feet
Vertical Scale: 1" = 4 feet



LOCATION MAP

Legend

Waste Rock Pit - Mine Waste

Acronyms:

- As Arsenic
- BTV Background threshold value
- mg/kg Milligram per kilogram
- PCI/G Picourie per gram
- Ra-226 Radium-226
- RSE Removal site evaluation
- U Uranium
- UCL 95 percent upper confidence limit on the mean of the background dataset
- V Vanadium

Legend - Analyte Concentrations Color Code

Result Color	Range [2,3]	As Concentration (mg/kg)
	< UCL	0.0 - 1.5
	UCL - 2 x UCL	1.5 - 2.9
	2 x UCL - BTV [1]	2.9 - 3.9
	BTV - 3 x UCL	3.9 - 4.4
	3 x UCL - 4 x UCL	4.4 - 5.8
	4 x UCL - 5 x UCL	5.8 - 7.3
	> 5 x UCL	7.3 - 200

Result Color	Range [2,3]	U Concentration (mg/kg)
	< UCL	0.0 - 0.9
	> UCL - BTV	0.9 - 1.5
	BTV - 2 x UCL	1.5 - 1.7
	2 x UCL - 3 x UCL	1.7 - 2.6
	3 x UCL - 4 x UCL	2.6 - 3.4
	4 x UCL - 5 x UCL	3.4 - 4.3
	> 5 x UCL	4.3 - 200

Result Color	Range [2,3]	V Concentration (mg/kg)
	< UCL	0.0 - 7.0
	> UCL - BTV	7.0 - 11
	BTV - 2 x UCL	11 - 14
	2 x UCL - 3 x UCL	14 - 21
	3 x UCL - 4 x UCL	21 - 28
	4 x UCL - 5 x UCL	28 - 35
	> 5 x UCL	35 - 200

Result Color	Range [2,3]	Ra-226 Concentration (pCi/g)
	< UCL	0.0 - 1.2
	> UCL - BTV [1]	1.2 - 2.3
	BTV - 2.5 x UCL	2.3 - 3.0
	2.5 x UCL - 3 x UCL	3.0 - 3.6
	3 x UCL - 4 x UCL	3.6 - 4.8
	4 x UCL - 5 x UCL	4.8 - 6.0
	> 5 x UCL	6.0 - 200

NOTES:

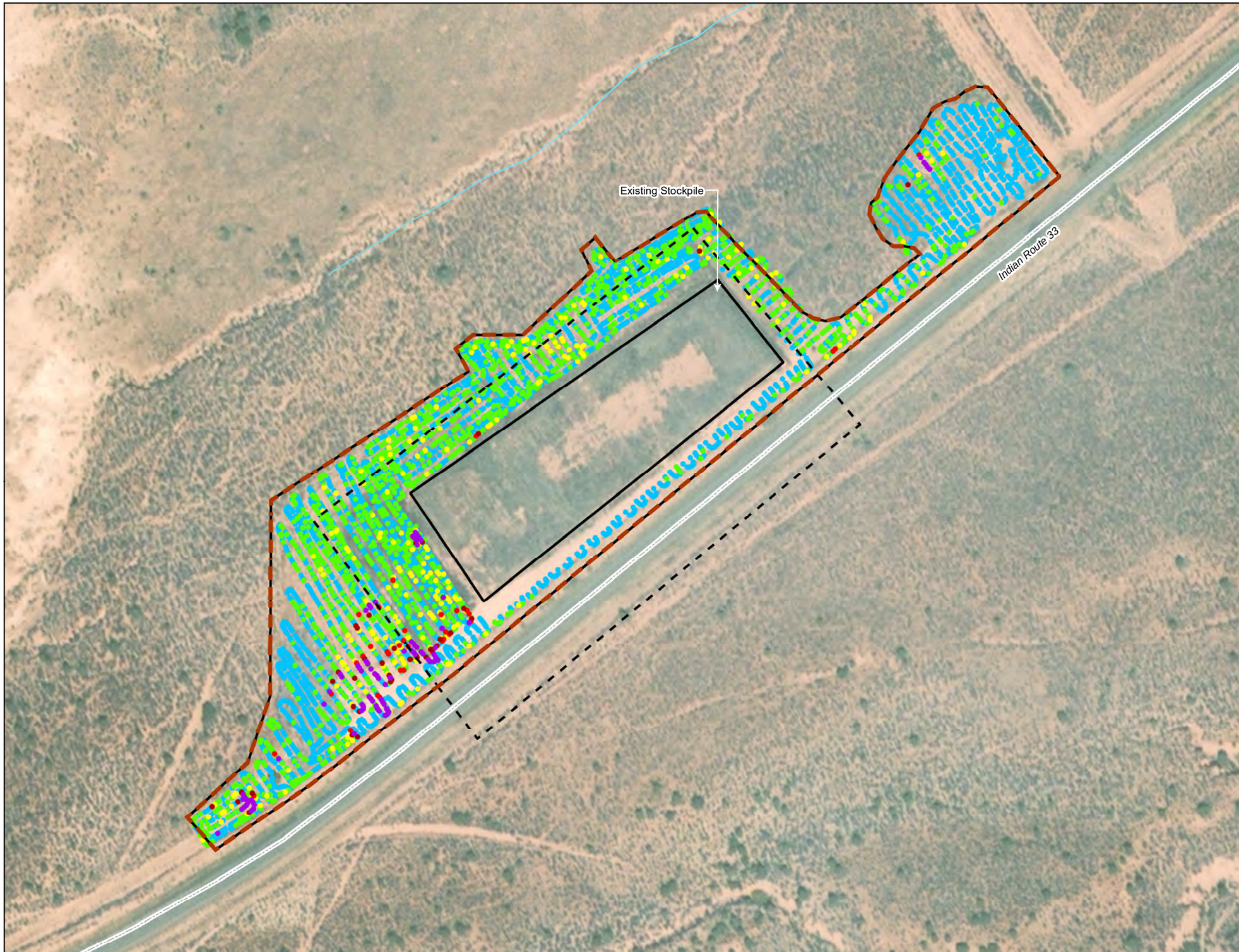
1) Selenium exceeds the BTV (0.88 mg/kg) in a single sample (0.94 mg/kg at T37-SB94 within sample collected from 24-36 inches below ground surface) within the cross-section.
2) BTV is based on the 95 percent upper tolerance limit with 95 percent coverage of the background dataset.
3) The HH RBSL is less than the BTV for all analytes; therefore, results are screened against background only.

Prepared for: U.S. EPA Region 9

Prepared by: TETRA TECH

SUBSURFACE CROSS-SECTION A-A' THROUGH COVE TRANSFER STATION SOUTH WASTE ROCK PIT

Task Order No.:	Contract No:	Figure No:
0016	EP-S9-17-03	20
Location.: NAVAJO NATION	Date: 9/23/2021	



Estimated Radium-226 (pCi/g)[1]

Chinle Formation - Trc

≤ 1.3	≤ UCL
1.3 - 2.4	UCL - BTV (RAG)[2]
2.4 - 3.3	BTV - 2.5 x UCL
3.3 - 3.9	2.5 x UCL - 3 x UCL
3.9 - 5.2	3 x UCL - 4 x UCL
5.2 - 6.5	4 x UCL - 4 x UCL
6.5	> 5 x UCL

Tetra Tech, Inc. RSE Survey Area

E&E Survey Area[1]

TENORM Boundary

Access Route - Vehicular

Drainage

Notes:

[1]See E&E (2013).

[2]BTV is based on the 95 percent upper tolerance limit with 95 percent coverage of the background dataset.

BTV	Background threshold value
E&E	Ecology & Environment, Inc.
pCi/g	Picocurie per gram
RAG	Removal action goal
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL	95 percent upper confidence limit on the mean of the background dataset

1 inch = 130 feet

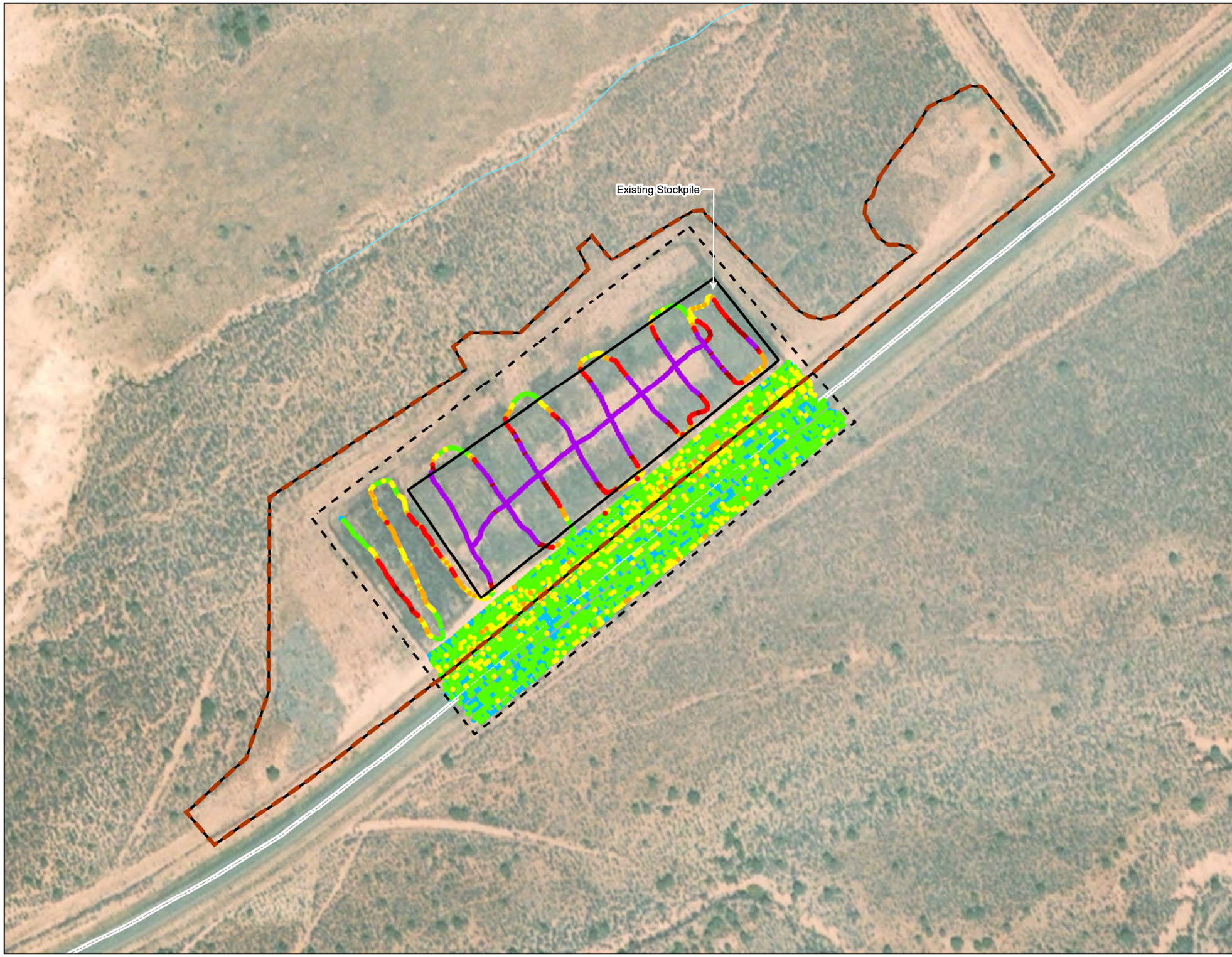
1:1,560

N W E S

0 65 130 260 Feet

COVE TRANSFER STATION 2
ESTIMATED RADIUM-226
SURFACE SOIL CONCENTRATIONS
(ADAPTED FROM E&E 2013)

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/30/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 21



Estimated Radium-226 (pCi/g)

Chinle Formation - Trc

≤ 1.3	≤ UCL
1.3 - 2.4	UCL - BTV (RAG)[1]
2.4 - 3.3	BTV - 2.5 x UCL
3.3 - 3.9	2.5 x UCL - 3 x UCL
3.9 - 5.2	3 x UCL - 4 x UCL
5.2 - 6.5	4 x UCL - 5 x UCL
> 6.5	> 5 x UCL

Tetra Tech, Inc. RSE Survey Area

E&E Survey Area[2]

TENORM Boundary

Access Route - Vehicular

Drainage

Notes:

[1]BTV is based on the 95 percent upper tolerance limit with 95 percent coverage of the background dataset.

[2]See E&E (2013).

BTV	Background threshold value
E&E	Ecology & Environment, Inc.
pCi/g	Picocurie per gram
RAG	Removal action goal
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL	95 percent upper confidence limit on the mean of the background dataset

1 inch = 130 feet

1:1,560

N W E S

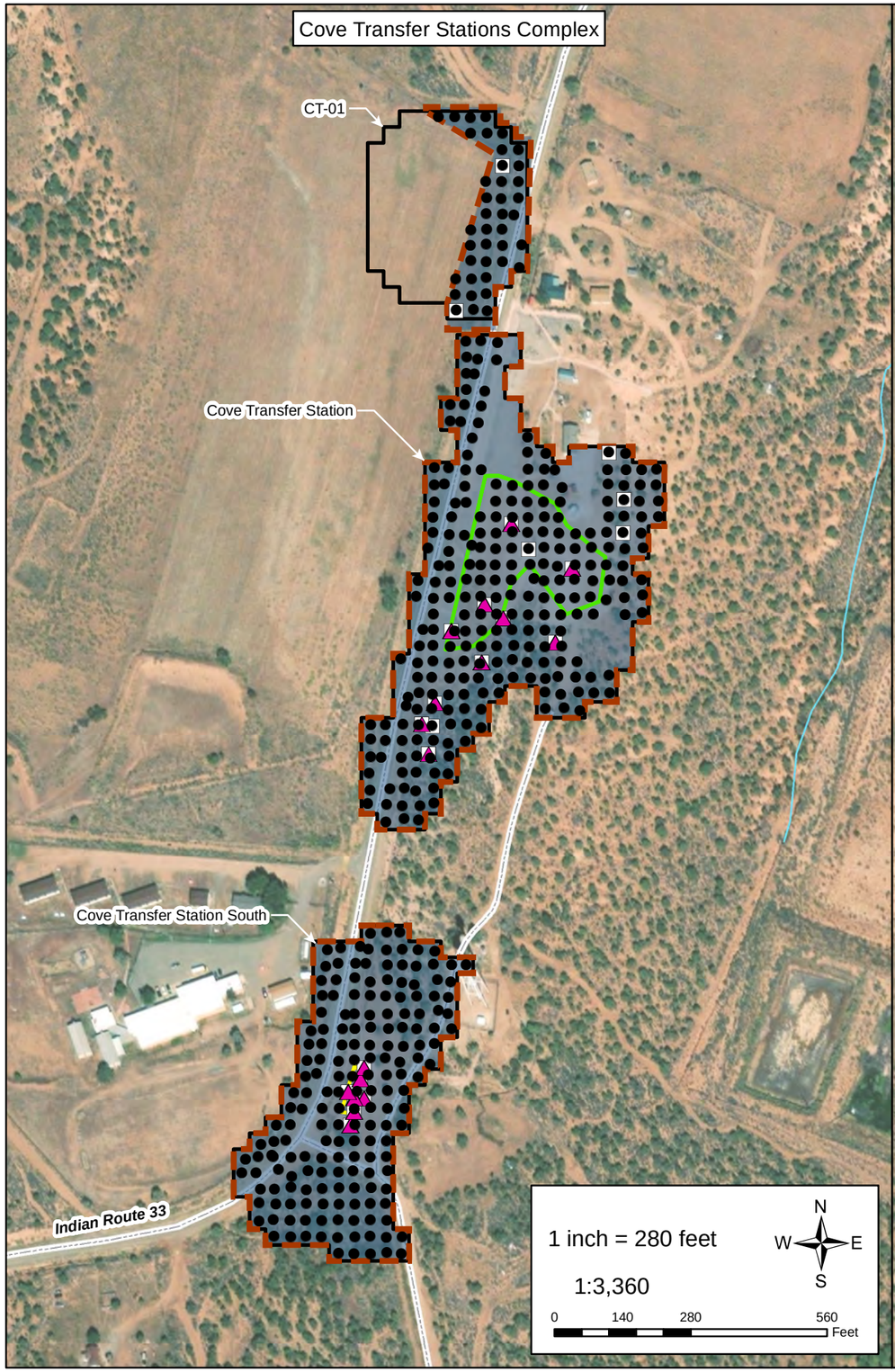
0 65 130 260 Feet

COVE TRANSFER STATION 2

RSE ESTIMATED RADIUM-226

SURFACE SOIL CONCENTRATIONS

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 22



Exposure Units

- EU 1 - Full-Time Residential *Chinle Formation*
- EU 2 - Full-Time Residential *Chinle Formation*

Soil Sample Locations

- In Situ XRF Measurement (0-1 inch bgs)
- Surface Soil Samples (0-12 inches bgs) *(includes all lab samples with bottom depth ≤ 12 inches)*
- Subsurface Soil Samples (below 12 inches bgs) *(includes all lab samples with bottom depth > 12 inches)*
- RSE Survey Area
- TENORM Boundary

Site Features

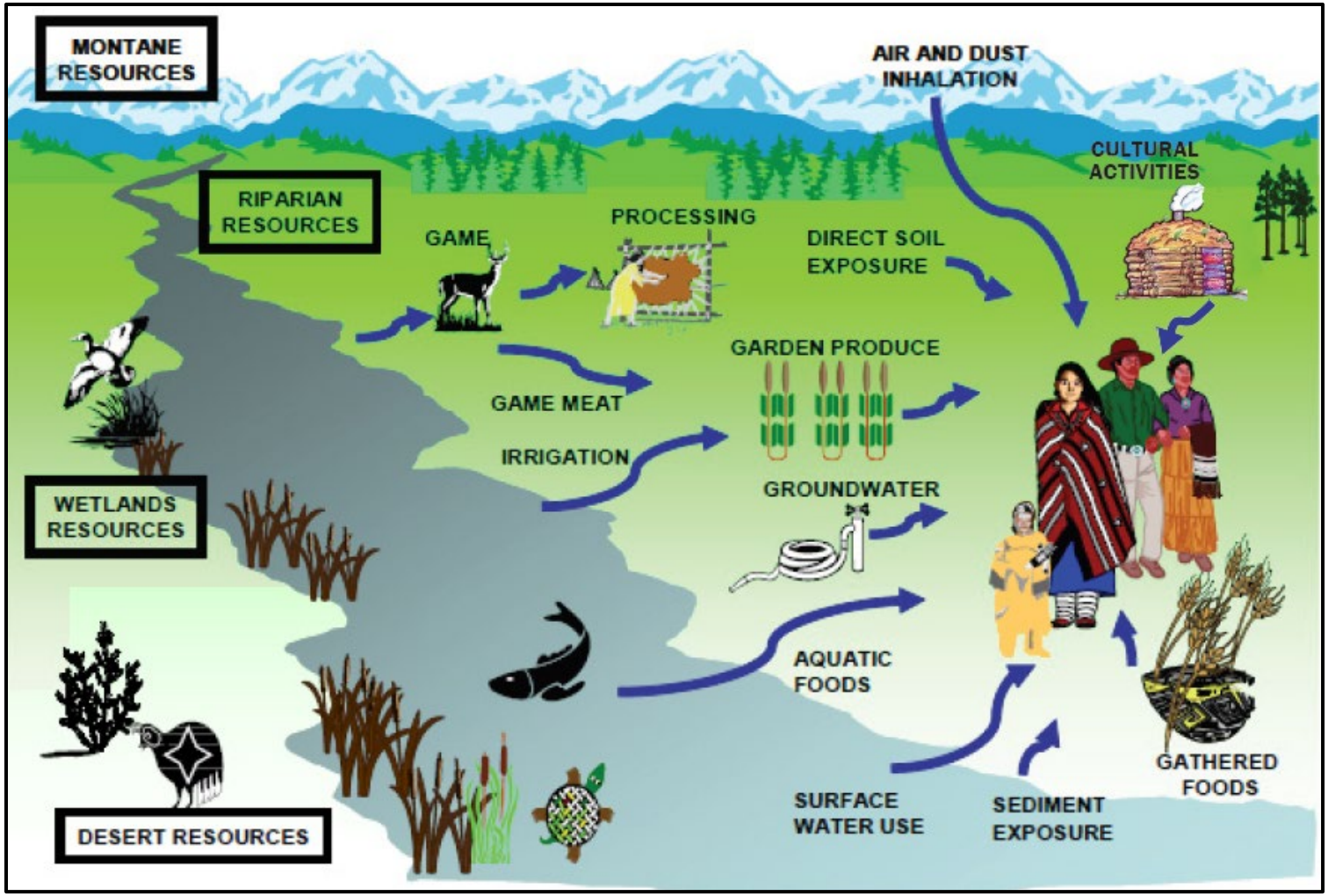
- Waste Pile - Reclaimed
- Cove Transfer Station South Waste Rock Pit *Reclaimed Waste Pile T37*
- Stockpile - Unreclaimed

Notes:

bgs	Below ground surface
EU	Exposure unit
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
XRF	X-ray fluorescence

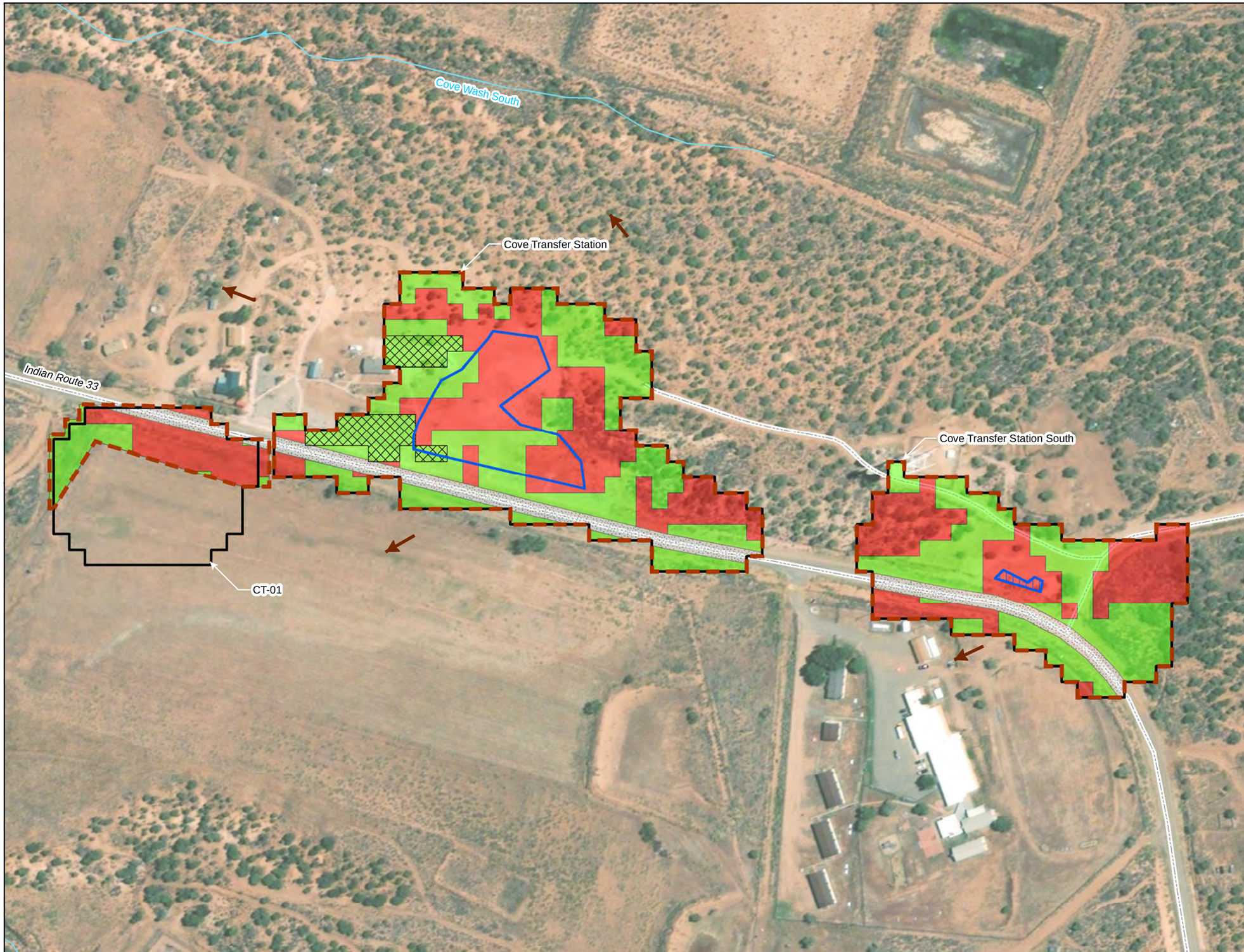
COVE TRANSFER STATIONS GROUP
EXPOSURE UNITS

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/29/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 23



Notes:
Some exposure pathways depicted above are not included in the exposure assessment. See the conceptual site model wire diagrams (Figures 12 and 14) for a description of the included pathways.
Adapted from B.L. Harper, A.K. Harding, T. Waterhous, and S.G. Harris. 2007. "Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual." Oregon State University. Corvallis, Oregon. August.

Figure 24. Other Potential Diné Lifeways Exposure Pathways



Proposed Removal Action Extent

- Excavation
- No Cleanup
- No Cleanup (Highway)
- Access Route - Vehicular
- Slope Direction
- Drainage
- RSE Survey Area
- TENORM Boundary
- Waste Rock Pit - Unreclaimed
- Waste Pile - Reclaimed
- Cultrual Exclusion Area

Notes:

RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material

1 inch = 200 feet

1:2,400

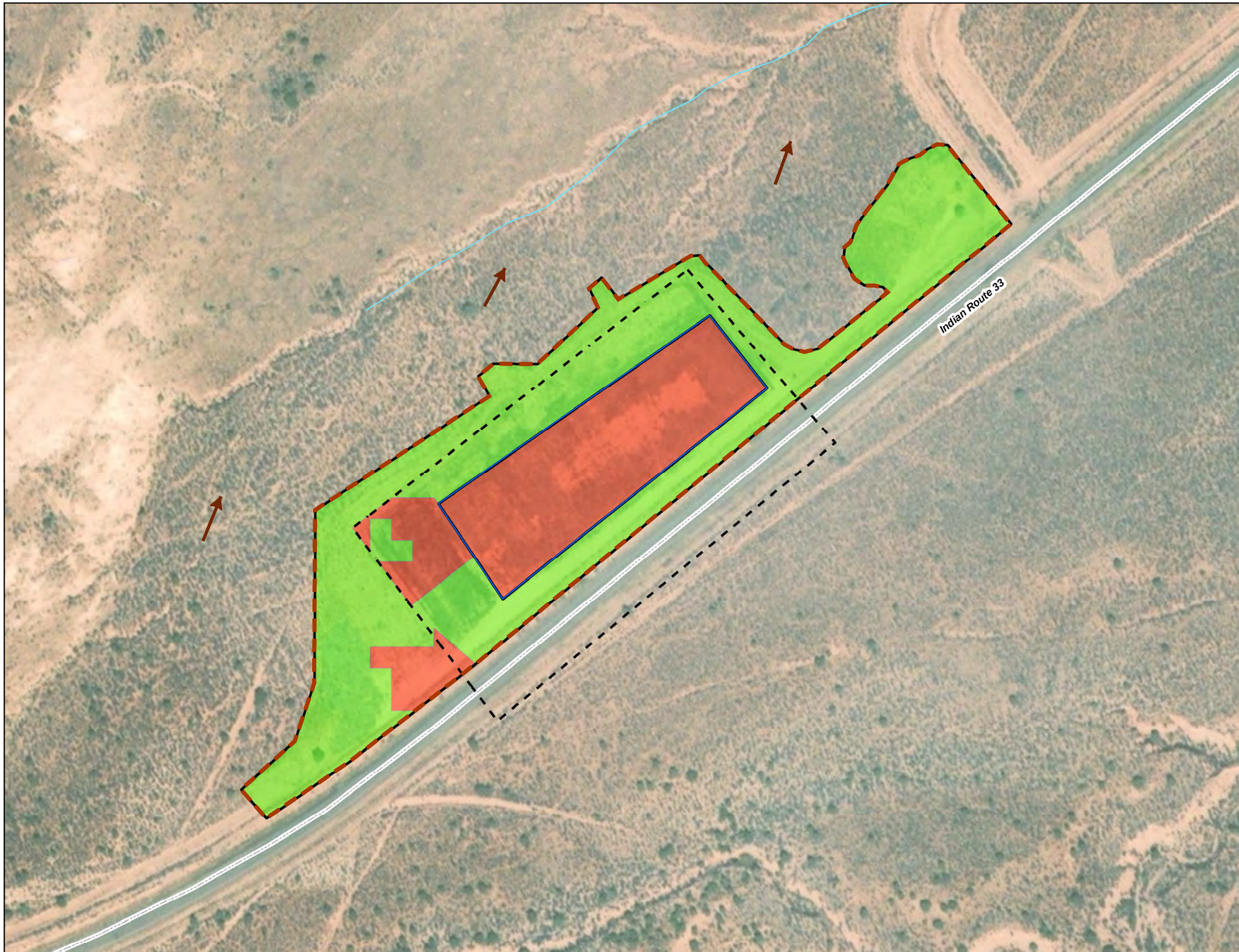
0 100 200 400 Feet

N E S W

COVE TRANSFER STATIONS COMPLEX

PROPOSED REMOVAL ACTION EXTENT

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 25



Proposed Removal Action Extent

- Excavation
- No Cleanup
- Access Route - Vehicular
- Slope Direction
- Drainage
- Tetra Tech, Inc. RSE Survey Area
- E&E Survey Area[1]
- TENORM Boundary
- Existing Stockpile

Notes:
[1]See E&E (2013).

E&E	Ecology & Environment, Inc.
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material

1 inch = 147 feet

1:1,768

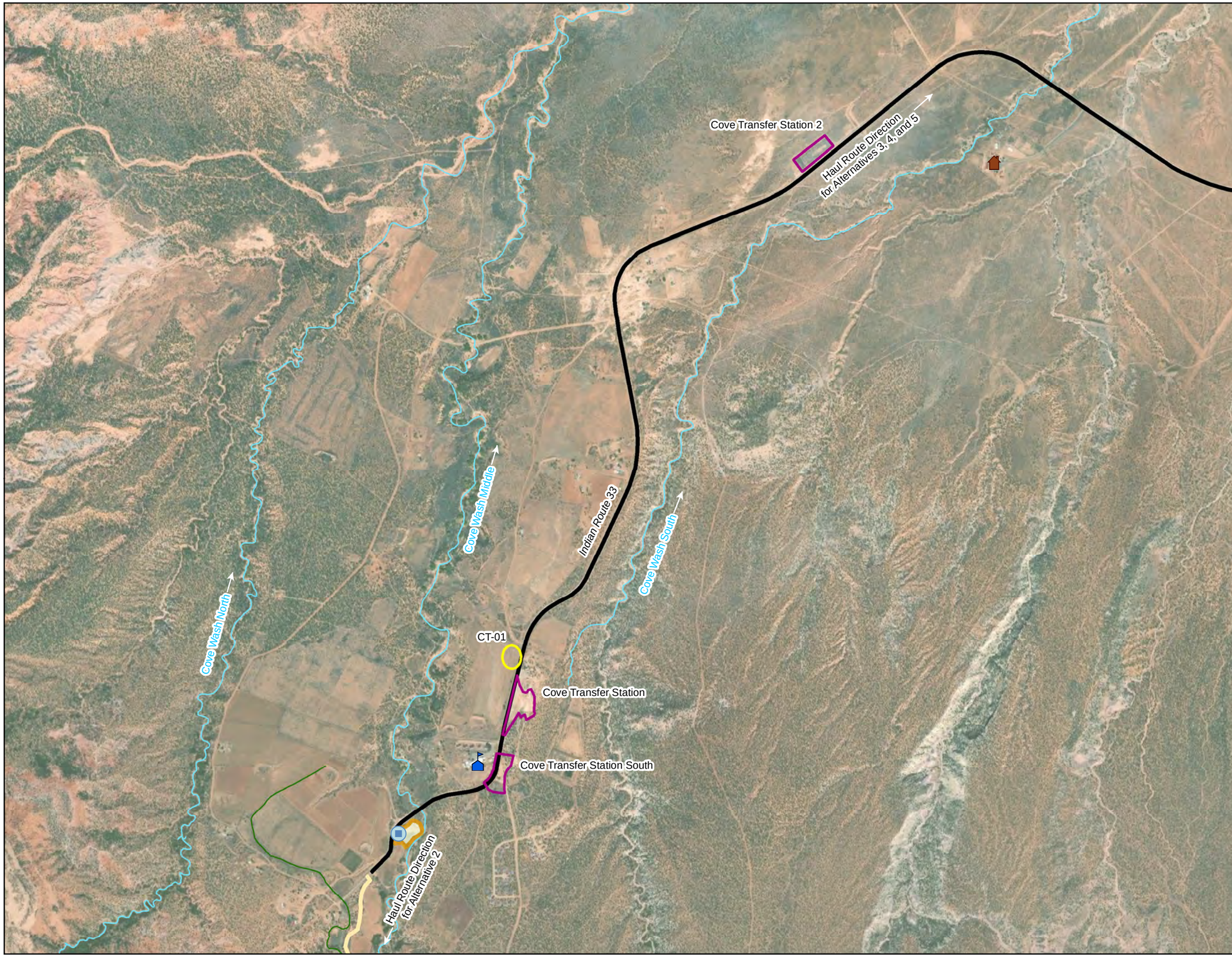
N W E S

0 70 140 280 Feet

COVE TRANSFER STATION 2

PROPOSED REMOVAL ACTION EXTENT

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH 1999 Harrison Street, Suite 500 Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 26



Proposed Construction Water Well Placement
Proposed Laydown Yard
Paved Haul Route
Improved Dirt Road
Cove Day School
Cove Chapter House
AUM-Related Site
Non-AUM Target Site
Drainage
Irrigation Canal

Note:
AUM Abandoned uranium mine

1 inch = 1,500 feet

1:18,000

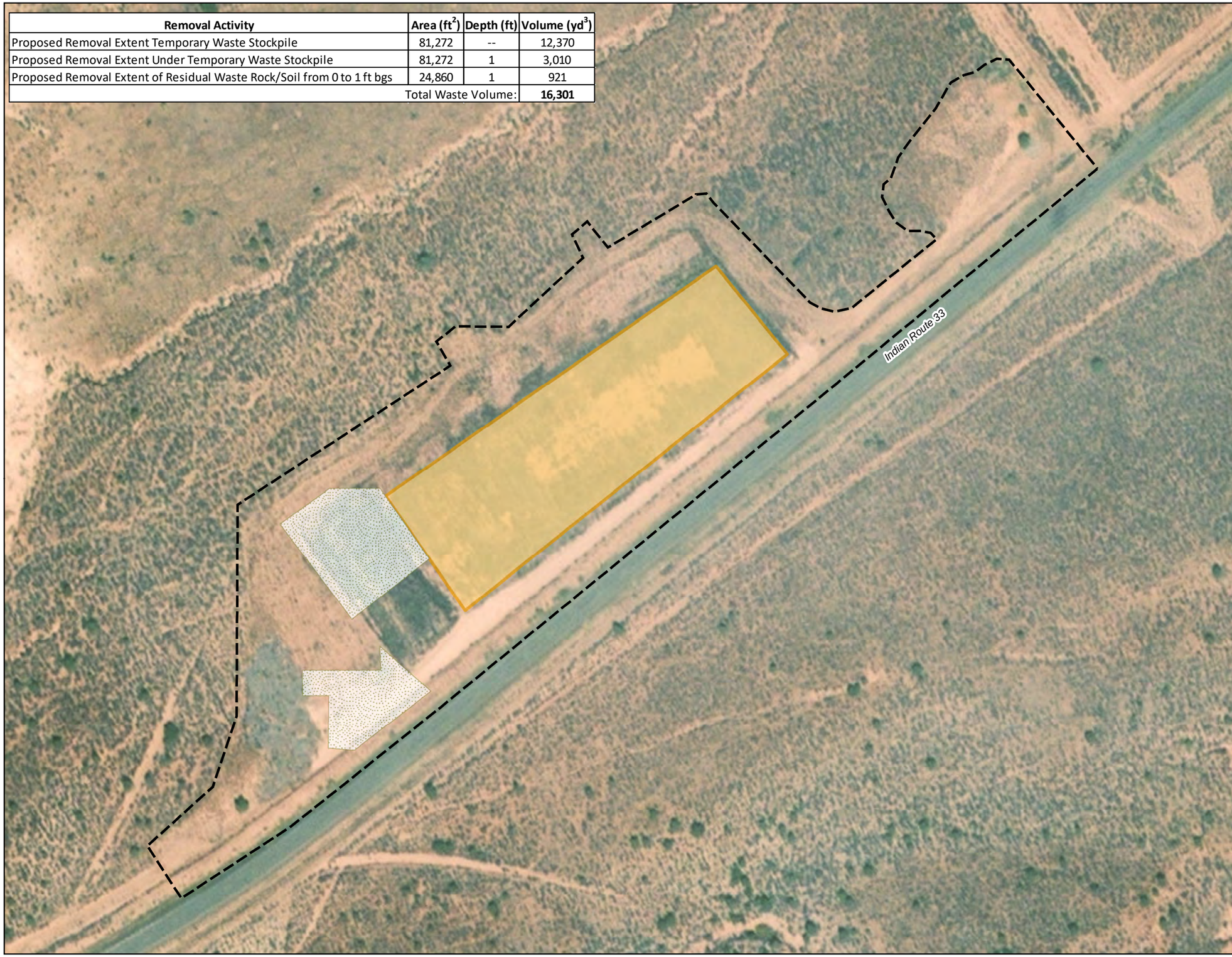
N W E S

0 750 1,500 3,000 Feet

HAUL ROUTE,
LAYDOWN AREA,
AND WASTE SOURCE

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH 1999 Harrison Street, Suite 500 Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 27

Removal Activity	Area (ft^2)	Depth (ft)	Volume (yd^3)
Proposed Removal Extent Temporary Waste Stockpile	81,272	--	12,370
Proposed Removal Extent Under Temporary Waste Stockpile	81,272	1	3,010
Proposed Removal Extent of Residual Waste Rock/Soil from 0 to 1 ft bgs	24,860	1	921
Total Waste Volume:			**16,301**



Temporary Waste Stockpile Excavation Area (pile + 1 foot bgs)

Excavation Areas (1 foot bgs)

Disturbance Area

Notes:

bgs	Below ground suface
ft	Foot
ft^2	Square foot
yd^3	Cubic yard

1 inch = 120 feet

1:1,440

N W E S

0 60 120 240 Feet

PROPOSED COVE TRANSFER STATION 2
CONSTRUCTION ACTIVITIES

Prepared For: U.S. EPA Region 9

Prepared By:

TETRA TECH
1999 Harrison Street, Suite 500
Oakland, CA 94612

Task Order No.:	Contract No.:
0016	EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: **28**

Restoration of Historical and Removal Action Disturbed Area[1]

Drainage

Note:
[1]Backfill excavations, grade, place erosion control matting on pad perimeter and road shoulder, and revegetate.

1 inch = 120 feet

1:1,440

N
W E
S

0 60 120 240 Feet

PROPOSED COVE TRANSFER STATION 2
SURFICIAL RESTORATION ACTIVITIES

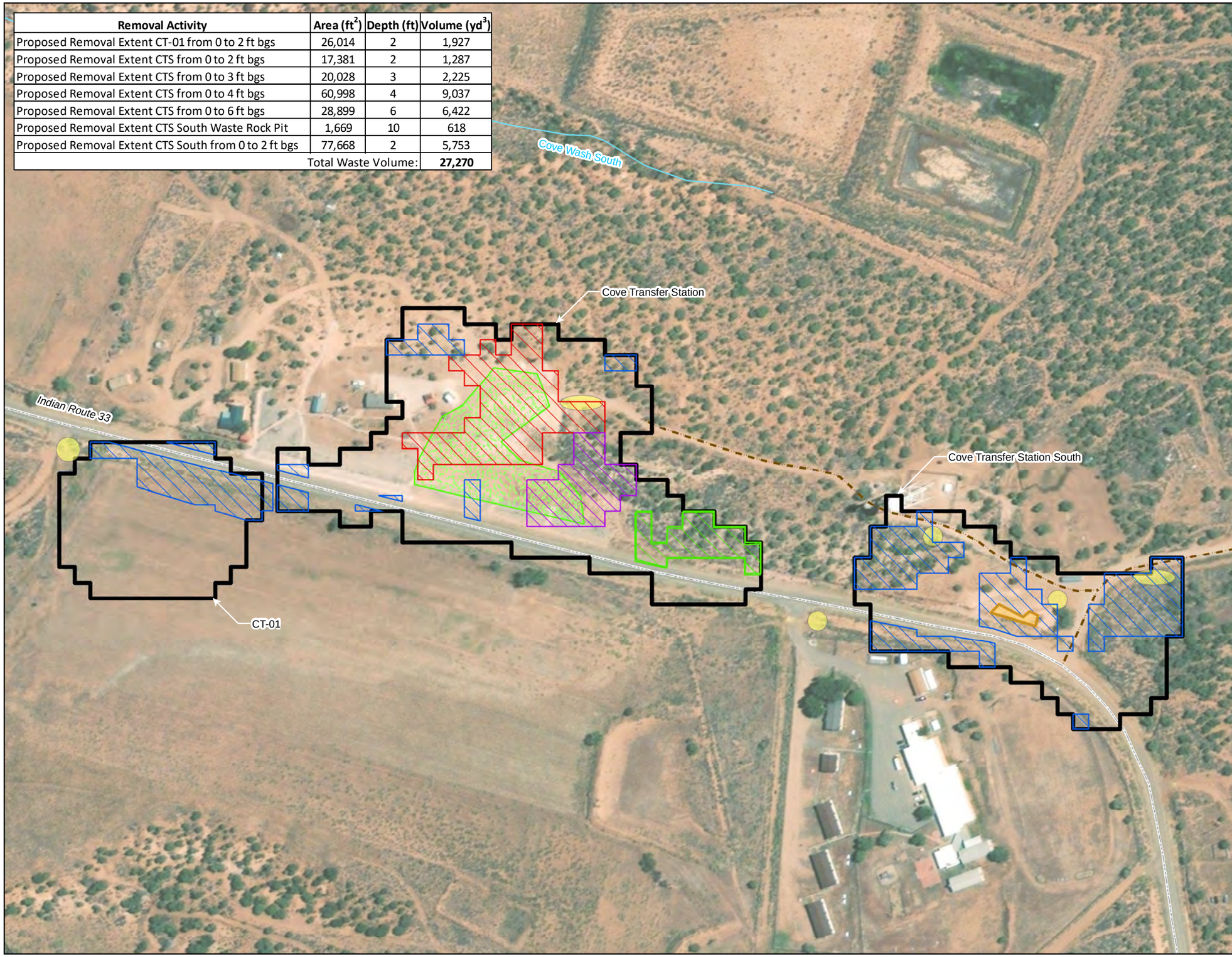
Prepared For: U.S. EPA Region 9

Prepared By:

TETRA TECH
1999 Harrison Street, Suite 500
Oakland, CA 94612

Task Order No.:	Contract No.:
0016	EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 29

Removal Activity	Area (ft^2)	Depth (ft)	Volume (yd^3)
Proposed Removal Extent CT-01 from 0 to 2 ft bgs	26,014	2	1,927
Proposed Removal Extent CTS from 0 to 2 ft bgs	17,381	2	1,287
Proposed Removal Extent CTS from 0 to 3 ft bgs	20,028	3	2,225
Proposed Removal Extent CTS from 0 to 4 ft bgs	60,998	4	9,037
Proposed Removal Extent CTS from 0 to 6 ft bgs	28,899	6	6,422
Proposed Removal Extent CTS South Waste Rock Pit	1,669	10	618
Proposed Removal Extent CTS South from 0 to 2 ft bgs	77,668	2	5,753
Total Waste Volume:			**27,270**



Excavation Area (2 feet bgs)
Excavation Area (3 feet bgs)
Excavation Area (4 feet bgs)
Excavation Area (6 feet bgs)
Waste Rock Pit Excavation (10 feet bgs)
Loading Area
Waste Pile - Reclaimed
RSE Survey Area
Paved Route
Unpaved Route
Drainage

Notes:

bgs	Below ground suface
ft	Foot
ft^2	Square foot
RSE	Removal site evaluation
yd^3	Cubic yard

1 inch = 200 feet

1:2,400

0 100 200 400 Feet

N E S W

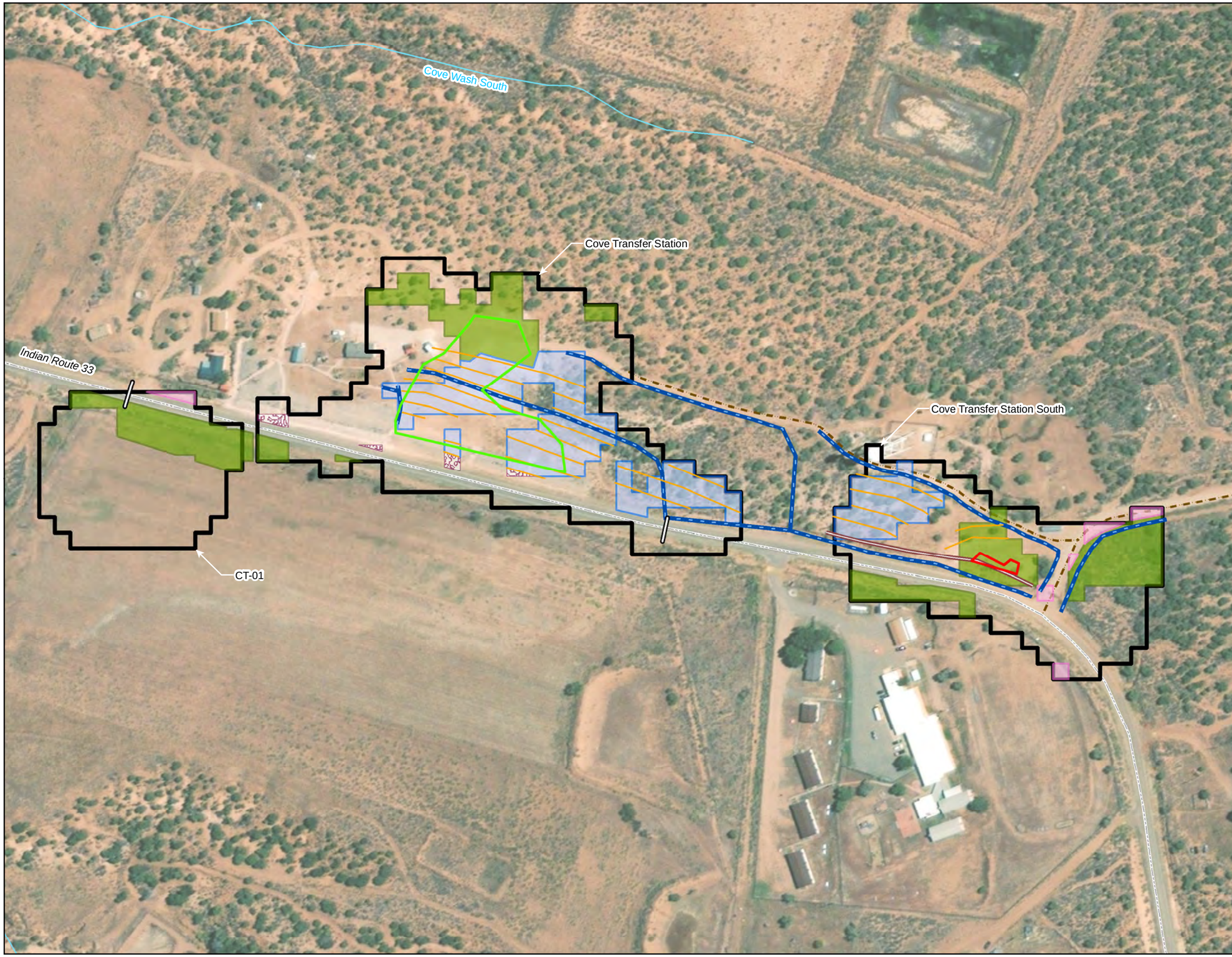
PROPOSED
COVE TRANSFER STATIONS COMPLEX
CONSTRUCTION ACTIVITIES

Prepared For: U.S. EPA Region 9

Prepared By:

TETRA TECH
1999 Harrison Street, Suite 500
Oakland, CA 94612

Task Order No.:	Contract No.:
0016	EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/30/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: **30**



Coir Logs
Soil Berm
Rock-Lined Drainage
Existing Culvert under Road
Backfill, Grading Area
Backfill, Grading and Revegetation Area
Backfill, Grading and Rock-Lined Drainage
Backfill, Grading, Erosion Control Matting, and Revegetation Area

Site Features

Waste Pile - Reclaimed
Waste Rock Pit

1 inch = 200 feet

1:2,400

0 100 200 400 Feet

N E S W

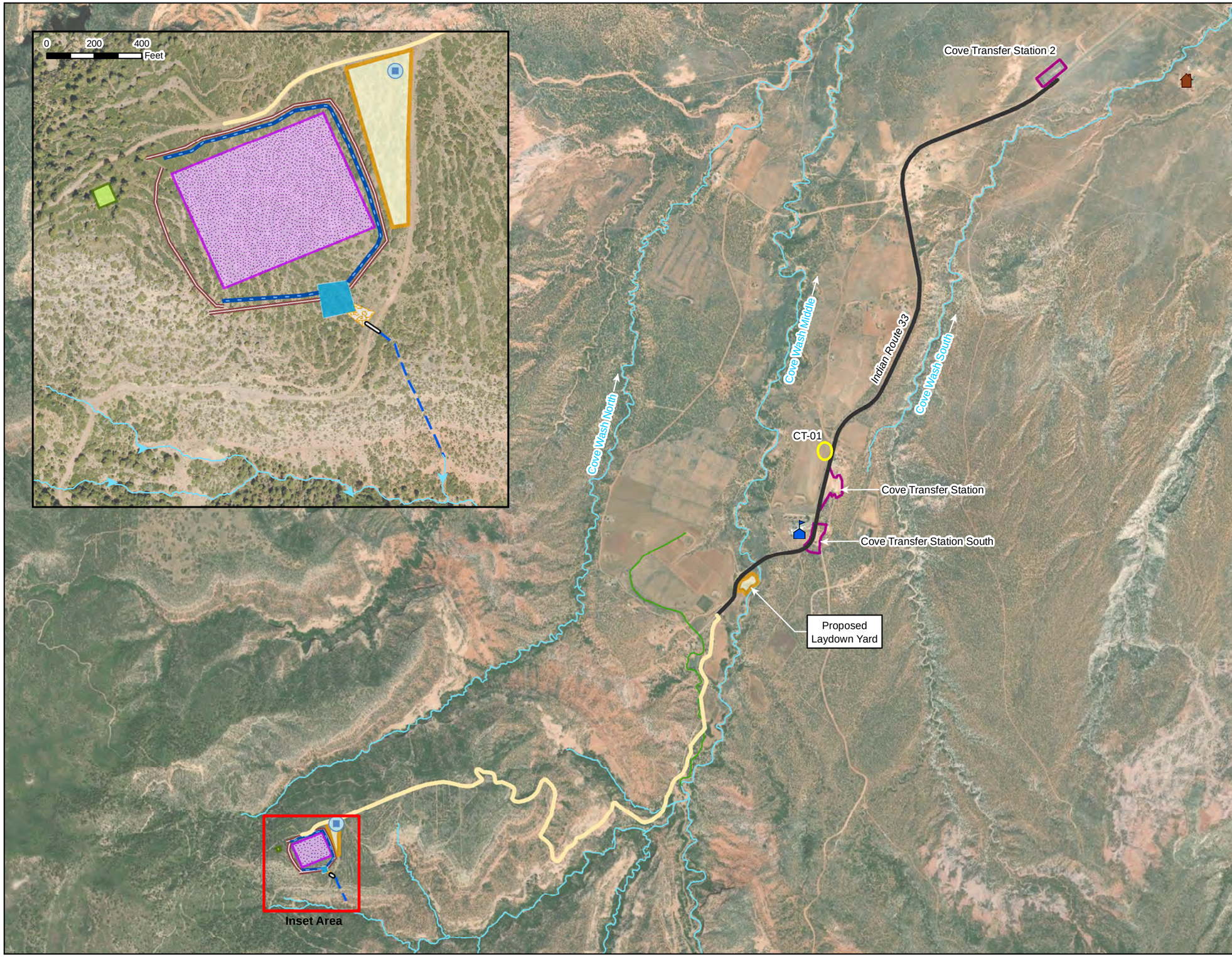
PROPOSED
COVE TRANSFER STATIONS COMPLEX
SURFICIAL RESTORATION ACTIVITIES

Prepared For: U.S. EPA Region 9

Prepared By:

TETRA TECH
1999 Harrison Street, Suite 500
Oakland, CA 94612

Task Order No.:	Contract No.:
0016	EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/30/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 31



Proposed Construction Water Well Placement
Proposed Mesa V Repository
Proposed Laydown Yard
Proposed Soil Borrow Area
Proposed Sediment / Water Detention Basin
Proposed Rock Outfall
Rock-Faced Berm
Drainage Channel
Culvert
Drainage Path
Paved Haul Route
Improved Dirt Road
Cove Day School
Cove Chapter House
AUM-Related Site
Non-AUM Target Site
Drainage
Irrigation Canal

Note:
AUM Abandoned uranium mine

1 inch = 2,000 feet

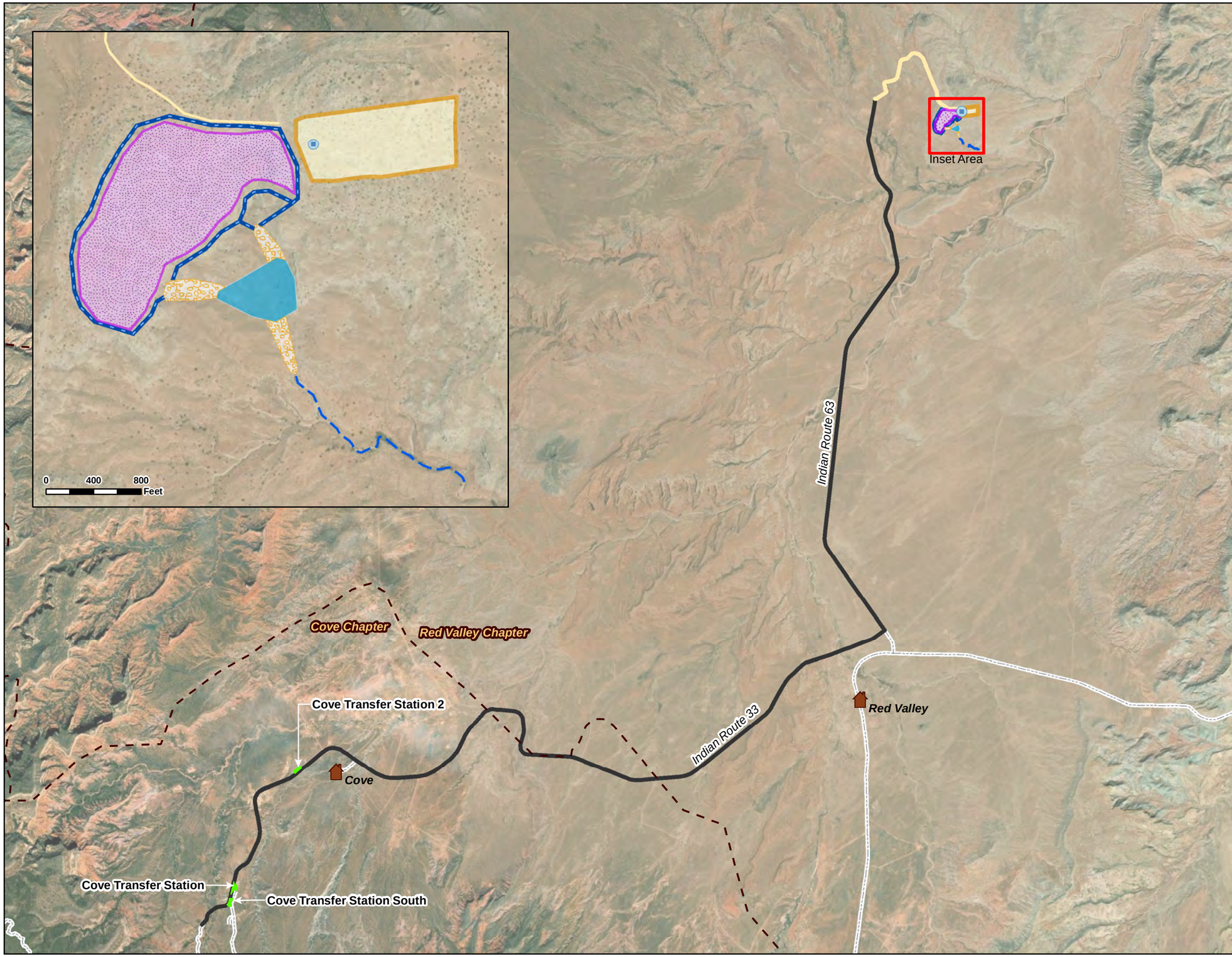
1:24,000

0 1,000 2,000 4,000 Feet

N W E S

ALTERNATIVE 2 — ON-MESA REPOSITORY LOCATION, FEATURES, AND HAUL ROUTE

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/29/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 32



Proposed Construction Water Well Placement
Proposed Regional Repository
Proposed Repository Laydown Yard
Proposed Sediment Detention Basin
Proposed Rock Outfall
Proposed Drainage Ditch
Existing Drainage Swale

Access Routes to Proposed Regional Repository

Paved Haul Route
Improved Dirt Road
Navajo Nation Chapter House
AUM-Related Site
Navajo Nation Chapter Boundary
Access Route - Vehicular

Note:
AUM Abandoned uranium mine

1 in = 7,000 ft

1:84,000

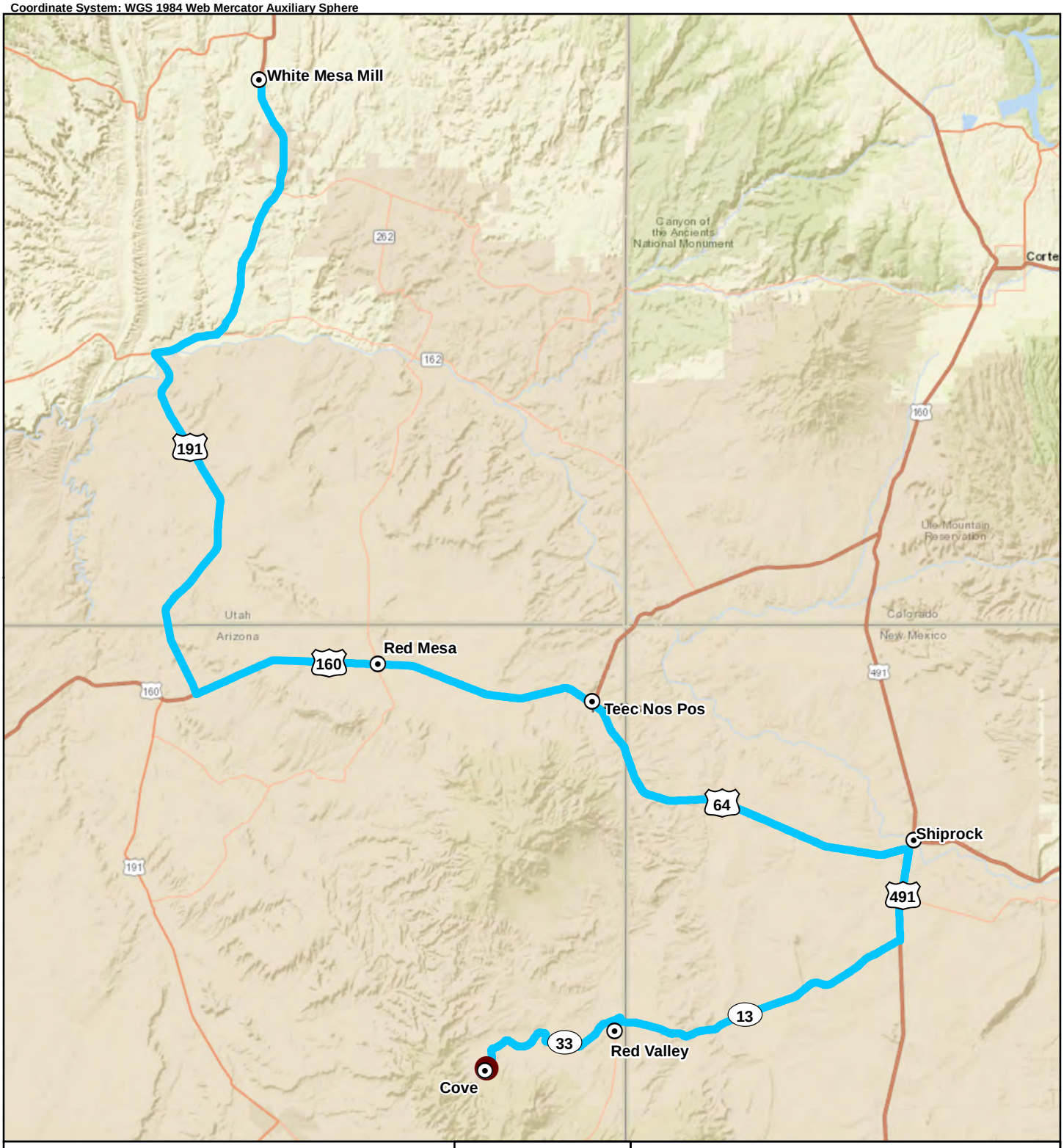
N
W E
S

0 3,500 7,000 14,000
Feet

ALTERNATIVE 3 — ON-NAVAJO NATION REGIONAL REPOSITORY LOCATION, FEATURES, AND HAUL ROUTE

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH, 1999 Harrison Street, Suite 500, Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: NAVAJO NATION	Date: 9/29/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: 33

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere



Populated Place

Cove Transfer Stations Group

Proposed Haul Route

0 6 12 Miles

N W E S

Prepared for: U.S. EPA Region 9

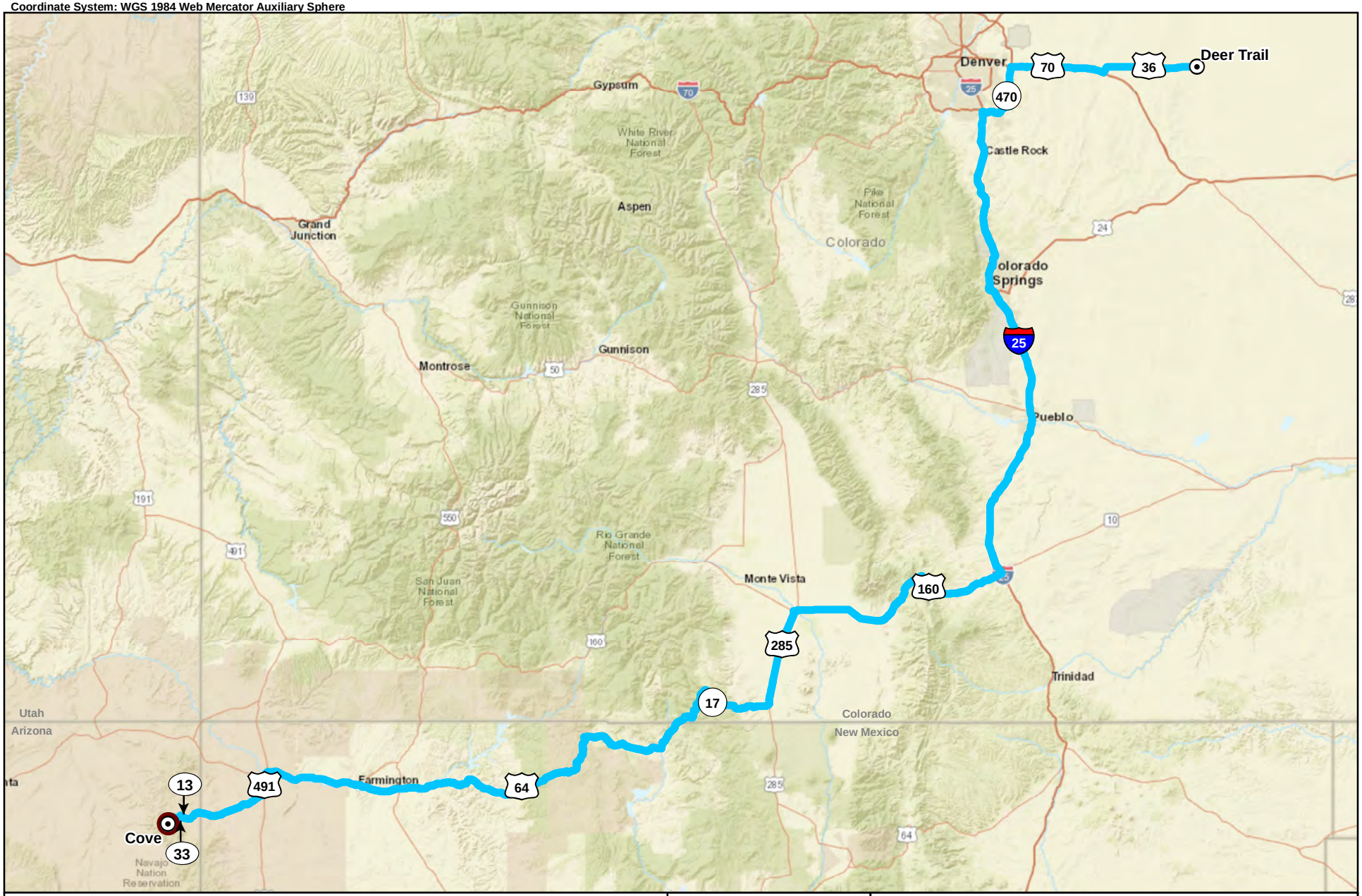
Prepared By:

TETRA TECH
1999 Harrison Street, Suite 500
Oakland, CA 94612

ALTERNATIVE 4 — OFF-NAVAJO NATION DISPOSAL AT WHITE MESA MILL HAUL ROUTE

Task Order No.:	Contract No.:	Figure No.:
0016	EP-S9-17-03	34
Location: NAVAJO NATION	Date: 9/29/2021	

Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere



Populated Place

Proposed Haul Route

Cove Transfer Stations Group

0 25 50 Miles

N W E S

Note:
RCRA Recource Conservation and Recovery Act

Prepared for: U.S. EPA Region 9

Prepared By: TETRA TECH
1999 Harrison Street, Suite 500
Oakland, CA 94612

ALTERNATIVE 5 — OFF-NAVAJO NATION DISPOSAL AT CLEAN HARBORS RCRA SUBTITLE C HAZARDOUS WASTE DISPOSAL FACILITY HAUL ROUTE

Task Order No.: 0016	Contract No.: EP-S9-17-03	Figure No.: 35
Location: COVE CHAPTER NAVAJO NATION	Date: 9/29/2021	

TABLES

Table 1. Mine-Related Features and Dimensions at Cove Transfer Stations Group

Feature	Reclamation Status	Reclamation Description	Dimensions
Cove Transfer Stations Complex			
Waste Pile 344A-1	Reclaimed	Approximately 2,150 cubic yards of waste were removed from CTS in 2003 and placed in Burial Cell NA-0344B located on Mesa V.	5.44 acres
Waste Pile T37	Reclaimed	Approximately 11,800 cubic yards of waste were removed from CTS South in 2012 and placed in the temporary waste stockpile at CTS 2.	0.65 acres
Unnamed Suspected Waste Rock Pit	Unreclaimed	Located beneath Waste Pile T37, the Waste Rock Pit was capped with 2 feet of clean backfill when Waste Pile T37 was removed.	8 feet deep
CTS 2			
Temporary Waste Stockpile	Unreclaimed	Stockpile of excavated waste material from CTS, CTS South, and CTS 2 was treated with a biodegradable liquid copolymer (“Gorilla-Snot”) to stabilize and solidify the material for erosion control and dust suppression, and the area was fenced with barbed wire to prevent livestock access.	2.23 acres; approximately 12,400 cubic yards waste

Notes:
CTS Cove Transfer Station
PUF Polyurethane foam
RSE Removal site evaluation

Table 2. COPC/COPEC Screening of Maximum Detected Concentrations against Risk-Based and Background Values

Evaluation of Soil Samples within the Chinle Formation						
Analyte	Units	Maximum Concentration in Surface Soil (0-12 inches bgs)	Navajo-Specific Human Health RBSL[a]	Ecological RBSL[b]	Background Values - Chinle Formation [c]	
			Kee'da'whíí téeh (Full-Time Navajo Resident)		UCL95	BTV
Radionuclides [d]						
Radium-226	pCi/g	4.1	**0.11**	15	**1.3**	**2.4**
Metals						
Arsenic	mg/kg	7.7	**0.31**	31	**2.0**	**2.9**
Selenium	mg/kg	2.3	5.8	**1**	**0.69**	**0.88**
Uranium	mg/kg	19	**0.92**	250	**0.69**	**1.7**
Vanadium	mg/kg	51	**27**	**9.5**	**13**	**18**

Notes:

Bolded values indicate the maximum site concentration exceeds the screening level or BTV.

a The human health RBSLs were calculated using the Navajo risk-based remediation goal calculator (under development). The screening levels were calculated using exposure parameter inputs recommended by the Navajo Nation Environmental Protection Agency and include external radiation exposure, soil ingestion, dermal contact (metals only), soil (or dust) inhalation, consumption of homegrown produce and gathered wild plants, consumption of homegrown animal products (meat, eggs, and milk), and consumption of hunted animals (meat only). The scenarios also include use of plants for medicinal and ceremonial purposes. Screening levels based on a target cancer risk of three in ten thousand (3E-04) and target noncancer hazard of 1. The exposure scenarios, including input parameters and rationale, are provided in the "Navajo Nation-Wide Risk Assessment Conceptual Site Model and Methodology" (Tetra Tech, Forthcoming). See Table 7 for the full set of human health RBSLs.

b Ecological RBSLs presented are the minimum LOEC for all applicable feeding guilds. LOECs are based on Los Alamos National Laboratory ECORISK database low effect level environmental screening levels (Newport News Nuclear BWXT-Los Alamos, LLC. 2020). See Table 7 for the full set of ecological RBSLs.

c Background values are UCL95 and UTL95-95 values from the 2021 Provisional Northern AUM Regional BTVs (Tetra Tech 2021).

d For radionuclides, uranium-238 is assumed to be in secular equilibrium with its decay chain (that is, all decay chain nuclides present in equal activity concentrations). In this case, the risk from radium-226 and it's decay products (that is radium-226 in secular equilibrium) will account for most of the risk from the uranium-238 decay chain. Further information on secular equilibrium is provided in Section 2.4.3.

Table 2. COPC/COPEC Screening of Maximum Detected Concentrations against Risk-Based and Background Values

Notes (continued):

AUM	Abandoned uranium mine
bgs	Below ground surface
BTV	Background threshold value
COPC	Contaminant of potential concern
COPEC	Contaminant of potential ecological concern
LOEC	Lowest observed effects concentration
mg/kg	Milligram per kilogram
pCi/g	Picocurie per gram
RBSL	Risk-based screening level
Tetra Tech	Tetra Tech, Inc.
UCL95	One-sided 95 percent upper confidence limit on the mean
UTL-95-95	95 percent upper tolerance limit with 95 percent coverage

References:

Newport News Nuclear BWXT-Los Alamos, LLC. 2020. “ECORISK Database (Release 4.2).” Document EM2020-0575, Los Alamos, New Mexico. N3B 2020, 701067. November.

Tetra Tech, Inc. (Tetra Tech). 2021. “Technical Memorandum on Regional Background Statistics and Provisional BTVs for the Lukachukai Mountain, Cove Valley, and Tse Tah Regions Using Tronox and Cyprus Amax Data.” August 8.

Tetra Tech. Forthcoming. “Navajo Nation-Wide Risk Assessment Conceptual Site Model and Methodology. ”

Table 3. Summary Statistics for all Depth Intervals in the TENORM Boundary

Cove Transfer Station Complex TENORM - Surface Soil (0-12 inches bgs)												
COPC / COPEC	Units	Detection Frequency	Number of High Nondetect Results[a]	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Location of Maximum Concentration	Arithmetic Mean[b]	95 UCL / Distribution[c, d]		Exposure Point Concentration		
										Value[e]	Statistic	Method[f]
Radium-226	pCi/g	66 / 68	0	0.72 LT	4.1	T9-SB216-1218-01-091118	1.4	1.7	NP	1.7	UCL	(15)
Arsenic	mg/kg	375 / 537	0	1.30	7.7	T37X166	2.5	2.7	NP	2.7	UCL	(15)
Selenium	mg/kg	68 / 68	0	0.46 J	2.3	T9-SB176-024036-01-091218	0.74	0.81	NP	0.81	UCL	(11)
Uranium	mg/kg	501 / 537	0	0.10 QL	19	T37X131	2.1	2.4	NP	2.4	UCL	(15)
Vanadium	mg/kg	304 / 537	0	8.0	51	T37X131	17	18	NP	18	UCL	(15)

Notes:

a Number of nondetect results that exceeded the maximum detected concentration. These results were not included in the statistical calculations.

b The arithmetic mean for datasets with nondetected results is calculated using the Kaplan-Meier method (USEPA 2015).

e The EPC is the lesser of the UCL95 and the maximum detected result. The maximum detected result is the default when there are fewer than 10 samples or fewer than four detected results. All methods follow USEPA (2002, 2015).

f The statistical methods for selecting the exposure point concentration are as follows (not all are used):

(1)	Maximum detected concentration	(8)	95% Gamma Approximate KM-UCL	(15)	95% KM Chebyshev UCL
(2)	95% Student's t UCL	(9)	95% H-UCL	(16)	97.5% Chebyshev UCL
(3)	95% Modified-t UCL	(10)	95% H-UCL (KM log)	(17)	97.5% KM Chebyshev UCL
(4)	95% KM (t) UCL	(11)	95% BCA Bootstrap UCL	(18)	99% Chebyshev UCL
(5)	95% Adjusted Gamma UCL	(12)	95% Bootstrap-t UCL	(19)	99% KM Chebyshev UCL
(6)	95% Gamma Adjusted KM-UCL	(13)	95% KM BCA UCL		
(7)	95% Approximate Gamma UCL	(14)	95% Chebyshev UCL		

95UCL	One-sided 95 percent upper confidence limit of the mean	KM (t)	UCL based upon Kaplan-Meier estimates using the Student's t-distribution critical value	QL	XRF reported value is detected but is less than the minimum XRF value used in the correlation but greater than the XRF value that would equal a laboratory concentration of zero.
BCA	Bias-corrected accelerated bootstrap method				
bgs	Below ground surface	LN	Lognormal distribution		
COPC	Contaminant of potential concern	LT	Result less than requested minimum detectable concentration, but greater than sample-specific minimum detectable concentration		
COPEC	Contaminant of potential ecological concern			TENORM	Technologically enhanced naturally occurring radioactive material
EPC	Exposure point concentration				
G	Gamma distribution	mg/kg	Milligram per kilogram	UCL	Upper confidence limit of the mean
H-UCL	UCL based upon Land's H-statistic	N	Normal distribution	USEPA	U.S. Environmental Protection Agency
J	Estimated value	NP	Nonparametric distribution	XRF	X-ray fluorescence
KM	Kaplan-Meier	pCi/g	Picocurie per gram		

References:

U.S. Environmental Protection Agency (USEPA). 2002. "Calculating Exposure Point Concentrations at Hazardous Waste Sites." OSWER 9285.6-10. Office of Emergency and Remedial Response. December.

USEPA. 2015. "ProUCL Version 5.1 Technical Guide." Prepared by A. Singh and A.K. Singh. EPA/600/R-07/041. October.

Table 4. Exposure Unit Summary of Type, Area, Land Use, Geologic Formation, and Available Samples

Exposure Unit [1,2]	Land Use / Receptor	Geologic Formation	Type	Area (m^2)	Depth (inches bgs)	XRF In Situ Soil (0-1 inches bgs)	XRF Confirmation Surface Soil (0-3 inches bgs)	Surface Soil (0-6 inches bgs)	Surface Soil (6-12 inches bgs)	Subsurface Soil (>12 inches bgs)	Sediment (0-12 inches bgs)	Total Number of Samples
1	Kee'da'whíí téeh (Full-Time Navajo Resident)	Chinle Formation	TENORM (CTS Complex)	52,953	0-12	469	7	17	2	0	0	495
1	Kee'da'whíí téeh (Full-Time Navajo Resident)	Chinle Formation	TENORM (CTS Complex)	52,953	0-72	469	7	17	2	42	0	537
2	Kee'da'whíí téeh (Full-Time Navajo Resident)	Chinle Formation	TENORM (CTS 2)	35,394	26,634	0	0	0	0	0	0	0

Notes:

1 EU 1 represents the CTS Complex, which includes CTS, CTS South, Target CT-01.

2 EU 2 represents CTS 2, the location of the constructed stockpile. Analytical data reflecting current conditions at CTS 2 are not available; however, historical soil sample results for radium-226 collected within and below the stockpile are available and used as a line of evidence in the risk assessment. No samples have been analyzed for metals at CTS 2.

bgs Below ground surface

AUM Abandoned uranium mine

CTS Cove Transfer Station

EU Exposure unit

m^2 Square meter

TENORM Technologically enhanced naturally occurring radioactive material

XRF X-ray fluorescence

Table 5. Summary Statistics for Exposure Units 1 and 2, All Soil and Sediment Samples

EU 1 - Kee'da'whíí téeh (Full-Time Navajo Resident) at Cove Transfer Stations Complex within the Chinle Formation - Surface Soil (0-12 inches bgs)											
COPC / COPEC	Units	Detection Frequency	Number of High Nondetect Results[a]	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Location of Maximum Concentration	Arithmetic Mean[b]	95 UCL / Distribution[c, d]	Exposure Point Concentration		
									Value	Statistic[e]	Method[f]
Surface Soil (0-12 inches bgs)											
Radium-226	pCi/g	25 / 26	0	0.8 LT	3.4	T10-XSG1-01-081818	1.5	2.2 LN	2.2	UCL	(15)
Arsenic	mg/kg	333 / 495	0	1.3	7.7	T37X166	2.4	2.7 NP	2.7	UCL	(15)
Selenium	mg/kg	26 / 26	0	0.47 J	0.9 J	T37-SS86A-01-091318	0.69	0.73 N	0.73	UCL	(2)
Uranium	mg/kg	459 / 495	0	0.10 QL	19	T37X131	2.1	2.4 NP	2.4	UCL	(15)
Vanadium	mg/kg	262 / 495	0	9.2	51	T37X131	17	18 NP	18	UCL	(15)

EU 1 - Kee'da'whíí téeh (Full-Time Navajo Resident) at Cove Transfer Stations Complex within the Chinle Formation - Surface and Subsurface Soil (0-72 inches bgs)											
COPC / COPEC	Units	Detection Frequency	Number of High Nondetect Results[a]	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Location of Maximum Concentration	Arithmetic Mean[b]	95 UCL / Distribution[c, d]	Exposure Point Concentration		
									Value	Statistic[e]	Method[f]
Surface and Subsurface Soil (0-72 inches bgs)											
Radium-226	pCi/g	66 / 68	0	0.72 LT	4.1	T9-SB216-1218-01-091118	1.4	1.7 NP	1.7	UCL	(15)
Arsenic	mg/kg	375 / 537	0	1.3	7.7	T37X166	2.5	2.7 NP	2.7	UCL	(15)
Selenium	mg/kg	68 / 68	0	0.46 J	2.3	T9-SB176-024036-01-091218	0.74	0.81 NP	0.81	UCL	(11)
Uranium	mg/kg	501 / 537	0	0.10 QL	19	T37X131	2.1	2.4 NP	2.4	UCL	(15)
Vanadium	mg/kg	304 / 537	0	8.0	51	T37X131	17	18 NP	18	UCL	(15)

EU 2 - Kee'da'whíí téeh (Full-Time Navajo Resident) at CTS 2 within the Chinle Formation											
COPC / COPEC	Units	Detection Frequency	Number of High Nondetect Results[a]	Minimum Concentration (qualifier)	Maximum Concentration (qualifier)	Location of Maximum Concentration	Arithmetic Mean[b]	95 UCL / Distribution[c, d]	Exposure Point Concentration		
									Value	Statistic[e]	Method[f]
Surface and Subsurface Soil (0-72 inches bgs)											
No analytical data or XRF measurements were collected in EU 2.											

Notes:

a Number of nondetect results that exceeded the maximum detected concentration. These results were not included in the statistical calculations.

b The arithmetic mean for datasets with nondetected results is calculated using the Kaplan-Meier method.

c Following USEPA (2002, 2015) guidance, this value may be estimated by a 95, 97.5, or 99 percent UCL depending on the sample size, skewness, and degree of censorship.

d Tested using the Shapiro-Wilk W or Lilliefors test for normal and lognormal distributions and the Anderson-Darling and Kolmogorov-Smirnov tests for gamma distributions. A 5 percent level of significance was used in all tests. Distribution tests were conducted only for samples with at least four detected results. Distributions not confirmed as normal (N), lognormal (LN), or gamma (G) were treated as nonparametric (NP) in all statistical calculations.

e The EPC is the lesser of the UCL95 and the maximum detected result. The maximum detected result is the default when there are fewer than 10 samples or fewer than four detected results. All methods follow USEPA (2002, 2015).

Table 5. Summary Statistics for Exposure Units 1 and 2, All Soil and Sediment Samples

Notes (continued):

f The statistical methods for selecting the exposure point concentration are as follows (not all are used):

(1) Maximum detected concentration
(2) 95% Student's t UCL
(3) 95% Modified-t UCL
(4) 95% KM (t) UCL
(5) 95% Adjusted Gamma UCL
(6) 95% Gamma Adjusted KM-UCL
(7) 95% Approximate Gamma UCL
(8) 95% Gamma Approximate KM-UCL
(9) 95% H-UCL
(10) 95% H-UCL (KM log)
(11) 95% BCA Bootstrap UCL
(12) 95% Bootstrap-t UCL
(13) 95% KM BCA UCL
(14) 95% Chebyshev UCL
(15) 95% KM Chebyshev UCL
(16) 97.5% Chebyshev UCL
(17) 97.5% KM Chebyshev UCL
(18) 99% Chebyshev UCL
(19) 99% KM Chebyshev UCL

--	Not applicable
BCA	Bias-corrected accelerated bootstrap method
bgs	Below ground surface
COPC	Contaminant of potential concern
COPEC	Contaminant of potential ecological concern
CTS	Cove transfer station
EPC	Exposure point concentration
EU	Exposure unit
G	Gamma distribution
H-UCL	UCL based upon Land's H-statistic
J	Estimated value
KM	Kaplan-Meier
KM (t)	UCL based upon Kaplan-Meier estimates using the Student's t-distribution critical value
LN	Lognormal distribution
LT	Result less than requested minimum detectable concentration, but greater than sample-specific
mg/kg	Milligram per kilogram
N	Normal distribution
NP	Nonparametric distribution
pCi/g	Picocurie per gram
QL	XRF reported value is detected but is less than the minimum XRF value used in the correlation but greater than the XRF value that would equal a laboratory concentration of zero.
UCL	Upper confidence limit of the mean
UCL95	One-sided 95 percent upper confidence limit on the mean
USEPA	U.S. Environmental Protection Agency
XRF	X-ray fluorescence

References:

U.S. Environmental Protection Agency (USEPA). 2002. "Calculating Exposure Point Concentrations at Hazardous Waste Sites." OSWER 9285.6-10. Office of Emergency and Remedial Response. December.
USEPA. 2015. "ProUCL Version 5.1 Technical Guide." Prepared by A. Singh and A.K. Singh. EPA/600/R-07/041. October.

Table 6. Risk-Based Soil Screening Levels for Human Health and Ecological Receptors

Human Receptors [a,b]							
Receptor	**Age**	**Toxic Effect**	**Radium-226 (pCi/g)**	**Arsenic (mg/kg)**	**Selenium (mg/kg)**	**Uranium (mg/kg)**	**Vanadium (mg/kg)**
Kee'da'whíí téeh (Full-Time Navajo Resident)	Child+Adult	Cancer	0.11	0.62	--	--	--
	Child	Noncancer	--	0.31	5.8	0.92	27
	Adult	Noncancer	--	0.9	22	3.2	75

Ecological Receptors [c]					
Receptor	**Radium-226 (pCi/g)**	**Arsenic (mg/kg)**	**Selenium (mg/kg)**	**Uranium (mg/kg)**	**Vanadium (mg/kg)**
Plant	540	91	3	250	80
Soil Invertebrates [d]	15	68	41	NA	NA
Avian Herbivore [d]	340	340	1.9	15,000	13
Avian Ground Insectivore [d]	82	150	1.4	11,000	9.5
Avian Carnivore [d]	610	1,000	7.5	140,000	110
Mammalian Herbivore	3,400	180	3.4	2,600	1,500
Mammalian Ground Insectivore	5,100	31	1	1,200	610
Mammalian Carnivore	3,700	1,300	130	12,000	6,900

Notes:

a The methodology and exposure inputs for calculating the human health RBSLs for cancer and noncancer are provided in the "Navajo Nation-Wide Risk Assessment Conceptual Site Model and Methodology" (Tetra Tech, Forthcoming).

b The target cancer risk used in the RBSLs is three in ten thousand (3E-04) and the target noncancer hazard is 1.

c Ecological RBSLs are LOECs based on Los Alamos National Laboratory ECORISK database low-effect level environmental screening levels (Newport News Nuclear BWXT-Los Alamos, LLC. 2020).
Screening levels for birds and mammals are low effect values for avian herbivores (American robin), avian ground insectivores (American robin), avian intermediate carnivores (American kestrel), mammalian herbivores (mountain cottontail), mammalian ground insectivores (montane shrew), and mammalian top carnivores (gray fox).

d Soil invertebrates and avian receptors are exposed to surface soil (0-12 inches below ground surface) only.

-- Not applicable

LOEC Lowest observed effect concentration

mg/kg Milligram per kilogram

NA Not available

pCi/g Picocurie per gram

RBSL Risk-based screening level

Table 6. Risk-Based Soil Screening Levels for Human Health and Ecological Receptors

References:

Newport News Nuclear BWXT-Los Alamos, LLC. 2020. “ECORISK Database (Release 4.2).” Document EM2020-0575, Los Alamos, New Mexico. N3B 2020, 701067. November.

Tetra Tech, Inc. (Tetra Tech). Forthcoming. “Navajo Nation-Wide Risk Assessment Conceptual Site Model and Methodology. ”

Table 7. Human Health Risk and Hazard Summary

EU 1 - Kee'da'whíí téeh (Full-Time Navajo Resident) at Cove Transfer Stations Complex within the Chinle Formation - Surface Soil (0-12 inches bgs)					
COPC [a]	Units	Exposure Point Concentration	Cancer Risk [b]	Noncancer Hazard [b]	
				Child	Adult
Surface Soil (0-12 inches bgs)					
Radionuclides [c]					
Radium-226	pCi/g	2.2	**6.0E-03**	--	--
		Radionuclide Total	**6E-03**	--	--
Metals					
Arsenic	mg/kg	2.7	**1.3E-03**	**8.5**	**2.9**
Selenium	mg/kg	0.73	--	0.13	0.033
Uranium	mg/kg	2.4	--	**2.6**	0.76
Vanadium	mg/kg	18	--	0.68	0.25
		Metal Total	**1E-03**	**10**	**4**
		Grand Total	**7E-03**	**10**	**4**

EU 1 - Kee'da'whíí téeh (Full-Time Navajo Resident) at Cove Transfer Stations Complex within the Chinle Formation - Surface and Subsurface Soil (0-72 inches bgs)					
COPC [a]	Units	Exposure Point Concentration	Cancer Risk [b]	Noncancer Hazard [b]	
				Child	Adult
Surface and Subsurface Soil (0-72 inches bgs)					
Radionuclides [c]					
Radium-226	pCi/g	1.7	**4.7E-03**	--	--
		Radionuclide Total	**5E-03**	--	--
Metals					
Arsenic	mg/kg	2.7	**1.3E-03**	**8.6**	**3.0**
Selenium	mg/kg	0.81	--	0.14	0.037
Uranium	mg/kg	2.4	--	**2.6**	0.76
Vanadium	mg/kg	18	--	0.68	0.24
		Metal Total	**1E-03**	**10**	**4**
		Grand Total	**6E-03**	**10**	**4**

Notes:

EU 2 is not included because there are not current soil sample or XRF sample results.

a **Bolded** COPCs are selected as risk-based contaminants of concern because cancer risk is greater than 3E-04 or noncancer hazard is greater than 1.

b **Bolded** values are values greater than the target cancer risk of 3E-04 or noncancer target hazard of 1. Cancer risk is calculated by dividing the EPC by the cancer RBSL and multiplying by the target risk used for the cancer RBSL. Noncancer hazard is calculated by dividing the EPC by the noncancer RBSL for the age group evaluated. The methodology for calculating the risks and hazards, and the inputs for cancer and noncancer equations are provided in the "Navajo Nation-Wide Risk Assessment Conceptual Site Model and Methodology" (Tetra Tech, Forthcoming). Total risks and total hazards are reported to 1 significant digit; thus, values are commonly rounded. In practice, values can be slightly higher than the stated cutoff but still be considered equal to the cutoff because of rounding.

Table 7. Human Health Risk and Hazard Summary

Notes (continued):

c	For radionuclides, uranium-238 is assumed to be in secular equilibrium with its decay chain, meaning all decay chain nuclides are present in equal activity concentrations. In this case, the risk from radium-226 and its decay products (that is radium-226 in secular equilibrium) will account for most of the risk from the uranium-238 decay chain. Further information on secular equilibrium is provided in Section 2.4.3.
--	Not applicable
bgs	Below ground surface
COPC	Contaminant of potential concern
EPC	Exposure point concentration
EU	Exposure unit
mg/kg	Milligram per kilogram
pCi/g	Picocurie per gram
RBSL	Risk-based screening level
XRF	X-ray fluorescence

Reference:

Tetra Tech, Inc. (Tetra Tech). Forthcoming. “Navajo Nation-Wide Risk Assessment Conceptual Site Model and Methodology. ”

Table 8. Human Health Risk-Based Contaminants of Concern Compared to Risk-Based Screening Levels and Background Threshold Values

EU 1 - Kee'da'whíí tééh (Full-Time Navajo Resident) at Cove Transfer Stations Complex within the Chinle Formation - Surface Soil (0-12 inches bgs)					
COC	**Units**	**EPC [a]**	**Human Health RBSL [b]**	**BTV [c]**	**Is EPC > RBSL and BTV? [d]**
Radium-226	pCi/g	2.2	0.11	2.4	No
Arsenic	mg/kg	2.7	0.31	2.9	No
Uranium	mg/kg	2.4	0.92	1.7	**Yes**

EU 1 - Kee'da'whíí tééh (Full-Time Navajo Resident) at Cove Transfer Stations Complex within the Chinle Formation - Surface and Subsurface Soil (0-72 inches bgs)					
COC	**Units**	**EPC [a]**	**Human Health RBSL [b]**	**BTV [c]**	**Is EPC > RBSL and BTV? [d]**
Radium-226	pCi/g	1.7	0.11	2.4	No
Arsenic	mg/kg	2.7	0.31	2.9	No
Uranium	mg/kg	2.4	0.92	1.7	**Yes**

Notes:

EU 2 is not included in this table because there are not analytical data or XRF measurements representing current conditions; therefore, risk and hazard cannot be calculated.

a EPCs are provided on Table 6.

b The human health RBSLs are provided on Table 6.

c The BTVs are provided on Table 2.

d If **Yes,** the contaminant of concern should be considered for removal action. If **No**, the contaminant of concern is not recommended for removal action based on the available data.

bgs	below ground surface
BTV	Background threshold value
COC	Contaminant of concern
EPC	Exposure point concentration
EU	Exposure unit
mg/kg	Milligram per kilogram
pCi/g	Picocurie per gram
RBSL	Risk-based screening level
XRF	X-ray fluorescence

Table 9. Uranium Concentrations in Cove Transfer Stations Complex Soil Borings

Cove Transfer Stations Complex Site	Boring ID	Sample Depth (Inches bgs)	Result (mg/kg)
CTS	T9-SS67	0-6	1.7
		6-48	0.85
		48-96	0.71
		120-132	0.4
	T9-SS109	0-6	4.4
		6-18	12
		60-72	0.72
		84-102	1.4
	T9-SS129	0-6	1
		6-24	1
		24-48	0.92
		48-96	0.48
		96-114	0.45
	T9-SS144	0-6	1.2
		6-18	1.4
		24-36	0.98
		48-60	0.94
		108-120	0.54
		156-162	0.49
	T9-SS155	0-6	0.71
		6-18	2.7 J
		48-60	11
		108-120	0.71
		168-180	0.6
	T9-SS176	0-6	0.67
		6-18	0.75
		24-36	4.6
		48-60	0.83
		108-120	0.75
	T9-SS185	0-6	0.88
		6-18	1.1
		24-36	0.73
		48-60	0.69
		108-120	0.54
		156-162	0.4
	T9-SS212	0-6	0.98
		6-18	1.4
		24-36	0.5
		48-60	0.54
		108-120	0.72
	T9-SS216	0-6	2.8
		6-12	4.6
		12-18	5.9
	T9-SS227	0-6	1.2
		6-12	1.8
		12-18	0.7

Table 9. Uranium Concentrations in Cove Transfer Stations Complex Soil Borings

Cove Transfer Stations Complex Site	Boring ID	Sample Depth (Inches bgs)	Result (mg/kg)
CTS South	T37-SS86A	0-6	0.86
		6-18	1.4
		24-36	1.2
		48-60	0.91
		108-120	0.55
	T37-SS69	0-6	0.65
		6-18	1.6
		18-48	0.58
		48-66	0.59
		84-96	0.85
	T37-SS77	0-6	0.43
		6-18	3.1
		18-48	1.9
		48-72	1.2
	T37-SS86	0-6	0.98
		6-18	13
		24-36	3.1
		48-60	0.81
		108-120	0.63
	T37-SS87	0-6	0.95
		6-18	0.6
		24-36	0.57
		48-60	0.85
		108-120	0.57
	T37-SS94	0-6	1.3
		6-18	1.5
		24-36	0.49
		48-60	0.77
		108-120	0.5
	T37-SS103	0-6	1.1
		6-18	1
		24-36	0.51
		48-60	0.62
		108-120	0.59

Notes:

X.X	Results highlighted in in pink exceed the BTV of 1.7 mg/kg.
a	Sample locations are shown on Figures 19 and 20.
b	Sample results for all the samples within each boring are shown to illustrate the vertical profile of uranium at each boring. The depth intervals of concern for full-time residents are 0 to 12 inches bgs and 0 to 72 inches bgs.
CTS	Cove Transfer Station
bgs	below ground surface
BTV	Background threshold value
J	Estimated
mg/kg	Milligram per kilogram

Table 10: Ecological Risk Hazard Quotients

EU 1 - Kee'da'whíí tééh (Full-Time Navajo Resident) at Cove Transfer Stations Complex within the Chinle Formation - Surface Soil (0-12 inches bgs)											
COPEC [a]	**Units**	**EPC**	**Plant HQ**	**Soil Invertebrates HQ**	**Avian Herbivore HQ**	**Avian Ground Insectivore HQ**	**Avian Carnivore HQ**	**Mammalian Herbivore HQ**	**Mammalian Ground Insectivore HQ**	**Mammalian Carnivore HQ**	**Maximum HQ**
Radionuclides											
Radium-226	pCi/g	2.2	0.004	0.1	0.006	0.03	0.004	0.0006	0.0004	0.0006	0.1
Metals											
Arsenic	mg/kg	2.7	0.03	0.04	0.008	0.02	0.003	0.01	0.09	0.002	0.09
Selenium	mg/kg	0.73	0.24	0.02	0.4	0.5	0.1	0.2	0.7	0.006	0.7
Uranium	mg/kg	2.4	0.01	--	0.0002	0.0002	0.000017	0.0009	0.002	0.0002	0.01
Vanadium	mg/kg	18	0.23	--	1	**2**	0.2	0.01	0.03	0.003	**2**

EU 1 - Kee'da'whíí tééh (Full-Time Navajo Resident) at Cove Transfer Stations Complex within the Chinle Formation - Surface and Subsurface Soil (0-72 inches bgs)											
COPEC [a]	**Units**	**EPC**	**Plant HQ**	**Soil Invertebrates HQ**	**Avian Herbivore HQ**	**Avian Ground Insectivore HQ**	**Avian Carnivore HQ**	**Mammalian Herbivore HQ**	**Mammalian Ground Insectivore HQ**	**Mammalian Carnivore HQ**	**Maximum HQ**
Radionuclides											
Radium-226	pCi/g	1.7	0.003	0.1	0.005	0.02	0.003	0.0005	0.0003	0.0005	0.1
Metals											
Arsenic	mg/kg	2.7	0.03	0.04	0.008	0.02	0.003	0.01	0.09	0.002	0.09
Selenium	mg/kg	0.81	0.27	0.02	0.4	0.6	0.1	0.2	0.8	0.006	0.8
Uranium	mg/kg	2.4	0.01	--	0.0002	0.0002	0.000017	0.0009	0.002	0.0002	0.01
Vanadium	mg/kg	18	0.23	--	1	**2**	0.2	0.01	0.03	0.003	**2**

Notes:

EU 2 is not included in this table because there are not analytical data or XRF measurements representing current conditions; therefore, HQs cannot be calculated.

HQ is calculated by dividing the EPC by the ecological RBSL. **Bolded** HQ values indicate HQs greater than 1.

Ecological RBSLs are LOECs based on Los Alamos National Laboratory ECORISK database low effect level environmental screening levels (Newport News Nuclear BWXT-Los Alamos, LLC. 2020). Screening levels for birds and mammals are low effect values for avian herbivore (American robin), avian insectivore (American robin), avian intermediate carnivore (American kestrel), mammalian herbivore (mountain cottontail), mammalian insectivore (montane shrew), and mammalian top carnivore (gray fox). The LOECs for each guild are provided on Table 7.

a **Bolded** COPECs have a HQ greater than 1.

Table 10: Ecological Risk Hazard Quotients

Notes (Continued):

--	No screening level	EU	Exposure Unit	RBSL	Risk-based screening level
bgs	Below ground surface	HQ	Hazard quotient	XRF	X-ray fluorescence
COPEC	Contaminant of potential ecological concern	mg/kg	Milligram per kilogram		
EPC	Exposure point concentration	pCi/g	Picocurie per gram		

Reference:

Newport News Nuclear BWXT-Los Alamos, LLC. 2020. “ECORISK Database (Release 4.2).” Document EM2020-0575, Los Alamos, New Mexico. N3B 2020, 701067. November.

Table 11: Contaminants of Ecological Concern Compared to Risk-Based Screening Levels and Background Threshold Values

EU 1 - Kee'da'whíí tééh (Full-Time Navajo Resident) at Cove Transfer Stations Complex within the Chinle Formation - Surface Soil (0-12 inches bgs)					
COPEC	**Units**	**EPC[a]**	**Ecological RBSL[b]**	**BTV [c]**	**Is EPC > RBSL and BTV?[d]**
Vanadium	mg/kg	18	9.5	18	No

EU 1 - Kee'da'whíí tééh (Full-Time Navajo Resident) at Cove Transfer Stations Complex within the Chinle Formation - Surface and Subsurface Soil (0-72 inches bgs)					
COPEC	**Units**	**EPC[a]**	**Ecological RBSL[b]**	**BTV [c]**	**Is EPC > RBSL and BTV?[d]**
Vanadium	mg/kg	18	9.5	18	No

Notes:

EU 2 is not included in this table because there are not current analytical data or XRF measurements; therefore, risk cannot be calculated.

a EPCs are provided on Table 6.

b The ecological RBSLs are provided on Table 7.

c The BTVs are provided on Table 2.

d If **Yes**, the COPEC is identified as a COEC and should be considered for removal action. If **No**, the COPEC is not recommended for removal action based on the available data.

bgs	below ground surface
BTV	Background threshold value
COEC	Contaminant of ecological concern
COPEC	Contaminant of potential ecological concern
EPC	Exposure point concentration
EU	Exposure unit
mg/kg	Milligram per kilogram
RBSL	Risk-based screening level
XRF	X-ray fluorescence

Table 12. Risk-Based Screening Levels, Background Threshold Values, and Removal Action Goals

EU 1 - Kee'da'whíí tééh (Full-Time Navajo Resident) at Cove Transfer Stations Complex within the Chinle Formation - Surface Soil (0-12 inches bgs)						
COC/ COEC [a]	**Units**	**EPC[b]**	**Human Health RBSL[c]**	**Ecological RBSL[c]**	**BTS[d]**	**Removal Action Goal[e]**
Surface Soil (0-12 inches bgs)						
Uranium	mg/kg	2.4	0.92	--	1.7	1.7

EU 1 - Kee'da'whíí tééh (Full-Time Navajo Resident) at Cove Transfer Stations Complex within the Chinle Formation - Surface and Subsurface Soil (0-72 inches bgs)						
COC/ COEC [a]	**Units**	**EPC[b]**	**Human Health RBSL[c]**	**Ecological RBSL[c]**	**BTS[d]**	**Removal Action Goal[e]**
Surface Soil (0-12 inches bgs)						
Uranium	mg/kg	2.4	0.92	--	1.7	1.7

Notes:

EU 2 is not included in this table because there are no analytical data or XRF measurements; therefore, risk cannot be calculated. Note: Multiple lines of evidence are used in determining whether an EU will have a removal action. Identification of COCs or COECs are two of these lines of evidence. Other lines of evidence include whether contamination is known to exist, such as in a burial cell, or elevated gamma radiation.

a The COCs are identified on Table 8 and the COECs are identified on Table 11. For radium-226, the human health RBSL assumes secular equilibrium of Ra-226 and its decay products.

b The EPCs are provided on Table 6.

c The human health and ecological RBSLs are provided on Table 6. The human health RBSL is based on the receptor assumed at each EU. The ecological RBSL is based on the minimum lowest observed effects concentration for all feeding guilds evaluated for the depth interval.

d The BTVs are provided on Table 2.

e The removal action goal is the lesser of the human health and ecological RBSLs, unless the background level is greater than both RBSLs. If the BTV is greater than the RBSLs, the removal action goal is the BTV.

-- Not a COC or COEC

bgs below ground surface

BTV Background threshold value

COC Contaminant of concern

COEC Contaminant of ecological concern

EPC Exposure point concentration

EU Exposure unit

mg/kg Milligram per kilogram

RBSL Risk-based screening level

XRF X-ray fluorescence

Table 13. General Response Actions, Technologies, and Process Options Screening Summary

General Response Actions	Response Action Technology	Process Options	Description	Screening Comment
No Action	None	Not applicable	No action	Not applicable
Institutional Controls	Access Restrictions	Land Use Controls	Implement administrative restrictions to control current and future land use, including traditional Navajo Lifeways.	Potentially effective in conjunction with other technologies; reduces opportunities for Navajo community exposure during typical land use activities. Protective in areas of a site with mineralized bedrock that cannot be addressed under CERCLA. Requires implementing authorities.
Engineering Controls	Access Restrictions	Fencing/Barrier	Install gate at road, fence around waste piles and mine shafts, and gates/barrier on adits to limit access.	Potentially effective in conjunction with other technologies; limits access to physical hazards and direct exposure to radionuclides and radon gas; however, would require annual inspection and repair for vandalism.
	Surface Controls	Consolidation, Grading, Revegetation, and Erosion Protection	Combine mine waste in a smaller common area. Return waste to mine openings, benches, and pits. Grade waste piles to reduce slopes for managing erosion and runoff. Add amendments and seed or revegetate to establish an erosion-resistant ground surface. Install sedimentation basins, run-on and run-off controls, and diversion ditches.	Effective in conjunction with other technologies; reduces physical hazards through backfilling of mine openings and pits; limits exposed waste surface area through consolidation; limits erosion of soil and migration to drainages; reduces storm water run-on and runoff; effective for material impinging on drainages; readily implementable. Does not fully address direct exposure, leaching, or potential wind erosion and migration off site.
		Soil Binder	Apply a chemical binder to soil to reduce wind and water erosion of soil.	Potentially effective in conjunction with other process options; limits mobility of metals and radionuclides to downwind receptors; does not address direct exposure, leaching, or stormwater erosion; not protective over long term; readily implementable.

Table 13. General Response Actions, Technologies, and Process Options Screening Summary

General Response Actions	Response Action Technology	Process Options	Description	Screening Comment
Engineering Controls	Containment	Earthen Cover	Apply soil cover over in situ or consolidated mine waste; establish vegetation to stabilize surface; waste materials are left in place. Reduces gamma and radon gas exposure.	Limits direct exposure and reduces gamma irradiation and radon gas flux; surface water infiltration would be reduced; should be combined with surface controls; implementable but would require a somewhat flat area and regrading. Earthen covers on moderate to steep slopes are not successful without benching. Retained for remote areas where access is limited and direct exposure and gamma irradiation reduction through soil shield is primary goal.
		Earthen Cover with Upper HDPE or Geosynthetic Clay Liner	Install clay layer, HDPE, or geosynthetic clay liner within cover over mine waste to reduce rainwater infiltration and radon flux; establish vegetation to stabilize surface; waste materials are left in place. Reduces gamma and radon exposure.	Limits direct exposure and reduces gamma irradiation; surface water infiltration and radon flux would be eliminated; should be combined with surface controls; implementable but would require a somewhat flat area and regrading. Earthen cover on steep slopes are not successful without benching. Retained where leachate is a concern.
	On-Mesa/ Regional Disposal	Repository with Upper HDPE or Geosynthetic Clay Liner	Excavate mine waste and consolidate but outside the 100-year flood plain. Install clay layer, HDPE, or geosynthetic clay liner within cover over mine waste to reduce rainwater infiltration and radon flux; establish vegetation to stabilize surface. Reduces gamma and radon exposure.	Limits direct exposure, reduces gamma irradiation, and reduces the overall surface exposure area through consolidation; surface water infiltration and radon flux would be eliminated; should be combined with surface controls; readily implementable. Retained where in situ capping is not feasible and leachate is a concern.

Table 13. General Response Actions, Technologies, and Process Options Screening Summary

General Response Actions	Response Action Technology	Process Options	Description	Screening Comment
Engineering Controls	On-Mesa/ Regional Disposal	Repository with Encapsulating Geosynthetic Clay Liners	Excavate mine waste and consolidate outside the 100-year flood plain. Install upper and lower geosynthetic clay liner to prevent rainwater infiltration, reduce radon flux, and capture any generated leachate; apply soil cover and establish vegetation to stabilize surface. A leachate collection system would be needed which requires significant site preparation. Reduces gamma and radon exposure.	Limits direct exposure, reduces gamma irradiation, and reduces the overall surface exposure area through consolidation; surface water infiltration and radon flux would be eliminated; any potential leachate generated would be controlled by bottom liner and recovery system; should be combined with surface controls; readily implementable. An encapsulation system would only be required for high concentration and highly leachable waste. An isolation cell within a less controlled system should be considered where only small volumes of this type of waste are present.
	Off-Navajo Nation Disposal	Class A LLRW or RCRA C Hazardous Waste Disposal Facility	Excavate mine waste, sort, transport, and dispose of waste at an off-Navajo Nation Class A LLRW or RCRA C hazardous waste disposal facility; leachate generation characteristics may require stabilization.	Removes on-site direct exposure and gamma irradiation by isolating waste at an off-Navajo Nation LLRW or hazardous waste disposal facility where waste is covered or encapsulated; readily implementable. However, transport, any pretreatment, and disposal costs may be cost prohibitive because of the long haul distances required. Transportation costs should be weighed against long-term O&M costs associated with on-site disposal.
Excavation and Treatment	Physical/ Chemical Treatment	Milling/ Reprocessing	Excavate mine waste, sort, transport, and process waste at an operating mill for economic recovery of uranium; dispose of tailings at mill tailings disposal facility.	Removes on-site direct exposure and gamma irradiation by processing of waste at an off-Navajo Nation mill. Processed waste (tailings) are covered or encapsulated in a disposal cell; readily implementable. However, transport, milling, and disposal costs may be cost prohibitive because of the long haul distances required. Transportation costs should be weighed against long-term O&M costs associated with on-site disposal. A portion of the costs may be offset by economic value of uranium recovered.

Table 13. General Response Actions, Technologies, and Process Options Screening Summary

General Response Actions	Response Action Technology	Process Options	Description	Screening Comment
Excavation and Treatment	Physical/ Chemical Treatment	Acid Extraction	Excavate mine waste, sort, and screen waste to increase percentage of fines for acid digestion. Solubilize uranium and other metals via dissolution or acid leaching and recover by precipitation. Dispose of fines, process solutions, and oversize of materials.	Treatability testing required; effectiveness questionable; increases mobility by partial dissolution of contaminants; difficulty encountered because of gravel to rock sized waste rock and disseminated nature of uranium; increases toxicity of fines; requires disposal of treated fines and oversize material; cost prohibitive.
		Fixation/ Stabilization	Uses solidifying agents to facilitate a physical or chemical change in leachability and mobility of contaminants.	Treatability testing required; readily implementable; would still require disposal following stabilization; cost prohibitive as a pretreatment step compared with a clay liner or geosynthetic clay upper liner within an earthen cover; feasible as a pretreatment option for a small volume of waste placed in an onsite or on-mesa isolation cell or for disposal off Navajo Nation where required to address contaminant leachability.
In-Place Treatment	Physical/ Chemical Treatment	Stabilization	Stabilize waste constituents in situ when combined with injected stabilizing agents.	Extensive treatability testing required; more difficulty encountered because of gravel to rock sized waste rock; does not reduce gamma irradiation; potentially implementable but requires a large amount of stabilizing agents and water for delivery (no water infrastructure); cost prohibitive.
		Solidification	Use solidifying agents in conjunction with deep soil mixing techniques to facilitate a physical or chemical change in the mobility of contaminants.	Extensive treatability testing required; more difficulty encountered because of gravel to rock sized waste rock; does not reduce gamma irradiation; potentially implementable but requires a large amount of solidifying agents and water for delivery (no water infrastructure); cost prohibitive.

Table 13. General Response Actions, Technologies, and Process Options Screening Summary

General Response Actions	Response Action Technology	Process Options	Description	Screening Comment
In-Place Treatment	Thermal Treatment	Vitrification	Uses extremely high temperature to melt and volatilize all components of the solid media; the molten material is cooled and, in the process, vitrified into a non-leachable form.	Extensive treatability testing required; difficulties may be encountered in establishing adequate control; does not reduce gamma irradiation; not implementable because of the remoteness of the site (no high voltage electrical infrastructure); cost prohibitive.
	Vegetative Treatment	Phytoextraction/ Phytostabilization	Uptake of contaminants by plant roots and accumulation of contaminants within plant shoots and leaves. Immobilization of contaminants at interfaces of roots and soil by absorption or adsorption; precipitation or complexation in root zone, binding to humic matter in the root zone.	Extensive treatability testing required for phytostabilization of radionuclides; phytoextraction requires harvest and disposal of vegetative growth containing radionuclides, and fencing to exclude livestock and wildlife to prevent vegetative bioaccumulation. Long-term protectiveness has not been demonstrated and O&M costs may be prohibitive.

Notes:

Eliminated alternatives are shaded.

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
HDPE High-density polyethylene
LLRW Low-level radioactive waste
O&M Operation and maintenance
RCRA Resource Conservation and Recovery Act

Table 14. Potential Federal and Tribal Chemical-Specific ARARs

Citation	Requirement	Prerequisite	Preliminary ARAR Determination	Comments
FEDERAL				
SOIL				
No potential chemical-specific ARARs are identified for metals or radionuclides or radioactivity in soil and waste rock at the Cove Transfer Stations Group. Preliminary removal action goals are risk-based goals and not ARAR-based standards.				
AIR				
Uranium Mill Tailings Radiation Control Act				
40 CFR § 192.02(b)	Control of residual radioactive materials and their listed constituents must be designed to assure that the release of radon-222 to the atmosphere: (1) not exceed an average (over the entire surface of the disposal site and over at least a 1-year period) of 20 pCi/m^2-sec; or (2) not increase the annual average concentration of radon-222 in air at or above any location outside the disposal site by more than 0.5 pCi/L.	UMTRCA Title I Site	Relevant and appropriate	These standards are applicable to UMTRCA Title I Sites. The Cove Transfer Stations Group, new Mesa V repository, and new regional repository are not Title I sites; therefore, these requirements are not applicable. These requirements have been determined to be relevant and appropriate to the design of the repository to be constructed in Alternatives 2 or 3, which consists of a disposal site for the contaminated soil and uranium waste rock.

Table 14. Potential Federal and Tribal Chemical-Specific ARARs

Citation	Requirement	Prerequisite	Preliminary ARAR Determination	Comments
FEDERAL				
Clean Air Act				
40 CFR §§ 61.222(a) and 61.223(a)	Radon-222 emissions to the ambient air from a uranium mill tailings pile that is no longer operational shall not exceed 20 pCi/m^2-sec. Testing shall be conducted in accordance with the procedures described in 40 CFR Part 61, Appendix B, Method 115, 60 days after completion of the waste pile cover to limit radon emissions, but before the long-term stabilization (defined as the addition of material on the pile for the purpose of ensuring compliance with the requirements of 40 CFR § 192.02[a]).	Non-operational uranium mill tailing disposal site	Relevant and appropriate	These requirements are applicable to non-operational uranium mill tailings piles. The Cove Transfer Stations Group does not contain uranium mill tailings and none of the waste to be disposed of in the new Mesa V or regional repositories are uranium mill tailings. These requirements have been determined to be relevant and appropriate for the new Mesa V and regional repositories, which consist of disposal sites for the uranium waste rock from the Cove Transfer Stations Group. Testing must be completed 60 days after completion of the waste pile cover to limit radon emission but before long-term stabilization.
TRIBAL				
No potential chemical-specific tribal ARARs are identified for metals or radionuclides or radioactivity in soil or in air emissions at the Cove Transfer Stations Group. Preliminary removal action goals are risk-based goals and not ARAR-based standards.				

Notes:

§	Section
§§	Sections
ARAR	Applicable or relevant and appropriate requirement
CFR	*Code of Federal Regulations*
pCi/L	Picocurie per liter
pCi/m^2-sec	Picocurie per square meter per second
UMTRCA	Uranium Mill Tailings Radiation Control Act

Table 15. Potential Federal and Tribal Location-Specific ARARs

Citation	Requirement	Prerequisite	Preliminary ARAR Determination	Comments
FEDERAL				
BIOLOGICAL RESOURCES				
Endangered Species Act				
16 U.S.C. §§ 1536(a)(2) and 1538 50 CFR § 17.11, 17.21, and 17.31(a)	Federal agencies may not carry out actions that jeopardize the continued existence of any listed species. It is unlawful to take a threatened or endangered species or cause the destruction or modification of critical habitat.	Presence of a threatened or endangered species	Applicable	The MSO, a federal threatened species, is not present at the Cove Transfer Stations Group but has been identified near the Mesa V repository location in Alternative 2. Biological surveys will be completed before onsite construction of the repository to assess whether MSOs are present and would be affected by the removal action. If present, USEPA will collaborate with the U.S. Fish and Wildlife Service to develop appropriate avoidance measures and habitat restoration requirements.
CULTURAL RESOURCES				
National Historic Preservation Act				
54 U.S.C. §§ 30610, 306102, 306107, and 306108 36 CFR Part 800	Federal agencies are required to protect historic properties and to take into account the effect of their actions on historic properties. Federal agencies must consult with the THPO to determine whether proposed federal actions will have an adverse effect on historic properties and to identify alternatives or modifications to the proposed action to avoid, minimize, or mitigate adverse effects.	Property included on or eligible for the National Register of Historic Places	Applicable	Cultural resource surveys identified culturally sensitive areas within the survey area boundaries of Cove Transfer Station (CTS) and CTS South. Cultural resource monitoring will continue during implementation of the removal action.

Table 15. Potential Federal and Tribal Location-Specific ARARs

Citation	Requirement	Prerequisite	Preliminary ARAR Determination	Comments
FEDERAL				
Preservation of Historical and Archaeological Data Act				
54 U.S.C. §§ 312502 and 312503	When federal agency action may cause irreparable loss or destruction of significant scientific, prehistorical, historical, or archaeological data, the federal agency may recover, protect, and preserve the data requested.	Federal agency action that would cause irreparable loss to significant historic or archaeologic al data.	Applicable	Cultural resource surveys identified culturally sensitive areas within the survey area boundaries of CTS and CTS South. Cultural resource monitoring will continue during implementation of the removal action.
Native American Graves Protection and Repatriation Act				
25 U.S.C. §§ 3001-3013 43 CFR §§ 10.4, 10.5, 10.6, and 10.7	When human remains, funerary objects, sacred objects, or objects of cultural patrimony on federal or tribal lands are discovered on tribal land, the responsible tribe must be notified, activity in the area must stop, and consultation with the tribe must be initiated to determine proper ownership and custody.	Excavation on federal or tribal land.	Applicable	Cultural resource surveys identified culturally sensitive areas within the survey area boundaries of CTS and CTS South. Cultural resource monitoring will continue during implementation of the removal action.

Table 15. Potential Federal and Tribal Location-Specific ARARs

Citation	Requirement	Prerequisite	Preliminary ARAR Determination	Comments
TRIBAL				
BIOLOGICAL RESOURCES				
Navajo Nation Endangered Species Act (ESA)				
Navajo Nation Code, Title 4, Chapter 3, Subchapter 21 § 507(A) and (C)	It is unlawful for anyone to take, possess, transport, export, process, sell, offer for sale, or ship any species appearing on any of the following lists: (1) the list of endangered species developed by the Navajo Nation Council; or (2) U.S. threatened or endangered species list.	A species on the Navajo Nation Council list or on the U.S. threatened or endangered species list	Applicable	The Navajo Nation has listed the MSO as a Group 3 endangered species. The MSO is not present at the Cove Transfer Stations Group but has been identified near the Mesa V repository location in Alternative 2. The Navajo Nation ESA is identified as a potential tribal ARAR to the extent that it presents requirements that are more stringent than those in the federal ESA. If the MSO is determined to be present at the Mesa V repository site and will be affected by the removal action, USEPA will collaborate with the Navajo Nation to determine if the Navajo Nation ESA presents requirements for avoidance and habitat restoration that are more stringent than those in the federal ESA.
CULTURAL RESOURCES				
Navajo Nation Cultural Resources Protection Act				
Navajo Nation Code, Title 19, Chapter 11 § 1021	The sponsor of any undertaking on Navajo land must obtain the approval from the Preservation Officer before implementation of the undertaking to ensure protection of cultural resources.	Undertaking on Navajo lands	Applicable	Cultural resource surveys identified culturally sensitive areas within the survey area boundaries of CTS and CTS South. Cultural resource monitoring will continue during implementation of the removal action.

Notes:

§	Section
§§	Sections
ARAR	Applicable or relevant and appropriate requirement
CFR	*Code of Federal Regulations*
CTS	Cove Transfer Station
ESA	Endangered Species Act
MSO	Mexican spotted owl
THPO	Tribal Historic Preservation Office
U.S.C.	*United States Code*
USEPA	U.S. Environmental Protection Agency

Table 16. Potential Federal and Tribal Action-Specific ARARs

Action	Alternatives	Citation	Summary of Requirement	Prerequisite	Preliminary ARAR Determination	Comments
FEDERAL						
Clean Water Act						
Excavation at the Cove Transfer Stations Group and construction , repair, and removal of haul/access roads	2, 3, 4, 5	33 U.S.C. § 1342(p)(3)(A) 40 CFR § 122.44(k)(2)	Construction activity that affects 1 acre or more must use best management practices to control stormwater discharge	Construction activity that effects 1 acre or more	Applicable	The excavation at the Cove Transfer Stations Group and the construction of the Mesa V or regional repository will affect more than 1 acre. Best management practices would be used to control stormwater discharge.
Uranium Mill Tailings Radiation Control Act						
Construction of the cap at the Mesa V or regional repository	2, 3	40 CFR § 192.02(a)	The design for the control of residual radioactive materials must be effective for up to 1,000 years to the extent reasonably achievable and, in any case, for at least 200 years.	UMTRCA Title I uranium mill site	Relevant and appropriate	The UMTRCA design standard is not applicable to the Mesa V or regional repository. However, the requirement is identified as relevant and appropriate because the Mesa V or regional repository will control residual radioactive materials similar to an UMTRCA disposal site, and will be considered to the extent practicable.

Table 16. Potential Federal and Tribal Action-Specific ARARs

Action	Alternatives	Citation	Summary of Requirement	Prerequisite	Preliminary ARAR Determination	Comments
FEDERAL						
Construction of the cap at the Mesa V or regional repository	2, 3	40 CFR § 192.02(d)	The uranium mill tailings disposal site must be designed and stabilized in a manner that minimizes the need for future maintenance.	UMTRCA Title I uranium mill site	Relevant and appropriate	The UMTRCA standard is not applicable to the Mesa V or regional repository. However, the requirement is identified as relevant and appropriate because the Mesa V or regional repository will control residual radioactive materials similar to an UMTRCA disposal site.
Atomic Energy Act						
Construction of the cap at the Mesa V or regional repository	2, 3	10 CFR Part 40, Appendix A, Criterion 1	Uranium mill tailings disposal site selection criteria, including (1) remoteness; (2) natural conditions that contribute to continued immobilization and isolation of contaminants from groundwater sources; (3) potential for minimizing erosion, disturbance, and dispersion by natural forces; and (4) disposed in a manner that no active maintenance is required to preserve site conditions.	NRC-licensed uranium mill tailings disposal site	Relevant and appropriate	These requirements are not applicable to the Mesa V or regional repository. However, the requirements are identified as relevant and appropriate because the Mesa V or regional repository will control residual radioactive materials.

Table 16. Potential Federal and Tribal Action-Specific ARARs

Action	Alternatives	Citation	Summary of Requirement	Prerequisite	Preliminary ARAR Determination	Comments
FEDERAL						
Construction of the cap at the Mesa V or regional repository	2, 3	10 CFR Part 40, Appendix A, Criterion 4	Uranium mill tailings disposal site design criteria, including (1) topographic features that provide good wind protection; (2) relatively flat cover slopes to minimize erosion; (3) full self-sustaining vegetative or rock cover to reduce wind and water erosion; (4) located away from a fault that could cause a maximum credible earthquake larger than what the impoundment could reasonably withstand; and (5) incorporate features that promote deposition where feasible.	NRC-licensed uranium mill tailings disposal site	Relevant and appropriate	These requirements are not applicable to the Mesa V or regional repository. However, the requirements are identified as relevant and appropriate because the Mesa V or regional repository will control residual radioactive materials.

Table 16. Potential Federal and Tribal Action-Specific ARARs

Action	Alternatives	Citation	Summary of Requirement	Prerequisite	Preliminary ARAR Determination	Comments
FEDERAL						
Construction of the cap at the Mesa V or regional repository	2, 3	10 CFR Part 40, Appendix A, Criterion 6(1)	Tailings must be covered by an earthen cover or approved appropriate alternative that (1) provides reasonable assurance of control of radiological hazards; (2) is effective for 1,000 years to the extent reasonably achievable and for at least 200 years; and (3) limits the release of radon-222 to the atmosphere so as not to exceed an average release rate of 20 pCi/m^2-sec to the extent practicable throughout the effective design life. Excess moisture in soil may not be considered; direct gamma exposure should be reduced to background; the effects of any thin synthetic layer may not be taken into account in calculating radon exhalation level; and non-soil covers must be demonstrated to not crack or degrade by differential settlement, weathering, or other mechanism.	NRC-licensed uranium mill tailings disposal site	Relevant and appropriate	These requirements are not applicable to the Mesa V or regional repository. However, the requirements are identified as relevant and appropriate because the Mesa V or regional repository will control residual radioactive materials. Three different types of covers, including an earthen cover, are evaluated for the Mesa V or regional repository. All of the covers would achieve the radon-222 emission standard (not to exceed 20 pCi/m2-sec) in this criterion and in the potential chemical-specific ARARs.

Table 16. Potential Federal and Tribal Action-Specific ARARs

Action	Alternatives	Citation	Summary of Requirement	Prerequisite	Preliminary ARAR Determination	Comments
FEDERAL						
Construction of the cap at the Mesa V or regional repository	2, 3	10 CFR Part 40, Appendix A, Criterion 6(3)	When the final radon barrier is placed in phases, verification of the radon-222 release rate must be completed for each portion of the final radon barrier as it is emplaced.	NRC-licensed uranium mill tailings disposal site	Relevant and appropriate	These requirements are not applicable to the Mesa V or regional repository. However, the requirements are identified as relevant and appropriate because the Mesa V or regional repository will control residual radioactive materials. Construction may occur over more than one season. If this occurs, the radon barrier will be tested when placed.
Construction of the cap at the Mesa V or regional repository	2, 3	10 CFR Part 40, Appendix A, Criterion 6(5)	Prohibiting near-surface materials from including waste or rock that contains elevated levels of radium, requiring that soils used for near-surface cover be essentially the same as far as radioactivity is concerned.	NRC-licensed uranium mill tailings disposal site	Relevant and appropriate	These requirements are not applicable to the Mesa V or regional repository. However, the requirement is identified as relevant and appropriate because Mesa V or regional repository will control residual radioactive materials. Soil cover material will be obtained from nearby borrow sources.

Table 16. Potential Federal and Tribal Action-Specific ARARs

Action	Alternatives	Citation	Summary of Requirement	Prerequisite	Preliminary ARAR Determination	Comments
FEDERAL						
Construction of the cap at the Mesa V or regional repository	2, 3	10 CFR Part 40, Appendix A, Criterion 6(7)	Disposal sites must be closed in a manner that minimizes the need for further maintenance and, to the extent necessary, to control, minimize, or eliminate post-closure escape of non-radiological hazardous constituents, leachate, contaminated rainwater, or waste decomposition products to the ground or surface waters or atmosphere.	NRC-licensed uranium mill tailings disposal site	Relevant and appropriate	These requirements are not applicable to the Mesa V or regional repository. However, the requirements are identified as relevant and appropriate because Mesa V or regional repository will control residual radioactive materials and uranium waste rock that contains metals. The containment of the radionuclides will also adequately contain the metals to prevent escape to other environmental media.
TRIBAL						
No potential tribal action-specific ARARs are identified						

Notes:

§	Section
§§	Sections
ARAR	Applicable or relevant and appropriate requirement
CFR	*Code of Federal Regulations*
NRC	Nuclear Regulatory Commission
pCi/m^2-sec	Picocurie per square meter per second
UMTRCA	Uranium Mill Tailings Radiation Control Act
U.S.C.	*United States Code*

Table 17. Site Restoration Matrix for Cove Transfer Stations Group

Restoration Areas	Surficial Restoration Type	Access Controls		Construction BMPs				Road Erosion Controls		Drainage Erosion Controls		Steep Slope Erosion Controls			Common Erosion Controls			
		Fencing/ Road Barriers	Portal Closure	Contouring and Inward Grading For Drainage	Benching/ Laying Back Steep Slopes and Highwalls	Pulling Overbank Material onto Road Cut	Grading Drainage for Energy Grade Line	Water Control Bars	Rock Crossings/ Culverts	Gabion Weir	Rocks/ Boulders/ Structures for Energy Dissipation	Gabion Wall	Articulated Concrete Matting	Shotcrete	Diverting Water Using Berms/ Ditches	Sediment Detention Basin/ Infiltration Gallery	Revegetation (Planting/ Seeding)	Blankets, Wattles, Coir Logs
Excavated Areas	Excavated Areas on Shallow Slopes																	

Notes:

Green shading means a restoration approach is applicable for a site area

No shading means a restoration approach is not applicable for a site area

BMP Best management practice

Table 18. Analysis of Alternatives for Cove Transfer Stations Group

Alternative		Threshold Criteria		Effectiveness		Implementability		Cost
		Protective of Human Health and the Environment	Compliance with ARARs	Short Term (during Action)	Long Term (after Action)	Technical Feasibility/ Availability of Services and Materials	Administrative Feasibility	$ (Million Dollars)
1	No Further Action	Not Protective	Not Applicable	Very Good	Very Poor	Very Good	Very Good	Very Good $0
2	Disposal in On-Mesa Repository	Protective	In Compliance	Good	Average	Very Good	Very Good	Good $13.2
3	Disposal at On-Navajo Nation Regional Repository	Protective	In Compliance	Average	Good	Good	Average	Good $11.0
4	Disposal at White Mesa Mill	Protective	In Compliance	Poor	Very Good	Average	Good	Poor $14.8
5	Disposal at Off-Navajo Nation Clean Harbors Hazardous Waste Disposal Facility	Protective	In Compliance	Very Poor	Very Good	Poor	Good	Very Poor $24.4

Note:
ARAR Applicable or relevant and appropriate requirement

APPENDIX A

SITE IMAGES

The Google Earth Aerial Images display the Cove Transfer Stations Group and associated features.

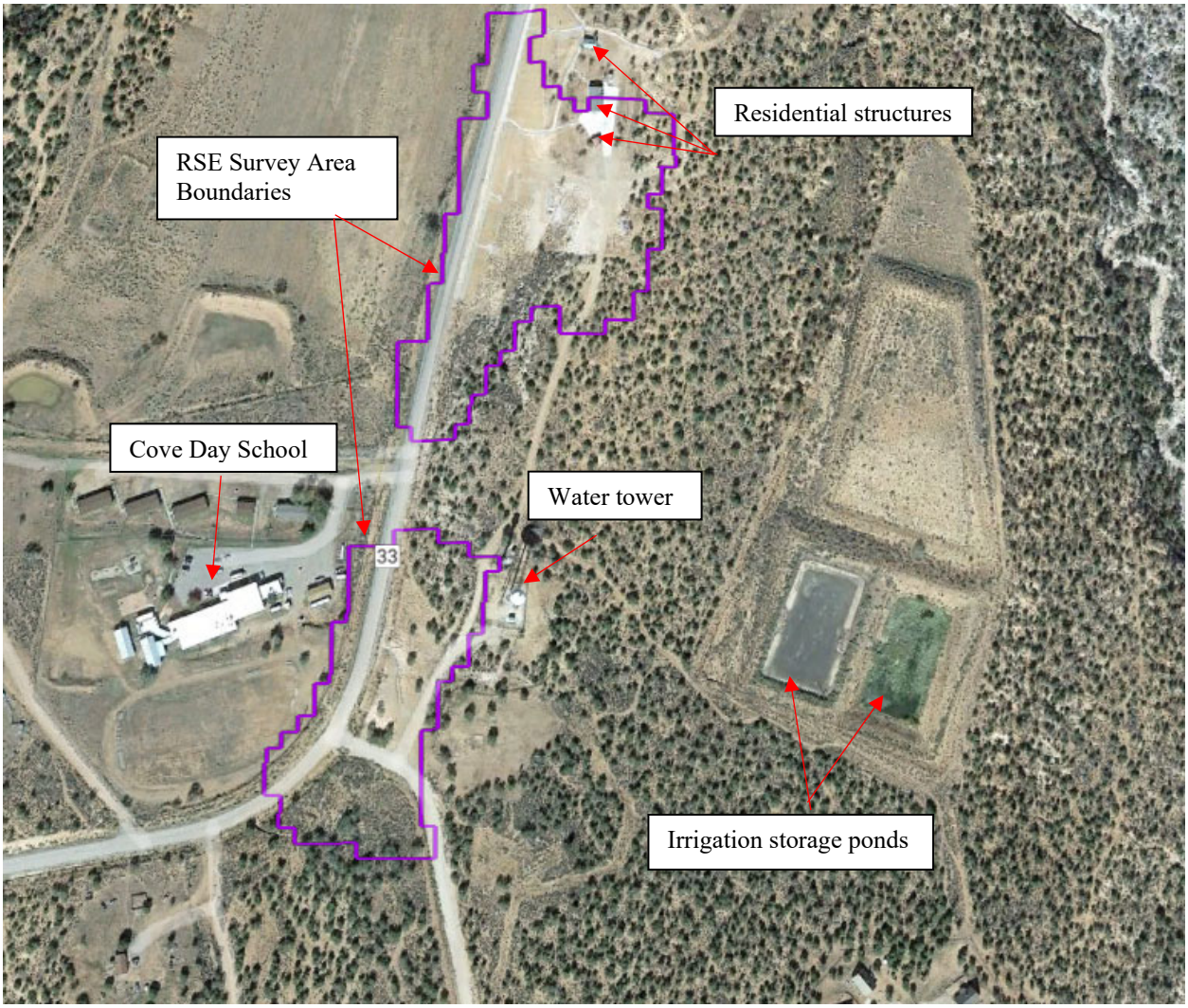


IMAGE 1

Date: Google Earth Aerial Image 10/19/2016; obtained 9/20/21

Location: Cove Transfer Station and Cove Transfer Station South

Description: Image shows the Cove Day School, the water tower, irrigation storage ponds, irrigation channels, and residential structures. Vegetation is sparse in the central portions of both sites. Image viewed from the north direction.

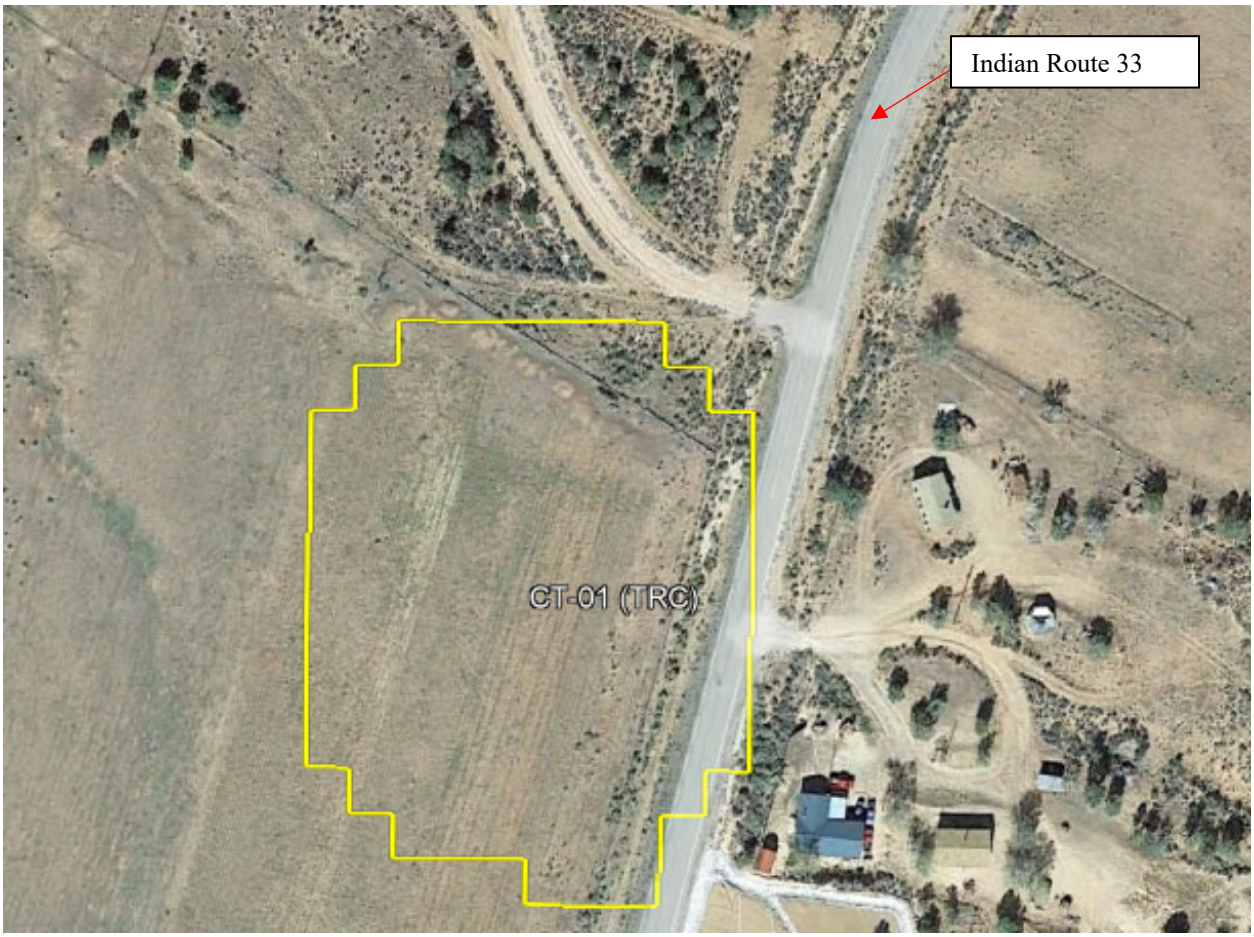


IMAGE 2

Date: Google Earth Aerial Image 10/19/2016; obtained 9/20/21

Location: Non-abandoned uranium mine Target CT-01.

Description: Image shows minimal vegetation in the central portion of CT-01 with sparse vegetation in the north and eastern portions. Indian Route 33 and residential structures are to the east of CT-01. Image viewed from the north direction.

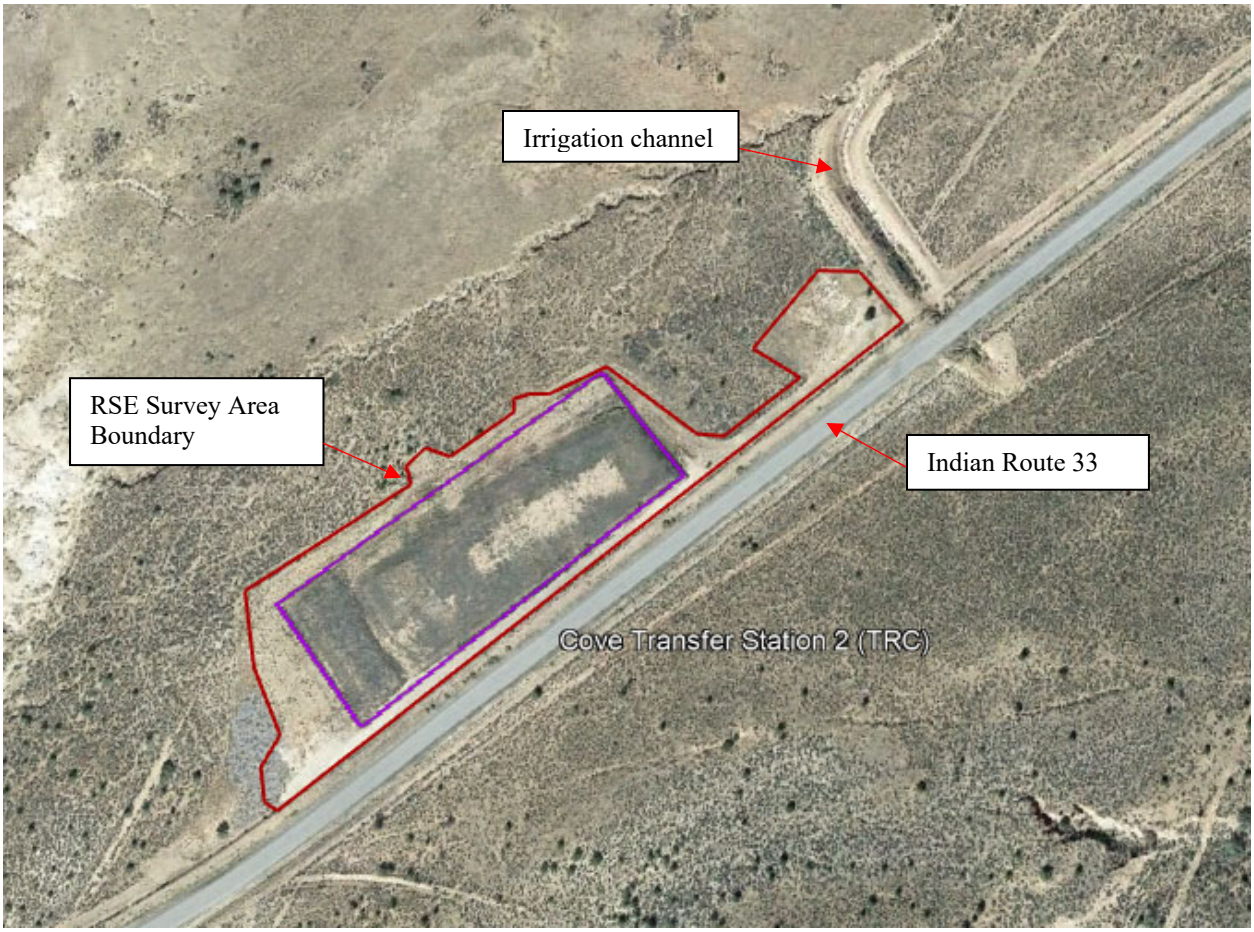


IMAGE 3

Date: Google Earth Aerial Image 10/19/2016; obtained 9/9/21

Location: Cove Transfer Station 2

Description: Site has minimal vegetation likely because of the impact of reclamation activities. Image viewed from the north.

The following photographs are from the removal site evaluation (RSE) field investigation of the Cove Transfer Stations Group in 2018 (by Tetra Tech) and during Removal Action in 2012 at the Cove Transfer Station Sites 1 and 2 (by Ecology & Environment).

PHOTOGRAPH 1

Date: 9/11/18

Location: Cove Transfer Station

Description: Subsurface drilling for soil samples within the southwestern edge of Waste Pile 344A-1

PHOTOGRAPH 2

Date: 9/11/18

Location: Cove Transfer Station

Description: Subsurface drilling for soil samples within Waste Pile 344A-1 with site vegetation mostly consisting of scattered low-lying shrubs

PHOTOGRAPH 3

Date: 9/11/18

Location: Cove Transfer Station

Description: Subsurface drilling within the southeastern portion of Waste Pile 344A-1

PHOTOGRAPH 4

Date: 9/11/18

Location: Cove Transfer Station

Description: Drilling in the southern portion of the site close to the road (visible in the upper left-hand corner)

PHOTOGRAPH 5

Date: 9/12/18

Location: Cove Transfer Station South

Description: Subsurface drilling using a hollow-stem auger drill rig in an area with sparse vegetation across the road from the Cove Day School

PHOTOGRAPH 6

Date: 10/19/12

Location: Cove Transfer Station 2

Description: Temporary waste stockpile (E&E 2013)

APPENDIX B

SITE DELINEATION

Tronox Navajo Area Uranium Mines
Northern Abandoned Uranium Mine Region

Appendix B: Site Delineation

Cove Transfer Stations Group
Alternatives Analysis Memorandum

Response, Assessment, and Evaluation Services

Contract No. EP-S9-17-03

Task Order 0016

September 30, 2021

Submitted to

U.S. Environmental Protection Agency

Submitted by

Tetra Tech, Inc.

1999 Harrison Street, Suite 500

Oakland, CA 94612

TETRA TECH

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Figure B-11. Cove Transfer Station 2 RSE Estimated Radium-226 Surface Soil Concentrations

Figure B-12. Cove Transfer Station 2 Stockpile from E&E (2013)

ACRONYMS AND ABBREVIATIONS

AUM	Abandoned uranium mine
BTV	Background threshold value
CTS	Cove Transfer Station
E&E	Ecology & Environment, Inc.
MARSSIM	*Multi-Agency Radiation Survey and Site Investigation Manual*
NORM	Naturally occurring radioactive material
pCi/g	Picocurie per gram
Ra-226	Radium-226
RSE	Removal site evaluation
Site	Cove Transfer Stations Group
TENORM	Technologically enhanced naturally occurring radioactive material
Tetra Tech	Tetra Tech, Inc.
USEPA	U.S. Environmental Protection Agency

1.0 INTRODUCTION

The purpose of this appendix is to describe the methods and observations that are used to identify and delineate naturally occurring radioactive material (NORM) and technologically enhanced naturally occurring radioactive material (TENORM) at the Cove Transfer Stations Group (Site). The Site consist of four non-abandoned uranium mines (AUM) located at or near the former uranium ore transfer station. Three of the four sites—the Cove Transfer Station (CTS), CTS South (an extension of CTS), and Target CT-01—are clustered near each other and collectively referred to as the Cove Transfer Stations Complex. The fourth site, CTS 2, is located approximately 2 miles northeast of the Cove Transfer Stations Complex.

NORM and TENORM boundaries are defined based on site reconnaissance observations and evaluation of removal site evaluation (RSE) data (Tetra Tech, Inc. [Tetra Tech] 2019) in accordance with the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) (U.S. Environmental Protection Agency [USEPA] 2000), "Technical Report on Technologically Enhanced Naturally Occurring Radioactive Materials from Uranium Mining" (USEPA 2008), "NORM-TENORM Determination and Delineation" (USEPA 2021a), and "Mining Forensics and Physical Disturbance Guidance" (USEPA 2021b) at AUMs. NORM and TENORM boundaries do not necessarily correspond to impacted and non-impacted areas at a site. Definitions for impacted and non-impacted areas and for NORM and TENORM in the above guidance documents are provided below.

MARSSIM (USEPA 2000) does not provide guidance on NORM and TENORM delineation but does provide guidance on categorizing site areas as follows: "Categorization is the act or result of separating an area or survey unit into one of two categories: impacted or non-impacted. Areas that have no reasonable potential for residual radioactive material are categorized as non-impacted areas. These areas have no radiological impact from site operations and are typically identified early in the cleanup process. Areas with some reasonable potential for residual radioactive material are categorized as impacted areas."

USEPA (2008) defines TENORM as, "Naturally occurring radioactive materials that have been concentrated or exposed to the accessible environment as a result of human activities such as manufacturing, mineral extraction, or water processing." Technologically enhanced means that "the radiological, physical, and chemical properties of the radioactive material have been concentrated or further altered by having been processed, or beneficiated, or disturbed in a way that increases the potential for human and/or environmental exposures."

USEPA (2008) defines NORM as, "Materials which may contain any of the primordial radionuclides or radioactive elements as they occur in nature, such as radium, uranium, thorium, potassium, and their radioactive decay products, such as radium and radon, that are undisturbed as a result of human activities."

According to USEPA (2021a), a feature is defined as TENORM at an AUM if it (1) has been processed, beneficiated, or otherwise disturbed (hereinafter referred to as disturbed) by mining activities; and (2) increases or could increase exposure to human health and the environment.

Based on the above definitions, an area that was physically disturbed can be classified as TENORM and non-impacted. Not all TENORM areas contain levels of radium-226 (Ra-226) or other contaminants of potential concern that require cleanup.

Disturbance at AUMs is divided into mechanical processes and transport processes (USEPA 2021b) as follows:

- Mechanical or geochemical disturbance of rock or soil and mechanical transport of those materials by direct mining activities. For example, dewatering ponds; excavating pits, adits, or shafts; pushing waste piles off cliffs; and ore spilling from haul trucks.
- Natural geologic or geomorphic disturbance of rock or soil and mechanical transport of those materials by gravity, wind, and water. For example, erosion triggered by mechanical disturbance that exposes contaminants that were not present at the surface before mining.

2.0 LINES OF EVIDENCE AND METHODS FOR MAPPING

During the NORM-TENORM delineation, the following lines of evidence were examined using the processes described below:

- ***Mapped Mine Features:*** Mine features such as waste piles, highwalls, rimstrips, and portals are defined as TENORM. As a starting point to mapping TENORM, the following buffer areas were applied to mine features:
    - Berms, highwalls, and portals received a buffer of 5 meters; 5 meters was selected to conservatively map TENORM and account for minor inaccuracies in global positioning system locations.
    - Field-mapped features such as pipes and mine debris received a buffer of 2 meters.
- ***Site History and Known Reclamation Activities:*** Reclamation features such as reclaimed rimstrips, reclaimed waste rock piles, covered benches, burial cells, and reclaimed portals are defined as TENORM. Depending on the material used, some reclamation features, such as berms, may be classified as disturbed NORM.
- ***Transport Features:***
    - Surface water pathways below mine features received a buffer of 5 meters and the buffer was extended based on gamma data.
    - A downgradient assessment of transport from mine features toward surface water pathways determined additional areas within the survey area boundary where transport is likely to occur.
    - A light detection and ranging aerial imagery and hillshades assessment identified any mass wasting areas from roads or other features and evaluated losses in vegetation potentially related to disturbances.
- ***Gamma Radiation Data and Estimated Ra-226 Data:*** Gamma radiation and estimated Ra-226 data were used to evaluate areas impacted by mining and where exposure to humans or the environment has been increased.
- ***Geologic Mapping:***
    - Undisturbed areas within the Salt Wash Member ore host rock unit are classified as NORM.
    - Areas within the host rock unit and disturbed in a way that increases contaminant mobility and risk to receptors, are classified as TENORM.

3.0 NORM AND TENORM SITE DELINEATION RESULTS

This section presents the results from the NORM-TENORM delineation. Figure B-1 through Figure B-12 show the lines of evidence, including supporting Site data and photographs, used to conduct the NORM-TENORM delineation. The NORM-TENORM delineation should be verified in the field for accuracy. The Cove Transfer Stations Complex and CTS 2 TENORM boundaries were developed separately.

3.1 COVE TRANSFER STATIONS COMPLEX

At the Cove Transfer Stations Complex, the raw and interpolated estimated Ra-226 concentrations (as converted from the Cove Transfer Stations Complex gamma survey data) and the mapped Site features were used as the primary lines of evidence for delineating NORM and TENORM. Figure B-1 through Figure B-3 present both the Site features (including mine features and transport features) and the estimated Ra-226 surface soil concentrations. All mine features, including the waste pile and waste rock pit, are mapped as TENORM. Transport areas from mining-related activities within the Cove Transfer Stations Complex are mapped as TENORM. In addition, the historical use of both CTS and CTS South as an uranium ore transfer station was considered. These lines of evidence support mapping the entirety of both CTS and CTS South, along with the northern and eastern portions of CT-01, as TENORM.

In Figure B-1, estimated Ra-226 concentrations at CTS are above the background threshold value (BTV) on the west side of Indian Route 33. These areas may have been impacted by windblown dust contamination originating from spilled ore at the former uranium ore transfer station. As a result, this area is considered TENORM. Figure B-4 shows that the interpolated estimated Ra-226 concentrations in the northern portion of CTS are below the BTV. However, the aerial imagery shows a lack of vegetation, disturbed land, and proximity to existing structures. In addition, the site is near residential structures. As a result, all of CTS is mapped as TENORM.

In Figure B-5, estimated Ra-226 concentrations are below the BTV at CTS South. However, Figure B-2 shows areas where estimated Ra-226 concentrations are above the BTV. This may be a result of windblown dust contamination from ore spilled at the former uranium ore transfer station. Figure B-8 shows the waste rock pit at CTS South. Because the site is near the Cove Day School, all areas of CTS South were conservatively assessed to be within the TENORM boundary.

In Figure B-3, estimated Ra-226 concentrations are greater than the BTV in the eastern and northern portions of Target CT-01. These areas may have likely been impacted by windblown dust contamination originating from spilled ore at the nearby former uranium ore transfer station and are mapped as TENORM. The central portion of CT-01 seen in Figure B-3 and Figure B-6 is an agricultural field with estimated Ra-226 concentrations less than the BTV; therefore, this area is excluded from the TENORM boundary.

Figure B-4 and Figure B-5 present the interpolated Ra-226 within the TENORM boundary for CTS and CTS South, respectively. Figure B-7 presents the interpolated Ra-226 within the TENORM boundary for CT-01.

All three sites within the Cove Transfer Stations Complex lie in the Chinle Formation, which is not a part of the uranium ore host rock unit. No NORM areas are mapped at the Cove Transfer Stations Complex.

In summary, the following features and areas were mapped as TENORM at the Cove Transfer Stations Complex:

- Entirety of CTS within the RSE survey area boundary
- Entirety of CTS South within the RSE survey area boundary
- Area adjacent to the road at CT-01
- Reclaimed waste pile at CTS and waste rock pit at CTS South
- Areas that show a significant lack of vegetation or are near structures

Not all TENORM features contain measured and interpolated concentrations of Ra-226 above the BTV, which is the removal action goal at the Cove Transfer Stations Group. Only TENORM areas with Ra-226 concentrations above the BTV or that are considered sources of contamination are recommended for cleanup.

3.2 COVE TRANSFER STATION 2

Two gamma surveys were performed at CTS 2. The first survey was conducted by Ecology & Environment, Inc. (E&E) (2013) in 2012 and included the stockpile and surrounding areas that were impacted. Figure B-9 shows the E&E gamma and correlated Ra-226 results obtained at CTS 2. Figure B-10 shows the estimated and correlated Ra-226 results from the E&E report mapped using the Tetra Tech BTV calculated for the RSE. Scan data for the stockpile were not available in the E&E (2013) report; therefore, no data are shown in this area on Figure B-10. The second survey was conducted by Tetra Tech (2019) in 2018 during the RSE investigation and included a low-density survey of the stockpile. Results of the estimated Ra-226 concentrations (as converted from CTS 2 gamma survey data) are presented in Figure B-11. The estimated Ra-226 concentrations within the stockpile area were above 5 picocuries per gram in Figure B-9 and greater than the BTV in Figure B-11. As a result, this area is considered TENORM.

The stockpile construction areas in the southern portion of CTS 2 and the chipping area in the northern portion of CTS 2 were also surveyed by E&E and Tetra Tech. The chipping area was where vegetation cleared for the stockpile was washed and chipped. Both Figure B-9 and Figure B-10 show areas where Ra-226 concentrations were elevated. As a result, these areas are mapped as TENORM.

In Figure B-11, Tetra Tech (2019) also surveyed the area adjacent to and immediately across from Indian Route 33. The estimated Ra-226 concentrations in this area are below the BTV. Therefore, this area is not considered TENORM.

The E&E (2013) data were not interpolated because no soil sample data were available to validate the interpolation model. The Tetra Tech (2019) data were not interpolated because of the low density of gamma scan survey data collected within the stockpile.

Figure B-12 shows a photograph of the stockpile construction at CTS 2 (E&E 2013).

CTS 2 lies in the Chinle Formation, which is not a part of the uranium ore host rock unit. No NORM areas are mapped at the CTS 2.

In summary, the following features and areas were mapped as TENORM at CTS 2:

- Entirety of CTS 2 within the E&E (2013) survey boundary
- Stockpile location at CTS 2

Not all TENORM features contain measured and interpolated concentrations of Ra-226 above the BTV, which is the removal action goal at the Cove Transfer Stations Group. Only TENORM areas with Ra-226 concentrations above the BTV or that are considered sources of contamination are recommended for cleanup.

4.0 REFERENCES

Ecology & Environment, Inc. (E&E). 2013. "Cove Transfer Station Sites 1 and 2, Abandoned Uranium Mine Waste Removal Action Report. Navajo Nation, Cove Chapter, Apache Country, Arizona." Prepared for USEPA Emergency Response Section, Region 9. February.

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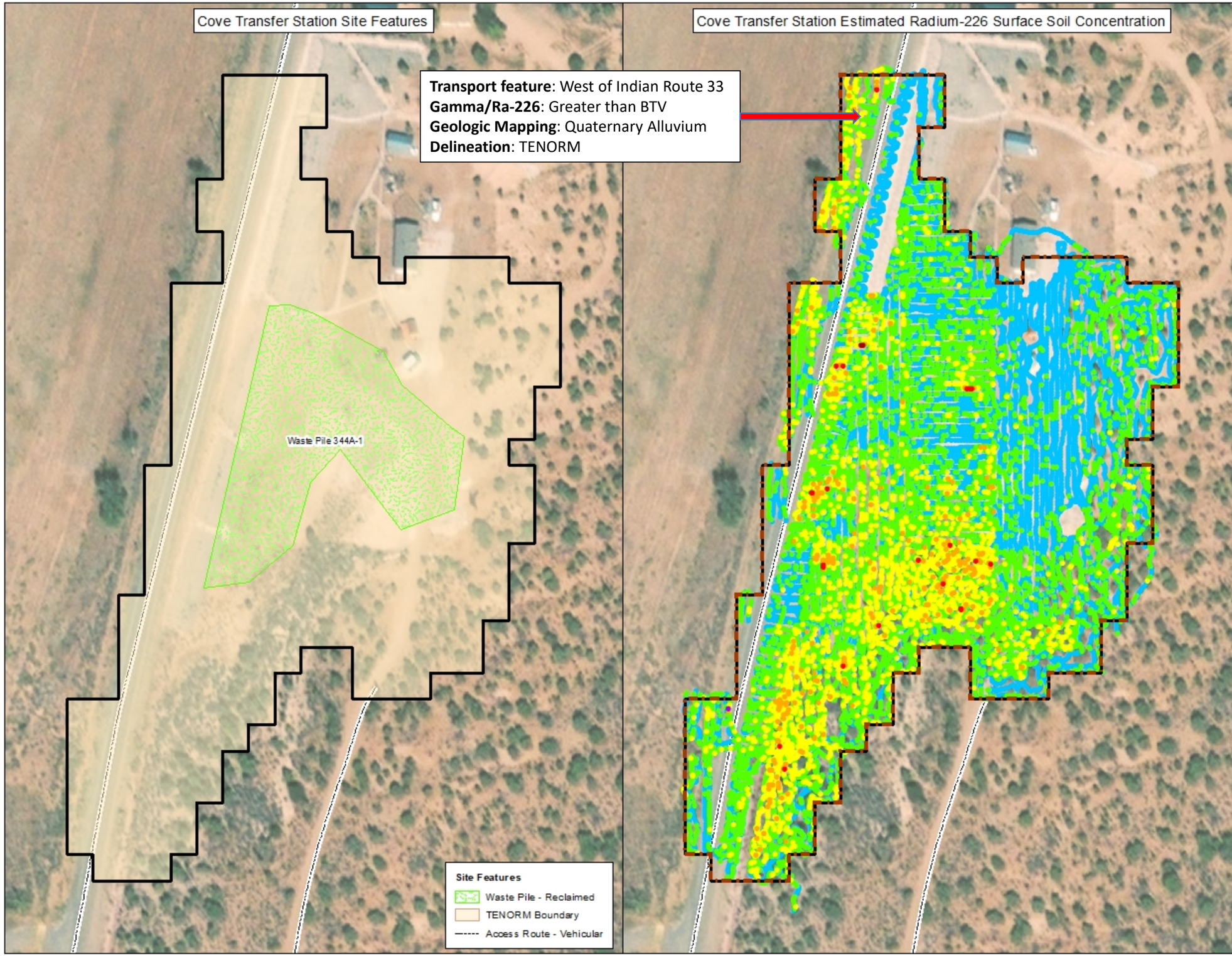
USEPA. 2008. "Technologically Enhanced Naturally Occurring Radioactive Material From Uranium Mining. Volume 1: Mining and Reclamation Background." EPA 402-R-08-005. April.

USEPA. 2021a. "NORM-TENORM Determination and Delineation." Draft. Received from Brandon Nichalson, USEPA Remedial Project Manager. June 14.

USEPA. 2021b. "Mining Forensics and Physical Disturbance Guidance." Draft. Received from Brandon Nichalson, USEPA Remedial Project Manager. June 14.

FIGURES



Estimated Radium-226 Soil Concentration (pCi/g)[1]

Quaternary Alluvium - Qal

≤ 1.3	≤ UCL95
1.3 - 2.4	UCL95 - 1 x BTV
2.4 - 3.6	1 xBTV - 1.5 x BTV
3.6 - 4.8	1.5 x BTV - 2 x BTV
4.8 - 6.0	2 x BTV - 2.5 x BTV
6.0 - 7.2	2.5 x BTV - 3 x BTV
> 7.2	≥ 3 x BTV

RSE Survey Area

TENORM Boundary

Notes:

[1]Gamma survey results were converted to estimated radium-226 concentrations using correlation sample data collected at multiple locations in the Chinle formation.

BTV	Background threshold value
pCi/g	Picocurie per gram
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL95	Upper confidence limit of exposure at 95th percentile

1 inch = 120 feet

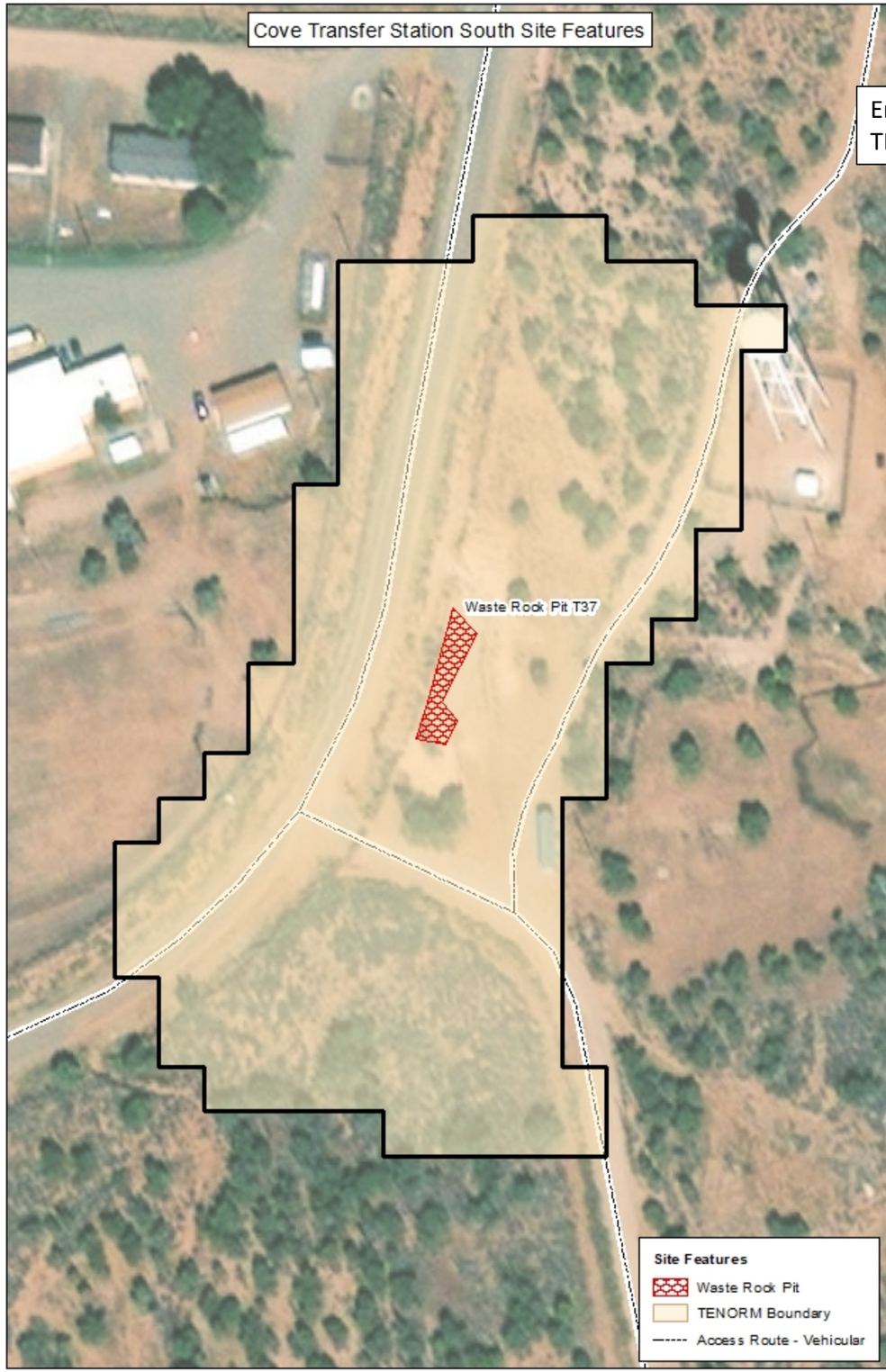
1:1,440

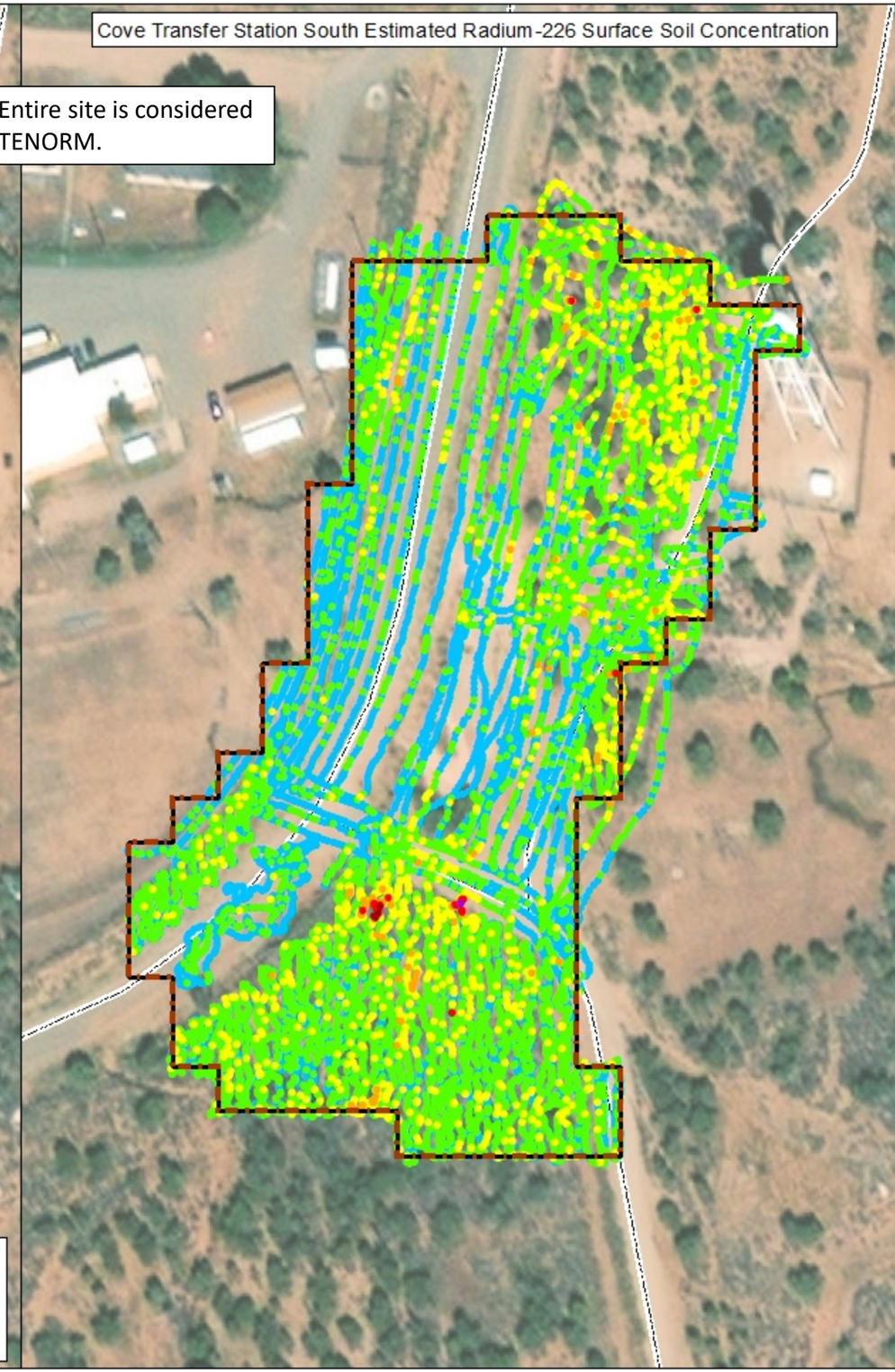
0 60 120 240 Feet

N W E S

COVE TRANSFER STATION
ESTIMATED RADIUM-226
SURFACE SOIL CONCENTRATIONS

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH 1999 Harrison Street, Suite 500 Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 8/9/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: B-1





Estimated Radium-226 Soil Concentration (pCi/g)[1]
Quaternary Alluvium - Qal

≤ 1.3	≤ UCL95
1.3 - 2.4	UCL95 - 1 x BTV
2.4 - 3.6	1 xBTV - 1.5 x BTV
3.6 - 4.8	1.5 x BTV - 2 x BTV
4.8 - 6.0	2 x BTV - 2.5 x BTV
6.0 - 7.2	2.5 x BTV - 3 x BTV
> 7.2	≥ 3 x BTV

RSE Survey Area
TENORM Boundary

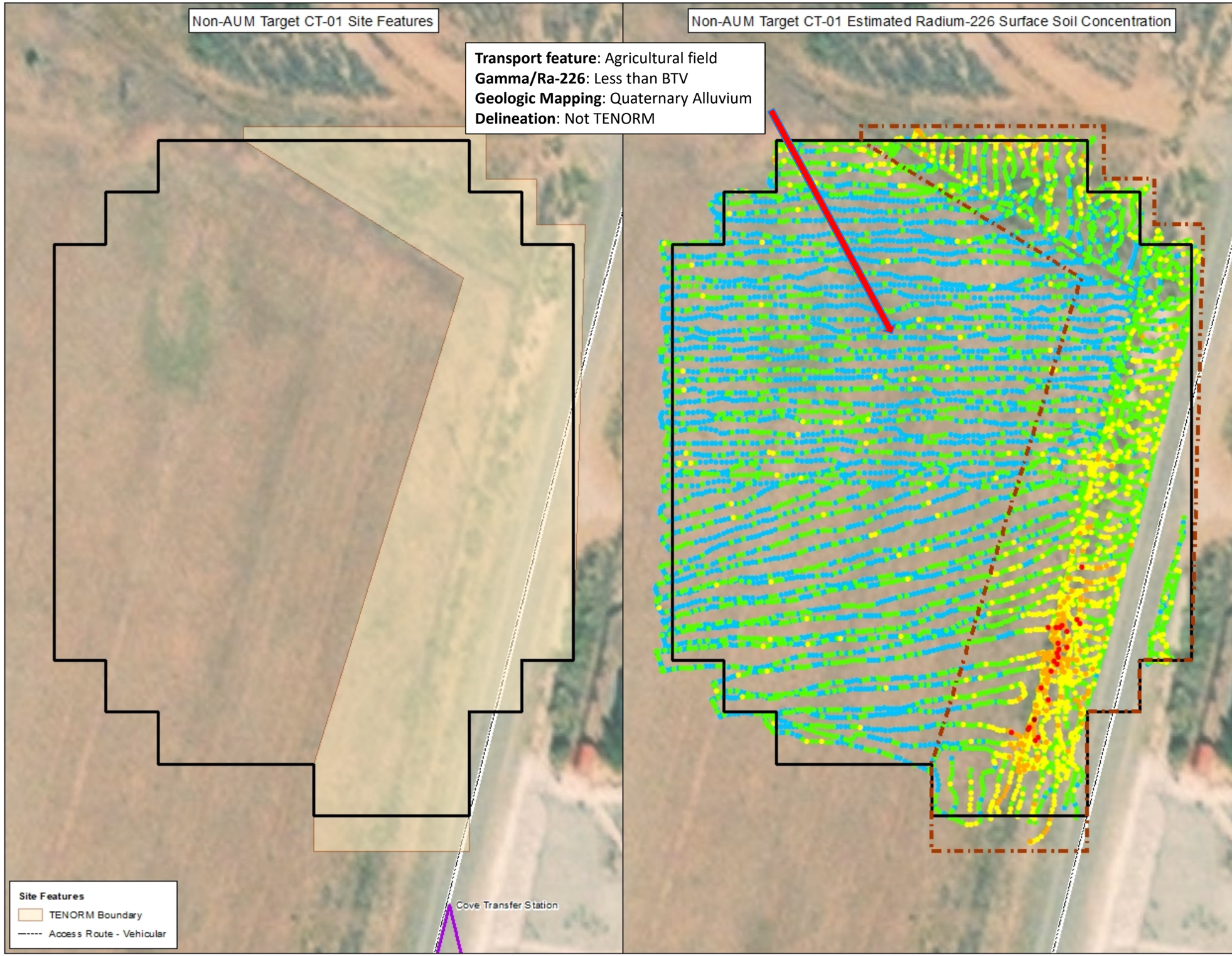
Notes:
[1]Gamma survey results were converted to estimated radium-226 concentrations using correlation sample data collected at multiple Tronox sites across the Tse Tah region.

BTV	Background threshold value
pCi/g	Picocurie per gram
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL95	Upper confidence limit of exposure at 95th percentile

1 inch = 100 feet
1:1,200
0 50 100 200 Feet
N W E S

COVE TRANSFER STATION SOUTH ESTIMATED RADIUM-226 SURFACE SOIL CONCENTRATIONS

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH 1999 Harrison Street, Suite 500 Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/21/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: B-2



Estimated Radium-226 Soil Concentration (pCi/g)[1]

Quaternary Alluvium - Qal

≤ 1.3	≤ UCL95
1.3 - 2.4	UCL95 - 1 x BTV
2.4 - 3.6	1 xBTV - 1.5 x BTV
3.6 - 4.8	1.5 x BTV - 2 x BTV
4.8 - 6.0	2 x BTV - 2.5 x BTV
6.0 - 7.2	2.5 x BTV - 3 x BTV
> 7.2	≥ 3 x BTV

RSE Survey Area

TENORM Boundary

Notes:

[1]Gamma survey results were converted to estimated radium-226 concentrations using correlation sample data collected at multiple locations in the Chinle formation.

AUM	Abandoned uranium mine
BTV	Background threshold value
pCi/g	Picocurie per gram
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL95	Upper confidence limit of exposure at 95th percentile

1 inch = 60 feet

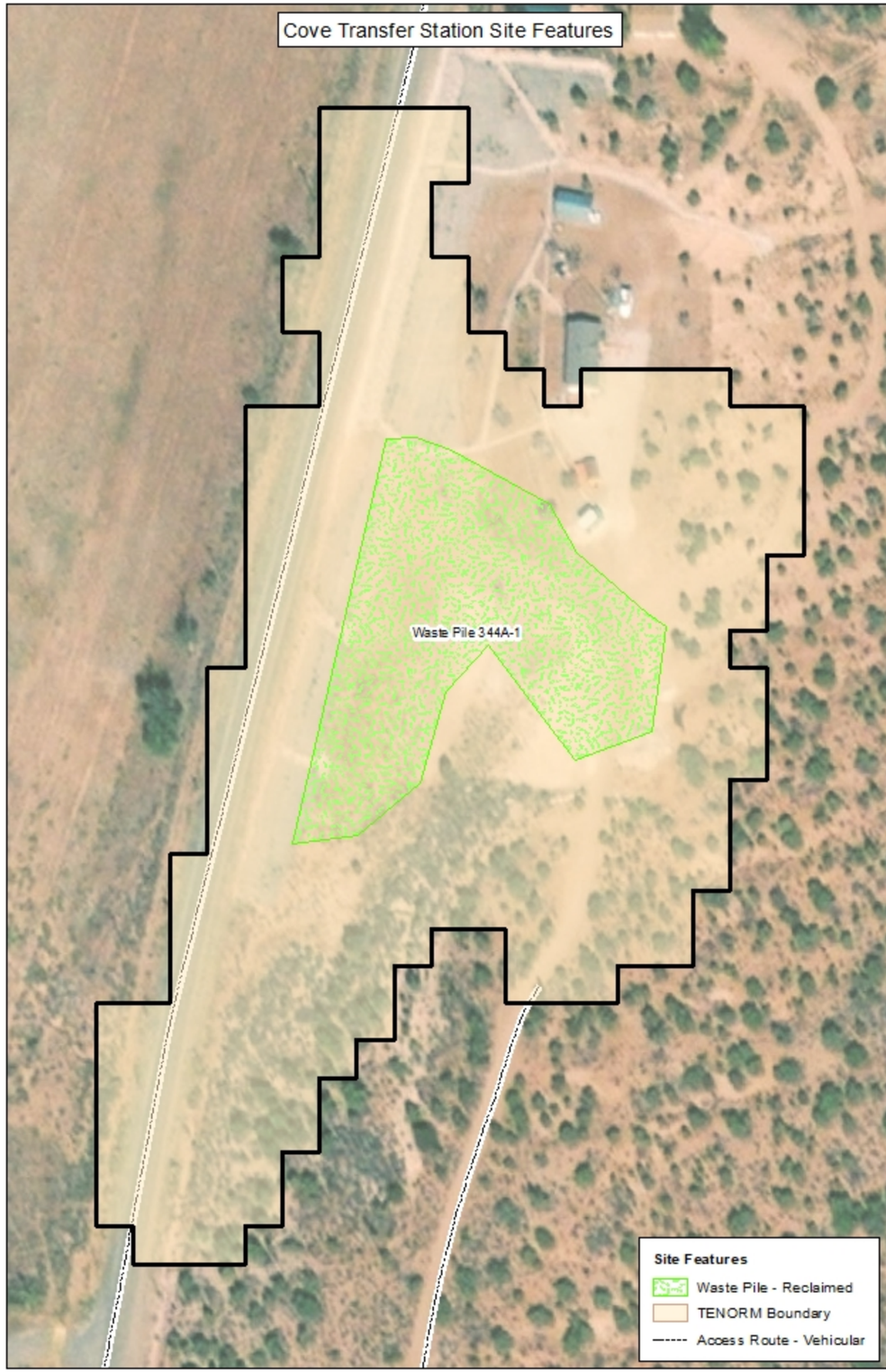
1:720

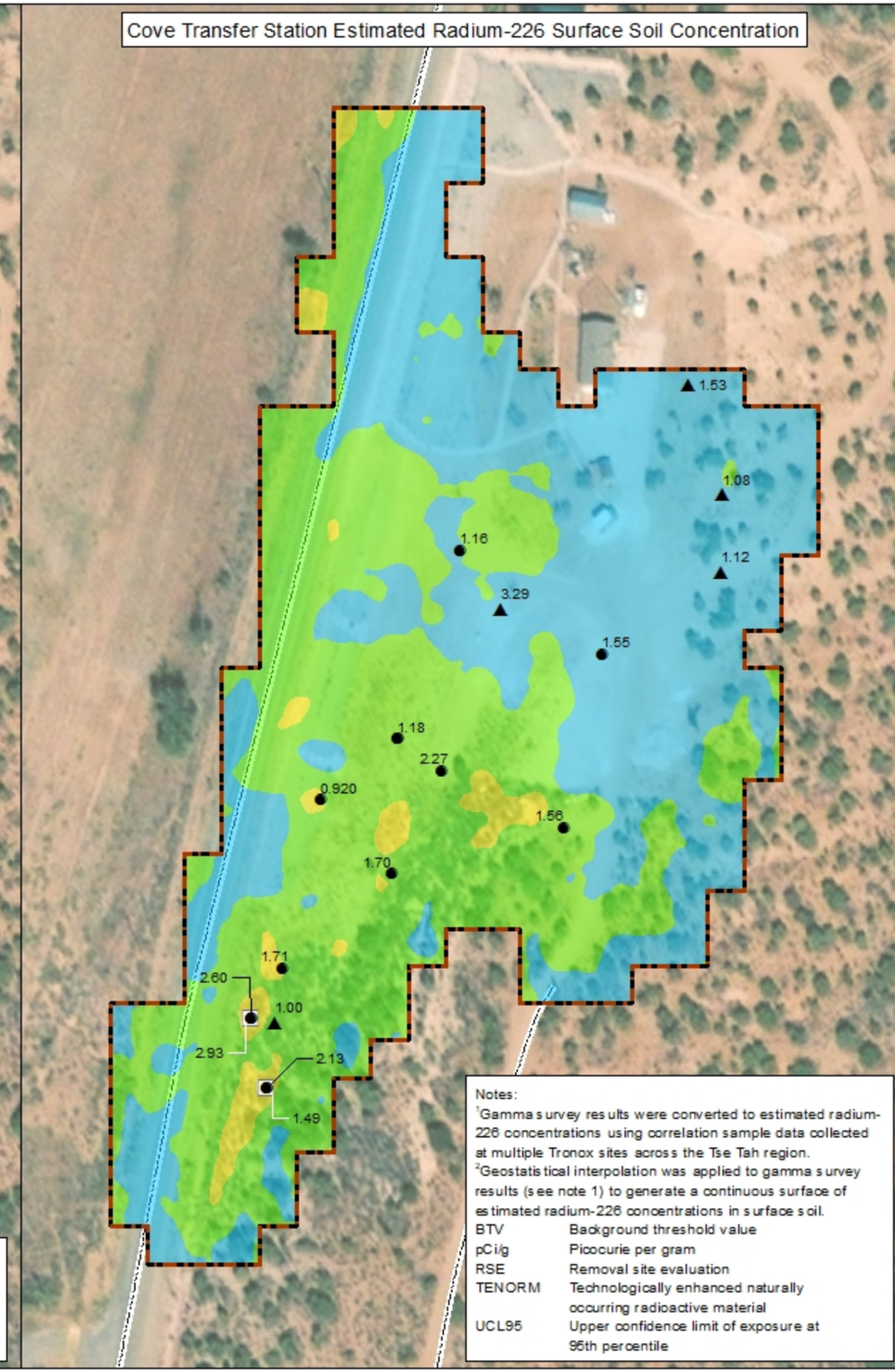
0 30 60 120 Feet

N W E S

NON-AUM TARGET CT-01
ESTIMATED RADIUM-226
SURFACE SOIL CONCENTRATIONS

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH 1999 Harrison Street, Suite 500 Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 8/9/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: B-3





Notes:
[1]Gamma survey results were converted to estimated radium-226 concentrations using correlation sample data collected at multiple Tronox sites across the Tse Tah region.
[2]Geostatistical interpolation was applied to gamma survey results (see note 1) to generate a continuous surface of estimated radium-226 concentrations in surface soil.

BTV	Background threshold value
pCi/g	Picocurie per gram
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL95	Upper confidence limit of exposure at 95th percentile

Interpolated Estimated Radium-226[1,2] (pCi/g)
Chinle Formation - Trc

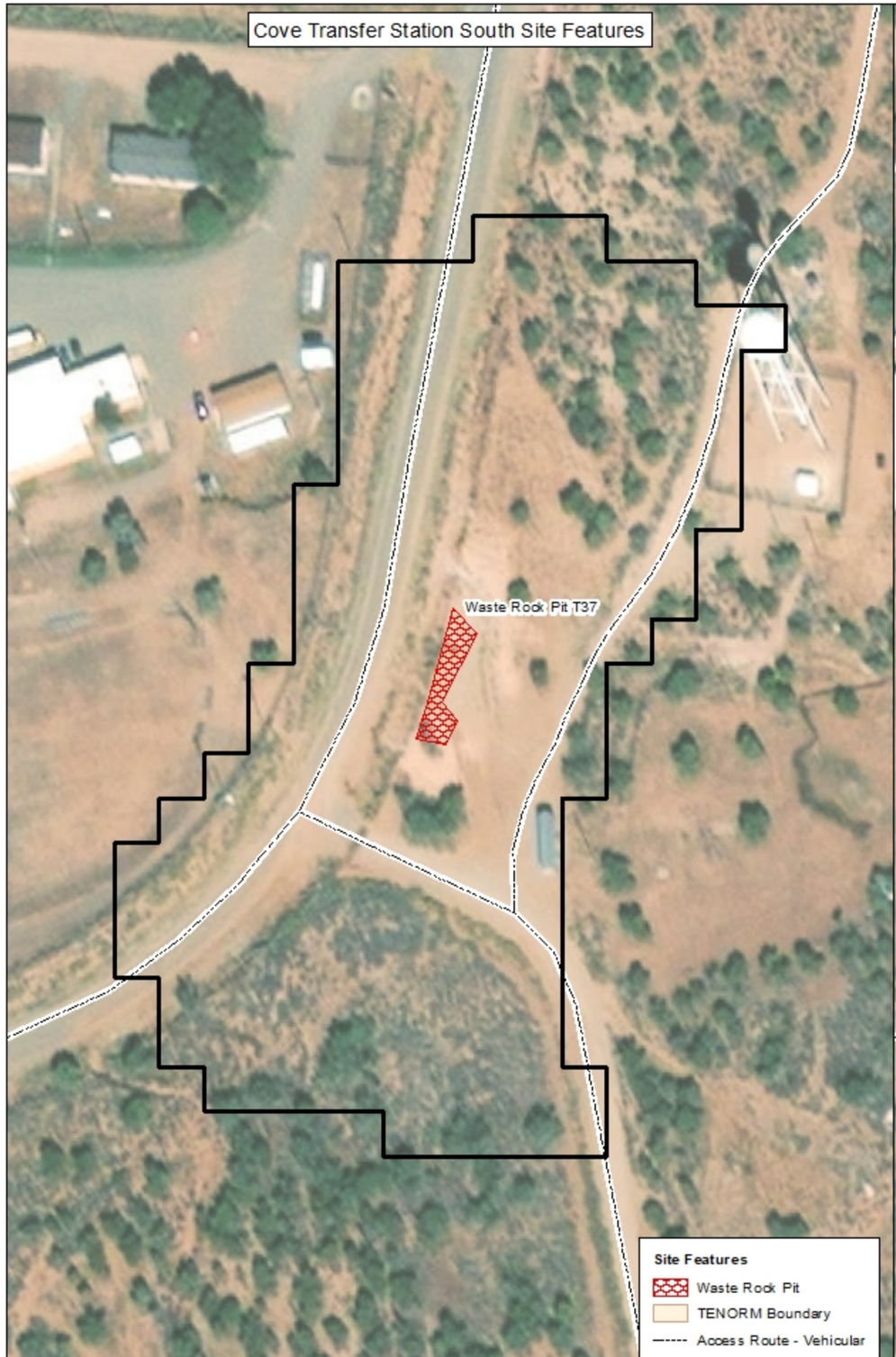
≤ 1.3	≤ UCL95
1.3 - 2.4	UCL95 - 1 x BTV
2.4 - 3.6	1 x BTV - 1.5 x BTV
3.6 - 4.8	1.5 x BTV - 2 x BTV
4.8 - 6.0	2 x BTV - 2.5 x BTV
6.0 - 7.2	2.5 x BTV - 3 x BTV
> 7.2	≥ 3 x BTV

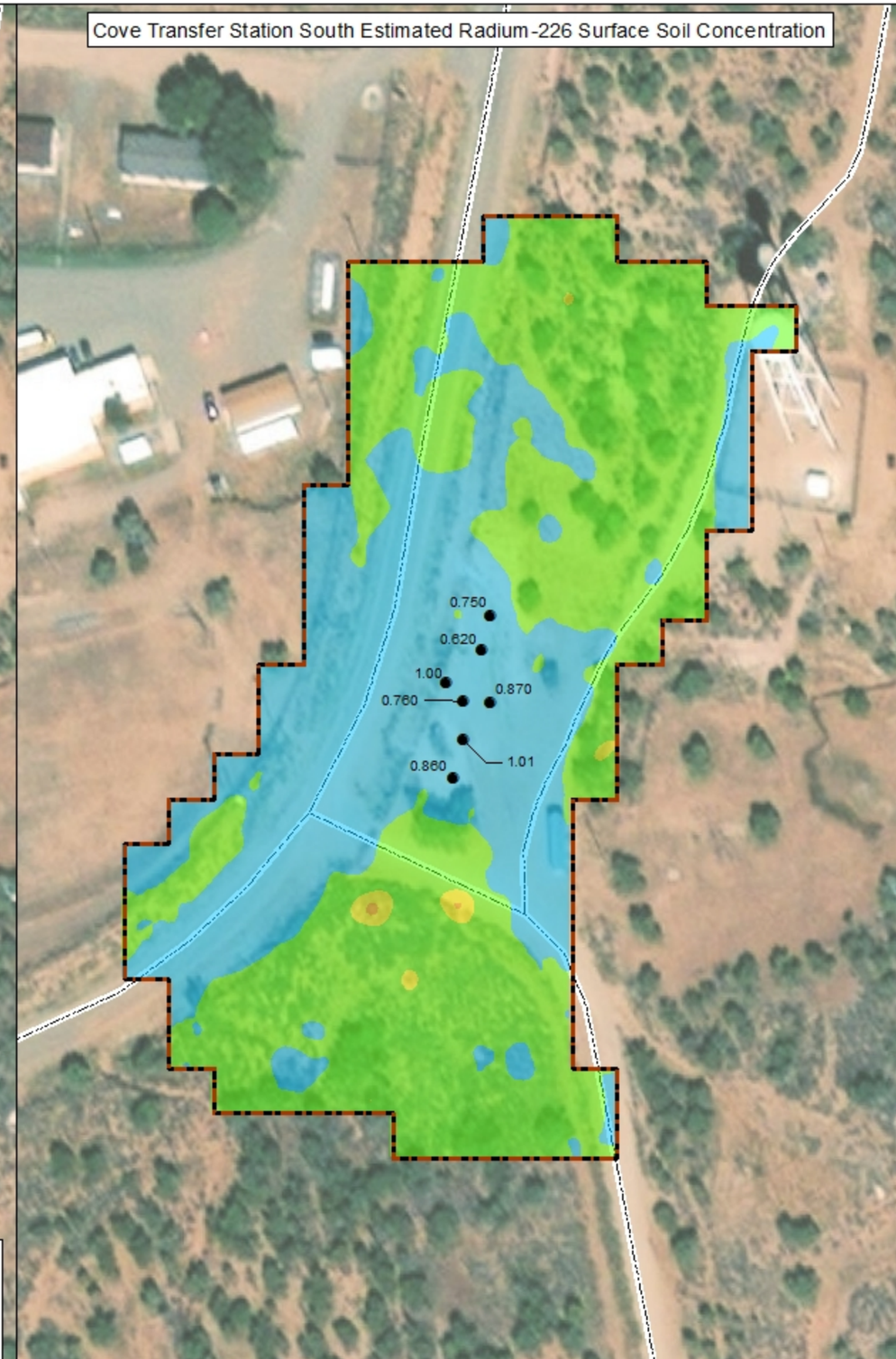
RSE Survey Area
Surface Soil Sample *0-6 Inches Below Ground Surface*
Surface Soil Sample *6-12 Inches Below Ground Surface*
XRF Confirmation Surface Soil Sample *0-3 Inches Below Ground Surface*
TENORM Boundary

1 inch = 120 feet
1:1,440
0 60 120 240 Feet
N W E S

COVE TRANSFER STATION
INTERPOLATED ESTIMATED RADIUM-226
WITHIN TENORM BOUNDARY

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH 1999 Harrison Street, Suite 500 Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 8/9/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: B-4





Interpolated Estimated Radium-226[1,2] (pCi/g)

Chinle Formation - Trc

≤ 1.26	≤ UCL95
1.26 - 2.40	UCL95 - 1 x BTV
2.40 - 3.60	1 xBTV - 1.5 x BTV
3.60 - 4.80	1.5 x BTV - 2 x BTV
4.80 - 6.00	2 x BTV - 2.5 x BTV
6.00 - 7.20	2.5 x BTV - 3 x BTV
> 7.20	≥ 3 x BTV

RSE Survey Area

Surface Soil Sample
0-6 Inches Below Ground Surface

TENORM Boundary

Notes:

[1]Gamma survey results were converted to estimated radium-226 concentrations using correlation sample data collected at multiple locations in the Chinle formation.

[2]Geostatistical interpolation was applied to gamma survey results (see note 1) to generate a continuous surface of estimated radium-226 concentrations in surface soil.

BTV	Background threshold value
pCi/g	Picocurie per gram
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL95	Upper confidence limit of exposure at 95th percentile

1 inch = 100 feet

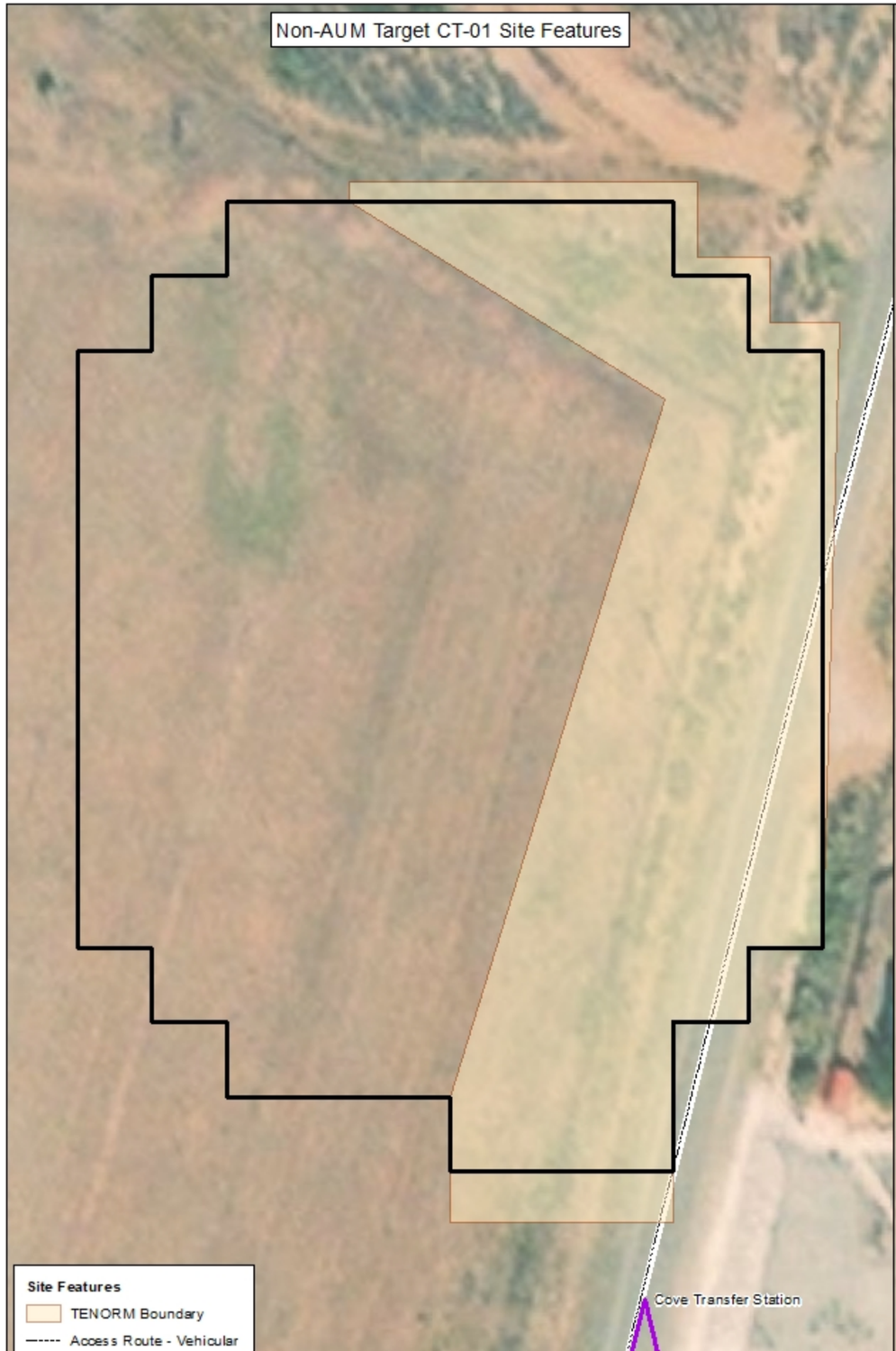
1:1,200

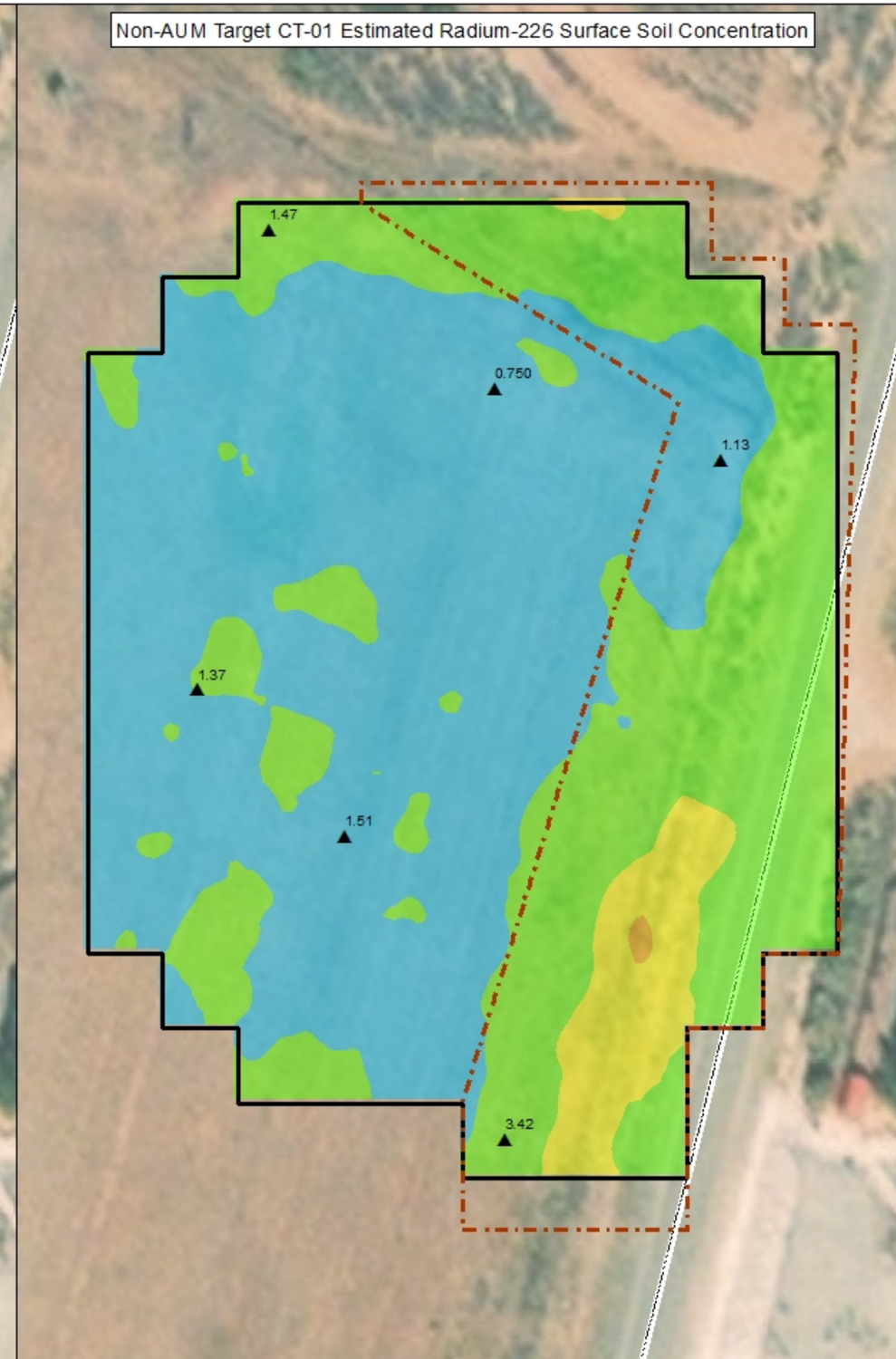
0 50 100 200 Feet

N W E S

COVE TRANSFER STATION SOUTH
INTERPOLATED ESTIMATED RADIUM-226
AND SURFACE SOIL SAMPLES

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH 1999 Harrison Street, Suite 500 Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/21/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: B-5





Interpolated Estimated Radium-226[1,2] (pCi/g)

<VALUE>

≤ 1.3	≤ UCL95
1.3 - 2.4	UCL95 - 1 x BTV
2.4 - 3.6	1 x BTV - 1.5 x BTV
3.6 - 4.8	1.5 x BTV - 2 x BTV
4.8 - 6.0	2 x BTV - 2.5 x BTV
6.0 - 7.2	2.5 x BTV - 3 x BTV
> 7.2	≥ 3 x BTV

RSE Survey Area

XRF Confirmation Surface Soil Sample
0-3 Inches Below Ground Surface

TENORM Boundary

Notes:

[1]Gamma survey results were converted to estimated radium-226 concentrations using correlation sample data collected at multiple Tronox sites across the Tse Tah region.

[2]Geostatistical interpolation was applied to gamma survey results (see note 1) to generate a continuous surface of estimated radium-226 concentrations in surface soil.

AUM	Abandoned uranium mine
BTV	Background threshold value
pCi/g	Picocurie per gram
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL95	Upper confidence limit of exposure at 95th percentile

1 inch = 60 feet

1:720

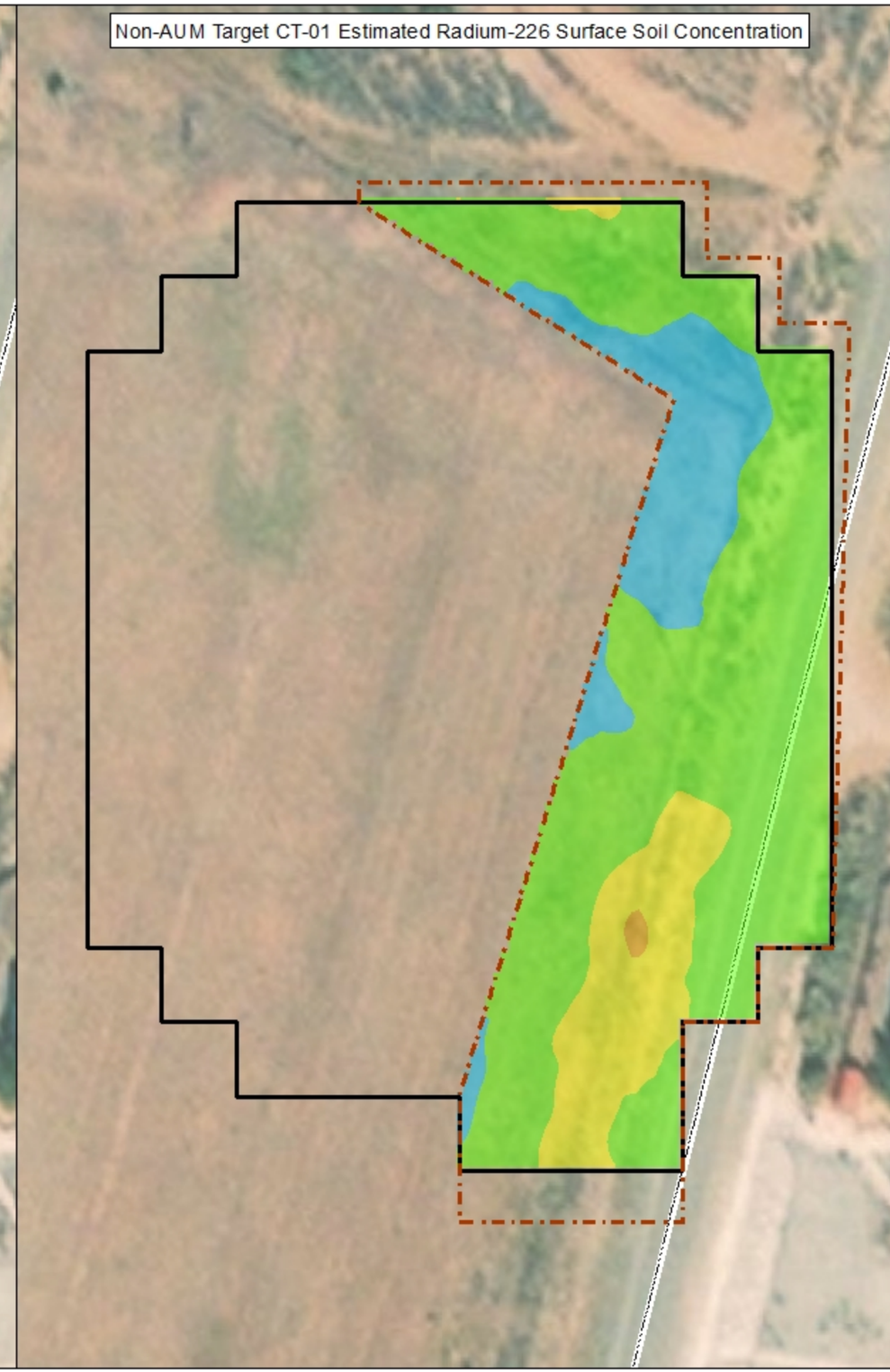
N W E S

0 30 60 120 Feet

NON-AUM TARGET CT-01

INTERPOLATED ESTIMATED RADIUM-226 AND SURFACE SOIL SAMPLES

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH 1999 Harrison Street, Suite 500 Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/21/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: B-6



Interpolated Estimated Radium-226[1,2] (pCi/g)

Chinle Formation - Trc

≤ 1.3	≤ UCL95
1.3 - 2.4	UCL95 - 1 x BTV
2.4 - 3.6	1 x BTV - 1.5 x BTV
3.6 - 4.8	1.5 x BTV - 2 x BTV
4.8 - 6.0	2 x BTV - 2.5 x BTV
6.0 - 7.2	2.5 x BTV - 3 x BTV
> 7.2	≥ 3 x BTV

RSE Survey Area

TENORM Boundary

Notes:

[1]Gamma survey results were converted to estimated radium-226 concentrations using correlation sample data collected at multiple locations in the Chinle formation.

[2]Geostatistical interpolation was applied to gamma survey results (see note 1) to generate a continuous surface of estimated radium-226 concentrations in

BTV	Background threshold value
pCi/g	Picocurie per gram
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL95	Upper confidence limit of exposure at 95th percentile

1 inch = 60 feet

1:720

0 30 60 120 Feet

N W E S

NON-AUM TARGET CT-01

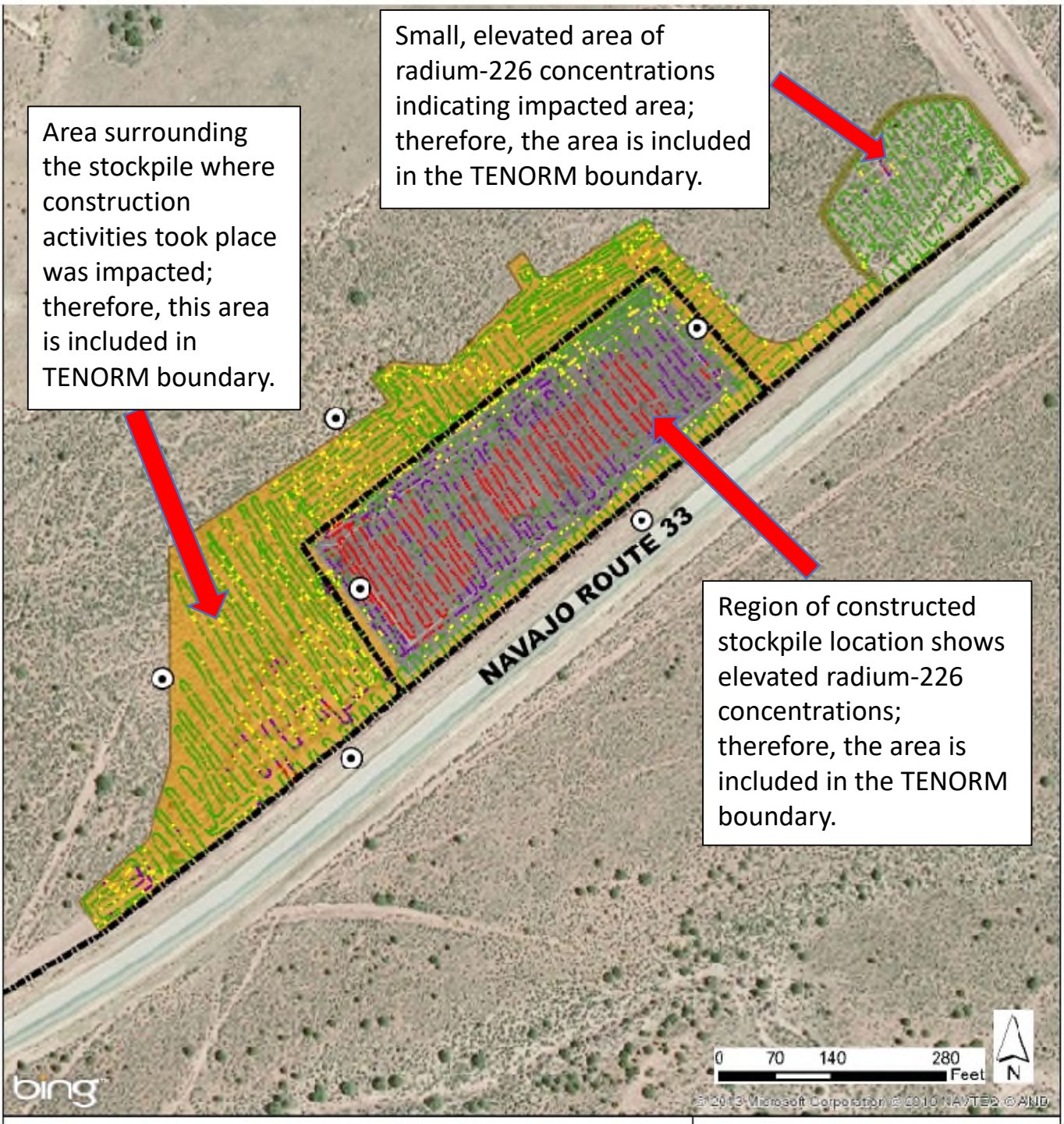
INTERPOLATED ESTIMATED RADIUM-226

WITHIN TENORM BOUNDARY

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH 1999 Harrison Street, Suite 500 Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/27/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: B-7

Within unreclaimed Waste Rock Pit T37. Slightly elevated radium-226 concentrations. Area considered TENORM.

Figure B-8. Cove Transfer Station South Waste Rock Pit T37



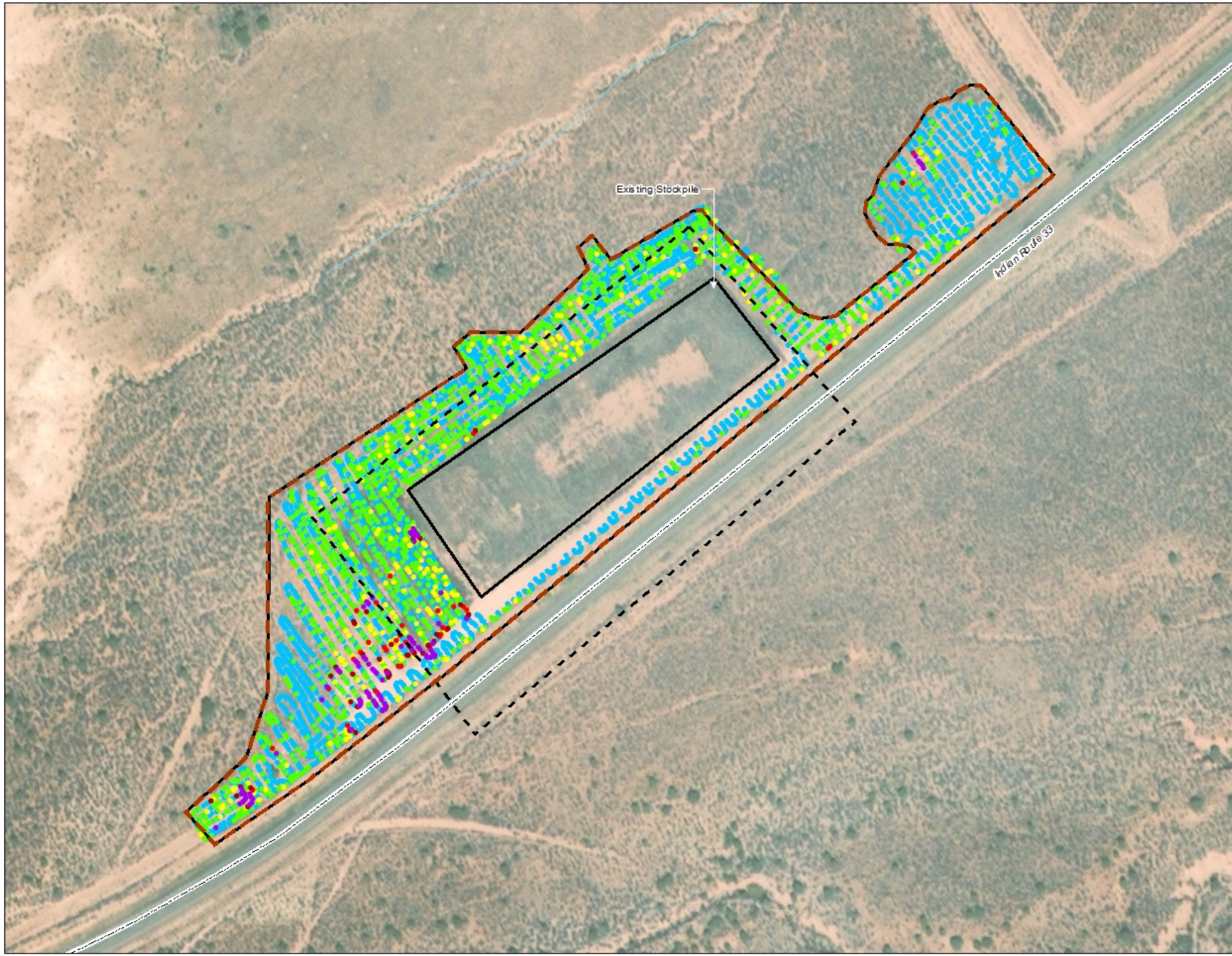
Air Sampling Location
Excavation Zone
Chipping Area
Constructed Stockpile
Fence Line
Buried Vegetation Zone

Gamma Activity (Counts Per Minute)	Correlated Radium 226 Concentration (picocuries per gram)
0 to 34,712	0 to 2
34,713 to 40,477	2.1 to 5
40,478 to 59,695	5.1 to 15
> 59,696	> 15

COVE TRANSFER STATION 2
SURFACE GAMMA ACTIVITY
FOLLOWING STOCKPILE PLACEMENT

Adapted from E&E 2013: E&E. 2013. Cove Transfer Station Sites 1 and 2 Abandoned Uranium Mine Waste Removal Action Report. Navajo Nation, Cove Chapter, Apache County, Arizona. February.

Task Order No.:	Prepared for:	Prepared by:	Date:
0016	USEPA Region 9	TETRA TECH	9/28/2021
Contract No.: EP-S9-17-03			Figure No.: B-9



Estimated Radium-226 (pCi/g)[1]

Chinle Formation - Trc

≤ 1.3	≤ UCL
1.3 - 2.4	UCL - BTV (RAG)[2]
2.4 - 3.3	BTV - 2.5 x UCL
3.3 - 3.9	2.5 x UCL - 3 x UCL
3.9 - 5.2	3 x UCL - 4 x UCL
5.2 - 6.5	4 x UCL - 4 x UCL
6.5	> 5 x UCL

Tetra Tech, Inc. RSE Survey Area

E&E Survey Area[1]

TENORM Boundary

Access Route - Vehicular

Drainage

Notes:

[1]See E&E (2013).

[2]BTV is based on the 95 percent upper tolerance limit with 95 percent coverage of the background dataset.

BTV	Background threshold value
E&E	Ecology & Environment, Inc.
pCi/g	Picocurie per gram
RAG	Removal action goal
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL	95 percent upper confidence limit on the mean of the background dataset

1 inch = 130 feet

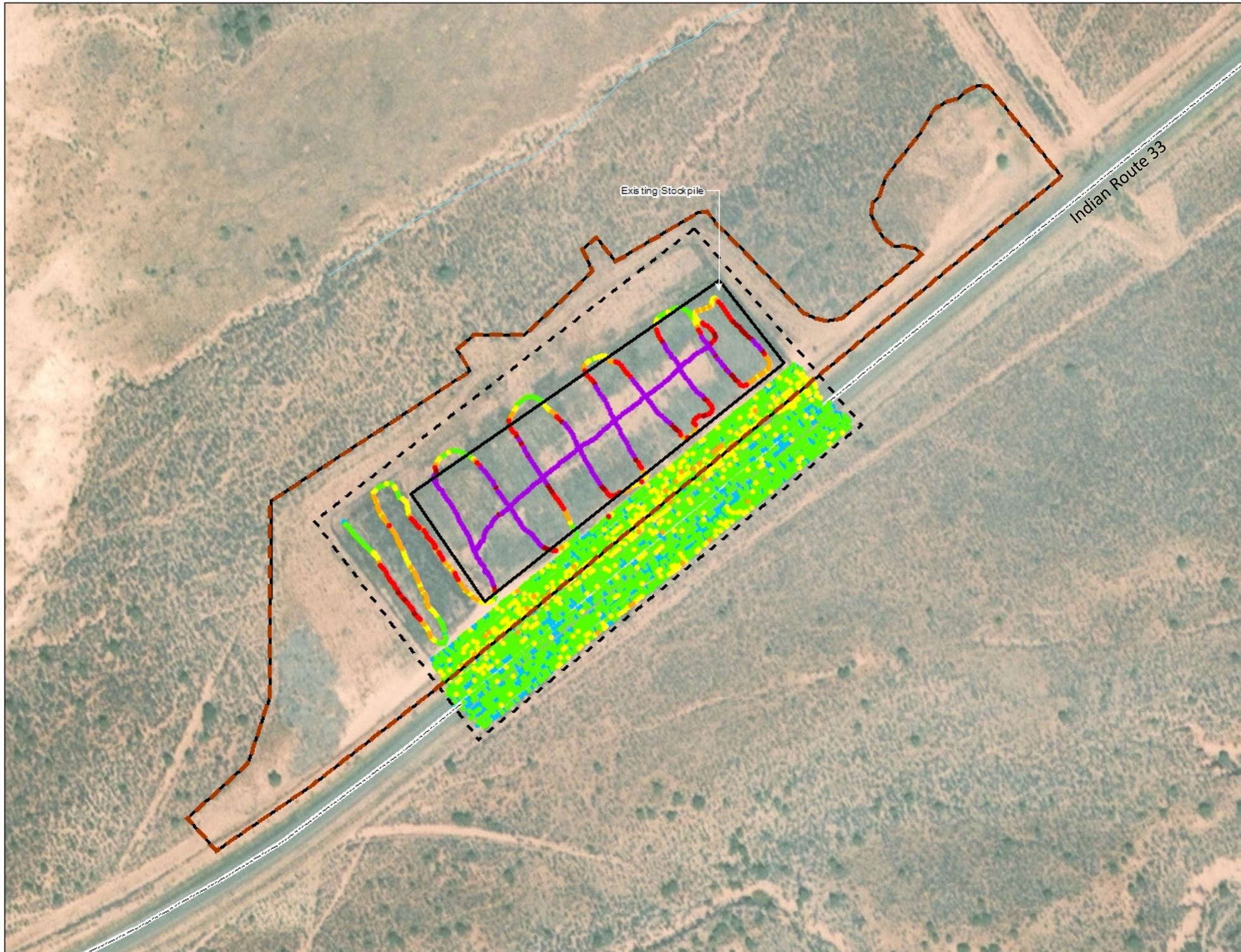
1:1,560

0 65 130 260 Feet

N W E S

COVE TRANSFER STATION 2
E&E ESTIMATED RADIUM-226
SURFACE SOIL CONCENTRATIONS

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH 1999 Harrison Street, Suite 500 Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/28/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: B-10



Estimated Radium-226 (pCi/g)

Chinle Formation - Trc

≤ 1.3	≤ UCL
1.3 - 2.4	UCL - BTV (RAG)[1]
2.4 - 3.3	BTV - 2.5 x UCL
3.3 - 3.9	2.5 x UCL - 3 x UCL
3.9 - 5.2	3 x UCL - 4 x UCL
5.2 - 6.5	4 x UCL - 5 x UCL
> 6.5	> 5 x UCL

Tetra Tech, Inc. RSE Survey Area

E&E Survey Area[2]

TENORM Boundary

Access Route - Vehicular

Drainage

Notes:

[1]BTV is based on the 95 percent upper tolerance limit with 95 percent coverage of the background dataset.

[2]See E&E (2013).

µR/hr	Microroentgen per hour
BTV	Background threshold value
E&E	Ecology & Environment, Inc.
RSE	Removal site evaluation
TENORM	Technologically enhanced naturally occurring radioactive material
UCL	95 percent upper confidence limit on the mean of the background dataset

1 inch = 130 feet

1:1,560

N W E S

0 65 130 260 Feet

COVE TRANSFER STATION 2
RSE ESTIMATED RADIUM-226
SURFACE SOIL CONCENTRATIONS

Prepared For: U.S. EPA Region 9	Prepared By: TETRA TECH 1999 Harrison Street, Suite 500 Oakland, CA 94612
Task Order No.: 0016	Contract No.: EP-S9-17-03
Location: COVE CHAPTER NAVAJO NATION	Date: 9/28/2021
Coordinate System: NAD 1983 State Plane Arizona East FIPS 0201 Feet Transverse Mercator	Figure No.: B-11

Figure B-12. Cove Transfer Station 2 Stockpile from E&E (2013)

APPENDIX C

DATA TABLES

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CT-01	Arsenic	T10X3	4/25/2018	0	1	1.80	QU		mg/kg	36.563683	-109.217171
1	Chinle Formation	CT-01	Arsenic	T10X4	4/25/2018	0	1	2.33			mg/kg	36.563679	-109.217056
1	Chinle Formation	CT-01	Arsenic	T10X5	4/25/2018	0	1	1.80	QU		mg/kg	36.563675	-109.216942
1	Chinle Formation	CT-01	Arsenic	T10X6	4/25/2018	0	1	1.95			mg/kg	36.563679	-109.216835
1	Chinle Formation	CT-01	Arsenic	T10X12	4/25/2018	0	1	1.80	QU		mg/kg	36.563587	-109.216942
1	Chinle Formation	CT-01	Arsenic	T10X13	4/25/2018	0	1	1.80	QU		mg/kg	36.563587	-109.216835
1	Chinle Formation	CT-01	Arsenic	T10X14	4/25/2018	0	1	3.01			mg/kg	36.563583	-109.216721
1	Chinle Formation	CT-01	Arsenic	T10X23	4/25/2018	0	1	1.80	QU		mg/kg	36.563492	-109.216728
1	Chinle Formation	CT-01	Arsenic	T10X24	4/25/2018	0	1	1.80	QU		mg/kg	36.563492	-109.216614
1	Chinle Formation	CT-01	Arsenic	T10-XS33-01-042518	4/25/2018	0	3	1.30			mg/kg	36.563405	-109.216725
1	Chinle Formation	CT-01	Arsenic	T10X34	4/25/2018	0	1	1.80	QU		mg/kg	36.5634	-109.216614
1	Chinle Formation	CT-01	Arsenic	T10X42	4/25/2018	0	1	2.71			mg/kg	36.563316	-109.216843
1	Chinle Formation	CT-01	Arsenic	T10X43	4/25/2018	0	1	1.80	QU		mg/kg	36.563313	-109.216736
1	Chinle Formation	CT-01	Arsenic	T10X44	4/25/2018	0	1	3.50			mg/kg	36.563313	-109.216614
1	Chinle Formation	CT-01	Arsenic	T10X52	4/25/2018	0	1	3.07			mg/kg	36.563225	-109.216835
1	Chinle Formation	CT-01	Arsenic	T10X53	4/25/2018	0	1	2.21			mg/kg	36.563217	-109.216736
1	Chinle Formation	CT-01	Arsenic	T10X54	4/25/2018	0	1	3.13			mg/kg	36.563217	-109.216614
1	Chinle Formation	CT-01	Arsenic	T10X62	4/25/2018	0	1	1.80	QU		mg/kg	36.563133	-109.216843
1	Chinle Formation	CT-01	Arsenic	T10X63	4/25/2018	0	1	2.22			mg/kg	36.563129	-109.216728
1	Chinle Formation	CT-01	Arsenic	T10X64	8/18/2018	0	1	1.80	QU		mg/kg	36.563126	-109.216644
1	Chinle Formation	CT-01	Arsenic	T10X71	4/25/2018	0	1	2.24			mg/kg	36.563042	-109.216949
1	Chinle Formation	CT-01	Arsenic	T10X72	4/25/2018	0	1	1.80	QU		mg/kg	36.563042	-109.216835
1	Chinle Formation	CT-01	Arsenic	T10X73	4/25/2018	0	1	1.80	QU		mg/kg	36.563042	-109.216728
1	Chinle Formation	CT-01	Arsenic	T10X81	4/25/2018	0	1	1.80	QU		mg/kg	36.562954	-109.216957
1	Chinle Formation	CT-01	Arsenic	T10X82	4/25/2018	0	1	1.80	QU		mg/kg	36.562958	-109.216843
1	Chinle Formation	CT-01	Arsenic	T10X83	4/25/2018	0	1	2.10			mg/kg	36.56295	-109.216728
1	Chinle Formation	CT-01	Arsenic	T10X84	8/18/2018	0	1	1.80	QU		mg/kg	36.562954	-109.216599
1	Chinle Formation	CT-01	Arsenic	T10X91	4/25/2018	0	1	1.80	QU		mg/kg	36.562866	-109.216957
1	Chinle Formation	CT-01	Arsenic	T10X92	4/25/2018	0	1	2.27			mg/kg	36.562862	-109.216843
1	Chinle Formation	CT-01	Arsenic	T10X93	4/25/2018	0	1	2.63			mg/kg	36.562859	-109.216728
1	Chinle Formation	CT-01	Arsenic	T10X94	5/14/2018	0	1	3.95			mg/kg	36.562824	-109.216614
1	Chinle Formation	CT-01	Arsenic	T10X99	5/14/2018	0	1	2.64			mg/kg	36.562767	-109.217056
1	Chinle Formation	CT-01	Arsenic	T10X100	5/14/2018	0	1	1.80	QU		mg/kg	36.562763	-109.216949
1	Chinle Formation	CT-01	Arsenic	T10X101	4/25/2018	0	1	2.93			mg/kg	36.562771	-109.216843
1	Chinle Formation	CT-01	Arsenic	T10X106	5/14/2018	0	1	1.80	QU		mg/kg	36.562675	-109.217064
1	Chinle Formation	CT-01	Arsenic	T10X107	5/14/2018	0	1	1.80	QU		mg/kg	36.562672	-109.216949
1	Chinle Formation	CT-01	Arsenic	T10X108	4/25/2018	0	1	1.80	QU		mg/kg	36.562683	-109.21685
1	Chinle Formation	CT-01	Arsenic	T10-XSG1-01-081818	8/18/2018	0	3	1.50			mg/kg	36.562593	-109.217057
1	Chinle Formation	CT-01	Arsenic	T10G2	8/18/2018	0	1	2.70			mg/kg	36.562592	-109.216942
1	Chinle Formation	CT-01	Arsenic	T10G3	8/18/2018	0	1	1.80	QU		mg/kg	36.562584	-109.216843
1	Chinle Formation	CTS	Arsenic	T9X1	5/14/2018	0	1	1.87			mg/kg	36.562405	-109.216774
1	Chinle Formation	CTS	Arsenic	T9X2	5/14/2018	0	1	1.99			mg/kg	36.562313	-109.216911
1	Chinle Formation	CTS	Arsenic	T9X3	5/14/2018	0	1	4.81			mg/kg	36.562309	-109.216782
1	Chinle Formation	CTS	Arsenic	T9X4	5/14/2018	0	1	2.78			mg/kg	36.562233	-109.216934
1	Chinle Formation	CTS	Arsenic	T9X6	5/14/2018	0	1	4.42			mg/kg	36.562134	-109.216866
1	Chinle Formation	CTS	Arsenic	T9X8	5/14/2018	0	1	2.37			mg/kg	36.56205	-109.216888
1	Chinle Formation	CTS	Arsenic	T9X11	5/14/2018	0	1	1.80	QU		mg/kg	36.561966	-109.217033
1	Chinle Formation	CTS	Arsenic	T9X12	5/14/2018	0	1	1.80	QU		mg/kg	36.561954	-109.216911

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Arsenic	T9X15	8/18/2018	0	1	1.80	QU		mg/kg	36.561867	-109.216957
1	Chinle Formation	CTS	Arsenic	T9X19	4/25/2018	0	1	2.00			mg/kg	36.561874	-109.216568
1	Chinle Formation	CTS	Arsenic	T9X20	8/18/2018	0	1	1.80	QU		mg/kg	36.561771	-109.216988
1	Chinle Formation	CTS	Arsenic	T9X24	4/25/2018	0	1	3.06			mg/kg	36.561787	-109.216568
1	Chinle Formation	CTS	Arsenic	T9X27	5/14/2018	0	1	1.80	QU		mg/kg	36.561687	-109.217003
1	Chinle Formation	CTS	Arsenic	T9X28	5/14/2018	0	1	3.29			mg/kg	36.561691	-109.216896
1	Chinle Formation	CTS	Arsenic	T9X31	4/25/2018	0	1	2.74			mg/kg	36.561687	-109.216568
1	Chinle Formation	CTS	Arsenic	T9X32	4/25/2018	0	1	2.23			mg/kg	36.561687	-109.216454
1	Chinle Formation	CTS	Arsenic	T9X33	4/25/2018	0	1	1.80	QU		mg/kg	36.561684	-109.216377
1	Chinle Formation	CTS	Arsenic	T9X36	4/25/2018	0	1	3.28			mg/kg	36.561684	-109.216011
1	Chinle Formation	CTS	Arsenic	T9X37	5/14/2018	0	1	1.80	QU		mg/kg	36.561611	-109.217148
1	Chinle Formation	CTS	Arsenic	T9X38	5/14/2018	0	1	1.80	QU		mg/kg	36.561596	-109.21701
1	Chinle Formation	CTS	Arsenic	T9X40	4/25/2018	0	1	1.80	QU		mg/kg	36.561607	-109.216789
1	Chinle Formation	CTS	Arsenic	T9X41	4/25/2018	0	1	1.80	QU		mg/kg	36.5616	-109.216675
1	Chinle Formation	CTS	Arsenic	T9X42	4/25/2018	0	1	2.07			mg/kg	36.5616	-109.216568
1	Chinle Formation	CTS	Arsenic	T9X43	4/25/2018	0	1	1.80	QU		mg/kg	36.5616	-109.216461
1	Chinle Formation	CTS	Arsenic	T9X44	4/25/2018	0	1	2.04			mg/kg	36.561584	-109.216331
1	Chinle Formation	CTS	Arsenic	T9X47	4/25/2018	0	1	3.71			mg/kg	36.561604	-109.216011
1	Chinle Formation	CTS	Arsenic	T9X48	4/25/2018	0	1	3.46			mg/kg	36.561592	-109.215897
1	Chinle Formation	CTS	Arsenic	T9X49	4/25/2018	0	1	4.76			mg/kg	36.5616	-109.215782
1	Chinle Formation	CTS	Arsenic	T9X50	8/18/2018	0	1	3.03			mg/kg	36.561497	-109.217079
1	Chinle Formation	CTS	Arsenic	T9X51	5/14/2018	0	1	2.16			mg/kg	36.561504	-109.217003
1	Chinle Formation	CTS	Arsenic	T9X53	4/25/2018	0	1	2.63			mg/kg	36.561512	-109.216797
1	Chinle Formation	CTS	Arsenic	T9X54	4/25/2018	0	1	1.80	QU		mg/kg	36.561512	-109.216682
1	Chinle Formation	CTS	Arsenic	T9X55	4/25/2018	0	1	1.80	QU		mg/kg	36.561504	-109.216576
1	Chinle Formation	CTS	Arsenic	T9X56	4/25/2018	0	1	2.17			mg/kg	36.561504	-109.216461
1	Chinle Formation	CTS	Arsenic	T9X57	4/25/2018	0	1	1.80	QU		mg/kg	36.561504	-109.216347
1	Chinle Formation	CTS	Arsenic	T9X60	4/25/2018	0	1	2.71			mg/kg	36.561504	-109.216011
1	Chinle Formation	CTS	Arsenic	T9-XS61-02-042518	4/25/2018	0	3	2.50			mg/kg	36.561513	-109.215899
1	Chinle Formation	CTS	Arsenic	T9X62	4/25/2018	0	1	2.87			mg/kg	36.561501	-109.21579
1	Chinle Formation	CTS	Arsenic	T9X63	8/18/2018	0	1	1.80	QU		mg/kg	36.561424	-109.217102
1	Chinle Formation	CTS	Arsenic	T9X65	4/25/2018	0	1	2.69			mg/kg	36.561424	-109.216904
1	Chinle Formation	CTS	Arsenic	T9X66	4/25/2018	0	1	1.80	QU		mg/kg	36.56142	-109.216797
1	Chinle Formation	CTS	Arsenic	T9-SS67-01-091118	9/11/2018	0	6	2.90			mg/kg	36.561384	-109.216688
1	Chinle Formation	CTS	Arsenic	T9X67	4/25/2018	0	1	3.56			mg/kg	36.56142	-109.216675
1	Chinle Formation	CTS	Arsenic	T9-SB67-006048-01-091118	9/11/2018	6	48	2.00			mg/kg	36.561382	-109.21669
1	Chinle Formation	CTS	Arsenic	T9X68	4/25/2018	0	1	1.80	QU		mg/kg	36.561417	-109.216568
1	Chinle Formation	CTS	Arsenic	T9X69	4/25/2018	0	1	1.80	QU		mg/kg	36.56142	-109.216454
1	Chinle Formation	CTS	Arsenic	T9X70	4/25/2018	0	1	3.40			mg/kg	36.561417	-109.216354
1	Chinle Formation	CTS	Arsenic	T9X73	4/25/2018	0	1	2.08			mg/kg	36.561417	-109.216003
1	Chinle Formation	CTS	Arsenic	T9X74	4/25/2018	0	1	1.93			mg/kg	36.56142	-109.215897
1	Chinle Formation	CTS	Arsenic	T9X75	5/14/2018	0	1	1.80	QU		mg/kg	36.561325	-109.217125
1	Chinle Formation	CTS	Arsenic	T9X76	5/14/2018	0	1	4.25			mg/kg	36.561321	-109.217018
1	Chinle Formation	CTS	Arsenic	T9X77	4/25/2018	0	1	2.57			mg/kg	36.561333	-109.216904
1	Chinle Formation	CTS	Arsenic	T9X78	4/25/2018	0	1	2.88			mg/kg	36.561329	-109.216797
1	Chinle Formation	CTS	Arsenic	T9X79	4/25/2018	0	1	3.93			mg/kg	36.561337	-109.216682
1	Chinle Formation	CTS	Arsenic	T9X80	4/25/2018	0	1	3.54			mg/kg	36.561329	-109.216576
1	Chinle Formation	CTS	Arsenic	T9X81	4/25/2018	0	1	1.80	QU		mg/kg	36.561337	-109.216469

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Arsenic	T9X82	4/25/2018	0	1	2.88			mg/kg	36.561329	-109.216354
1	Chinle Formation	CTS	Arsenic	T9X83	4/25/2018	0	1	3.24			mg/kg	36.561321	-109.21624
1	Chinle Formation	CTS	Arsenic	T9X84	4/25/2018	0	1	3.84			mg/kg	36.561325	-109.216133
1	Chinle Formation	CTS	Arsenic	T9X85	4/25/2018	0	1	2.43			mg/kg	36.561329	-109.216019
1	Chinle Formation	CTS	Arsenic	T9-XS86-01-042518	4/25/2018	0	3	2.10			mg/kg	36.561327	-109.215908
1	Chinle Formation	CTS	Arsenic	T9X87	8/18/2018	0	1	1.80	QU		mg/kg	36.561249	-109.21727
1	Chinle Formation	CTS	Arsenic	T9X88	5/14/2018	0	1	1.80	QU		mg/kg	36.56123	-109.217125
1	Chinle Formation	CTS	Arsenic	T9X89	4/25/2018	0	1	2.50			mg/kg	36.56126	-109.216965
1	Chinle Formation	CTS	Arsenic	T9X90	4/25/2018	0	1	1.80	QU		mg/kg	36.561249	-109.216904
1	Chinle Formation	CTS	Arsenic	T9X91	4/25/2018	0	1	3.56			mg/kg	36.561241	-109.216797
1	Chinle Formation	CTS	Arsenic	T9X92	4/25/2018	0	1	3.16			mg/kg	36.561245	-109.216682
1	Chinle Formation	CTS	Arsenic	T9-XS93-01-042518	4/25/2018	0	3	2.00			mg/kg	36.561241	-109.216568
1	Chinle Formation	CTS	Arsenic	T9X94	4/25/2018	0	1	1.80	QU		mg/kg	36.561245	-109.216461
1	Chinle Formation	CTS	Arsenic	T9X95	4/25/2018	0	1	1.80	QU		mg/kg	36.561237	-109.216347
1	Chinle Formation	CTS	Arsenic	T9X96	4/25/2018	0	1	1.80	QU		mg/kg	36.561237	-109.21624
1	Chinle Formation	CTS	Arsenic	T9X97	4/25/2018	0	1	3.36			mg/kg	36.561241	-109.216125
1	Chinle Formation	CTS	Arsenic	T9X98	4/25/2018	0	1	1.80	QU		mg/kg	36.561241	-109.216011
1	Chinle Formation	CTS	Arsenic	T9X99	4/25/2018	0	1	2.31			mg/kg	36.561234	-109.215897
1	Chinle Formation	CTS	Arsenic	T9X100	8/18/2018	0	1	2.14			mg/kg	36.56115	-109.217194
1	Chinle Formation	CTS	Arsenic	T9X101	5/14/2018	0	1	1.95			mg/kg	36.56115	-109.217125
1	Chinle Formation	CTS	Arsenic	T9X102	4/25/2018	0	1	1.90			mg/kg	36.561153	-109.21698
1	Chinle Formation	CTS	Arsenic	T9X103	4/25/2018	0	1	1.80	QU		mg/kg	36.56115	-109.216904
1	Chinle Formation	CTS	Arsenic	T9X104	4/25/2018	0	1	2.38			mg/kg	36.56115	-109.216805
1	Chinle Formation	CTS	Arsenic	T9X105	4/25/2018	0	1	2.32			mg/kg	36.56115	-109.21669
1	Chinle Formation	CTS	Arsenic	T9X106	4/25/2018	0	1	1.80	QU		mg/kg	36.561153	-109.21656
1	Chinle Formation	CTS	Arsenic	T9X107	4/25/2018	0	1	1.80	QU		mg/kg	36.561153	-109.216469
1	Chinle Formation	CTS	Arsenic	T9X108	4/25/2018	0	1	3.91			mg/kg	36.561138	-109.21637
1	Chinle Formation	CTS	Arsenic	T9-SS109-01-091118	9/11/2018	0	6	1.90			mg/kg	36.56113	-109.216267
1	Chinle Formation	CTS	Arsenic	T9X109	4/25/2018	0	1	2.57			mg/kg	36.561146	-109.21624
1	Chinle Formation	CTS	Arsenic	T9-SB109-006018-01-091118	9/11/2018	6	18	2.10			mg/kg	36.561131	-109.216263
1	Chinle Formation	CTS	Arsenic	T9-SB109-060072-01-091118	9/11/2018	60	72	1.30			mg/kg	36.561131	-109.216263
1	Chinle Formation	CTS	Arsenic	T9X110	4/25/2018	0	1	4.38			mg/kg	36.561146	-109.216133
1	Chinle Formation	CTS	Arsenic	T9X111	4/25/2018	0	1	4.55			mg/kg	36.561146	-109.216026
1	Chinle Formation	CTS	Arsenic	T9X112	4/25/2018	0	1	1.80	QU		mg/kg	36.561138	-109.215912
1	Chinle Formation	CTS	Arsenic	T9X113	8/18/2018	0	1	6.21			mg/kg	36.561054	-109.217224
1	Chinle Formation	CTS	Arsenic	T9X114	5/14/2018	0	1	1.91			mg/kg	36.561058	-109.217117
1	Chinle Formation	CTS	Arsenic	T9X115	4/25/2018	0	1	2.97			mg/kg	36.561073	-109.217003
1	Chinle Formation	CTS	Arsenic	T9X116	4/25/2018	0	1	3.37			mg/kg	36.561066	-109.216911
1	Chinle Formation	CTS	Arsenic	T9X117	4/25/2018	0	1	1.80	QU		mg/kg	36.561062	-109.216805
1	Chinle Formation	CTS	Arsenic	T9X118	4/25/2018	0	1	1.91			mg/kg	36.561066	-109.21669
1	Chinle Formation	CTS	Arsenic	T9X119	4/25/2018	0	1	2.41			mg/kg	36.561069	-109.21653
1	Chinle Formation	CTS	Arsenic	T9X120	4/25/2018	0	1	1.80	QU		mg/kg	36.561058	-109.216461
1	Chinle Formation	CTS	Arsenic	T9X121	4/25/2018	0	1	1.80	QU		mg/kg	36.561058	-109.216354
1	Chinle Formation	CTS	Arsenic	T9X122	4/25/2018	0	1	2.61			mg/kg	36.561066	-109.216248
1	Chinle Formation	CTS	Arsenic	T9X123	4/25/2018	0	1	6.26			mg/kg	36.561054	-109.216118
1	Chinle Formation	CTS	Arsenic	T9X124	4/25/2018	0	1	4.04			mg/kg	36.561058	-109.216003
1	Chinle Formation	CTS	Arsenic	T9X125	4/25/2018	0	1	3.06			mg/kg	36.561054	-109.215912
1	Chinle Formation	CTS	Arsenic	T9X126	5/14/2018	0	1	2.76			mg/kg	36.560966	-109.217239

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Arsenic	T9X127	5/14/2018	0	1	2.46			mg/kg	36.56097	-109.217125
1	Chinle Formation	CTS	Arsenic	T9X128	4/25/2018	0	1	3.68			mg/kg	36.56097	-109.21701
1	Chinle Formation	CTS	Arsenic	T9-SS129-02-091118	9/11/2018	0	6	2.40			mg/kg	36.56093	-109.216882
1	Chinle Formation	CTS	Arsenic	T9X129	4/25/2018	0	1	2.51			mg/kg	36.560974	-109.216904
1	Chinle Formation	CTS	Arsenic	T9-SB129-006024-01-091118	9/11/2018	6	24	2.70			mg/kg	36.560932	-109.216881
1	Chinle Formation	CTS	Arsenic	T9-SB129-024048-01-091118	9/11/2018	24	48	2.80			mg/kg	36.560932	-109.216881
1	Chinle Formation	CTS	Arsenic	T9X130	4/25/2018	0	1	2.63			mg/kg	36.560966	-109.216797
1	Chinle Formation	CTS	Arsenic	T9X131	4/25/2018	0	1	2.27			mg/kg	36.560978	-109.216698
1	Chinle Formation	CTS	Arsenic	T9X132	4/25/2018	0	1	2.97			mg/kg	36.560974	-109.216568
1	Chinle Formation	CTS	Arsenic	T9X133	4/25/2018	0	1	1.80	QU		mg/kg	36.560963	-109.216461
1	Chinle Formation	CTS	Arsenic	T9X134	4/25/2018	0	1	1.80	QU		mg/kg	36.560963	-109.216354
1	Chinle Formation	CTS	Arsenic	T9X135	4/25/2018	0	1	3.07			mg/kg	36.560966	-109.216248
1	Chinle Formation	CTS	Arsenic	T9X136	4/25/2018	0	1	2.28			mg/kg	36.56097	-109.216141
1	Chinle Formation	CTS	Arsenic	T9X137	4/25/2018	0	1	4.02			mg/kg	36.560951	-109.216026
1	Chinle Formation	CTS	Arsenic	T9X138	4/25/2018	0	1	3.12			mg/kg	36.560963	-109.215904
1	Chinle Formation	CTS	Arsenic	T9X140	5/14/2018	0	1	1.80	QU		mg/kg	36.560875	-109.217239
1	Chinle Formation	CTS	Arsenic	T9X142	5/14/2018	0	1	1.80	QU		mg/kg	36.560871	-109.217018
1	Chinle Formation	CTS	Arsenic	T9X143	5/14/2018	0	1	2.73			mg/kg	36.560875	-109.216911
1	Chinle Formation	CTS	Arsenic	T9-SS144-01-091218	9/12/2018	0	6	2.40	J		mg/kg	36.560853	-109.216753
1	Chinle Formation	CTS	Arsenic	T9X144	5/14/2018	0	1	2.51			mg/kg	36.560875	-109.216797
1	Chinle Formation	CTS	Arsenic	T9-SB144-006018-01-091218	9/12/2018	6	18	2.40			mg/kg	36.560852	-109.216751
1	Chinle Formation	CTS	Arsenic	T9-SB144-024036-01-091218	9/12/2018	24	36	1.60			mg/kg	36.560852	-109.216751
1	Chinle Formation	CTS	Arsenic	T9-SB144-048060-01-091218	9/12/2018	48	60	2.10			mg/kg	36.560852	-109.216751
1	Chinle Formation	CTS	Arsenic	T9X145	5/14/2018	0	1	1.99			mg/kg	36.560875	-109.21669
1	Chinle Formation	CTS	Arsenic	T9X146	5/14/2018	0	1	3.82			mg/kg	36.560871	-109.216576
1	Chinle Formation	CTS	Arsenic	T9X147	5/14/2018	0	1	2.58			mg/kg	36.560867	-109.216461
1	Chinle Formation	CTS	Arsenic	T9X148	5/14/2018	0	1	1.80	QU		mg/kg	36.560867	-109.216347
1	Chinle Formation	CTS	Arsenic	T9X149	5/14/2018	0	1	1.80	QU		mg/kg	36.560871	-109.216232
1	Chinle Formation	CTS	Arsenic	T9X150	5/14/2018	0	1	2.58			mg/kg	36.560871	-109.216118
1	Chinle Formation	CTS	Arsenic	T9X152	5/14/2018	0	1	1.80	QU		mg/kg	36.560867	-109.215897
1	Chinle Formation	CTS	Arsenic	T9X153	8/18/2018	0	1	1.80	QU		mg/kg	36.560787	-109.217316
1	Chinle Formation	CTS	Arsenic	T9X154	5/14/2018	0	1	4.07			mg/kg	36.560791	-109.217239
1	Chinle Formation	CTS	Arsenic	T9-SS155-01-091118	9/11/2018	0	6	4.20			mg/kg	36.560784	-109.217115
1	Chinle Formation	CTS	Arsenic	T9X155	5/14/2018	0	1	3.02			mg/kg	36.560783	-109.217094
1	Chinle Formation	CTS	Arsenic	T9-SB155-006018-01-091118	9/11/2018	6	18	2.60			mg/kg	36.560783	-109.217117
1	Chinle Formation	CTS	Arsenic	T9-SB155-048060-01-091118	9/11/2018	48	60	2.90			mg/kg	36.560783	-109.217117
1	Chinle Formation	CTS	Arsenic	T9X156	5/14/2018	0	1	1.88			mg/kg	36.560783	-109.217018
1	Chinle Formation	CTS	Arsenic	T9X157	5/14/2018	0	1	1.80	QU		mg/kg	36.560783	-109.216904
1	Chinle Formation	CTS	Arsenic	T9X158	5/14/2018	0	1	2.87			mg/kg	36.56078	-109.216797
1	Chinle Formation	CTS	Arsenic	T9X159	5/14/2018	0	1	3.22			mg/kg	36.560787	-109.21669
1	Chinle Formation	CTS	Arsenic	T9X160	5/14/2018	0	1	1.80	QU		mg/kg	36.56078	-109.216576
1	Chinle Formation	CTS	Arsenic	T9X161	5/14/2018	0	1	2.67			mg/kg	36.560783	-109.216461
1	Chinle Formation	CTS	Arsenic	T9X162	5/14/2018	0	1	2.64			mg/kg	36.560776	-109.216347
1	Chinle Formation	CTS	Arsenic	T9X167	8/18/2018	0	1	1.87			mg/kg	36.560699	-109.217339
1	Chinle Formation	CTS	Arsenic	T9X168	5/14/2018	0	1	5.99			mg/kg	36.560699	-109.217247
1	Chinle Formation	CTS	Arsenic	T9X169	5/14/2018	0	1	4.32			mg/kg	36.560696	-109.217125
1	Chinle Formation	CTS	Arsenic	T9X170	5/14/2018	0	1	2.15			mg/kg	36.560696	-109.21701
1	Chinle Formation	CTS	Arsenic	T9X171	5/14/2018	0	1	3.08			mg/kg	36.560696	-109.216904

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Arsenic	T9X172	5/14/2018	0	1	1.80	QU		mg/kg	36.560696	-109.216797
1	Chinle Formation	CTS	Arsenic	T9X173	5/14/2018	0	1	1.93			mg/kg	36.560699	-109.216682
1	Chinle Formation	CTS	Arsenic	T9X174	5/14/2018	0	1	1.80	QU		mg/kg	36.560688	-109.216568
1	Chinle Formation	CTS	Arsenic	T9X175	5/14/2018	0	1	1.86			mg/kg	36.560688	-109.216461
1	Chinle Formation	CTS	Arsenic	T9-SS176-01-091218	9/12/2018	0	6	2.00			mg/kg	36.560713	-109.216389
1	Chinle Formation	CTS	Arsenic	T9X176	5/14/2018	0	1	2.00			mg/kg	36.560692	-109.216347
1	Chinle Formation	CTS	Arsenic	T9-SB176-006018-01-091218	9/12/2018	6	18	2.10			mg/kg	36.560715	-109.216393
1	Chinle Formation	CTS	Arsenic	T9-SB176-024036-01-091218	9/12/2018	24	36	5.00			mg/kg	36.560715	-109.216393
1	Chinle Formation	CTS	Arsenic	T9-SB176-048060-01-091218	9/12/2018	48	60	1.60			mg/kg	36.560715	-109.216393
1	Chinle Formation	CTS	Arsenic	T9X181	5/14/2018	0	1	1.80	QU		mg/kg	36.560604	-109.217354
1	Chinle Formation	CTS	Arsenic	T9X182	4/25/2018	0	1	3.55			mg/kg	36.560616	-109.217247
1	Chinle Formation	CTS	Arsenic	T9X183	4/25/2018	0	1	2.89			mg/kg	36.560604	-109.217133
1	Chinle Formation	CTS	Arsenic	T9X184	4/25/2018	0	1	3.61			mg/kg	36.560612	-109.217026
1	Chinle Formation	CTS	Arsenic	T9-SS185-01-091218	9/12/2018	0	6	2.00			mg/kg	36.560605	-109.216904
1	Chinle Formation	CTS	Arsenic	T9X185	4/25/2018	0	1	1.80	QU		mg/kg	36.560596	-109.216919
1	Chinle Formation	CTS	Arsenic	T9-SB185-006018-01-091218	9/12/2018	6	18	2.60			mg/kg	36.560604	-109.216904
1	Chinle Formation	CTS	Arsenic	T9-SB185-024036-01-091218	9/12/2018	24	36	2.50			mg/kg	36.560604	-109.216904
1	Chinle Formation	CTS	Arsenic	T9-SB185-048060-01-091218	9/12/2018	48	60	2.70			mg/kg	36.560604	-109.216904
1	Chinle Formation	CTS	Arsenic	T9X186	4/25/2018	0	1	1.96			mg/kg	36.560604	-109.216797
1	Chinle Formation	CTS	Arsenic	T9X187	4/25/2018	0	1	1.80	QU		mg/kg	36.560619	-109.21669
1	Chinle Formation	CTS	Arsenic	T9X188	4/25/2018	0	1	2.67			mg/kg	36.5606	-109.216591
1	Chinle Formation	CTS	Arsenic	T9X189	4/25/2018	0	1	1.93			mg/kg	36.5606	-109.216469
1	Chinle Formation	CTS	Arsenic	T9X190	4/25/2018	0	1	2.10			mg/kg	36.560604	-109.216354
1	Chinle Formation	CTS	Arsenic	T9X191	5/14/2018	0	1	3.26			mg/kg	36.560604	-109.21624
1	Chinle Formation	CTS	Arsenic	T9X196	5/14/2018	0	1	1.80	QU		mg/kg	36.56052	-109.217354
1	Chinle Formation	CTS	Arsenic	T9X197	4/25/2018	0	1	6.15			mg/kg	36.56052	-109.217255
1	Chinle Formation	CTS	Arsenic	T9X198	4/25/2018	0	1	3.73			mg/kg	36.560516	-109.217133
1	Chinle Formation	CTS	Arsenic	T9X199	4/25/2018	0	1	1.80	QU		mg/kg	36.560516	-109.217026
1	Chinle Formation	CTS	Arsenic	T9X200	4/25/2018	0	1	2.08			mg/kg	36.560516	-109.216927
1	Chinle Formation	CTS	Arsenic	T9X201	4/25/2018	0	1	4.10			mg/kg	36.56052	-109.21637
1	Chinle Formation	CTS	Arsenic	T9X202	4/25/2018	0	1	2.17			mg/kg	36.560516	-109.216248
1	Chinle Formation	CTS	Arsenic	T9X203	4/25/2018	0	1	2.77			mg/kg	36.560513	-109.216141
1	Chinle Formation	CTS	Arsenic	T9X204	8/18/2018	0	1	1.80	QU		mg/kg	36.56041	-109.217422
1	Chinle Formation	CTS	Arsenic	T9X205	5/14/2018	0	1	1.80	QU		mg/kg	36.560436	-109.217346
1	Chinle Formation	CTS	Arsenic	T9X206	4/25/2018	0	1	2.55			mg/kg	36.560429	-109.217247
1	Chinle Formation	CTS	Arsenic	T9X207	4/25/2018	0	1	1.80	QU		mg/kg	36.560425	-109.21714
1	Chinle Formation	CTS	Arsenic	T9X208	4/25/2018	0	1	2.62			mg/kg	36.560425	-109.217033
1	Chinle Formation	CTS	Arsenic	T9X209	4/25/2018	0	1	1.80	QU		mg/kg	36.560417	-109.216354
1	Chinle Formation	CTS	Arsenic	T9X210	8/18/2018	0	1	2.13			mg/kg	36.56036	-109.217438
1	Chinle Formation	CTS	Arsenic	T9X211	5/14/2018	0	1	3.98			mg/kg	36.560341	-109.217361
1	Chinle Formation	CTS	Arsenic	T9-SS212-01-091218	9/12/2018	0	6	2.40			mg/kg	36.560378	-109.217234
1	Chinle Formation	CTS	Arsenic	T9X212	4/25/2018	0	1	2.48			mg/kg	36.560349	-109.217255
1	Chinle Formation	CTS	Arsenic	T9-SB212-006018-01-091218	9/12/2018	6	18	2.10			mg/kg	36.560379	-109.217232
1	Chinle Formation	CTS	Arsenic	T9-SB212-024036-01-091218	9/12/2018	24	36	2.60			mg/kg	36.560379	-109.217232
1	Chinle Formation	CTS	Arsenic	T9-SB212-048060-01-091218	9/12/2018	48	60	2.90			mg/kg	36.560379	-109.217232
1	Chinle Formation	CTS	Arsenic	T9X213	4/25/2018	0	1	4.35			mg/kg	36.560337	-109.217148
1	Chinle Formation	CTS	Arsenic	T9X214	4/25/2018	0	1	2.48			mg/kg	36.560345	-109.217026
1	Chinle Formation	CTS	Arsenic	T9X215	5/14/2018	0	1	1.80	QU		mg/kg	36.560261	-109.217461

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Arsenic	T9-SS216-01-091118	9/11/2018	0	6	2.20			mg/kg	36.56026	-109.21733
1	Chinle Formation	CTS	Arsenic	T9X216	5/14/2018	0	1	1.80	QU		mg/kg	36.560253	-109.217346
1	Chinle Formation	CTS	Arsenic	T9-SB216-0612-01-091118	9/11/2018	6	12	2.60			mg/kg	36.56026	-109.21733
1	Chinle Formation	CTS	Arsenic	T9-SB216-1218-01-091118	9/11/2018	12	18	2.40			mg/kg	36.560261	-109.217331
1	Chinle Formation	CTS	Arsenic	T9-XS217-01-042518	4/25/2018	0	3	2.00			mg/kg	36.560249	-109.217256
1	Chinle Formation	CTS	Arsenic	T9X218	5/14/2018	0	1	2.44			mg/kg	36.560257	-109.217125
1	Chinle Formation	CTS	Arsenic	T9X219	5/14/2018	0	1	2.33			mg/kg	36.560165	-109.217583
1	Chinle Formation	CTS	Arsenic	T9X220	5/14/2018	0	1	2.82			mg/kg	36.560165	-109.217468
1	Chinle Formation	CTS	Arsenic	T9X221	4/25/2018	0	1	2.87			mg/kg	36.560173	-109.217361
1	Chinle Formation	CTS	Arsenic	T9X222	4/25/2018	0	1	3.02			mg/kg	36.560165	-109.217247
1	Chinle Formation	CTS	Arsenic	T9X223	4/25/2018	0	1	2.63			mg/kg	36.560146	-109.217148
1	Chinle Formation	CTS	Arsenic	T9X224	5/14/2018	0	1	2.27			mg/kg	36.560074	-109.217613
1	Chinle Formation	CTS	Arsenic	T9X225	5/14/2018	0	1	2.38			mg/kg	36.56007	-109.217476
1	Chinle Formation	CTS	Arsenic	T9X226	4/25/2018	0	1	1.98			mg/kg	36.560081	-109.217361
1	Chinle Formation	CTS	Arsenic	T9-SS227-01-091118	9/11/2018	0	6	2.40			mg/kg	36.560092	-109.217284
1	Chinle Formation	CTS	Arsenic	T9X227	4/25/2018	0	1	1.80	QU		mg/kg	36.56007	-109.21727
1	Chinle Formation	CTS	Arsenic	T9-SB227-0612-01-091118	9/11/2018	6	12	2.50			mg/kg	36.560092	-109.217284
1	Chinle Formation	CTS	Arsenic	T9-SB227-1218-01-091118	9/11/2018	12	18	2.50			mg/kg	36.560093	-109.217285
1	Chinle Formation	CTS	Arsenic	T9X229	5/14/2018	0	1	3.40			mg/kg	36.559982	-109.217468
1	Chinle Formation	CTS	Arsenic	T9X230	4/25/2018	0	1	1.96			mg/kg	36.55999	-109.217369
1	Chinle Formation	CTS	Arsenic	T9X231	5/14/2018	0	1	3.22			mg/kg	36.559895	-109.21756
1	Chinle Formation	CTS	Arsenic	T9X232	5/14/2018	0	1	1.80	QU		mg/kg	36.559898	-109.217453
1	Chinle Formation	CTS	Arsenic	T9X233	4/25/2018	0	1	1.80	QU		mg/kg	36.559883	-109.217377
1	Chinle Formation	CTS	Arsenic	T9X234	4/25/2018	0	1	1.80	QU		mg/kg	36.559814	-109.217712
1	Chinle Formation	CTS	Arsenic	T9X235	5/14/2018	0	1	1.80	QU		mg/kg	36.559807	-109.217575
1	Chinle Formation	CTS	Arsenic	T9X236	4/25/2018	0	1	2.47			mg/kg	36.559799	-109.217468
1	Chinle Formation	CTS	Arsenic	T9G1	8/18/2018	0	1	2.39			mg/kg	36.562412	-109.216995
1	Chinle Formation	CTS	Arsenic	T9G10	8/18/2018	0	1	1.80	QU		mg/kg	36.561962	-109.21711
1	Chinle Formation	CTS	Arsenic	T9G11	8/18/2018	0	1	2.26			mg/kg	36.561775	-109.216438
1	Chinle Formation	CTS	Arsenic	T9-XSG12-01-081818	8/18/2018	0	3	2.00			mg/kg	36.56178	-109.215999
1	Chinle Formation	CTS	Arsenic	T9G13	8/18/2018	0	1	2.62			mg/kg	36.561771	-109.215881
1	Chinle Formation	CTS	Arsenic	T9G14	8/18/2018	0	1	2.07			mg/kg	36.561703	-109.217224
1	Chinle Formation	CTS	Arsenic	T9G15	8/18/2018	0	1	1.80	QU		mg/kg	36.561695	-109.217125
1	Chinle Formation	CTS	Arsenic	T9G16	8/18/2018	0	1	1.80	QU		mg/kg	36.56168	-109.215881
1	Chinle Formation	CTS	Arsenic	T9G17	8/18/2018	0	1	2.73			mg/kg	36.561676	-109.215775
1	Chinle Formation	CTS	Arsenic	T9G18	8/18/2018	0	1	3.37			mg/kg	36.56168	-109.215668
1	Chinle Formation	CTS	Arsenic	T9G19	8/18/2018	0	1	3.02			mg/kg	36.561604	-109.217224
1	Chinle Formation	CTS	Arsenic	T9G2	8/18/2018	0	1	4.73			mg/kg	36.562412	-109.216888
1	Chinle Formation	CTS	Arsenic	T9G20	8/18/2018	0	1	2.62			mg/kg	36.561588	-109.215675
1	Chinle Formation	CTS	Arsenic	T9G21	8/18/2018	0	1	1.96			mg/kg	36.561508	-109.217224
1	Chinle Formation	CTS	Arsenic	T9G22	8/18/2018	0	1	1.96			mg/kg	36.561501	-109.215652
1	Chinle Formation	CTS	Arsenic	T9G23	8/18/2018	0	1	1.80	QU		mg/kg	36.56142	-109.217232
1	Chinle Formation	CTS	Arsenic	T9G24	8/18/2018	0	1	1.80	QU		mg/kg	36.561413	-109.215775
1	Chinle Formation	CTS	Arsenic	T9G25	8/18/2018	0	1	1.85			mg/kg	36.561413	-109.21566
1	Chinle Formation	CTS	Arsenic	T9G26	8/18/2018	0	1	1.80	QU		mg/kg	36.561337	-109.217239
1	Chinle Formation	CTS	Arsenic	T9G27	8/18/2018	0	1	2.22			mg/kg	36.561321	-109.215782
1	Chinle Formation	CTS	Arsenic	T9G28	8/18/2018	0	1	4.28			mg/kg	36.561237	-109.215767
1	Chinle Formation	CTS	Arsenic	T9G29	8/18/2018	0	1	2.17			mg/kg	36.561066	-109.217346

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Arsenic	T9G30	8/18/2018	0	1	2.43			mg/kg	36.561058	-109.215782
1	Chinle Formation	CTS	Arsenic	T9G31	8/18/2018	0	1	3.60			mg/kg	36.560978	-109.217354
1	Chinle Formation	CTS	Arsenic	T9G32	8/18/2018	0	1	4.01			mg/kg	36.56097	-109.215775
1	Chinle Formation	CTS	Arsenic	T9G33	8/18/2018	0	1	2.60			mg/kg	36.560871	-109.215775
1	Chinle Formation	CTS	Arsenic	T9G34	8/18/2018	0	1	1.80	QU		mg/kg	36.560623	-109.217468
1	Chinle Formation	CTS	Arsenic	T9G35	8/18/2018	0	1	3.01			mg/kg	36.560513	-109.216789
1	Chinle Formation	CTS	Arsenic	T9G36	8/18/2018	0	1	1.80	QU		mg/kg	36.560516	-109.21669
1	Chinle Formation	CTS	Arsenic	T9G37	8/18/2018	0	1	1.80	QU		mg/kg	36.560513	-109.21656
1	Chinle Formation	CTS	Arsenic	T9G38	8/18/2018	0	1	1.80	QU		mg/kg	36.560505	-109.216461
1	Chinle Formation	CTS	Arsenic	T9G39	8/18/2018	0	1	3.04			mg/kg	36.56052	-109.216011
1	Chinle Formation	CTS	Arsenic	T9G4	8/18/2018	0	1	2.81			mg/kg	36.562321	-109.216988
1	Chinle Formation	CTS	Arsenic	T9G40	8/18/2018	0	1	1.80	QU		mg/kg	36.560429	-109.216896
1	Chinle Formation	CTS	Arsenic	T9G41	8/18/2018	0	1	1.80	QU		mg/kg	36.560429	-109.216789
1	Chinle Formation	CTS	Arsenic	T9G42	8/18/2018	0	1	1.80	QU		mg/kg	36.560429	-109.216469
1	Chinle Formation	CTS	Arsenic	T9G43	8/18/2018	0	1	2.11			mg/kg	36.560429	-109.216232
1	Chinle Formation	CTS	Arsenic	T9G44	8/18/2018	0	1	1.80	QU		mg/kg	36.560421	-109.216125
1	Chinle Formation	CTS	Arsenic	T9G45	8/18/2018	0	1	2.48			mg/kg	36.560421	-109.216011
1	Chinle Formation	CTS	Arsenic	T9G46	8/18/2018	0	1	1.80	QU		mg/kg	36.560337	-109.216911
1	Chinle Formation	CTS	Arsenic	T9G47	8/18/2018	0	1	1.80	QU		mg/kg	36.560333	-109.216461
1	Chinle Formation	CTS	Arsenic	T9G48	8/18/2018	0	1	3.45			mg/kg	36.560341	-109.216331
1	Chinle Formation	CTS	Arsenic	T9G49	8/18/2018	0	1	1.80	QU		mg/kg	36.560326	-109.216217
1	Chinle Formation	CTS	Arsenic	T9G50	8/18/2018	0	1	3.78			mg/kg	36.560257	-109.217682
1	Chinle Formation	CTS	Arsenic	T9G51	8/18/2018	0	1	1.80	QU		mg/kg	36.560257	-109.217583
1	Chinle Formation	CTS	Arsenic	T9G52	8/18/2018	0	1	1.80	QU		mg/kg	36.560253	-109.217018
1	Chinle Formation	CTS	Arsenic	T9G53	8/18/2018	0	1	2.12			mg/kg	36.560234	-109.216911
1	Chinle Formation	CTS	Arsenic	T9G54	8/18/2018	0	1	1.80	QU		mg/kg	36.560173	-109.217682
1	Chinle Formation	CTS	Arsenic	T9G55	8/18/2018	0	1	1.80	QU		mg/kg	36.560158	-109.217026
1	Chinle Formation	CTS	Arsenic	T9G56	8/18/2018	0	1	4.18			mg/kg	36.560074	-109.217682
1	Chinle Formation	CTS	Arsenic	T9G57	8/18/2018	0	1	1.80	QU		mg/kg	36.560074	-109.21714
1	Chinle Formation	CTS	Arsenic	T9G58	8/18/2018	0	1	3.12			mg/kg	36.559982	-109.217697
1	Chinle Formation	CTS	Arsenic	T9G59	8/18/2018	0	1	2.59			mg/kg	36.559978	-109.217239
1	Chinle Formation	CTS	Arsenic	T9G6	8/18/2018	0	1	2.49			mg/kg	36.562229	-109.216995
1	Chinle Formation	CTS	Arsenic	T9G60	8/18/2018	0	1	1.99			mg/kg	36.559975	-109.217148
1	Chinle Formation	CTS	Arsenic	T9G61	8/18/2018	0	1	1.80	QU		mg/kg	36.559883	-109.217697
1	Chinle Formation	CTS	Arsenic	T9G62	8/18/2018	0	1	2.01			mg/kg	36.559891	-109.217255
1	Chinle Formation	CTS	Arsenic	T9G63	8/18/2018	0	1	1.80	QU		mg/kg	36.559792	-109.217346
1	Chinle Formation	CTS	Arsenic	T9G64	8/18/2018	0	1	2.58			mg/kg	36.559811	-109.217247
1	Chinle Formation	CTS	Arsenic	T9G65	8/18/2018	0	1	1.80	QU		mg/kg	36.559708	-109.21759
1	Chinle Formation	CTS	Arsenic	T9G66	8/18/2018	0	1	2.67			mg/kg	36.559723	-109.217461
1	Chinle Formation	CTS	Arsenic	T9G67	8/18/2018	0	1	1.80	QU		mg/kg	36.559715	-109.217361
1	Chinle Formation	CTS	Arsenic	T9G7	8/18/2018	0	1	2.51			mg/kg	36.562138	-109.216995
1	Chinle Formation	CTS	Arsenic	T9G8	8/18/2018	0	1	2.99			mg/kg	36.562054	-109.21711
1	Chinle Formation	CTS	Arsenic	T9G9	8/18/2018	0	1	2.40			mg/kg	36.56205	-109.217003
1	Chinle Formation	CTS South	Arsenic	T37X1	5/14/2018	0	1	4.98			mg/kg	36.558987	-109.218002
1	Chinle Formation	CTS South	Arsenic	T37X2	5/14/2018	0	1	3.37			mg/kg	36.558998	-109.217911
1	Chinle Formation	CTS South	Arsenic	T37X3	5/14/2018	0	1	3.05			mg/kg	36.559002	-109.217773
1	Chinle Formation	CTS South	Arsenic	T37X4	5/14/2018	0	1	3.92			mg/kg	36.558987	-109.21772
1	Chinle Formation	CTS South	Arsenic	T37X5	5/14/2018	0	1	2.44			mg/kg	36.558983	-109.21759

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Arsenic	T37X6	5/14/2018	0	1	1.80	QU		mg/kg	36.55899	-109.217484
1	Chinle Formation	CTS South	Arsenic	T37X7	5/14/2018	0	1	4.26			mg/kg	36.558983	-109.217369
1	Chinle Formation	CTS South	Arsenic	T37X8	5/14/2018	0	1	2.64			mg/kg	36.558975	-109.217255
1	Chinle Formation	CTS South	Arsenic	T37X9	5/14/2018	0	1	2.57			mg/kg	36.558891	-109.218018
1	Chinle Formation	CTS South	Arsenic	T37X10	5/14/2018	0	1	6.43			mg/kg	36.55891	-109.217934
1	Chinle Formation	CTS South	Arsenic	T37X11	5/14/2018	0	1	3.10			mg/kg	36.558907	-109.217804
1	Chinle Formation	CTS South	Arsenic	T37X12	5/14/2018	0	1	4.84			mg/kg	36.558907	-109.217735
1	Chinle Formation	CTS South	Arsenic	T37X13	5/14/2018	0	1	2.49			mg/kg	36.558899	-109.217583
1	Chinle Formation	CTS South	Arsenic	T37X14	5/14/2018	0	1	4.11			mg/kg	36.558895	-109.217476
1	Chinle Formation	CTS South	Arsenic	T37X15	5/14/2018	0	1	2.56			mg/kg	36.558891	-109.217384
1	Chinle Formation	CTS South	Arsenic	T37X16	5/14/2018	0	1	3.47			mg/kg	36.558903	-109.217262
1	Chinle Formation	CTS South	Arsenic	T37X17	5/14/2018	0	1	2.84			mg/kg	36.558895	-109.217133
1	Chinle Formation	CTS South	Arsenic	T37X18	5/14/2018	0	1	2.00			mg/kg	36.558899	-109.217033
1	Chinle Formation	CTS South	Arsenic	T37X19	5/14/2018	0	1	1.80	QU		mg/kg	36.558811	-109.218048
1	Chinle Formation	CTS South	Arsenic	T37X20	5/14/2018	0	1	3.31			mg/kg	36.558815	-109.217941
1	Chinle Formation	CTS South	Arsenic	T37X21	5/14/2018	0	1	3.41			mg/kg	36.558826	-109.217812
1	Chinle Formation	CTS South	Arsenic	T37X22	5/14/2018	0	1	4.54			mg/kg	36.558804	-109.217705
1	Chinle Formation	CTS South	Arsenic	T37X23	5/14/2018	0	1	3.80			mg/kg	36.558815	-109.217583
1	Chinle Formation	CTS South	Arsenic	T37X24	5/14/2018	0	1	2.31			mg/kg	36.5588	-109.217484
1	Chinle Formation	CTS South	Arsenic	T37X25	5/14/2018	0	1	2.52			mg/kg	36.558784	-109.2174
1	Chinle Formation	CTS South	Arsenic	T37X26	5/14/2018	0	1	3.80			mg/kg	36.558815	-109.217239
1	Chinle Formation	CTS South	Arsenic	T37X27	5/14/2018	0	1	1.80	QU		mg/kg	36.5588	-109.21714
1	Chinle Formation	CTS South	Arsenic	T37X28	5/14/2018	0	1	3.06			mg/kg	36.558727	-109.21804
1	Chinle Formation	CTS South	Arsenic	T37X29	5/14/2018	0	1	1.87			mg/kg	36.558727	-109.217964
1	Chinle Formation	CTS South	Arsenic	T37X30	5/14/2018	0	1	3.37			mg/kg	36.558731	-109.217819
1	Chinle Formation	CTS South	Arsenic	T37X31	5/14/2018	0	1	2.24			mg/kg	36.558727	-109.217705
1	Chinle Formation	CTS South	Arsenic	T37X32	5/14/2018	0	1	2.00			mg/kg	36.558727	-109.217598
1	Chinle Formation	CTS South	Arsenic	T37X33	5/14/2018	0	1	2.10			mg/kg	36.558716	-109.217499
1	Chinle Formation	CTS South	Arsenic	T37X34	5/14/2018	0	1	3.36			mg/kg	36.55872	-109.217384
1	Chinle Formation	CTS South	Arsenic	T37X35	5/14/2018	0	1	4.52			mg/kg	36.55872	-109.217255
1	Chinle Formation	CTS South	Arsenic	T37X36	5/14/2018	0	1	4.88			mg/kg	36.558712	-109.217163
1	Chinle Formation	CTS South	Arsenic	T37X37	5/14/2018	0	1	3.08			mg/kg	36.558632	-109.218048
1	Chinle Formation	CTS South	Arsenic	T37X38	8/18/2018	0	1	2.70			mg/kg	36.55862	-109.21788
1	Chinle Formation	CTS South	Arsenic	T37X39	5/14/2018	0	1	3.48			mg/kg	36.558628	-109.217819
1	Chinle Formation	CTS South	Arsenic	T37X40	5/14/2018	0	1	3.08			mg/kg	36.558617	-109.217712
1	Chinle Formation	CTS South	Arsenic	T37X41	5/14/2018	0	1	2.58			mg/kg	36.558624	-109.21759
1	Chinle Formation	CTS South	Arsenic	T37X42	5/14/2018	0	1	1.80	QU		mg/kg	36.55862	-109.217468
1	Chinle Formation	CTS South	Arsenic	T37X43	5/14/2018	0	1	2.11			mg/kg	36.55862	-109.217361
1	Chinle Formation	CTS South	Arsenic	T37X44	5/14/2018	0	1	2.00			mg/kg	36.55864	-109.217232
1	Chinle Formation	CTS South	Arsenic	T37X45	5/14/2018	0	1	1.80	QU		mg/kg	36.55862	-109.217163
1	Chinle Formation	CTS South	Arsenic	T37X46	5/14/2018	0	1	1.90			mg/kg	36.558529	-109.218124
1	Chinle Formation	CTS South	Arsenic	T37X47	5/14/2018	0	1	2.15			mg/kg	36.558537	-109.218033
1	Chinle Formation	CTS South	Arsenic	T37X48	8/18/2018	0	1	1.80	QU		mg/kg	36.558544	-109.217903
1	Chinle Formation	CTS South	Arsenic	T37X49	5/14/2018	0	1	3.77			mg/kg	36.558548	-109.217819
1	Chinle Formation	CTS South	Arsenic	T37X50	5/14/2018	0	1	3.18			mg/kg	36.558548	-109.217705
1	Chinle Formation	CTS South	Arsenic	T37X51	5/14/2018	0	1	3.48			mg/kg	36.55854	-109.217583
1	Chinle Formation	CTS South	Arsenic	T37X52	5/14/2018	0	1	1.80	QU		mg/kg	36.558544	-109.217484
1	Chinle Formation	CTS South	Arsenic	T37X53	5/14/2018	0	1	1.80	QU		mg/kg	36.558537	-109.217384

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Arsenic	T37X54	5/14/2018	0	1	3.17			mg/kg	36.55854	-109.217262
1	Chinle Formation	CTS South	Arsenic	T37X55	5/14/2018	0	1	3.15			mg/kg	36.558533	-109.21714
1	Chinle Formation	CTS South	Arsenic	T37X56	5/14/2018	0	1	3.19			mg/kg	36.558453	-109.21814
1	Chinle Formation	CTS South	Arsenic	T37X57	5/14/2018	0	1	2.33			mg/kg	36.558456	-109.218048
1	Chinle Formation	CTS South	Arsenic	T37X58	5/14/2018	0	1	1.80	QU		mg/kg	36.558456	-109.217903
1	Chinle Formation	CTS South	Arsenic	T37X59	5/14/2018	0	1	3.38			mg/kg	36.558456	-109.217819
1	Chinle Formation	CTS South	Arsenic	T37X60	5/14/2018	0	1	5.64			mg/kg	36.558445	-109.217712
1	Chinle Formation	CTS South	Arsenic	T37X61	5/14/2018	0	1	1.80	QU		mg/kg	36.558441	-109.21759
1	Chinle Formation	CTS South	Arsenic	T37X62	5/14/2018	0	1	2.60			mg/kg	36.558437	-109.217476
1	Chinle Formation	CTS South	Arsenic	T37X63	5/14/2018	0	1	3.58			mg/kg	36.558441	-109.217361
1	Chinle Formation	CTS South	Arsenic	T37X64	5/14/2018	0	1	4.02			mg/kg	36.558453	-109.217262
1	Chinle Formation	CTS South	Arsenic	T37X65	5/14/2018	0	1	2.67			mg/kg	36.558361	-109.218155
1	Chinle Formation	CTS South	Arsenic	T37X66	5/14/2018	0	1	4.61			mg/kg	36.558365	-109.218063
1	Chinle Formation	CTS South	Arsenic	T37X67	5/14/2018	0	1	1.80	QU		mg/kg	36.558365	-109.217934
1	Chinle Formation	CTS South	Arsenic	T37X68	5/14/2018	0	1	2.69			mg/kg	36.558361	-109.217819
1	Chinle Formation	CTS South	Arsenic	T37-SS69-01-091218	9/12/2018	0	6	2.30			mg/kg	36.558325	-109.217756
1	Chinle Formation	CTS South	Arsenic	T37X69	5/14/2018	0	1	3.99			mg/kg	36.558372	-109.217712
1	Chinle Formation	CTS South	Arsenic	T37-SB69-006018-01-091218	9/12/2018	6	18	2.80			mg/kg	36.558327	-109.217758
1	Chinle Formation	CTS South	Arsenic	T37-SB69-018048-01-091218	9/12/2018	18	48	2.40			mg/kg	36.558327	-109.217758
1	Chinle Formation	CTS South	Arsenic	T37-SB69-048066-01-091218	9/12/2018	48	66	2.50			mg/kg	36.558327	-109.217758
1	Chinle Formation	CTS South	Arsenic	T37X70	5/14/2018	0	1	2.57			mg/kg	36.558372	-109.217606
1	Chinle Formation	CTS South	Arsenic	T37X71	5/14/2018	0	1	1.80	QU		mg/kg	36.55835	-109.217506
1	Chinle Formation	CTS South	Arsenic	T37X72	5/14/2018	0	1	1.80	QU		mg/kg	36.558372	-109.217377
1	Chinle Formation	CTS South	Arsenic	T37X73	5/14/2018	0	1	1.80	QU		mg/kg	36.558334	-109.217293
1	Chinle Formation	CTS South	Arsenic	T37X74	5/14/2018	0	1	3.43			mg/kg	36.558273	-109.218163
1	Chinle Formation	CTS South	Arsenic	T37X75	5/14/2018	0	1	3.28			mg/kg	36.558289	-109.218086
1	Chinle Formation	CTS South	Arsenic	T37X76	5/14/2018	0	1	3.75			mg/kg	36.558273	-109.217926
1	Chinle Formation	CTS South	Arsenic	T37-SS77-01-091218	9/12/2018	0	6	2.50			mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Arsenic	T37X77	5/14/2018	0	1	2.86			mg/kg	36.55827	-109.217834
1	Chinle Formation	CTS South	Arsenic	T37-SB77-006018-01-091218	9/12/2018	6	18	2.80			mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Arsenic	T37-SB77-018048-01-091218	9/12/2018	18	48	2.70			mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Arsenic	T37-SB77-048072-01-091218	9/12/2018	48	72	2.90			mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Arsenic	T37X78	5/14/2018	0	1	1.80	QU		mg/kg	36.558277	-109.21772
1	Chinle Formation	CTS South	Arsenic	T37X79	5/14/2018	0	1	3.79			mg/kg	36.558277	-109.217598
1	Chinle Formation	CTS South	Arsenic	T37X80	5/14/2018	0	1	2.48			mg/kg	36.558281	-109.217499
1	Chinle Formation	CTS South	Arsenic	T37X81	5/14/2018	0	1	1.80	QU		mg/kg	36.558266	-109.217377
1	Chinle Formation	CTS South	Arsenic	T37X82	5/14/2018	0	1	1.80	QU		mg/kg	36.558182	-109.218246
1	Chinle Formation	CTS South	Arsenic	T37X83	5/14/2018	0	1	3.37			mg/kg	36.558182	-109.218155
1	Chinle Formation	CTS South	Arsenic	T37X84	5/14/2018	0	1	1.80	QU		mg/kg	36.558189	-109.21801
1	Chinle Formation	CTS South	Arsenic	T37X85	5/14/2018	0	1	4.29			mg/kg	36.558189	-109.217934
1	Chinle Formation	CTS South	Arsenic	T37-SS86-01-091318	9/13/2018	0	6	2.50			mg/kg	36.558156	-109.217825
1	Chinle Formation	CTS South	Arsenic	T37X86	5/14/2018	0	1	1.90			mg/kg	36.558186	-109.217804
1	Chinle Formation	CTS South	Arsenic	T37-SB86-006018-01-091318	9/13/2018	6	18	2.70			mg/kg	36.558155	-109.217827
1	Chinle Formation	CTS South	Arsenic	T37-SB86-024036-01-091318	9/13/2018	24	36	2.90			mg/kg	36.558155	-109.217827
1	Chinle Formation	CTS South	Arsenic	T37-SB86-048060-01-091318	9/13/2018	48	60	3.00			mg/kg	36.558155	-109.217827
1	Chinle Formation	CTS South	Arsenic	T37-SS87-01-091318	9/13/2018	0	6	2.80			mg/kg	36.558151	-109.217759
1	Chinle Formation	CTS South	Arsenic	T37X87	5/14/2018	0	1	1.80	QU		mg/kg	36.558189	-109.217705
1	Chinle Formation	CTS South	Arsenic	T37-SB87-006018-01-091318	9/13/2018	6	18	2.90			mg/kg	36.558151	-109.217758

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Arsenic	T37-SB87-024036-01-091318	9/13/2018	24	36	3.10			mg/kg	36.558151	-109.217758
1	Chinle Formation	CTS South	Arsenic	T37-SB87-048060-01-091318	9/13/2018	48	60	2.40			mg/kg	36.558151	-109.217758
1	Chinle Formation	CTS South	Arsenic	T37X88	5/14/2018	0	1	3.31			mg/kg	36.558189	-109.21759
1	Chinle Formation	CTS South	Arsenic	T37X89	5/14/2018	0	1	2.21			mg/kg	36.558189	-109.217476
1	Chinle Formation	CTS South	Arsenic	T37X90	5/14/2018	0	1	2.87			mg/kg	36.558098	-109.218269
1	Chinle Formation	CTS South	Arsenic	T37X91	5/14/2018	0	1	2.50			mg/kg	36.55809	-109.218193
1	Chinle Formation	CTS South	Arsenic	T37X92	5/14/2018	0	1	1.80	QU		mg/kg	36.558098	-109.218048
1	Chinle Formation	CTS South	Arsenic	T37X93	5/14/2018	0	1	2.21			mg/kg	36.558094	-109.217926
1	Chinle Formation	CTS South	Arsenic	T37-SS94-01-091318	9/13/2018	0	6	2.40			mg/kg	36.558078	-109.217828
1	Chinle Formation	CTS South	Arsenic	T37X94	5/14/2018	0	1	3.27			mg/kg	36.558086	-109.217827
1	Chinle Formation	CTS South	Arsenic	T37-SB94-006018-01-091318	9/13/2018	6	18	2.60			mg/kg	36.558079	-109.217827
1	Chinle Formation	CTS South	Arsenic	T37-SB94-024036-01-091318	9/13/2018	24	36	3.00			mg/kg	36.558079	-109.217827
1	Chinle Formation	CTS South	Arsenic	T37-SB94-048060-01-091318	9/13/2018	48	60	3.50			mg/kg	36.558079	-109.217827
1	Chinle Formation	CTS South	Arsenic	T37X95	5/14/2018	0	1	1.80	QU		mg/kg	36.558094	-109.217712
1	Chinle Formation	CTS South	Arsenic	T37X96	5/14/2018	0	1	2.07			mg/kg	36.558086	-109.21759
1	Chinle Formation	CTS South	Arsenic	T37X97	5/14/2018	0	1	1.80	QU		mg/kg	36.558086	-109.217476
1	Chinle Formation	CTS South	Arsenic	T37X98	5/14/2018	0	1	2.05			mg/kg	36.558006	-109.218369
1	Chinle Formation	CTS South	Arsenic	T37X99	5/14/2018	0	1	1.80	QU		mg/kg	36.558006	-109.218277
1	Chinle Formation	CTS South	Arsenic	T37X101	5/14/2018	0	1	1.80	QU		mg/kg	36.558006	-109.218056
1	Chinle Formation	CTS South	Arsenic	T37X102	5/14/2018	0	1	2.42			mg/kg	36.558002	-109.217934
1	Chinle Formation	CTS South	Arsenic	T37-SS103-01-091318	9/13/2018	0	6	2.30			mg/kg	36.558001	-109.217855
1	Chinle Formation	CTS South	Arsenic	T37X103	5/14/2018	0	1	2.13			mg/kg	36.558002	-109.217819
1	Chinle Formation	CTS South	Arsenic	T37-SB103-006018-01-091318	9/13/2018	6	18	2.20			mg/kg	36.558002	-109.217857
1	Chinle Formation	CTS South	Arsenic	T37-SB103-024036-01-091318	9/13/2018	24	36	2.30			mg/kg	36.558002	-109.217857
1	Chinle Formation	CTS South	Arsenic	T37-SB103-048060-01-091318	9/13/2018	48	60	2.70			mg/kg	36.558002	-109.217857
1	Chinle Formation	CTS South	Arsenic	T37X104	5/14/2018	0	1	1.80	QU		mg/kg	36.557999	-109.217712
1	Chinle Formation	CTS South	Arsenic	T37X105	5/14/2018	0	1	1.80	QU		mg/kg	36.557999	-109.217606
1	Chinle Formation	CTS South	Arsenic	T37X106	5/14/2018	0	1	2.74			mg/kg	36.557999	-109.217491
1	Chinle Formation	CTS South	Arsenic	T37X107	8/18/2018	0	1	2.28			mg/kg	36.557896	-109.218483
1	Chinle Formation	CTS South	Arsenic	T37X108	5/14/2018	0	1	3.60			mg/kg	36.557915	-109.218391
1	Chinle Formation	CTS South	Arsenic	T37X109	5/14/2018	0	1	1.80	QU		mg/kg	36.557922	-109.218307
1	Chinle Formation	CTS South	Arsenic	T37X111	5/14/2018	0	1	2.01			mg/kg	36.557915	-109.218025
1	Chinle Formation	CTS South	Arsenic	T37X112	5/14/2018	0	1	1.80	QU		mg/kg	36.557907	-109.217934
1	Chinle Formation	CTS South	Arsenic	T37X113	5/14/2018	0	1	2.76			mg/kg	36.557915	-109.217827
1	Chinle Formation	CTS South	Arsenic	T37X114	5/14/2018	0	1	3.47			mg/kg	36.557915	-109.217712
1	Chinle Formation	CTS South	Arsenic	T37X115	5/14/2018	0	1	1.80	QU		mg/kg	36.557911	-109.217606
1	Chinle Formation	CTS South	Arsenic	T37X116	8/18/2018	0	1	1.80	QU		mg/kg	36.557812	-109.21859
1	Chinle Formation	CTS South	Arsenic	T37X117	5/14/2018	0	1	1.80	QU		mg/kg	36.557827	-109.218506
1	Chinle Formation	CTS South	Arsenic	T37X118	5/14/2018	0	1	1.80	QU		mg/kg	36.557827	-109.218399
1	Chinle Formation	CTS South	Arsenic	T37X118A	8/18/2018	0	1	1.80	QU		mg/kg	36.557835	-109.218407
1	Chinle Formation	CTS South	Arsenic	T37X119	5/14/2018	0	1	1.80	QU		mg/kg	36.557823	-109.218277
1	Chinle Formation	CTS South	Arsenic	T37X120	5/14/2018	0	1	1.80	QU		mg/kg	36.557827	-109.218178
1	Chinle Formation	CTS South	Arsenic	T37X121	5/14/2018	0	1	2.36			mg/kg	36.557816	-109.218056
1	Chinle Formation	CTS South	Arsenic	T37X122	5/14/2018	0	1	1.80	QU		mg/kg	36.557819	-109.217941
1	Chinle Formation	CTS South	Arsenic	T37X123	5/14/2018	0	1	3.19			mg/kg	36.557823	-109.217827
1	Chinle Formation	CTS South	Arsenic	T37X124	5/14/2018	0	1	1.80	QU		mg/kg	36.557819	-109.21772
1	Chinle Formation	CTS South	Arsenic	T37X125	5/14/2018	0	1	1.80	QU		mg/kg	36.557823	-109.217606
1	Chinle Formation	CTS South	Arsenic	T37X126	5/14/2018	0	1	2.09			mg/kg	36.557739	-109.218613

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Arsenic	T37X127	5/14/2018	0	1	4.20			mg/kg	36.557735	-109.218521
1	Chinle Formation	CTS South	Arsenic	T37X128	5/14/2018	0	1	1.80	QU		mg/kg	36.557747	-109.218361
1	Chinle Formation	CTS South	Arsenic	T37X129	5/14/2018	0	1	1.80	QU		mg/kg	36.557709	-109.218269
1	Chinle Formation	CTS South	Arsenic	T37X130	5/14/2018	0	1	1.80	QU		mg/kg	36.557743	-109.218155
1	Chinle Formation	CTS South	Arsenic	T37X131	5/14/2018	0	1	1.80	QU		mg/kg	36.557732	-109.218063
1	Chinle Formation	CTS South	Arsenic	T37X132	5/14/2018	0	1	3.69			mg/kg	36.557732	-109.217941
1	Chinle Formation	CTS South	Arsenic	T37X133	5/14/2018	0	1	4.33			mg/kg	36.557735	-109.217842
1	Chinle Formation	CTS South	Arsenic	T37X134	5/14/2018	0	1	2.26			mg/kg	36.557724	-109.217728
1	Chinle Formation	CTS South	Arsenic	T37X135	5/14/2018	0	1	1.80	QU		mg/kg	36.557735	-109.217598
1	Chinle Formation	CTS South	Arsenic	T37X137	5/14/2018	0	1	1.80	QU		mg/kg	36.557644	-109.218491
1	Chinle Formation	CTS South	Arsenic	T37X138	5/14/2018	0	1	1.80	QU		mg/kg	36.557644	-109.218391
1	Chinle Formation	CTS South	Arsenic	T37X139	5/14/2018	0	1	1.80	QU		mg/kg	36.557652	-109.218277
1	Chinle Formation	CTS South	Arsenic	T37X140	5/14/2018	0	1	2.53			mg/kg	36.557636	-109.218163
1	Chinle Formation	CTS South	Arsenic	T37X141	5/14/2018	0	1	5.47			mg/kg	36.557644	-109.218056
1	Chinle Formation	CTS South	Arsenic	T37X142	5/14/2018	0	1	1.89			mg/kg	36.557644	-109.217941
1	Chinle Formation	CTS South	Arsenic	T37X143	5/14/2018	0	1	3.15			mg/kg	36.557644	-109.217834
1	Chinle Formation	CTS South	Arsenic	T37X144	5/14/2018	0	1	4.15			mg/kg	36.557644	-109.217712
1	Chinle Formation	CTS South	Arsenic	T37X145	5/14/2018	0	1	1.80	QU		mg/kg	36.55764	-109.217606
1	Chinle Formation	CTS South	Arsenic	T37X146	5/14/2018	0	1	2.46			mg/kg	36.557564	-109.218498
1	Chinle Formation	CTS South	Arsenic	T37X147	5/14/2018	0	1	2.74			mg/kg	36.55756	-109.218384
1	Chinle Formation	CTS South	Arsenic	T37X148	5/14/2018	0	1	1.80	QU		mg/kg	36.557556	-109.218277
1	Chinle Formation	CTS South	Arsenic	T37X149	5/14/2018	0	1	3.10			mg/kg	36.55756	-109.21817
1	Chinle Formation	CTS South	Arsenic	T37X150	5/14/2018	0	1	1.85			mg/kg	36.557556	-109.218048
1	Chinle Formation	CTS South	Arsenic	T37X151	5/14/2018	0	1	3.68			mg/kg	36.557552	-109.217941
1	Chinle Formation	CTS South	Arsenic	T37X152	5/14/2018	0	1	3.05			mg/kg	36.557552	-109.217827
1	Chinle Formation	CTS South	Arsenic	T37X153	5/14/2018	0	1	3.49			mg/kg	36.557556	-109.21772
1	Chinle Formation	CTS South	Arsenic	T37X154	5/14/2018	0	1	2.49			mg/kg	36.557556	-109.217613
1	Chinle Formation	CTS South	Arsenic	T37X155	5/14/2018	0	1	1.80	QU		mg/kg	36.557465	-109.218498
1	Chinle Formation	CTS South	Arsenic	T37X156	5/14/2018	0	1	1.96			mg/kg	36.557472	-109.218399
1	Chinle Formation	CTS South	Arsenic	T37X157	5/14/2018	0	1	2.16			mg/kg	36.557465	-109.218285
1	Chinle Formation	CTS South	Arsenic	T37X158	5/14/2018	0	1	2.97			mg/kg	36.557465	-109.218178
1	Chinle Formation	CTS South	Arsenic	T37X159	5/14/2018	0	1	1.80	QU		mg/kg	36.557461	-109.218063
1	Chinle Formation	CTS South	Arsenic	T37X160	5/14/2018	0	1	2.87			mg/kg	36.557465	-109.217949
1	Chinle Formation	CTS South	Arsenic	T37X161	5/14/2018	0	1	2.66			mg/kg	36.557461	-109.217834
1	Chinle Formation	CTS South	Arsenic	T37X162	5/14/2018	0	1	3.42			mg/kg	36.557465	-109.21772
1	Chinle Formation	CTS South	Arsenic	T37X163	5/14/2018	0	1	1.93			mg/kg	36.557461	-109.217606
1	Chinle Formation	CTS South	Arsenic	T37X164	5/14/2018	0	1	1.89			mg/kg	36.557377	-109.218399
1	Chinle Formation	CTS South	Arsenic	T37X165	5/14/2018	0	1	1.80	QU		mg/kg	36.557373	-109.218277
1	Chinle Formation	CTS South	Arsenic	T37X166	5/14/2018	0	1	7.69			mg/kg	36.557377	-109.218178
1	Chinle Formation	CTS South	Arsenic	T37X167	5/14/2018	0	1	1.80	QU		mg/kg	36.557373	-109.218063
1	Chinle Formation	CTS South	Arsenic	T37X168	5/14/2018	0	1	1.80	QU		mg/kg	36.557365	-109.217949
1	Chinle Formation	CTS South	Arsenic	T37X169	5/14/2018	0	1	3.71			mg/kg	36.557369	-109.217834
1	Chinle Formation	CTS South	Arsenic	T37X170	5/14/2018	0	1	3.23			mg/kg	36.557369	-109.217728
1	Chinle Formation	CTS South	Arsenic	T37X171	5/14/2018	0	1	2.21			mg/kg	36.557365	-109.217613
1	Chinle Formation	CTS South	Arsenic	T37X172	5/14/2018	0	1	2.50			mg/kg	36.557365	-109.217499
1	Chinle Formation	CTS South	Arsenic	T37X173	5/14/2018	0	1	3.66			mg/kg	36.557278	-109.217949
1	Chinle Formation	CTS South	Arsenic	T37X174	5/14/2018	0	1	2.47			mg/kg	36.557274	-109.217834
1	Chinle Formation	CTS South	Arsenic	T37X175	5/14/2018	0	1	2.78			mg/kg	36.55727	-109.217728

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Arsenic	T37X176	5/14/2018	0	1	2.88			mg/kg	36.557278	-109.217613
1	Chinle Formation	CTS South	Arsenic	T37X177	5/14/2018	0	1	4.32			mg/kg	36.557274	-109.217506
1	Chinle Formation	CTS South	Arsenic	T37-SS86A-01-091318	9/13/2018	0	6	2.70			mg/kg	36.558191	-109.217869
1	Chinle Formation	CTS South	Arsenic	T37-SB86A-006018-01-091318	9/13/2018	6	18	2.80			mg/kg	36.558189	-109.217865
1	Chinle Formation	CTS South	Arsenic	T37-SB86A-024036-01-091318	9/13/2018	24	36	2.90			mg/kg	36.558189	-109.217865
1	Chinle Formation	CTS South	Arsenic	T37-SB86A-048060-01-091318	9/13/2018	48	60	3.00			mg/kg	36.558189	-109.217865
1	Chinle Formation	CTS South	Arsenic	T37G1	8/18/2018	0	1	2.09			mg/kg	36.559078	-109.217705
1	Chinle Formation	CTS South	Arsenic	T37G2	8/18/2018	0	1	2.69			mg/kg	36.559082	-109.21759
1	Chinle Formation	CTS South	Arsenic	T37G3	8/18/2018	0	1	2.29			mg/kg	36.559082	-109.217499
1	Chinle Formation	CT-01	Ra-226	T10-XS33-01-042518	4/25/2018	0	3	1.13		0.26	pCi/g	36.563405	-109.216725
1	Chinle Formation	CT-01	Ra-226	T10-XSG1-01-081818	8/18/2018	0	3	3.42		0.54	pCi/g	36.562593	-109.217057
1	Chinle Formation	CTS	Ra-226	T9-XS61-01-042518	4/25/2018	0	3	1.08	J+	0.29	pCi/g	36.561513	-109.215899
1	Chinle Formation	CTS	Ra-226	T9-SS67-01-091118	9/11/2018	0	6	1.16		0.23	pCi/g	36.561384	-109.216688
1	Chinle Formation	CTS	Ra-226	T9-SB67-006048-01-091118	9/11/2018	6	48	0.960	LT	0.28	pCi/g	36.561382	-109.21669
1	Chinle Formation	CTS	Ra-226	T9-XS86-01-042518	4/25/2018	0	3	1.12		0.29	pCi/g	36.561327	-109.215908
1	Chinle Formation	CTS	Ra-226	T9-XS93-01-042518	4/25/2018	0	3	3.29		0.56	pCi/g	36.561241	-109.216568
1	Chinle Formation	CTS	Ra-226	T9-SS109-01-091118	9/11/2018	0	6	1.55		0.29	pCi/g	36.56113	-109.216267
1	Chinle Formation	CTS	Ra-226	T9-SB109-006018-01-091118	9/11/2018	6	18	1.17		0.29	pCi/g	36.561131	-109.216263
1	Chinle Formation	CTS	Ra-226	T9-SB109-060072-01-091118	9/11/2018	60	72	1.39		0.24	pCi/g	36.561131	-109.216263
1	Chinle Formation	CTS	Ra-226	T9-SS129-01-091118	9/11/2018	0	6	1.18		0.28	pCi/g	36.56093	-109.216882
1	Chinle Formation	CTS	Ra-226	T9-SB129-006024-01-091118	9/11/2018	6	24	0.960	UJ	0.33	pCi/g	36.560932	-109.216881
1	Chinle Formation	CTS	Ra-226	T9-SB129-024048-01-091118	9/11/2018	24	48	0.990	LT	0.23	pCi/g	36.560932	-109.216881
1	Chinle Formation	CTS	Ra-226	T9-SS144-01-091218	9/12/2018	0	6	2.27		0.42	pCi/g	36.560853	-109.216753
1	Chinle Formation	CTS	Ra-226	T9-SB144-006018-01-091218	9/12/2018	6	18	1.97		0.36	pCi/g	36.560852	-109.216751
1	Chinle Formation	CTS	Ra-226	T9-SB144-024036-01-091218	9/12/2018	24	36	1.59		0.26	pCi/g	36.560852	-109.216751
1	Chinle Formation	CTS	Ra-226	T9-SB144-048060-01-091218	9/12/2018	48	60	1.51		0.33	pCi/g	36.560852	-109.216751
1	Chinle Formation	CTS	Ra-226	T9-SS155-01-091118	9/11/2018	0	6	0.920	LT	0.23	pCi/g	36.560784	-109.217115
1	Chinle Formation	CTS	Ra-226	T9-SB155-006018-01-091118	9/11/2018	6	18	2.38		0.4	pCi/g	36.560783	-109.217117
1	Chinle Formation	CTS	Ra-226	T9-SB155-048060-01-091118	9/11/2018	48	60	0.930	LT	0.27	pCi/g	36.560783	-109.217117
1	Chinle Formation	CTS	Ra-226	T9-SS176-01-091218	9/12/2018	0	6	1.56		0.34	pCi/g	36.560713	-109.216389
1	Chinle Formation	CTS	Ra-226	T9-SB176-006018-01-091218	9/12/2018	6	18	0.720	LT	0.21	pCi/g	36.560715	-109.216393
1	Chinle Formation	CTS	Ra-226	T9-SB176-024036-01-091218	9/12/2018	24	36	2.97		0.48	pCi/g	36.560715	-109.216393
1	Chinle Formation	CTS	Ra-226	T9-SB176-048060-01-091218	9/12/2018	48	60	1.12	J-	0.25	pCi/g	36.560715	-109.216393
1	Chinle Formation	CTS	Ra-226	T9-SS185-01-091218	9/12/2018	0	6	1.70		0.33	pCi/g	36.560605	-109.216904
1	Chinle Formation	CTS	Ra-226	T9-SB185-006018-01-091218	9/12/2018	6	18	1.25		0.31	pCi/g	36.560604	-109.216904
1	Chinle Formation	CTS	Ra-226	T9-SB185-024036-01-091218	9/12/2018	24	36	1.07		0.24	pCi/g	36.560604	-109.216904
1	Chinle Formation	CTS	Ra-226	T9-SB185-048060-01-091218	9/12/2018	48	60	1.05		0.29	pCi/g	36.560604	-109.216904
1	Chinle Formation	CTS	Ra-226	T9-SS212-01-091218	9/12/2018	0	6	1.71		0.36	pCi/g	36.560378	-109.217234
1	Chinle Formation	CTS	Ra-226	T9-SB212-006018-01-091218	9/12/2018	6	18	1.42		0.29	pCi/g	36.560379	-109.217232
1	Chinle Formation	CTS	Ra-226	T9-SB212-024036-01-091218	9/12/2018	24	36	0.960	LT	0.26	pCi/g	36.560379	-109.217232
1	Chinle Formation	CTS	Ra-226	T9-SB212-048060-01-091218	9/12/2018	48	60	1.01		0.21	pCi/g	36.560379	-109.217232
1	Chinle Formation	CTS	Ra-226	T9-SS216-01-091118	9/11/2018	0	6	2.60		0.45	pCi/g	36.56026	-109.21733
1	Chinle Formation	CTS	Ra-226	T9-SB216-0612-01-091118	9/11/2018	6	12	2.93		0.49	pCi/g	36.56026	-109.21733
1	Chinle Formation	CTS	Ra-226	T9-SB216-1218-01-091118	9/11/2018	12	18	4.08		0.54	pCi/g	36.560261	-109.217331
1	Chinle Formation	CTS	Ra-226	T9-XS217-01-042518	4/25/2018	0	3	1.00		0.25	pCi/g	36.560249	-109.217256
1	Chinle Formation	CTS	Ra-226	T9-SS227-01-091118	9/11/2018	0	6	2.13		0.41	pCi/g	36.560092	-109.217284
1	Chinle Formation	CTS	Ra-226	T9-SB227-0612-01-091118	9/11/2018	6	12	1.49		0.34	pCi/g	36.560092	-109.217284
1	Chinle Formation	CTS	Ra-226	T9-SB227-1218-01-091118	9/11/2018	12	18	1.40		0.31	pCi/g	36.560093	-109.217285

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Ra-226	T9-XSG12-01-081818	8/18/2018	0	3	1.53		0.29	pCi/g	36.56178	-109.215999
1	Chinle Formation	CTS South	Ra-226	T37-SS69-01-091218	9/12/2018	0	6	0.750	LT	0.17	pCi/g	36.558325	-109.217756
1	Chinle Formation	CTS South	Ra-226	T37-SB69-006018-01-091218	9/12/2018	6	18	0.860	LT	0.23	pCi/g	36.558327	-109.217758
1	Chinle Formation	CTS South	Ra-226	T37-SB69-018048-01-091218	9/12/2018	18	48	1.17		0.3	pCi/g	36.558327	-109.217758
1	Chinle Formation	CTS South	Ra-226	T37-SB69-048066-01-091218	9/12/2018	48	66	0.980	LT	0.26	pCi/g	36.558327	-109.217758
1	Chinle Formation	CTS South	Ra-226	T37-SS77-01-091218	9/12/2018	0	6	0.620	UJ	0.23	pCi/g	36.558258	-109.217781
1	Chinle Formation	CTS South	Ra-226	T37-SB77-006018-01-091218	9/12/2018	6	18	1.10		0.29	pCi/g	36.558258	-109.217781
1	Chinle Formation	CTS South	Ra-226	T37-SB77-018048-01-091218	9/12/2018	18	48	1.16		0.26	pCi/g	36.558258	-109.217781
1	Chinle Formation	CTS South	Ra-226	T37-SB77-048072-01-091218	9/12/2018	48	72	0.860	LT	0.27	pCi/g	36.558258	-109.217781
1	Chinle Formation	CTS South	Ra-226	T37-SS86-01-091318	9/13/2018	0	6	0.760	LT	0.25	pCi/g	36.558156	-109.217825
1	Chinle Formation	CTS South	Ra-226	T37-SB86-006018-01-091318	9/13/2018	6	18	1.33		0.27	pCi/g	36.558155	-109.217827
1	Chinle Formation	CTS South	Ra-226	T37-SB86-024036-01-091318	9/13/2018	24	36	0.970	LT	0.27	pCi/g	36.558155	-109.217827
1	Chinle Formation	CTS South	Ra-226	T37-SB86-048060-01-091318	9/13/2018	48	60	1.10		0.23	pCi/g	36.558155	-109.217827
1	Chinle Formation	CTS South	Ra-226	T37-SS87-01-091318	9/13/2018	0	6	0.870	LT	0.25	pCi/g	36.558151	-109.217759
1	Chinle Formation	CTS South	Ra-226	T37-SB87-006018-01-091318	9/13/2018	6	18	1.30		0.3	pCi/g	36.558151	-109.217758
1	Chinle Formation	CTS South	Ra-226	T37-SB87-024036-01-091318	9/13/2018	24	36	1.15		0.25	pCi/g	36.558151	-109.217758
1	Chinle Formation	CTS South	Ra-226	T37-SB87-048060-01-091318	9/13/2018	48	60	0.820	LT	0.23	pCi/g	36.558151	-109.217758
1	Chinle Formation	CTS South	Ra-226	T37-SS94-01-091318	9/13/2018	0	6	1.01	J-	0.25	pCi/g	36.558078	-109.217828
1	Chinle Formation	CTS South	Ra-226	T37-SB94-006018-01-091318	9/13/2018	6	18	1.07		0.23	pCi/g	36.558079	-109.217827
1	Chinle Formation	CTS South	Ra-226	T37-SB94-024036-01-091318	9/13/2018	24	36	1.12		0.26	pCi/g	36.558079	-109.217827
1	Chinle Formation	CTS South	Ra-226	T37-SB94-048060-01-091318	9/13/2018	48	60	1.10		0.31	pCi/g	36.558079	-109.217827
1	Chinle Formation	CTS South	Ra-226	T37-SS103-01-091318	9/13/2018	0	6	0.860	LT	0.18	pCi/g	36.558001	-109.217855
1	Chinle Formation	CTS South	Ra-226	T37-SB103-006018-01-091318	9/13/2018	6	18	0.910	LT	0.25	pCi/g	36.558002	-109.217857
1	Chinle Formation	CTS South	Ra-226	T37-SB103-024036-01-091318	9/13/2018	24	36	1.19		0.28	pCi/g	36.558002	-109.217857
1	Chinle Formation	CTS South	Ra-226	T37-SB103-048060-01-091318	9/13/2018	48	60	1.23		0.26	pCi/g	36.558002	-109.217857
1	Chinle Formation	CTS South	Ra-226	T37-SS86A-01-091318	9/13/2018	0	6	1.00	LT	0.26	pCi/g	36.558191	-109.217869
1	Chinle Formation	CTS South	Ra-226	T37-SB86A-006018-01-091318	9/13/2018	6	18	0.840	LT	0.22	pCi/g	36.558189	-109.217865
1	Chinle Formation	CTS South	Ra-226	T37-SB86A-024036-01-091318	9/13/2018	24	36	1.26		0.31	pCi/g	36.558189	-109.217865
1	Chinle Formation	CTS South	Ra-226	T37-SB86A-048060-01-091318	9/13/2018	48	60	0.940	LT	0.29	pCi/g	36.558189	-109.217865
1	Chinle Formation	CT-01	Selenium	T10-XS33-01-042518	4/25/2018	0	3	0.470	J		mg/kg	36.563405	-109.216725
1	Chinle Formation	CT-01	Selenium	T10-XSG1-01-081818	8/18/2018	0	3	0.530	J		mg/kg	36.562593	-109.217057
1	Chinle Formation	CTS	Selenium	T9-XS61-02-042518	4/25/2018	0	3	0.520	J		mg/kg	36.561513	-109.215899
1	Chinle Formation	CTS	Selenium	T9-SS67-01-091118	9/11/2018	0	6	0.730	J		mg/kg	36.561384	-109.216688
1	Chinle Formation	CTS	Selenium	T9-SB67-006048-01-091118	9/11/2018	6	48	0.600	J		mg/kg	36.561382	-109.21669
1	Chinle Formation	CTS	Selenium	T9-XS86-01-042518	4/25/2018	0	3	0.500	J		mg/kg	36.561327	-109.215908
1	Chinle Formation	CTS	Selenium	T9-XS93-01-042518	4/25/2018	0	3	0.730	J		mg/kg	36.561241	-109.216568
1	Chinle Formation	CTS	Selenium	T9-SS109-01-091118	9/11/2018	0	6	0.550	J		mg/kg	36.56113	-109.216267
1	Chinle Formation	CTS	Selenium	T9-SB109-006018-01-091118	9/11/2018	6	18	0.700	J		mg/kg	36.561131	-109.216263
1	Chinle Formation	CTS	Selenium	T9-SB109-060072-01-091118	9/11/2018	60	72	0.460	J		mg/kg	36.561131	-109.216263
1	Chinle Formation	CTS	Selenium	T9-SS129-01-091118	9/11/2018	0	6	0.700	J		mg/kg	36.56093	-109.216882
1	Chinle Formation	CTS	Selenium	T9-SB129-006024-01-091118	9/11/2018	6	24	0.730	J		mg/kg	36.560932	-109.216881
1	Chinle Formation	CTS	Selenium	T9-SB129-024048-01-091118	9/11/2018	24	48	0.680	J		mg/kg	36.560932	-109.216881
1	Chinle Formation	CTS	Selenium	T9-SS144-01-091218	9/12/2018	0	6	0.660	J		mg/kg	36.560853	-109.216753
1	Chinle Formation	CTS	Selenium	T9-SB144-006018-01-091218	9/12/2018	6	18	0.670	J		mg/kg	36.560852	-109.216751
1	Chinle Formation	CTS	Selenium	T9-SB144-024036-01-091218	9/12/2018	24	36	0.500	J		mg/kg	36.560852	-109.216751
1	Chinle Formation	CTS	Selenium	T9-SB144-048060-01-091218	9/12/2018	48	60	0.610	J		mg/kg	36.560852	-109.216751
1	Chinle Formation	CTS	Selenium	T9-SS155-01-091118	9/11/2018	0	6	0.680	J		mg/kg	36.560784	-109.217115
1	Chinle Formation	CTS	Selenium	T9-SB155-006018-01-091118	9/11/2018	6	18	0.770	J		mg/kg	36.560783	-109.217117

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Selenium	T9-SB155-048060-01-091118	9/11/2018	48	60	0.910	J		mg/kg	36.560783	-109.217117
1	Chinle Formation	CTS	Selenium	T9-SS176-01-091218	9/12/2018	0	6	0.580	J		mg/kg	36.560713	-109.216389
1	Chinle Formation	CTS	Selenium	T9-SB176-006018-01-091218	9/12/2018	6	18	0.480	J		mg/kg	36.560715	-109.216393
1	Chinle Formation	CTS	Selenium	T9-SB176-024036-01-091218	9/12/2018	24	36	2.30			mg/kg	36.560715	-109.216393
1	Chinle Formation	CTS	Selenium	T9-SB176-048060-01-091218	9/12/2018	48	60	0.630	J		mg/kg	36.560715	-109.216393
1	Chinle Formation	CTS	Selenium	T9-SS185-01-091218	9/12/2018	0	6	0.670	J		mg/kg	36.560605	-109.216904
1	Chinle Formation	CTS	Selenium	T9-SB185-006018-01-091218	9/12/2018	6	18	0.730	J		mg/kg	36.560604	-109.216904
1	Chinle Formation	CTS	Selenium	T9-SB185-024036-01-091218	9/12/2018	24	36	0.680	J		mg/kg	36.560604	-109.216904
1	Chinle Formation	CTS	Selenium	T9-SB185-048060-01-091218	9/12/2018	48	60	0.860	J		mg/kg	36.560604	-109.216904
1	Chinle Formation	CTS	Selenium	T9-SS212-01-091218	9/12/2018	0	6	0.770	J		mg/kg	36.560378	-109.217234
1	Chinle Formation	CTS	Selenium	T9-SB212-006018-01-091218	9/12/2018	6	18	0.850	J		mg/kg	36.560379	-109.217232
1	Chinle Formation	CTS	Selenium	T9-SB212-024036-01-091218	9/12/2018	24	36	0.580	J		mg/kg	36.560379	-109.217232
1	Chinle Formation	CTS	Selenium	T9-SB212-048060-01-091218	9/12/2018	48	60	0.660	J		mg/kg	36.560379	-109.217232
1	Chinle Formation	CTS	Selenium	T9-SS216-01-091118	9/11/2018	0	6	0.710	J		mg/kg	36.56026	-109.21733
1	Chinle Formation	CTS	Selenium	T9-SB216-0612-01-091118	9/11/2018	6	12	0.690	J		mg/kg	36.56026	-109.21733
1	Chinle Formation	CTS	Selenium	T9-SB216-1218-01-091118	9/11/2018	12	18	0.820	J		mg/kg	36.560261	-109.217331
1	Chinle Formation	CTS	Selenium	T9-XS217-01-042518	4/25/2018	0	3	0.650	J		mg/kg	36.560249	-109.217256
1	Chinle Formation	CTS	Selenium	T9-SS227-01-091118	9/11/2018	0	6	0.790	J		mg/kg	36.560092	-109.217284
1	Chinle Formation	CTS	Selenium	T9-SB227-0612-01-091118	9/11/2018	6	12	0.860	J		mg/kg	36.560092	-109.217284
1	Chinle Formation	CTS	Selenium	T9-SB227-1218-01-091118	9/11/2018	12	18	0.820	J		mg/kg	36.560093	-109.217285
1	Chinle Formation	CTS	Selenium	T9-XSG12-01-081818	8/18/2018	0	3	0.640	J		mg/kg	36.56178	-109.215999
1	Chinle Formation	CTS South	Selenium	T37-SS69-01-091218	9/12/2018	0	6	0.710	J		mg/kg	36.558325	-109.217756
1	Chinle Formation	CTS South	Selenium	T37-SB69-006018-01-091218	9/12/2018	6	18	0.730	J		mg/kg	36.558327	-109.217758
1	Chinle Formation	CTS South	Selenium	T37-SB69-018048-01-091218	9/12/2018	18	48	0.740	J		mg/kg	36.558327	-109.217758
1	Chinle Formation	CTS South	Selenium	T37-SB69-048066-01-091218	9/12/2018	48	66	0.740	J		mg/kg	36.558327	-109.217758
1	Chinle Formation	CTS South	Selenium	T37-SS77-01-091218	9/12/2018	0	6	0.700	J		mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Selenium	T37-SB77-006018-01-091218	9/12/2018	6	18	0.800	J		mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Selenium	T37-SB77-018048-01-091218	9/12/2018	18	48	0.790	J		mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Selenium	T37-SB77-048072-01-091218	9/12/2018	48	72	0.720	J		mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Selenium	T37-SS86-01-091318	9/13/2018	0	6	0.790	J		mg/kg	36.558156	-109.217825
1	Chinle Formation	CTS South	Selenium	T37-SB86-006018-01-091318	9/13/2018	6	18	0.810	J		mg/kg	36.558155	-109.217827
1	Chinle Formation	CTS South	Selenium	T37-SB86-024036-01-091318	9/13/2018	24	36	0.820	J		mg/kg	36.558155	-109.217827
1	Chinle Formation	CTS South	Selenium	T37-SB86-048060-01-091318	9/13/2018	48	60	0.810	J		mg/kg	36.558155	-109.217827
1	Chinle Formation	CTS South	Selenium	T37-SS87-01-091318	9/13/2018	0	6	0.750	J		mg/kg	36.558151	-109.217759
1	Chinle Formation	CTS South	Selenium	T37-SB87-006018-01-091318	9/13/2018	6	18	0.810	J		mg/kg	36.558151	-109.217758
1	Chinle Formation	CTS South	Selenium	T37-SB87-024036-02-091318	9/13/2018	24	36	0.790	J		mg/kg	36.558151	-109.217758
1	Chinle Formation	CTS South	Selenium	T37-SB87-048060-01-091318	9/13/2018	48	60	0.780	J		mg/kg	36.558151	-109.217758
1	Chinle Formation	CTS South	Selenium	T37-SS94-01-091318	9/13/2018	0	6	0.770	J		mg/kg	36.558078	-109.217828
1	Chinle Formation	CTS South	Selenium	T37-SB94-006018-01-091318	9/13/2018	6	18	0.770	J		mg/kg	36.558079	-109.217827
1	Chinle Formation	CTS South	Selenium	T37-SB94-024036-01-091318	9/13/2018	24	36	0.940	J		mg/kg	36.558079	-109.217827
1	Chinle Formation	CTS South	Selenium	T37-SB94-048060-01-091318	9/13/2018	48	60	0.790	J		mg/kg	36.558079	-109.217827
1	Chinle Formation	CTS South	Selenium	T37-SS103-01-091318	9/13/2018	0	6	0.780	J		mg/kg	36.558001	-109.217855
1	Chinle Formation	CTS South	Selenium	T37-SB103-006018-01-091318	9/13/2018	6	18	0.680	J		mg/kg	36.558002	-109.217857
1	Chinle Formation	CTS South	Selenium	T37-SB103-024036-01-091318	9/13/2018	24	36	0.690	J		mg/kg	36.558002	-109.217857
1	Chinle Formation	CTS South	Selenium	T37-SB103-048060-01-091318	9/13/2018	48	60	0.810	J		mg/kg	36.558002	-109.217857
1	Chinle Formation	CTS South	Selenium	T37-SS86A-01-091318	9/13/2018	0	6	0.940	J		mg/kg	36.558191	-109.217869
1	Chinle Formation	CTS South	Selenium	T37-SB86A-006018-01-091318	9/13/2018	6	18	0.760	J		mg/kg	36.558189	-109.217865
1	Chinle Formation	CTS South	Selenium	T37-SB86A-024036-01-091318	9/13/2018	24	36	0.780	J		mg/kg	36.558189	-109.217865

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Selenium	T37-SB86A-048060-01-091318	9/13/2018	48	60	0.610	J		mg/kg	36.558189	-109.217865
1	Chinle Formation	CT-01	Uranium	T10G2	8/18/2018	0	1	3.82			mg/kg	36.562592	-109.216942
1	Chinle Formation	CT-01	Uranium	T10G3	8/18/2018	0	1	0.975			mg/kg	36.562584	-109.216843
1	Chinle Formation	CT-01	Uranium	T10X100	5/14/2018	0	1	2.99			mg/kg	36.562763	-109.216949
1	Chinle Formation	CT-01	Uranium	T10X101	4/25/2018	0	1	1.76			mg/kg	36.562771	-109.216843
1	Chinle Formation	CT-01	Uranium	T10X106	5/14/2018	0	1	1.91			mg/kg	36.562675	-109.217064
1	Chinle Formation	CT-01	Uranium	T10X107	5/14/2018	0	1	2.46			mg/kg	36.562672	-109.216949
1	Chinle Formation	CT-01	Uranium	T10X108	4/25/2018	0	1	1.77			mg/kg	36.562683	-109.21685
1	Chinle Formation	CT-01	Uranium	T10X12	4/25/2018	0	1	1.08			mg/kg	36.563587	-109.216942
1	Chinle Formation	CT-01	Uranium	T10X13	4/25/2018	0	1	0.568			mg/kg	36.563587	-109.216835
1	Chinle Formation	CT-01	Uranium	T10X14	4/25/2018	0	1	0.080	QU		mg/kg	36.563583	-109.216721
1	Chinle Formation	CT-01	Uranium	T10X23	4/25/2018	0	1	0.080	QU		mg/kg	36.563492	-109.216728
1	Chinle Formation	CT-01	Uranium	T10X24	4/25/2018	0	1	3.35			mg/kg	36.563492	-109.216614
1	Chinle Formation	CT-01	Uranium	T10X3	4/25/2018	0	1	0.627			mg/kg	36.563683	-109.217171
1	Chinle Formation	CT-01	Uranium	T10X34	4/25/2018	0	1	2.13			mg/kg	36.5634	-109.216614
1	Chinle Formation	CT-01	Uranium	T10X4	4/25/2018	0	1	1.09			mg/kg	36.563679	-109.217056
1	Chinle Formation	CT-01	Uranium	T10X42	4/25/2018	0	1	1.53			mg/kg	36.563316	-109.216843
1	Chinle Formation	CT-01	Uranium	T10X43	4/25/2018	0	1	1.58			mg/kg	36.563313	-109.216736
1	Chinle Formation	CT-01	Uranium	T10X44	4/25/2018	0	1	1.93			mg/kg	36.563313	-109.216614
1	Chinle Formation	CT-01	Uranium	T10X5	4/25/2018	0	1	0.676			mg/kg	36.563675	-109.216942
1	Chinle Formation	CT-01	Uranium	T10X52	4/25/2018	0	1	2.77			mg/kg	36.563225	-109.216835
1	Chinle Formation	CT-01	Uranium	T10X53	4/25/2018	0	1	2.20			mg/kg	36.563217	-109.216736
1	Chinle Formation	CT-01	Uranium	T10X54	4/25/2018	0	1	2.05			mg/kg	36.563217	-109.216614
1	Chinle Formation	CT-01	Uranium	T10X6	4/25/2018	0	1	1.88			mg/kg	36.563679	-109.216835
1	Chinle Formation	CT-01	Uranium	T10X62	4/25/2018	0	1	2.23			mg/kg	36.563133	-109.216843
1	Chinle Formation	CT-01	Uranium	T10X63	4/25/2018	0	1	1.37			mg/kg	36.563129	-109.216728
1	Chinle Formation	CT-01	Uranium	T10X64	8/18/2018	0	1	0.080	QU		mg/kg	36.563126	-109.216644
1	Chinle Formation	CT-01	Uranium	T10X71	4/25/2018	0	1	2.22			mg/kg	36.563042	-109.216949
1	Chinle Formation	CT-01	Uranium	T10X72	4/25/2018	0	1	2.65			mg/kg	36.563042	-109.216835
1	Chinle Formation	CT-01	Uranium	T10X73	4/25/2018	0	1	2.17			mg/kg	36.563042	-109.216728
1	Chinle Formation	CT-01	Uranium	T10X81	4/25/2018	0	1	5.46			mg/kg	36.562954	-109.216957
1	Chinle Formation	CT-01	Uranium	T10X82	4/25/2018	0	1	3.12			mg/kg	36.562958	-109.216843
1	Chinle Formation	CT-01	Uranium	T10X83	4/25/2018	0	1	2.20			mg/kg	36.56295	-109.216728
1	Chinle Formation	CT-01	Uranium	T10X84	8/18/2018	0	1	3.42			mg/kg	36.562954	-109.216599
1	Chinle Formation	CT-01	Uranium	T10X91	4/25/2018	0	1	3.59			mg/kg	36.562866	-109.216957
1	Chinle Formation	CT-01	Uranium	T10X92	4/25/2018	0	1	2.91			mg/kg	36.562862	-109.216843
1	Chinle Formation	CT-01	Uranium	T10X93	4/25/2018	0	1	2.91			mg/kg	36.562859	-109.216728
1	Chinle Formation	CT-01	Uranium	T10X94	5/14/2018	0	1	2.72			mg/kg	36.562824	-109.216614
1	Chinle Formation	CT-01	Uranium	T10X99	5/14/2018	0	1	3.13			mg/kg	36.562767	-109.217056
1	Chinle Formation	CT-01	Uranium	T10-XS33-01-042518	4/25/2018	0	3	0.790			mg/kg	36.563405	-109.216725
1	Chinle Formation	CT-01	Uranium	T10-XSG1-01-081818	8/18/2018	0	3	2.60			mg/kg	36.562593	-109.217057
1	Chinle Formation	CTS South	Uranium	T37G1	8/18/2018	0	1	0.080	QU		mg/kg	36.559078	-109.217705
1	Chinle Formation	CTS South	Uranium	T37G2	8/18/2018	0	1	4.83			mg/kg	36.559082	-109.21759
1	Chinle Formation	CTS South	Uranium	T37G3	8/18/2018	0	1	2.05			mg/kg	36.559082	-109.217499
1	Chinle Formation	CTS South	Uranium	T37-SB103-006018-01-091318	9/13/2018	6	18	1.00			mg/kg	36.558002	-109.217857
1	Chinle Formation	CTS South	Uranium	T37-SB103-024036-01-091318	9/13/2018	24	36	0.510			mg/kg	36.558002	-109.217857
1	Chinle Formation	CTS South	Uranium	T37-SB103-048060-01-091318	9/13/2018	48	60	0.620			mg/kg	36.558002	-109.217857
1	Chinle Formation	CTS South	Uranium	T37-SB69-006018-01-091218	9/12/2018	6	18	1.60			mg/kg	36.558327	-109.217758

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Uranium	T37-SB69-018048-01-091218	9/12/2018	18	48	0.580			mg/kg	36.558327	-109.217758
1	Chinle Formation	CTS South	Uranium	T37-SB69-048066-01-091218	9/12/2018	48	66	0.590			mg/kg	36.558327	-109.217758
1	Chinle Formation	CTS South	Uranium	T37-SB77-006018-01-091218	9/12/2018	6	18	3.10			mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Uranium	T37-SB77-018048-01-091218	9/12/2018	18	48	1.90			mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Uranium	T37-SB77-048072-01-091218	9/12/2018	48	72	1.20			mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Uranium	T37-SB86-006018-01-091318	9/13/2018	6	18	13.0			mg/kg	36.558155	-109.217827
1	Chinle Formation	CTS South	Uranium	T37-SB86-024036-01-091318	9/13/2018	24	36	3.10			mg/kg	36.558155	-109.217827
1	Chinle Formation	CTS South	Uranium	T37-SB86-048060-01-091318	9/13/2018	48	60	0.810			mg/kg	36.558155	-109.217827
1	Chinle Formation	CTS South	Uranium	T37-SB86A-006018-01-091318	9/13/2018	6	18	1.40			mg/kg	36.558189	-109.217865
1	Chinle Formation	CTS South	Uranium	T37-SB86A-024036-01-091318	9/13/2018	24	36	1.20			mg/kg	36.558189	-109.217865
1	Chinle Formation	CTS South	Uranium	T37-SB86A-048060-01-091318	9/13/2018	48	60	0.910			mg/kg	36.558189	-109.217865
1	Chinle Formation	CTS South	Uranium	T37-SB87-006018-01-091318	9/13/2018	6	18	0.600			mg/kg	36.558151	-109.217758
1	Chinle Formation	CTS South	Uranium	T37-SB87-024036-01-091318	9/13/2018	24	36	0.570			mg/kg	36.558151	-109.217758
1	Chinle Formation	CTS South	Uranium	T37-SB87-048060-01-091318	9/13/2018	48	60	0.850			mg/kg	36.558151	-109.217758
1	Chinle Formation	CTS South	Uranium	T37-SB94-006018-01-091318	9/13/2018	6	18	1.50			mg/kg	36.558079	-109.217827
1	Chinle Formation	CTS South	Uranium	T37-SB94-024036-01-091318	9/13/2018	24	36	0.490			mg/kg	36.558079	-109.217827
1	Chinle Formation	CTS South	Uranium	T37-SB94-048060-01-091318	9/13/2018	48	60	0.770			mg/kg	36.558079	-109.217827
1	Chinle Formation	CTS South	Uranium	T37-SS103-01-091318	9/13/2018	0	6	1.10			mg/kg	36.558001	-109.217855
1	Chinle Formation	CTS South	Uranium	T37-SS69-01-091218	9/12/2018	0	6	0.650			mg/kg	36.558325	-109.217756
1	Chinle Formation	CTS South	Uranium	T37-SS77-01-091218	9/12/2018	0	6	0.430			mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Uranium	T37-SS86-01-091318	9/13/2018	0	6	0.980			mg/kg	36.558156	-109.217825
1	Chinle Formation	CTS South	Uranium	T37-SS86A-01-091318	9/13/2018	0	6	0.860			mg/kg	36.558191	-109.217869
1	Chinle Formation	CTS South	Uranium	T37-SS87-01-091318	9/13/2018	0	6	0.950			mg/kg	36.558151	-109.217759
1	Chinle Formation	CTS South	Uranium	T37-SS94-01-091318	9/13/2018	0	6	1.30			mg/kg	36.558078	-109.217828
1	Chinle Formation	CTS South	Uranium	T37X1	5/14/2018	0	1	2.86			mg/kg	36.558987	-109.218002
1	Chinle Formation	CTS South	Uranium	T37X10	5/14/2018	0	1	2.60			mg/kg	36.55891	-109.217934
1	Chinle Formation	CTS South	Uranium	T37X101	5/14/2018	0	1	1.13			mg/kg	36.558006	-109.218056
1	Chinle Formation	CTS South	Uranium	T37X102	5/14/2018	0	1	2.52			mg/kg	36.558002	-109.217934
1	Chinle Formation	CTS South	Uranium	T37X103	5/14/2018	0	1	3.08			mg/kg	36.558002	-109.217819
1	Chinle Formation	CTS South	Uranium	T37X104	5/14/2018	0	1	1.34			mg/kg	36.557999	-109.217712
1	Chinle Formation	CTS South	Uranium	T37X105	5/14/2018	0	1	0.995			mg/kg	36.557999	-109.217606
1	Chinle Formation	CTS South	Uranium	T37X106	5/14/2018	0	1	2.34			mg/kg	36.557999	-109.217491
1	Chinle Formation	CTS South	Uranium	T37X107	8/18/2018	0	1	0.619			mg/kg	36.557896	-109.218483
1	Chinle Formation	CTS South	Uranium	T37X108	5/14/2018	0	1	1.97			mg/kg	36.557915	-109.218391
1	Chinle Formation	CTS South	Uranium	T37X109	5/14/2018	0	1	0.080	QU		mg/kg	36.557922	-109.218307
1	Chinle Formation	CTS South	Uranium	T37X11	5/14/2018	0	1	1.97			mg/kg	36.558907	-109.217804
1	Chinle Formation	CTS South	Uranium	T37X111	5/14/2018	0	1	3.21			mg/kg	36.557915	-109.218025
1	Chinle Formation	CTS South	Uranium	T37X112	5/14/2018	0	1	0.080	QU		mg/kg	36.557907	-109.217934
1	Chinle Formation	CTS South	Uranium	T37X113	5/14/2018	0	1	0.665			mg/kg	36.557915	-109.217827
1	Chinle Formation	CTS South	Uranium	T37X114	5/14/2018	0	1	0.441			mg/kg	36.557915	-109.217712
1	Chinle Formation	CTS South	Uranium	T37X115	5/14/2018	0	1	1.57			mg/kg	36.557911	-109.217606
1	Chinle Formation	CTS South	Uranium	T37X116	8/18/2018	0	1	2.97			mg/kg	36.557812	-109.21859
1	Chinle Formation	CTS South	Uranium	T37X117	5/14/2018	0	1	1.16			mg/kg	36.557827	-109.218506
1	Chinle Formation	CTS South	Uranium	T37X118	5/14/2018	0	1	1.78			mg/kg	36.557827	-109.218399
1	Chinle Formation	CTS South	Uranium	T37X118A	8/18/2018	0	1	0.433			mg/kg	36.557835	-109.218407
1	Chinle Formation	CTS South	Uranium	T37X119	5/14/2018	0	1	2.30			mg/kg	36.557823	-109.218277
1	Chinle Formation	CTS South	Uranium	T37X12	5/14/2018	0	1	1.37			mg/kg	36.558907	-109.217735
1	Chinle Formation	CTS South	Uranium	T37X120	5/14/2018	0	1	0.466			mg/kg	36.557827	-109.218178

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Uranium	T37X121	5/14/2018	0	1	0.397			mg/kg	36.557816	-109.218056
1	Chinle Formation	CTS South	Uranium	T37X122	5/14/2018	0	1	2.40			mg/kg	36.557819	-109.217941
1	Chinle Formation	CTS South	Uranium	T37X123	5/14/2018	0	1	0.864			mg/kg	36.557823	-109.217827
1	Chinle Formation	CTS South	Uranium	T37X124	5/14/2018	0	1	0.080	QU		mg/kg	36.557819	-109.21772
1	Chinle Formation	CTS South	Uranium	T37X125	5/14/2018	0	1	0.828			mg/kg	36.557823	-109.217606
1	Chinle Formation	CTS South	Uranium	T37X126	5/14/2018	0	1	0.891			mg/kg	36.557739	-109.218613
1	Chinle Formation	CTS South	Uranium	T37X127	5/14/2018	0	1	1.52			mg/kg	36.557735	-109.218521
1	Chinle Formation	CTS South	Uranium	T37X128	5/14/2018	0	1	1.03			mg/kg	36.557747	-109.218361
1	Chinle Formation	CTS South	Uranium	T37X129	5/14/2018	0	1	0.080	QU		mg/kg	36.557709	-109.218269
1	Chinle Formation	CTS South	Uranium	T37X13	5/14/2018	0	1	3.39			mg/kg	36.558899	-109.217583
1	Chinle Formation	CTS South	Uranium	T37X130	5/14/2018	0	1	2.06			mg/kg	36.557743	-109.218155
1	Chinle Formation	CTS South	Uranium	T37X131	5/14/2018	0	1	19.2			mg/kg	36.557732	-109.218063
1	Chinle Formation	CTS South	Uranium	T37X132	5/14/2018	0	1	0.080	QU		mg/kg	36.557732	-109.217941
1	Chinle Formation	CTS South	Uranium	T37X133	5/14/2018	0	1	3.55			mg/kg	36.557735	-109.217842
1	Chinle Formation	CTS South	Uranium	T37X134	5/14/2018	0	1	0.080	QU		mg/kg	36.557724	-109.217728
1	Chinle Formation	CTS South	Uranium	T37X135	5/14/2018	0	1	1.42			mg/kg	36.557735	-109.217598
1	Chinle Formation	CTS South	Uranium	T37X137	5/14/2018	0	1	0.080	QU		mg/kg	36.557644	-109.218491
1	Chinle Formation	CTS South	Uranium	T37X138	5/14/2018	0	1	0.080	QU		mg/kg	36.557644	-109.218391
1	Chinle Formation	CTS South	Uranium	T37X139	5/14/2018	0	1	1.89			mg/kg	36.557652	-109.218277
1	Chinle Formation	CTS South	Uranium	T37X14	5/14/2018	0	1	3.07			mg/kg	36.558895	-109.217476
1	Chinle Formation	CTS South	Uranium	T37X140	5/14/2018	0	1	0.859			mg/kg	36.557636	-109.218163
1	Chinle Formation	CTS South	Uranium	T37X141	5/14/2018	0	1	1.43			mg/kg	36.557644	-109.218056
1	Chinle Formation	CTS South	Uranium	T37X142	5/14/2018	0	1	5.33			mg/kg	36.557644	-109.217941
1	Chinle Formation	CTS South	Uranium	T37X143	5/14/2018	0	1	1.26			mg/kg	36.557644	-109.217834
1	Chinle Formation	CTS South	Uranium	T37X144	5/14/2018	0	1	1.11			mg/kg	36.557644	-109.217712
1	Chinle Formation	CTS South	Uranium	T37X145	5/14/2018	0	1	1.53			mg/kg	36.55764	-109.217606
1	Chinle Formation	CTS South	Uranium	T37X146	5/14/2018	0	1	1.06			mg/kg	36.557564	-109.218498
1	Chinle Formation	CTS South	Uranium	T37X147	5/14/2018	0	1	0.390			mg/kg	36.55756	-109.218384
1	Chinle Formation	CTS South	Uranium	T37X148	5/14/2018	0	1	0.356			mg/kg	36.557556	-109.218277
1	Chinle Formation	CTS South	Uranium	T37X149	5/14/2018	0	1	0.753			mg/kg	36.55756	-109.21817
1	Chinle Formation	CTS South	Uranium	T37X15	5/14/2018	0	1	2.53			mg/kg	36.558891	-109.217384
1	Chinle Formation	CTS South	Uranium	T37X150	5/14/2018	0	1	0.436			mg/kg	36.557556	-109.218048
1	Chinle Formation	CTS South	Uranium	T37X151	5/14/2018	0	1	1.78			mg/kg	36.557552	-109.217941
1	Chinle Formation	CTS South	Uranium	T37X152	5/14/2018	0	1	2.12			mg/kg	36.557552	-109.217827
1	Chinle Formation	CTS South	Uranium	T37X153	5/14/2018	0	1	1.54			mg/kg	36.557556	-109.21772
1	Chinle Formation	CTS South	Uranium	T37X154	5/14/2018	0	1	3.62			mg/kg	36.557556	-109.217613
1	Chinle Formation	CTS South	Uranium	T37X155	5/14/2018	0	1	0.258			mg/kg	36.557465	-109.218498
1	Chinle Formation	CTS South	Uranium	T37X156	5/14/2018	0	1	2.00			mg/kg	36.557472	-109.218399
1	Chinle Formation	CTS South	Uranium	T37X157	5/14/2018	0	1	1.38			mg/kg	36.557465	-109.218285
1	Chinle Formation	CTS South	Uranium	T37X158	5/14/2018	0	1	1.88			mg/kg	36.557465	-109.218178
1	Chinle Formation	CTS South	Uranium	T37X159	5/14/2018	0	1	1.14			mg/kg	36.557461	-109.218063
1	Chinle Formation	CTS South	Uranium	T37X16	5/14/2018	0	1	4.94			mg/kg	36.558903	-109.217262
1	Chinle Formation	CTS South	Uranium	T37X160	5/14/2018	0	1	2.61			mg/kg	36.557465	-109.217949
1	Chinle Formation	CTS South	Uranium	T37X161	5/14/2018	0	1	2.40			mg/kg	36.557461	-109.217834
1	Chinle Formation	CTS South	Uranium	T37X162	5/14/2018	0	1	2.52			mg/kg	36.557465	-109.21772
1	Chinle Formation	CTS South	Uranium	T37X163	5/14/2018	0	1	0.869			mg/kg	36.557461	-109.217606
1	Chinle Formation	CTS South	Uranium	T37X164	5/14/2018	0	1	0.492			mg/kg	36.557377	-109.218399
1	Chinle Formation	CTS South	Uranium	T37X165	5/14/2018	0	1	2.13			mg/kg	36.557373	-109.218277

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Uranium	T37X166	5/14/2018	0	1	0.738			mg/kg	36.557377	-109.218178
1	Chinle Formation	CTS South	Uranium	T37X167	5/14/2018	0	1	0.080	QU		mg/kg	36.557373	-109.218063
1	Chinle Formation	CTS South	Uranium	T37X168	5/14/2018	0	1	1.93			mg/kg	36.557365	-109.217949
1	Chinle Formation	CTS South	Uranium	T37X169	5/14/2018	0	1	2.16			mg/kg	36.557369	-109.217834
1	Chinle Formation	CTS South	Uranium	T37X17	5/14/2018	0	1	2.09			mg/kg	36.558895	-109.217133
1	Chinle Formation	CTS South	Uranium	T37X170	5/14/2018	0	1	1.25			mg/kg	36.557369	-109.217728
1	Chinle Formation	CTS South	Uranium	T37X171	5/14/2018	0	1	1.78			mg/kg	36.557365	-109.217613
1	Chinle Formation	CTS South	Uranium	T37X172	5/14/2018	0	1	2.15			mg/kg	36.557365	-109.217499
1	Chinle Formation	CTS South	Uranium	T37X173	5/14/2018	0	1	2.50			mg/kg	36.557278	-109.217949
1	Chinle Formation	CTS South	Uranium	T37X174	5/14/2018	0	1	1.37			mg/kg	36.557274	-109.217834
1	Chinle Formation	CTS South	Uranium	T37X175	5/14/2018	0	1	1.57			mg/kg	36.55727	-109.217728
1	Chinle Formation	CTS South	Uranium	T37X176	5/14/2018	0	1	2.70			mg/kg	36.557278	-109.217613
1	Chinle Formation	CTS South	Uranium	T37X177	5/14/2018	0	1	3.14			mg/kg	36.557274	-109.217506
1	Chinle Formation	CTS South	Uranium	T37X18	5/14/2018	0	1	1.01			mg/kg	36.558899	-109.217033
1	Chinle Formation	CTS South	Uranium	T37X19	5/14/2018	0	1	2.45			mg/kg	36.558811	-109.218048
1	Chinle Formation	CTS South	Uranium	T37X2	5/14/2018	0	1	3.36			mg/kg	36.558998	-109.217911
1	Chinle Formation	CTS South	Uranium	T37X20	5/14/2018	0	1	2.43			mg/kg	36.558815	-109.217941
1	Chinle Formation	CTS South	Uranium	T37X21	5/14/2018	0	1	2.25			mg/kg	36.558826	-109.217812
1	Chinle Formation	CTS South	Uranium	T37X22	5/14/2018	0	1	2.38			mg/kg	36.558804	-109.217705
1	Chinle Formation	CTS South	Uranium	T37X23	5/14/2018	0	1	6.11			mg/kg	36.558815	-109.217583
1	Chinle Formation	CTS South	Uranium	T37X24	5/14/2018	0	1	0.852			mg/kg	36.5588	-109.217484
1	Chinle Formation	CTS South	Uranium	T37X25	5/14/2018	0	1	4.19			mg/kg	36.558784	-109.2174
1	Chinle Formation	CTS South	Uranium	T37X26	5/14/2018	0	1	4.79			mg/kg	36.558815	-109.217239
1	Chinle Formation	CTS South	Uranium	T37X27	5/14/2018	0	1	0.716			mg/kg	36.5588	-109.21714
1	Chinle Formation	CTS South	Uranium	T37X28	5/14/2018	0	1	2.40			mg/kg	36.558727	-109.21804
1	Chinle Formation	CTS South	Uranium	T37X29	5/14/2018	0	1	0.366			mg/kg	36.558727	-109.217964
1	Chinle Formation	CTS South	Uranium	T37X3	5/14/2018	0	1	1.59			mg/kg	36.559002	-109.217773
1	Chinle Formation	CTS South	Uranium	T37X30	5/14/2018	0	1	1.87			mg/kg	36.558731	-109.217819
1	Chinle Formation	CTS South	Uranium	T37X31	5/14/2018	0	1	2.14			mg/kg	36.558727	-109.217705
1	Chinle Formation	CTS South	Uranium	T37X32	5/14/2018	0	1	1.24			mg/kg	36.558727	-109.217598
1	Chinle Formation	CTS South	Uranium	T37X33	5/14/2018	0	1	4.94			mg/kg	36.558716	-109.217499
1	Chinle Formation	CTS South	Uranium	T37X34	5/14/2018	0	1	1.59			mg/kg	36.55872	-109.217384
1	Chinle Formation	CTS South	Uranium	T37X35	5/14/2018	0	1	3.10			mg/kg	36.55872	-109.217255
1	Chinle Formation	CTS South	Uranium	T37X36	5/14/2018	0	1	3.45			mg/kg	36.558712	-109.217163
1	Chinle Formation	CTS South	Uranium	T37X37	5/14/2018	0	1	2.60			mg/kg	36.558632	-109.218048
1	Chinle Formation	CTS South	Uranium	T37X38	8/18/2018	0	1	2.13			mg/kg	36.55862	-109.21788
1	Chinle Formation	CTS South	Uranium	T37X39	5/14/2018	0	1	1.63			mg/kg	36.558628	-109.217819
1	Chinle Formation	CTS South	Uranium	T37X4	5/14/2018	0	1	2.36			mg/kg	36.558987	-109.21772
1	Chinle Formation	CTS South	Uranium	T37X40	5/14/2018	0	1	1.76			mg/kg	36.558617	-109.217712
1	Chinle Formation	CTS South	Uranium	T37X41	5/14/2018	0	1	2.17			mg/kg	36.558624	-109.21759
1	Chinle Formation	CTS South	Uranium	T37X42	5/14/2018	0	1	3.86			mg/kg	36.55862	-109.217468
1	Chinle Formation	CTS South	Uranium	T37X43	5/14/2018	0	1	2.06			mg/kg	36.55862	-109.217361
1	Chinle Formation	CTS South	Uranium	T37X44	5/14/2018	0	1	1.04			mg/kg	36.55864	-109.217232
1	Chinle Formation	CTS South	Uranium	T37X45	5/14/2018	0	1	1.85			mg/kg	36.55862	-109.217163
1	Chinle Formation	CTS South	Uranium	T37X46	5/14/2018	0	1	1.57			mg/kg	36.558529	-109.218124
1	Chinle Formation	CTS South	Uranium	T37X47	5/14/2018	0	1	1.75			mg/kg	36.558537	-109.218033
1	Chinle Formation	CTS South	Uranium	T37X48	8/18/2018	0	1	0.080	QU		mg/kg	36.558544	-109.217903
1	Chinle Formation	CTS South	Uranium	T37X49	5/14/2018	0	1	1.38			mg/kg	36.558548	-109.217819

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Uranium	T37X5	5/14/2018	0	1	1.82			mg/kg	36.558983	-109.21759
1	Chinle Formation	CTS South	Uranium	T37X50	5/14/2018	0	1	1.64			mg/kg	36.558548	-109.217705
1	Chinle Formation	CTS South	Uranium	T37X51	5/14/2018	0	1	2.14			mg/kg	36.55854	-109.217583
1	Chinle Formation	CTS South	Uranium	T37X52	5/14/2018	0	1	1.07			mg/kg	36.558544	-109.217484
1	Chinle Formation	CTS South	Uranium	T37X53	5/14/2018	0	1	3.51			mg/kg	36.558537	-109.217384
1	Chinle Formation	CTS South	Uranium	T37X54	5/14/2018	0	1	1.29			mg/kg	36.55854	-109.217262
1	Chinle Formation	CTS South	Uranium	T37X55	5/14/2018	0	1	1.20			mg/kg	36.558533	-109.21714
1	Chinle Formation	CTS South	Uranium	T37X56	5/14/2018	0	1	1.56			mg/kg	36.558453	-109.21814
1	Chinle Formation	CTS South	Uranium	T37X57	5/14/2018	0	1	2.55			mg/kg	36.558456	-109.218048
1	Chinle Formation	CTS South	Uranium	T37X58	5/14/2018	0	1	0.080	QU		mg/kg	36.558456	-109.217903
1	Chinle Formation	CTS South	Uranium	T37X59	5/14/2018	0	1	1.91			mg/kg	36.558456	-109.217819
1	Chinle Formation	CTS South	Uranium	T37X6	5/14/2018	0	1	1.51			mg/kg	36.55899	-109.217484
1	Chinle Formation	CTS South	Uranium	T37X60	5/14/2018	0	1	1.47			mg/kg	36.558445	-109.217712
1	Chinle Formation	CTS South	Uranium	T37X61	5/14/2018	0	1	0.080	QU		mg/kg	36.558441	-109.21759
1	Chinle Formation	CTS South	Uranium	T37X62	5/14/2018	0	1	1.13			mg/kg	36.558437	-109.217476
1	Chinle Formation	CTS South	Uranium	T37X63	5/14/2018	0	1	1.10			mg/kg	36.558441	-109.217361
1	Chinle Formation	CTS South	Uranium	T37X64	5/14/2018	0	1	2.50			mg/kg	36.558453	-109.217262
1	Chinle Formation	CTS South	Uranium	T37X65	5/14/2018	0	1	3.10			mg/kg	36.558361	-109.218155
1	Chinle Formation	CTS South	Uranium	T37X66	5/14/2018	0	1	3.14			mg/kg	36.558365	-109.218063
1	Chinle Formation	CTS South	Uranium	T37X67	5/14/2018	0	1	1.84			mg/kg	36.558365	-109.217934
1	Chinle Formation	CTS South	Uranium	T37X68	5/14/2018	0	1	2.86			mg/kg	36.558361	-109.217819
1	Chinle Formation	CTS South	Uranium	T37X69	5/14/2018	0	1	6.08			mg/kg	36.558372	-109.217712
1	Chinle Formation	CTS South	Uranium	T37X7	5/14/2018	0	1	3.15			mg/kg	36.558983	-109.217369
1	Chinle Formation	CTS South	Uranium	T37X70	5/14/2018	0	1	2.27			mg/kg	36.558372	-109.217606
1	Chinle Formation	CTS South	Uranium	T37X71	5/14/2018	0	1	1.31			mg/kg	36.55835	-109.217506
1	Chinle Formation	CTS South	Uranium	T37X72	5/14/2018	0	1	1.16			mg/kg	36.558372	-109.217377
1	Chinle Formation	CTS South	Uranium	T37X73	5/14/2018	0	1	1.31			mg/kg	36.558334	-109.217293
1	Chinle Formation	CTS South	Uranium	T37X74	5/14/2018	0	1	1.24			mg/kg	36.558273	-109.218163
1	Chinle Formation	CTS South	Uranium	T37X75	5/14/2018	0	1	0.676			mg/kg	36.558289	-109.218086
1	Chinle Formation	CTS South	Uranium	T37X76	5/14/2018	0	1	4.91			mg/kg	36.558273	-109.217926
1	Chinle Formation	CTS South	Uranium	T37X77	5/14/2018	0	1	2.88			mg/kg	36.55827	-109.217834
1	Chinle Formation	CTS South	Uranium	T37X78	5/14/2018	0	1	1.30			mg/kg	36.558277	-109.21772
1	Chinle Formation	CTS South	Uranium	T37X79	5/14/2018	0	1	4.93			mg/kg	36.558277	-109.217598
1	Chinle Formation	CTS South	Uranium	T37X8	5/14/2018	0	1	4.31			mg/kg	36.558975	-109.217255
1	Chinle Formation	CTS South	Uranium	T37X80	5/14/2018	0	1	1.57			mg/kg	36.558281	-109.217499
1	Chinle Formation	CTS South	Uranium	T37X81	5/14/2018	0	1	2.01			mg/kg	36.558266	-109.217377
1	Chinle Formation	CTS South	Uranium	T37X82	5/14/2018	0	1	0.080	QU		mg/kg	36.558182	-109.218246
1	Chinle Formation	CTS South	Uranium	T37X83	5/14/2018	0	1	1.12			mg/kg	36.558182	-109.218155
1	Chinle Formation	CTS South	Uranium	T37X84	5/14/2018	0	1	1.19			mg/kg	36.558189	-109.21801
1	Chinle Formation	CTS South	Uranium	T37X85	5/14/2018	0	1	2.03			mg/kg	36.558189	-109.217934
1	Chinle Formation	CTS South	Uranium	T37X86	5/14/2018	0	1	0.893			mg/kg	36.558186	-109.217804
1	Chinle Formation	CTS South	Uranium	T37X87	5/14/2018	0	1	2.03			mg/kg	36.558189	-109.217705
1	Chinle Formation	CTS South	Uranium	T37X88	5/14/2018	0	1	3.09			mg/kg	36.558189	-109.21759
1	Chinle Formation	CTS South	Uranium	T37X89	5/14/2018	0	1	3.38			mg/kg	36.558189	-109.217476
1	Chinle Formation	CTS South	Uranium	T37X9	5/14/2018	0	1	3.06			mg/kg	36.558891	-109.218018
1	Chinle Formation	CTS South	Uranium	T37X90	5/14/2018	0	1	2.17			mg/kg	36.558098	-109.218269
1	Chinle Formation	CTS South	Uranium	T37X91	5/14/2018	0	1	3.07			mg/kg	36.55809	-109.218193
1	Chinle Formation	CTS South	Uranium	T37X92	5/14/2018	0	1	1.38			mg/kg	36.558098	-109.218048

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Uranium	T37X93	5/14/2018	0	1	2.67			mg/kg	36.558094	-109.217926
1	Chinle Formation	CTS South	Uranium	T37X94	5/14/2018	0	1	2.33			mg/kg	36.558086	-109.217827
1	Chinle Formation	CTS South	Uranium	T37X95	5/14/2018	0	1	2.51			mg/kg	36.558094	-109.217712
1	Chinle Formation	CTS South	Uranium	T37X96	5/14/2018	0	1	1.50			mg/kg	36.558086	-109.21759
1	Chinle Formation	CTS South	Uranium	T37X97	5/14/2018	0	1	1.24			mg/kg	36.558086	-109.217476
1	Chinle Formation	CTS South	Uranium	T37X98	5/14/2018	0	1	0.080	QU		mg/kg	36.558006	-109.218369
1	Chinle Formation	CTS South	Uranium	T37X99	5/14/2018	0	1	0.506			mg/kg	36.558006	-109.218277
1	Chinle Formation	CTS	Uranium	T9G1	8/18/2018	0	1	1.88			mg/kg	36.562412	-109.216995
1	Chinle Formation	CTS	Uranium	T9G10	8/18/2018	0	1	1.03			mg/kg	36.561962	-109.21711
1	Chinle Formation	CTS	Uranium	T9G11	8/18/2018	0	1	0.942			mg/kg	36.561775	-109.216438
1	Chinle Formation	CTS	Uranium	T9G13	8/18/2018	0	1	3.35			mg/kg	36.561771	-109.215881
1	Chinle Formation	CTS	Uranium	T9G14	8/18/2018	0	1	0.811			mg/kg	36.561703	-109.217224
1	Chinle Formation	CTS	Uranium	T9G15	8/18/2018	0	1	0.562			mg/kg	36.561695	-109.217125
1	Chinle Formation	CTS	Uranium	T9G16	8/18/2018	0	1	0.654			mg/kg	36.56168	-109.215881
1	Chinle Formation	CTS	Uranium	T9G17	8/18/2018	0	1	0.080	QU		mg/kg	36.561676	-109.215775
1	Chinle Formation	CTS	Uranium	T9G18	8/18/2018	0	1	1.37			mg/kg	36.56168	-109.215668
1	Chinle Formation	CTS	Uranium	T9G19	8/18/2018	0	1	2.50			mg/kg	36.561604	-109.217224
1	Chinle Formation	CTS	Uranium	T9G2	8/18/2018	0	1	2.08			mg/kg	36.562412	-109.216888
1	Chinle Formation	CTS	Uranium	T9G20	8/18/2018	0	1	1.56			mg/kg	36.561588	-109.215675
1	Chinle Formation	CTS	Uranium	T9G21	8/18/2018	0	1	1.27			mg/kg	36.561508	-109.217224
1	Chinle Formation	CTS	Uranium	T9G22	8/18/2018	0	1	1.42			mg/kg	36.561501	-109.215652
1	Chinle Formation	CTS	Uranium	T9G23	8/18/2018	0	1	0.839			mg/kg	36.56142	-109.217232
1	Chinle Formation	CTS	Uranium	T9G24	8/18/2018	0	1	0.856			mg/kg	36.561413	-109.215775
1	Chinle Formation	CTS	Uranium	T9G25	8/18/2018	0	1	1.12			mg/kg	36.561413	-109.21566
1	Chinle Formation	CTS	Uranium	T9G26	8/18/2018	0	1	1.48			mg/kg	36.561337	-109.217239
1	Chinle Formation	CTS	Uranium	T9G27	8/18/2018	0	1	2.32			mg/kg	36.561321	-109.215782
1	Chinle Formation	CTS	Uranium	T9G28	8/18/2018	0	1	2.32			mg/kg	36.561237	-109.215767
1	Chinle Formation	CTS	Uranium	T9G29	8/18/2018	0	1	1.13			mg/kg	36.561066	-109.217346
1	Chinle Formation	CTS	Uranium	T9G30	8/18/2018	0	1	4.14			mg/kg	36.561058	-109.215782
1	Chinle Formation	CTS	Uranium	T9G31	8/18/2018	0	1	1.07			mg/kg	36.560978	-109.217354
1	Chinle Formation	CTS	Uranium	T9G32	8/18/2018	0	1	2.41			mg/kg	36.56097	-109.215775
1	Chinle Formation	CTS	Uranium	T9G33	8/18/2018	0	1	1.32			mg/kg	36.560871	-109.215775
1	Chinle Formation	CTS	Uranium	T9G34	8/18/2018	0	1	1.32			mg/kg	36.560623	-109.217468
1	Chinle Formation	CTS	Uranium	T9G35	8/18/2018	0	1	0.415			mg/kg	36.560513	-109.216789
1	Chinle Formation	CTS	Uranium	T9G36	8/18/2018	0	1	1.38			mg/kg	36.560516	-109.21669
1	Chinle Formation	CTS	Uranium	T9G37	8/18/2018	0	1	0.957			mg/kg	36.560513	-109.21656
1	Chinle Formation	CTS	Uranium	T9G38	8/18/2018	0	1	2.13			mg/kg	36.560505	-109.216461
1	Chinle Formation	CTS	Uranium	T9G39	8/18/2018	0	1	2.71			mg/kg	36.56052	-109.216011
1	Chinle Formation	CTS	Uranium	T9G4	8/18/2018	0	1	3.08			mg/kg	36.562321	-109.216988
1	Chinle Formation	CTS	Uranium	T9G40	8/18/2018	0	1	4.77			mg/kg	36.560429	-109.216896
1	Chinle Formation	CTS	Uranium	T9G41	8/18/2018	0	1	3.85			mg/kg	36.560429	-109.216789
1	Chinle Formation	CTS	Uranium	T9G42	8/18/2018	0	1	0.642			mg/kg	36.560429	-109.216469
1	Chinle Formation	CTS	Uranium	T9G43	8/18/2018	0	1	1.30			mg/kg	36.560429	-109.216232
1	Chinle Formation	CTS	Uranium	T9G44	8/18/2018	0	1	0.080	QU		mg/kg	36.560421	-109.216125
1	Chinle Formation	CTS	Uranium	T9G45	8/18/2018	0	1	2.30			mg/kg	36.560421	-109.216011
1	Chinle Formation	CTS	Uranium	T9G46	8/18/2018	0	1	2.28			mg/kg	36.560337	-109.216911
1	Chinle Formation	CTS	Uranium	T9G47	8/18/2018	0	1	0.080	QU		mg/kg	36.560333	-109.216461
1	Chinle Formation	CTS	Uranium	T9G48	8/18/2018	0	1	2.01			mg/kg	36.560341	-109.216331

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Uranium	T9G49	8/18/2018	0	1	1.27			mg/kg	36.560326	-109.216217
1	Chinle Formation	CTS	Uranium	T9G50	8/18/2018	0	1	1.76			mg/kg	36.560257	-109.217682
1	Chinle Formation	CTS	Uranium	T9G51	8/18/2018	0	1	1.33			mg/kg	36.560257	-109.217583
1	Chinle Formation	CTS	Uranium	T9G52	8/18/2018	0	1	1.45			mg/kg	36.560253	-109.217018
1	Chinle Formation	CTS	Uranium	T9G53	8/18/2018	0	1	0.136			mg/kg	36.560234	-109.216911
1	Chinle Formation	CTS	Uranium	T9G54	8/18/2018	0	1	1.59			mg/kg	36.560173	-109.217682
1	Chinle Formation	CTS	Uranium	T9G55	8/18/2018	0	1	0.080	QU		mg/kg	36.560158	-109.217026
1	Chinle Formation	CTS	Uranium	T9G56	8/18/2018	0	1	0.080	QU		mg/kg	36.560074	-109.217682
1	Chinle Formation	CTS	Uranium	T9G57	8/18/2018	0	1	6.78			mg/kg	36.560074	-109.21714
1	Chinle Formation	CTS	Uranium	T9G58	8/18/2018	0	1	0.860			mg/kg	36.559982	-109.217697
1	Chinle Formation	CTS	Uranium	T9G59	8/18/2018	0	1	2.87			mg/kg	36.559978	-109.217239
1	Chinle Formation	CTS	Uranium	T9G6	8/18/2018	0	1	0.101	QL		mg/kg	36.562229	-109.216995
1	Chinle Formation	CTS	Uranium	T9G60	8/18/2018	0	1	4.25			mg/kg	36.559975	-109.217148
1	Chinle Formation	CTS	Uranium	T9G61	8/18/2018	0	1	1.47			mg/kg	36.559883	-109.217697
1	Chinle Formation	CTS	Uranium	T9G62	8/18/2018	0	1	4.02			mg/kg	36.559891	-109.217255
1	Chinle Formation	CTS	Uranium	T9G63	8/18/2018	0	1	2.27			mg/kg	36.559792	-109.217346
1	Chinle Formation	CTS	Uranium	T9G64	8/18/2018	0	1	2.03			mg/kg	36.559811	-109.217247
1	Chinle Formation	CTS	Uranium	T9G65	8/18/2018	0	1	1.88			mg/kg	36.559708	-109.21759
1	Chinle Formation	CTS	Uranium	T9G66	8/18/2018	0	1	2.41			mg/kg	36.559723	-109.217461
1	Chinle Formation	CTS	Uranium	T9G67	8/18/2018	0	1	4.38			mg/kg	36.559715	-109.217361
1	Chinle Formation	CTS	Uranium	T9G7	8/18/2018	0	1	1.90			mg/kg	36.562138	-109.216995
1	Chinle Formation	CTS	Uranium	T9G8	8/18/2018	0	1	0.896			mg/kg	36.562054	-109.21711
1	Chinle Formation	CTS	Uranium	T9G9	8/18/2018	0	1	1.39			mg/kg	36.56205	-109.217003
1	Chinle Formation	CTS	Uranium	T9-SB109-006018-01-091118	9/11/2018	6	18	12.0			mg/kg	36.561131	-109.216263
1	Chinle Formation	CTS	Uranium	T9-SB109-060072-01-091118	9/11/2018	60	72	0.720			mg/kg	36.561131	-109.216263
1	Chinle Formation	CTS	Uranium	T9-SB129-006024-01-091118	9/11/2018	6	24	1.00			mg/kg	36.560932	-109.216881
1	Chinle Formation	CTS	Uranium	T9-SB129-024048-01-091118	9/11/2018	24	48	0.920			mg/kg	36.560932	-109.216881
1	Chinle Formation	CTS	Uranium	T9-SB144-006018-01-091218	9/12/2018	6	18	1.40			mg/kg	36.560852	-109.216751
1	Chinle Formation	CTS	Uranium	T9-SB144-024036-01-091218	9/12/2018	24	36	0.980			mg/kg	36.560852	-109.216751
1	Chinle Formation	CTS	Uranium	T9-SB144-048060-01-091218	9/12/2018	48	60	0.940			mg/kg	36.560852	-109.216751
1	Chinle Formation	CTS	Uranium	T9-SB155-006018-01-091118	9/11/2018	6	18	2.70	J		mg/kg	36.560783	-109.217117
1	Chinle Formation	CTS	Uranium	T9-SB155-048060-01-091118	9/11/2018	48	60	11.0			mg/kg	36.560783	-109.217117
1	Chinle Formation	CTS	Uranium	T9-SB176-006018-01-091218	9/12/2018	6	18	0.750			mg/kg	36.560715	-109.216393
1	Chinle Formation	CTS	Uranium	T9-SB176-024036-01-091218	9/12/2018	24	36	4.60			mg/kg	36.560715	-109.216393
1	Chinle Formation	CTS	Uranium	T9-SB176-048060-01-091218	9/12/2018	48	60	0.830			mg/kg	36.560715	-109.216393
1	Chinle Formation	CTS	Uranium	T9-SB185-006018-01-091218	9/12/2018	6	18	1.10			mg/kg	36.560604	-109.216904
1	Chinle Formation	CTS	Uranium	T9-SB185-024036-01-091218	9/12/2018	24	36	0.730			mg/kg	36.560604	-109.216904
1	Chinle Formation	CTS	Uranium	T9-SB185-048060-01-091218	9/12/2018	48	60	0.690			mg/kg	36.560604	-109.216904
1	Chinle Formation	CTS	Uranium	T9-SB212-006018-01-091218	9/12/2018	6	18	1.40			mg/kg	36.560379	-109.217232
1	Chinle Formation	CTS	Uranium	T9-SB212-024036-01-091218	9/12/2018	24	36	0.500			mg/kg	36.560379	-109.217232
1	Chinle Formation	CTS	Uranium	T9-SB212-048060-01-091218	9/12/2018	48	60	0.540			mg/kg	36.560379	-109.217232
1	Chinle Formation	CTS	Uranium	T9-SB216-0612-01-091118	9/11/2018	6	12	4.60			mg/kg	36.56026	-109.21733
1	Chinle Formation	CTS	Uranium	T9-SB216-1218-01-091118	9/11/2018	12	18	5.90			mg/kg	36.560261	-109.217331
1	Chinle Formation	CTS	Uranium	T9-SB227-0612-01-091118	9/11/2018	6	12	1.80			mg/kg	36.560092	-109.217284
1	Chinle Formation	CTS	Uranium	T9-SB227-1218-01-091118	9/11/2018	12	18	0.700			mg/kg	36.560093	-109.217285
1	Chinle Formation	CTS	Uranium	T9-SB67-006048-01-091118	9/11/2018	6	48	0.850			mg/kg	36.561382	-109.21669
1	Chinle Formation	CTS	Uranium	T9-SS109-01-091118	9/11/2018	0	6	4.40			mg/kg	36.56113	-109.216267
1	Chinle Formation	CTS	Uranium	T9-SS129-01-091118	9/11/2018	0	6	1.00			mg/kg	36.56093	-109.216882

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Uranium	T9-SS144-01-091218	9/12/2018	0	6	1.20			mg/kg	36.560853	-109.216753
1	Chinle Formation	CTS	Uranium	T9-SS155-01-091118	9/11/2018	0	6	0.710			mg/kg	36.560784	-109.217115
1	Chinle Formation	CTS	Uranium	T9-SS176-01-091218	9/12/2018	0	6	0.670			mg/kg	36.560713	-109.216389
1	Chinle Formation	CTS	Uranium	T9-SS185-01-091218	9/12/2018	0	6	0.880			mg/kg	36.560605	-109.216904
1	Chinle Formation	CTS	Uranium	T9-SS212-01-091218	9/12/2018	0	6	0.980			mg/kg	36.560378	-109.217234
1	Chinle Formation	CTS	Uranium	T9-SS216-01-091118	9/11/2018	0	6	2.80			mg/kg	36.56026	-109.21733
1	Chinle Formation	CTS	Uranium	T9-SS227-01-091118	9/11/2018	0	6	1.20			mg/kg	36.560092	-109.217284
1	Chinle Formation	CTS	Uranium	T9-SS67-01-091118	9/11/2018	0	6	1.70			mg/kg	36.561384	-109.216688
1	Chinle Formation	CTS	Uranium	T9X1	5/14/2018	0	1	2.69			mg/kg	36.562405	-109.216774
1	Chinle Formation	CTS	Uranium	T9X100	8/18/2018	0	1	0.101	QL		mg/kg	36.56115	-109.217194
1	Chinle Formation	CTS	Uranium	T9X101	5/14/2018	0	1	1.69			mg/kg	36.56115	-109.217125
1	Chinle Formation	CTS	Uranium	T9X102	4/25/2018	0	1	0.080	QU		mg/kg	36.561153	-109.21698
1	Chinle Formation	CTS	Uranium	T9X103	4/25/2018	0	1	2.54			mg/kg	36.56115	-109.216904
1	Chinle Formation	CTS	Uranium	T9X104	4/25/2018	0	1	0.080	QU		mg/kg	36.56115	-109.216805
1	Chinle Formation	CTS	Uranium	T9X105	4/25/2018	0	1	4.13			mg/kg	36.56115	-109.21669
1	Chinle Formation	CTS	Uranium	T9X106	4/25/2018	0	1	4.22			mg/kg	36.561153	-109.21656
1	Chinle Formation	CTS	Uranium	T9X107	4/25/2018	0	1	7.53			mg/kg	36.561153	-109.216469
1	Chinle Formation	CTS	Uranium	T9X108	4/25/2018	0	1	1.57			mg/kg	36.561138	-109.21637
1	Chinle Formation	CTS	Uranium	T9X109	4/25/2018	0	1	3.71			mg/kg	36.561146	-109.21624
1	Chinle Formation	CTS	Uranium	T9X11	5/14/2018	0	1	2.45			mg/kg	36.561966	-109.217033
1	Chinle Formation	CTS	Uranium	T9X110	4/25/2018	0	1	1.80			mg/kg	36.561146	-109.216133
1	Chinle Formation	CTS	Uranium	T9X111	4/25/2018	0	1	3.50			mg/kg	36.561146	-109.216026
1	Chinle Formation	CTS	Uranium	T9X112	4/25/2018	0	1	0.080	QU		mg/kg	36.561138	-109.215912
1	Chinle Formation	CTS	Uranium	T9X113	8/18/2018	0	1	2.16			mg/kg	36.561054	-109.217224
1	Chinle Formation	CTS	Uranium	T9X114	5/14/2018	0	1	1.82			mg/kg	36.561058	-109.217117
1	Chinle Formation	CTS	Uranium	T9X115	4/25/2018	0	1	1.53			mg/kg	36.561073	-109.217003
1	Chinle Formation	CTS	Uranium	T9X116	4/25/2018	0	1	0.080	QU		mg/kg	36.561066	-109.216911
1	Chinle Formation	CTS	Uranium	T9X117	4/25/2018	0	1	1.75			mg/kg	36.561062	-109.216805
1	Chinle Formation	CTS	Uranium	T9X118	4/25/2018	0	1	3.04			mg/kg	36.561066	-109.21669
1	Chinle Formation	CTS	Uranium	T9X119	4/25/2018	0	1	3.60			mg/kg	36.561069	-109.21653
1	Chinle Formation	CTS	Uranium	T9X12	5/14/2018	0	1	0.717			mg/kg	36.561954	-109.216911
1	Chinle Formation	CTS	Uranium	T9X120	4/25/2018	0	1	3.13			mg/kg	36.561058	-109.216461
1	Chinle Formation	CTS	Uranium	T9X121	4/25/2018	0	1	3.56			mg/kg	36.561058	-109.216354
1	Chinle Formation	CTS	Uranium	T9X122	4/25/2018	0	1	4.97			mg/kg	36.561066	-109.216248
1	Chinle Formation	CTS	Uranium	T9X123	4/25/2018	0	1	15.3			mg/kg	36.561054	-109.216118
1	Chinle Formation	CTS	Uranium	T9X124	4/25/2018	0	1	4.32			mg/kg	36.561058	-109.216003
1	Chinle Formation	CTS	Uranium	T9X125	4/25/2018	0	1	3.42			mg/kg	36.561054	-109.215912
1	Chinle Formation	CTS	Uranium	T9X126	5/14/2018	0	1	2.19			mg/kg	36.560966	-109.217239
1	Chinle Formation	CTS	Uranium	T9X127	5/14/2018	0	1	4.63			mg/kg	36.56097	-109.217125
1	Chinle Formation	CTS	Uranium	T9X128	4/25/2018	0	1	1.73			mg/kg	36.56097	-109.21701
1	Chinle Formation	CTS	Uranium	T9X129	4/25/2018	0	1	1.82			mg/kg	36.560974	-109.216904
1	Chinle Formation	CTS	Uranium	T9X130	4/25/2018	0	1	0.941			mg/kg	36.560966	-109.216797
1	Chinle Formation	CTS	Uranium	T9X131	4/25/2018	0	1	3.77			mg/kg	36.560978	-109.216698
1	Chinle Formation	CTS	Uranium	T9X132	4/25/2018	0	1	2.50			mg/kg	36.560974	-109.216568
1	Chinle Formation	CTS	Uranium	T9X133	4/25/2018	0	1	1.68			mg/kg	36.560963	-109.216461
1	Chinle Formation	CTS	Uranium	T9X134	4/25/2018	0	1	6.97			mg/kg	36.560963	-109.216354
1	Chinle Formation	CTS	Uranium	T9X135	4/25/2018	0	1	4.12			mg/kg	36.560966	-109.216248
1	Chinle Formation	CTS	Uranium	T9X136	4/25/2018	0	1	0.851			mg/kg	36.56097	-109.216141

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Uranium	T9X137	4/25/2018	0	1	4.37			mg/kg	36.560951	-109.216026
1	Chinle Formation	CTS	Uranium	T9X138	4/25/2018	0	1	0.987			mg/kg	36.560963	-109.215904
1	Chinle Formation	CTS	Uranium	T9X140	5/14/2018	0	1	0.080	QU		mg/kg	36.560875	-109.217239
1	Chinle Formation	CTS	Uranium	T9X142	5/14/2018	0	1	3.97			mg/kg	36.560871	-109.217018
1	Chinle Formation	CTS	Uranium	T9X143	5/14/2018	0	1	1.99			mg/kg	36.560875	-109.216911
1	Chinle Formation	CTS	Uranium	T9X144	5/14/2018	0	1	1.33			mg/kg	36.560875	-109.216797
1	Chinle Formation	CTS	Uranium	T9X145	5/14/2018	0	1	0.935			mg/kg	36.560875	-109.21669
1	Chinle Formation	CTS	Uranium	T9X146	5/14/2018	0	1	1.81			mg/kg	36.560871	-109.216576
1	Chinle Formation	CTS	Uranium	T9X147	5/14/2018	0	1	4.06			mg/kg	36.560867	-109.216461
1	Chinle Formation	CTS	Uranium	T9X148	5/14/2018	0	1	4.22			mg/kg	36.560867	-109.216347
1	Chinle Formation	CTS	Uranium	T9X149	5/14/2018	0	1	0.535			mg/kg	36.560871	-109.216232
1	Chinle Formation	CTS	Uranium	T9X15	8/18/2018	0	1	1.20			mg/kg	36.561867	-109.216957
1	Chinle Formation	CTS	Uranium	T9X150	5/14/2018	0	1	4.12			mg/kg	36.560871	-109.216118
1	Chinle Formation	CTS	Uranium	T9X152	5/14/2018	0	1	1.69			mg/kg	36.560867	-109.215897
1	Chinle Formation	CTS	Uranium	T9X153	8/18/2018	0	1	2.28			mg/kg	36.560787	-109.217316
1	Chinle Formation	CTS	Uranium	T9X154	5/14/2018	0	1	1.30			mg/kg	36.560791	-109.217239
1	Chinle Formation	CTS	Uranium	T9X155	5/14/2018	0	1	2.92			mg/kg	36.560783	-109.217094
1	Chinle Formation	CTS	Uranium	T9X156	5/14/2018	0	1	1.33			mg/kg	36.560783	-109.217018
1	Chinle Formation	CTS	Uranium	T9X157	5/14/2018	0	1	2.41			mg/kg	36.560783	-109.216904
1	Chinle Formation	CTS	Uranium	T9X158	5/14/2018	0	1	3.11			mg/kg	36.56078	-109.216797
1	Chinle Formation	CTS	Uranium	T9X159	5/14/2018	0	1	1.65			mg/kg	36.560787	-109.21669
1	Chinle Formation	CTS	Uranium	T9X160	5/14/2018	0	1	2.05			mg/kg	36.56078	-109.216576
1	Chinle Formation	CTS	Uranium	T9X161	5/14/2018	0	1	4.85			mg/kg	36.560783	-109.216461
1	Chinle Formation	CTS	Uranium	T9X162	5/14/2018	0	1	2.17			mg/kg	36.560776	-109.216347
1	Chinle Formation	CTS	Uranium	T9X167	8/18/2018	0	1	1.87			mg/kg	36.560699	-109.217339
1	Chinle Formation	CTS	Uranium	T9X168	5/14/2018	0	1	0.127	QL		mg/kg	36.560699	-109.217247
1	Chinle Formation	CTS	Uranium	T9X169	5/14/2018	0	1	2.28			mg/kg	36.560696	-109.217125
1	Chinle Formation	CTS	Uranium	T9X170	5/14/2018	0	1	3.20			mg/kg	36.560696	-109.21701
1	Chinle Formation	CTS	Uranium	T9X171	5/14/2018	0	1	4.99			mg/kg	36.560696	-109.216904
1	Chinle Formation	CTS	Uranium	T9X172	5/14/2018	0	1	2.58			mg/kg	36.560696	-109.216797
1	Chinle Formation	CTS	Uranium	T9X173	5/14/2018	0	1	3.56			mg/kg	36.560699	-109.216682
1	Chinle Formation	CTS	Uranium	T9X174	5/14/2018	0	1	1.39			mg/kg	36.560688	-109.216568
1	Chinle Formation	CTS	Uranium	T9X175	5/14/2018	0	1	1.71			mg/kg	36.560688	-109.216461
1	Chinle Formation	CTS	Uranium	T9X176	5/14/2018	0	1	2.11			mg/kg	36.560692	-109.216347
1	Chinle Formation	CTS	Uranium	T9X181	5/14/2018	0	1	2.84			mg/kg	36.560604	-109.217354
1	Chinle Formation	CTS	Uranium	T9X182	4/25/2018	0	1	1.80			mg/kg	36.560616	-109.217247
1	Chinle Formation	CTS	Uranium	T9X183	4/25/2018	0	1	2.28			mg/kg	36.560604	-109.217133
1	Chinle Formation	CTS	Uranium	T9X184	4/25/2018	0	1	1.65			mg/kg	36.560612	-109.217026
1	Chinle Formation	CTS	Uranium	T9X185	4/25/2018	0	1	1.63			mg/kg	36.560596	-109.216919
1	Chinle Formation	CTS	Uranium	T9X186	4/25/2018	0	1	4.16			mg/kg	36.560604	-109.216797
1	Chinle Formation	CTS	Uranium	T9X187	4/25/2018	0	1	2.22			mg/kg	36.560619	-109.21669
1	Chinle Formation	CTS	Uranium	T9X188	4/25/2018	0	1	3.15			mg/kg	36.5606	-109.216591
1	Chinle Formation	CTS	Uranium	T9X189	4/25/2018	0	1	4.70			mg/kg	36.5606	-109.216469
1	Chinle Formation	CTS	Uranium	T9X19	4/25/2018	0	1	0.265			mg/kg	36.561874	-109.216568
1	Chinle Formation	CTS	Uranium	T9X190	4/25/2018	0	1	1.95			mg/kg	36.560604	-109.216354
1	Chinle Formation	CTS	Uranium	T9X191	5/14/2018	0	1	0.459			mg/kg	36.560604	-109.21624
1	Chinle Formation	CTS	Uranium	T9X196	5/14/2018	0	1	0.080	QU		mg/kg	36.56052	-109.217354
1	Chinle Formation	CTS	Uranium	T9X197	4/25/2018	0	1	3.01			mg/kg	36.56052	-109.217255

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Uranium	T9X198	4/25/2018	0	1	1.38			mg/kg	36.560516	-109.217133
1	Chinle Formation	CTS	Uranium	T9X199	4/25/2018	0	1	4.89			mg/kg	36.560516	-109.217026
1	Chinle Formation	CTS	Uranium	T9X2	5/14/2018	0	1	1.67			mg/kg	36.562313	-109.216911
1	Chinle Formation	CTS	Uranium	T9X20	8/18/2018	0	1	4.17			mg/kg	36.561771	-109.216988
1	Chinle Formation	CTS	Uranium	T9X200	4/25/2018	0	1	1.18			mg/kg	36.560516	-109.216927
1	Chinle Formation	CTS	Uranium	T9X201	4/25/2018	0	1	1.83			mg/kg	36.56052	-109.21637
1	Chinle Formation	CTS	Uranium	T9X202	4/25/2018	0	1	0.297			mg/kg	36.560516	-109.216248
1	Chinle Formation	CTS	Uranium	T9X203	4/25/2018	0	1	0.414			mg/kg	36.560513	-109.216141
1	Chinle Formation	CTS	Uranium	T9X204	8/18/2018	0	1	0.793			mg/kg	36.56041	-109.217422
1	Chinle Formation	CTS	Uranium	T9X205	5/14/2018	0	1	1.30			mg/kg	36.560436	-109.217346
1	Chinle Formation	CTS	Uranium	T9X206	4/25/2018	0	1	0.751			mg/kg	36.560429	-109.217247
1	Chinle Formation	CTS	Uranium	T9X207	4/25/2018	0	1	2.32			mg/kg	36.560425	-109.21714
1	Chinle Formation	CTS	Uranium	T9X208	4/25/2018	0	1	1.92			mg/kg	36.560425	-109.217033
1	Chinle Formation	CTS	Uranium	T9X209	4/25/2018	0	1	1.65			mg/kg	36.560417	-109.216354
1	Chinle Formation	CTS	Uranium	T9X210	8/18/2018	0	1	2.88			mg/kg	36.56036	-109.217438
1	Chinle Formation	CTS	Uranium	T9X211	5/14/2018	0	1	3.09			mg/kg	36.560341	-109.217361
1	Chinle Formation	CTS	Uranium	T9X212	4/25/2018	0	1	2.90			mg/kg	36.560349	-109.217255
1	Chinle Formation	CTS	Uranium	T9X213	4/25/2018	0	1	3.30			mg/kg	36.560337	-109.217148
1	Chinle Formation	CTS	Uranium	T9X214	4/25/2018	0	1	2.28			mg/kg	36.560345	-109.217026
1	Chinle Formation	CTS	Uranium	T9X215	5/14/2018	0	1	2.70			mg/kg	36.560261	-109.217461
1	Chinle Formation	CTS	Uranium	T9X216	5/14/2018	0	1	1.90			mg/kg	36.560253	-109.217346
1	Chinle Formation	CTS	Uranium	T9X218	5/14/2018	0	1	0.497			mg/kg	36.560257	-109.217125
1	Chinle Formation	CTS	Uranium	T9X219	5/14/2018	0	1	1.73			mg/kg	36.560165	-109.217583
1	Chinle Formation	CTS	Uranium	T9X220	5/14/2018	0	1	0.836			mg/kg	36.560165	-109.217468
1	Chinle Formation	CTS	Uranium	T9X221	4/25/2018	0	1	0.172			mg/kg	36.560173	-109.217361
1	Chinle Formation	CTS	Uranium	T9X222	4/25/2018	0	1	2.19			mg/kg	36.560165	-109.217247
1	Chinle Formation	CTS	Uranium	T9X223	4/25/2018	0	1	0.932			mg/kg	36.560146	-109.217148
1	Chinle Formation	CTS	Uranium	T9X224	5/14/2018	0	1	1.86			mg/kg	36.560074	-109.217613
1	Chinle Formation	CTS	Uranium	T9X225	5/14/2018	0	1	0.601			mg/kg	36.56007	-109.217476
1	Chinle Formation	CTS	Uranium	T9X226	4/25/2018	0	1	2.45			mg/kg	36.560081	-109.217361
1	Chinle Formation	CTS	Uranium	T9X227	4/25/2018	0	1	4.21			mg/kg	36.56007	-109.21727
1	Chinle Formation	CTS	Uranium	T9X229	5/14/2018	0	1	1.85			mg/kg	36.559982	-109.217468
1	Chinle Formation	CTS	Uranium	T9X230	4/25/2018	0	1	3.37			mg/kg	36.55999	-109.217369
1	Chinle Formation	CTS	Uranium	T9X231	5/14/2018	0	1	0.434			mg/kg	36.559895	-109.21756
1	Chinle Formation	CTS	Uranium	T9X232	5/14/2018	0	1	2.25			mg/kg	36.559898	-109.217453
1	Chinle Formation	CTS	Uranium	T9X233	4/25/2018	0	1	2.47			mg/kg	36.559883	-109.217377
1	Chinle Formation	CTS	Uranium	T9X234	4/25/2018	0	1	0.080	QU		mg/kg	36.559814	-109.217712
1	Chinle Formation	CTS	Uranium	T9X235	5/14/2018	0	1	1.58			mg/kg	36.559807	-109.217575
1	Chinle Formation	CTS	Uranium	T9X236	4/25/2018	0	1	1.16			mg/kg	36.559799	-109.217468
1	Chinle Formation	CTS	Uranium	T9X24	4/25/2018	0	1	0.640			mg/kg	36.561787	-109.216568
1	Chinle Formation	CTS	Uranium	T9X27	5/14/2018	0	1	0.080	QU		mg/kg	36.561687	-109.217003
1	Chinle Formation	CTS	Uranium	T9X28	5/14/2018	0	1	0.331			mg/kg	36.561691	-109.216896
1	Chinle Formation	CTS	Uranium	T9X3	5/14/2018	0	1	5.32			mg/kg	36.562309	-109.216782
1	Chinle Formation	CTS	Uranium	T9X31	4/25/2018	0	1	2.59			mg/kg	36.561687	-109.216568
1	Chinle Formation	CTS	Uranium	T9X32	4/25/2018	0	1	0.877			mg/kg	36.561687	-109.216454
1	Chinle Formation	CTS	Uranium	T9X33	4/25/2018	0	1	0.340			mg/kg	36.561684	-109.216377
1	Chinle Formation	CTS	Uranium	T9X36	4/25/2018	0	1	1.22			mg/kg	36.561684	-109.216011
1	Chinle Formation	CTS	Uranium	T9X37	5/14/2018	0	1	2.20			mg/kg	36.561611	-109.217148

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Uranium	T9X38	5/14/2018	0	1	0.114	QL		mg/kg	36.561596	-109.21701
1	Chinle Formation	CTS	Uranium	T9X4	5/14/2018	0	1	1.42			mg/kg	36.562233	-109.216934
1	Chinle Formation	CTS	Uranium	T9X40	4/25/2018	0	1	3.18			mg/kg	36.561607	-109.216789
1	Chinle Formation	CTS	Uranium	T9X41	4/25/2018	0	1	2.19			mg/kg	36.5616	-109.216675
1	Chinle Formation	CTS	Uranium	T9X42	4/25/2018	0	1	1.44			mg/kg	36.5616	-109.216568
1	Chinle Formation	CTS	Uranium	T9X43	4/25/2018	0	1	0.080	QU		mg/kg	36.5616	-109.216461
1	Chinle Formation	CTS	Uranium	T9X44	4/25/2018	0	1	0.535			mg/kg	36.561584	-109.216331
1	Chinle Formation	CTS	Uranium	T9X47	4/25/2018	0	1	0.080	QU		mg/kg	36.561604	-109.216011
1	Chinle Formation	CTS	Uranium	T9X48	4/25/2018	0	1	3.28			mg/kg	36.561592	-109.215897
1	Chinle Formation	CTS	Uranium	T9X49	4/25/2018	0	1	2.31			mg/kg	36.5616	-109.215782
1	Chinle Formation	CTS	Uranium	T9X50	8/18/2018	0	1	2.39			mg/kg	36.561497	-109.217079
1	Chinle Formation	CTS	Uranium	T9X51	5/14/2018	0	1	0.903			mg/kg	36.561504	-109.217003
1	Chinle Formation	CTS	Uranium	T9X53	4/25/2018	0	1	1.38			mg/kg	36.561512	-109.216797
1	Chinle Formation	CTS	Uranium	T9X54	4/25/2018	0	1	2.54			mg/kg	36.561512	-109.216682
1	Chinle Formation	CTS	Uranium	T9X55	4/25/2018	0	1	1.32			mg/kg	36.561504	-109.216576
1	Chinle Formation	CTS	Uranium	T9X56	4/25/2018	0	1	0.080	QU		mg/kg	36.561504	-109.216461
1	Chinle Formation	CTS	Uranium	T9X57	4/25/2018	0	1	1.12			mg/kg	36.561504	-109.216347
1	Chinle Formation	CTS	Uranium	T9X6	5/14/2018	0	1	1.88			mg/kg	36.562134	-109.216866
1	Chinle Formation	CTS	Uranium	T9X60	4/25/2018	0	1	0.756			mg/kg	36.561504	-109.216011
1	Chinle Formation	CTS	Uranium	T9X62	4/25/2018	0	1	2.91			mg/kg	36.561501	-109.21579
1	Chinle Formation	CTS	Uranium	T9X63	8/18/2018	0	1	1.56			mg/kg	36.561424	-109.217102
1	Chinle Formation	CTS	Uranium	T9X65	4/25/2018	0	1	1.95			mg/kg	36.561424	-109.216904
1	Chinle Formation	CTS	Uranium	T9X66	4/25/2018	0	1	1.69			mg/kg	36.56142	-109.216797
1	Chinle Formation	CTS	Uranium	T9X67	4/25/2018	0	1	4.11			mg/kg	36.56142	-109.216675
1	Chinle Formation	CTS	Uranium	T9X68	4/25/2018	0	1	2.48			mg/kg	36.561417	-109.216568
1	Chinle Formation	CTS	Uranium	T9X69	4/25/2018	0	1	0.080	QU		mg/kg	36.56142	-109.216454
1	Chinle Formation	CTS	Uranium	T9X70	4/25/2018	0	1	1.80			mg/kg	36.561417	-109.216354
1	Chinle Formation	CTS	Uranium	T9X73	4/25/2018	0	1	2.76			mg/kg	36.561417	-109.216003
1	Chinle Formation	CTS	Uranium	T9X74	4/25/2018	0	1	1.91			mg/kg	36.56142	-109.215897
1	Chinle Formation	CTS	Uranium	T9X75	5/14/2018	0	1	7.20			mg/kg	36.561325	-109.217125
1	Chinle Formation	CTS	Uranium	T9X76	5/14/2018	0	1	3.29			mg/kg	36.561321	-109.217018
1	Chinle Formation	CTS	Uranium	T9X77	4/25/2018	0	1	4.11			mg/kg	36.561333	-109.216904
1	Chinle Formation	CTS	Uranium	T9X78	4/25/2018	0	1	1.08			mg/kg	36.561329	-109.216797
1	Chinle Formation	CTS	Uranium	T9X79	4/25/2018	0	1	2.91			mg/kg	36.561337	-109.216682
1	Chinle Formation	CTS	Uranium	T9X8	5/14/2018	0	1	1.22			mg/kg	36.56205	-109.216888
1	Chinle Formation	CTS	Uranium	T9X80	4/25/2018	0	1	3.44			mg/kg	36.561329	-109.216576
1	Chinle Formation	CTS	Uranium	T9X81	4/25/2018	0	1	3.23			mg/kg	36.561337	-109.216469
1	Chinle Formation	CTS	Uranium	T9X82	4/25/2018	0	1	0.080	QU		mg/kg	36.561329	-109.216354
1	Chinle Formation	CTS	Uranium	T9X83	4/25/2018	0	1	0.218			mg/kg	36.561321	-109.21624
1	Chinle Formation	CTS	Uranium	T9X84	4/25/2018	0	1	7.03			mg/kg	36.561325	-109.216133
1	Chinle Formation	CTS	Uranium	T9X85	4/25/2018	0	1	2.12			mg/kg	36.561329	-109.216019
1	Chinle Formation	CTS	Uranium	T9X87	8/18/2018	0	1	1.42			mg/kg	36.561249	-109.21727
1	Chinle Formation	CTS	Uranium	T9X88	5/14/2018	0	1	0.670			mg/kg	36.56123	-109.217125
1	Chinle Formation	CTS	Uranium	T9X89	4/25/2018	0	1	1.07			mg/kg	36.56126	-109.216965
1	Chinle Formation	CTS	Uranium	T9X90	4/25/2018	0	1	1.93			mg/kg	36.561249	-109.216904
1	Chinle Formation	CTS	Uranium	T9X91	4/25/2018	0	1	2.90			mg/kg	36.561241	-109.216797
1	Chinle Formation	CTS	Uranium	T9X92	4/25/2018	0	1	3.54			mg/kg	36.561245	-109.216682
1	Chinle Formation	CTS	Uranium	T9X94	4/25/2018	0	1	3.53			mg/kg	36.561245	-109.216461

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Uranium	T9X95	4/25/2018	0	1	2.22			mg/kg	36.561237	-109.216347
1	Chinle Formation	CTS	Uranium	T9X96	4/25/2018	0	1	2.92			mg/kg	36.561237	-109.21624
1	Chinle Formation	CTS	Uranium	T9X97	4/25/2018	0	1	3.37			mg/kg	36.561241	-109.216125
1	Chinle Formation	CTS	Uranium	T9X98	4/25/2018	0	1	0.149			mg/kg	36.561241	-109.216011
1	Chinle Formation	CTS	Uranium	T9X99	4/25/2018	0	1	3.45			mg/kg	36.561234	-109.215897
1	Chinle Formation	CTS	Uranium	T9-XS217-01-042518	4/25/2018	0	3	0.570			mg/kg	36.560249	-109.217256
1	Chinle Formation	CTS	Uranium	T9-XS61-01-042518	4/25/2018	0	3	13.0			mg/kg	36.561513	-109.215899
1	Chinle Formation	CTS	Uranium	T9-XS86-01-042518	4/25/2018	0	3	1.60			mg/kg	36.561327	-109.215908
1	Chinle Formation	CTS	Uranium	T9-XS93-01-042518	4/25/2018	0	3	11.0			mg/kg	36.561241	-109.216568
1	Chinle Formation	CTS	Uranium	T9-XSG12-01-081818	8/18/2018	0	3	0.710			mg/kg	36.56178	-109.215999
1	Chinle Formation	CT-01	Vanadium	T10X3	4/25/2018	0	1	16.0	QU		mg/kg	36.563683	-109.217171
1	Chinle Formation	CT-01	Vanadium	T10X4	4/25/2018	0	1	16.0	QU		mg/kg	36.563679	-109.217056
1	Chinle Formation	CT-01	Vanadium	T10X5	4/25/2018	0	1	23.6			mg/kg	36.563675	-109.216942
1	Chinle Formation	CT-01	Vanadium	T10X6	4/25/2018	0	1	16.0	QU		mg/kg	36.563679	-109.216835
1	Chinle Formation	CT-01	Vanadium	T10X12	4/25/2018	0	1	16.0	QU		mg/kg	36.563587	-109.216942
1	Chinle Formation	CT-01	Vanadium	T10X13	4/25/2018	0	1	16.0	QU		mg/kg	36.563587	-109.216835
1	Chinle Formation	CT-01	Vanadium	T10X14	4/25/2018	0	1	16.0	QU		mg/kg	36.563583	-109.216721
1	Chinle Formation	CT-01	Vanadium	T10X23	4/25/2018	0	1	16.0	QU		mg/kg	36.563492	-109.216728
1	Chinle Formation	CT-01	Vanadium	T10X24	4/25/2018	0	1	16.0	QU		mg/kg	36.563492	-109.216614
1	Chinle Formation	CT-01	Vanadium	T10-XS33-01-042518	4/25/2018	0	3	9.20			mg/kg	36.563405	-109.216725
1	Chinle Formation	CT-01	Vanadium	T10X34	4/25/2018	0	1	16.0	QU		mg/kg	36.5634	-109.216614
1	Chinle Formation	CT-01	Vanadium	T10X42	4/25/2018	0	1	16.0	QU		mg/kg	36.563316	-109.216843
1	Chinle Formation	CT-01	Vanadium	T10X43	4/25/2018	0	1	16.0	QU		mg/kg	36.563313	-109.216736
1	Chinle Formation	CT-01	Vanadium	T10X44	4/25/2018	0	1	16.0	QU		mg/kg	36.563313	-109.216614
1	Chinle Formation	CT-01	Vanadium	T10X52	4/25/2018	0	1	16.0	QU		mg/kg	36.563225	-109.216835
1	Chinle Formation	CT-01	Vanadium	T10X53	4/25/2018	0	1	16.1			mg/kg	36.563217	-109.216736
1	Chinle Formation	CT-01	Vanadium	T10X54	4/25/2018	0	1	16.0	QU		mg/kg	36.563217	-109.216614
1	Chinle Formation	CT-01	Vanadium	T10X62	4/25/2018	0	1	16.0	QU		mg/kg	36.563133	-109.216843
1	Chinle Formation	CT-01	Vanadium	T10X63	4/25/2018	0	1	16.0	QU		mg/kg	36.563129	-109.216728
1	Chinle Formation	CT-01	Vanadium	T10X64	8/18/2018	0	1	16.0	QU		mg/kg	36.563126	-109.216644
1	Chinle Formation	CT-01	Vanadium	T10X71	4/25/2018	0	1	16.0	QU		mg/kg	36.563042	-109.216949
1	Chinle Formation	CT-01	Vanadium	T10X72	4/25/2018	0	1	20.2			mg/kg	36.563042	-109.216835
1	Chinle Formation	CT-01	Vanadium	T10X73	4/25/2018	0	1	16.0	QU		mg/kg	36.563042	-109.216728
1	Chinle Formation	CT-01	Vanadium	T10X81	4/25/2018	0	1	25.6			mg/kg	36.562954	-109.216957
1	Chinle Formation	CT-01	Vanadium	T10X82	4/25/2018	0	1	16.3			mg/kg	36.562958	-109.216843
1	Chinle Formation	CT-01	Vanadium	T10X83	4/25/2018	0	1	19.2			mg/kg	36.56295	-109.216728
1	Chinle Formation	CT-01	Vanadium	T10X84	8/18/2018	0	1	16.0	QU		mg/kg	36.562954	-109.216599
1	Chinle Formation	CT-01	Vanadium	T10X91	4/25/2018	0	1	20.0			mg/kg	36.562866	-109.216957
1	Chinle Formation	CT-01	Vanadium	T10X92	4/25/2018	0	1	16.3			mg/kg	36.562862	-109.216843
1	Chinle Formation	CT-01	Vanadium	T10X93	4/25/2018	0	1	16.0	QU		mg/kg	36.562859	-109.216728
1	Chinle Formation	CT-01	Vanadium	T10X94	5/14/2018	0	1	22.9			mg/kg	36.562824	-109.216614
1	Chinle Formation	CT-01	Vanadium	T10X99	5/14/2018	0	1	16.7			mg/kg	36.562767	-109.217056
1	Chinle Formation	CT-01	Vanadium	T10X100	5/14/2018	0	1	16.9			mg/kg	36.562763	-109.216949
1	Chinle Formation	CT-01	Vanadium	T10X101	4/25/2018	0	1	22.2			mg/kg	36.562771	-109.216843
1	Chinle Formation	CT-01	Vanadium	T10X106	5/14/2018	0	1	22.7			mg/kg	36.562675	-109.217064
1	Chinle Formation	CT-01	Vanadium	T10X107	5/14/2018	0	1	22.3			mg/kg	36.562672	-109.216949
1	Chinle Formation	CT-01	Vanadium	T10X108	4/25/2018	0	1	16.0	QU		mg/kg	36.562683	-109.21685
1	Chinle Formation	CT-01	Vanadium	T10-XSG1-01-081818	8/18/2018	0	3	16.0			mg/kg	36.562593	-109.217057

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CT-01	Vanadium	T10G2	8/18/2018	0	1	27.7			mg/kg	36.562592	-109.216942
1	Chinle Formation	CT-01	Vanadium	T10G3	8/18/2018	0	1	16.0	QU		mg/kg	36.562584	-109.216843
1	Chinle Formation	CTS	Vanadium	T9X1	5/14/2018	0	1	28.8			mg/kg	36.562405	-109.216774
1	Chinle Formation	CTS	Vanadium	T9X2	5/14/2018	0	1	16.0	QU		mg/kg	36.562313	-109.216911
1	Chinle Formation	CTS	Vanadium	T9X3	5/14/2018	0	1	18.8			mg/kg	36.562309	-109.216782
1	Chinle Formation	CTS	Vanadium	T9X4	5/14/2018	0	1	16.0	QU		mg/kg	36.562233	-109.216934
1	Chinle Formation	CTS	Vanadium	T9X6	5/14/2018	0	1	18.2			mg/kg	36.562134	-109.216866
1	Chinle Formation	CTS	Vanadium	T9X8	5/14/2018	0	1	16.0	QU		mg/kg	36.56205	-109.216888
1	Chinle Formation	CTS	Vanadium	T9X11	5/14/2018	0	1	17.1			mg/kg	36.561966	-109.217033
1	Chinle Formation	CTS	Vanadium	T9X12	5/14/2018	0	1	16.0	QU		mg/kg	36.561954	-109.216911
1	Chinle Formation	CTS	Vanadium	T9X15	8/18/2018	0	1	21.8			mg/kg	36.561867	-109.216957
1	Chinle Formation	CTS	Vanadium	T9X19	4/25/2018	0	1	16.0	QU		mg/kg	36.561874	-109.216568
1	Chinle Formation	CTS	Vanadium	T9X20	8/18/2018	0	1	20.7			mg/kg	36.561771	-109.216988
1	Chinle Formation	CTS	Vanadium	T9X24	4/25/2018	0	1	16.0	QU		mg/kg	36.561787	-109.216568
1	Chinle Formation	CTS	Vanadium	T9X27	5/14/2018	0	1	16.0	QU		mg/kg	36.561687	-109.217003
1	Chinle Formation	CTS	Vanadium	T9X28	5/14/2018	0	1	25.9			mg/kg	36.561691	-109.216896
1	Chinle Formation	CTS	Vanadium	T9X31	4/25/2018	0	1	23.6			mg/kg	36.561687	-109.216568
1	Chinle Formation	CTS	Vanadium	T9X32	4/25/2018	0	1	16.0	QU		mg/kg	36.561687	-109.216454
1	Chinle Formation	CTS	Vanadium	T9X33	4/25/2018	0	1	20.1			mg/kg	36.561684	-109.216377
1	Chinle Formation	CTS	Vanadium	T9X36	4/25/2018	0	1	16.0	QU		mg/kg	36.561684	-109.216011
1	Chinle Formation	CTS	Vanadium	T9X37	5/14/2018	0	1	23.0			mg/kg	36.561611	-109.217148
1	Chinle Formation	CTS	Vanadium	T9X38	5/14/2018	0	1	16.0	QU		mg/kg	36.561596	-109.21701
1	Chinle Formation	CTS	Vanadium	T9X40	4/25/2018	0	1	16.4			mg/kg	36.561607	-109.216789
1	Chinle Formation	CTS	Vanadium	T9X41	4/25/2018	0	1	16.0	QU		mg/kg	36.5616	-109.216675
1	Chinle Formation	CTS	Vanadium	T9X42	4/25/2018	0	1	16.0	QU		mg/kg	36.5616	-109.216568
1	Chinle Formation	CTS	Vanadium	T9X43	4/25/2018	0	1	18.9			mg/kg	36.5616	-109.216461
1	Chinle Formation	CTS	Vanadium	T9X44	4/25/2018	0	1	16.0	QU		mg/kg	36.561584	-109.216331
1	Chinle Formation	CTS	Vanadium	T9X47	4/25/2018	0	1	16.0	QU		mg/kg	36.561604	-109.216011
1	Chinle Formation	CTS	Vanadium	T9X48	4/25/2018	0	1	21.2			mg/kg	36.561592	-109.215897
1	Chinle Formation	CTS	Vanadium	T9X49	4/25/2018	0	1	16.0	QU		mg/kg	36.5616	-109.215782
1	Chinle Formation	CTS	Vanadium	T9X50	8/18/2018	0	1	23.0			mg/kg	36.561497	-109.217079
1	Chinle Formation	CTS	Vanadium	T9X51	5/14/2018	0	1	17.7			mg/kg	36.561504	-109.217003
1	Chinle Formation	CTS	Vanadium	T9X53	4/25/2018	0	1	16.0	QU		mg/kg	36.561512	-109.216797
1	Chinle Formation	CTS	Vanadium	T9X54	4/25/2018	0	1	17.1			mg/kg	36.561512	-109.216682
1	Chinle Formation	CTS	Vanadium	T9X55	4/25/2018	0	1	19.3			mg/kg	36.561504	-109.216576
1	Chinle Formation	CTS	Vanadium	T9X56	4/25/2018	0	1	16.0	QU		mg/kg	36.561504	-109.216461
1	Chinle Formation	CTS	Vanadium	T9X57	4/25/2018	0	1	16.0	QU		mg/kg	36.561504	-109.216347
1	Chinle Formation	CTS	Vanadium	T9X60	4/25/2018	0	1	16.0	QU		mg/kg	36.561504	-109.216011
1	Chinle Formation	CTS	Vanadium	T9-XS61-01-042518	4/25/2018	0	3	13.0			mg/kg	36.561513	-109.215899
1	Chinle Formation	CTS	Vanadium	T9X62	4/25/2018	0	1	23.9			mg/kg	36.561501	-109.21579
1	Chinle Formation	CTS	Vanadium	T9X63	8/18/2018	0	1	22.6			mg/kg	36.561424	-109.217102
1	Chinle Formation	CTS	Vanadium	T9X65	4/25/2018	0	1	16.0	QU		mg/kg	36.561424	-109.216904
1	Chinle Formation	CTS	Vanadium	T9X66	4/25/2018	0	1	16.0	QU		mg/kg	36.56142	-109.216797
1	Chinle Formation	CTS	Vanadium	T9-SS67-01-091118	9/11/2018	0	6	21.0			mg/kg	36.561384	-109.216688
1	Chinle Formation	CTS	Vanadium	T9X67	4/25/2018	0	1	32.8			mg/kg	36.56142	-109.216675
1	Chinle Formation	CTS	Vanadium	T9-SB67-006048-01-091118	9/11/2018	6	48	10.0			mg/kg	36.561382	-109.21669
1	Chinle Formation	CTS	Vanadium	T9X68	4/25/2018	0	1	16.0	QU		mg/kg	36.561417	-109.216568
1	Chinle Formation	CTS	Vanadium	T9X69	4/25/2018	0	1	16.0	QU		mg/kg	36.56142	-109.216454

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Vanadium	T9X70	4/25/2018	0	1	16.0	QU		mg/kg	36.561417	-109.216354
1	Chinle Formation	CTS	Vanadium	T9X73	4/25/2018	0	1	24.2			mg/kg	36.561417	-109.216003
1	Chinle Formation	CTS	Vanadium	T9X74	4/25/2018	0	1	16.0	QU		mg/kg	36.56142	-109.215897
1	Chinle Formation	CTS	Vanadium	T9X75	5/14/2018	0	1	30.5			mg/kg	36.561325	-109.217125
1	Chinle Formation	CTS	Vanadium	T9X76	5/14/2018	0	1	34.5			mg/kg	36.561321	-109.217018
1	Chinle Formation	CTS	Vanadium	T9X77	4/25/2018	0	1	16.0	QU		mg/kg	36.561333	-109.216904
1	Chinle Formation	CTS	Vanadium	T9X78	4/25/2018	0	1	19.4			mg/kg	36.561329	-109.216797
1	Chinle Formation	CTS	Vanadium	T9X79	4/25/2018	0	1	16.0	QU		mg/kg	36.561337	-109.216682
1	Chinle Formation	CTS	Vanadium	T9X80	4/25/2018	0	1	16.0	QU		mg/kg	36.561329	-109.216576
1	Chinle Formation	CTS	Vanadium	T9X81	4/25/2018	0	1	16.1			mg/kg	36.561337	-109.216469
1	Chinle Formation	CTS	Vanadium	T9X82	4/25/2018	0	1	17.5			mg/kg	36.561329	-109.216354
1	Chinle Formation	CTS	Vanadium	T9X83	4/25/2018	0	1	16.0	QU		mg/kg	36.561321	-109.21624
1	Chinle Formation	CTS	Vanadium	T9X84	4/25/2018	0	1	16.0	QU		mg/kg	36.561325	-109.216133
1	Chinle Formation	CTS	Vanadium	T9X85	4/25/2018	0	1	16.0	QU		mg/kg	36.561329	-109.216019
1	Chinle Formation	CTS	Vanadium	T9-XS86-01-042518	4/25/2018	0	3	12.0			mg/kg	36.561327	-109.215908
1	Chinle Formation	CTS	Vanadium	T9X87	8/18/2018	0	1	16.0	QU		mg/kg	36.561249	-109.21727
1	Chinle Formation	CTS	Vanadium	T9X88	5/14/2018	0	1	16.0	QU		mg/kg	36.56123	-109.217125
1	Chinle Formation	CTS	Vanadium	T9X89	4/25/2018	0	1	16.3			mg/kg	36.56126	-109.216965
1	Chinle Formation	CTS	Vanadium	T9X90	4/25/2018	0	1	16.0	QU		mg/kg	36.561249	-109.216904
1	Chinle Formation	CTS	Vanadium	T9X91	4/25/2018	0	1	16.0	QU		mg/kg	36.561241	-109.216797
1	Chinle Formation	CTS	Vanadium	T9X92	4/25/2018	0	1	25.3			mg/kg	36.561245	-109.216682
1	Chinle Formation	CTS	Vanadium	T9-XS93-01-042518	4/25/2018	0	3	23.0			mg/kg	36.561241	-109.216568
1	Chinle Formation	CTS	Vanadium	T9X94	4/25/2018	0	1	16.0	QU		mg/kg	36.561245	-109.216461
1	Chinle Formation	CTS	Vanadium	T9X95	4/25/2018	0	1	16.0	QU		mg/kg	36.561237	-109.216347
1	Chinle Formation	CTS	Vanadium	T9X96	4/25/2018	0	1	20.5			mg/kg	36.561237	-109.21624
1	Chinle Formation	CTS	Vanadium	T9X97	4/25/2018	0	1	17.5			mg/kg	36.561241	-109.216125
1	Chinle Formation	CTS	Vanadium	T9X98	4/25/2018	0	1	16.0	QU		mg/kg	36.561241	-109.216011
1	Chinle Formation	CTS	Vanadium	T9X99	4/25/2018	0	1	16.0	QU		mg/kg	36.561234	-109.215897
1	Chinle Formation	CTS	Vanadium	T9X100	8/18/2018	0	1	22.1			mg/kg	36.56115	-109.217194
1	Chinle Formation	CTS	Vanadium	T9X101	5/14/2018	0	1	16.0	QU		mg/kg	36.56115	-109.217125
1	Chinle Formation	CTS	Vanadium	T9X102	4/25/2018	0	1	16.0	QU		mg/kg	36.561153	-109.21698
1	Chinle Formation	CTS	Vanadium	T9X103	4/25/2018	0	1	16.0	QU		mg/kg	36.56115	-109.216904
1	Chinle Formation	CTS	Vanadium	T9X104	4/25/2018	0	1	20.8			mg/kg	36.56115	-109.216805
1	Chinle Formation	CTS	Vanadium	T9X105	4/25/2018	0	1	16.0	QU		mg/kg	36.56115	-109.21669
1	Chinle Formation	CTS	Vanadium	T9X106	4/25/2018	0	1	16.7			mg/kg	36.561153	-109.21656
1	Chinle Formation	CTS	Vanadium	T9X107	4/25/2018	0	1	16.0	QU		mg/kg	36.561153	-109.216469
1	Chinle Formation	CTS	Vanadium	T9X108	4/25/2018	0	1	21.7			mg/kg	36.561138	-109.21637
1	Chinle Formation	CTS	Vanadium	T9-SS109-01-091118	9/11/2018	0	6	11.0			mg/kg	36.56113	-109.216267
1	Chinle Formation	CTS	Vanadium	T9X109	4/25/2018	0	1	16.5			mg/kg	36.561146	-109.21624
1	Chinle Formation	CTS	Vanadium	T9-SB109-006018-01-091118	9/11/2018	6	18	10.0			mg/kg	36.561131	-109.216263
1	Chinle Formation	CTS	Vanadium	T9-SB109-060072-01-091118	9/11/2018	60	72	10.0			mg/kg	36.561131	-109.216263
1	Chinle Formation	CTS	Vanadium	T9X110	4/25/2018	0	1	22.5			mg/kg	36.561146	-109.216133
1	Chinle Formation	CTS	Vanadium	T9X111	4/25/2018	0	1	16.4			mg/kg	36.561146	-109.216026
1	Chinle Formation	CTS	Vanadium	T9X112	4/25/2018	0	1	16.0	QU		mg/kg	36.561138	-109.215912
1	Chinle Formation	CTS	Vanadium	T9X113	8/18/2018	0	1	17.5			mg/kg	36.561054	-109.217224
1	Chinle Formation	CTS	Vanadium	T9X114	5/14/2018	0	1	16.0	QU		mg/kg	36.561058	-109.217117
1	Chinle Formation	CTS	Vanadium	T9X115	4/25/2018	0	1	16.0	QU		mg/kg	36.561073	-109.217003
1	Chinle Formation	CTS	Vanadium	T9X116	4/25/2018	0	1	16.0	QU		mg/kg	36.561066	-109.216911

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Vanadium	T9X117	4/25/2018	0	1	16.0	QU		mg/kg	36.561062	-109.216805
1	Chinle Formation	CTS	Vanadium	T9X118	4/25/2018	0	1	17.5			mg/kg	36.561066	-109.21669
1	Chinle Formation	CTS	Vanadium	T9X119	4/25/2018	0	1	16.0	QU		mg/kg	36.561069	-109.21653
1	Chinle Formation	CTS	Vanadium	T9X120	4/25/2018	0	1	18.9			mg/kg	36.561058	-109.216461
1	Chinle Formation	CTS	Vanadium	T9X121	4/25/2018	0	1	16.0	QU		mg/kg	36.561058	-109.216354
1	Chinle Formation	CTS	Vanadium	T9X122	4/25/2018	0	1	16.0	QU		mg/kg	36.561066	-109.216248
1	Chinle Formation	CTS	Vanadium	T9X123	4/25/2018	0	1	19.1			mg/kg	36.561054	-109.216118
1	Chinle Formation	CTS	Vanadium	T9X124	4/25/2018	0	1	37.1			mg/kg	36.561058	-109.216003
1	Chinle Formation	CTS	Vanadium	T9X125	4/25/2018	0	1	18.1			mg/kg	36.561054	-109.215912
1	Chinle Formation	CTS	Vanadium	T9X126	5/14/2018	0	1	19.4			mg/kg	36.560966	-109.217239
1	Chinle Formation	CTS	Vanadium	T9X127	5/14/2018	0	1	17.9			mg/kg	36.56097	-109.217125
1	Chinle Formation	CTS	Vanadium	T9X128	4/25/2018	0	1	19.8			mg/kg	36.56097	-109.21701
1	Chinle Formation	CTS	Vanadium	T9-SS129-01-091118	9/11/2018	0	6	11.0			mg/kg	36.56093	-109.216882
1	Chinle Formation	CTS	Vanadium	T9X129	4/25/2018	0	1	18.7			mg/kg	36.560974	-109.216904
1	Chinle Formation	CTS	Vanadium	T9-SB129-006024-01-091118	9/11/2018	6	24	13.0			mg/kg	36.560932	-109.216881
1	Chinle Formation	CTS	Vanadium	T9-SB129-024048-01-091118	9/11/2018	24	48	13.0			mg/kg	36.560932	-109.216881
1	Chinle Formation	CTS	Vanadium	T9X130	4/25/2018	0	1	20.5			mg/kg	36.560966	-109.216797
1	Chinle Formation	CTS	Vanadium	T9X131	4/25/2018	0	1	20.6			mg/kg	36.560978	-109.216698
1	Chinle Formation	CTS	Vanadium	T9X132	4/25/2018	0	1	16.4			mg/kg	36.560974	-109.216568
1	Chinle Formation	CTS	Vanadium	T9X133	4/25/2018	0	1	19.2			mg/kg	36.560963	-109.216461
1	Chinle Formation	CTS	Vanadium	T9X134	4/25/2018	0	1	16.0	QU		mg/kg	36.560963	-109.216354
1	Chinle Formation	CTS	Vanadium	T9X135	4/25/2018	0	1	18.2			mg/kg	36.560966	-109.216248
1	Chinle Formation	CTS	Vanadium	T9X136	4/25/2018	0	1	25.1			mg/kg	36.56097	-109.216141
1	Chinle Formation	CTS	Vanadium	T9X137	4/25/2018	0	1	16.0	QU		mg/kg	36.560951	-109.216026
1	Chinle Formation	CTS	Vanadium	T9X138	4/25/2018	0	1	16.0	QU		mg/kg	36.560963	-109.215904
1	Chinle Formation	CTS	Vanadium	T9X140	5/14/2018	0	1	16.0	QU		mg/kg	36.560875	-109.217239
1	Chinle Formation	CTS	Vanadium	T9X142	5/14/2018	0	1	16.6			mg/kg	36.560871	-109.217018
1	Chinle Formation	CTS	Vanadium	T9X143	5/14/2018	0	1	17.5			mg/kg	36.560875	-109.216911
1	Chinle Formation	CTS	Vanadium	T9-SS144-01-091218	9/12/2018	0	6	16.0	J		mg/kg	36.560853	-109.216753
1	Chinle Formation	CTS	Vanadium	T9X144	5/14/2018	0	1	17.0			mg/kg	36.560875	-109.216797
1	Chinle Formation	CTS	Vanadium	T9-SB144-006018-01-091218	9/12/2018	6	18	15.0			mg/kg	36.560852	-109.216751
1	Chinle Formation	CTS	Vanadium	T9-SB144-024036-01-091218	9/12/2018	24	36	11.0			mg/kg	36.560852	-109.216751
1	Chinle Formation	CTS	Vanadium	T9-SB144-048060-01-091218	9/12/2018	48	60	12.0			mg/kg	36.560852	-109.216751
1	Chinle Formation	CTS	Vanadium	T9X145	5/14/2018	0	1	16.0	QU		mg/kg	36.560875	-109.21669
1	Chinle Formation	CTS	Vanadium	T9X146	5/14/2018	0	1	31.5			mg/kg	36.560871	-109.216576
1	Chinle Formation	CTS	Vanadium	T9X147	5/14/2018	0	1	16.0	QU		mg/kg	36.560867	-109.216461
1	Chinle Formation	CTS	Vanadium	T9X148	5/14/2018	0	1	16.0	QU		mg/kg	36.560867	-109.216347
1	Chinle Formation	CTS	Vanadium	T9X149	5/14/2018	0	1	21.4			mg/kg	36.560871	-109.216232
1	Chinle Formation	CTS	Vanadium	T9X150	5/14/2018	0	1	17.5			mg/kg	36.560871	-109.216118
1	Chinle Formation	CTS	Vanadium	T9X152	5/14/2018	0	1	25.8			mg/kg	36.560867	-109.215897
1	Chinle Formation	CTS	Vanadium	T9X153	8/18/2018	0	1	16.0	QU		mg/kg	36.560787	-109.217316
1	Chinle Formation	CTS	Vanadium	T9X154	5/14/2018	0	1	16.0	QU		mg/kg	36.560791	-109.217239
1	Chinle Formation	CTS	Vanadium	T9-SS155-01-091118	9/11/2018	0	6	18.0			mg/kg	36.560784	-109.217115
1	Chinle Formation	CTS	Vanadium	T9X155	5/14/2018	0	1	46.9			mg/kg	36.560783	-109.217094
1	Chinle Formation	CTS	Vanadium	T9-SB155-006018-01-091118	9/11/2018	6	18	20.0	J		mg/kg	36.560783	-109.217117
1	Chinle Formation	CTS	Vanadium	T9-SB155-048060-01-091118	9/11/2018	48	60	16.0			mg/kg	36.560783	-109.217117
1	Chinle Formation	CTS	Vanadium	T9X156	5/14/2018	0	1	16.0	QU		mg/kg	36.560783	-109.217018
1	Chinle Formation	CTS	Vanadium	T9X157	5/14/2018	0	1	21.6			mg/kg	36.560783	-109.216904

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Vanadium	T9X158	5/14/2018	0	1	21.5			mg/kg	36.56078	-109.216797
1	Chinle Formation	CTS	Vanadium	T9X159	5/14/2018	0	1	17.0			mg/kg	36.560787	-109.21669
1	Chinle Formation	CTS	Vanadium	T9X160	5/14/2018	0	1	19.9			mg/kg	36.56078	-109.216576
1	Chinle Formation	CTS	Vanadium	T9X161	5/14/2018	0	1	25.9			mg/kg	36.560783	-109.216461
1	Chinle Formation	CTS	Vanadium	T9X162	5/14/2018	0	1	31.6			mg/kg	36.560776	-109.216347
1	Chinle Formation	CTS	Vanadium	T9X167	8/18/2018	0	1	27.5			mg/kg	36.560699	-109.217339
1	Chinle Formation	CTS	Vanadium	T9X168	5/14/2018	0	1	16.0	QU		mg/kg	36.560699	-109.217247
1	Chinle Formation	CTS	Vanadium	T9X169	5/14/2018	0	1	28.4			mg/kg	36.560696	-109.217125
1	Chinle Formation	CTS	Vanadium	T9X170	5/14/2018	0	1	18.8			mg/kg	36.560696	-109.21701
1	Chinle Formation	CTS	Vanadium	T9X171	5/14/2018	0	1	38.8			mg/kg	36.560696	-109.216904
1	Chinle Formation	CTS	Vanadium	T9X172	5/14/2018	0	1	16.0	QU		mg/kg	36.560696	-109.216797
1	Chinle Formation	CTS	Vanadium	T9X173	5/14/2018	0	1	23.1			mg/kg	36.560699	-109.216682
1	Chinle Formation	CTS	Vanadium	T9X174	5/14/2018	0	1	26.8			mg/kg	36.560688	-109.216568
1	Chinle Formation	CTS	Vanadium	T9X175	5/14/2018	0	1	19.1			mg/kg	36.560688	-109.216461
1	Chinle Formation	CTS	Vanadium	T9-SS176-01-091218	9/12/2018	0	6	12.0			mg/kg	36.560713	-109.216389
1	Chinle Formation	CTS	Vanadium	T9X176	5/14/2018	0	1	16.0	QU		mg/kg	36.560692	-109.216347
1	Chinle Formation	CTS	Vanadium	T9-SB176-006018-01-091218	9/12/2018	6	18	8.00			mg/kg	36.560715	-109.216393
1	Chinle Formation	CTS	Vanadium	T9-SB176-024036-01-091218	9/12/2018	24	36	44.0			mg/kg	36.560715	-109.216393
1	Chinle Formation	CTS	Vanadium	T9-SB176-048060-01-091218	9/12/2018	48	60	12.0			mg/kg	36.560715	-109.216393
1	Chinle Formation	CTS	Vanadium	T9X181	5/14/2018	0	1	16.0	QU		mg/kg	36.560604	-109.217354
1	Chinle Formation	CTS	Vanadium	T9X182	4/25/2018	0	1	16.0	QU		mg/kg	36.560616	-109.217247
1	Chinle Formation	CTS	Vanadium	T9X183	4/25/2018	0	1	16.0	QU		mg/kg	36.560604	-109.217133
1	Chinle Formation	CTS	Vanadium	T9X184	4/25/2018	0	1	16.0	QU		mg/kg	36.560612	-109.217026
1	Chinle Formation	CTS	Vanadium	T9-SS185-01-091218	9/12/2018	0	6	13.0			mg/kg	36.560605	-109.216904
1	Chinle Formation	CTS	Vanadium	T9X185	4/25/2018	0	1	16.0	QU		mg/kg	36.560596	-109.216919
1	Chinle Formation	CTS	Vanadium	T9-SB185-006018-01-091218	9/12/2018	6	18	15.0			mg/kg	36.560604	-109.216904
1	Chinle Formation	CTS	Vanadium	T9-SB185-024036-01-091218	9/12/2018	24	36	14.0			mg/kg	36.560604	-109.216904
1	Chinle Formation	CTS	Vanadium	T9-SB185-048060-01-091218	9/12/2018	48	60	13.0			mg/kg	36.560604	-109.216904
1	Chinle Formation	CTS	Vanadium	T9X186	4/25/2018	0	1	16.0	QU		mg/kg	36.560604	-109.216797
1	Chinle Formation	CTS	Vanadium	T9X187	4/25/2018	0	1	23.4			mg/kg	36.560619	-109.21669
1	Chinle Formation	CTS	Vanadium	T9X188	4/25/2018	0	1	16.0	QU		mg/kg	36.5606	-109.216591
1	Chinle Formation	CTS	Vanadium	T9X189	4/25/2018	0	1	25.2			mg/kg	36.5606	-109.216469
1	Chinle Formation	CTS	Vanadium	T9X190	4/25/2018	0	1	16.0	QU		mg/kg	36.560604	-109.216354
1	Chinle Formation	CTS	Vanadium	T9X191	5/14/2018	0	1	16.0	QU		mg/kg	36.560604	-109.21624
1	Chinle Formation	CTS	Vanadium	T9X196	5/14/2018	0	1	16.5			mg/kg	36.56052	-109.217354
1	Chinle Formation	CTS	Vanadium	T9X197	4/25/2018	0	1	16.0	QU		mg/kg	36.56052	-109.217255
1	Chinle Formation	CTS	Vanadium	T9X198	4/25/2018	0	1	19.1			mg/kg	36.560516	-109.217133
1	Chinle Formation	CTS	Vanadium	T9X199	4/25/2018	0	1	16.0	QU		mg/kg	36.560516	-109.217026
1	Chinle Formation	CTS	Vanadium	T9X200	4/25/2018	0	1	16.0	QU		mg/kg	36.560516	-109.216927
1	Chinle Formation	CTS	Vanadium	T9X201	4/25/2018	0	1	29.0			mg/kg	36.56052	-109.21637
1	Chinle Formation	CTS	Vanadium	T9X202	4/25/2018	0	1	16.0	QU		mg/kg	36.560516	-109.216248
1	Chinle Formation	CTS	Vanadium	T9X203	4/25/2018	0	1	22.4			mg/kg	36.560513	-109.216141
1	Chinle Formation	CTS	Vanadium	T9X204	8/18/2018	0	1	16.0	QU		mg/kg	36.56041	-109.217422
1	Chinle Formation	CTS	Vanadium	T9X205	5/14/2018	0	1	16.0	QU		mg/kg	36.560436	-109.217346
1	Chinle Formation	CTS	Vanadium	T9X206	4/25/2018	0	1	25.6			mg/kg	36.560429	-109.217247
1	Chinle Formation	CTS	Vanadium	T9X207	4/25/2018	0	1	19.9			mg/kg	36.560425	-109.21714
1	Chinle Formation	CTS	Vanadium	T9X208	4/25/2018	0	1	16.0	QU		mg/kg	36.560425	-109.217033
1	Chinle Formation	CTS	Vanadium	T9X209	4/25/2018	0	1	16.0	QU		mg/kg	36.560417	-109.216354

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Vanadium	T9X210	8/18/2018	0	1	19.0			mg/kg	36.56036	-109.217438
1	Chinle Formation	CTS	Vanadium	T9X211	5/14/2018	0	1	17.9			mg/kg	36.560341	-109.217361
1	Chinle Formation	CTS	Vanadium	T9-SS212-01-091218	9/12/2018	0	6	15.0			mg/kg	36.560378	-109.217234
1	Chinle Formation	CTS	Vanadium	T9X212	4/25/2018	0	1	16.0	QU		mg/kg	36.560349	-109.217255
1	Chinle Formation	CTS	Vanadium	T9-SB212-006018-01-091218	9/12/2018	6	18	13.0			mg/kg	36.560379	-109.217232
1	Chinle Formation	CTS	Vanadium	T9-SB212-024036-01-091218	9/12/2018	24	36	15.0			mg/kg	36.560379	-109.217232
1	Chinle Formation	CTS	Vanadium	T9-SB212-048060-01-091218	9/12/2018	48	60	13.0			mg/kg	36.560379	-109.217232
1	Chinle Formation	CTS	Vanadium	T9X213	4/25/2018	0	1	24.5			mg/kg	36.560337	-109.217148
1	Chinle Formation	CTS	Vanadium	T9X214	4/25/2018	0	1	21.5			mg/kg	36.560345	-109.217026
1	Chinle Formation	CTS	Vanadium	T9X215	5/14/2018	0	1	16.0	QU		mg/kg	36.560261	-109.217461
1	Chinle Formation	CTS	Vanadium	T9-SS216-01-091118	9/11/2018	0	6	18.0			mg/kg	36.56026	-109.21733
1	Chinle Formation	CTS	Vanadium	T9X216	5/14/2018	0	1	21.6			mg/kg	36.560253	-109.217346
1	Chinle Formation	CTS	Vanadium	T9-SB216-0612-01-091118	9/11/2018	6	12	19.0			mg/kg	36.56026	-109.21733
1	Chinle Formation	CTS	Vanadium	T9-SB216-1218-01-091118	9/11/2018	12	18	21.0			mg/kg	36.560261	-109.217331
1	Chinle Formation	CTS	Vanadium	T9-XS217-01-042518	4/25/2018	0	3	12.0			mg/kg	36.560249	-109.217256
1	Chinle Formation	CTS	Vanadium	T9X218	5/14/2018	0	1	16.0	QU		mg/kg	36.560257	-109.217125
1	Chinle Formation	CTS	Vanadium	T9X219	5/14/2018	0	1	16.0	QU		mg/kg	36.560165	-109.217583
1	Chinle Formation	CTS	Vanadium	T9X220	5/14/2018	0	1	17.2			mg/kg	36.560165	-109.217468
1	Chinle Formation	CTS	Vanadium	T9X221	4/25/2018	0	1	20.0			mg/kg	36.560173	-109.217361
1	Chinle Formation	CTS	Vanadium	T9X222	4/25/2018	0	1	20.1			mg/kg	36.560165	-109.217247
1	Chinle Formation	CTS	Vanadium	T9X223	4/25/2018	0	1	16.0	QU		mg/kg	36.560146	-109.217148
1	Chinle Formation	CTS	Vanadium	T9X224	5/14/2018	0	1	24.7			mg/kg	36.560074	-109.217613
1	Chinle Formation	CTS	Vanadium	T9X225	5/14/2018	0	1	16.0	QU		mg/kg	36.56007	-109.217476
1	Chinle Formation	CTS	Vanadium	T9X226	4/25/2018	0	1	19.9			mg/kg	36.560081	-109.217361
1	Chinle Formation	CTS	Vanadium	T9-SS227-01-091118	9/11/2018	0	6	15.0			mg/kg	36.560092	-109.217284
1	Chinle Formation	CTS	Vanadium	T9X227	4/25/2018	0	1	21.7			mg/kg	36.56007	-109.21727
1	Chinle Formation	CTS	Vanadium	T9-SB227-0612-01-091118	9/11/2018	6	12	13.0			mg/kg	36.560092	-109.217284
1	Chinle Formation	CTS	Vanadium	T9-SB227-1218-01-091118	9/11/2018	12	18	12.0			mg/kg	36.560093	-109.217285
1	Chinle Formation	CTS	Vanadium	T9X229	5/14/2018	0	1	16.0	QU		mg/kg	36.559982	-109.217468
1	Chinle Formation	CTS	Vanadium	T9X230	4/25/2018	0	1	16.5			mg/kg	36.55999	-109.217369
1	Chinle Formation	CTS	Vanadium	T9X231	5/14/2018	0	1	16.0	QU		mg/kg	36.559895	-109.21756
1	Chinle Formation	CTS	Vanadium	T9X232	5/14/2018	0	1	16.9			mg/kg	36.559898	-109.217453
1	Chinle Formation	CTS	Vanadium	T9X233	4/25/2018	0	1	25.5			mg/kg	36.559883	-109.217377
1	Chinle Formation	CTS	Vanadium	T9X234	4/25/2018	0	1	16.0	QU		mg/kg	36.559814	-109.217712
1	Chinle Formation	CTS	Vanadium	T9X235	5/14/2018	0	1	17.4			mg/kg	36.559807	-109.217575
1	Chinle Formation	CTS	Vanadium	T9X236	4/25/2018	0	1	21.1			mg/kg	36.559799	-109.217468
1	Chinle Formation	CTS	Vanadium	T9G1	8/18/2018	0	1	25.8			mg/kg	36.562412	-109.216995
1	Chinle Formation	CTS	Vanadium	T9G10	8/18/2018	0	1	17.7			mg/kg	36.561962	-109.21711
1	Chinle Formation	CTS	Vanadium	T9G11	8/18/2018	0	1	16.0	QU		mg/kg	36.561775	-109.216438
1	Chinle Formation	CTS	Vanadium	T9-XSG12-01-081818	8/18/2018	0	3	12.0			mg/kg	36.56178	-109.215999
1	Chinle Formation	CTS	Vanadium	T9G13	8/18/2018	0	1	16.0	QU		mg/kg	36.561771	-109.215881
1	Chinle Formation	CTS	Vanadium	T9G14	8/18/2018	0	1	26.1			mg/kg	36.561703	-109.217224
1	Chinle Formation	CTS	Vanadium	T9G15	8/18/2018	0	1	16.0	QU		mg/kg	36.561695	-109.217125
1	Chinle Formation	CTS	Vanadium	T9G16	8/18/2018	0	1	18.1			mg/kg	36.56168	-109.215881
1	Chinle Formation	CTS	Vanadium	T9G17	8/18/2018	0	1	16.0	QU		mg/kg	36.561676	-109.215775
1	Chinle Formation	CTS	Vanadium	T9G18	8/18/2018	0	1	31.9			mg/kg	36.56168	-109.215668
1	Chinle Formation	CTS	Vanadium	T9G19	8/18/2018	0	1	19.4			mg/kg	36.561604	-109.217224
1	Chinle Formation	CTS	Vanadium	T9G2	8/18/2018	0	1	16.0	QU		mg/kg	36.562412	-109.216888

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Vanadium	T9G20	8/18/2018	0	1	22.5			mg/kg	36.561588	-109.215675
1	Chinle Formation	CTS	Vanadium	T9G21	8/18/2018	0	1	19.2			mg/kg	36.561508	-109.217224
1	Chinle Formation	CTS	Vanadium	T9G22	8/18/2018	0	1	21.1			mg/kg	36.561501	-109.215652
1	Chinle Formation	CTS	Vanadium	T9G23	8/18/2018	0	1	22.2			mg/kg	36.56142	-109.217232
1	Chinle Formation	CTS	Vanadium	T9G24	8/18/2018	0	1	17.0			mg/kg	36.561413	-109.215775
1	Chinle Formation	CTS	Vanadium	T9G25	8/18/2018	0	1	16.0	QU		mg/kg	36.561413	-109.21566
1	Chinle Formation	CTS	Vanadium	T9G26	8/18/2018	0	1	18.3			mg/kg	36.561337	-109.217239
1	Chinle Formation	CTS	Vanadium	T9G27	8/18/2018	0	1	21.4			mg/kg	36.561321	-109.215782
1	Chinle Formation	CTS	Vanadium	T9G28	8/18/2018	0	1	17.7			mg/kg	36.561237	-109.215767
1	Chinle Formation	CTS	Vanadium	T9G29	8/18/2018	0	1	16.0	QU		mg/kg	36.561066	-109.217346
1	Chinle Formation	CTS	Vanadium	T9G30	8/18/2018	0	1	16.0	QU		mg/kg	36.561058	-109.215782
1	Chinle Formation	CTS	Vanadium	T9G31	8/18/2018	0	1	33.0			mg/kg	36.560978	-109.217354
1	Chinle Formation	CTS	Vanadium	T9G32	8/18/2018	0	1	16.0	QU		mg/kg	36.56097	-109.215775
1	Chinle Formation	CTS	Vanadium	T9G33	8/18/2018	0	1	16.2			mg/kg	36.560871	-109.215775
1	Chinle Formation	CTS	Vanadium	T9G34	8/18/2018	0	1	21.1			mg/kg	36.560623	-109.217468
1	Chinle Formation	CTS	Vanadium	T9G35	8/18/2018	0	1	25.2			mg/kg	36.560513	-109.216789
1	Chinle Formation	CTS	Vanadium	T9G36	8/18/2018	0	1	26.3			mg/kg	36.560516	-109.21669
1	Chinle Formation	CTS	Vanadium	T9G37	8/18/2018	0	1	16.7			mg/kg	36.560513	-109.21656
1	Chinle Formation	CTS	Vanadium	T9G38	8/18/2018	0	1	30.8			mg/kg	36.560505	-109.216461
1	Chinle Formation	CTS	Vanadium	T9G39	8/18/2018	0	1	32.8			mg/kg	36.56052	-109.216011
1	Chinle Formation	CTS	Vanadium	T9G4	8/18/2018	0	1	31.2			mg/kg	36.562321	-109.216988
1	Chinle Formation	CTS	Vanadium	T9G40	8/18/2018	0	1	16.0	QU		mg/kg	36.560429	-109.216896
1	Chinle Formation	CTS	Vanadium	T9G41	8/18/2018	0	1	16.0	QU		mg/kg	36.560429	-109.216789
1	Chinle Formation	CTS	Vanadium	T9G42	8/18/2018	0	1	17.0			mg/kg	36.560429	-109.216469
1	Chinle Formation	CTS	Vanadium	T9G43	8/18/2018	0	1	16.7			mg/kg	36.560429	-109.216232
1	Chinle Formation	CTS	Vanadium	T9G44	8/18/2018	0	1	16.0	QU		mg/kg	36.560421	-109.216125
1	Chinle Formation	CTS	Vanadium	T9G45	8/18/2018	0	1	19.7			mg/kg	36.560421	-109.216011
1	Chinle Formation	CTS	Vanadium	T9G46	8/18/2018	0	1	33.7			mg/kg	36.560337	-109.216911
1	Chinle Formation	CTS	Vanadium	T9G47	8/18/2018	0	1	16.0	QU		mg/kg	36.560333	-109.216461
1	Chinle Formation	CTS	Vanadium	T9G48	8/18/2018	0	1	25.4			mg/kg	36.560341	-109.216331
1	Chinle Formation	CTS	Vanadium	T9G49	8/18/2018	0	1	21.8			mg/kg	36.560326	-109.216217
1	Chinle Formation	CTS	Vanadium	T9G50	8/18/2018	0	1	16.0	QU		mg/kg	36.560257	-109.217682
1	Chinle Formation	CTS	Vanadium	T9G51	8/18/2018	0	1	17.6			mg/kg	36.560257	-109.217583
1	Chinle Formation	CTS	Vanadium	T9G52	8/18/2018	0	1	16.0	QU		mg/kg	36.560253	-109.217018
1	Chinle Formation	CTS	Vanadium	T9G53	8/18/2018	0	1	16.0	QU		mg/kg	36.560234	-109.216911
1	Chinle Formation	CTS	Vanadium	T9G54	8/18/2018	0	1	17.0			mg/kg	36.560173	-109.217682
1	Chinle Formation	CTS	Vanadium	T9G55	8/18/2018	0	1	16.0	QU		mg/kg	36.560158	-109.217026
1	Chinle Formation	CTS	Vanadium	T9G56	8/18/2018	0	1	16.0	QU		mg/kg	36.560074	-109.217682
1	Chinle Formation	CTS	Vanadium	T9G57	8/18/2018	0	1	26.5			mg/kg	36.560074	-109.21714
1	Chinle Formation	CTS	Vanadium	T9G58	8/18/2018	0	1	19.3			mg/kg	36.559982	-109.217697
1	Chinle Formation	CTS	Vanadium	T9G59	8/18/2018	0	1	21.0			mg/kg	36.559978	-109.217239
1	Chinle Formation	CTS	Vanadium	T9G6	8/18/2018	0	1	16.0	QU		mg/kg	36.562229	-109.216995
1	Chinle Formation	CTS	Vanadium	T9G60	8/18/2018	0	1	17.2			mg/kg	36.559975	-109.217148
1	Chinle Formation	CTS	Vanadium	T9G61	8/18/2018	0	1	16.0	QU		mg/kg	36.559883	-109.217697
1	Chinle Formation	CTS	Vanadium	T9G62	8/18/2018	0	1	26.1			mg/kg	36.559891	-109.217255
1	Chinle Formation	CTS	Vanadium	T9G63	8/18/2018	0	1	22.7			mg/kg	36.559792	-109.217346
1	Chinle Formation	CTS	Vanadium	T9G64	8/18/2018	0	1	16.0	QU		mg/kg	36.559811	-109.217247
1	Chinle Formation	CTS	Vanadium	T9G65	8/18/2018	0	1	16.0	QU		mg/kg	36.559708	-109.21759

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS	Vanadium	T9G66	8/18/2018	0	1	26.9			mg/kg	36.559723	-109.217461
1	Chinle Formation	CTS	Vanadium	T9G67	8/18/2018	0	1	16.0	QU		mg/kg	36.559715	-109.217361
1	Chinle Formation	CTS	Vanadium	T9G7	8/18/2018	0	1	23.9			mg/kg	36.562138	-109.216995
1	Chinle Formation	CTS	Vanadium	T9G8	8/18/2018	0	1	26.9			mg/kg	36.562054	-109.21711
1	Chinle Formation	CTS	Vanadium	T9G9	8/18/2018	0	1	17.2			mg/kg	36.56205	-109.217003
1	Chinle Formation	CTS South	Vanadium	T37X1	5/14/2018	0	1	27.2			mg/kg	36.558987	-109.218002
1	Chinle Formation	CTS South	Vanadium	T37X2	5/14/2018	0	1	24.6			mg/kg	36.558998	-109.217911
1	Chinle Formation	CTS South	Vanadium	T37X3	5/14/2018	0	1	16.0	QU		mg/kg	36.559002	-109.217773
1	Chinle Formation	CTS South	Vanadium	T37X4	5/14/2018	0	1	16.0	QU		mg/kg	36.558987	-109.21772
1	Chinle Formation	CTS South	Vanadium	T37X5	5/14/2018	0	1	21.3			mg/kg	36.558983	-109.21759
1	Chinle Formation	CTS South	Vanadium	T37X6	5/14/2018	0	1	16.0	QU		mg/kg	36.55899	-109.217484
1	Chinle Formation	CTS South	Vanadium	T37X7	5/14/2018	0	1	26.6			mg/kg	36.558983	-109.217369
1	Chinle Formation	CTS South	Vanadium	T37X8	5/14/2018	0	1	35.3			mg/kg	36.558975	-109.217255
1	Chinle Formation	CTS South	Vanadium	T37X9	5/14/2018	0	1	23.2			mg/kg	36.558891	-109.218018
1	Chinle Formation	CTS South	Vanadium	T37X10	5/14/2018	0	1	17.5			mg/kg	36.55891	-109.217934
1	Chinle Formation	CTS South	Vanadium	T37X11	5/14/2018	0	1	16.0	QU		mg/kg	36.558907	-109.217804
1	Chinle Formation	CTS South	Vanadium	T37X12	5/14/2018	0	1	20.2			mg/kg	36.558907	-109.217735
1	Chinle Formation	CTS South	Vanadium	T37X13	5/14/2018	0	1	30.7			mg/kg	36.558899	-109.217583
1	Chinle Formation	CTS South	Vanadium	T37X14	5/14/2018	0	1	31.8			mg/kg	36.558895	-109.217476
1	Chinle Formation	CTS South	Vanadium	T37X15	5/14/2018	0	1	21.2			mg/kg	36.558891	-109.217384
1	Chinle Formation	CTS South	Vanadium	T37X16	5/14/2018	0	1	18.0			mg/kg	36.558903	-109.217262
1	Chinle Formation	CTS South	Vanadium	T37X17	5/14/2018	0	1	16.7			mg/kg	36.558895	-109.217133
1	Chinle Formation	CTS South	Vanadium	T37X18	5/14/2018	0	1	16.0	QU		mg/kg	36.558899	-109.217033
1	Chinle Formation	CTS South	Vanadium	T37X19	5/14/2018	0	1	20.1			mg/kg	36.558811	-109.218048
1	Chinle Formation	CTS South	Vanadium	T37X20	5/14/2018	0	1	16.0	QU		mg/kg	36.558815	-109.217941
1	Chinle Formation	CTS South	Vanadium	T37X21	5/14/2018	0	1	17.1			mg/kg	36.558826	-109.217812
1	Chinle Formation	CTS South	Vanadium	T37X22	5/14/2018	0	1	22.4			mg/kg	36.558804	-109.217705
1	Chinle Formation	CTS South	Vanadium	T37X23	5/14/2018	0	1	30.9			mg/kg	36.558815	-109.217583
1	Chinle Formation	CTS South	Vanadium	T37X24	5/14/2018	0	1	16.6			mg/kg	36.5588	-109.217484
1	Chinle Formation	CTS South	Vanadium	T37X25	5/14/2018	0	1	41.0			mg/kg	36.558784	-109.2174
1	Chinle Formation	CTS South	Vanadium	T37X26	5/14/2018	0	1	28.6			mg/kg	36.558815	-109.217239
1	Chinle Formation	CTS South	Vanadium	T37X27	5/14/2018	0	1	19.1			mg/kg	36.5588	-109.21714
1	Chinle Formation	CTS South	Vanadium	T37X28	5/14/2018	0	1	16.0	QU		mg/kg	36.558727	-109.21804
1	Chinle Formation	CTS South	Vanadium	T37X29	5/14/2018	0	1	21.1			mg/kg	36.558727	-109.217964
1	Chinle Formation	CTS South	Vanadium	T37X30	5/14/2018	0	1	16.7			mg/kg	36.558731	-109.217819
1	Chinle Formation	CTS South	Vanadium	T37X31	5/14/2018	0	1	22.3			mg/kg	36.558727	-109.217705
1	Chinle Formation	CTS South	Vanadium	T37X32	5/14/2018	0	1	24.1			mg/kg	36.558727	-109.217598
1	Chinle Formation	CTS South	Vanadium	T37X33	5/14/2018	0	1	26.3			mg/kg	36.558716	-109.217499
1	Chinle Formation	CTS South	Vanadium	T37X34	5/14/2018	0	1	22.9			mg/kg	36.55872	-109.217384
1	Chinle Formation	CTS South	Vanadium	T37X35	5/14/2018	0	1	17.8			mg/kg	36.55872	-109.217255
1	Chinle Formation	CTS South	Vanadium	T37X36	5/14/2018	0	1	38.1			mg/kg	36.558712	-109.217163
1	Chinle Formation	CTS South	Vanadium	T37X37	5/14/2018	0	1	16.0	QU		mg/kg	36.558632	-109.218048
1	Chinle Formation	CTS South	Vanadium	T37X38	8/18/2018	0	1	17.3			mg/kg	36.55862	-109.21788
1	Chinle Formation	CTS South	Vanadium	T37X39	5/14/2018	0	1	16.0	QU		mg/kg	36.558628	-109.217819
1	Chinle Formation	CTS South	Vanadium	T37X40	5/14/2018	0	1	24.6			mg/kg	36.558617	-109.217712
1	Chinle Formation	CTS South	Vanadium	T37X41	5/14/2018	0	1	19.9			mg/kg	36.558624	-109.21759
1	Chinle Formation	CTS South	Vanadium	T37X42	5/14/2018	0	1	16.0	QU		mg/kg	36.55862	-109.217468
1	Chinle Formation	CTS South	Vanadium	T37X43	5/14/2018	0	1	19.1			mg/kg	36.55862	-109.217361

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Vanadium	T37X44	5/14/2018	0	1	16.0	QU		mg/kg	36.55864	-109.217232
1	Chinle Formation	CTS South	Vanadium	T37X45	5/14/2018	0	1	16.0	QU		mg/kg	36.55862	-109.217163
1	Chinle Formation	CTS South	Vanadium	T37X46	5/14/2018	0	1	16.0	QU		mg/kg	36.558529	-109.218124
1	Chinle Formation	CTS South	Vanadium	T37X47	5/14/2018	0	1	21.5			mg/kg	36.558537	-109.218033
1	Chinle Formation	CTS South	Vanadium	T37X48	8/18/2018	0	1	16.0	QU		mg/kg	36.558544	-109.217903
1	Chinle Formation	CTS South	Vanadium	T37X49	5/14/2018	0	1	16.4			mg/kg	36.558548	-109.217819
1	Chinle Formation	CTS South	Vanadium	T37X50	5/14/2018	0	1	18.0			mg/kg	36.558548	-109.217705
1	Chinle Formation	CTS South	Vanadium	T37X51	5/14/2018	0	1	16.0	QU		mg/kg	36.55854	-109.217583
1	Chinle Formation	CTS South	Vanadium	T37X52	5/14/2018	0	1	16.0	QU		mg/kg	36.558544	-109.217484
1	Chinle Formation	CTS South	Vanadium	T37X53	5/14/2018	0	1	16.0	QU		mg/kg	36.558537	-109.217384
1	Chinle Formation	CTS South	Vanadium	T37X54	5/14/2018	0	1	16.0	QU		mg/kg	36.55854	-109.217262
1	Chinle Formation	CTS South	Vanadium	T37X55	5/14/2018	0	1	22.2			mg/kg	36.558533	-109.21714
1	Chinle Formation	CTS South	Vanadium	T37X56	5/14/2018	0	1	16.6			mg/kg	36.558453	-109.21814
1	Chinle Formation	CTS South	Vanadium	T37X57	5/14/2018	0	1	20.2			mg/kg	36.558456	-109.218048
1	Chinle Formation	CTS South	Vanadium	T37X58	5/14/2018	0	1	16.0	QU		mg/kg	36.558456	-109.217903
1	Chinle Formation	CTS South	Vanadium	T37X59	5/14/2018	0	1	16.3			mg/kg	36.558456	-109.217819
1	Chinle Formation	CTS South	Vanadium	T37X60	5/14/2018	0	1	18.0			mg/kg	36.558445	-109.217712
1	Chinle Formation	CTS South	Vanadium	T37X61	5/14/2018	0	1	16.0	QU		mg/kg	36.558441	-109.21759
1	Chinle Formation	CTS South	Vanadium	T37X62	5/14/2018	0	1	28.1			mg/kg	36.558437	-109.217476
1	Chinle Formation	CTS South	Vanadium	T37X63	5/14/2018	0	1	16.0	QU		mg/kg	36.558441	-109.217361
1	Chinle Formation	CTS South	Vanadium	T37X64	5/14/2018	0	1	20.7			mg/kg	36.558453	-109.217262
1	Chinle Formation	CTS South	Vanadium	T37X65	5/14/2018	0	1	17.1			mg/kg	36.558361	-109.218155
1	Chinle Formation	CTS South	Vanadium	T37X66	5/14/2018	0	1	21.1			mg/kg	36.558365	-109.218063
1	Chinle Formation	CTS South	Vanadium	T37X67	5/14/2018	0	1	16.0	QU		mg/kg	36.558365	-109.217934
1	Chinle Formation	CTS South	Vanadium	T37X68	5/14/2018	0	1	17.8			mg/kg	36.558361	-109.217819
1	Chinle Formation	CTS South	Vanadium	T37-SS69-01-091218	9/12/2018	0	6	13.0			mg/kg	36.558325	-109.217756
1	Chinle Formation	CTS South	Vanadium	T37X69	5/14/2018	0	1	33.0			mg/kg	36.558372	-109.217712
1	Chinle Formation	CTS South	Vanadium	T37-SB69-006018-01-091218	9/12/2018	6	18	15.0			mg/kg	36.558327	-109.217758
1	Chinle Formation	CTS South	Vanadium	T37-SB69-018048-01-091218	9/12/2018	18	48	13.0			mg/kg	36.558327	-109.217758
1	Chinle Formation	CTS South	Vanadium	T37-SB69-048066-01-091218	9/12/2018	48	66	13.0			mg/kg	36.558327	-109.217758
1	Chinle Formation	CTS South	Vanadium	T37X70	5/14/2018	0	1	21.9			mg/kg	36.558372	-109.217606
1	Chinle Formation	CTS South	Vanadium	T37X71	5/14/2018	0	1	16.0	QU		mg/kg	36.55835	-109.217506
1	Chinle Formation	CTS South	Vanadium	T37X72	5/14/2018	0	1	21.0			mg/kg	36.558372	-109.217377
1	Chinle Formation	CTS South	Vanadium	T37X73	5/14/2018	0	1	16.0	QU		mg/kg	36.558334	-109.217293
1	Chinle Formation	CTS South	Vanadium	T37X74	5/14/2018	0	1	16.0	QU		mg/kg	36.558273	-109.218163
1	Chinle Formation	CTS South	Vanadium	T37X75	5/14/2018	0	1	21.4			mg/kg	36.558289	-109.218086
1	Chinle Formation	CTS South	Vanadium	T37X76	5/14/2018	0	1	26.4			mg/kg	36.558273	-109.217926
1	Chinle Formation	CTS South	Vanadium	T37-SS77-01-091218	9/12/2018	0	6	12.0			mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Vanadium	T37X77	5/14/2018	0	1	28.4			mg/kg	36.55827	-109.217834
1	Chinle Formation	CTS South	Vanadium	T37-SB77-006018-01-091218	9/12/2018	6	18	15.0			mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Vanadium	T37-SB77-018048-01-091218	9/12/2018	18	48	14.0			mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Vanadium	T37-SB77-048072-01-091218	9/12/2018	48	72	14.0			mg/kg	36.558258	-109.217781
1	Chinle Formation	CTS South	Vanadium	T37X78	5/14/2018	0	1	16.0	QU		mg/kg	36.558277	-109.21772
1	Chinle Formation	CTS South	Vanadium	T37X79	5/14/2018	0	1	33.1			mg/kg	36.558277	-109.217598
1	Chinle Formation	CTS South	Vanadium	T37X80	5/14/2018	0	1	16.0	QU		mg/kg	36.558281	-109.217499
1	Chinle Formation	CTS South	Vanadium	T37X81	5/14/2018	0	1	16.0	QU		mg/kg	36.558266	-109.217377
1	Chinle Formation	CTS South	Vanadium	T37X82	5/14/2018	0	1	16.0	QU		mg/kg	36.558182	-109.218246
1	Chinle Formation	CTS South	Vanadium	T37X83	5/14/2018	0	1	16.5			mg/kg	36.558182	-109.218155

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Vanadium	T37X84	5/14/2018	0	1	16.0	QU		mg/kg	36.558189	-109.21801
1	Chinle Formation	CTS South	Vanadium	T37X85	5/14/2018	0	1	19.3			mg/kg	36.558189	-109.217934
1	Chinle Formation	CTS South	Vanadium	T37-SS86-01-091318	9/13/2018	0	6	12.0			mg/kg	36.558156	-109.217825
1	Chinle Formation	CTS South	Vanadium	T37X86	5/14/2018	0	1	17.1			mg/kg	36.558186	-109.217804
1	Chinle Formation	CTS South	Vanadium	T37-SB86-006018-01-091318	9/13/2018	6	18	16.0			mg/kg	36.558155	-109.217827
1	Chinle Formation	CTS South	Vanadium	T37-SB86-024036-01-091318	9/13/2018	24	36	15.0			mg/kg	36.558155	-109.217827
1	Chinle Formation	CTS South	Vanadium	T37-SB86-048060-01-091318	9/13/2018	48	60	14.0			mg/kg	36.558155	-109.217827
1	Chinle Formation	CTS South	Vanadium	T37-SS87-01-091318	9/13/2018	0	6	13.0			mg/kg	36.558151	-109.217759
1	Chinle Formation	CTS South	Vanadium	T37X87	5/14/2018	0	1	16.0	QU		mg/kg	36.558189	-109.217705
1	Chinle Formation	CTS South	Vanadium	T37-SB87-006018-01-091318	9/13/2018	6	18	17.0			mg/kg	36.558151	-109.217758
1	Chinle Formation	CTS South	Vanadium	T37-SB87-024036-01-091318	9/13/2018	24	36	14.0			mg/kg	36.558151	-109.217758
1	Chinle Formation	CTS South	Vanadium	T37-SB87-048060-01-091318	9/13/2018	48	60	13.0			mg/kg	36.558151	-109.217758
1	Chinle Formation	CTS South	Vanadium	T37X88	5/14/2018	0	1	17.3			mg/kg	36.558189	-109.21759
1	Chinle Formation	CTS South	Vanadium	T37X89	5/14/2018	0	1	16.0	QU		mg/kg	36.558189	-109.217476
1	Chinle Formation	CTS South	Vanadium	T37X90	5/14/2018	0	1	16.0	QU		mg/kg	36.558098	-109.218269
1	Chinle Formation	CTS South	Vanadium	T37X91	5/14/2018	0	1	16.0	QU		mg/kg	36.55809	-109.218193
1	Chinle Formation	CTS South	Vanadium	T37X92	5/14/2018	0	1	16.0	QU		mg/kg	36.558098	-109.218048
1	Chinle Formation	CTS South	Vanadium	T37X93	5/14/2018	0	1	16.0	QU		mg/kg	36.558094	-109.217926
1	Chinle Formation	CTS South	Vanadium	T37-SS94-01-091318	9/13/2018	0	6	13.0			mg/kg	36.558078	-109.217828
1	Chinle Formation	CTS South	Vanadium	T37X94	5/14/2018	0	1	17.4			mg/kg	36.558086	-109.217827
1	Chinle Formation	CTS South	Vanadium	T37-SB94-006018-01-091318	9/13/2018	6	18	15.0			mg/kg	36.558079	-109.217827
1	Chinle Formation	CTS South	Vanadium	T37-SB94-024036-01-091318	9/13/2018	24	36	14.0			mg/kg	36.558079	-109.217827
1	Chinle Formation	CTS South	Vanadium	T37-SB94-048060-01-091318	9/13/2018	48	60	13.0			mg/kg	36.558079	-109.217827
1	Chinle Formation	CTS South	Vanadium	T37X95	5/14/2018	0	1	16.0	QU		mg/kg	36.558094	-109.217712
1	Chinle Formation	CTS South	Vanadium	T37X96	5/14/2018	0	1	16.0	QU		mg/kg	36.558086	-109.21759
1	Chinle Formation	CTS South	Vanadium	T37X97	5/14/2018	0	1	16.0	QU		mg/kg	36.558086	-109.217476
1	Chinle Formation	CTS South	Vanadium	T37X98	5/14/2018	0	1	16.0	QU		mg/kg	36.558006	-109.218369
1	Chinle Formation	CTS South	Vanadium	T37X99	5/14/2018	0	1	16.0	QU		mg/kg	36.558006	-109.218277
1	Chinle Formation	CTS South	Vanadium	T37X101	5/14/2018	0	1	16.0	QU		mg/kg	36.558006	-109.218056
1	Chinle Formation	CTS South	Vanadium	T37X102	5/14/2018	0	1	16.0	QU		mg/kg	36.558002	-109.217934
1	Chinle Formation	CTS South	Vanadium	T37-SS103-01-091318	9/13/2018	0	6	11.0			mg/kg	36.558001	-109.217855
1	Chinle Formation	CTS South	Vanadium	T37X103	5/14/2018	0	1	16.0	QU		mg/kg	36.558002	-109.217819
1	Chinle Formation	CTS South	Vanadium	T37-SB103-006018-01-091318	9/13/2018	6	18	13.0			mg/kg	36.558002	-109.217857
1	Chinle Formation	CTS South	Vanadium	T37-SB103-024036-01-091318	9/13/2018	24	36	14.0			mg/kg	36.558002	-109.217857
1	Chinle Formation	CTS South	Vanadium	T37-SB103-048060-01-091318	9/13/2018	48	60	14.0			mg/kg	36.558002	-109.217857
1	Chinle Formation	CTS South	Vanadium	T37X104	5/14/2018	0	1	21.2			mg/kg	36.557999	-109.217712
1	Chinle Formation	CTS South	Vanadium	T37X105	5/14/2018	0	1	16.0	QU		mg/kg	36.557999	-109.217606
1	Chinle Formation	CTS South	Vanadium	T37X106	5/14/2018	0	1	16.0	QU		mg/kg	36.557999	-109.217491
1	Chinle Formation	CTS South	Vanadium	T37X107	8/18/2018	0	1	20.9			mg/kg	36.557896	-109.218483
1	Chinle Formation	CTS South	Vanadium	T37X108	5/14/2018	0	1	16.0	QU		mg/kg	36.557915	-109.218391
1	Chinle Formation	CTS South	Vanadium	T37X109	5/14/2018	0	1	16.0	QU		mg/kg	36.557922	-109.218307
1	Chinle Formation	CTS South	Vanadium	T37X111	5/14/2018	0	1	16.0	QU		mg/kg	36.557915	-109.218025
1	Chinle Formation	CTS South	Vanadium	T37X112	5/14/2018	0	1	16.0	QU		mg/kg	36.557907	-109.217934
1	Chinle Formation	CTS South	Vanadium	T37X113	5/14/2018	0	1	16.0	QU		mg/kg	36.557915	-109.217827
1	Chinle Formation	CTS South	Vanadium	T37X114	5/14/2018	0	1	16.0	QU		mg/kg	36.557915	-109.217712
1	Chinle Formation	CTS South	Vanadium	T37X115	5/14/2018	0	1	16.0	QU		mg/kg	36.557911	-109.217606
1	Chinle Formation	CTS South	Vanadium	T37X116	8/18/2018	0	1	16.6			mg/kg	36.557812	-109.21859
1	Chinle Formation	CTS South	Vanadium	T37X117	5/14/2018	0	1	16.6			mg/kg	36.557827	-109.218506

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Vanadium	T37X118	5/14/2018	0	1	16.0	QU		mg/kg	36.557827	-109.218399
1	Chinle Formation	CTS South	Vanadium	T37X118A	8/18/2018	0	1	16.0	QU		mg/kg	36.557835	-109.218407
1	Chinle Formation	CTS South	Vanadium	T37X119	5/14/2018	0	1	16.0	QU		mg/kg	36.557823	-109.218277
1	Chinle Formation	CTS South	Vanadium	T37X120	5/14/2018	0	1	16.0	QU		mg/kg	36.557827	-109.218178
1	Chinle Formation	CTS South	Vanadium	T37X121	5/14/2018	0	1	16.0	QU		mg/kg	36.557816	-109.218056
1	Chinle Formation	CTS South	Vanadium	T37X122	5/14/2018	0	1	16.0	QU		mg/kg	36.557819	-109.217941
1	Chinle Formation	CTS South	Vanadium	T37X123	5/14/2018	0	1	16.0	QU		mg/kg	36.557823	-109.217827
1	Chinle Formation	CTS South	Vanadium	T37X124	5/14/2018	0	1	16.0	QU		mg/kg	36.557819	-109.21772
1	Chinle Formation	CTS South	Vanadium	T37X125	5/14/2018	0	1	16.0	QU		mg/kg	36.557823	-109.217606
1	Chinle Formation	CTS South	Vanadium	T37X126	5/14/2018	0	1	16.0	QU		mg/kg	36.557739	-109.218613
1	Chinle Formation	CTS South	Vanadium	T37X127	5/14/2018	0	1	22.0			mg/kg	36.557735	-109.218521
1	Chinle Formation	CTS South	Vanadium	T37X128	5/14/2018	0	1	16.0	QU		mg/kg	36.557747	-109.218361
1	Chinle Formation	CTS South	Vanadium	T37X129	5/14/2018	0	1	16.0	QU		mg/kg	36.557709	-109.218269
1	Chinle Formation	CTS South	Vanadium	T37X130	5/14/2018	0	1	16.6			mg/kg	36.557743	-109.218155
1	Chinle Formation	CTS South	Vanadium	T37X131	5/14/2018	0	1	51.0			mg/kg	36.557732	-109.218063
1	Chinle Formation	CTS South	Vanadium	T37X132	5/14/2018	0	1	16.0	QU		mg/kg	36.557732	-109.217941
1	Chinle Formation	CTS South	Vanadium	T37X133	5/14/2018	0	1	19.9			mg/kg	36.557735	-109.217842
1	Chinle Formation	CTS South	Vanadium	T37X134	5/14/2018	0	1	16.0	QU		mg/kg	36.557724	-109.217728
1	Chinle Formation	CTS South	Vanadium	T37X135	5/14/2018	0	1	16.0	QU		mg/kg	36.557735	-109.217598
1	Chinle Formation	CTS South	Vanadium	T37X137	5/14/2018	0	1	16.0	QU		mg/kg	36.557644	-109.218491
1	Chinle Formation	CTS South	Vanadium	T37X138	5/14/2018	0	1	16.0	QU		mg/kg	36.557644	-109.218391
1	Chinle Formation	CTS South	Vanadium	T37X139	5/14/2018	0	1	16.0	QU		mg/kg	36.557652	-109.218277
1	Chinle Formation	CTS South	Vanadium	T37X140	5/14/2018	0	1	16.0	QU		mg/kg	36.557636	-109.218163
1	Chinle Formation	CTS South	Vanadium	T37X141	5/14/2018	0	1	22.2			mg/kg	36.557644	-109.218056
1	Chinle Formation	CTS South	Vanadium	T37X142	5/14/2018	0	1	28.8			mg/kg	36.557644	-109.217941
1	Chinle Formation	CTS South	Vanadium	T37X143	5/14/2018	0	1	16.0			mg/kg	36.557644	-109.217834
1	Chinle Formation	CTS South	Vanadium	T37X144	5/14/2018	0	1	16.0	QU		mg/kg	36.557644	-109.217712
1	Chinle Formation	CTS South	Vanadium	T37X145	5/14/2018	0	1	16.0	QU		mg/kg	36.55764	-109.217606
1	Chinle Formation	CTS South	Vanadium	T37X146	5/14/2018	0	1	21.7			mg/kg	36.557564	-109.218498
1	Chinle Formation	CTS South	Vanadium	T37X147	5/14/2018	0	1	16.0	QU		mg/kg	36.55756	-109.218384
1	Chinle Formation	CTS South	Vanadium	T37X148	5/14/2018	0	1	16.0	QU		mg/kg	36.557556	-109.218277
1	Chinle Formation	CTS South	Vanadium	T37X149	5/14/2018	0	1	25.0			mg/kg	36.55756	-109.21817
1	Chinle Formation	CTS South	Vanadium	T37X150	5/14/2018	0	1	16.0	QU		mg/kg	36.557556	-109.218048
1	Chinle Formation	CTS South	Vanadium	T37X151	5/14/2018	0	1	19.3			mg/kg	36.557552	-109.217941
1	Chinle Formation	CTS South	Vanadium	T37X152	5/14/2018	0	1	25.4			mg/kg	36.557552	-109.217827
1	Chinle Formation	CTS South	Vanadium	T37X153	5/14/2018	0	1	16.0	QU		mg/kg	36.557556	-109.21772
1	Chinle Formation	CTS South	Vanadium	T37X154	5/14/2018	0	1	16.0	QU		mg/kg	36.557556	-109.217613
1	Chinle Formation	CTS South	Vanadium	T37X155	5/14/2018	0	1	16.0	QU		mg/kg	36.557465	-109.218498
1	Chinle Formation	CTS South	Vanadium	T37X156	5/14/2018	0	1	16.0	QU		mg/kg	36.557472	-109.218399
1	Chinle Formation	CTS South	Vanadium	T37X157	5/14/2018	0	1	16.0	QU		mg/kg	36.557465	-109.218285
1	Chinle Formation	CTS South	Vanadium	T37X158	5/14/2018	0	1	16.0	QU		mg/kg	36.557465	-109.218178
1	Chinle Formation	CTS South	Vanadium	T37X159	5/14/2018	0	1	16.0	QU		mg/kg	36.557461	-109.218063
1	Chinle Formation	CTS South	Vanadium	T37X160	5/14/2018	0	1	19.0			mg/kg	36.557465	-109.217949
1	Chinle Formation	CTS South	Vanadium	T37X161	5/14/2018	0	1	16.0	QU		mg/kg	36.557461	-109.217834
1	Chinle Formation	CTS South	Vanadium	T37X162	5/14/2018	0	1	16.0	QU		mg/kg	36.557465	-109.21772
1	Chinle Formation	CTS South	Vanadium	T37X163	5/14/2018	0	1	16.0	QU		mg/kg	36.557461	-109.217606
1	Chinle Formation	CTS South	Vanadium	T37X164	5/14/2018	0	1	16.0	QU		mg/kg	36.557377	-109.218399
1	Chinle Formation	CTS South	Vanadium	T37X165	5/14/2018	0	1	16.0	QU		mg/kg	36.557373	-109.218277

Table C-1. Soil Sample Results in Exposure Unit 1 within the Chinle Formation at Cove Transfer Stations Complex

Exposure Unit	Geology	Site	Analyte	Sample ID	Sample Date	Sample Top Depth (inches bgs)	Sample Bottom Depth (inches bgs)	Result	Qualifier	TPU	Units	Latitude	Longitude
1	Chinle Formation	CTS South	Vanadium	T37X166	5/14/2018	0	1	17.3			mg/kg	36.557377	-109.218178
1	Chinle Formation	CTS South	Vanadium	T37X167	5/14/2018	0	1	16.0	QU		mg/kg	36.557373	-109.218063
1	Chinle Formation	CTS South	Vanadium	T37X168	5/14/2018	0	1	16.0	QU		mg/kg	36.557365	-109.217949
1	Chinle Formation	CTS South	Vanadium	T37X169	5/14/2018	0	1	16.3			mg/kg	36.557369	-109.217834
1	Chinle Formation	CTS South	Vanadium	T37X170	5/14/2018	0	1	19.8			mg/kg	36.557369	-109.217728
1	Chinle Formation	CTS South	Vanadium	T37X171	5/14/2018	0	1	22.4			mg/kg	36.557365	-109.217613
1	Chinle Formation	CTS South	Vanadium	T37X172	5/14/2018	0	1	16.0	QU		mg/kg	36.557365	-109.217499
1	Chinle Formation	CTS South	Vanadium	T37X173	5/14/2018	0	1	26.8			mg/kg	36.557278	-109.217949
1	Chinle Formation	CTS South	Vanadium	T37X174	5/14/2018	0	1	16.0	QU		mg/kg	36.557274	-109.217834
1	Chinle Formation	CTS South	Vanadium	T37X175	5/14/2018	0	1	16.0	QU		mg/kg	36.55727	-109.217728
1	Chinle Formation	CTS South	Vanadium	T37X176	5/14/2018	0	1	16.0	QU		mg/kg	36.557278	-109.217613
1	Chinle Formation	CTS South	Vanadium	T37X177	5/14/2018	0	1	17.7			mg/kg	36.557274	-109.217506
1	Chinle Formation	CTS South	Vanadium	T37-SS86A-01-091318	9/13/2018	0	6	13.0			mg/kg	36.558191	-109.217869
1	Chinle Formation	CTS South	Vanadium	T37-SB86A-006018-01-091318	9/13/2018	6	18	15.0			mg/kg	36.558189	-109.217865
1	Chinle Formation	CTS South	Vanadium	T37-SB86A-024036-01-091318	9/13/2018	24	36	15.0			mg/kg	36.558189	-109.217865
1	Chinle Formation	CTS South	Vanadium	T37-SB86A-048060-01-091318	9/13/2018	48	60	15.0			mg/kg	36.558189	-109.217865
1	Chinle Formation	CTS South	Vanadium	T37G1	8/18/2018	0	1	16.0	QU		mg/kg	36.559078	-109.217705
1	Chinle Formation	CTS South	Vanadium	T37G2	8/18/2018	0	1	24.9			mg/kg	36.559082	-109.21759
1	Chinle Formation	CTS South	Vanadium	T37G3	8/18/2018	0	1	16.7			mg/kg	36.559082	-109.217499

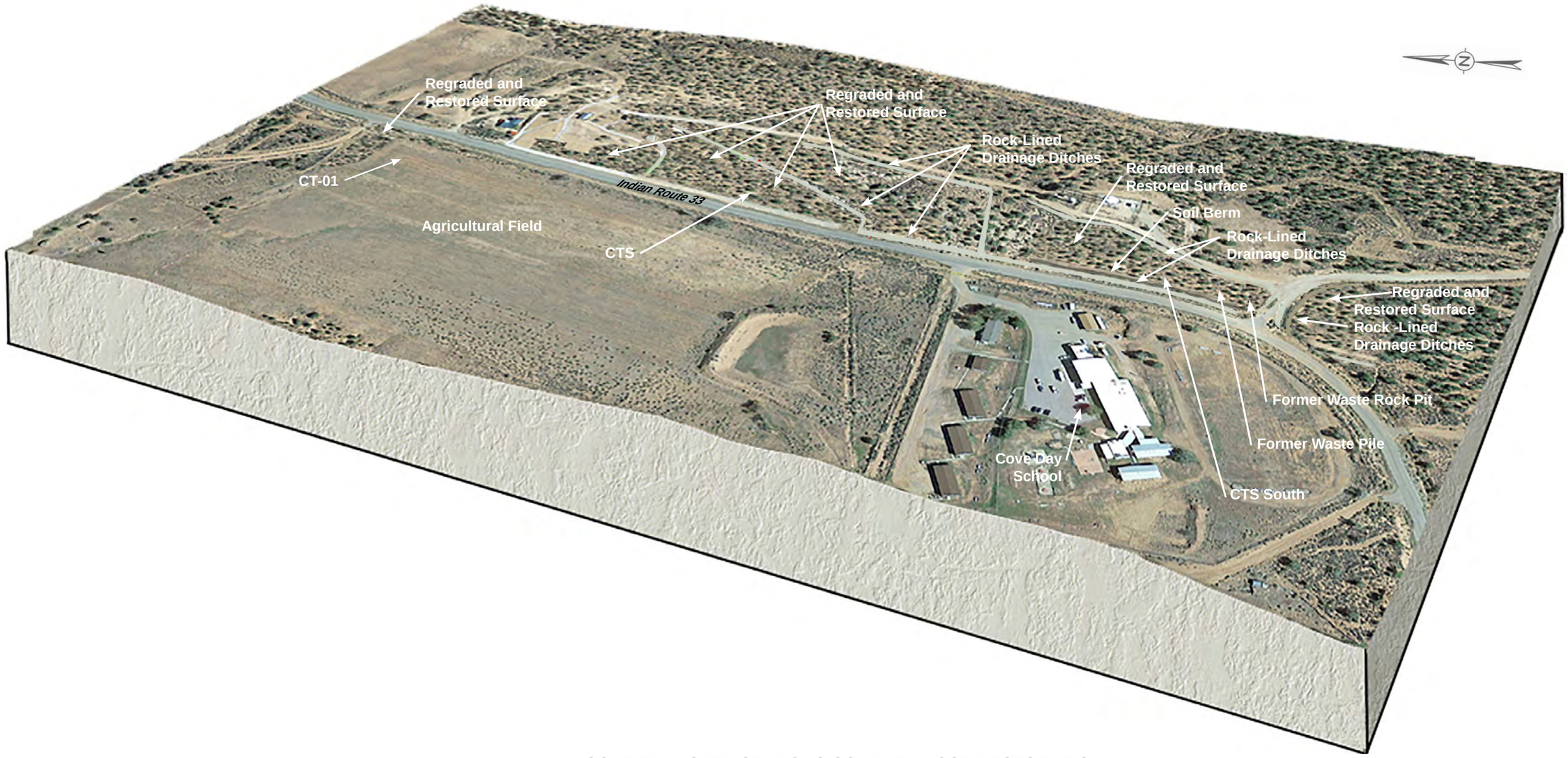
Notes:

Data used in exposure point concentration calculations are presented.

bgs	Below ground surface
CTS	Cove Transfer Station
J	Estimated value
J-	Estimated value, may be biased low.
J+	Estimated value, may be biased high.
LT	Result less than requested minimum detectable concentration, but greater than sample-specific minimum detectable concentration.
MDL	Method detection limit
mg/kg	Milligram per kilogram
pCi/g	Picocurie per gram
QL	Qualifer is given to value when the data are detected but are outside of the lower limits of the prediction model.
QU	Qualifier is given to a reported value where the XRF reported value is detected but is less than XRFMIN and also less than XRFO. This result is nondetect and reported as the maximum observed laboratory MDL for that analyte.
Ra-226	Radium-226
TPU	Total propagated uncertainty
UJ	Not considered detected. The associated value is the reported concentration, which is estimated.
XRF	X-ray fluorescence

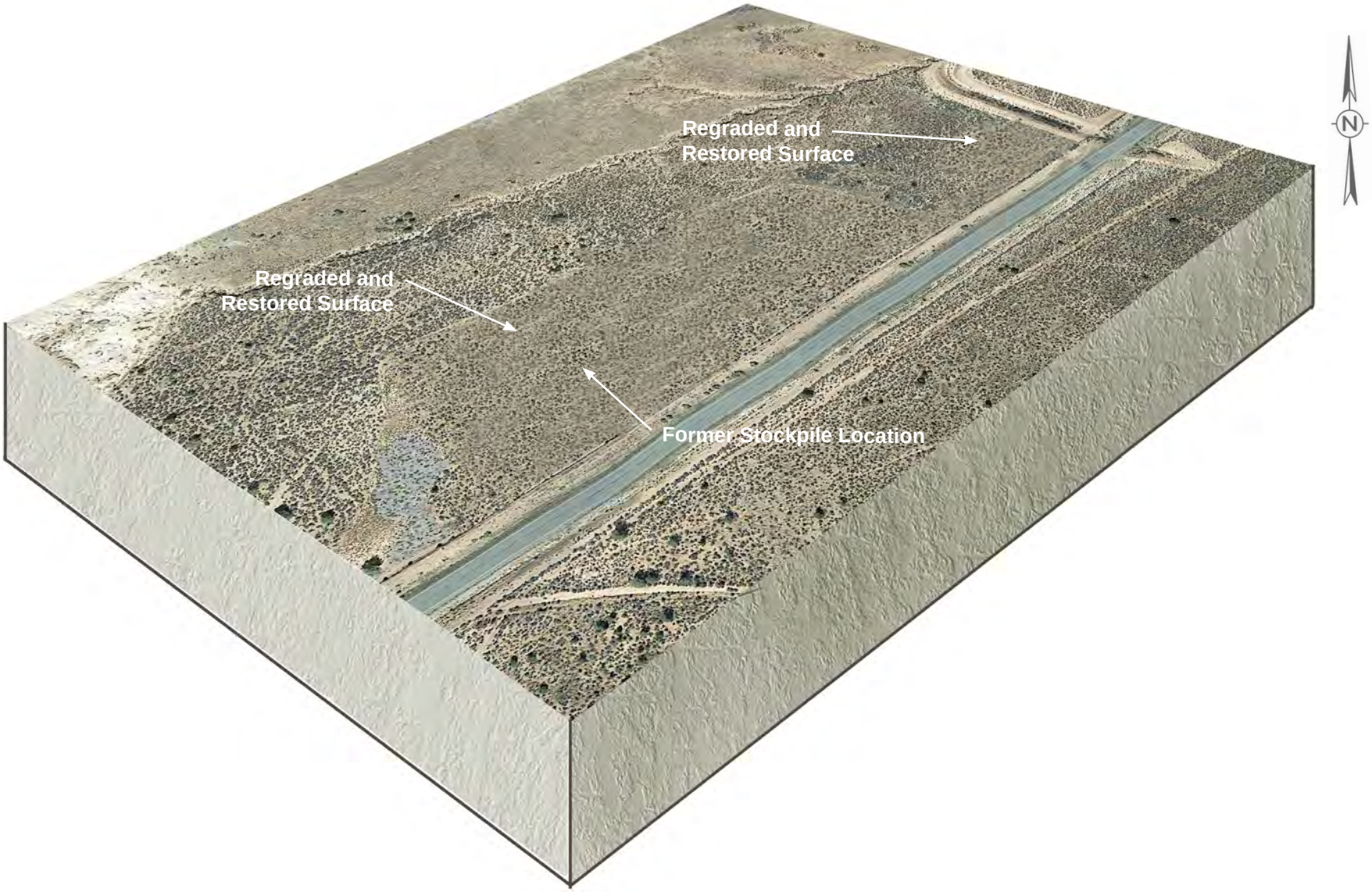
APPENDIX D

POST-RESTORATION VISUALIZATIONS



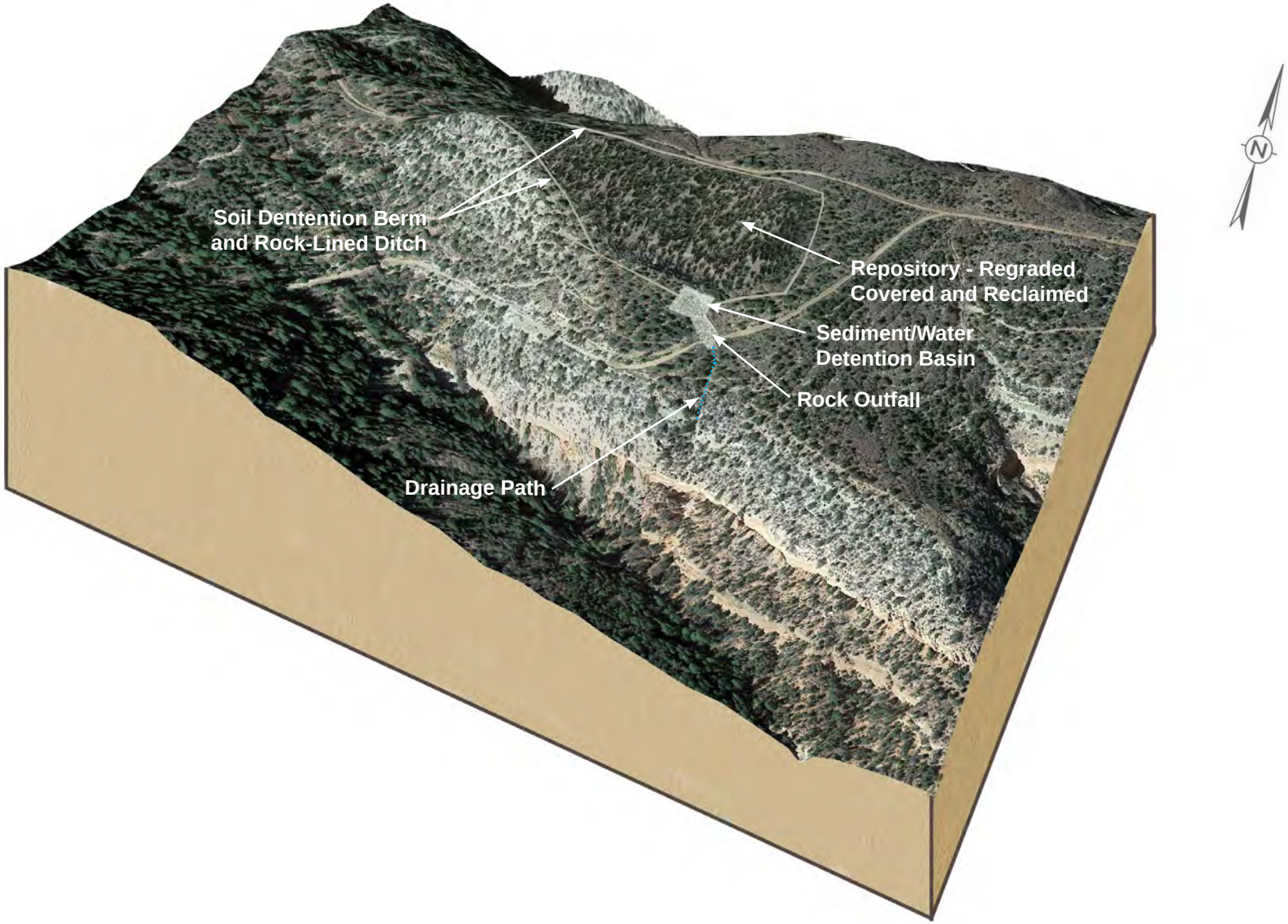
COVE TRANSFER STATIONS COMPLEX POST-RESTORATION

Prepared for: U.S. EPA Region 9	COVE TRANSFER STATIONS COMPLEX POST-RESTORATION VISUALIZATION		
Prepared by: TETRA TECH	Task Order No.: 0016	Contract No: EP-S9-17-03	Figure No: D-1
	Location.: COVE CHAPTER NAVAJO NATION	Date: 9/30/2021	



COVE TRANSFER STATION 2 POST-RESTORATION

Prepared for: U.S. EPA Region 9	COVE TRANSFER STATION 2 POST-RESTORATION VISUALIZATION		
Prepared by: TETRA TECH	Task Order No.: 0016	Contract No: EP-S9-17-03	Figure No: D-2
	Location.: COVE CHAPTER NAVAJO NATION	Date: 9/29/2021	



MESA V REPOSITORY POST-RESTORATION

Prepared for: U.S. EPA Region 9	MESA V REPOSITORY POST-RESTORATION VISUALIZATION		
Prepared by: TETRA TECH	Task Order No.: 0016	Contract No: EP-S9-17-03	Figure No: D-3
	Location.: COVE CHAPTER NAVAJO NATION	Date: 9/30/2021	

APPENDIX E

COST ANALYSIS

Tronox Navajo Area Uranium Mines
Northern Abandoned Uranium Mine Region

Appendix E: Cost Analysis

Cove Transfer Stations Group
Alternatives Analysis Memorandum

Response, Assessment, and Evaluation Services

Contract No. EP-S9-17-03

Task Order 0016

September 30, 2021

Submitted to

U.S. Environmental Protection Agency

Submitted by

Tetra Tech, Inc.

1999 Harrison Street, Suite 500

Oakland, CA 94612

TETRA TECH

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Table E-1. Cove Transfer Stations Group Comparison of Costs for Each Alternative

Alternative	Capital Cost	O&M Yearly Cost (10 Years)	O&M Yearly Cost (1000 Years)	Net Present Value (3.5%)
Cove Transfer Station Complex				
Alternative 2	$6,942,054	$59,999	$20,972	$8,082,132
Alternative 3	$5,942,949	$59,999	$13,125	$6,938,938
Alternative 4	$8,769,391	$59,999	--	$9,268,341
Alternative 5	$14,779,699	$59,999	--	$15,278,649
Cove Transfer Station 2				
Alternative 2	$4,481,349	$26,605	$12,538	$5,085,897
Alternative 3	$3,582,017	$26,605	$7,844	$4,100,622
Alternative 4	$5,271,807	$26,605	--	$5,493,053
Alternative 5	$8,864,548	$26,605	--	$9,085,794
Cove Transfer Stations Group Summary				
Alternative 2	$11,423,403	$86,604	$33,510	$13,168,029
Alternative 3	$9,524,966	$86,604	$20,969	$11,039,560
Alternative 4	$14,041,198	$86,604	--	$14,761,394
Alternative 5	$23,644,247	$86,604	--	$24,364,443

Notes:
O&M Operation & Maintenance

Table E-2. Cove Transfer Stations Group, Cost Rollup for Alternative 2

Cost Component	Cove Transfer Station Complex	Cove Transfer Station 2	Cove Transfer Station Group Totals
Excavated Surface Area (SF)	232,657	107,600	340,527
Excavated Volume (CY)	27,270	16,301	43,571
Capital Costs			
Waste Excavation and Hauling	$1,060,252	$765,737	$1,825,989
Site Restoration	$392,694	$126,950	$519,644
On-Mesa Repository Construction (shared)	$1,226,730	$733,235	$1,959,965
Other Construction	$0	$0	$0
Subtotal Construction	$2,679,676	$1,625,922	$4,305,598
Non-Construction	$4,262,378	$2,855,426	$7,117,804
Total Capital Costs	$6,942,054	$4,481,348	$11,423,402
O&M Costs			
Annual Site Restoration (10 years)	$59,999	$26,605	$86,604
Annual Access Road Maintenance (1,000 years)	$5,862	$3,507	$9,369
Annual Burial Cell Cap Maintenance (1,000 years)	$15,110	$9,031	$24,141
Total Annual O&M Costs	$80,971	$39,143	$120,114
NPV Costs			
10-Year Site Restoration	$498,950	$221,246	$720,196
1,000-Year Trunk Road	$209,297	$125,110	$334,407
1,000 Year On-Mesa Repository	$431,831	$258,193	$690,024
Total NPV Costs	$8,082,132	$5,085,897	$13,168,029

Notes:

CY	Cubic yard
NPV	Net present value
O&M	Operation and maintenance
SF	Square foot

Table E-3. Cove Transfer Stations Group, Cost Rollup for Alternative 3

Cost Component	Cove Transfer Station Complex	Cove Transfer Station 2	Cove Transfer Station Group Totals
Excavated Surface Area (SF)	232,657	107,600	340,527
Excavated Volume (CY)	27,270	16,301	43,571
Capital Costs			
Waste Excavation and Loading	$373,080	$218,982	$592,062
Site Restoration	$392,694	$126,950	$519,644
Repository Access Road Construction (shared)	$438,032	$261,763	$699,795
Hauling to Regional Repository	$282,245	$168,715	$450,960
Regional Repository Construction (shared)	$981,465	$586,513	$1,567,978
Other Construction	$0	$0	$0
Subtotal Construction	$2,467,516	$1,362,923	$3,830,439
Non-Construction	$3,475,433	$2,219,094	$5,694,527
Total Capital Costs	$5,942,949	$3,582,017	$9,524,966
O&M Costs			
Annual Site Restoration (10 years)	$59,999	$26,605	$86,604
Annual Trunk Road Maintenance (1,000 years)	$1,127	$674	$1,801
Annual Regional Repository Maintenance (1,000 years)	$11,998	$7,170	$19,168
Total Annual O&M Costs	$73,124	$34,449	$107,573
NPV Costs			
10-Year Site Restoration	$498,950	$221,246	$720,196
1,000-Year Trunk Road	$149,637	$89,524	$239,161
1,000 Year Regional Repository	$347,402	$207,835	$555,237
Total NPV Costs	$6,938,938	$4,100,622	$11,039,560

Notes:

CY	Cubic yard
NPV	Net present value
O&M	Operation and maintenance
SF	Square foot

Table E-4. Cove Transfer Stations Group, Cost Rollup for Alternative 4

Cost Component	Cove Transfer Station Complex	Cove Transfer Station 2	Cove Transfer Station Group Totals
Excavated Surface Area (SF)	232,657	107,600	340,527
Excavated Volume (CY)	27,270	16,301	43,571
Capital Costs			
Waste Excavation and Loading	$373,080	$218,982	$592,062
Site Restoration	$392,694	$126,950	$519,644
Waste Hauling to White Mesa Mill	$1,767,096	$1,056,305	$2,823,401
Disposal at White Mesa Mill	$2,761,088	$1,650,476	$4,411,564
Other Construction	$0	$0	$0
Subtotal Construction	$5,293,958	$3,052,713	$8,346,671
Non-Construction	$3,475,433	$2,219,094	$5,694,527
Total Capital Costs	$8,769,391	$5,271,807	$14,041,198
O&M Costs			
Annual Site Restoration (10 years)	$59,999	$26,605	$86,604
Total Annual O&M Costs	$59,999	$26,605	$86,604
NPV Costs			
10-Year Site Restoration	$498,950	$221,246	$720,196
Total NPV Costs	$9,268,341	$5,493,053	$14,761,394

Notes:

CY	Cubic yard
NPV	Net present value
O&M	Operation and maintenance
SF	Square foot

Table E-5. Cove Transfer Stations Group, Cost Rollup for Alternative 5

Cost Component	Cove Transfer Station Complex	Cove Transfer Station 2	Cove Transfer Station Group Totals
Excavated Surface Area (SF)	232,657	107,600	340,527
Excavated Volume (CY)	27,270	16,301	43,571
Capital Costs			
Waste Excavation and Loading	$373,080	$218,982	$592,062
Site Restoration	$392,694	$126,950	$519,644
Waste Hauling to RCRA C Facility	$6,959,304	$4,160,015	$11,119,319
Disposal at RCRA C Facility	$3,579,188	$2,139,506	$5,718,694
Other Construction	$0	$0	$0
Subtotal Construction	$11,304,266	$6,645,453	$17,949,719
Non-Construction	$3,475,433	$2,219,094	$5,694,527
Total Capital Costs	$14,779,699	$8,864,547	$23,644,246
O&M Costs			
Annual Site Restoration (10 years)	$59,999	$26,605	$86,604
Total Annual O&M Costs	$59,999	$26,605	$86,604
NPV Costs			
10-Year Site Restoration	$498,950	$221,247	$720,197
Total NPV Costs	$15,278,649	$9,085,794	$24,364,443

Notes:

CY	Cubic yard
NPV	Net present value
O&M	Operation and maintenance
SF	Square foot

Table E-6. Cove Transfer Station Complex, Cost Estimate Scenario Assumptions for Alternative 2, Disposal in On-Mesa Repository

Technology	Assumptions	Cost Effects
Excavation Methods	Waste removed by an excavator is assumed to be removed with a large excavator, unless specified	Excavators can operate on steeper terrain than bulldozers and are better at moving waste uphill. Bulldozers cost less to operate. Spider excavators or other specialized equipment are more expensive.
	Any disturbed surface can be restored using grading and erosion controls	Quantities of erosion control materials and grading may be lower than costed
	Land is barren to warrant no clearing or grubbing	Costs of clearing and grubbing are zero
	All waste specified in the risk assessment will be excavated	Volumes of excavated waste may be lower than costed
	The site is accessible to haul trucks and trucks can be easily loaded	Accessing difficult-to-reach mines increase costs.
Soil and Waste Sorting	Waste will be sorted based on grain size; rock greater than 3 inches will be segregated	NA
	Waste can be sorted within the mine waste footprint	Additional restoration of a separate area would be needed, increasing costs
	Waste can be processed through the screening plant using an excavator	NA
On-Mesa Repository	On-mesa repository is built on top of the nearest Cove mesa	Greater distance to repository increases costs
	Waste can be consolidated into a 360,000 square foot area, which will be graded	Consolidation into a larger area decreases the cost for relocating the waste; however, it increases cost for cover soil
	Access road into site will be maintained for PRSC of the burial cell	Removing the road is cheaper
	A bulldozer will be used to excavate borrow soil	Use of an excavator may increase costs
	Multiple cells will be required to be opened and closed	Multiple mobilizations to open/close cells increases costs
	ET cap will be 3 feet of soil with a biobarrier and capillary break but no liner	Adding biobarrier, capillary break, or liner will increase costs
	No bottom liner or leachate collection system will be installed	Adding bottom liner or leachate collection system increases costs
	Bulldozer will be used to move borrow soil to form cap	Use of an excavator may increase costs.
	The waste excavation area will require cover soil or amendment	If cover soil or amendments are required, costs will increase.
	PRSC inspection of the mine site will be completed for 10 years. PRSC Inspection of the on-mesa repository cell will be completed for 1000 years.	More PRSC inspections will increase costs

Notes:

CY	Cubic yard
ET	Evapotranspiration
NA	Not applicable - inherent assumption
PRSC	Post-removal site control

Table E-7. Cove Transfer Station Complex, Crew Time Productivity Calculations for Alternative 2, Disposal in On-Mesa Repository

	Waste Volume	27,270	CY		
	Removal Area	5.34	AC		
Step	**CTS Complex Excavation & Hauling**				
1	**Action**	**QTY**	**Unit**	**Production CY**	**Days**
	Waste Removal CTS - Excavate/Load/Haul	23,715	LCY	476	50
	Waste Removal CTS South - Excavate/Load/Haul	7,964	LCY	476	17
	Waste Removal CT-01 - Excavate/Load/Haul	2,409	LCY	476	5
		34,088		**Control Days**	**72**
Step	**CTS Complex Restoration**				
2	**Action**	**QTY**	**Unit**	**Production Rate**	**Days**
	Clean Borrow Fill	34,088	LCY	2,888	11.8
	Grading	25,851	SY	12 Days for 22,222 SY	12.0
	Mechanical Seeding, Fertilizer, Mulch	22,094	SY	1,000	22.1
	Erosion Control - Erosion Control Matting	12,033	SY	1,000	12.0
	Erosion Control - Coir Logs/Wattles	3,476	LF	1,000	3.5
	Rock-Lined Ditches	978	CY	1,904	0.5
	Soil Berms	334	CY	2,888	0.1
				Control Days	**62**
				TOTAL PROJECT DAYS	**134**
				Slowest Rate Project Days:	134

Notes:

AC	
BCY	Bank cubic yard
CTS	Cove Transfer Station
CY	Cubic yard
LCY	Loose cubic yard
LF	Linear foot
Mi	Mile
QTY	Quantity
SY	Square yard

Table E-8. Cove Transfer Station Complex, Equipment Cost Details for Alternative 2, Disposal in On-Mesa Repository

Step	Equipment List	QTY	RSMeans #	RSMeans Description	Unit Cost	Unit	Crew
	CTS Complex Excavation						
1	Off-Road Haul Truck	4	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$6.32	LCY	B34F
	Loader 5cy+	1	312323154080	Common Earth - 5cy bucket, front end loader	$16.30	BCY	B10U
			015433204760	Rent front end loader, articulating, 5.25-5.75 CY 270 HP	$8,478.75	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$12,705.00	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity=300 CY/hour	$1.78	BCY	B12D
	CTS Complex Reclamation						
2	Off-Road Haul Truck	1	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$6.32	LCY	B34F
	Loader 5CY+	1	312323154080	Common Earth - 5 CY bucket, front-end loader	$16.30	BCY	B10U
			015433204760	Rent front-end loader, articulating, 5.25-5.75 CY 270 hp	$8,478.75	Month	None (Rental)
	Dozer D6	1	312213200170	8,100-10,000 SF Grading, Dozer	$1,378.08	each	B10L
			015433204260	Rent Dozer, crawler, torque converter, diesel 200 hp	$15,960.00	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$12,705.00	Month	None (Rental)
	Drill Rig	1	015433401865	Rent drill, rotary, crawler, 250hp	$ 23,249.00	Month	None (Rental)
			023213100600	Subsurface investigation, boring and exploratory drilling, auger holes in earth	$ 26.28	LF	B55
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity = 300 CY/hour	$1.78	BCY	B12D
	Rip Rap Class III 24"+	293		Assume $6/mile Class III within 115 miles – $690 delivery of 23 tons and Class II Rip-rap at $45/ton	$75.00	Ton	

Notes:
BCY Bank cubic yard
CTS Cove Transfer Station
CY Cubic yard

Table E-8. Cove Transfer Station Complex, Equipment Cost Details for Alternative 2, Disposal in On-Mesa Repository

hp	Horsepower
K	Thousand
lb.	Pound
LCY	Loose cubic yard
ld.	Loaded
LF	Linear foot
MPH	Mile per hour
SF	Square feet
unld.	Unloaded

Table E-9. Cove Transfer Station Complex, Mesa V Trunk Road Cost Details for Alternative 2, Disposal in On-Mesa Repository

Site Characteristics				
Volume of Waste Transported	576,479	CY		
Length of Road:	10.11	Miles		
Day of Operation	1,400	Days		
Cost Item	**Quantity**	**Unit**	**Unit Cost**	**Crew Cost**
Capital Costs				
Road Grader	1,400	Day	$1,882.05	$ 2,339,077
Off-Road Haul Truck	280	Day	$2,185.20	$ 2,507,713
Dust Control Additive	33	Container	$5,700.00	$ 188,100
Water Truck	1,400	Day	$898.29	$ 3,149,972
Air Quality Monitoring	1,400	Day	$250.00	$ 350,000
Onsite Dust Control Coordinator	1,400	Day	$100.00	$ 140,000
Dozer	280	Day	$2,329.00	$ 3,361,508
Loader 5CY	1,112	Day	$2,032.94	$ 2,877,123
Excavator 2CY	1,112	Day	$2,299.37	$ 3,254,189
Excavator 2CY Rock Hammer	101	Day	$2,759.24	$ 1,115,431
Stormwater BMP's (Hay Bales/Wattles and Silt Fence)	20,782	LF	$8.55	$ 177,690
Culverts 24"	2,657	LF	$137.05	$ 364,143
Gravel (Road Mix)	16,828	Tons	$18.00	$ 302,911
Rip-Rap Class II	3,719	Tons	$55.00	$ 204,523
Subtotal Construction Costs				**$ 20,332,380**
Mobilization				$ 222,925
Travel + Lodging				$ 4,873,298
Project Management		5% of Construction Cost		$ 1,016,619
Engineering Design		8% of Construction Cost		$ 1,626,590
Contractor Site Overhead				$ 3,937,116
Construction Contingencies		20% of Construction Cost		$ 4,066,476
Navajo Tax		6% of Construction, Construction Management, and Contingencies Cost		$ 2,005,932
Total Capital Costs				**$ 38,081,336**
Yearly Post Removal Site Control (PRSC) Costs				
Site Maintenance		0.5% of Construction Cost		$ 101,662
Subtotal PRSC Costs				$ 101,662
PRSC Contingencies		15%		$ 15,249
Navajo Tax		6% of PRSC and Contingencies Cost		$ 7,015
Total Yearly PRSC Cost				**$ 123,926**
Present Value of PRSC Costs Based on 1000 Year Life at 3.50%		PV Factor = 28.571		$ 3,540,686
Total Present Value				**$ 41,622,022**
Construction Cost Per CY				**$ 66**
Total Present Value Cost Per CY				**$ 6**
Total Cost Per CY				**$ 72**

Notes:

"	Inch
CY	Cubic yard
LF	Linear feet
PV	Present value
PRSC	Post-removal site control

Table E-10. Cove Transfer Station Complex, On-Mesa Repository Cost Details for Alternative 2, Disposal in On-Mesa Repository

Site Measurements	QTY	Unit	QTY	Unit		
Repository Area	12.91	AC	562,525	SF		
Repository topsoil 3"	5,209	CY				
Borrow Topsoil 3" (1.5 AC)	605	CY				
Clean Fill Volume (Volume From Estimate calculator)	53,336	CY				
Soil Barrow Fill Volume (at 10' depth need 0.1 AC Area)	9,452	CY				
Waste Volume	213,345	CY				
Laydown Area (google earth)	2.8	AC	121,532	SF		
Laydown topsoil 3"	1,125	CY				
Engineering Design	**Equipment List**	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager			Hour	45	$ 158.00	$ 7,083
Project Engineer			Hour	179.0	$ 122.00	$ 21,839
Design Engineer			Hour	89.5	$ 158.00	$ 14,142
CAD/GIS Operator			Hour	44.8	$ 102.00	$ 4,573
Admin			Hour	18	$ 67.00	$ 1,199
Reproduction			LS	3	$ 500.00	$ 1,500
						$ 50,336
Site Prep	**Equipment List**	**Crew**	**Daily**	**Unit**	**Days**	**Cost**
Clearing and Grubbing	Mulching EQ	B-65	$ 1,712.23	1	5.23	**$ 8,963**
Storm Drain Channel Excavation(includes laydown+25%)	Excavator 3.5 CY = 300CY/hr.	B-12D	$ 3,664.80	1	2.76	**$ 10,100**
Storm Drain Channel Armoring (Riprap)(includes laydown and Pond +25%)	Rip Rap Class II 18"-24"		$ 52.00	311.85		$ 16,216
	Excavator 3.5 CY = 300CY/hr.	B-12D	$ 3,664.80	1	0.59	$ 2,177
	Loader 5.5CY	B-10U	$ 2,032.94	1	0.59	$ 1,208
						$ 19,601
Water Berm Construction and Compaction (includes laydown +25%)	Excavator 3.5 CY = 300CY/hr.	B-12D	$ 3,664.80	1		$ -
	Vibrating plate, Gas 21"	B-18	$ 1,796.16	1	2.76	$ 4,950
	Water Truck	B-59	$ 1,124.99	1	2.76	$ 3,100
						$ 8,051

Table E-10. Cove Transfer Station Complex, On-Mesa Repository Cost Details for Alternative 2, Disposal in On-Mesa Repository

Storm Drain Pond Excavation (includes laydown +25%)	Excavator 3.5 CY = 300CY/hr.	B-12D	$ 3,664.80	1	0.14	**$ 510**
						$ 47,225
Excavation	**Equipment List**	**Crew**	**Daily**	**Unit**	**Days**	**Cost**
Topsoil Stripping and Stockpiling	Excavator 3.5 CY = 300CY/hr.	B-12D	$ 3,664.80	1	3.30	$ 12,109
	Off Road Haul Truck	B34F	$ 1,653.82	3	3.30	$ 16,394
	Loader 5.5CY	B-10U	$ 2,032.94	1	3.30	$ 6,717
	Water Truck	B-59	$ 1,124.99	1	3.30	$ 3,717
						$ 38,938
Repository and Soil Barrow Excavation and Stockpiling	Excavator 3.5 CY = 300CY/hr.	B-12D	$ 3,664.80	1	35.88	$ 131,489
	Off Road Haul Truck 22CY	B34F	$ 1,653.82	2	35.88	$ 118,674
	Dozer 300 HP	B-10M	$ 2,931.70	1	35.88	$ 105,186
	Water Truck	B-59	$ 1,124.99	1	35.88	$ 40,363
						$ 395,713
Borrow Material Screening	Loader 5.5CY	B-10U	$ 2,032.94	1	35.88	$ 72,940
	Screen Plant		$ 4,725.00	1	35.88	$ 169,528
	Water Truck	B-59	$ 1,124.99	1	35.88	$ 40,363
						$ 282,831
Bottom Grading	30,000 lb. Grader	B-11L	$ 2,413.50	1	35.88	**$ 86,594**
						$ 804,074
Operation	**Equipment List**	**Crew**	**Daily**	**Unit**	**Days**	**Cost**
Waste Screening	Loader 5.5CY	B-10U	$ 2,032.94	1	121.9	$ 247,839
	Screen Plant		$ 4,725.00	1	121.9	$ 576,032
	Off Road Haul Truck	B34F	$ 1,653.82	3	121.9	$ 604,859
	Dozer 300 HP	B-10M	$ 2,931.70	1	121.9	$ 357,408
	Water Truck	B-59	$ 1,124.99	1	121.9	$ 137,149
						$ 1,923,286
		Cost of 5 Years Operation = 1 Year Cost of Waste Screening * 20% for Mobilization / Lodging				**$ 2,307,943**
Waste Grading of Each Lift + Waste Compaction of Each Lift	30,000 lb. Grader	B-32A	$ 3,856.00	1	121.9	$ 470,090
	Water Truck	B-59	$ 1,124.99	1	121.9	$ 137,149
						$ 607,240

Table E-10. Cove Transfer Station Complex, On-Mesa Repository Cost Details for Alternative 2, Disposal in On-Mesa Repository

						$ 2,915,182
Closure	**Equipment List**	**Crew**	**Daily**	**Unit**	**Days**	**Cost**
Waste Final Grading	30,000 lb. Grader	B-11L	$ 2,413.50	1	4.3	$ 10,389
	Water Truck	B-59	$ 1,124.99	1	4.3	$ 4,843
						$ 15,232
Cap Cover Installation	Gravel Delivered - 1" Rock Crushed Size 56 (Tons)		$ 10.95	1250	1	$ 13,688
	Gravel Delivered - 5/8" Rock Crushed (Tons)		$ 18.80	3545	1	$ 66,646
	Loader 5.5CY	B-10U	$ 2,032.94	1	59.8	$ 121,566
	Off Road Haul Truck	B34F	$ 1,653.82	4	29.9	$ 197,791
	Dozer 300 HP	B-10M	$ 2,931.70	1	29.9	$ 87,655
	30,000 lb. Grader	B-11L	$ 2,413.50	1	29.9	$ 72,161
	Water Truck	B-59	$ 1,124.99	1	29.9	$ 33,636
						$ 593,143
						$ 608,374
Reclamation	**Equipment List**	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Revegetation Mat			SF	56,763	$ 1.68	$ 95,362
Hay Bales/Wattles and Silt Fence			LF	2500	$ 8.55	$ 21,375
Fertilizer, Seed, and Mulch			SY	56763	$ 4.02	$ 228,189
						$ 344,926
Other Line Items	**Equipment List**	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Fence			LF	3180	$ 38.00	$ 120,840
Survey			AC	12.91	$ 3,425.00	$ 44,230
Water Well, Pump, Tank and Generator			LS	1	$ 65,523.48	$ 65,523
Well Installation			LS	1	$ 462,794.91	$ 462,795
						$ 693,388
Subtotal Construction Costs						**$ 5,413,169**
Contractor Site Overhead						**$ 1,620,980**
Travel + Lodging:						**$ 678,179**
Mobilization / Demobilization:						**$ 250,015**
Level of Accuracy (20%)						**$ 1,082,634**
Navajo Tax (6%):						**$ 502,008**
Total Construction Cost:						**$ 9,597,321**

Table E-10. Cove Transfer Station Complex, On-Mesa Repository Cost Details for Alternative 2, Disposal in On-Mesa Repository

Yearly Post Removal Site Control (PRSC) Costs						
Site Inspections			1	EA	$1,000.00	$ 1,000
Site Maintenance			1% of Construction Cost			$ 95,973
Subtotal PRSC Costs						**$ 96,973**
PRSC Contingencies			15%			$ 14,546
Navajo Tax			6% of PRSC and Contingencies Cost			$ 6,691
Total Yearly PRSC Cost						**$ 118,210**
Present Value of PRSC Costs Based on 1,000 Year Life at 3.50%			PF Factor = 28.571			**$ 3,377,388**
Total Present Worth						**$ 12,974,708**
Cost Per CY:						**$ 61**

Notes:

"	Inch
AC	Acres
CAD	Computer-aided design
CY	Cubic yard
EQ	Equipment
GIS	Geographic information system
hr	Hour
lb.	Pound
LF	Linear feet
LS	Lump sum
N/A	Not applicable
PRSC	Post-removal site control
SY	Square yard

Table E-11. Cove Transfer Station Complex, Cost Estimate Details for Alternative 2, Disposal in On-Mesa Repository

Engineering Design	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	293	$ 158.00	$ 46,294
Project Engineer	N/A	Hour	1,170	$ 122.00	$ 142,740
Design Engineer	N/A	Hour	585	$ 158.00	$ 92,430
CAD/GIS Operator	N/A	Hour	293	$ 102.00	$ 29,886
Admin	N/A	Hour	117	$ 67.00	$ 7,839
Reproduction	N/A	LS	3	$ 500.00	$ 1,500
					$ 320,689
Planning Documents	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	405	$ 158.00	$ 63,990
Project Engineer	N/A	Hour	1,620	$ 122.00	$ 197,640
CAD/GIS Operator	N/A	Hour	405	$ 102.00	$ 41,310
Admin	N/A	Hour	162	$ 67.00	$ 10,854
Reproduction	N/A	LS	3	$ 500.00	$ 1,500
					$ 315,294
Resource Surveys	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Cultural Resources Mitigation	N/A	Each	1	$ 27,361.11	$ 27,361
Biological Resources Mitigation	N/A	Each	1	$ 54,722.22	$ 54,722
Geotechnical Testing and Report	N/A	Each	1	$ 54,722.22	$ 54,722
Pre-Project Aerial LIDAR Survey	N/A	Each	0	$ 30,000.00	$ -
Post-Project Aerial LiDAR Survey	N/A	Each	1	$ 82,083.33	$ 82,083
					$ 218,889
Confirmation Sampling	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Developing Sampling and Analysis Plan					
Project Geologist	N/A	Hour	360	$ 158.00	$ 56,880
Project Manager	N/A	Hour	180	$ 111.00	$ 19,980
CAD/GIS Operator	N/A	Hour	180	$ 122.00	$ 21,960
Project Chemist	N/A	Hour	360	$ 111.00	$ 39,960
Health and Safety Manager	N/A	Hour	180	$ 151.00	$ 27,180
Admin	N/A	Hour	72	$ 67.00	$ 4,824
Reproduction	N/A	LS	3	$ 250.00	$ 750
Sampling					
Sampling Team - Staff Geologist	N/A	Hour	82	$ 77.00	$ 6,320
Sampling Team - Staff Engineer	N/A	Hour	82	$ 81.00	$ 6,649
Travel	N/A	Day	17	$ 170.00	$ 2,890
Per Diem (96/55)	N/A	Day	17	$ 151.00	$ 2,567
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 13,987.00	$ 13,987
Lab Analysis	N/A	LS	1	$ 4,506.38	$ 4,506
XRF Surveying					
Sampling Team - Staff Geologist	N/A	Hour	306	$ 77.00	$ 23,596
Sampling Team - Staff Engineer	N/A	Hour	306	$ 81.00	$ 24,822
Travel	N/A	Day	28	$ 170.00	$ 4,760
Per Diem (96/55)	N/A	Day	49	$ 151.00	$ 7,437
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 13,987.00	$ 13,987
Lab Analysis	N/A	LS	1	$ 4,506.38	$ 4,506

Table E-11. Cove Transfer Station Complex, Cost Estimate Details for Alternative 2, Disposal in On-Mesa Repository

Frisking Equipment	N/A	Month	27	$ 144.00	$ 3,940
					$ 291,502
Reporting	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Geologist	N/A	Hour	316	$ 105.00	$ 33,180
Project Manager	N/A	Hour	158	$ 175.00	$ 27,650
Project Engineer	N/A	Hour	474	$ 122.00	$ 57,828
Chemist	N/A	Hour	158	$ 111.00	$ 17,538
CAD/GIS Operator	N/A	Hour	158	$ 102.00	$ 16,116
Admin	N/A	Hour	63	$ 67.00	$ 4,221
Reproduction	N/A	LS	3	$ 500.00	$ 1,500
					$ 158,033
Mobilization/Demobilization	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Crew Mileage	N/A	Mile	7,920	$ 0.56	$ 4,435
Per Diem	N/A	Day	24	$ 182.00	$ 4,368
Labor	N/A	Day	24	$ 300.00	$ 7,200
Standard Equipment Mileage	N/A	Mile	7,920	$ 0.56	$ 4,435
Standard Equipment Rental	N/A	Day	4	$ 14,349.78	$ 57,399
					$ 77,838
Excavation & Hauling	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Loader 5cy+	B10U	$ 2,032.94	1	72	$ 146,372
Off Road Haul Truck	B34F	$ 1,653.82	4	72	$ 476,300
Grader 30,000 lb.	B11L	$ 2,413.50	1	72	$ 173,772
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664.00	1	72	$ 263,808
				Total	**$ 1,060,252**
Reclamation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Off Road Haul Truck	B34F	$ 1,653.82	1	26	$ 102,537
Loader 5cy+	B10U	$ 2,032.94	1	1	$ 26,428
Grader 30,000 lb.	B11L	$ 2,413.50	1	7	$ 28,962
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664.00	1	1	$ 47,632
Dozer D6	B10M	$ 2,931.70	1	1	$ 35,180
Rip Rap Class II 18"-24"	NA	$ 45.00	293	1	$ 13,204
Site Area Reclamation Materials	N/A	$ 68,239.50	1	1	$ 138,751
				Total	**$ 392,694**
Contractor Site Overhead	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager (10% of time)	N/A	Hour	134	$ 175.00	$ 23,388
Site Superintendent	N/A	Hour	1,336	$ 191.00	$ 255,259
H&S Officer	N/A	Hour	1,336	$ 85.00	$ 113,597
QA/QC Officer	N/A	Hour	1,336	$ 85.00	$ 113,597
Field Clerk	N/A	Hour	1,336	$ 19.00	$ 25,392
Fuel for Site Vehicles	N/A	Month	31	$ 1,600.00	$ 49,894
Port-o-let Rental (4)	N/A	Month	27	$ 208.00	$ 5,560
Permanent Fencing Installation and Demolition	N/A	LF	1,929	$ 41.92	$ 80,880
Job Trailers (1)	N/A	Month	7	$ 269.00	$ 1,798
Storage Boxes (1)	N/A	Month	7	$ 94.50	$ 631
Field Office Lights/HVAC (1)	N/A	Month	7	$ 179.00	$ 1,196
Generator (1)	N/A	Month	13	$ 2,400.00	$ 32,074

Table E-11. Cove Transfer Station Complex, Cost Estimate Details for Alternative 2, Disposal in On-Mesa Repository

Fuel for Generator	N/A	Gallons	4,009	$ 4.00	$ 16,037
Telephone/internet (1)	N/A	Month	7	$ 384.00	$ 2,566
Field Office Equipment	N/A	Month	7	$ 230.00	$ 1,537
Field Office Supplies	N/A	Month	7	$ 96.00	$ 641
Trash (1 dumpster)	N/A	Month	7	$ 910.00	$ 6,081
Clin 1034 High Volume Air Sampling (4)	N/A	Month	27	$ 383.00	$ 10,237
Clin 1025 Ludlum 2121 and 43-10-1	N/A	Month	7	$ 275.00	$ 1,838
Air Monitoring Lab Confirmation Sampling (5 samples per day)	N/A	Day	668	$ 600.00	$ 400,930
Clin 1036 Personal Air Monitor	N/A	Month	40	$ 204.00	$ 8,252
Clin 1038 Personal Dust Monitor	N/A	Month	40	$ 1,555.00	$ 62,900
Clin 1068 Personal Dosimeter Badge	N/A	Month	40	$ 59.00	$ 2,387
Truck Scales	N/A	Month	7	$ 300.00	$ 2,005
Construction Water (excavation)	N/A	Gallon	64,085	$ 0.05	$ 3,204
Construction Water (hauling waste soil plus cap mat'l)	N/A	Gallon	1,311,336	$ 0.05	$ 65,567
6,000 Gallon Water Truck and Operator (1)	N/A	Day	134	$ 889.00	$ 118,809
Portal Water Tower Trailer, 10,000 gallons (1)	N/A	Day	134	$ 172.36	$ 23,035
					$ 1,429,290
Third-Party Oversight	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Travel and Lodging (4 people)	N/A	Day	535	$ 151.00	$ 80,721
Labor	N/A	Hour	5,346	$ 80.00	$ 427,659
Car Rental (4 cars)	N/A	Month	27	$ 400.00	$ 10,691
Car Fuel	N/A	Month	27	$ 760.00	$ 20,314
					$ 539,385
Level of Accuracy (20%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
20% of Construction Cost	N/A	N/A	N/A	N/A	**$ 288,279**
Navajo Tax (6%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
6% of Confirmation Sampling, Construction, Contractor Overhead, Mobilization / Demobilization, and Third Party Oversight Costs	N/A	N/A	N/A	N/A	**$ 244,061**
				GRAND TOTAL	**$ 5,707,515**
PRSC Costs	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
(4 person crew, 1 day, 10 hr/day)	N/A	Hour	80	$ 85.00	$ 6,800
Mileage (Farmington, NM, to Site, roundtrip)	N/A	Mile	815	$ 0.58	$ 473
Inspection Crew Per Diem	N/A	Day	24	$ 151.00	$ 3,624
(revegetation, grading, watering)	N/A	SY	25,851	$ 1.11	$ 28,723
(Professional Engineer)	N/A	Hour	80	$ 120.00	$ 9,600
PRSC Annual Cost					**$ 49,220**
PRSC Contingency (15%)					**$ 7,383**
Navajo Tax (6% of PRSC and Contingencies Cost					**$ 3,396**
Total PRSC Annual Cost					**$ 59,999**

Table E-11. Cove Transfer Station Complex, Cost Estimate Details for Alternative 2, Disposal in On-Mesa Repository

Notes:

"	Inch
CAD	Computer-aided design
CY	Cubic yard
GIS	Geographic information system
H&S	Health and safety
hp	Horsepower
hr	Hour
HVAC	Heating, ventilation, and air conditioning
K	Thousand
lb.	Pound
LF	Linear feet
LiDAR	Light detection and ranging
LS	Lump sum
M2	Square meters
N/A	Not applicable
NM	New Mexico
PRSC	Post-removal site control
QA/QC	Quality assurance/quality control
SY	Square yard
XRF	X-ray fluorescence

Table E-12. Cove Transfer Station Complex, Cost Estimate Summary for Alternative 2, Disposal in On-Mesa Repository

Waste Volume		27,270 CY
Removal Area		5.34 AC
Excavation & Hauling		**Unit Cost**
Loader 5cy+	$	146,372
Off Road Haul Truck	$	476,300
Grader 30,000 lb.	$	173,772
Excavator 3.5 cy ~ 80K-100K lb.	$	263,808
Subtotals Step 1	**$**	**1,060,252**
Reclamation		**Unit Cost**
Haul Truck	$	102,537
Loader 5cy+	$	26,428
Grader 30,000 lb.	$	28,962
Excavator 3.5 cy ~ 80K-100K lb.	$	47,632
Dozer D6	$	35,180
Rip Rap Class II 18"-24"	$	13,204
Site Area Reclamation Materials	$	138,751
Subtotals Step 2	**$**	**392,694**
Subtotal Construction	**$**	**1,452,946**
Other Costs		**Unit Cost**
Non-Construction Costs		
Engineering Design	$	320,689
Planning Documents	$	315,294
Resource Surveys	$	218,889
Confirmation Sampling	$	291,502
Reporting	$	158,033
Contractor Site Overhead	$	1,426,623
Mobilization / Demobilization	$	77,838
Travel+ Lodging (Construction Workers)	$	380,024
Level of Accuracy (20%)	$	290,589
Third-Party Oversight	$	538,233
Navajo Tax (6%)	$	244,664
Subtotals Step 6	**$**	**4,262,378**
Total Site Capital Costs	**$**	**5,715,324**
Yearly On-Site PRSC Costs		**Unit Cost**
Bi-annual Inspection (4 person crew, 3 days, 10 hr/day)	$	6,800
Mileage (Farmington, NM, to Site, roundtrip)	$	473
Inspection Crew Per Diem	$	3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	$	28,723
Preperation of Semi-annual Reports (Professional Engineer)	$	9,600
Subtotal PRSC Costs	**$**	**49,220**
PRSC Contingencies (15%)	$	7,383
Navajo Tax (6% of PRSC and Contingencies Cost)	$	3,396
Total Yearly PRSC Costs	**$**	**59,999**
Present Value of PRSC Costs Based on 10-Year Life at 3.50% (PV Factor = 8.317)	**$**	**498,950**
Mesa V Trunk Road Cost Share (4.7%)		
Mesa V Trunk Road Yearly PRSC Costs	**$**	**5,862**

Table E-12. Cove Transfer Station Complex, Cost Estimate Summary for Alternative 2, Disposal in On-Mesa Repository

Mesa V Trunk Road Cost per CY (Includes 1000-year PRSC)	**$**	**6**
Mesa V Trunk Road Shared Cost	**$**	**209,297**
Mesa V ET Cap Cost Share (12.8%)		
Mesa V ET Cap Construction Costs	**$**	**1,226,730**
Mesa V ET Cap Total Yearly PRSC Costs	**$**	**15,110**
Mesa V ET Cap Cost per CY (Includes 1000-year PRSC)	**$**	**61**
Mesa V ET Cap Shared Cost	**$**	**1,658,561**
Grand Total Capital Costs	**$**	**6,942,054**
TOTAL COSTS	**$**	**8,082,132**

Notes:

"	Inch
AC	Acres
CY	Cubic yard
ET	Evapotranspiration
hp	Horsepower
hr	Hour
K	Thousand
lb.	Pound
LF	Linear feet
NM	New Mexico
PRSC	Post-removal site control
PV	Present value
T&M	Time and material

Table E-13. Cove Transfer Station Complex, Cost Estimate Scenario Assumptions for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Technology	Assumptions	Cost Effects
Excavation Methods	Waste removed by an excavator is assumed to be removed with a large excavator, unless specified	Excavators can operate on steeper terrain than bulldozers and are better at moving waste uphill. Bulldozers cost less to operate. Spider excavators or other specialized equipment are more expensive.
	Any disturbed surface can be restored using grading and erosion controls	Quantities of erosion control materials and grading may be lower than costed
	Land is barren to warrant no clearing or grubbing	Costs of clearing and grubbing are zero
	All waste specified in the risk assessment will be excavated	Volumes of excavated waste may be lower than costed
	The site is accessible to haul trucks and trucks can be easily loaded	Accessing difficult-to-reach mines increase costs.
Soil and Waste Sorting	Waste will be sorted based on grain size; rock greater than 3 inches will be segregated	NA
	Waste can be sorted within the mine waste footprint	Additional restoration of a separate area would be needed, increasing costs
	Waste can be processed through the screening plant using an excavator	NA
Regional Repository	Suitable repository location is available within 25 road miles of the waste	Greater distance to repository increases costs
	Waste can be consolidated into a 1,700,000 square foot area, which will be graded	Consolidation into a larger area decreases the cost for relocating the waste; however, it increases cost for cover soil
	A bulldozer will be used to excavate borrow soil	Use of an excavator may increase costs
	One cell will be constructed in the repository	Multiple cells will be required because of weather conditions and will increase complexity and costs
	Waste will be consolidated from multiple locations	Consolidating waste from multiple locations increases costs
	Waste will be transported in haul trucks	Longer hauling distances will slow production rate of excavation
	ET cap will be 3 feet of soil with a biobarrier and capillary break but no liner	Adding biobarrier, capillary break, or liner will increase costs
	No bottom liner or leachate collection system will be installed	Adding bottom liner or leachate collection system increases costs
	Bulldozer will be used to move borrow soil to form cap	Use of an excavator may increase costs.
	The waste excavation area will not require cover soil or amendment	If cover soil or amendments are required, costs will increase.
	PRSC inspection of the mine site will be completed for 10 years. PRSC Inspection of the on-site burial cell will be completed for 1000 years.	More PRSC inspections will increase costs

Notes:

CY	Cubic yard
ET	Evapotranspiration
GCL	Geosynthetic clay liner
NA	Not applicable - inherent assumption
PRSC	Post-removal site control

Table E-14. Cove Transfer Station Complex, Crew Time Productivity Calculations for Alternative 3, Disposal in On-Navajo Nation Regional Repository

	Waste Volume	27,270	CY		
	Removal Area	5.34	AC		
Step	**CTS Complex Excavation & Hauling**				
	Action	**QTY**	**Unit**	**Production CY**	**Days**
1	Waste Removal CTS - Excavate/Load/Haul	23,715	LCY	756	31
	Waste Removal CTS South - Excavate/Load/Haul	7,964	LCY	756	11
	Waste Removal CT-01 - Excavate/Load/Haul	2,409	LCY	756	3
		34,088		**Control Days**	**45**
Step	**CTS Complex Restoration**				
	Action	**QTY**	**Unit**	**Production Rate**	**Days**
2	Clean Borrow Fill	34,088	LCY	2,888	11.8
	Grading	25,851	SY	12 Days for 22,222 SY	12.0
	Mechanical Seeding, Fertilizer, Mulch	22,094	SY	1,000	22.1
	Erosion Control - Erosion Control Matting	12,033	SY	1,000	12.0
	Erosion Control - Coir Logs/Wattles	3,476	LF	1,000	3.5
	Rock-Lined Ditches	978	CY	1,904	0.5
	Soil Berms	334	CY	2,888	0.1
				Control Days	**62**
				TOTAL PROJECT DAYS	**107**
				Slowest Rate Project Days:	107

Notes:

AC	Acre
BCY	Bank cubic yard
CTS	Cove Transfer Station
CY	Cubic yard
LCY	Loose cubic yard
LF	Linear foot
Mi	Mile
QTY	Quantity
SY	Square yard

Table E-15. Cove Transfer Station Complex, Equipment Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Step	Equipment List	QTY	RSMeans #	RSMeans Description	Unit Cost	Unit	Crew
	CTS Complex Excavation						
1	Off-Road Haul Truck	0	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$ 6.32	LCY	B34F
	Loader 5cy+	1	312323154080	Common Earth - 5cy bucket, front end loader	$ 16.30	BCY	B10U
			015433204760	Rent front end loader, articulating, 5.25-5.75 CY 270 HP	$ 8,478.75	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$ 631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$ 12,705	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity=300 CY/hour	$ 1.78	BCY	B12D
	CTS Complex Reclamation						
2	Off-Road Haul Truck	1	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$ 6.32	LCY	B34F
	Loader 5CY+	1	312323154080	Common Earth - 5 CY bucket, front-end loader	$ 16.30	BCY	B10U
			015433204760	Rent front-end loader, articulating, 5.25-5.75 CY 270 hp	$ 8,478.75	Month	None (Rental)
	Dozer D6	1	312213200170	8,100-10,000 SF Grading, Dozer	$ 1,378.08	each	B10L
			015433204260	Rent Dozer, crawler, torque converter, diesel 200 hp	$ 15,960	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$ 631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$ 12,705	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity = 300 CY/hour	$ 1.78	BCY	B12D
	Rip Rap Class III 24"+	293		Assume $6/mile Class III within 115 miles =	$ 75	Ton	

Notes:

BCY	Bank cubic yard
CTS	Cove Transfer Station
CY	Cubic yard
hp	Horsepower
K	Thousand
lb.	Pound
LCY	Loose cubic yard
ld.	Loaded
LF	Linear foot

Table E-15. Cove Transfer Station Complex, Equipment Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

MPH	Mile per hour
SF	Square feet
unld.	Unloaded

Table E-16. Cove Transfer Station Complex, Regional Repository Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Site Measurements	QTY	Unit	Site Measurements	QTY	Unit	
Repository Area	39.2	AC	Yearly Waste Volume	981,220	CY	
Laydown Area	15.0	AC	Yearly Borrow Volume	21,286	CY	
Haul Route From transfer	21	Mile				
Haul Road to Repository	2	Mile				
Topsoil Volume	21,562	CY				
Borrow Volume	194,058	CY				
Waste volume	934,022	CY				
Engineering Design	**Equipment List**	**Unit**	**Amount**	**Price**	**Cost**	
Project Manager		Hour	293	$ 158.00	$ 46,294	
Project Engineer		Hour	1,170	$ 122.00	$ 142,740	
Design Engineer		Hour	585	$ 158.00	$ 92,430	
CAD/GIS Operator		Hour	293	$ 102.00	$ 29,886	
Admin		Hour	117	$ 67.00	$ 7,839	
Reproduction		LS	3	$ 500.00	$ 1,500	
					$ 320,689	
Site Prep	**Component**	**Crew/Unit**	**Crew Day/Total Cost**	**Days**	**Total Cost**	
Clearing and Grubbing	Flatbed truck, Power Mulcher	B-65	$ 5,136.69	16	$ 84,230	
Stormwater channel	Excavator 3.5 CY = 300CY/hr.	B-12Y	$ 4,194.80	3.3	$ 13,987	
Stormwater pond	Excavator 3.5 CY = 300CY/hr.	B-12Y	$ 4,194.80	1.6	$ 6,832	
RipRap for channel and pond outfall	Class II riprap (delivered)	Tons	$ 126,500.00		$ 126,500	
	Off-road Haul Truck 22CY	B34F	$ 1,653.82	2.7	$ 4,528	
	Loader 5CY	B-10U	$ 2,032.94	2.0	$ 4,066	
	Excavator 3.5 CY = 300CY/hr.	B-12Y	$ 4,194.80	5.0	$ 20,974	
Culverts	Excavator 3.5 CY = 300CY/hr.	B-12Y	$ 4,194.80	5.0	$ 20,974	
	Culverts 24"	LF	$ 27,400.00		$ 27,400	
Water Well pump, Tank and Generator		EA	$ 38,350.00		$ 38,350	

Table E-16. Cove Transfer Station Complex, Regional Repository Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Well Drilling		LF	$ 77,000.00		$ 77,000	
Water Truck		B-59	$ 1,124.99	36	$ 40,611	
					$ 465,451	
Yearly Operation	**Component**	**Crew/Unit**	**Crew Day/Total Cost**	**Days**	**Total Year Cost**	**10 year cost**
Strip and stockpile Soil	Scraper 21 CY, Dozer 300HP	B-33E	$ 4,556.48	0.52	$ 2,385	$ 23,846
	Scraper 21 CY, Dozer 300HP	B-33E!	$ 10,874.40	0.52	$ 5,691	$ 56,911
Strip Barrow	Scraper 21 CY, Dozer 300HP	B-33E	$ 4,556.48	5.2	$ 23,535	$ 235,350
	Scraper 21 CY, Dozer 300HP	B-33E!	$ 10,874.40	5.2	$ 56,168	$ 561,682
Screen Barrow	Loader 5CY	B-10U	$ 2,032.94	11	$ 21,636	$ 216,363
	Screen Plant	Daily	$ 4,725.00	11	$ 50,287	$ 502,875
Bottom Grading	Grader- 30K lb.	B-11L	$ 2,413.50	1.6	$ 3,973	$ 39,735
Waste Screening and Sorting	Loader 5CY	B-10U	$ 2,032.94	49	$ 99,738	$ 997,381
	Screen Plant	Daily	$ 4,725.00	49	$ 231,813	$ 2,318,132
Waste Placement	Scraper 21 CY, Dozer 300HP	B-33E	$ 4,556.48	5.2	$ 23,541	$ 1,085,172
	Scraper 21 CY, Dozer 300HP	B-33E!	$ 10,874.40	5.2	$ 56,182	$ 2,589,849
	Loader 5CY	B-10U	$ 2,032.94	5.2	$ 10,503	$ 484,165
	Off-road Haul Truck 22CY	B34F	$ 3,307.64	5.2	$ 17,089	$ 787,748
Waste Grading and Compacting	30,000 lb. Grader + 25 ton roller	B-32A	$ 3,856.00	52	$ 199,136	$ 1,991,360
Cap Cover 2 ft.	Scraper 21 CY, Dozer 300HP	B-33E	$ 9,112.96	11	$ 102,092	$ 1,020,925
	30,000 lb. Grader + 25 ton roller	B-32A	$ 3,856.00	11	$ 43,199	$ 431,988
Topsoil	Scraper 21 CY, Dozer 300HP	B-33E	$ 18,225.92	0.52	$ 9,539	$ 95,385
	Grader- 30K lb.	B-11L	$ 603.38	0.52	$ 316	$ 3,158
Temporary Cap cell end cover HDPE Liner			$ 23,054.10		$ 23,054	$ 230,541
Water Truck	5,000 Gallon	B-59	$ 1,124.99	140	$ 157,499	$ 1,574,986
Revegetation mat			$ 35,759.98		$ 35,760	$ 357,600
Bales/Wattles + Silt fence			$ 4,341.69		$ 4,342	$ 43,417
Mechanical Seeding, Fertilizer, Mulch			$ 78,011.32		$ 78,011	$ 780,113
						$ 16,428,683
Subtotal Construction Costs						**$ 16,894,133**
Contractor Site Overhead						**$ 9,334,339**
Travel + Lodging:						**$ 2,690,044**
Mobilization / Demobilization:						**$ 864,519**

Table E-16. Cove Transfer Station Complex, Regional Repository Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Level of Accuracy (20%)						**$ 3,378,827**
Navajo Tax (6%):						**$ 1,828,309**
Total Construction Cost:						**$ 35,310,859**
Yearly Post Removal Site Control (PRSC) Costs						
Yearly Operation	**Component**	**Crew/Unit**	**Crew Day/Total Cost**	**Days**	**Total Year Cost**	**10 year cost**
Site Inspections			1	EA	$1,000.00	$ 1,000
Site Maintenance				1% of Construction Cost		$ 353,109
Subtotal PRSC Costs						**$ 354,109**
PRSC Contingencies				15%		$ 53,116
Navajo Tax				6% of PRSC and Contingencies		$ 24,433
Total Yearly PRSC Cost						**$ 431,658**
Present Value of PRSC Costs Based on 1000 Year Life at 1.50%				PV Factor = 28.571		**$ 12,332,911**
Total Present Worth						**$ 47,643,771**
Cost Per CY:						**$ 49**

Notes:

"	Inch
AC	Acres
CAD	Computer-aided design
CY	Cubic yard
EA	Each
EQ	Equipment
GIS	Geographic information system
hr	Hour
lb.	Pound
LF	Linear feet
LS	Lump sum
N/A	Not applicable
PRSC	Post-removal site control
SY	Square yard

Table E-17. Cove Transfer Station Complex, Regional Repository Trunk Road Cost Details for Alternative 2, Disposal in On-Navajo Nation Regional Repository

Site Characteristics				
Volume of Waste Transported	981,220	CY		
Length of Road:	2.00	Miles		
Day of Operation	1,400	Days		
Cost Item	**Quantity**	**Unit**	**Unit Cost**	**Crew Cost**
Capital Costs				
Road Grader	1,400	Day	$1,882.05	$ 450,245
Off-Road Haul Truck	280	Day	$2,185.20	$ 469,323
Dust Control Additive	33	Container	$5,700	$ 188,100
Water Truck	1,400	Day	$898.29	$ 3,149,972
Air Quality Monitoring	1,400	Day	$250	$ 350,000
Onsite Dust Control Coordinator	1,400	Day	$100	$ 140,000
Dozer	280	Day	$2,329	$ 634,237
Loader 5CY	217	Day	$2,032.94	$ 542,846
Excavator 2CY	217	Day	$2,299.37	$ 613,989
Excavator 2CY Rock Hammer	0	Day	$2,759.24	$ -
Stormwater BMP's (Hay Bales/Wattles and Silt Fence)	3,355	LF	$8.55	$ 28,682
Culverts 24"	273	LF	$137.05	$ 37,469
Gravel (Road Mix)	1,592	Tons	$18	$ 28,656
Rip-Rap Class II	357	Tons	$55	$ 19,651
Subtotal Construction Costs				**$ 6,653,170**
Mobilization				$ 222,925
Travel + Lodging				$ 2,254,110
Project Management		5% of Construction Cost		$ 332,659
Engineering Design		8% of Construction Cost		$ 532,254
Contractor Site Overhead				$ 3,590,532
Construction Contingencies		20% of Construction Cost		$ 1,330,634
Navajo Tax		6% of Construction, Construction Management, and Contingencies Cost		$ 843,082
Total Capital Costs				**$ 15,759,365**
Yearly Post Removal Site Control (PRSC) Costs				
Site Maintenance		0.5% of Construction Cost		$ 33,266
Subtotal PRSC Costs				$ 33,266
PRSC Contingencies		15%		$ 4,990
Navajo Tax		6% of PRSC and Contingencies Cost		$ 2,295
Total Yearly PRSC Cost				**$ 40,551**
Present Value of PRSC Costs Based on 1000 Year Life at 3.50%		PV Factor = 28.571		$ 1,158,585
Total Present Value				**$ 16,917,950**
Construction Cost Per CY				**$ 16**
Total Present Value Cost Per CY				**$ 1**
Total Cost Per CY				**$ 17**

Table E-17. Cove Transfer Station Complex, Regional Repository Trunk Road Cost Details for Alternative 2, Disposal in On-Navajo Nation Regional Repository

Notes:

"	Inch
CY	Cubic yard
LF	Linear feet
PV	Present value
PRSC	Post-removal site control

Table E-18. Cove Transfer Station Complex, Cost Estimate Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Engineering Design	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	293	$ 158	$ 46,294
Project Engineer	N/A	Hour	1,170	$ 122	$ 142,740
Design Engineer	N/A	Hour	585	$ 158	$ 92,430
CAD/GIS Operator	N/A	Hour	293	$ 102	$ 29,886
Admin	N/A	Hour	117	$ 67	$ 7,839
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 320,689
Planning Documents	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	405	$ 158	$ 63,990
Project Engineer	N/A	Hour	1,620	$ 122	$ 197,640
CAD/GIS Operator	N/A	Hour	405	$ 102	$ 41,310
Admin	N/A	Hour	162	$ 67	$ 10,854
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 315,294
Resource Surveys	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Cultural Resources Mitigation	N/A	Each	1	$ 27,361.11	$ 27,361
Biological Resources Mitigation	N/A	Each	1	$ 54,722.22	$ 54,722
Geotechnical Testing and Report	N/A	Each	1	$ 54,722.22	$ 54,722
Pre-Project Aerial LIDAR Survey	N/A	Each	0	$ 30,000	$ -
Post-Project Aerial LiDAR Survey	N/A	Each	1	$ 82,083.33	$ 82,083
					$ 218,889
Confirmation Sampling	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Developing Sampling and Analysis Plan					
Project Geologist	N/A	Hour	360	$ 158	$ 56,880
Project Manager	N/A	Hour	180	$ 111	$ 19,980
CAD/GIS Operator	N/A	Hour	180	$ 122	$ 21,960
Project Chemist	N/A	Hour	360	$ 111	$ 39,960
Health and Safety Manager	N/A	Hour	180	$ 151	$ 27,180
Admin	N/A	Hour	72	$ 67	$ 4,824
Reproduction	N/A	LS	3	$ 250	$ 750
Sampling					
Sampling Team - Staff Geologist	N/A	Hour	82	$ 77	$ 6,320
Sampling Team - Staff Engineer	N/A	Hour	82	$ 81	$ 6,649
Travel	N/A	Day	17	$ 170	$ 2,890
Per Diem (96/55)	N/A	Day	17	$ 151	$ 2,567
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 13,987	$ 13,987
Lab Analysis	N/A	LS	1	$ 4,506.38	$ 4,506
XRF Surveying					
Sampling Team - Staff Geologist	N/A	Hour	306	$ 77	$ 23,596
Sampling Team - Staff Engineer	N/A	Hour	306	$ 81	$ 24,822
Travel	N/A	Day	28	$ 170	$ 4,760
Per Diem (96/55)	N/A	Day	49	$ 151	$ 7,437
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 13,987	$ 13,987
Lab Analysis	N/A	LS	1	$ 4,506.38	$ 4,506
Frisking Equipment	N/A	Month	27	$ 144	$ 3,940
					$ 291,502

Table E-18. Cove Transfer Station Complex, Cost Estimate Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Reporting	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Geologist	N/A	Hour	316	$ 105	$ 33,180
Project Manager	N/A	Hour	158	$ 175	$ 27,650
Project Engineer	N/A	Hour	474	$ 122	$ 57,828
Chemist	N/A	Hour	158	$ 111	$ 17,538
CAD/GIS Operator	N/A	Hour	158	$ 102	$ 16,116
Admin	N/A	Hour	63	$ 67	$ 4,221
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 158,033
Mobilization/Demobilization	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Crew Mileage	N/A	Mile	2,880	$ 0.56	$ 1,613
Per Diem	N/A	Day	8	$ 182	$ 1,456
Labor	N/A	Day	8	$ 300	$ 2,400
Standard Equipment Mileage	N/A	Mile	2,880	$ 0.56	$ 1,613
Standard Equipment Rental	N/A	Day	2	$ 14,349.78	$ 28,700
					$ 35,781
Excavation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Loader 5cy+	B10U	$ 2,032.94	1	46	$ 93,515
Off Road Haul Truck	B34F	$ 1,653.82	4	46	$ -
Grader 30,000 lb.	B11L	$ 2,413.50	1	46	$ 111,021
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664	1	46	$ 168,544
				Total	**$ 373,080**
Reclamation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Off Road Haul Truck	B34F	$ 1,653.82	1	26	$ 102,537
Loader 5cy+	B10U	$ 2,032.94	1	1	$ 26,428
Grader 30,000 lb.	B11L	$ 2,413.50	1	7	$ 28,962
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664	1	1	$ 47,632
Dozer D6	B10M	$ 2,931.70	1	1	$ 35,180
Rip Rap Class II 18"-24"	NA	$ 45	293	1	$ 13,204
Site Area Reclamation Materials	N/A	$ 68,239.50	1	1	$ 138,751
				Total	**$ 392,694**
Contractor Site Overhead	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager (10% of time)	N/A	Hour	107	$ 175	$ 18,697
Site Superintendent	N/A	Hour	1,068	$ 191	$ 204,070
H&S Officer	N/A	Hour	1,068	$ 85	$ 90,816
QA/QC Officer	N/A	Hour	1,068	$ 85	$ 90,816
Field Clerk	N/A	Hour	1,068	$ 19	$ 20,300
Fuel for Site Vehicles	N/A	Month	14	$ 1,600	$ 22,793
Port-o-let Rental (4)	N/A	Month	21	$ 208	$ 4,445
Permanent Fencing Installation and Demolition	N/A	LF	1,929	$ 41.92	$ 80,880
Job Trailers (1)	N/A	Month	5	$ 269	$ 1,437
Storage Boxes (1)	N/A	Month	5	$ 94.50	$ 505
Field Office Lights/HVAC (1)	N/A	Month	5	$ 179	$ 956
Generator (1)	N/A	Month	11	$ 2,400	$ 25,642
Fuel for Generator	N/A	Gallons	3,205	$ 4	$ 12,821
Telephone/internet (1)	N/A	Month	5	$ 384	$ 2,051

Table E-18. Cove Transfer Station Complex, Cost Estimate Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Field Office Equipment	N/A	Month	5	$ 230	$ 1,229
Field Office Supplies	N/A	Month	5	$ 96	$ 513
Trash (1 dumpster)	N/A	Month	5	$ 910	$ 4,861
Clin 1034 High Volume Air Sampling (4)	N/A	Month	21	$ 383	$ 8,184
Clin 1025 Ludlum 2121 and 43-10	N/A	Month	5	$ 275	$ 1,469
Air Monitoring Lab Confirmation Sampling (5 samples per day)	N/A	Day	534	$ 600	$ 320,528
Clin 1036 Personal Air Monitor	N/A	Month	18	$ 204	$ 3,713
Clin 1038 Personal Dust Monitor	N/A	Month	18	$ 1,555	$ 28,301
Clin 1068 Personal Dosimeter Badge	N/A	Month	18	$ 59	$ 1,074
Truck Scales	N/A	Month	5	$ 300	$ 1,603
Construction Water (excavation)	N/A	Gallon	64,085	$ 0.05	$ 3,204
Construction Water (hauling waste soil plus cap mat'l)	N/A	Gallon	1,311,336	$ 0.05	$ 65,567
6,000 Gallon Water Truck and Operator (1)	N/A	Day	107	$ 889	$ 94,983
Portal Water Tower Trailer, 10,000 gallons (1)	N/A	Day	107	$ 172.36	$ 18,415
					$ 1,129,875
Third-Party Oversight	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Travel and Lodging (4 people)	N/A	Day	427	$ 151	$ 64,533
Labor	N/A	Hour	4,274	$ 80	$ 341,897
Car Rental (4 cars)	N/A	Month	21	$ 400	$ 8,547
Car Fuel	N/A	Month	21	$ 760	$ 16,240
					$ 431,217
Level of Accuracy (20%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
20% of Construction Cost	N/A	N/A	N/A	N/A	**$ 153,155**
Navajo Tax (6%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
6% of Confirmation Sampling, Construction, Contractor Overhead, Mobilization / Demobilization, and Third Party Oversight	N/A	N/A	N/A	N/A	**$ 168,438**
				GRAND TOTAL	**$ 4,241,208**
PRSC Costs	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Bi-annual Inspection (4 person crew, 1 day, 10 hr/day)	N/A	Hour	80	$ 85	$ 6,800
Mileage (Farmington, NM, to Site, roundtrip)	N/A	Mile	815	$ 0.58	$ 473
Inspection Crew Per Diem	N/A	Day	24	$ 151	$ 3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	N/A	SY	25,851	$ 1.11	$ 28,723
Preperation of Semi-annual Reports (Professional Engineer)	N/A	Hour	80	$ 120	$ 9,600
PRSC Annual Cost					**$ 49,220**
PRSC Contingency (15%)					**$ 7,383**
Navajo Tax (6% of PRSC and Contingencies Cost					**$ 3,396**
Total PRSC Annual Cost					**$ 59,999**

Notes:

"	Inch
CAD	Computer-aided design
CY	Cubic yard
GIS	Geographic information system

Table E-18. Cove Transfer Station Complex, Cost Estimate Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

H&S	Health and safety
hp	Horsepower
hr	Hour
HVAC	Heating, ventilation, and air conditioning
K	Thousand
lb.	Pound
LF	Linear feet
LiDAR	Light detection and ranging
LS	Lump sum
M2	Square meters
N/A	Not applicable
NM	New Mexico
PRSC	Post-removal site control
QA/QC	Quality assurance/quality control
SY	Square yard
XRF	X-ray fluorescence

Table E-19. Cove Transfer Station Complex, Cost Estimate Summary for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Waste Volume	27,270 CY	
Removal Area	5.34 AC	
Excavation & Hauling	**Unit Cost**	
Loader 5cy+	$	93,515
Off Road Haul Truck	$	-
Grader 30,000 lb.	$	111,021
Excavator 3.5 cy ~ 80K-100K lb.	$	168,544
Subtotals Step 1	**$**	**373,080**
Reclamation	**Unit Cost**	
Haul Truck	$	102,537
Loader 5cy+	$	26,428
Grader 30,000 lb.	$	28,962
Excavator 3.5 cy ~ 80K-100K lb.	$	47,632
Dozer D6	$	35,180
Rip Rap Class II 18"-24"	$	13,204
Site Area Reclamation Materials	$	138,751
Subtotals Step 2	**$**	**392,694**
Subtotal Construction	**$**	**765,774**
Other Costs	**Unit Cost**	
Non-Construction Costs		
Engineering Design	$	320,689
Planning Documents	$	315,294
Resource Surveys	$	218,889
Confirmation Sampling	$	291,502
Reporting	$	158,033
Contractor Site Overhead	$	1,129,875
Mobilization / Demobilization	$	35,781
Travel+ Lodging (Construction Workers)	$	252,560
Level of Accuracy (20%)	$	153,155
Third-Party Oversight	$	431,217
Navajo Tax (6%)	$	168,438
Subtotals Step 6	**$**	**3,475,433**
Total Site Capital Costs	**$**	**4,241,208**
Yearly On-Site PRSC Costs	**Unit Cost**	
Bi-annual Inspection (4 person crew, 3 days, 10 hr/day)	$	6,800
Mileage (Farmington, NM, to Site, roundtrip)	$	473
Inspection Crew Per Diem	$	3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	$	28,723
Preperation of Semi-annual Reports (Professional Engineer)	$	9,600
Subtotal PRSC Costs	**$**	**49,220**
PRSC Contingencies (15%)	$	7,383
Navajo Tax (6% of PRSC and Contingencies Cost)	$	3,396
Total Yearly PRSC Costs	**$**	**59,999**
Present Value of PRSC Costs Based on 10-Year Life at 3.50% (PV Factor = 8.317)	**$**	**498,950**
Regional Repository Access Road Cost Share (2.78%)		
Regional Repository Acccess Road Construction Costs	**$**	**438,032**

Table E-19. Cove Transfer Station Complex, Cost Estimate Summary for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Regional Repository Access Road Annual PRSC Costs	**$**	**1,127**
Regional Repository Access Road Cost per CY (includes 1000-Year PRSC)	**$**	**17**
Regional Repository Access Road Shared Cost	**$**	**587,669**
Waste Hauling Cost		
Waste Hauling Cost per CY	**$**	**8**
Waste Hauling Total Cost	**$**	**282,245**
Regional Repository Cap Cost Share (2.78%)		
Regional Repository Cap Construction Costs	**$**	**981,465**
Regional Repository Cap Annual PRSC Costs	**$**	**11,998**
Regional Repository Cap Cost per CY (includes 1000-year PRSC)	**$**	**49**
Regional Repository Cap Shared Cost	**$**	**1,328,867**
Grand Total Capital Costs	**$**	**5,942,949**
TOTAL COSTS	**$**	**6,938,938**

Notes:

"	Inch
AC	Acres
CY	Cubic yard
hp	Horsepower
hr	Hour
K	Thousand
lb.	Pound
LF	Linear feet
NM	New Mexico
PRSC	Post-removal site control
PV	Present value
T&M	Time and material

Table E-20. Cove Transfer Station Complex, Cost Estimate Scenario Assumptions for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Technology	Assumptions	Cost Effects
Excavation Methods	Waste removed by an excavator is assumed to be removed with a large excavator, unless specified	Excavators can operate on steeper terrain than bulldozers and are better at moving waste uphill. Bulldozers cost less to operate. Spider excavators or other specialized equipment are more expensive.
	Any disturbed surface can be restored using grading and erosion controls	Quantities of erosion control materials and grading may be lower than costed
	Land is barren to warrant no clearing or grubbing	Costs of clearing and grubbing are zero
	All waste specified in the risk assessment will be excavated	Volumes of excavated waste may be lower than costed
	The site is accessible to haul trucks and trucks can be easily loaded	Accessing difficult-to-reach mines increase costs.
Soil and Waste Sorting	Waste will be sorted based on grain size; rock greater than 3 inches will be segregated	NA
	Waste can be sorted within the mine waste footprint	Additional restoration of a separate area would be needed, increasing costs
Operating Mill	Waste will be transported 135 miles in highway-legal trucks from the mine site to the White Mesa mill	Greater distance to repository increases costs
	Waste weighs 1.5 tons per cubic yard	Denser waste will increase costs
	Tipping fee at uranium mill to cover milling costs	Higher tipping fee results in increased costs; current tipping fees are from previous cost estimate
	0.01 percent by weight recoverable uranium in waste, equal to 0.12 pounds	Higher percent of recoverable uranium increases economic value of waste, thus decreasing net costs
	Cycle time limited to 25 trucks per day, due to space. Assumes maximum number of trucks (25) for fastest production rate.	Less trucks will reduce production time and require more time on-site, increasing costs.
	Uranium market price is $30/pound	Market value at time of milling will increase or decrease economic value of waste, thus increasing or decreasing costs
	PRSC inspection of the mine site will be completed for 10 years	More PRSC inspections will increase costs

Notes:

CY	Cubic yard
ET	Evapotranspiration
GCL	Geosynthetic clay liner
NA	Not applicable - inherent assumption
PRSC	Post-removal site control

Table E-21. Cove Transfer Station Complex, Crew Time Productivity Calculations for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

	Waste Volume	27,270	CY		
	Removal Area	5.34	AC		
Step	**CTS Complex Excavation & Hauling**				
	Action	**QTY**	**Unit**	**Production CY**	**Days**
1	Waste Removal CTS - Excavate/Load/Haul	23,715	LCY	756	31
	Waste Removal CTS South - Excavate/Load/Haul	7,964	LCY	756	11
	Waste Removal CT-01 - Excavate/Load/Haul	2,409	LCY	756	3
		34,088		**Control Days**	**45**
Step	**CTS Complex Restoration**				
	Action	**QTY**	**Unit**	**Production Rate**	**Days**
2	Clean Borrow Fill	34,088	LCY	2,888	11.8
	Grading	25,851	SY	12 Days for 22,222 SY	12.0
	Mechanical Seeding, Fertilizer, Mulch	22,094	SY	1,000	22.1
	Erosion Control - Erosion Control Matting	12,033	SY	1,000	12.0
	Erosion Control - Coir Logs/Wattles	3,476	LF	1,000	3.5
	Rock-Lined Ditches	978	CY	1,904	0.5
	Soil Berms	334	CY	2,888	0.1
				Control Days	**62**
				TOTAL PROJECT DAYS	**107**
				Slowest Rate Project Days:	107

Notes:

AC	
BCY	Bank cubic yard
CTS	Cove Transfer Station
CY	Cubic yard
LCY	Loose cubic yard
LF	Linear foot
Mi	Mile
QTY	Quantity
SY	Square yard

Table E-22. Cove Transfer Station Complex, Equipment Cost Details for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Step	Equipment List	QTY	RSMeans #	RSMeans Description	Unit Cost	Unit	Crew
1	**CTS Complex Excavation**						
	Off-Road Haul Truck	0	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$ 6.32	LCY	B34F
	Loader 5cy+	1	312323154080	Common Earth - 5cy bucket, front end loader	$ 16.30	BCY	B10U
			015433204760	Rent front end loader, articulating, 5.25-5.75 CY 270 HP	$ 8,478.75	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$ 631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$ 12,705	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity=300 CY/hour	$ 1.78	BCY	B12D
2	**CTS Complex Reclamation**						
	Off-Road Haul Truck	1	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$ 6.32	LCY	B34F
	Loader 5CY+	1	312323154080	Common Earth - 5 CY bucket, front-end loader	$ 16.30	BCY	B10U
			015433204760	Rent front-end loader, articulating, 5.25-5.75 CY 270 hp	$ 8,478.75	Month	None (Rental)
	Dozer D6	1	312213200170	8,100-10,000 SF Grading, Dozer	$ 1,378.08	each	B10L
			015433204260	Rent Dozer, crawler, torque converter, diesel 200 hp	$ 15,960	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$ 631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$ 12,705	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity = 300 CY/hour	$ 1.78	BCY	B12D
	Rip Rap Class III 24"+	293		Assume $6/mile Class III within 115 miles = $690 delivery of 23 tons and Class II Rip-rap at $45/ton	$ 75.00	Ton	

Notes:
BCY Bank cubic yard
CTS Cove Transfer Station
CY Cubic yard

Table E-22. Cove Transfer Station Complex, Equipment Cost Details for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

hp	Horsepower
K	Thousand
lb.	Pound
LCY	Loose cubic yard
ld.	Loaded
LF	Linear foot
MPH	Mile per hour
SF	Square feet
unld.	Unloaded

Table E-23. Cove Transfer Station Complex, Cost Estimate Details for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Engineering Design	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	293	$ 158	$ 46,294
Project Engineer	N/A	Hour	1170	$ 122	$ 142,740
Design Engineer	N/A	Hour	585	$ 158	$ 92,430
CAD/GIS Operator	N/A	Hour	293	$ 102	$ 29,886
Admin	N/A	Hour	117	$ 67	$ 7,839
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 320,689
Planning Documents	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	405	$ 158	$ 63,990
Project Engineer	N/A	Hour	1620	$ 122	$ 197,640
CAD/GIS Operator	N/A	Hour	405	$ 102	$ 41,310
Admin	N/A	Hour	162	$ 67	$ 10,854
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 315,294
Resource Surveys	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Cultural Resources Mitigation	N/A	Each	1	$ 27,361.11	$ 27,361
Biological Resources Mitigation	N/A	Each	1	$ 54,722.22	$ 54,722
Geotechnical Testing and Report	N/A	Each	1	$ 54,722.22	$ 54,722
Pre-Project Aerial LIDAR Survey	N/A	Each	0	$ 30,000.00	$ -
Post-Project Aerial LiDAR Survey	N/A	Each	1	$ 82,083.33	$ 82,083
					$ 218,889
Confirmation Sampling	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Developing Sampling and Analysis Plan					
Project Geologist	N/A	Hour	360	$ 158	$ 56,880
Project Manager	N/A	Hour	180	$ 111	$ 19,980
CAD/GIS Operator	N/A	Hour	180	$ 122	$ 21,960
Project Chemist	N/A	Hour	360	$ 111	$ 39,960
Health and Safety Manager	N/A	Hour	180	$ 151	$ 27,180
Admin	N/A	Hour	72	$ 67	$ 4,824
Reproduction	N/A	LS	3	$ 250	$ 750
Sampling					
Sampling Team - Staff Geologist	N/A	Hour	82	$ 77	$ 6,320
Sampling Team - Staff Engineer	N/A	Hour	82	$ 81	$ 6,649
Travel	N/A	Day	17	$ 170	$ 2,890
Per Diem (96/55)	N/A	Day	17	$ 151	$ 2,567
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 13,987	$ 13,987
Lab Analysis	N/A	LS	1	$ 4,506	$ 4,506
XRF Surveying					
Sampling Team - Staff Geologist	N/A	Hour	306	$ 77	$ 23,596
Sampling Team - Staff Engineer	N/A	Hour	306	$ 81	$ 24,822
Travel	N/A	Day	28	$ 170	$ 4,760
Per Diem (96/55)	N/A	Day	49	$ 151	$ 7,437
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 13,987	$ 13,987
Lab Analysis	N/A	LS	1	$ 4,506.38	$ 4,506

Table E-23. Cove Transfer Station Complex, Cost Estimate Details for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Frisking Equipment	N/A	Month	27	$ 144	$ 3,940
					$ 291,502
Reporting	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Geologist	N/A	Hour	316	$ 105	$ 33,180
Project Manager	N/A	Hour	158	$ 175	$ 27,650
Project Engineer	N/A	Hour	474	$ 122	$ 57,828
Chemist	N/A	Hour	158	$ 111	$ 17,538
CAD/GIS Operator	N/A	Hour	158	$ 102	$ 16,116
Admin	N/A	Hour	63	$ 67	$ 4,221
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 158,033
Mobilization/Demobilization	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Crew Mileage	N/A	Mile	2,880	$ 0.56	$ 1,613
Per Diem	N/A	Day	8	$ 182	$ 1,456
Labor	N/A	Day	8	$ 300	$ 2,400
Standard Equipment Mileage	N/A	Mile	2,880	$ 0.56	$ 1,613
Standard Equipment Rental	N/A	Day	2	$ 14,349.78	$ 28,700
					$ 35,781
Excavation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Loader 5cy+	B10U	$ 2,032.94	1	46	$ 93,515
Off Road Haul Truck	B34F	$ 1,653.82	4	46	$ -
Grader 30,000 lb.	B11L	$ 2,413.50	1	46	$ 111,021
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664	1	46	$ 168,544
				Total	**$ 373,080**
Reclamation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Off Road Haul Truck	B34F	$ 1,653.82	1	26	$ 102,537
Loader 5cy+	B10U	$ 2,032.94	1	1	$ 26,428
Grader 30,000 lb.	B11L	$ 2,413.50	1	7	$ 28,962
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664	1	1	$ 47,632
Dozer D6	B10M	$ 2,931.70	1	1	$ 35,180
Rip Rap Class II 18"-24"	NA	$ 45	293	1	$ 13,204
Site Area Reclamation Materials	N/A	$ 68,239.50	1	1	$ 138,751
				Total	**$ 392,694**
Contractor Site Overhead	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager (10% of time)	N/A	Hour	107	$ 175	$ 18,697
Site Superintendent	N/A	Hour	1068	$ 191	$ 204,070
H&S Officer	N/A	Hour	1068	$ 85	$ 90,816
QA/QC Officer	N/A	Hour	1068	$ 85	$ 90,816
Field Clerk	N/A	Hour	1068	$ 19	$ 20,300
Fuel for Site Vehicles	N/A	Month	14	$ 1,600	$ 22,793
Port-o-let Rental (4)	N/A	Month	21	$ 208	$ 4,445
Permanent Fencing Installation and Demolition	N/A	LF	1929	$ 41.92	$ 80,880
Job Trailers (1)	N/A	Month	5	$ 269	$ 1,437
Storage Boxes (1)	N/A	Month	5	$ 95	$ 505
Field Office Lights/HVAC (1)	N/A	Month	5	$ 179	$ 956
Generator (1)	N/A	Month	11	$ 2,400	$ 25,642

Table E-23. Cove Transfer Station Complex, Cost Estimate Details for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Fuel for Generator	N/A	Gallons	3205	$ 4	$ 12,821
Telephone/internet (1)	N/A	Month	5	$ 384	$ 2,051
Field Office Equipment	N/A	Month	5	$ 230	$ 1,229
Field Office Supplies	N/A	Month	5	$ 96	$ 513
Trash (1 dumpster)	N/A	Month	5	$ 910	$ 4,861
Clin 1034 High Volume Air Sampling (4)	N/A	Month	21	$ 383	$ 8,184
Clin 1025 Ludlum 2121 and 43-10-1	N/A	Month	5	$ 275	$ 1,469
Air Monitoring Lab Confirmation Sampling (5 samples per day)	N/A	Day	534	$ 600	$ 320,528
Clin 1036 Personal Air Monitor	N/A	Month	18	$ 204	$ 3,713
Clin 1038 Personal Dust Monitor	N/A	Month	18	$ 1,555	$ 28,301
Clin 1068 Personal Dosimeter Badge	N/A	Month	18	$ 59	$ 1,074
Truck Scales	N/A	Month	5	$ 300	$ 1,603
Construction Water (excavation)	N/A	Gallon	64085	$ 0.05	$ 3,204
Construction Water (hauling waste soil plus cap mat'l)	N/A	Gallon	1311336	$ 0.05	$ 65,567
6,000 Gallon Water Truck and Operator (1)	N/A	Day	107	$ 889	$ 94,983
Portal Water Tower Trailer, 10,000 gallons (1)	N/A	Day	107	$ 172.36	$ 18,415
					$ 1,129,875
Third-Party Oversight	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Travel and Lodging (4 people)	N/A	Day	427	$ 151	$ 64,533
Labor	N/A	Hour	4274	$ 80	$ 341,897
Car Rental (4 cars)	N/A	Month	21	$ 400	$ 8,547
Car Fuel	N/A	Month	21	$ 760	$ 16,240
					$ 431,217
Level of Accuracy (20%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
20% of Construction Cost	N/A	N/A	N/A	N/A	**$ 153,155**
Navajo Tax (6%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
6% of Confirmation Sampling, Construction, Contractor Overhead, Mobilization / Demobilization, and Third Party Oversight Costs	N/A	N/A	N/A	N/A	**$ 168,438**
				GRAND TOTAL	**$ 4,241,208**
PRSC Costs	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
(4 person crew, 1 day, 10 hr/day)	N/A	Hour	80	$ 85.00	$ 6,800
roundtrip)	N/A	Mile	815	$ 0.58	$ 473
Inspection Crew Per Diem	N/A	Day	24	$ 151.00	$ 3,624
(revegetation, grading, watering)	N/A	SY	25,851	$ 1.11	$ 28,723
(Professional Engineer)	N/A	Hour	80	$ 120.00	$ 9,600
PRSC Annual Cost					**$ 49,220**
PRSC Contingency (15%)					**$ 7,383**
Navajo Tax (6% of PRSC and Contingencies Cost					**$ 3,396**
Total PRSC Annual Cost					**$ 59,999**

Table E-23. Cove Transfer Station Complex, Cost Estimate Details for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Notes:

"	Inch
CAD	Computer-aided design
CY	Cubic yard
GIS	Geographic information system
H&S	Health and safety
hp	Horsepower
hr	Hour
HVAC	Heating, ventilation, and air conditioning
K	Thousand
lb.	Pound
LF	Linear feet
LiDAR	Light detection and ranging
LS	Lump sum
M2	Square meters
N/A	Not applicable
NM	New Mexico
PRSC	Post-removal site control
QA/QC	Quality assurance/quality control
SY	Square yard
XRF	X-ray fluorescence

Table E-24. Cove Transfer Station Complex, Cost Estimate Summary for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Waste Volume	27,270 CY	
Removal Area	5.34 AC	
Excavation & Hauling	**Unit Cost**	
Loader 5cy+	$	93,515
Off Road Haul Truck	$	-
Grader 30,000 lb.	$	111,021
Excavator 3.5 cy ~ 80K-100K lb.	$	168,544
Subtotals Step 1	**$**	**373,080**
Reclamation	**Unit Cost**	
Haul Truck	$	102,537
Loader 5cy+	$	26,428
Grader 30,000 lb.	$	28,962
Excavator 3.5 cy ~ 80K-100K lb.	$	47,632
Dozer D6	$	35,180
Rip Rap Class II 18"-24"	$	13,204
Site Area Reclamation Materials	$	138,751
Subtotals Step 2	**$**	**392,694**
Subtotal Construction	**$**	**765,774**
Other Costs	**Unit Cost**	
Non-Construction Costs		
Engineering Design	$	320,689
Planning Documents	$	315,294
Resource Surveys	$	218,889
Confirmation Sampling	$	291,502
Reporting	$	158,033
Contractor Site Overhead	$	1,129,875
Mobilization / Demobilization	$	35,781
Travel+ Lodging (Construction Workers)	$	252,560
Level of Accuracy (20%)	$	153,155
Third-Party Oversight	$	431,217
Navajo Tax (6%)	$	168,438
Subtotals Step 6	**$**	**3,475,433**
Total Site Capital Costs	**$**	**4,241,208**
Yearly On-Site PRSC Costs	**Unit Cost**	
Bi-annual Inspection (4 person crew, 3 days, 10 hr/day)	$	6,800
Mileage (Farmington, NM, to Site, roundtrip)	$	473
Inspection Crew Per Diem	$	3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	$	28,723
Preperation of Semi-annual Reports (Professional Engineer)	$	9,600
Subtotal PRSC Costs	**$**	**49,220**
PRSC Contingencies (15%)	$	7,383
Navajo Tax (6% of PRSC and Contingencies Cost)	$	3,396
Total Yearly PRSC Costs	**$**	**59,999**
Present Value of PRSC Costs Based on 10-Year Life at 3.50% (PV Factor = 8.317)	**$**	**498,950**

Table E-24. Cove Transfer Station Complex, Cost Estimate Summary for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Waste Hauling Cost		
Waste Hauling Cost per CY	**$**	**52**
Waste Hauling Total Cost	**$**	**1,767,096**
White Mesa Milling and Disposal Cost		
White Mesa Milling and Disposal Cost per CY	**$**	**81**
White Mesa Milling and Disposal Cost	**$**	**2,761,088**
Grand Total Capital Costs	**$**	**8,769,391**
TOTAL COSTS	**$**	**9,268,341**

Notes:

"	Inch
AC	Acres
CY	Cubic yard
hp	Horsepower
hr	Hour
K	Thousand
lb.	Pound
LF	Linear feet
NM	New Mexico
PRSC	Post-removal site control
PV	Present value
T&M	Time and material

Table E-25. Cove Transfer Station Complex, Cost Estimate Scenario Assumptions for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Technology	Assumptions	Cost Effects
Excavation Methods	Waste removed by an excavator is assumed to be removed with a large excavator, unless specified	Excavators can operate on steeper terrain than bulldozers and are better at moving waste uphill. Bulldozers cost less to operate. Spider excavators or other specialized equipment are more expensive.
	Any disturbed surface can be restored using grading and erosion controls	Quantities of erosion control materials and grading may be lower than costed
	Land is barren to warrant no clearing or grubbing	Costs of clearing and grubbing are zero
	All waste specified in the risk assessment will be excavated	Volumes of excavated waste may be lower than costed
	The site is accessible to haul trucks and trucks can be easily loaded	Accessing difficult-to-reach mines increase costs.
Soil and Waste Sorting	Waste will be sorted based on grain size; rock greater than 3 inches will be segregated	NA
	Waste can be sorted within the mine waste footprint	Additional restoration of a separate area would be needed, increasing costs
Hazardous Waste Landfill or Licensed Low-Level Radioactive Waste Facility	Landfill location is available within 600 road miles of the mine waste	Greater distance to repository increases costs.
	Waste can go to Deer Trail, Colorado (558 miles); Andrews, Texas (618 miles); or Clive, Utah (450 miles).	Waste will go to the closest facility that is accepting waste, Deer Trail, Colorado
	Waste will be transported 558 miles in highway-legal trucks from the site to the disposal facility in Deer Trail, Colorado	Greater distance to repository increases costs
	Waste weighs 1.5 tons per cubic yard	Higher density waste will increase costs
	Tipping fee ($/CY)	Higher tipping fee results in increased costs; current tipping fees are from previous cost estimate
	PRSC inspection of the mine site will be completed for 10 years	More PRSC inspections will increase costs
	Assumes up to 120 trucks every three days are available.	Less trucks will reduce production time and require more time on-site, increasing costs.

Notes:

CY	Cubic yard
ET	Evapotranspiration
NA	Not applicable - inherent assumption
PRSC	Post-removal site control

Table E-26. Cove Transfer Station Complex, Crew Time Productivity Calculations for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

	Waste Volume	27,270	CY		
	Removal Area	5.34	AC		
Step	**CTS Complex Excavation & Hauling**				
1	**Action**	**QTY**	**Unit**	**Production CY**	**Days**
	Waste Removal CTS - Excavate/Load/Haul	23,715	LCY	756	31
	Waste Removal CTS South - Excavate/Load/Haul	7,964	LCY	756	11
	Waste Removal CT-01 - Excavate/Load/Haul	2,409	LCY	756	3
		34,088		**Control Days**	**45**
Step	**CTS Complex Restoration**				
2	**Action**	**QTY**	**Unit**	**Production Rate**	**Days**
	Clean Borrow Fill	34,088	LCY	2,888	11.8
	Grading	25,851	SY	12 Days for 22,222 SY	12.0
	Mechanical Seeding, Fertilizer, Mulch	22,094	SY	1,000	22.1
	Erosion Control - Erosion Control Matting	12,033	SY	1,000	12.0
	Erosion Control - Coir Logs/Wattles	3,476	LF	1,000	3.5
	Rock-Lined Ditches	978	CY	1,904	0.5
	Soil Berms	334	CY	2,888	0.1
				Control Days	**62**
				TOTAL PROJECT DAYS	**107**
				Slowest Rate Project Days:	107

Notes:

AC	
BCY	Bank cubic yard
CTS	Cove Transfer Station
CY	Cubic yard
LCY	Loose cubic yard
LF	Linear foot
Mi	Mile
QTY	Quantity
SY	Square yard

Table E-27. Cove Transfer Station Complex, Equipment Cost Details for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Step	Equipment List	QTY	RSMeans #	RSMeans Description	Unit Cost	Unit	Crew
	CTS Complex Excavation						
1	Off-Road Haul Truck	0	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$6.32	LCY	B34F
	Loader 5cy+	1	312323154080	Common Earth - 5cy bucket, front end loader	$16.30	BCY	B10U
			015433204760	Rent front end loader, articulating, 5.25-5.75 CY 270 HP	$8,478.75	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$12,705	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity=300 CY/hour	$1.78	BCY	B12D
2	**CTS Complex Reclamation**						
	Off-Road Haul Truck	1	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$6.32	LCY	B34F
	Loader 5CY+	1	312323154080	Common Earth - 5 CY bucket, front-end loader	$16.30	BCY	B10U
			015433204760	Rent front-end loader, articulating, 5.25-5.75 CY 270 hp	$8,478.75	Month	None (Rental)
	Dozer D6	1	312213200170	8,100-10,000 SF Grading, Dozer	$1,378.08	each	B10L
			015433204260	Rent Dozer, crawler, torque converter, diesel 200 hp	$15,960	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$12,705	Month	None (Rental)
	Drill Rig	1	015433401865	Rent drill, rotary, crawler, 250hp	$ 23,249.00	Month	None (Rental)
			023213100600	Subsurface investigation, boring and exploratory drilling, auger holes in earth	$ 26.28	LF	B55
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity = 300 CY/hour	$1.78	BCY	B12D

Notes:

BCY Bank cubic yard
CTS Cove Transfer Station
CY Cubic yard
hp Horsepower
K Thousand
lb. Pound

Table E-27. Cove Transfer Station Complex, Equipment Cost Details for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

LCY	Loose cubic yard
ld.	Loaded
LF	Linear foot
MPH	Mile per hour
SF	Square feet
unld.	Unloaded

Table E-28. Cove Transfer Station Complex, Cost Estimate Details for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Engineering Design	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	293	$ 158	$ 46,294
Project Engineer	N/A	Hour	1170	$ 122	$ 142,740
Design Engineer	N/A	Hour	585	$ 158	$ 92,430
CAD/GIS Operator	N/A	Hour	293	$ 102	$ 29,886
Admin	N/A	Hour	117	$ 67	$ 7,839
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 320,689
Planning Documents	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	405	$ 158	$ 63,990
Project Engineer	N/A	Hour	1620	$ 122	$ 197,640
CAD/GIS Operator	N/A	Hour	405	$ 102	$ 41,310
Admin	N/A	Hour	162	$ 67	$ 10,854
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 315,294
Resource Surveys	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Cultural Resources Mitigation	N/A	Each	1	$ 27,361.11	$ 27,361
Biological Resources Mitigation	N/A	Each	1	$ 54,722.22	$ 54,722
Geotechnical Testing and Report	N/A	Each	1	$ 54,722.22	$ 54,722
Post-Project Aerial LiDAR Survey	N/A	Each	1	$ 82,083.33	$ 82,083
					$ 218,889
Confirmation Sampling	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Developing Sampling and Analysis Plan					
Project Geologist	N/A	Hour	360	$ 158	$ 56,880
Project Manager	N/A	Hour	180	$ 111	$ 19,980
CAD/GIS Operator	N/A	Hour	180	$ 122	$ 21,960
Project Chemist	N/A	Hour	360	$ 111	$ 39,960
Health and Safety Manager	N/A	Hour	180	$ 151	$ 27,180
Admin	N/A	Hour	72	$ 67	$ 4,824
Reproduction	N/A	LS	3	$ 250	$ 750
Sampling					
Sampling Team - Staff Geologist	N/A	Hour	82	$ 77	$ 6,320
Sampling Team - Staff Engineer	N/A	Hour	82	$ 81	$ 6,649
Travel	N/A	Day	17	$ 170	$ 2,890
Per Diem (96/55)	N/A	Day	17	$ 151	$ 2,567
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 13,987	$ 13,987
Lab Analysis	N/A	LS	1	$ 4,506.38	$ 4,506
XRF Surveying					
Sampling Team - Staff Geologist	N/A	Hour	306	$ 77	$ 23,596
Sampling Team - Staff Engineer	N/A	Hour	306	$ 81	$ 24,822
Travel	N/A	Day	28	$ 170	$ 4,760
Per Diem (96/55)	N/A	Day	49	$ 151	$ 7,437
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 13,987	$ 13,987
Lab Analysis	N/A	LS	1	$ 4,506.38	$ 4,506
Frisking Equipment	N/A	Month	27	$ 144	$ 3,940
					$ 291,502
Reporting	**Crew**	**Unit**	**Amount**	**Price**	**Cost**

Table E-28. Cove Transfer Station Complex, Cost Estimate Details for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Project Geologist	N/A	Hour	316	$ 105	$ 33,180
Project Manager	N/A	Hour	158	$ 175	$ 27,650
Project Engineer	N/A	Hour	474	$ 122	$ 57,828
Chemist	N/A	Hour	158	$ 111	$ 17,538
CAD/GIS Operator	N/A	Hour	158	$ 102	$ 16,116
Admin	N/A	Hour	63	$ 67	$ 4,221
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 158,033
Mobilization/Demobilization	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Crew Mileage	N/A	Mile	2,880	$ 0.56	$ 1,613
Per Diem	N/A	Day	8	$ 182	$ 1,456
Labor	N/A	Day	8	$ 300	$ 2,400
Standard Equipment Mileage	N/A	Mile	2,880	$ 0.56	$ 1,613
Standard Equipment Rental	N/A	Day	2	$ 14,349.78	$ 28,700
					$ 35,781
Excavation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Loader 5cy+	B10U	$ 2,032.94	1	46	$ 93,515
Off Road Haul Truck	B34F	$ 1,653.82	4	46	$ -
Grader 30,000 lb.	B11L	$ 2,413.50	1	46	$ 111,021
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664.00	1	46	$ 168,544
				Total	**$ 373,080**
Reclamation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Off Road Haul Truck	B34F	$ 1,653.82	1	26	$ 102,537
Loader 5cy+	B10U	$ 2,032.94	1	1	$ 26,428
Grader 30,000 lb.	B11L	$ 2,413.50	1	7	$ 28,962
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664.00	1	1	$ 47,632
Dozer D6	B10M	$ 2,931.70	1	1	$ 35,180
Rip Rap Class II 18"-24"	NA	$ 45.00	293	1	$ 13,204
Site Area Reclamation Materials	N/A	$ 68,239.50	1	1	$ 138,751
				Total	**$ 392,694**
Contractor Site Overhead	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager (10% of time)	N/A	Hour	107	$ 175	$ 18,697
Site Superintendent	N/A	Hour	1068	$ 191	$ 204,070
H&S Officer	N/A	Hour	1068	$ 85	$ 90,816
QA/QC Officer	N/A	Hour	1068	$ 85	$ 90,816
Field Clerk	N/A	Hour	1068	$ 19	$ 20,300
Fuel for Site Vehicles	N/A	Month	14	$ 1,600	$ 22,793
Port-o-let Rental (4)	N/A	Month	21	$ 208	$ 4,445
Permanent Fencing Installation and Demolition	N/A	LF	1929	$ 41.92	$ 80,880
Job Trailers (1)	N/A	Month	5	$ 269	$ 1,437
Storage Boxes (1)	N/A	Month	5	$ 95	$ 505
Field Office Lights/HVAC (1)	N/A	Month	5	$ 179	$ 956
Generator (1)	N/A	Month	11	$ 2,400	$ 25,642
Fuel for Generator	N/A	Gallons	3205	$ 4	$ 12,821
Telephone/internet (1)	N/A	Month	5	$ 384	$ 2,051
Field Office Equipment	N/A	Month	5	$ 230	$ 1,229

Table E-28. Cove Transfer Station Complex, Cost Estimate Details for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Field Office Supplies	N/A	Month	5	$ 96	$ 513
Trash (1 dumpster)	N/A	Month	5	$ 910	$ 4,861
Clin 1034 High Volume Air Sampling (4)	N/A	Month	21	$ 383	$ 8,184
Clin 1025 Ludlum 2121 and 43-10-1	N/A	Month	5	$ 275	$ 1,469
Air Monitoring Lab Confirmation Sampling (5 samples per day)	N/A	Day	534	$ 600	$ 320,528
Clin 1036 Personal Air Monitor	N/A	Month	18	$ 204	$ 3,713
Clin 1038 Personal Dust Monitor	N/A	Month	18	$ 1,555	$ 28,301
Clin 1068 Personal Dosimeter Badge	N/A	Month	18	$ 59	$ 1,074
Truck Scales	N/A	Month	5	$ 300	$ 1,603
Construction Water (excavation)	N/A	Gallon	64085	$ 0.05	$ 3,204
Construction Water (hauling waste soil plus cap mat'l)	N/A	Gallon	1311336	$ 0.05	$ 65,567
6,000 Gallon Water Truck and Operator (1)	N/A	Day	107	$ 889	$ 94,983
Portal Water Tower Trailer, 10,000 gallons (1)	N/A	Day	107	$ 172.36	$ 18,415
					$ 1,129,875
Third-Party Oversight	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Travel and Lodging (4 people)	N/A	Day	427	$ 151	$ 64,533
Labor	N/A	Hour	4274	$ 80	$ 341,897
Car Rental (4 cars)	N/A	Month	21	$ 400	$ 8,547
Car Fuel	N/A	Month	21	$ 760	$ 16,240
					$ 431,217
Level of Accuracy (20%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
20% of Construction Cost	N/A	N/A	N/A	N/A	**$ 153,155**
Navajo Tax (6%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
6% of Confirmation Sampling, Construction, Contractor Overhead, Mobilization / Demobilization, and Third Party Oversight Costs	N/A	N/A	N/A	N/A	**$ 168,438**
				GRAND TOTAL	**$ 4,241,208**
PRSC Costs	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Bi-annual Inspection (4 person crew, 1 day, 10 hr/day)	N/A	Hour	80	$ 85	$ 6,800
Mileage (Farmington, NM, to Site, roundtrip)	N/A	Mile	815	$ 0.58	$ 473
Inspection Crew Per Diem	N/A	Day	24	$ 151	$ 3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	N/A	SY	25,851	$ 1.11	$ 28,723
Preperation of Semi-annual Reports (Professional Engineer)	N/A	Hour	80	$ 120	$ 9,600
PRSC Annual Cost					**$ 49,220**
PRSC Contingency (15%)					**$ 7,383**
Navajo Tax (6% of PRSC and Contingencies Cost					**$ 3,396**
Total PRSC Annual Cost					**$ 59,999**

Notes:

"	Inch
CAD	Computer-aided design
CY	Cubic yard
GIS	Geographic information system

H&S	Health and safety
hp	Horsepower
hr	Hour
HVAC	Heating, ventilation, and air conditioning
K	Thousand
lb.	Pound
LF	Linear feet
LiDAR	Light detection and ranging
LS	Lump sum
M2	Square meters
N/A	Not applicable
NM	New Mexico
PRSC	Post-removal site control
QA/QC	Quality assurance/quality control
SY	Square yard
XRF	X-ray fluorescence

Table E-29. Cove Transfer Station Complex, Cost Estimate Summary for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Waste Volume		27,270 CY
Removal Area		5.34 AC
Excavation & Hauling		**Unit Cost**
Loader 5cy+	$	93,515
Off Road Haul Truck	$	-
Grader 30,000 lb.	$	111,021
Excavator 3.5 cy ~ 80K-100K lb.	$	168,544
Subtotals Step 1	**$**	**373,080**
Reclamation		**Unit Cost**
Haul Truck	$	102,537
Loader 5cy+	$	26,428
Grader 30,000 lb.	$	28,962
Excavator 3.5 cy ~ 80K-100K lb.	$	47,632
Dozer D6	$	35,180
Rip Rap Class II 18"-24"	$	13,204
Site Area Reclamation Materials	$	138,751
Subtotals Step 2	**$**	**392,694**
Subtotal Construction	**$**	**765,774**
Other Costs		**Unit Cost**
Non-Construction Costs		
Engineering Design	$	320,689
Planning Documents	$	315,294
Resource Surveys	$	218,889
Confirmation Sampling	$	291,502
Reporting	$	158,033
Contractor Site Overhead	$	1,129,875
Mobilization / Demobilization	$	35,781
Travel+ Lodging (Construction Workers)	$	252,560
Level of Accuracy (20%)	$	153,155
Third-Party Oversight	$	431,217
Navajo Tax (6%)	$	168,438
Subtotals Step 6	**$**	**3,475,433**
Total Site Capital Costs	**$**	**4,241,208**
Yearly On-Site PRSC Costs		**Unit Cost**
Bi-annual Inspection (4 person crew, 3 days, 10 hr/day)	$	6,800
Mileage (Farmington, NM, to Site, roundtrip)	$	473
Inspection Crew Per Diem	$	3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	$	28,723
Preperation of Semi-annual Reports (Professional Engineer)	$	9,600
Subtotal PRSC Costs	**$**	**49,220**
PRSC Contingencies (15%)	$	7,383
Navajo Tax (6% of PRSC and Contingencies Cost)	$	3,396
Total Yearly PRSC Costs	**$**	**59,999**
Present Value of PRSC Costs Based on 10-Year Life at 3.50% (PV Factor = 8.317)	**$**	**498,950**
Waste Hauling Cost		
Waste Hauling Cost per CY	**$**	**204**

Table E-29. Cove Transfer Station Complex, Cost Estimate Summary for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Waste Hauling Total Cost	**$**	**6,959,304**
Low-Level Radioactive Waste Disposal Facility Cost		
Low-Level Radioactive Waste Disposal Facility Cost per CY	**$**	**105**
Low-Level Radioactive Waste Disposal Facility Cost	**$**	**3,579,188**
Grand Total Capital Costs	**$**	**14,779,699**
TOTAL COSTS	**$**	**15,278,649**

Notes:

"	Inch
AC	Acres
CY	Cubic yard
hp	Horsepower
hr	Hour
K	Thousand
lb.	Pound
LF	Linear feet
NM	New Mexico
PRSC	Post-removal site control
PV	Present value
T&M	Time and material

Table E-30. Cove Transfer Station 2, Cost Estimate Scenario Assumptions for Alternative 2, Disposal in On-Mesa Repository

Technology	Assumptions	Cost Effects
Excavation Methods	Waste removed by an excavator is assumed to be removed with a large excavator, unless specified	Excavators can operate on steeper terrain than bulldozers and are better at moving waste uphill. Bulldozers cost less to operate. Spider excavators or other specialized equipment are more expensive.
	Any disturbed surface can be restored using grading and erosion controls	Quantities of erosion control materials and grading may be lower than costed
	Land is barren to warrant no clearing or grubbing	Costs of clearing and grubbing are zero
	All waste specified in the risk assessment will be excavated	Volumes of excavated waste may be lower than costed
	The site is accessible to haul trucks and trucks can be easily loaded	Accessing difficult-to-reach mines increase costs.
Soil and Waste Sorting	Waste will be sorted based on grain size; rock greater than 3 inches will be segregated	NA
	Waste can be sorted within the mine waste footprint	Additional restoration of a separate area would be needed, increasing costs
	Waste can be processed through the screening plant using an excavator	NA
On-Mesa Repository	On-mesa repository is built on top of the nearest Cove mesa	Greater distance to repository increases costs
	Waste can be consolidated into a 360,000 square foot area, which will be graded	Consolidation into a larger area decreases the cost for relocating the waste; however, it increases cost for cover soil
	Access road into site will be maintained for PRSC of the burial cell	Removing the road is cheaper
	A bulldozer will be used to excavate borrow soil	Use of an excavator may increase costs
	Multiple cells will be required to be opened and closed	Multiple mobilizations to open/close cells increases costs
	ET cap (if chosen) will be 3 feet of soil with a biobarrier and capillary break but no liner	Adding biobarrier, capillary break, or liner will increase costs
	No bottom liner or leachate collection system will be installed	Adding bottom liner or leachate collection system increases costs
	Bulldozer will be used to move borrow soil to form cap	Use of an excavator may increase costs.
	The waste excavation area will require cover soil or amendment	If cover soil or amendments are required, costs will increase.
	PRSC inspection of the mine site will be completed for 10 years. PRSC Inspection of the on-mesa repository cell will be completed for 1000 years.	More PRSC inspections will increase costs

Notes:

CY	Cubic yard
ET	Evapotranspiration
NA	Not applicable - inherent assumption
PRSC	Post-removal site control

Table E-31. Cove Transfer Station 2, Crew Time Productivity Calculations for Alternative 2, Disposal in On-Mesa Repository

	Waste Volume	16,301	CY		
	Removal Area	2.47	AC		
Step	**CTS 2 Excavation**				
1	**Action**	**QTY**	**Unit**	**Production CY**	**Days**
	Waste Removal CTS 2 - Excavate/Load/Haul	20,376	LCY	397	51
		20,376		**Control Days**	**51**
Step	**CTS 2 Restoration**				
2	**Action**	**QTY**	**Unit**	**Production Rate**	**Days**
	Clean Borrow Fill	1,993	CY	2,888	0.7
	Grading	11,957	SY	6.3 Days for 11,111 SY	6.3
	Mechanical Seeding, Fertilizer, Mulch	11,957	SY	1,000	12.0
	Erosion Control - Erosion Control Blanket	6,167	SY	1,000	6.2
				Control Days	**25**
				TOTAL PROJECT DAYS	**76**
				Slowest Rate Project Days:	76

Notes:

AC	
BCY	Bank cubic yard
CTS	Cove Transfer Station
CY	Cubic yard
LCY	Loose cubic yard
LF	Linear foot
Mi	Mile
QTY	Quantity
SY	Square yard

Table E-32. Cove Transfer Station 2, Equipment Cost Details for Alternative 2, Disposal in On-Mesa Repository

Step	Equipment List	QTY	RSMeans #	RSMeans Description	Unit Cost	Unit	Crew
1	**CTS2 Excavation and Restoration**						
	Off-Road Haul Truck	4	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$ 6.32	LCY	B34F
	Loader 5cy+	1	312323154080	Common Earth - 5cy bucket, front end loader	$ 16.30	BCY	B10U
			015433204760	Rent front end loader, articulating, 5.25-5.75 CY 270 HP	$ 8,478.75	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$ 631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$ 12,705	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity=300 CY/hour	$ 1.78	BCY	B12D
2	**CTS2 Reclamation**						
	Off-Road Haul Truck	1	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$ 6.32	LCY	B34F
	Loader 5CY+	1	312323154080	Common Earth - 5 CY bucket, front-end loader	$ 16.30	BCY	B10U
			015433204760	Rent front-end loader, articulating, 5.25-5.75 CY 270 hp	$ 8,478.75	Month	None (Rental)
	Dozer D6	1	312213200170	8,100-10,000 SF Grading, Dozer	$ 1,378.08	each	B10L
			015433204260	Rent Dozer, crawler, torque converter, diesel 200 hp	$ 15,960	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$ 631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$ 12,705	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity = 300 CY/hour	$ 1.78	BCY	B12D

Notes:

BCY	Bank cubic yard
CTS	Cove Transfer Station
CY	Cubic yard
hp	Horsepower
K	Thousand
lb.	Pound
LCY	Loose cubic yard
ld.	Loaded
LF	Linear foot
MPH	Mile per hour
SF	Square feet
unld.	Unloaded

Table E-33. Cove Transfer Station 2, Mesa V Trunk Road Cost Details for Alternative 2, Disposal in On-Mesa Repository

Site Characteristics				
Volume of Waste Transported	576,479	CY		
Length of Road:	10.11	Miles		
Day of Operation	1,400	Days		
Cost Item	**Quantity**	**Unit**	**Unit Cost**	**Crew Cost**
Capital Costs				
Road Grader	1,400	Day	$ 1,882.05	$ 2,339,077
Off-Road Haul Truck	280	Day	$ 2,185.20	$ 2,507,713
Dust Control Additive	33	Container	$ 5,700	$ 188,100
Water Truck	1,400	Day	$ 898.29	$ 3,149,972
Air Quality Monitoring	1,400	Day	$ 250	$ 350,000
Onsite Dust Control Coordinator	1,400	Day	$ 100	$ 140,000
Dozer	280	Day	$ 2,329	$ 3,361,508
Loader 5CY	1,112	Day	$ 2,032.94	$ 2,877,123
Excavator 2CY	1,112	Day	$ 2,299.37	$ 3,254,189
Excavator 2CY Rock Hammer	101	Day	$ 2,759.24	$ 1,115,431
Stormwater BMP's (Hay Bales/Wattles and Silt Fence)	20,782	LF	$ 8.55	$ 177,690
Culverts 24"	2,657	LF	$ 137.05	$ 364,143
Gravel (Road Mix)	16,828	Tons	$ 18	$ 302,911
Rip-Rap Class II	3,719	Tons	$ 55	$ 204,523
Subtotal Construction Costs				**$ 20,332,380**
Mobilization				$ 222,925
Travel + Lodging				$ 4,873,298
Project Management		5% of Construction Cost		$ 1,016,619
Engineering Design		8% of Construction Cost		$ 1,626,590
Contractor Site Overhead				$ 3,937,116
Construction Contingencies		20% of Construction Cost		$ 4,066,476
Navajo Tax		6% of Construction, Construction Management, and Contingencies Cost		$ 2,005,932
Total Capital Costs				**$ 38,081,336**
Yearly Post Removal Site Control (PRSC) Costs				
Site Maintenance		0.5% of Construction Cost		$ 101,662
Subtotal PRSC Costs				$ 101,662
PRSC Contingencies		15%		$ 15,249
Navajo Tax		6% of PRSC and Contingencies Cost		$ 7,015
Total Yearly PRSC Cost				**$ 123,926**
Present Value of PRSC Costs Based on 1000 Year Life at 3.50%		PV Factor = 28.571		$ 3,540,686
Total Present Value				**$ 41,622,022**
Construction Cost Per CY				**$ 66**
Total Present Value Cost Per CY				**$ 6**
Total Cost Per CY				**$ 72**

Notes:

"	Inch
CY	Cubic yard
LF	Linear feet
PV	Present value
PRSC	Post-removal site control

Table E-34. Cove Transfer Station 2, On-Mesa Repository Cost Details for Alternative 2, Disposal in On-Mesa Repository

Site Measurements	QTY	Unit	QTY	Unit		
Repository Area	12.91	AC	562,525	SF		
Repository topsoil 3"	5,209	CY				
Borrow Topsoil 3" (1.5 AC)	605	CY				
Clean Fill Volume (Volume From Estimate calculator)	53,336	CY				
Soil Barrow Fill Volume (at 10' depth need 0.1 AC Area)	9,452	CY				
Waste Volume	213,345	CY				
Laydown Area (google earth)	2.8	AC	121,532	SF		
Laydown topsoil 3"	1,125	CY				
Engineering Design	**Equipment List**	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager			Hour	45	$ 158.00	$ 7,083
Project Engineer			Hour	179.0	$ 122.00	$ 21,839
Design Engineer			Hour	89.5	$ 158.00	$ 14,142
CAD/GIS Operator			Hour	44.8	$ 102.00	$ 4,573
Admin			Hour	18	$ 67.00	$ 1,199
Reproduction			LS	3	$ 500.00	$ 1,500
						$ 50,336
Site Prep	**Equipment List**	**Crew**	**Daily**	**Unit**	**Days**	**Cost**
Clearing and Grubbing	Mulching EQ	B-65	$ 1,712.23	1	5.23	**$ 8,963**
Storm Drain Channel Excavation (includes laydown+25%)	Excavator 3.5 CY = 300CY/hr.	B-12D	$ 3,664.80	1	2.76	**$ 10,100**
Storm Drain Channel Armoring (Riprap)(includes laydown and Pond +25%)	Rip Rap Class II 18"-24"		$ 52.00	311.85		$ 16,216
	Excavator 3.5 CY = 300CY/hr.	B-12D	$ 3,664.80	1	0.59	$ 2,177
	Loader 5.5CY	B-10U	$ 2,032.94	1	0.59	$ 1,208
						$ 19,601
Water Berm Construction and Compaction (includes laydown +25%)	Excavator 3.5 CY = 300CY/hr.	B-12D	$ 3,664.80	1		$ -
	Vibrating plate, Gas 21"	B-18	$ 1,796.16	1	2.76	$ 4,950
	Water Truck	B-59	$ 1,124.99	1	2.76	$ 3,100
						$ 8,051
Storm Drain Pond Excavation (includes laydown +25%)	Excavator 3.5 CY = 300CY/hr.	B-12D	$ 3,664.80	1	0.14	**$ 510**
						$ 47,225

Table E-34. Cove Transfer Station 2, On-Mesa Repository Cost Details for Alternative 2, Disposal in On-Mesa Repository

Excavation	Equipment List	Crew	Daily	Unit	Days	Cost
Topsoil Stripping and Stockpiling	Excavator 3.5 CY = 300CY/hr.	B-12D	$ 3,664.80	1	3.30	$ 12,109
	Off Road Haul Truck	B34F	$ 1,653.82	3	3.30	$ 16,394
	Loader 5.5CY	B-10U	$ 2,032.94	1	3.30	$ 6,717
	Water Truck	B-59	$ 1,124.99	1	3.30	$ 3,717
						$ 38,938
Repository and Soil Barrow Excavation and Stockpiling	Excavator 3.5 CY = 300CY/hr.	B-12D	$ 3,664.80	1	35.88	$ 131,489
	Off Road Haul Truck 22CY	B34F	$ 1,653.82	2	35.88	$ 118,674
	Dozer 300 HP	B-10M	$ 2,931.70	1	35.88	$ 105,186
	Water Truck	B-59	$ 1,124.99	1	35.88	$ 40,363
						$ 395,713
Borrow Material Screening	Loader 5.5CY	B-10U	$ 2,032.94	1	35.88	$ 72,940
	Screen Plant		$ 4,725.00	1	35.88	$ 169,528
	Water Truck	B-59	$ 1,124.99	1	35.88	$ 40,363
						$ 282,831
Bottom Grading	30,000 lb. Grader	B-11L	$ 2,413.50	1	35.88	**$ 86,594**
						$ 804,074
Operation	**Equipment List**	**Crew**	**Daily**	**Unit**	**Days**	**Cost**
Waste Screening	Loader 5.5CY	B-10U	$ 2,032.94	1	121.9	$ 247,839
	Screen Plant		$ 4,725.00	1	121.9	$ 576,032
	Off Road Haul Truck	B34F	$ 1,653.82	3	121.9	$ 604,859
	Dozer 300 HP	B-10M	$ 2,931.70	1	121.9	$ 357,408
	Water Truck	B-59	$ 1,124.99	1	121.9	$ 137,149
						$ 1,923,286
		Cost of 5 Years Operation = 1 Year Cost of Waste Screening * 20% for Mobilization / Lodging				**$ 2,307,943**
Waste Grading of Each Lift + Waste Compaction of Each Lift	30,000 lb. Grader	B-32A	$ 3,856.00	1	121.9	$ 470,090
	Water Truck	B-59	$ 1,124.99	1	121.9	$ 137,149
						$ 607,240
						$ 2,915,182
Closure	**Equipment List**	**Crew**	**Daily**	**Unit**	**Days**	**Cost**
Waste Final Grading	30,000 lb. Grader	B-11L	$ 2,413.50	1	4.3	$ 10,389
	Water Truck	B-59	$ 1,124.99	1	4.3	$ 4,843
						$ 15,232

Table E-34. Cove Transfer Station 2, On-Mesa Repository Cost Details for Alternative 2, Disposal in On-Mesa Repository

Cap Cover Installation	Gravel Delivered - 1" Rock Crushed Size 56 (Tons)		$ 10.95	1250	1	$ 13,688
	Gravel Delivered - 5/8" Rock Crushed (Tons)		$ 18.80	3545	1	$ 66,646
	Loader 5.5CY	B-10U	$ 2,032.94	1	59.8	$ 121,566
	Off Road Haul Truck	B34F	$ 1,653.82	4	29.9	$ 197,791
	Dozer 300 HP	B-10M	$ 2,931.70	1	29.9	$ 87,655
	30,000 lb. Grader	B-11L	$ 2,413.50	1	29.9	$ 72,161
	Water Truck	B-59	$ 1,124.99	1	29.9	$ 33,636
						$ 593,143
						$ 608,374
Reclamation	**Equipment List**	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Revegetation Mat			SF	56,763	$ 1.68	$ 95,362
Hay Bales/Wattles and Silt Fence			LF	2500	$ 8.55	$ 21,375
Fertilizer, Seed, and Mulch			SY	56763	$ 4.02	$ 228,189
						$ 344,926
Other Line Items	**Equipment List**	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Fence			LF	3180	$ 38.00	$ 120,840
Survey			AC	12.91	$ 3,425.00	$ 44,230
Water Well, Pump, Tank and Generator			LS	1	$ 65,523.48	$ 65,523
Well Installation			LS	1	$ 462,794.91	$ 462,795
						$ 693,388
Subtotal Construction Costs						**$ 5,413,169**
Contractor Site Overhead						**$ 1,620,980**
Travel + Lodging:						**$ 678,179**
Mobilization / Demobilization:						**$ 250,015**
Level of Accuracy (20%)						**$ 1,082,634**
Navajo Tax (6%):						**$ 502,008**
Total Construction Cost:						**$ 9,597,321**
Yearly Post Removal Site Control (PRSC) Costs						
Site Inspections			1	EA	$1,000.00	$ 1,000
Site Maintenance			1% of Construction Cost			$ 95,973
Subtotal PRSC Costs						**$ 96,973**
PRSC Contingencies			15%			$ 14,546

Table E-34. Cove Transfer Station 2, On-Mesa Repository Cost Details for Alternative 2, Disposal in On-Mesa Repository

Navajo Tax			6% of PRSC and Contingencies Cost			$ 6,691
Total Yearly PRSC Cost						**$ 118,210**
Present Value of PRSC Costs Based on 1,000 Year Life at 3.50%			PF Factor = 28.571			**$ 3,377,388**
Total Present Worth						**$ 12,974,708**
Cost Per CY:						**$ 61**

Notes:

"	Inch
AC	Acres
CAD	Computer-aided design
CY	Cubic yard
EQ	Equipment
GIS	Geographic information system
hr	Hour
lb.	Pound
LF	Linear feet
LS	Lump sum
N/A	Not applicable
PRSC	Post-removal site control
SY	Square yard

Table E-35. Cove Transfer Station 2, Cost Estimate Details for Alternative 2, Disposal in On-Mesa Repository

Engineering Design	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	293	$ 158	$ 46,294
Project Engineer	N/A	Hour	1170	$ 122	$ 142,740
Design Engineer	N/A	Hour	585	$ 158	$ 92,430
CAD/GIS Operator	N/A	Hour	293	$ 102	$ 29,886
Admin	N/A	Hour	117	$ 67	$ 7,839
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 320,689
Planning Documents	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	405	$ 158	$ 63,990
Project Engineer	N/A	Hour	1620	$ 122	$ 197,640
CAD/GIS Operator	N/A	Hour	405	$ 102	$ 41,310
Admin	N/A	Hour	162	$ 67	$ 10,854
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 315,294
Resource Surveys	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Cultural Resources Mitigation	N/A	Each	1	$ 12,655.82	$ 12,656
Biological Resources Mitigation	N/A	Each	1	$ 25,311.65	$ 25,312
Geotechnical Testing and Report	N/A	Each	1	$ 25,311.65	$ 25,312
Pre-Project Aerial LIDAR Survey	N/A	Each	0	$ 30,000.00	$ -
Post-Project Aerial LiDAR Survey	N/A	Each	1	$ 37,967.47	$ 37,967
					$ 101,247
Confirmation Sampling	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Developing Sampling and Analysis Plan					
Project Geologist	N/A	Hour	360	$ 158	$ 56,880
Project Manager	N/A	Hour	180	$ 111	$ 19,980
CAD/GIS Operator	N/A	Hour	180	$ 122	$ 21,960
Project Chemist	N/A	Hour	360	$ 111	$ 39,960
Health and Safety Manager	N/A	Hour	180	$ 151	$ 27,180
Admin	N/A	Hour	72	$ 67	$ 4,824
Reproduction	N/A	LS	3	$ 250	$ 750
Sampling					
Sampling Team - Staff Geologist	N/A	Hour	38	$ 77	$ 2,923
Sampling Team - Staff Engineer	N/A	Hour	38	$ 81	$ 3,075
Travel	N/A	Day	8	$ 170	$ 1,360
Per Diem (96/55)	N/A	Day	8	$ 151	$ 1,208
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 6,469.66	$ 6,470
Lab Analysis	N/A	LS	1	$ 2,084.41	$ 2,084
XRF Surveying					
Sampling Team - Staff Geologist	N/A	Hour	142	$ 77	$ 10,914
Sampling Team - Staff Engineer	N/A	Hour	142	$ 81	$ 11,481
Travel	N/A	Day	13	$ 170	$ 2,210
Per Diem (96/55)	N/A	Day	23	$ 151	$ 3,440
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 6,469.66	$ 6,470
Lab Analysis	N/A	LS	1	$ 2,084.41	$ 2,084
Frisking Equipment	N/A	Month	13	$ 144	$ 1,822
					$ 227,077

Table E-35. Cove Transfer Station 2, Cost Estimate Details for Alternative 2, Disposal in On-Mesa Repository

Reporting	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Geologist	N/A	Hour	316	$ 105	$ 33,180
Project Manager	N/A	Hour	158	$ 175	$ 27,650
Project Engineer	N/A	Hour	474	$ 122	$ 57,828
Chemist	N/A	Hour	158	$ 111	$ 17,538
CAD/GIS Operator	N/A	Hour	158	$ 102	$ 16,116
Admin	N/A	Hour	63	$ 67	$ 4,221
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 158,033
Mobilization/Demobilization	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Crew Mileage	N/A	Mile	4,320	$ 0.56	$ 2,419
Per Diem	N/A	Day	12	$ 182	$ 2,184
Labor	N/A	Day	12	$ 300	$ 3,600
Standard Equipment Mileage	N/A	Mile	4,320	$ 0.56	$ 2,419
Standard Equipment Rental	N/A	Day	2	$ 14,349.78	$ 28,700
					$ 39,322
Excavation & Hauling	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Loader 5cy+	B10U	$ 2,032.94	1	52	$ 105,713
Off Road Haul Truck	B34F	$ 1,653.82	4	52	$ 343,995
Grader 30,000 lb.	B11L	$ 2,413.50	1	52	$ 125,502
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664.00	1	52	$ 190,528
				Total	**$ 765,737**
Reclamation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Off Road Haul Truck	B34F	$ 1,653.82	1	26	$ 42,999
Loader 5cy+	B10U	$ 2,032.94	1	1	$ 2,033
Grader 30,000 lb.	B11L	$ 2,413.50	1	7	$ 16,895
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664.00	1	1	$ 3,664
Dozer D6	B10M	$ 2,931.70	1	1	$ 2,932
Site Area Reclamation Materials	N/A	$ 68,239.50	1	1	$ 58,428
				Total	**$ 126,950**
Contractor Site Overhead	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager (10% of time)	N/A	Hour	76	$ 175	$ 13,387
Site Superintendent	N/A	Hour	765	$ 191	$ 146,112
H&S Officer	N/A	Hour	765	$ 85	$ 65,024
QA/QC Officer	N/A	Hour	765	$ 85	$ 65,024
Field Clerk	N/A	Hour	765	$ 19	$ 14,535
Fuel for Site Vehicles	N/A	Month	18	$ 1,600	$ 28,559
Port-o-let Rental (4)	N/A	Month	15	$ 208	$ 3,182
Permanent Fencing Installation and Demolition	N/A	LF	1312	$ 41.92	$ 55,007
Job Trailers (1)	N/A	Month	4	$ 269	$ 1,029
Storage Boxes (1)	N/A	Month	4	$ 95	$ 361
Field Office Lights/HVAC (1)	N/A	Month	4	$ 179	$ 685
Generator (1)	N/A	Month	8	$ 2,400	$ 18,360
Fuel for Generator	N/A	Gallons	2295	$ 4	$ 9,180
Telephone/internet (1)	N/A	Month	4	$ 384	$ 1,469
Field Office Equipment	N/A	Month	4	$ 230	$ 880

Table E-35. Cove Transfer Station 2, Cost Estimate Details for Alternative 2, Disposal in On-Mesa Repository

Field Office Supplies	N/A	Month	4	$ 96	$ 367
Trash (1 dumpster)	N/A	Month	4	$ 910	$ 3,481
Clin 1034 High Volume Air Sampling (4)	N/A	Month	15	$ 383	$ 5,860
Clin 1025 Ludlum 2121 and 43-10-1	N/A	Month	4	$ 275	$ 1,052
Air Monitoring Lab Confirmation Sampling (5 samples per day)	N/A	Day	382	$ 600	$ 229,495
Clin 1036 Personal Air Monitor	N/A	Month	27	$ 204	$ 5,590
Clin 1038 Personal Dust Monitor	N/A	Month	27	$ 1,555	$ 42,607
Clin 1068 Personal Dosimeter Badge	N/A	Month	27	$ 59	$ 1,617
Truck Scales	N/A	Month	4	$ 300	$ 1,147
Construction Water (excavation)	N/A	Gallon	38307	$ 0.05	$ 1,915
Construction Water (hauling waste soil plus cap mat'l)	N/A	Gallon	783869	$ 0.05	$ 39,193
6,000 Gallon Water Truck and Operator (1)	N/A	Day	76	$ 889	$ 68,007
Portal Water Tower Trailer, 10,000 gallons (1)	N/A	Day	76	$ 172.36	$ 13,185
					$ 836,310
Third-Party Oversight	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Travel and Lodging (4 people)	N/A	Day	306	$ 151	$ 46,205
Labor	N/A	Hour	3060	$ 80	$ 244,795
Car Rental (4 cars)	N/A	Month	15	$ 400	$ 6,120
Car Fuel	N/A	Month	15	$ 760	$ 11,628
					$ 308,748
Level of Accuracy (20%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
20% of Construction Cost	N/A	N/A	N/A	N/A	**$ 178,538**
Navajo Tax (6%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
6% of Confirmation Sampling, Construction, Contractor Overhead, Mobilization / Demobilization, and Third Party Oversight Costs	N/A	N/A	N/A	N/A	**$ 148,961**
				GRAND TOTAL	**$ 3,748,114**
PRSC Costs	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Bi-annual Inspection (4 person crew, 1 day, 10 hr/day)	N/A	Hour	80	$ 85	$ 6,800
Mileage (Farmington, NM, to Site, roundtrip)	N/A	Mile	815	$ 0.58	$ 473
Inspection Crew Per Diem	N/A	Day	24	$ 151	$ 3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	N/A	SY	1,196	$ 1.11	$ 1,329
Preperation of Semi-annual Reports (Professional Engineer)	N/A	Hour	80	$ 120	$ 9,600
PRSC Annual Cost					**$ 21,825**
PRSC Contingency (15%)					**$ 3,274**
Navajo Tax (6% of PRSC and Contingencies Cost					**$ 1,506**
Total PRSC Annual Cost					**$ 26,605**

Notes:

"	Inch
CAD	Computer-aided design
CY	Cubic yard
GIS	Geographic information system
H&S	Health and safety

Table E-35. Cove Transfer Station 2, Cost Estimate Details for Alternative 2, Disposal in On-Mesa Repository

hp	Horsepower
hr	Hour
HVAC	Heating, ventilation, and air conditioning
K	Thousand
lb.	Pound
LF	Linear feet
LiDAR	Light detection and ranging
LS	Lump sum
M2	Square meters
N/A	Not applicable
NM	New Mexico
PRSC	Post-removal site control
QA/QC	Quality assurance/quality control
SY	Square yard
XRF	X-ray fluorescence

Table E-36. Cove Transfer Station 2, Cost Estimate Summary for Alternative 2, Disposal in On-Mesa Repository

Waste Volume	16,301 CY	
Removal Area	2.47 AC	
Excavation & Hauling	**Unit Cost**	
Loader 5cy+	$	105,713
Off Road Haul Truck	$	343,995
Grader 30,000 lb.	$	125,502
Excavator 3.5 cy ~ 80K-100K lb.	$	190,528
Subtotals Step 1	**$**	**765,737**
Reclamation	**Unit Cost**	
Haul Truck	$	42,999
Loader 5cy+	$	2,033
Grader 30,000 lb.	$	16,895
Excavator 3.5 cy ~ 80K-100K lb.	$	3,664
Dozer D6	$	2,932
Site Area Reclamation Materials	$	58,428
Subtotals Step 2	**$**	**126,950**
Subtotal Construction	**$**	**892,688**
Other Costs	**Unit Cost**	
Non-Construction Costs		
Engineering Design	$	320,689
Planning Documents	$	315,294
Resource Surveys	$	101,247
Confirmation Sampling	$	227,077
Reporting	$	158,033
Contractor Site Overhead	$	836,310
Mobilization / Demobilization	$	39,322
Travel+ Lodging (Construction Workers)	$	221,208
Level of Accuracy (20%)	$	178,538
Third-Party Oversight	$	308,748
Navajo Tax (6%)	$	148,961
Subtotals Step 6	**$**	**2,855,426**
Total Site Capital Costs	**$**	**3,748,114**
Yearly On-Site PRSC Costs	**Unit Cost**	
Bi-annual Inspection (4 person crew, 3 days, 10 hr/day)	$	6,800
Mileage (Farmington, NM, to Site, roundtrip)	$	473
Inspection Crew Per Diem	$	3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	$	1,329
Preperation of Semi-annual Reports (Professional Engineer)	$	9,600
Subtotal PRSC Costs	**$**	**21,825**
PRSC Contingencies (15%)	$	3,274
Navajo Tax (6% of PRSC and Contingencies Cost)	$	1,506
Total Yearly PRSC Costs	**$**	**26,605**
Present Value of PRSC Costs Based on 10-Year Life at 3.50% (PV Factor = 8.317)	**$**	**221,246**
Mesa V Trunk Road Cost Share (2.8%)		
Mesa V Trunk Road Yearly PRSC Costs	**$**	**3,507**
Mesa V Trunk Road Cost per CY (Includes 1000-year PRSC)	**$**	**6**

Table E-36. Cove Transfer Station 2, Cost Estimate Summary for Alternative 2, Disposal in On-Mesa Repository

Mesa V Trunk Road Shared Cost	**$**	**125,110**
Mesa V ET Cap Cost Share (7.6%)		
Mesa V ET Cap Construction Costs	**$**	**733,235**
Mesa V ET Cap Total Yearly PRSC Costs	**$**	**9,031**
Mesa V ET Cap Cost per CY (Includes 1000-year PRSC)	**$**	**61**
Mesa V ET Cap Shared Cost	**$**	**991,427**
Grand Total Capital Costs	**$**	**4,481,349**
TOTAL COSTS	**$**	**5,085,897**

Notes:

"	Inch
AC	Acres
CY	Cubic yard
ET	Evapotranspiration
hp	Horsepower
hr	Hour
K	Thousand
lb.	Pound
LF	Linear feet
NM	New Mexico
PRSC	Post-removal site control
PV	Present value
T&M	Time and material

Table E-37. Cove Transfer Station 2, Cost Estimate Scenario Assumptions for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Technology	Assumptions	Cost Effects
Excavation Methods	Waste removed by an excavator is assumed to be removed with a large excavator, unless specified	Excavators can operate on steeper terrain than bulldozers and are better at moving waste uphill. Bulldozers cost less to operate. Spider excavators or other specialized equipment are more expensive.
	Any disturbed surface can be restored using grading and erosion controls	Quantities of erosion control materials and grading may be lower than costed
	Land is barren to warrant no clearing or grubbing	Costs of clearing and grubbing are zero
	All waste specified in the risk assessment will be excavated	Volumes of excavated waste may be lower than costed
	The site is accessible to haul trucks and trucks can be easily loaded	Accessing difficult-to-reach mines increase costs.
Soil and Waste Sorting	Waste will be sorted based on grain size; rock greater than 3 inches will be segregated	NA
	Waste can be sorted within the mine waste footprint	Additional restoration of a separate area would be needed, increasing costs
	Waste can be processed through the screening plant using an excavator	NA
Regional Repository	Suitable repository location is available within 25 road miles of the waste	Greater distance to repository increases costs
	Waste can be consolidated into a 1,700,000 square foot area, which will be graded	Consolidation into a larger area decreases the cost for relocating the waste; however, it increases cost for cover soil
	A bulldozer will be used to excavate borrow soil	Use of an excavator may increase costs
	One cell will be constructed in the repository	Multiple cells will be required because of weather conditions and will increase complexity and costs
	Waste will be consolidated from multiple locations	Consolidating waste from multiple locations increases costs
	Waste will be transported in haul trucks	Longer hauling distances will slow production rate of excavation
	ET cap will be 3 feet of soil with a biobarrier and capillary break but no liner	Adding biobarrier, capillary break, or liner will increase costs
	No bottom liner or leachate collection system will be installed	Adding bottom liner or leachate collection system increases costs
	Bulldozer will be used to move borrow soil to form cap	Use of an excavator may increase costs.
	The waste excavation area will not require cover soil or amendment	If cover soil or amendments are required, costs will increase.
	PRSC inspection of the mine site will be completed for 10 years. PRSC Inspection of the on-site burial cell will be completed for 1000 years.	More PRSC inspections will increase costs

Notes:

CY	Cubic yard
ET	Evapotranspiration
NA	Not applicable - inherent assumption
PRSC	Post-removal site control

Table E-38. Cove Transfer Station 2, Crew Time Productivity Calculations for Alternative 3, Disposal in On-Navajo Nation Regional Repository

	Waste Volume	16,301	CY		
	Removal Area	2.47	AC		
Step	**CTS 2 Excavation**				
1	**Action**	**QTY**	**Unit**	**Production CY**	**Days**
	Waste Removal CTS 2 - Excavate/Haul/Load	20,376	LCY	756	27
		20,376		**Control Days**	**27**
Step	**CTS 2 Restoration**				
2	**Action**	**QTY**	**Unit**	**Production Rate**	**Days**
	Clean Borrow Fill	1,993	CY	2,888	0.7
	Grading	11,957	SY	6.3 Days for 11,111 SY	6.3
	Mechanical Seeding, Fertilizer, Mulch	11,957	SY	1,000	12
	Erosion Control - Erosion Control Blanket	6,167	SY	1,000	6.2
				Control Days	**25**
				TOTAL PROJECT DAYS	**52**
				Slowest Rate Project Days:	52

Notes:

AC	
BCY	Bank cubic yard
CTS	Cove Transfer Station
CY	Cubic yard
LCY	Loose cubic yard
LF	Linear foot
Mi	Mile
QTY	Quantity
SY	Square yard

Table E-39. Cove Transfer Station 2, Equipment Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Step	Equipment List	QTY	RSMeans #	RSMeans Description	Unit Cost	Unit	Crew
	CTS2 Excavation and Restoration						
1	Loader 5cy+	1	312323154080	Common Earth - 5cy bucket, front end loader	$ 16.30	BCY	B10U
			015433204760	Rent front end loader, articulating, 5.25-5.75 CY 270 HP	$ 8,478.75	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$ 631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$ 12,705	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity=300 CY/hour	$ 1.78	BCY	B12D
	CTS2 Reclamation						
2	Off-Road Haul Truck	1	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$ 6.32	LCY	B34F
	Loader 5CY+	1	312323154080	Common Earth - 5 CY bucket, front-end loader	$ 16.30	BCY	B10U
			015433204760	Rent front-end loader, articulating, 5.25-5.75 CY 270 hp	$ 8,478.75	Month	None (Rental)
	Dozer D6	1	312213200170	8,100-10,000 SF Grading, Dozer	$ 1,378.08	each	B10L
			015433204260	Rent Dozer, crawler, torque converter, diesel 200 hp	$ 15,960	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$ 631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$ 12,705	Month	None (Rental)
	Drill Rig	1	015433401865	Rent drill, rotary, crawler, 250hp	$ 23,249.00	Month	None (Rental)
			023213100600	Subsurface investigation, boring and exploratory drilling, auger holes in earth	$ 26.28	LF	B55
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity = 300 CY/hour	$ 1.78	BCY	B12D

Notes:

BCY	Bank cubid yard
CTS	Cove Transfer Station
CY	Cubic yard
hp	Horse power
K	Thousand
lb.	Pound
LCY	Loose cubic yard
ld.	Loaded

Table E-39. Cove Transfer Station 2, Equipment Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

LF	Linear foot
MPH	Mile per hour
SF	Square feet
unld.	Unloaded

Table E-40. Cove Transfer Station 2, Regional Repository Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Site Measurements	QTY	Unit	Site Measurements	QTY	Unit	
Repository Area	39.2	AC	Yearly Waste Volume	981,220	CY	
Laydown Area	15.0	AC	Yearly Borrow Volume	21,286	CY	
Haul Route From transfer	21	Mile				
Haul Road to Repository	2	Mile				
Topsoil Volume	21,562	CY				
Borrow Volume	194,058	CY				
Waste volume	934,022	CY				
Engineering Design	**Equipment List**	**Unit**	**Amount**	**Price**	**Cost**	
Project Manager		Hour	293	$ 158	$ 46,294	
Project Engineer		Hour	1,170	$ 122	$ 142,740	
Design Engineer		Hour	585	$ 158	$ 92,430	
CAD/GIS Operator		Hour	293	$ 102	$ 29,886	
Admin		Hour	117	$ 67	$ 7,839	
Reproduction		LS	3	$ 500	$ 1,500	
					$ 320,689	
Site Prep	**Component**	**Crew/Unit**	**Crew Day/ Total Cost**	**Days**	**Total Cost**	
Clearing and Grubbing	Flatbed truck, Power Mul	B-65	$ 5,136.69	16	$ 84,230	
Stormwater channel	Excavator 3.5 CY = 300CY/hr.	B-12Y	$ 4,194.80	3.3	$ 13,987	
Stormwater pond	Excavator 3.5 CY = 300CY/hr.	B-12Y	$ 4,194.80	1.6	$ 6,832	
RipRap for channel and pond outfall	Class II riprap (delivered)	Tons	$ 126,500.00		$ 126,500	
	Off-road Haul Truck 22CY	B34F	$ 1,653.82	2.7	$ 4,528	
	Loader 5CY	B-10U	$ 2,032.94	2.0	$ 4,066	
	Excavator 3.5 CY = 300CY/hr.	B-12Y	$ 4,194.80	5.0	$ 20,974	
Culverts	Excavator 3.5 CY = 300CY/hr.	B-12Y	$ 4,194.80	5.0	$ 20,974	
	Culverts 24"	LF	$ 27,400.00		$ 27,400	

Table E-40. Cove Transfer Station 2, Regional Repository Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Water Well pump, Tank and Generator		EA	$ 38,350.00		$ 38,350	
Well Drilling		LF	$ 77,000.00		$ 77,000	
Water Truck		B-59	$ 1,124.99	36	$ 40,611	
					$ 465,451	
Yearly Operation	**Component**	**Crew/Unit**	**Crew Day/ Total Cost**	**Days**	**Total Year Cost**	**10 year cost**
Strip and stockpile Soil	Scraper 21 CY, Dozer 300HP	B-33E	$ 4,556.48	0.52	$ 2,385	$ 23,846
	Scraper 21 CY, Dozer 300HP	B-33E!	$ 10,874.40	0.52	$ 5,691	$ 56,911
Strip Barrow	Scraper 21 CY, Dozer 300HP	B-33E	$ 4,556.48	5.2	$ 23,535	$ 235,350
	Scraper 21 CY, Dozer 300HP	B-33E!	$ 10,874.40	5.2	$ 56,168	$ 561,682
Screen Barrow	Loader 5CY	B-10U	$ 2,032.94	11	$ 21,636	$ 216,363
	Screen Plant	Daily	$ 4,725.00	11	$ 50,287	$ 502,875
Bottom Grading	Grader- 30K lb.	B-11L	$ 2,413.50	1.6	$ 3,973	$ 39,735
Waste Screening and Sorting	Loader 5CY	B-10U	$ 2,032.94	49	$ 99,738	$ 997,381
	Screen Plant	Daily	$ 4,725.00	49	$ 231,813	$ 2,318,132
Waste Placement	Scraper 21 CY, Dozer 300HP	B-33E	$ 4,556.48	5.2	$ 23,541	$ 1,085,172
	Scraper 21 CY, Dozer 300HP	B-33E!	$ 10,874.40	5.2	$ 56,182	$ 2,589,849
	Loader 5CY	B-10U	$ 2,032.94	5.2	$ 10,503	$ 484,165
	Off-road Haul Truck 22CY	B34F	$ 3,307.64	5.2	$ 17,089	$ 787,748
Waste Grading and Compacting	30,000 lb. Grader + 25 ton roller	B-32A	$ 3,856.00	52	$ 199,136	$ 1,991,360
Cap Cover 2' ft.	Scraper 21 CY, Dozer 300HP	B-33E	$ 9,112.96	11	$ 102,092	$ 1,020,925
	30,000 lb. Grader + 25 ton roller	B-32A	$ 3,856.00	11	$ 43,199	$ 431,988
Topsoil	Scraper 21 CY, Dozer 300HP	B-33E	$ 18,225.92	0.52	$ 9,539	$ 95,385
	Grader- 30K lb.	B-11L	$ 603.38	0.52	$ 316	$ 3,158
Temporary Cap cell end cover HDPE Liner			$ 23,054.10		$ 23,054	$ 230,541

Table E-40. Cove Transfer Station 2, Regional Repository Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Water Truck	5,000 Gallon	B-59	$ 1,124.99	140	$ 157,499	$ 1,574,986
Revegetation mat			$ 35,759.98		$ 35,760	$ 357,600
Bales/Wattles + Silt fence			$ 4,341.69		$ 4,342	$ 43,417
Mechanical Seeding, Fertilizer, Mulch			$ 78,011.32		$ 78,011	$ 780,113
						$ 16,428,683
Subtotal Construction Costs						**$ 16,894,133**
Contractor Site Overhead						**$ 9,334,339**
Travel + Lodging:						**$ 2,690,044**
Mobilization / Demobilization:						**$ 864,519**
Level of Accuracy (20%)						**$ 3,378,827**
Navajo Tax (6%):						**$ 1,828,309**
Total Construction Cost:						**$ 35,310,859**
Yearly Operation	**Component**	**Crew/Unit**	**Crew Day/ Total Cost**	**Days**	**Total Year Cost**	**10 year cost**
Yearly Post Removal Site Control (PRSC) Costs						
Site Inspections			1	EA	$1,000.00	$ 1,000
Site Maintenance				1% of Construction Cost		$ 353,109
Subtotal PRSC Costs						**$ 354,109**
PRSC Contingencies				15%		$ 53,116
Navajo Tax				6% of PRSC and Contingencies Cost		$ 24,433
Total Yearly PRSC Cost						**$ 431,658**
Present Value of PRSC Costs Based on 1000 Year Life at 1.50%				PV Factor = 28.571		**$ 12,332,911**
Total Present Worth						**$ 47,643,771**
Cost Per CY:						**$ 49**

Notes:

"	Inch
AC	Acres
CAD	Computer-aided design
CY	Cubic yard
EA	Each
EQ	Equipment
GIS	Geographic information system

Table E-40. Cove Transfer Station 2, Regional Repository Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

hr	Hour
lb.	Pound
LF	Linear feet
LS	Lump sum
N/A	Not applicable
PRSC	Post-removal site control
SY	Square yard

Table E-41. Cove Transfer Station 2, Regional Repository Trunk Road Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Site Characteristics				
Volume of Waste Transported	981,220	CY		
Length of Road:	2.00	Miles		
Day of Operation	1,400	Days		
Cost Item	**Quantity**	**Unit**	**Unit Cost**	**Crew Cost**
Capital Costs				
Road Grader	1,400	Day	$ 1,882.05	$ 450,245
Off-Road Haul Truck	280	Day	$ 2,185	$ 469,323
Dust Control Additive	33	Container	$ 5,700	$ 188,100
Water Truck	1,400	Day	$ 898.29	$ 3,149,972
Air Quality Monitoring	1,400	Day	$ 250	$ 350,000
Onsite Dust Control Coordinator	1,400	Day	$ 100	$ 140,000
Dozer	280	Day	$ 2,329	$ 634,237
Loader 5CY	217	Day	$ 2,032.94	$ 542,846
Excavator 2CY	217	Day	$ 2,299.37	$ 613,989
Excavator 2CY Rock Hammer	0	Day	$ 2,759.24	$ -
Stormwater BMP's (Hay Bales/Wattles and Silt Fence)	3,355	LF	$ 8.55	$ 28,682
Culverts 24"	273	LF	$ 137.05	$ 37,469
Gravel (Road Mix)	1,592	Tons	$ 18	$ 28,656
Rip-Rap Class II	357	Tons	$ 55	$ 19,651
Subtotal Construction Costs				**$ 6,653,170**
Mobilization				$ 222,925
Travel + Lodging				$ 2,254,110
Project Management		5% of Construction Cost		$ 332,659
Engineering Design		8% of Construction Cost		$ 532,254
Contractor Site Overhead				$ 3,590,532
Construction Contingencies		20% of Construction Cost		$ 1,330,634
Navajo Tax		6% of Construction, Construction Management, and Contingencies Cost		$ 843,082
Total Capital Costs				**$ 15,759,365**
Yearly Post Removal Site Control (PRSC) Costs				
Site Maintenance		0.5% of Construction Cost		$ 33,266
Subtotal PRSC Costs				$ 33,266
PRSC Contingencies		15%		$ 4,990
Navajo Tax		6% of PRSC and Contingencies Cost		$ 2,295
Total Yearly PRSC Cost				**$ 40,551**
Present Value of PRSC Costs Based on 1000 Year Life at 3.50%		PV Factor = 28.571		$ 1,158,585
Total Present Value				**$ 16,917,950**
Construction Cost Per CY				**$ 16**
Total Present Value Cost Per CY				**$ 1**
Total Cost Per CY				**$ 17**

Notes:

" Inch

CY Cubic yard

Table E-41. Cove Transfer Station 2, Regional Repository Trunk Road Cost Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

LF	Linear feet
PV	Present value
PRSC	Post-removal site control

Table E-42. Cove Transfer Station 2, Cost Estimate Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Engineering Design	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	293	$ 158	$ 46,294
Project Engineer	N/A	Hour	1170	$ 122	$ 142,740
Design Engineer	N/A	Hour	585	$ 158	$ 92,430
CAD/GIS Operator	N/A	Hour	293	$ 102	$ 29,886
Admin	N/A	Hour	117	$ 67	$ 7,839
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 320,689
Planning Documents	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	405	$ 158	$ 63,990
Project Engineer	N/A	Hour	1620	$ 122	$ 197,640
CAD/GIS Operator	N/A	Hour	405	$ 102	$ 41,310
Admin	N/A	Hour	162	$ 67	$ 10,854
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 315,294
Resource Surveys	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Cultural Resources Mitigation	N/A	Each	1	$ 12,655.82	$ 12,656
Biological Resources Mitigation	N/A	Each	1	$ 25,311.65	$ 25,312
Geotechnical Testing and Report	N/A	Each	1	$ 25,311.65	$ 25,312
Pre-Project Aerial LIDAR Survey	N/A	Each	0	$ 30,000.00	$ -
Post-Project Aerial LiDAR Survey	N/A	Each	1	$ 37,967.47	$ 37,967
					$ 101,247
Confirmation Sampling	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Developing Sampling and Analysis Plan					
Project Geologist	N/A	Hour	360	$ 158	$ 56,880
Project Manager	N/A	Hour	180	$ 111	$ 19,980
CAD/GIS Operator	N/A	Hour	180	$ 122	$ 21,960
Project Chemist	N/A	Hour	360	$ 111	$ 39,960
Health and Safety Manager	N/A	Hour	180	$ 151	$ 27,180
Admin	N/A	Hour	72	$ 67	$ 4,824
Reproduction	N/A	LS	3	$ 250	$ 750
Sampling					
Sampling Team - Staff Geologist	N/A	Hour	38	$ 77	$ 2,923
Sampling Team - Staff Engineer	N/A	Hour	38	$ 81	$ 3,075
Travel	N/A	Day	8	$ 170	$ 1,360
Per Diem (96/55)	N/A	Day	8	$ 151	$ 1,208
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 6,469.66	$ 6,470
Lab Analysis	N/A	LS	1	$ 2,084.41	$ 2,084
XRF Surveying					
Sampling Team - Staff Geologist	N/A	Hour	142	$ 77	$ 10,914
Sampling Team - Staff Engineer	N/A	Hour	142	$ 81	$ 11,481
Travel	N/A	Day	13	$ 170	$ 2,210
Per Diem (96/55)	N/A	Day	23	$ 151	$ 3,440
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 6,469.66	$ 6,470
Lab Analysis	N/A	LS	1	$ 2,084.41	$ 2,084
Frisking Equipment	N/A	Month	13	$ 144	$ 1,822
					$ 227,077

Table E-42. Cove Transfer Station 2, Cost Estimate Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Reporting	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Geologist	N/A	Hour	316	$ 105	$ 33,180
Project Manager	N/A	Hour	158	$ 175	$ 27,650
Project Engineer	N/A	Hour	474	$ 122	$ 57,828
Chemist	N/A	Hour	158	$ 111	$ 17,538
CAD/GIS Operator	N/A	Hour	158	$ 102	$ 16,116
Admin	N/A	Hour	63	$ 67	$ 4,221
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 158,033
Mobilization/Demobilization	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Crew Mileage	N/A	Mile	2,880	$ 0.56	$ 1,613
Per Diem	N/A	Day	8	$ 182	$ 1,456
Labor	N/A	Day	8	$ 300	$ 2,400
Standard Equipment Mileage	N/A	Mile	2,880	$ 0.56	$ 1,613
Standard Equipment Rental	N/A	Day	2	$ 14,349.78	$ 28,700
					$ 35,781
Excavation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Loader 5cy+	B10U	$ 2,032.94	1	27	$ 54,889
Off Road Haul Truck	B34F	$ 1,653.82	0	27	$ -
Grader 30,000 lb.	B11L	$ 2,413.50	1	27	$ 65,165
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664.00	1	27	$ 98,928
				Total	**$ 218,982**
Reclamation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Off Road Haul Truck	B34F	$ 1,653.82	1	26	$ 42,999
Loader 5cy+	B10U	$ 2,032.94	1	1	$ 2,033
Grader 30,000 lb.	B11L	$ 2,413.50	1	7	$ 16,895
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664.00	1	1	$ 3,664
Dozer D6	B10M	$ 2,931.70	1	1	$ 2,932
Site Area Reclamation Materials	N/A	$ 68,239.50	1	1	$ 58,428
				Total	**$ 126,950**
Contractor Site Overhead	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager (10% of time)	N/A	Hour	52	$ 175	$ 9,114
Site Superintendent	N/A	Hour	521	$ 191	$ 99,467
H&S Officer	N/A	Hour	521	$ 85	$ 44,266
QA/QC Officer	N/A	Hour	521	$ 85	$ 44,266
Field Clerk	N/A	Hour	521	$ 19	$ 9,895
Fuel for Site Vehicles	N/A	Month	7	$ 1,600	$ 11,110
Port-o-let Rental (4)	N/A	Month	10	$ 208	$ 2,166
Permanent Fencing Installation and Demolition	N/A	LF	1312	$ 41.92	$ 55,007
Job Trailers (1)	N/A	Month	3	$ 269	$ 700
Storage Boxes (1)	N/A	Month	3	$ 95	$ 246
Field Office Lights/HVAC (1)	N/A	Month	3	$ 179	$ 466
Generator (1)	N/A	Month	5	$ 2,400	$ 12,499
Fuel for Generator	N/A	Gallons	1562	$ 4	$ 6,249
Telephone/internet (1)	N/A	Month	3	$ 384	$ 1,000
Field Office Equipment	N/A	Month	3	$ 230	$ 599

Table E-42. Cove Transfer Station 2, Cost Estimate Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Field Office Supplies	N/A	Month	3	$ 96	$ 250
Trash (1 dumpster)	N/A	Month	3	$ 910	$ 2,370
Clin 1034 High Volume Air Sampling (4)	N/A	Month	10	$ 383	$ 3,989
Clin 1025 Ludlum 2121 and 43-10-1	N/A	Month	3	$ 275	$ 716
Air Monitoring Lab Confirmation Sampling (5 samples per day)	N/A	Day	260	$ 600	$ 156,232
Clin 1036 Personal Air Monitor	N/A	Month	10	$ 204	$ 1,938
Clin 1038 Personal Dust Monitor	N/A	Month	10	$ 1,555	$ 14,773
Clin 1068 Personal Dosimeter Badge	N/A	Month	10	$ 59	$ 561
Truck Scales	N/A	Month	3	$ 300	$ 781
Construction Water (excavation)	N/A	Gallon	38307	$ 0.05	$ 1,915
Construction Water (hauling waste soil plus cap mat'l)	N/A	Gallon	783869	$ 0.05	$ 39,193
6,000 Gallon Water Truck and Operator (1)	N/A	Day	52	$ 889	$ 46,297
Portal Water Tower Trailer, 10,000 gallons (1)	N/A	Day	52	$ 172.36	$ 8,976
					$ 575,039
Third-Party Oversight	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Travel and Lodging (4 people)	N/A	Day	208	$ 151	$ 31,455
Labor	N/A	Hour	2083	$ 80	$ 166,647
Car Rental (4 cars)	N/A	Month	10	$ 400	$ 4,166
Car Fuel	N/A	Month	10	$ 760	$ 7,916
					$ 210,184
Level of Accuracy (20%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
20% of Construction Cost	N/A	N/A	N/A	N/A	**$ 69,186**
Navajo Tax (6%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
6% of Confirmation Sampling, Construction, Contractor Overhead, Mobilization / Demobilization, and Third Party Oversight Costs	N/A	N/A	N/A	N/A	**$ 87,792**
				GRAND TOTAL	**$ 2,565,026**
PRSC Costs	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Bi-annual Inspection (4 person crew, 1 day, 10 hr/day)	N/A	Hour	80	$ 85	$ 6,800
Mileage (Farmington, NM, to Site, roundtrip)	N/A	Mile	815	$ 0.58	$ 473
Inspection Crew Per Diem	N/A	Day	24	$ 151	$ 3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	N/A	SY	1,196	$ 1.11	$ 1,329
Preperation of Semi-annual Reports (Professional Engineer)	N/A	Hour	80	$ 120	$ 9,600
PRSC Annual Cost					**$ 21,825**
PRSC Contingency (15%)					**$ 3,274**
Navajo Tax (6% of PRSC and Contingencies Cost					**$ 1,506**
Total PRSC Annual Cost					**$ 26,605**

Notes:

"	Inch
CAD	Computer-aided design
CY	Cubic yard
GIS	Geographic information system

Table E-42. Cove Transfer Station 2, Cost Estimate Details for Alternative 3, Disposal in On-Navajo Nation Regional Repository

H&S	Health and safety
hp	Horsepower
hr	Hour
HVAC	Heating, ventilation, and air conditioning
K	Thousand
lb.	Pound
LF	Linear feet
LiDAR	Light detection and ranging
LS	Lump sum
M2	Square meters
N/A	Not applicable
NM	New Mexico
PRSC	Post-removal site control
QA/QC	Quality assurance/quality control
SY	Square yard
XRF	X-ray fluorescence

Table E-43. Cove Transfer Station 2, Cost Estimate Summary for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Waste Volume	16,301 CY	
Removal Area	2.47 AC	
Excavation	**Unit Cost**	
Loader 5cy+	$	54,889
Haul Truck	$	-
Grader 30,000 lb.	$	65,165
Excavator 3.5 cy ~ 80K-100K lb.	$	98,928
Subtotals Step 1	**$**	**218,982**
Reclamation	**Unit Cost**	
Haul Truck	$	42,999
Loader 5cy+	$	2,033
Grader 30,000 lb.	$	16,895
Excavator 3.5 cy ~ 80K-100K lb.	$	3,664
Dozer D6	$	2,932
Site Area Reclamation Materials	$	58,428
Subtotals Step 2	**$**	**126,950**
Subtotal Construction	**$**	**892,688**
Other Costs	**Unit Cost**	
Non-Construction Costs		
Engineering Design	$	320,689
Planning Documents	$	315,294
Resource Surveys	$	101,247
Confirmation Sampling	$	227,077
Reporting	$	158,033
Contractor Site Overhead	$	575,039
Mobilization / Demobilization	$	35,781
Travel+ Lodging (Construction Workers)	$	118,772
Level of Accuracy (20%)	$	69,186
Third-Party Oversight	$	210,184
Navajo Tax (6%)	$	87,792
Subtotals Step 6	**$**	**2,219,094**
Total Site Capital Costs	**$**	**2,565,026**
Yearly On-Site PRSC Costs	**Unit Cost**	
Bi-annual Inspection (4 person crew, 3 days, 10 hr/day)	$	6,800
Mileage (Farmington, NM, to Site, roundtrip)	$	473
Inspection Crew Per Diem	$	3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	$	1,329
Preperation of Semi-annual Reports (Professional Engineer)	$	9,600
Subtotal PRSC Costs	**$**	**21,825**
PRSC Contingencies (15%)	$	3,274
Navajo Tax (6% of PRSC and Contingencies Cost)	$	1,506
Total Yearly PRSC Costs	**$**	**26,605**
Present Value of PRSC Costs Based on 10-Year Life at 3.50% (PV Factor = 8.317)	**$**	**221,246**
Regional Repository Access Road Cost Share (1.6%)		
Regional Repository Acccess Road Construction Costs	**$**	**261,763**
Regional Repository Access Road Annual PRSC Costs	**$**	**674**

Table E-43. Cove Transfer Station 2, Cost Estimate Summary for Alternative 3, Disposal in On-Navajo Nation Regional Repository

Regional Repository Access Road Cost per CY (Includes 1000-year PRSC)	**$**	**17**
Regional Repository Access Road Shared Cost	**$**	**351,287**
Waste Hauling Cost		
Waste Hauling Cost per CY	**$**	**8**
Waste Total Hauling Cost	**$**	**168,715**
Regional Repository Cap Cost Share (1.6%)		
Regional Repository Cap Construction Costs	**$**	**586,513**
Regional Repository Cap Annual PRSC Costs	**$**	**7,170**
Regional Repository Cap Cost per CY (Includes 1000-year PRSC)	**$**	**49**
Regional Repository Cap Shared Cost	**$**	**794,348**
Grand Total Capital Costs	**$**	**3,582,017**
TOTAL COSTS	**$**	**4,100,622**

Notes:

"	Inch
AC	Acres
CY	Cubic yard
ET	Evapotranspiration
hp	Horsepower
hr	Hour
K	Thousand
lb.	Pound
LF	Linear feet
NM	New Mexico
PRSC	Post-removal site control
PV	Present value
T&M	Time and material

Table E-44. Cove Transfer Station 2, Cost Estimate Scenario Assumptions for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Technology	Assumptions	Cost Effects
Excavation Methods	Waste removed by an excavator is assumed to be removed with a large excavator, unless specified	Excavators can operate on steeper terrain than bulldozers and are better at moving waste uphill. Bulldozers cost less to operate. Spider excavators or other specialized equipment are more expensive.
	Any disturbed surface can be restored using grading and erosion controls	Quantities of erosion control materials and grading may be lower than costed
	Land is barren to warrant no clearing or grubbing	Costs of clearing and grubbing are zero
	All waste specified in the risk assessment will be excavated	Volumes of excavated waste may be lower than costed
	The site is accessible to haul trucks and trucks can be easily loaded	Accessing difficult-to-reach mines increase costs.
Soil and Waste Sorting	Waste will be sorted based on grain size; rock greater than 3 inches will be segregated	NA
	Waste can be sorted within the mine waste footprint	Additional restoration of a separate area would be needed, increasing costs
Operating Mill	Waste will be transported 135 miles in highway-legal trucks from the mine site to the White Mesa mill	Greater distance to repository increases costs
	Waste weighs 1.5 tons per cubic yard	Denser waste will increase costs
	Tipping fee at uranium mill to cover milling costs	Higher tipping fee results in increased costs; current tipping fees are from previous cost estimate
	0.01 percent by weight recoverable uranium in waste, equal to 0.12 pounds	Higher percent of recoverable uranium increases economic value of waste, thus decreasing net costs
	Cycle time limited to 25 trucks per day, due to space. Assumes maximum number of trucks (25) for fastest production rate.	Less trucks will reduce production time and require more time on-site, increasing costs.
	Uranium market price is $30/pound	Market value at time of milling will increase or decrease economic value of waste, thus increasing or decreasing costs
	PRSC inspection of the mine site will be completed for 10 years	More PRSC inspections will increase costs
	The waste excavation area will not require cover soil or amendment	If cover soil or amendments are required, costs will increase

Notes:

CY	Cubic yard
ET	Evapotranspiration
NA	Not applicable - inherent assumption
PRSC	Post-removal site control

Table E-45. Cove Transfer Station 2, Crew Time Productivity Calculations for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

	Waste Volume	16,301	CY		
	Removal Area	2.47	AC		
Step	**CTS 2 Excavation**				
1	**Action**	**QTY**	**Unit**	**Production CY**	**Days**
	Waste Removal CTS 2 - Excavate/Haul/Load	20,376	LCY	756	27
		20,376		**Control Days**	**27**
Step	**CTS 2 Restoration**				
2	**Action**	**QTY**	**Unit**	**Production Rate**	**Days**
	Clean Borrow Fill	1,993	CY	2,888	0.7
	Grading	11,957	SY	6.3 Days for 11,111 SY	6.3
	Mechanical Seeding, Fertilizer, Mulch	11,957	SY	1,000	12.0
	Erosion Control - Erosion Control Blanket	6,167	SY	1,000	6.2
				Control Days	**25**
				TOTAL PROJECT DAYS	**52**
				Slowest Rate Project Days:	52

Notes:

AC	
BCY	Bank cubic yard
CTS	Cove Transfer Station
CY	Cubic yard
LCY	Loose cubic yard
LF	Linear foot
Mi	Mile
QTY	Quantity
SY	Square yard

Table E-46. Cove Transfer Station 2, Equipment Cost Details for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Step	Equipment List	QTY	RSMeans #	RSMeans Description	Unit Cost	Unit	Crew
	CTS2 Excavation and Restoration						
1	Loader 5cy+	1	312323154080	Common Earth - 5cy bucket, front end loader	$ 16.30	BCY	B10U
			015433204760	Rent front end loader, articulating, 5.25-5.75 CY 270 HP	$ 8,478.75	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$ 631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$ 12,705	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity=300 CY/hour	$ 1.78	BCY	B12D
	CTS2 Reclamation						
2	Off-Road Haul Truck	1	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$ 6.32	LCY	B34F
	Loader 5CY+	1	312323154080	Common Earth - 5 CY bucket, front-end loader	$ 16.30	BCY	B10U
			015433204760	Rent front-end loader, articulating, 5.25-5.75 CY 270 hp	$ 8,478.75	Month	None (Rental)
	Dozer D6	1	312213200170	8,100-10,000 SF Grading, Dozer	$ 1,378.08	each	B10L
			015433204260	Rent Dozer, crawler, torque converter, diesel 200 hp	$ 15,960	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$ 631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$ 12,705	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity = 300 CY/hour	$ 1.78	BCY	B12D

Notes:

BCY	Bank cubic yard
CTS	Cove Transfer Station
CY	Cubic yard
hp	Horse power
K	Thousand
lb.	Pound
LCY	Loose cubic yard
ld.	Loaded
LF	Linear foot
MPH	Mile per hour
SF	Square feet
unld.	Unloaded

Table E-47. Cove Transfer Station 2, Cost Estimate Details for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Engineering Design	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	293	$ 158	$ 46,294
Project Engineer	N/A	Hour	1170	$ 122	$ 142,740
Design Engineer	N/A	Hour	585	$ 158	$ 92,430
CAD/GIS Operator	N/A	Hour	293	$ 102	$ 29,886
Admin	N/A	Hour	117	$ 67	$ 7,839
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 320,689
Planning Documents	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	405	$ 158	$ 63,990
Project Engineer	N/A	Hour	1620	$ 122	$ 197,640
CAD/GIS Operator	N/A	Hour	405	$ 102	$ 41,310
Admin	N/A	Hour	162	$ 67	$ 10,854
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 315,294
Resource Surveys	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Cultural Resources Mitigation	N/A	Each	1	$ 12,655.82	$ 12,656
Biological Resources Mitigation	N/A	Each	1	$ 25,311.65	$ 25,312
Geotechnical Testing and Report	N/A	Each	1	$ 25,311.65	$ 25,312
Pre-Project Aerial LIDAR Survey	N/A	Each	0	$ 30,000.00	$ -
Post-Project Aerial LiDAR Survey	N/A	Each	1	$ 37,967.47	$ 37,967
					$ 101,247
Confirmation Sampling	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Developing Sampling and Analysis Plan					
Project Geologist	N/A	Hour	360	$ 158	$ 56,880
Project Manager	N/A	Hour	180	$ 111	$ 19,980
CAD/GIS Operator	N/A	Hour	180	$ 122	$ 21,960
Project Chemist	N/A	Hour	360	$ 111	$ 39,960
Health and Safety Manager	N/A	Hour	180	$ 151	$ 27,180
Admin	N/A	Hour	72	$ 67	$ 4,824
Reproduction	N/A	LS	3	$ 250	$ 750
Sampling					
Sampling Team - Staff Geologist	N/A	Hour	38	$ 77	$ 2,923
Sampling Team - Staff Engineer	N/A	Hour	38	$ 81	$ 3,075
Travel	N/A	Day	8	$ 170	$ 1,360
Per Diem (96/55)	N/A	Day	8	$ 151	$ 1,208
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 6,469.66	$ 6,470
Lab Analysis	N/A	LS	1	$ 2,084.41	$ 2,084
XRF Surveying					
Sampling Team - Staff Geologist	N/A	Hour	142	$ 77	$ 10,914
Sampling Team - Staff Engineer	N/A	Hour	142	$ 81	$ 11,481
Travel	N/A	Day	13	$ 170	$ 2,210
Per Diem (96/55)	N/A	Day	23	$ 151	$ 3,440
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 6,469.66	$ 6,470
Lab Analysis	N/A	LS	1	$ 2,084.41	$ 2,084
Frisking Equipment	N/A	Month	13	$ 144	$ 1,822
					$ 227,077

Table E-47. Cove Transfer Station 2, Cost Estimate Details for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Reporting	Crew	Unit	Amount	Price	Cost
Project Geologist	N/A	Hour	316	$ 105	$ 33,180
Project Manager	N/A	Hour	158	$ 175	$ 27,650
Project Engineer	N/A	Hour	474	$ 122	$ 57,828
Chemist	N/A	Hour	158	$ 111	$ 17,538
CAD/GIS Operator	N/A	Hour	158	$ 102	$ 16,116
Admin	N/A	Hour	63	$ 67	$ 4,221
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 158,033
Mobilization/Demobilization	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Crew Mileage	N/A	Mile	2,880	$ 0.56	$ 1,613
Per Diem	N/A	Day	8	$ 182	$ 1,456
Labor	N/A	Day	8	$ 300	$ 2,400
Standard Equipment Mileage	N/A	Mile	2,880	$ 0.56	$ 1,613
Standard Equipment Rental	N/A	Day	2	$ 14,349.78	$ 28,700
					$ 35,781
Excavation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Loader 5cy+	B10U	$ 2,032.94	1	27	$ 54,889
Off Road Haul Truck	B34F	$ 1,653.82	0	27	$ -
Grader 30,000 lb.	B11L	$ 2,413.50	1	27	$ 65,165
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664.00	1	27	$ 98,928
				Total	**$ 218,982**
Reclamation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Off Road Haul Truck	B34F	$ 1,653.82	1	26	$ 42,999
Loader 5cy+	B10U	$ 2,032.94	1	1	$ 2,033
Grader 30,000 lb.	B11L	$ 2,413.50	1	7	$ 16,895
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664.00	1	1	$ 3,664
Dozer D6	B10M	$ 2,931.70	1	1	$ 2,932
Site Area Reclamation Materials	N/A	$ 68,239.50	1	1	$ 58,428
				Total	**$ 126,950**
Contractor Site Overhead	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager (10% of time)	N/A	Hour	52	$ 175	$ 9,114
Site Superintendent	N/A	Hour	521	$ 191	$ 99,467
H&S Officer	N/A	Hour	521	$ 85	$ 44,266
QA/QC Officer	N/A	Hour	521	$ 85	$ 44,266
Field Clerk	N/A	Hour	521	$ 19	$ 9,895
Fuel for Site Vehicles	N/A	Month	7	$ 1,600	$ 11,110
Port-o-let Rental (4)	N/A	Month	10	$ 208	$ 2,166
Permanent Fencing Installation and Demolition	N/A	LF	1312	$ 41.92	$ 55,007
Job Trailers (1)	N/A	Month	3	$ 269	$ 700
Storage Boxes (1)	N/A	Month	3	$ 95	$ 246
Field Office Lights/HVAC (1)	N/A	Month	3	$ 179	$ 466
Generator (1)	N/A	Month	5	$ 2,400	$ 12,499
Fuel for Generator	N/A	Gallons	1562	$ 4	$ 6,249
Telephone/internet (1)	N/A	Month	3	$ 384	$ 1,000
Field Office Equipment	N/A	Month	3	$ 230	$ 599

Table E-47. Cove Transfer Station 2, Cost Estimate Details for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Field Office Supplies	N/A	Month	3	$ 96	$ 250
Trash (1 dumpster)	N/A	Month	3	$ 910	$ 2,370
Clin 1034 High Volume Air Sampling (4)	N/A	Month	10	$ 383	$ 3,989
Clin 1025 Ludlum 2121 and 43-10-1	N/A	Month	3	$ 275	$ 716
Air Monitoring Lab Confirmation Sampling (5 samples per day)	N/A	Day	260	$ 600	$ 156,232
Clin 1036 Personal Air Monitor	N/A	Month	10	$ 204	$ 1,938
Clin 1038 Personal Dust Monitor	N/A	Month	10	$ 1,555	$ 14,773
Clin 1068 Personal Dosimeter Badge	N/A	Month	10	$ 59	$ 561
Truck Scales	N/A	Month	3	$ 300	$ 781
Construction Water (excavation)	N/A	Gallon	38307	$ 0.05	$ 1,915
Construction Water (hauling waste soil plus cap mat'l)	N/A	Gallon	783869	$ 0.05	$ 39,193
6,000 Gallon Water Truck and Operator (1)	N/A	Day	52	$ 889	$ 46,297
Portal Water Tower Trailer, 10,000 gallons (1)	N/A	Day	52	$ 172.36	$ 8,976
					$ 575,039
Third-Party Oversight	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Travel and Lodging (4 people)	N/A	Day	208	$ 151	$ 31,455
Labor	N/A	Hour	2083	$ 80	$ 166,647
Car Rental (4 cars)	N/A	Month	10	$ 400	$ 4,166
Car Fuel	N/A	Month	10	$ 760	$ 7,916
					$ 210,184
Level of Accuracy (20%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
20% of Construction Cost	N/A	N/A	N/A	N/A	**$ 69,186**
Navajo Tax (6%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
6% of Confirmation Sampling, Construction, Contractor Overhead, Mobilization / Demobilization, and Third Party Oversight Costs	N/A	N/A	N/A	N/A	**$ 87,792**
				GRAND TOTAL	**$ 2,565,026**
PRSC Costs	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Bi-annual Inspection (4 person crew, 1 day, 10 hr/day)	N/A	Hour	80	$ 85.00	$ 6,800
Mileage (Farmington, NM, to Site, roundtrip)	N/A	Mile	815	$ 0.58	$ 473
Inspection Crew Per Diem	N/A	Day	24	$ 151.00	$ 3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	N/A	SY	1,196	$ 1.11	$ 1,329
Preperation of Semi-annual Reports (Professional Engineer)	N/A	Hour	80	$ 120	$ 9,600
PRSC Annual Cost					**$ 21,825**
PRSC Contingency (15%)					**$ 3,274**
Navajo Tax (6% of PRSC and Contingencies Cost					**$ 1,506**
Total PRSC Annual Cost					**$ 26,605**

Notes:

"	Inch
CAD	Computer-aided design
CY	Cubic yard
GIS	Geographic information system

Table E-47. Cove Transfer Station 2, Cost Estimate Details for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

H&S	Health and safety
hp	Horsepower
hr	Hour
HVAC	Heating, ventilation, and air conditioning
K	Thousand
lb.	Pound
LF	Linear feet
LiDAR	Light detection and ranging
LS	Lump sum
M2	Square meters
N/A	Not applicable
NM	New Mexico
PRSC	Post-removal site control
QA/QC	Quality assurance/quality control
SY	Square yard
XRF	X-ray fluorescence

Table E-48. Cove Transfer Station 2, Cost Estimate Summary for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

Waste Volume		16,301 CY
Removal Area		2.47 AC
Excavation		**Unit Cost**
Loader 5cy+	$	54,889
Haul Truck	$	-
Grader 30,000 lb.	$	65,165
Excavator 3.5 cy ~ 80K-100K lb.	$	98,928
Subtotals Step 1	**$**	**218,982**
Reclamation		**Unit Cost**
Haul Truck	$	42,999
Loader 5cy+	$	2,033
Grader 30,000 lb.	$	16,895
Excavator 3.5 cy ~ 80K-100K lb.	$	3,664
Dozer D6	$	2,932
Site Area Reclamation Materials	$	58,428
Subtotals Step 2	**$**	**126,950**
Subtotal Construction	**$**	**892,688**
Other Costs		**Unit Cost**
Non-Construction Costs		
Engineering Design	$	320,689
Planning Documents	$	315,294
Resource Surveys	$	101,247
Confirmation Sampling	$	227,077
Reporting	$	158,033
Contractor Site Overhead	$	575,039
Mobilization / Demobilization	$	35,781
Travel+ Lodging (Construction Workers)	$	118,772
Level of Accuracy (20%)	$	69,186
Third-Party Oversight	$	210,184
Navajo Tax (6%)	$	87,792
Subtotals Step 6	**$**	**2,219,094**
Total Site Capital Costs	**$**	**2,565,026**
Yearly On-Site PRSC Costs		**Unit Cost**
Bi-annual Inspection (4 person crew, 3 days, 10 hr/day)	$	6,800
Mileage (Farmington, NM, to Site, roundtrip)	$	473
Inspection Crew Per Diem	$	3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	$	1,329
Preperation of Semi-annual Reports (Professional Engineer)	$	9,600
Subtotal PRSC Costs	**$**	**21,825**
PRSC Contingencies (15%)	$	3,274
Navajo Tax (6% of PRSC and Contingencies Cost)	$	1,506
Total Yearly PRSC Costs	**$**	**26,605**
Present Value of PRSC Costs Based on 10-Year Life at 3.50% (PV Factor = 8.317)	**$**	**221,246**
Waste Hauling Cost		
Waste Hauling Cost per CY	**$**	**52**
Waste Hauling Total Cost	**$**	**1,056,305**

Table E-48. Cove Transfer Station 2, Cost Estimate Summary for Alternative 4, Off-Navajo Nation Disposal at White Mesa Mill

White Mesa Milling and Disposal Cost		
White Mesa Milling and Disposal Cost per CY	**$**	**81**
White Mesa Milling and Disposal Cost	**$**	**1,650,476**
Grand Total Capital Costs	**$**	**5,271,807**
TOTAL COSTS	**$**	**5,493,053**

Notes:

"	Inch
AC	Acres
CY	Cubic yard
hp	Horsepower
hr	Hour
K	Thousand
lb.	Pound
LF	Linear feet
NM	New Mexico
PRSC	Post-removal site control
PV	Present value
T&M	Time and material

Table E-49. Cove Transfer Station 2, Cost Estimate Scenario Assumptions for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Technology	Assumptions	Cost Effects
Excavation Methods	Waste removed by an excavator is assumed to be removed with a large excavator, unless specified	Excavators can operate on steeper terrain than bulldozers and are better at moving waste uphill. Bulldozers cost less to operate. Spider excavators or other specialized equipment are more expensive.
	Any disturbed surface can be restored using grading and erosion controls	Quantities of erosion control materials and grading may be lower than costed
	Land is barren to warrant no clearing or grubbing	Costs of clearing and grubbing are zero
	All waste specified in the risk assessment will be excavated	Volumes of excavated waste may be lower than costed
	The site is accessible to haul trucks and trucks can be easily loaded	Accessing difficult-to-reach mines increase costs.
Soil and Waste Sorting	Waste will be sorted based on grain size; rock greater than 3 inches will be segregated	NA
	Waste can be sorted within the mine waste footprint	Additional restoration of a separate area would be needed, increasing costs
Hazardous Waste Landfill or Licensed Low-Level Radioactive Waste Facility	Landfill location is available within 600 road miles of the mine waste	Greater distance to repository increases costs.
	Waste can go to Deer Trail, Colorado (558 miles); Andrews, Texas (618 miles); or Clive, Utah (450 miles).	Waste will go to the closest facility that is accepting waste, Deer Trail, Colorado
	Waste will be transported 558 miles in highway-legal trucks from the site to the disposal facility in Deer Trail, Colorado	Greater distance to repository increases costs
	Waste weighs 1.5 tons per cubic yard	Higher density waste will increase costs
	Tipping fee ($/CY)	Higher tipping fee results in increased costs; current tipping fees are from previous cost estimate
	PRSC inspection of the mine site will be completed for 10 years	More PRSC inspections will increase costs
	Assumes up to 120 trucks every three days are available.	Less trucks will reduce production time and require more time on-site, increasing costs.
	The waste excavation area will not require cover soil or amendment	If cover soil or amendments are required, costs will increase

Notes:

CY	Cubic yard
ET	Evapotranspiration
NA	Not applicable - inherent assumption
PRSC	Post-removal site control

Table E-50. Cove Transfer Station 2, Crew Time Productivity Calculations for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

	Waste Volume	16,301	CY		
	Removal Area	2.47	AC		
Step	**CTS 2 Excavation**				
1	**Action**	**QTY**	**Unit**	**Production CY**	**Days**
	Waste Removal CTS 2 - Excavate/Haul/Load	20,376	LCY	756	27
		20,376		**Control Days**	**27**
Step	**CTS 2 Restoration**				
2	**Action**	**QTY**	**Unit**	**Production Rate**	**Days**
	Clean Borrow Fill	1,993	CY	2,888	0.7
	Grading	11,957	SY	6.3 Days for 11,111 SY	6.3
	Mechanical Seeding, Fertilizer, Mulch	11,957	SY	1,000	12.0
	Erosion Control - Erosion Control Blanket	6,167	SY	1,000	6.2
				Control Days	**25**
				TOTAL PROJECT DAYS	**52**
				Slowest Rate Project Days:	52

Notes:

AC	
BCY	Bank cubic yard
CTS	Cove Transfer Station
CY	Cubic yard
LCY	Loose cubic yard
LF	Linear foot
Mi	Mile
QTY	Quantity
SY	Square yard

Table E-51. Cove Transfer Station 2, Equipment Cost Details for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Step	Equipment List	QTY	RSMeans #	RSMeans Description	Unit Cost	Unit	Crew
	CTS2 Excavation and Restoration						
1	Loader 5cy+	1	312323154080	Common Earth - 5cy bucket, front end loader	$ 16.30	BCY	B10U
			015433204760	Rent front end loader, articulating, 5.25-5.75 CY 270 HP	$ 8,478.75	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$ 631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$ 12,705	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity=300 CY/hour	$ 1.78	BCY	B12D
	CTS2 Reclamation						
2	Off-Road Haul Truck	1	312323205110	22 CY, 5 MPH, 15 min wait/ld./unld, 2-mile cycle	$ 6.32	LCY	B34F
	Loader 5CY+	1	312323154080	Common Earth - 5 CY bucket, front-end loader	$ 16.30	BCY	B10U
			015433204760	Rent front-end loader, articulating, 5.25-5.75 CY 270 hp	$ 8,478.75	Month	None (Rental)
	Dozer D6	1	312213200170	8,100-10,000 SF Grading, Dozer	$ 1,378.08	each	B10L
			015433204260	Rent Dozer, crawler, torque converter, diesel 200 hp	$ 15,960	Month	None (Rental)
	Grader 30,000 lb.	1	340113100310	Maintenance grading of roadway, 4 passes, 3.0 MPH	$ 631.65	Mile	B11L
			015433201910	Rent Grader, Self Propelled, 30,000 lb.	$ 12,705	Month	None (Rental)
	Excavator 3.5 CY ~ 80K-100K lb.	1	312316420305	3.5 CY Excavator Capacity = 300 CY/hour	$ 1.78	BCY	B12D

Notes:

BCY	Bank cubic yard
CTS	Cove Transfer Station
CY	Cubic yard
hp	Horsepower
K	Thousand
lb.	Pound
LCY	Loose cubic yard
ld.	Loaded
LF	Linear foot
MPH	Mile per hour
SF	Square feet
unld.	Unloaded

Table E-52. Cove Transfer Station 2, Cost Estimate Details for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Engineering Design	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	293	$ 158	$ 46,294
Project Engineer	N/A	Hour	1170	$ 122	$ 142,740
Design Engineer	N/A	Hour	585	$ 158	$ 92,430
CAD/GIS Operator	N/A	Hour	293	$ 102	$ 29,886
Admin	N/A	Hour	117	$ 67	$ 7,839
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 320,689
Planning Documents	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager	N/A	Hour	405	$ 158	$ 63,990
Project Engineer	N/A	Hour	1620	$ 122	$ 197,640
CAD/GIS Operator	N/A	Hour	405	$ 102	$ 41,310
Admin	N/A	Hour	162	$ 67	$ 10,854
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 315,294
Resource Surveys	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Cultural Resources Mitigation	N/A	Each	1	$ 12,655.82	$ 12,656
Biological Resources Mitigation	N/A	Each	1	$ 25,311.65	$ 25,312
Geotechnical Testing and Report	N/A	Each	1	$ 25,311.65	$ 25,312
Post-Project Aerial LiDAR Survey	N/A	Each	1	$ 37,967.47	$ 37,967
					$ 101,247
Confirmation Sampling	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Developing Sampling and Analysis Plan					
Project Geologist	N/A	Hour	360	$ 158	$ 56,880
Project Manager	N/A	Hour	180	$ 111	$ 19,980
CAD/GIS Operator	N/A	Hour	180	$ 122	$ 21,960
Project Chemist	N/A	Hour	360	$ 111	$ 39,960
Health and Safety Manager	N/A	Hour	180	$ 151	$ 27,180
Admin	N/A	Hour	72	$ 67	$ 4,824
Reproduction	N/A	LS	3	$ 250	$ 750
Sampling					
Sampling Team - Staff Geologist	N/A	Hour	38	$ 77	$ 2,923
Sampling Team - Staff Engineer	N/A	Hour	38	$ 81	$ 3,075
Travel	N/A	Day	8	$ 170	$ 1,360
Per Diem (96/55)	N/A	Day	8	$ 151	$ 1,208
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 6,469.66	$ 6,470
Lab Analysis	N/A	LS	1	$ 2,084.41	$ 2,084
XRF Surveying					
Sampling Team - Staff Geologist	N/A	Hour	142	$ 77	$ 10,914
Sampling Team - Staff Engineer	N/A	Hour	142	$ 81	$ 11,481
Travel	N/A	Day	13	$ 170	$ 2,210
Per Diem (96/55)	N/A	Day	23	$ 151	$ 3,440
Miscellaneous Field Supplies and Expenses	N/A	LS	1	$ 6,469.66	$ 6,470
Lab Analysis	N/A	LS	1	$ 2,084.41	$ 2,084
Frisking Equipment	N/A	Month	13	$ 144.00	$ 1,822

Table E-52. Cove Transfer Station 2, Cost Estimate Details for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

					$ 227,077
Reporting	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Geologist	N/A	Hour	316	$ 105	$ 33,180
Project Manager	N/A	Hour	158	$ 175	$ 27,650
Project Engineer	N/A	Hour	474	$ 122	$ 57,828
Chemist	N/A	Hour	158	$ 111	$ 17,538
CAD/GIS Operator	N/A	Hour	158	$ 102	$ 16,116
Admin	N/A	Hour	63	$ 67	$ 4,221
Reproduction	N/A	LS	3	$ 500	$ 1,500
					$ 158,033
Mobilization/Demobilization	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Crew Mileage	N/A	Mile	2,880	$ 0.56	$ 1,613
Per Diem	N/A	Day	8	$ 182	$ 1,456
Labor	N/A	Day	8	$ 300	$ 2,400
Standard Equipment Mileage	N/A	Mile	2,880	$ 0.56	$ 1,613
Standard Equipment Rental	N/A	Day	2	$ 14,349.78	$ 28,700
					$ 35,781
Excavation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Loader 5cy+	B10U	$ 2,032.94	1	27	$ 54,889
Off Road Haul Truck	B34F	$ 1,653.82	0	27	$ -
Grader 30,000 lb.	B11L	$ 2,413.50	1	27	$ 65,165
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664.00	1	27	$ 98,928
				Total	**$ 218,982**
Reclamation	**Crew**	**Daily**	**Unit #**	**Days**	**Cost**
Off Road Haul Truck	B34F	$ 1,653.82	1	26	$ 42,999
Loader 5cy+	B10U	$ 2,032.94	1	1	$ 2,033
Grader 30,000 lb.	B11L	$ 2,413.50	1	7	$ 16,895
Excavator 3.5 cy ~ 80K-100K lb.	B12D	$ 3,664.00	1	1	$ 3,664
Dozer D6	B10M	$ 2,931.70	1	1	$ 2,932
Site Area Reclamation Materials	N/A	$ 68,239.50	1	1	$ 58,428
				Total	**$ 126,950**
Contractor Site Overhead	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Project Manager (10% of time)	N/A	Hour	52	$ 175	$ 9,114
Site Superintendent	N/A	Hour	521	$ 191	$ 99,467
H&S Officer	N/A	Hour	521	$ 85	$ 44,266
QA/QC Officer	N/A	Hour	521	$ 85	$ 44,266
Field Clerk	N/A	Hour	521	$ 19	$ 9,895
Fuel for Site Vehicles	N/A	Month	7	$ 1,600	$ 11,110
Port-o-let Rental (4)	N/A	Month	10	$ 208	$ 2,166
Permanent Fencing Installation and Demolition	N/A	LF	1312	$ 41.92	$ 55,007
Job Trailers (1)	N/A	Month	3	$ 269	$ 700
Storage Boxes (1)	N/A	Month	3	$ 94.50	$ 246
Field Office Lights/HVAC (1)	N/A	Month	3	$ 179	$ 466
Generator (1)	N/A	Month	5	$ 2,400	$ 12,499
Fuel for Generator	N/A	Gallons	1562	$ 4	$ 6,249
Telephone/internet (1)	N/A	Month	3	$ 384	$ 1,000

Table E-52. Cove Transfer Station 2, Cost Estimate Details for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Field Office Equipment	N/A	Month	3	$ 230	$ 599
Field Office Supplies	N/A	Month	3	$ 96	$ 250
Trash (1 dumpster)	N/A	Month	3	$ 910	$ 2,370
Clin 1034 High Volume Air Sampling (4)	N/A	Month	10	$ 383	$ 3,989
Clin 1025 Ludlum 2121 and 43-10-1	N/A	Month	3	$ 275	$ 716
Air Monitoring Lab Confirmation Sampling (5 samples per day)	N/A	Day	260	$ 600	$ 156,232
Clin 1036 Personal Air Monitor	N/A	Month	10	$ 204	$ 1,938
Clin 1038 Personal Dust Monitor	N/A	Month	10	$ 1,555	$ 14,773
Clin 1068 Personal Dosimeter Badge	N/A	Month	10	$ 59	$ 561
Truck Scales	N/A	Month	3	$ 300	$ 781
Construction Water (excavation)	N/A	Gallon	38307	$ 0.05	$ 1,915
Construction Water (hauling waste soil plus cap mat'l)	N/A	Gallon	783869	$ 0.05	$ 39,193
6,000 Gallon Water Truck and Operator (1)	N/A	Day	52	$ 889	$ 46,297
Portal Water Tower Trailer, 10,000 gallons (1)	N/A	Day	52	$ 172.36	$ 8,976
					$ 575,039
Third-Party Oversight	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Travel and Lodging (4 people)	N/A	Day	208	$ 151	$ 31,455
Labor	N/A	Hour	2083	$ 80	$ 166,647
Car Rental (4 cars)	N/A	Month	10	$ 400	$ 4,166
Car Fuel	N/A	Month	10	$ 760	$ 7,916
					$ 210,184
Level of Accuracy (20%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
20% of Construction Cost	N/A	N/A	N/A	N/A	**$ 69,186**
Navajo Tax (6%)	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
6% of Confirmation Sampling, Construction, Contractor Overhead, Mobilization / Demobilization, and Third Party Oversight Costs	N/A	N/A	N/A	N/A	**$ 87,792**
				GRAND TOTAL	**$ 2,565,026**
PRSC Costs	**Crew**	**Unit**	**Amount**	**Price**	**Cost**
Bi-annual Inspection (4 person crew, 1 day, 10 hr/day)	N/A	Hour	80	$ 85	$ 6,800
Mileage (Farmington, NM, to Site, roundtrip)	N/A	Mile	815	$ 0.58	$ 473
Inspection Crew Per Diem	N/A	Day	24	$ 151	$ 3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	N/A	SY	1,196	$ 1.11	$ 1,329
Preperation of Semi-annual Reports (Professional Engineer)	N/A	Hour	80	$ 120	$ 9,600
PRSC Annual Cost					**$ 21,825**
PRSC Contingency (15%)					**$ 3,274**
Navajo Tax (6% of PRSC and Contingencies Cost					**$ 1,506**
Total PRSC Annual Cost					**$ 26,605**

Table E-52. Cove Transfer Station 2, Cost Estimate Details for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Notes:

"	Inch
CAD	Computer-aided design
CY	Cubic yard
GIS	Geographic information system
H&S	Health and safety
hp	Horsepower
hr	Hour
HVAC	Heating, ventilation, and air conditioning
K	Thousand
lb.	Pound
LF	Linear feet
LiDAR	Light detection and ranging
LS	Lump sum
M2	Square meters
N/A	Not applicable
NM	New Mexico
PRSC	Post-removal site control
QA/QC	Quality assurance/quality control
SY	Square yard
XRF	X-ray fluorescence

Table E-53. Cove Transfer Station 2, Cost Estimate Summary for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Waste Volume	16,301 CY	
Removal Area	2.47 AC	
Excavation	**Unit Cost**	
Loader 5cy+	$	54,889
Grader 30,000 lb.	$	65,165
Excavator 3.5 cy ~ 80K-100K lb.	$	98,928
Subtotals Step 1	**$**	**218,982**
Reclamation	**Unit Cost**	
Haul Truck	$	42,999
Loader 5cy+	$	2,033
Grader 30,000 lb.	$	16,895
Excavator 3.5 cy ~ 80K-100K lb.	$	3,664
Dozer D6	$	2,932
Site Area Reclamation Materials	$	58,428
Subtotals Step 2	**$**	**126,950**
Subtotal Construction	**$**	**892,688**
Other Costs	**Unit Cost**	
Non-Construction Costs		
Engineering Design	$	320,689
Planning Documents	$	315,294
Resource Surveys	$	101,247
Confirmation Sampling	$	227,077
Reporting	$	158,033
Contractor Site Overhead	$	575,039
Mobilization / Demobilization	$	35,781
Travel+ Lodging (Construction Workers)	$	118,772
Level of Accuracy (20%)	$	69,186
Third-Party Oversight	$	210,184
Navajo Tax (6%)	$	87,792
Subtotals Step 6	**$**	**2,219,094**
Total Site Capital Costs	**$**	**2,565,026**
Yearly On-Site PRSC Costs	**Unit Cost**	
Bi-annual Inspection (4 person crew, 3 days, 10 hr/day)	$	6,800
Mileage (Farmington, NM, to Site, roundtrip)	$	473
Inspection Crew Per Diem	$	3,624
Assumed Annual Maintenance costs (revegetation, grading, watering)	$	1,329
Preperation of Semi-annual Reports (Professional Engineer)	$	9,600
Subtotal PRSC Costs	**$**	**21,825**
PRSC Contingencies (15%)	$	3,274
Navajo Tax (6% of PRSC and Contingencies Cost)	$	1,506
Total Yearly PRSC Costs	**$**	**26,605**
Present Value of PRSC Costs Based on 10-Year Life at 3.50% (PV Factor = 8.317)	**$**	**221,246**
Waste Hauling Cost		
Waste Hauling Cost per CY	**$**	**204**
Waste Hauling Total Cost	**$**	**4,160,015**

Table E-53. Cove Transfer Station 2, Cost Estimate Summary for Alternative 5, Off-Navajo Nation Disposal at Clean Harbors RCRA C Hazardous Waste Disposal Facility

Low-Level Radioactive Waste Disposal Cost		
Low-Level Radioactive Waste Cost per CY	**$**	**105**
Low-Level Radioactive Waste Disposal Cost	**$**	**2,139,506**
Grand Total Capital Costs	**$**	**8,864,548**
TOTAL COSTS	**$**	**9,085,794**

Notes:

"	Inch
AC	Acres
CY	Cubic yard
hp	Horsepower
hr	Hour
K	Thousand
lb.	Pound
LF	Linear feet
NM	New Mexico
PRSC	Post-removal site control
PV	Present value
T&M	Time and material

APPENDIX F

GREENER CLEANUP ANALYSIS (*NOT INCLUDED IN DRAFT*)