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Subject: NPDES Permit No. NM0030759 – Alternative Compliance Request for 17 Site Monitoring Area/Site Combinations Exceeding Target Action Levels from Nonpoint Sources

Dear Ms. Johnsey and Mr. Spencer:

Enclosed please find one hard copy with electronic files of the U.S. Department of Energy (DOE) and Los Alamos National Security, LLC (LANS) (the Permittees) written request for alternative compliance for 17 Site Monitoring Area (SMA)/Site combinations at Los Alamos National Laboratory (the Laboratory). The request is being made in accordance National Pollutant Discharge Elimination System Permit No. NM0030759 (the Individual Permit) for the Laboratory.

If the Permittees believe they have installed control measures to minimize pollutants in storm water discharges from Sites but are unable to certify completion of corrective action under Part I.E.2(a) through (d) of the Individual Permit, Part I.E.3 allows them to request the Sites be placed into alternative compliance. The enclosed requests address 17 SMA/Site combinations where target action level (TAL) exceedances result from non-Site-related nonpoint sources.

As required by Part I.E.3, the Permittees will issue a public notice of issuance of the alternative compliance request by publishing a notice in the Los Alamos Monitor and the Santa Fe New Mexican newspapers, by mailing a copy of the notice to those individuals on the New Mexico Environmental Department– (NMED-) maintained Laboratory Facility Mailing List and to NMED, and by posting the notice on the Individual Permit section of the Laboratory's public website for a public review and comment period of 45 days. The Permittees will prepare a written response to all relevant and significant comments, which will also be posted on the Individual Permit section of the Laboratory's public website.

After the 45-day comment period, the Permittees will submit the alternative compliance request along with the complete record of public comment and the Permittees' response to comments to the U.S. Environmental Protection Agency, Region 6, for a final determination on the requests.

If you have any questions, please contact Steve Veenis at (505) 667-0013 (veenis@lanl.gov) or David Rhodes at (505) 665-5325 (david.rhodes@em.doe.gov).

Sincerely,

John P. McCann, Acting Division Leader
Environmental Protection & Compliance Division
Los Alamos National Laboratory

Sincerely,

David S. Rhodes, Supervisor
Environmental Management
Los Alamos Field Office

JM/DR/BR/SV:sm

Enclosure: One hard copy with electronic files – Alternative Compliance Request for 17 Site Monitoring Area/Site Combinations Exceeding Target Action Levels from Nonpoint Sources (EP2016-0016)

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LA-UR-16-20864
February 2016
EP2016-0016

Alternative Compliance Request for 17 Site Monitoring Area/ Site Combinations Exceeding Target Action Levels from Nonpoint Sources

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared by the Associate Directorate for Environmental Management

Cover photo: 1000-yr flood event that occurred in September 2013

CERTIFICATION

LOS ALAMOS NATIONAL LABORATORY
NPDES Permit No. NM0030759

ALTERNATIVE COMPLIANCE REQUEST FOR 17 SITE MONITORING AREA/

SITE COMBINATIONS EXCEEDING TARGET ACTION LEVELS FROM NONPOINT SOURCES

CERTIFICATION STATEMENT OF AUTHORIZATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

2/16/2016

Bruce Robinson, Program Director
Environmental Remediation Program
Los Alamos National Security, LLC

Date

CERTIFICATION

LOS ALAMOS NATIONAL LABORATORY
NPDES Permit No. NM0030759

ALTERNATIVE COMPLIANCE REQUEST FOR 17 SITE MONITORING AREA/ SITE COMBINATIONS EXCEEDING TARGET ACTION LEVELS FROM NONPOINT SOURCES

CERTIFICATION STATEMENT OF AUTHORIZATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

2-26-2016

David S. Rhodes, Supervisor, Soil and Water Remediation
Environmental Management
Los Alamos Field Office

Date

EXECUTIVE SUMMARY

Los Alamos National Security, LLC (LANS), under the direction of the U.S. Department of Energy (DOE), has prepared this request for alternative compliance for the Individual Storm Water Permit pursuant to the requirements of the National Pollutant Discharge Elimination System Permit No. NM0030759 (hereafter, the Individual Permit or Permit). The Individual Permit authorizes the discharge of storm water associated with historical industrial activities at the Los Alamos National Laboratory from specified solid waste management units and areas of concern, collectively referred to as Sites. The Permit, incorporating the latest modifications, became effective on November 1, 2010.

This request for alternative compliance addresses 17 site monitoring area (SMA)/Site combinations regulated under the Individual Permit. These 17 combinations result from 17 Sites located within 5 SMAs. Alternative compliance is being requested because DOE and LANS have determined that it will not be possible to certify completion of corrective action under Part I.E.2 of the Individual Permit. These SMAs/Sites are addressed in a single request because the target action level exceedances are not known to be associated with Site operations and are within the range expected for runoff from developed and undeveloped landscapes. Therefore, completion of corrective action cannot be certified under any other means provided in the Individual Permit.

CONTENTS

1.0 INTRODUCTION 1

2.0 REGULATORY FRAMEWORK 2

3.0 OVERVIEW OF ALTERNATIVE COMPLIANCE PROCESS 3

4.0 SITE INFORMATION 5

5.0 BASIS FOR ALTERNATIVE COMPLIANCE REQUEST 5

5.1 Potential Sources of TAL Exceedances 5

5.1.1 Runoff from Developed Landscapes 6

5.1.2 Runoff from Undeveloped Landscapes 7

5.1.3 Site-Related Sources of Aluminum, Copper, and PCBs 7

5.1.4 Site-Related Sources of Adjusted Gross Alpha 8

5.2 Rationale for Alternative Compliance 8

5.2.1 Enhanced Control Measures to Meet the TAL 9

5.2.2 Control Measures That Totally Retain and Prevent Discharge from Storm Water 10

5.2.3 Control Measures That Totally Eliminate the Exposure of Pollutants to Storm Water 10

6.0 PROPOSED ALTERNATIVE COMPLIANCE APPROACH 10

7.0 REFERENCES 10

Figures

Figure 1.0-1 Location of the Laboratory with insets of New Mexico State and Los Alamos County 13

Figure 2.0-1 Flow chart of the corrective action process/alternative compliance 14

Tables

Table 3.0-1 TAL Exceedance for the SMA/Sites Included in the Request for Alternative Compliance 15

Table 4.1-1 Comparison of Storm Water Monitoring Results to the UTL 15

Table 4.1-2 SMA Storm Water Sampling Results 16

Table 4.1-3 Percentage of Developed and Undeveloped landscapes within Each SMA 16

Appendixes

Appendix A Data for 17 Site Monitoring Area/Site Combinations Exceeding Target Action Levels from Nonpoint Sources

ACRONYMS AND ABBREVIATIONS

ACA	accelerated corrective action
AOC	area of concern
ATAL	average target action level
bgs	below ground surface
BMP	best management practice
BV	background value
CFR	Code of Federal Regulations
CMP	corrugated metal pipe
COC	certificate of completion
Consent Order	Compliance Order on Consent
D&D	decontamination and decommissioning
DOE	Department of Energy (U.S.)
EPA	Environmental Protection Agency (U.S.)
HE	high explosives
Individual Permit	National Pollutant Discharge Elimination System Permit No. NM0030759
Laboratory	Los Alamos National Laboratory
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
MDA	material disposal area
MTAL	maximum target action level
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
PAH	polyaromatic hydrocarbon
PCB	polychlorinated biphenyl
PBX	plastic-bonded explosive
Permit	NPDES Permit No. NM0030759
Permittees	U.S. Department of Energy and Los Alamos National Security, LLC
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
SMA	site monitoring area
SSC	suspended sediment concentration
SSL	soil screening level
SWMU	solid waste management unit

TA	technical area
TAL	target action level
UTL	upper tolerance limit
VCP	vitrified clay pipe
VOC	volatile organic compound
WWTP	wastewater treatment plant

1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by Los Alamos National Security, LLC (LANS). The Laboratory, located in Los Alamos County in northern New Mexico, covers approximately 39 mi^2 (Figure 1.0-1). It is situated on the Pajarito Plateau, which is made up of a series of finger-like mesas separated by deep west-to-east-oriented canyons cut by predominantly ephemeral and intermittent streams.

On February 13, 2009, the U.S. Environmental Protection Agency (EPA), Region 6, issued National Pollutant Discharge Elimination System (NPDES) Permit No. NM0030759 (hereafter, the Individual Permit or Permit) to DOE and LANS (collectively, the Permittees). The Individual Permit incorporating the latest modifications became effective on November 1, 2010 (EPA 2010). The Individual Permit regulates storm water discharges from certain solid waste management units (SWMUs) and areas of concern (AOCs) (hereafter, Sites). For purposes of implementing the Individual Permit, Sites are organized into site monitoring areas (SMAs).

Under the Individual Permit, DOE and LANS are required to perform corrective actions if storm water monitoring results at an SMA exceed target action levels (TALs). The Permittees can place a Site into alternative compliance where they have installed measures to minimize pollutants in their storm water discharges, as required by Part I.A of the Permit at a Site or Sites, but are unable to certify completion of corrective action under Sections E.2.(a) through E.2(d) (individually or collectively). As described below, the Permittees have determined that the Sites addressed in this request can achieve completion of corrective action only through the alternative compliance process described in Part I.E.3.

This request for alternative compliance addresses 17 SMA/Site combinations. These 17 combinations result from 17 Sites located within 5 SMAs. These Site/SMA combinations are addressed in a single request because the TAL exceedances for these SMAs/Sites are not known to be associated with Site operations and are within the range expected for runoff from developed and undeveloped landscapes on the Pajarito Plateau. As a consequence, the Permittees cannot certify completion of corrective action under any other means provided in the Permit. Part I. 3.(a) of the Permit specifically identifies "background concentrations of pollutants of concern" as a reason for the Permittees to place a Site into alternative compliance. In this case, "background concentrations" are the result of natural background and/or contributions from developed landscapes not related to the Sites.

This alternative compliance request is organized as follows.

- Section 2.0, Regulatory Framework, summarizes the scope of the Individual Permit, the relationship between the Individual Permit and the March 2005 Compliance Order on Consent (Consent Order), administered by the New Mexico Environment Department (NMED), and its associated corrective action processes.
- Section 3.0, Overview of the Alternative Compliance Process, summarizes the requirements in Part I.E.3.(b) of the Permit for making an alternative compliance request to EPA.
- Section 4.0, Site Information, provides relevant site information including descriptions/history, storm water controls, TAL exceedances, soil data, and hydrologic conditions.

- Section 5.0, Basis of Alternative Compliance Request, summarizes the basis for the Permittees' conclusion that certification of completion of corrective action cannot be achieved under Parts I.E.2(a) through 2(d) of the Permit.
- Section 6.0, Proposed Alternative Compliance Approach, describes the actions proposed by the Permittees to achieve completion of corrective action under Part I.E.3 of the Permit.

2.0 REGULATORY FRAMEWORK

The Individual Permit authorizes discharge of storm water associated with industrial activities from specified Sites. The Individual Permit treats historical releases at a Site as "significant materials" [as defined in 40 Code of Federal Regulations (CFR) 122.26(b)(12)] that may potentially be released with "storm water discharge[s] associated with industrial activity" [as defined in 40 CFR 122.26(b)(14)]. Such discharges are considered to be point-source discharges, and the Individual Permit directs the Permittees to monitor storm water discharges from Sites at specified sampling points known as SMAs. An SMA is a drainage area within a subwatershed and may include more than one Site.

The Sites regulated under the Individual Permit are a subset of the SWMUs and AOCs that are being addressed under the Consent Order issued by NMED. The Consent Order fulfills the corrective action requirements in §3004(u) and §3008(h) of the Resource Conservation and Recovery Act (RCRA).

A SWMU is a discernible unit at which solid wastes may have been "routinely and systematically released," possibly resulting in a release of hazardous constituents. The Consent Order also regulates AOCs, areas where releases of hazardous constituents may potentially have occurred but that are not SWMUs. The process of identifying and investigating SWMUs and AOCs is iterative. The initial identification process is conservative—that is, it errs on the side of inclusion if there is any indication in the record a possible historical release of hazardous wastes or hazardous constituents. The Consent Order requires initial investigations to run broad, conservative analytical scans regardless of what the historical reviews indicate may have been released. As a result, all samples in the first phase of investigations under the Consent Order are typically analyzed for EPA target analyte list metals, total cyanide, volatile organic compounds, semivolatile organic compounds, polychlorinated biphenyls (PCBs), nitrate, and perchlorate.

As the investigations under the Consent Order proceed, some SWMUs and AOCs will be eligible for corrective action complete status (e.g., the data reveal no hazardous constituents were released). For the remaining SWMUs and AOCs, the investigations proceed until the nature and extent of contamination from the historical release have been defined in all relevant media, and it can be shown that the Site poses no unacceptable risk to human health and the environment under current and reasonably foreseeable future land use. The investigations of SWMUs and AOCs under the Consent Order began before the effective date of the Individual Permit and continue concurrently with implementation of the Permit.

A Site that has met the definition of a SWMU or AOC was evaluated for inclusion in the Individual Permit based on the following criteria: (1) the SWMU/AOC potentially contains "significant material" (i.e., a release has potentially occurred and has not been cleaned up; (2) the significant material is exposed to storm water (e.g., not covered or limited to the subsurface); and (3) the significant material may be released with storm water discharges to a receiving water. The selection of SWMUs and AOCs for inclusion in the Individual Permit was based on historical information and any storm water data available at the time the Permit application was submitted.

The Individual Permit contains nonnumeric technology-based effluent limitations, coupled with a comprehensive, coordinated inspection and monitoring program, to minimize pollutants in the Permittees' storm water discharges associated with historical industrial activities from specified Sites. The Permittees are required to implement site-specific control measures (including best management practices) to address the nonnumeric technology-based effluent limits, as necessary, to minimize pollutants from the Sites in their storm water discharges.

The Permit establishes TALs that are used as benchmarks to determine the effectiveness of control measures implemented under the Permit. Baseline confirmation monitoring sample results for an SMA are compared with applicable TALs. If one or more baseline confirmation monitoring result exceeds a TAL, the Permittees must take corrective action. Depending of the type of corrective action implemented, corrective action confirmation monitoring may be needed to verify the effectiveness of the corrective action (e.g., enhanced controls). The Permittees must then certify completion of corrective action within the deadlines specified in the Permit. Part I.E.2 of the Individual Permit defines "completion of corrective action" as follows:

- Analytical results from corrective action confirmation sampling show pollutant concentrations for all pollutants of concern at a Site to be at or below applicable TALs;
- Control measures that totally retain and prevent the discharge of storm water have been installed at the Site;
- Control measures that totally eliminate exposure of pollutants to storm water have been installed at the Site; or
- The Site has achieved RCRA corrective action complete with or without controls status or a certificate of completion (COC) under the Consent Order.

Under certain circumstances, the Individual Permit allows the Permittees to submit a request to EPA to have a Site or Sites placed into "Alternative Compliance." Part I.E.3, Alternative Compliance, addresses the criteria and requirements for making a request for an alternative compliance and the actions EPA will take in response to the request. This corrective action process is illustrated schematically in Figure 2.0-1.

3.0 OVERVIEW OF ALTERNATIVE COMPLIANCE PROCESS

The Permittees may seek to place a Site or Sites into alternative compliance when they have installed baseline control measures to minimize pollutants in storm water discharges but are unable to certify completion of corrective action under Parts I.E.2.(a) through (d), individually or collectively. Under the Individual Permit, the Permittees must certify completion of corrective action for High Priority Sites on or before November 1, 2013, unless a confirmation sample could not be collected from a measurable storm event at an individual Site before the second year of the Permit (or before September 30, 2012) (see Part E.1.d). The Permittees must certify completion of corrective action for Medium Priority Sites on or before November 1, 2015. Part E.1.d further provides that the compliance deadline for corrective action under Part E.4 is "extended for a one (1) year period following the first successful confirmation sampling event." Part E.3.b, in turn, provides that if the Permittees seek to place a Site into alternative compliance, they shall not be out of compliance with the applicable deadlines for achieving completion of corrective action under Part E.4, provided the request and supporting documentation are submitted to EPA on or at least six (6) months before the applicable deadlines.

If EPA grants the alternative compliance request, in whole or in part, it will indicate completion of corrective action on a "case-by-case basis," and EPA may require a new individually tailored work plan for the Site or Sites as necessary. As stated in Part I.E.3.(b), "The Permittees shall not be out of compliance with the applicable deadlines for achieving completion of corrective action under Section E.4 with respect to the Site or Sites covered by a request, provided that the request is submitted to EPA on or at least six months before the applicable deadlines."

If EPA denies the alternative compliance request, it will promptly notify the Permittees of the specifics of its decision and of the time frame under which completion of corrective action must be completed under Parts I.E.2.(a) through I.E.2.(d).

The first requirement that must be met to qualify for alternative compliance is that the Permittees must have "installed measures to minimize pollutants in their storm water discharges as required by Part. I.A of the Permit at a Site or Sites…." Part I.A describes the nonnumeric technology-based effluent limitations required under the Individual Permit to minimize pollutants in storm water discharges. The erosion and sedimentation and run-on and runoff controls identified in Part I.A were installed as baseline controls measures within the first 6 mo of the effective date of the Permit, and COCs were submitted to EPA. The other nonnumeric technology-based effluent limitations include employee training and the elimination of non–storm water discharges not authorized by an NPDES permit.

The second requirement is that the Permittees must demonstrate they will not be able to certify completion of corrective action under Parts I.E.2.(a) through I.E.2.(d), individually or collectively. Part I.E.3 lists the following examples of conditions that could prevent the Permittees from certifying corrective action complete: force majeure events, background concentrations of pollutants of concern, site conditions that make installing further control measures impracticable, or pollutants of concern contributed by sources beyond the Permittees' control. This list provides examples of the types of conditions EPA will consider as the basis for an alternative requirements request; it is not an inclusive list.

The third requirement is that the Permittees develop a detailed demonstration of how they reached the conclusion that they are unable to certify completion of corrective action under Parts I.E.2.(a) through (d), individually or collectively. This demonstration should include any underlying studies and technical information.

Once completed, the alternative compliance request and all supporting documentation must be submitted to EPA and made available for public review and comment for a period of 45 d.

The Permittees will issue a public notice of issuance of the alternative compliance request by publishing a notice in the Los Alamos Monitor and the Santa Fe New Mexican, by mailing a copy of the notice to those individuals on the NMED-maintained LANL Facility Mailing List, list of individuals who have subscribed to the LANL-maintained IP Subscriber List, and to NMED, and by posting the notice on the Individual Permit section of the Laboratory's public website.

This public notice will include the following:

- The name and address of the EPA office processing the alternative compliance request for which notice is being given;
- The name, address and telephone number of a person from whom interested persons may obtain further information; and
- A description of where interested persons may secure hard copies of the alternative compliance request.

At the conclusion of the public comment period, the Permittees will prepare a written response to all relevant and significant comments and concerns raised during the comment period. This response will be provided to each person who requests a copy in writing by mail or email, including those who check the option for a copy on the online comment submittal form. The response will also be posted in the Individual Permit section of the Laboratory's public website.

The Permittees will then submit the alternative compliance request, along with the complete record of public comment and the Permittees' response to comments, to EPA Region 6 for a final determination on the request.

4.0 SITE INFORMATION

This request for alternative compliance addresses 17 SMA/Site combinations. These SMA/Sites and the relative TAL exceedance(s) and constituent(s) for the current compliance stage are listed in Table 3.0-1. Appendix A contains the relevant information for each SMA/Site included in this request. Site information provided in Appendix A includes descriptions of Site features and operating history, storm water controls, storm water monitoring data, including the TAL exceedance plots, Site-related soil sampling data results (where available), and SMA drainage areas and surface conditions (percentage of developed and undeveloped landscapes). Land classification for each SMA was prepared using information gathered during multiple site visits and/or geographic information system tools. Developed landscapes consist of surfaces such as pavement, buildings, dirt or gravel. Undeveloped landscapes consist of bare soil, bare rock, riprap, grassland, ponderosa, piñon, juniper, chamisa, gambel oak brush, willows, and mulch.

5.0 BASIS FOR ALTERNATIVE COMPLIANCE REQUEST

The basis for this alternative compliance request is that the constituents exceeding TALs for these SMAs/Sites are not known to be associated with Site operations and are within the range expected for runoff from developed and undeveloped landscapes.

5.1 Potential Sources of TAL Exceedances

At all the SMAs included in this alternative compliance request, each SMA contains non-Site-affected developed and undeveloped landscapes that contribute storm water to the SMA sampler. Storm water samples collected at these SMAs, therefore, represent runoff from landscapes not affected by the Site as well as areas potentially affected by releases from the Site. Potential non-Site-related and Site-related sources of aluminum, copper, polychlorinated biphenyls (PCBs), and/or gross-alpha radioactivity in storm water samples are summarized below.

The Sites contained in this request were placed into corrective action based on storm water monitoring results that exceeded TALs for one or more of the following constituents: aluminum, copper, PCBs, and/or adjusted gross-alpha radioactivity. In all cases, detected concentrations of copper and PCBs were below the upper tolerance limits (UTLs) in storm water runoff from developed landscape for the current compliance stage. As explained below, the UTLs are representative of concentrations of constituents in storm water runoff from developed and undeveloped landscapes that have not been affected by Laboratory operations.

5.1.1 Runoff from Developed Landscapes

Copper is known to be present in storm water runoff from developed landscapes from various anthropogenic sources (e.g., automobile brake pads, galvanized metal, building materials). To determine the contribution of metals to runoff from developed landscapes not affected by Laboratory operations, storm water samples were collected from 2009 to 2012 in developed watersheds on the Pajarito Plateau and analyzed for metals. These results are summarized in the Laboratory publication entitled "Background Metals Concentrations and Radioactivity in Storm Water on the Pajarito Plateau, Northern New Mexico" (hereafter, the Background Metals Report) (LANL 2013a). Sampling locations were selected to avoid any known Laboratory-related contamination and to provide reasonable estimates of runoff from a variety of developed landscapes representative of buildings, parking lots, and roads.

In the Background Metals Report, the 95% UTL was used to represent the upper limit of storm water background concentrations of a constituent. EPA provides methods for calculating the 95% UTL using the ProUCL program (EPA 2013). When comparing single results to background (as performed in evaluation of storm water data), the ProUCL technical guidance recommends comparing the concentrations of that result with the 95% UTL background concentration. The UTL for copper in runoff from developed areas is 32.3 µg/L (LANL 2013a).

PCBs are common anthropogenic-sourced constituents as a result of environmental cycling on a global scale of past releases of PCBs, and as an additive historically used in hundreds of industrial and commercial applications. These applications included electrical, heat-transfer, and hydraulic equipment; plasticizers in paints, plastics, calking, and rubber products; pigments, dyes, and carbonless copy paper; and many other uses (LANL 2012). DOE, the NMED-DOE Oversight Bureau, and the Laboratory conducted a multiyear cooperative study to characterize PCBs in certain surface waters located in the upper Rio Grande watershed in and around the Los Alamos townsite and the Laboratory. The May 2012 report, entitled "Polychlorinated Biphenyls in Precipitation and Stormwater within the Upper Rio Grande Watershed" (hereafter, the PCB Background Report), was submitted to EPA on February 1, 2013.

The PCB Background Report documents the results of storm water sampling conducted in locations representing storm water runoff from relatively small urban watersheds. Samplers were placed around the edge of urban development to collect storm water runoff primarily from developed landscapes such as buildings, parking lots and roads; no samplers were placed below any known areas of contamination. The UTL for PCBs in storm water runoff from developed landscapes is 0.098 µg/L (LANL 2012).

Table 4.1-1 compares the constituents detected in storm water samples at each SMA to the UTLs for storm water runoff from developed and undeveloped landscapes. As shown in Table 4.1-1, the concentrations of copper and PCBs detected in the storm water samples ranged from 17.1% to 20.6% of the UTLs for runoff from undeveloped landscapes and the concentrations of aluminum and gross-alpha radioactivity ranged from 1.1% to 85.9% of the UTLs for runoff from undeveloped landscapes. Each of the SMAs in this request receives runoff from undeveloped and developed landscapes. Therefore, the concentrations associated with the TAL exceedances are within the ranges of background that would be expected based on the landscape type(s) in the SMA drainage areas.

Table 4.1-2 presents the storm water sampling results for the SMAs contained in this request along with the corresponding sample collection date and compliance stage. Table 4.1-3 summarizes the percentage developed and undeveloped landscape in each SMA. Appendix A presents a detailed delineation of the developed and undeveloped landscapes within each SMA.

5.1.2 Runoff from Undeveloped Landscapes

Shallow bedrock at the Laboratory is predominately the Tshirege unit of the Bandelier Tuff. Surface geology maps presented in the Hydrogeologic Site Atlas (LANL 2009) show that the surface geology of the western part of the Laboratory is primarily Tshirege unit 4 (Qbt 4) and the eastern portion is primarily Tshirege unit 3 (Qbt 3). Aluminum and several alpha-emitting radionuclides (e.g., thorium and uranium isotopes) are naturally present in Bandelier Tuff. As a result, these naturally occurring constituents are present in the soils and sediments weathered from Bandelier Tuff and in the storm water runoff containing these soils and sediments. To determine the contribution of naturally occurring metals and radionuclides to runoff from undeveloped areas not affected by Site operations, storm water samples were collected from 2009 to 2012 in remote watersheds on the Pajarito Plateau and analyzed for metals and radioactivity, including gross-alpha radioactivity. These results are summarized in the Laboratory Background Metals Report (LANL 2013a). Sampling locations were selected to avoid any known contamination or developed area and to provide reasonable estimates of runoff from a variety of bedrock source areas and sediment texture. The predominant sediment was composed of weathered Bandelier Tuff. Water-quality conditions measured at background Sites reflect the contaminant levels in storm runoff that were derived from undeveloped landscapes on the Pajarito Plateau.

The 95% UTL was used to represent the background concentration of a constituent. The UTLs for aluminum and gross-alpha radioactivity calculated for storm water runoff from remote watersheds composed primarily of weathered Bandelier Tuff are 2210 µg/L and 1490 pCi/L, respectively (LANL 2013a). This value is considered the natural background concentration for undeveloped landscapes and applies to SMAs in the Individual Permit because the underlying geology of the Laboratory and surrounding area is Bandelier Tuff.

As discussed above, each SMA in this request contains non-Site-affected undeveloped landscapes. These areas contribute storm water runoff to the SMA sampler. Table 4.1-3 summarizes the contributions from the undeveloped landscape to total storm water runoff captured at each SMA. Appendix A shows a detailed delineation of the undeveloped landscapes within each SMA.

5.1.3 Site-Related Sources of Aluminum, Copper, and PCBs

Aluminum and copper although used at the Laboratory, are not known to be associated with industrial materials managed or released as significant industrial materials exposed to storm water at any of the Sites in this request. A PCB TAL exceedance detected at one SMA, STRM-SMA-5.05, may be linked to a former surface disposal area 09-013 (Material Disposal Area [MDA] M). However, based on descriptions of the wastes stored at the MDA, PCBs are not known to have been associated with industrial materials historically managed at the Site but may have been present in small amounts as minor components of the materials managed at the Site. Materials such as metal debris, wood debris, laboratory appliances and fixtures, and metal and glass containers were stored at the MDA from 1960 to 1965, but all debris and contaminated soil were removed from the MDA during an expedited cleanup conducted from 1995 to 1996. Soil concentrations for PCBs are now below SSLs and Individual Permit storm water sampling PCB concentrations are below developed and undeveloped background levels. While this Site may be a source of PCBs in storm water, concentrations are no different from ambient concentrations of PCBs in storm water.

The Site descriptions in Appendix A present historical industrial activities of each Site in this request. The storm water monitoring section in the appendix discusses the TAL exceedance for each SMA/Site combination in this request and summarizes the soil sampling results (where available) for each TAL exceedance.

5.1.4 Site-Related Sources of Adjusted Gross Alpha

Storm water samples collected at the SMAs addressed by this request were analyzed for gross-alpha radioactivity, which is a measure of the alpha radioactivity associated with all alpha-emitting radionuclides detected in the sample. The TAL contained in the Individual Permit, however, is for adjusted gross-alpha radioactivity. Adjusted gross-alpha radioactivity does not include the alpha radioactivity associated with certain radionuclides that are excluded from regulation under the Clean Water Act because they are regulated by DOE under the Atomic Energy Act of 1954. Because the gross-alpha radioactivity of a sample will always be greater than the adjusted gross-alpha radioactivity, use of gross-alpha radioactivity for comparison to the TAL is conservative.

The New Mexico Water Quality Control Commission regulations (New Mexico Administrative Code 20.6.4) define adjusted gross-alpha radioactivity as "total radioactivity due to alpha particle emission as inferred from measurements on a dry sample, including radium-226, but excluding radon-222 and uranium. Also excluded are source, special nuclear and by-product material as defined by the Atomic Energy Act of 1954."

Significant industrial materials managed and potentially released at the Sites contained in this request may have included alpha-emitting radionuclides (see Appendix A). Because of the nature of the activities conducted at the Laboratory, however, these radionuclides would all be source, special nuclear, and/or by-product material as defined by the Atomic Energy Act of 1954. Therefore, any contribution to gross-alpha radioactivity by significant materials potentially released to storm water discharges associated with industrial activities could not contribute to adjusted gross-alpha radioactivity. There are, therefore, no sources of adjusted gross-alpha radioactivity associated with any of the Sites contained in this request.

5.2 Rationale for Alternative Compliance

As described in section 5.1, storm water runoff from the SMAs addressed in this request contains non-Site-affected contributions from developed and undeveloped landscape. The concentrations of copper and PCBs detected in storm water runoff from the SMAs in this request are within the ranges of concentrations in runoff from areas of both developed and undeveloped landscapes.

After reviewing the Site histories and comparison of the storm water sampling results to the background studies, the Permittees have concluded that the detected copper exceedance is a result of nonpoint source runoff from natural background sources and urban runoff. Nonpoint source urban runoff is not regulated under the Individual Permit, and the developed landscapes within the SMAs are not different from land types found in urban areas (e.g., buildings, parking lots, roads). Amigos Bravos, a member of Communities for Clean Water, used this exclusion of urban runoff from regulation under the Individual Permit as one of the bases for its June 30, 2014, petition for a "Determination that Storm Water Discharges in Los Alamos County Contribute to Water Quality Standards Violations and Require a Clean Water Act Permit." Specifically, the petition states, "Further, the individual permits for LANL and Los Alamos County do not cover storm water discharges from the urbanized features that generate the pollution" (p. 8 of the petition) and "NM0030759 does not regulate general urbanized runoff at LANL or from the Los Alamos Townsite"(Statement of Fact 22).

At STRM-SMA-5.05, PCBs were detected in storm water at concentrations that were less than both the developed and undeveloped UTLs; however, Site 09-013 regulated by the SMA was subject to a remediation effort that included PCBs. At Site 09-013, PCBs were detected in shallow soil at levels that initially exceeded the residential soil screening level (SSL), potentially from former surface disposal area, MDA M. However, a Site cleanup conducted from 1995 to 1996 reduced PCB concentrations to less than the residential SSL (LANL 1998). As evidenced from the low concentrations of PCBs in storm water that

Site 09-013 is no longer a source of PCBs and concentrations of PCBs in storm water runoff are no different from PCBs in storm water discharged from undeveloped landscapes. Therefore, further reduction of PCBs through the installation of enhanced controls will not improve water quality in the contributing watershed because of ambient concentrations of PCBs in storm water.

The SMAs with TAL exceedances for aluminum and adjusted gross-alpha radioactivity also receive runoff from undeveloped landscapes, and the concentrations of these constituents are within the ranges expected for runoff from undeveloped landscapes. In cases where the TAL for adjusted gross-alpha radioactivity is exceeded, the Sites included in this alternative compliance request are not considered sources of adjusted gross-alpha radioactivity subject to regulation under the Individual Permit.

The compliance actions specified in Section E.2 of the Individual Permit are not likely to achieve levels of the TAL exceedance constituents in storm water runoff that are different than background. The Permittees believe the Sites(s) are not contributing to the TAL exceedance(s) and undeveloped and developed landscapes not affected by the Site are the source of these TAL exceeding constituents. Therefore, mitigating Site-related storm water would not reduce concentrations of TAL exceeding constituents within the SMA. Additional details related to each of the corrective action approaches in Permit Sections E.2.(a) through E.2.(d) are provided below.

5.2.1 Enhanced Control Measures to Meet the TAL

As shown in Table 4.1-3, the Sites contained in this request receive runoff from undeveloped and/or developed landscapes. The concentrations of aluminum, copper, and PCBs and the gross-alpha radioactivity in storm water samples are within the range of background expected for these landscapes (Table 4.1-3). Although these constituents exceed TALs, concentrations in storm water are within the range of what would be expected from similar landscape types not affected by Site activities. In the case of copper and PCBs, the Sites are not considered a source of the TAL exceedances based on Site history and available soil sampling data.

In the case of aluminum and gross-alpha radioactivity, the concentrations detected in storm water are consistent with natural background. Aluminum and gross-alpha radioactivity are naturally present in sediment derived from Bandelier Tuff throughout the Pajarito Plateau (LANL 1998), including sediments in this SMA. Gross-alpha concentrations in storm water are directly correlated to suspended sediment concentrations (SSC) and are present in the smallest sediment size fraction (LANL 2007). Aluminum is present in the smallest SSC fraction as feldspars, these sediments partition to aqueous form as Al^{+3} in storm water (Kawano and Tomita 1996), and an increase in SSC can result in an increase in dissolved aluminum in storm water. Several variables such as storm intensity, antecedent moisture conditions, and installation of sediment retention best management practices (BMPs) affect SSC. It is not possible to eliminate SSC from storm water with the installation of BMPs because of the extended time it takes to settle silt and smaller-sized sediment fractions (<62.5 µm). Therefore, any storm water runoff generated from the SMAs with TAL exceedances has the potential to exceed TALs for these constituents; the likely source of these constituents is natural background in sediment derived from tuff.

If storm water discharges from the Site were mitigated through the installation of enhanced controls, the SMA and receiving waters downstream of the Sites would continue to receive runoff from developed and undeveloped landscapes both within the SMA and surrounding areas. The anthropogenic background levels PCBs from undeveloped landscape nonpoint sources, copper from developed landscape non-point sources, and the naturally occurring background levels of aluminum and gross-alpha radioactivity in this runoff would likely continue to exceed the TALs.

5.2.2 Control Measures That Totally Retain and Prevent Discharge from Storm Water

For some of the Sites contained in this request, it may be possible to totally retain storm water runoff so no discharge occurs. If storm water discharges from the Site were totally retained, the receiving waters downstream of the Sites would continue to receive runoff from developed and undeveloped landscapes not affected by the Sites. The anthropogenic levels of copper and/or PCBs from nonpoint sources and the naturally occurring background levels of aluminum and gross-alpha radioactivity in this runoff would likely exceed TALs.

5.2.3 Control Measures That Totally Eliminate the Exposure of Pollutants to Storm Water

For some of the Sites contained in this request, it may be possible to totally eliminate the exposure of pollutants to storm water. If exposure to pollutants were totally eliminated, the receiving waters downstream of the Sites would continue to receive runoff from developed and undeveloped landscapes not affected by the Sites. As indicated, the concentrations of aluminum, copper, and/or PCBs in this runoff would be expected to exceed TALs. In addition, any significant materials at the Sites that contain alpha-emitting radionuclides would be exempt from the definition of adjusted gross-alpha radioactivity and, therefore, are not regulated under the Individual Permit and are not considered a source of the adjusted gross-alpha radioactivity TAL exceedance. Therefore, no exposure of aluminum, copper, and/or PCBs and/or adjusted gross-alpha radioactivity from the Sites to storm water is currently occurring, and installation of a no exposure control measure, such as a cap or cover, would not reduce the TAL exceedance constituent concentrations in storm water.

6.0 PROPOSED ALTERNATIVE COMPLIANCE APPROACH

The Permittees believe that no corrective action is required for the Sites submitted herein for alternative compliance because the Sites are not considered sources of the TAL exceedance constituents. In conclusion, the primary source of copper is nonpoint source runoff from developed landscapes within the SMAs; the source of PCBs is anthropogenic background from undeveloped landscapes; and the source of the aluminum and adjusted gross-alpha radioactivity in the SMAs is natural background from Bandelier Tuff. Furthermore, any alpha-emitting radionuclides the Sites in this request may contribute are exempt and are not regulated under the Individual Permit.

The Permittees propose to continue to inspect and maintain existing controls until the Sites in the Individual Permit are removed from the Permit.

7.0 REFERENCES

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LANL (Los Alamos National Laboratory), August 2013b. "Supplemental Investigation Report for Upper Sandia Canyon Aggregate Area," Los Alamos National Laboratory document LA-UR-13-26024, Los Alamos, New Mexico.

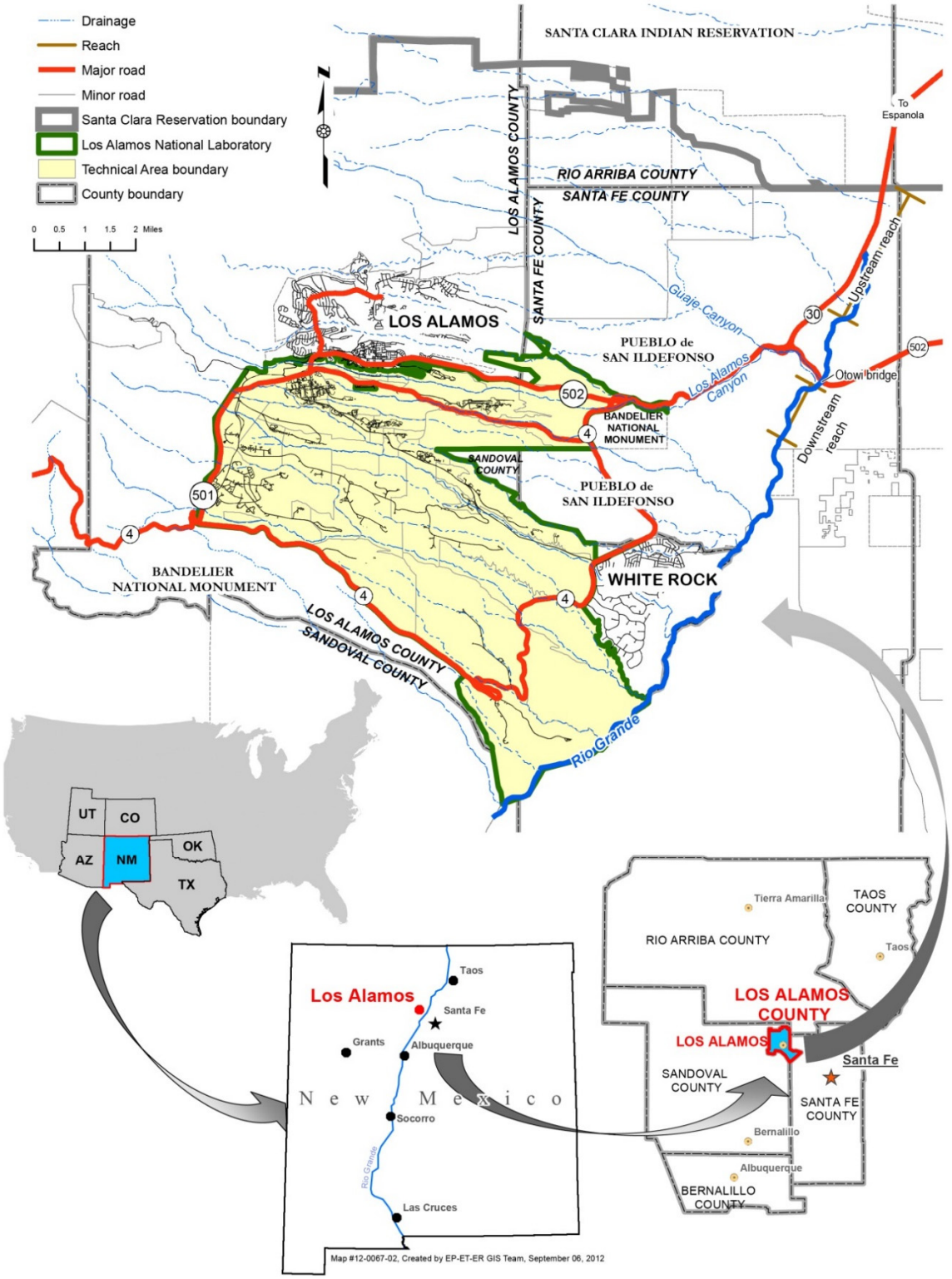
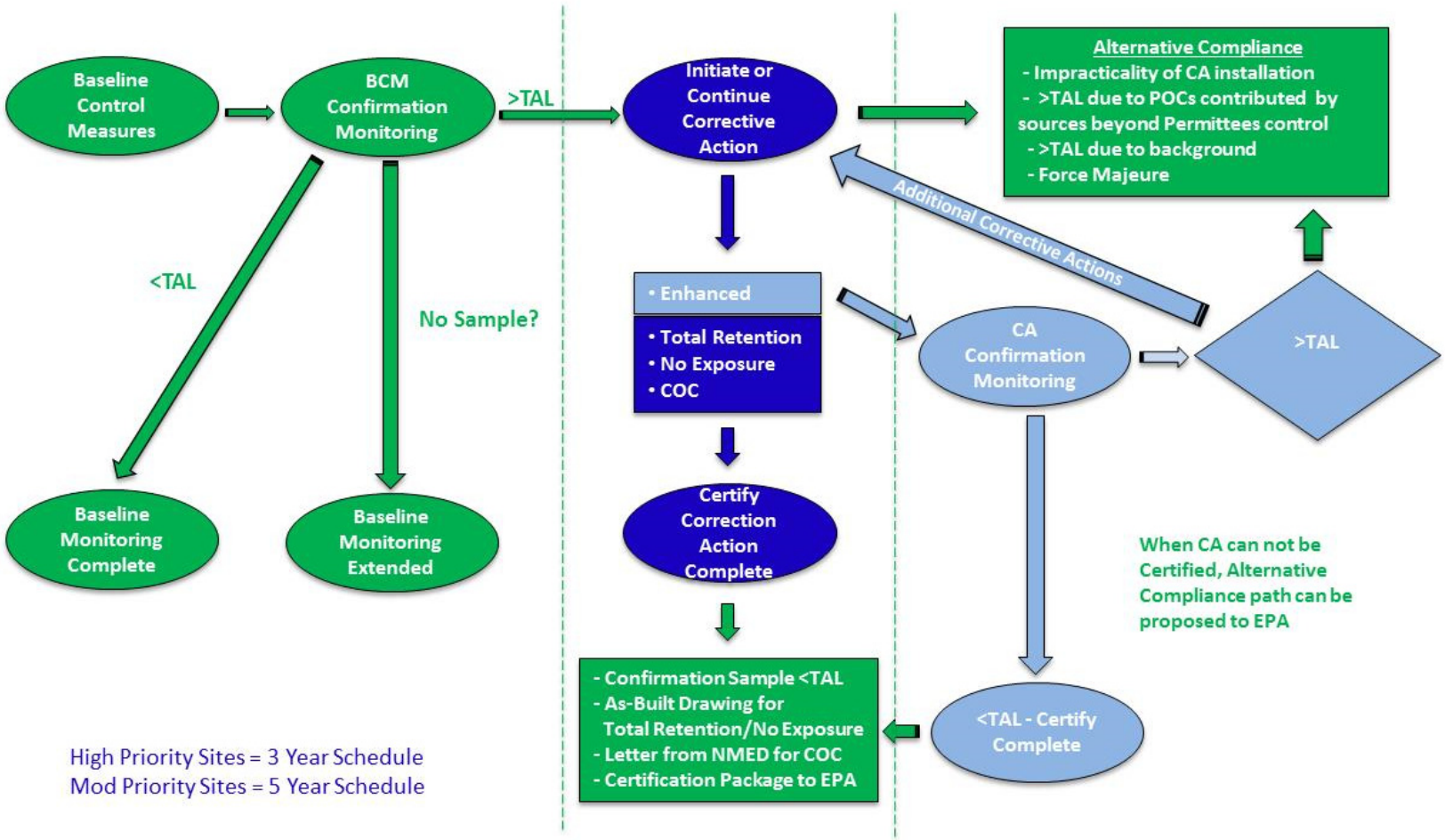


Figure 1.0-1 Location of the Laboratory with insets of New Mexico State and Los Alamos County



Note: BCM = Baseline Control Measures, CA = Corrective Action, COC = Certificate of Completion, POC = Pollutants of Concern, TAL = Target Action Level.

Figure 2.0-1 Flow chart of the corrective action process/alternative compliance

Table 3.0-1
TAL Exceedance for the SMA/Sites Included in the Request for Alternative Compliance

SMA	Site	Brief Description	TAL Exceedance[a,b]
2M-SMA-1.42	06-001(a)	Septic tank	Al(2.5), GA(1.1)
CDB-SMA-0.15	04-003(a)	Outfall from Building 04-7	Al(1.7), Cu(1.5)
CDB-SMA-0.15	04-004	Soil Contamination from Building 04-7	Al(1.7), Cu(1.5)
CDV-SMA-2.3	13-001	Firing Site	GA(3.6)
CDV-SMA-2.3	13-002	Surface Disposal Area	GA(3.6)
CDV-SMA-2.3	16-003(n)	Sump from Building 16-342	GA(3.6)
CDV-SMA-2.3	16-003(o)	Sumps from Building 16-340	GA(3.6)
CDV-SMA-2.3	16-029(h)	Outfall and drain lines from sump	GA(3.6)
CDV-SMA-2.3	16-031(h)	Outfall from Building 16-340	GA(3.6)
STRM-SMA-5.05	09-013	Surface disposal areas	PCB(3.5)
W-SMA-10	11-002	Burn area	GA(5.2)
W-SMA-10	11-005(a)	Septic system	GA(5.2)
W-SMA-10	11-005(b)	Septic system	GA(5.2)
W-SMA-10	11-006(c)	Catch basins and outfall near drop tower	GA(5.2)
W-SMA-10	11-006(d)	Catch basins and outfall near drop tower	GA(5.2)
W-SMA-10	11-011(d)	Outfall from Building 11-24	GA(5.2)
W-SMA-10	11-003(b)	Mortar impact area	GA(5.2)

[a] Al = aluminum, GA = gross-alpha radioactivity, Cu = copper.

[b] Number in parentheses is the storm water sample concentration divided by the applicable maximum TAL (MTAL) or average TAL (ATAL) value (i.e., 1.9 indicates storm water concentration was 1.9 times greater than the TAL). If the MTAL applies the greater of any validated sample result for the compliance stage for the SMA in Table 5.1-2 is used to represent the storm water concentration. If the ATAL applies, and more than one validated sample result exists for the compliance stage, as reported in Table 5.1-2, then the geometric mean of the reported values is used to represent the storm water concentration. If the ATAL applies and only one validated sample result exists for the compliance stage the value is used to represent the storm water sample concentration.

Table 4.1-1
Comparison of Storm Water Monitoring Results to the UTL

SMA	Sample Date	Sample Type	Constituent	Concentration/ Activity (µg/L or pCi/L)[a]	Comparison to Developed UTL[b]	Comparison to Undeveloped UTL[b]
2M-SMA-1.42	7/20/2015	Corrective Action	Aluminum	1900	—[c]	86%
	7/20/2015	Corrective Action	Gross Alpha	16	—	1.1%
CDB-SMA-0.15	7/20/2015	Baseline	Aluminum	1250	—	56.6%
	7/20/2015	Baseline	Copper	6.66	20.6%	—
CDV-SMA-2.3	7/20/15	Baseline	Gross Alpha	54.4	—	3.6%
STRM-SMA-5.05	8/2/2015	Corrective Action	PCBs	0.002	—	17.1%
W-SMA-10	8/1/2015	Corrective Action	Gross Alpha	77.8	—	5.2%

[a] Results presented in the following units: µg/L for aluminum, copper, and PCBs. pCi/L for gross alpha and radium-226 and radium-228.

[b] The values represent the concentration in the storm water sample as a percentage of the UTL. Dissolved aluminum undeveloped landscape runoff UTL = 2210 µg/L. Dissolved copper developed landscape runoff UTL = 32.3 µg/L. Unfiltered gross alpha undeveloped landscape runoff UTL = 1490 pCi/L. Unfiltered PCBs undeveloped landscape runoff UTL = 0.0117 µg/L.

[c] — = Not available.

Table 4.1-2
SMA Storm Water Sampling Results

SMA	Analyte	Sample	Detect Flag	Result	Units	Collection Date	Compliance Stage
2M-SMA-1.42	Aluminum	WT_IPC-15-101962	Y	1900	µg/L	7/20/2015	Corrective Action
2M-SMA-1.42	Gross alpha	WT_IPC-15-101960	Y	16	pCi/L	7/20/2015	Corrective Action
CDB-SMA-0.15	Aluminum	WT_IPC-15-102123	Y	1250	µg/L	7/20/2015	Baseline
CDB-SMA-0.15	Copper	WT_IPC-15-102123	Y	6.66	µg/L	7/20/2015	Baseline
CDV-SMA-2.3	Gross Alpha	WT_IPC-15-102065	Y	54.4	pCi/L	7/20/2015	Baseline
STRM-SMA-5.05	Total PCB	WT_IPC-15-101952	Y	0.002	µg/L	8/2/2015	Corrective Action
W-SMA-10	Gross Alpha	WT_IPC-15-101966	Y	77.8	pCi/L	8/1/2015	Corrective Action

Table 4.1-3
Percentage of Developed and Undeveloped Landscapes within Each SMA

SMA	Watershed	TAL Exceedance Constituent*	SMA Drainage Area (acre)	Developed Landscape within SMA	Undeveloped Landscape within SMA
2M-SMA-1.42	Pajarito	Al(2.5), GA(1.1)	0.005	0%	100%
CDB-SMA-0.15	Sandia/Mortandad	Al(1.7), Cu(1.5)	0.23	17%	83%
CDV-SMA-2.3	Water/ Cañon de Valle	GA(3.6)	101.4	9.8%	90.2%
STRM-SMA-5.05	Pajarito	PCB(3.5)	2.0	0%	100%
W-SMA-10	Water/ Cañon de Valle	GA(5.2)	7.8	29%	71%

* Al=aluminum, GA = gross-alpha radioactivity, Cu=copper.

Appendix A

Data for 17 Site Monitoring Area/Site Combinations Exceeding Target Action Levels from Nonpoint Sources

CONTENTS

A-1.0 INTRODUCTION A-1
A-1.1 Site Description A-1
A-1.2 Storm Water Monitoring Results A-1
A-1.3 Developed and Undeveloped Sources of the TAL Exceedance in the SMA Landscape A-1
A-1.4 Evaluation of Historical Industrial Activities and TAL Exceedance Constituents A-1

A-2.0 2M-SMA-1.42 ..... A-2
A-2.1 Site Description A-2
A-2.2 Storm Water Monitoring Results A-2
A-2.3 Developed and Undeveloped Sources of the TAL Exceedance in the SMA Landscape A-3
A-2.4 Evaluation of Historical Industrial Activities and TAL Exceedance Constituents A-3

A-3.0 CDB-SMA-0.15 ..... A-6
A-3.1 Site Description A-6
A-3.2 Storm Water Monitoring Results A-6
A-3.3 Developed and Undeveloped Sources of the TAL Exceedance in the SMA Landscape A-6
A-3.4 Evaluation of Historical Industrial Activities and TAL Exceedance Constituents A-7

A-4.0 CDV-SMA-2.3 ..... A-10
A-4.1 Site Description A-10
A-4.2 Storm Water Monitoring Results A-11
A-4.3 Developed and Undeveloped Sources of the TAL Exceedance in the SMA Landscape A-12
A-4.4 Evaluation of Historical Industrial Activities and TAL Exceedance Constituents A-12

A-5.0 STRM-SMA-5.05 ..... A-16
A-5.1 Site Description A-16
A-5.2 Storm Water Monitoring Results A-16
A-5.3 Developed and Undeveloped Sources of the TAL Exceedance in the SMA Landscape A-16
A-5.4 Evaluation of Historical Industrial Activities and TAL Exceedance Constituents A-17

A-6.0 W-SMA-10 ..... A-21
A-6.1 Site Description A-21
A-6.2 Storm Water Monitoring Results A-23
A-6.3 Developed and Undeveloped Sources of the TAL Exceedance in the SMA Landscape A-23
A-6.4 Evaluation of Historical Industrial Activities and TAL Exceedance Constituents A-24

A-7.0 REFERENCES A-28

Figures

Figure A-2.2-1 TAL exceedance plot for 2M-SMA-1.42 ..... A-4
Figure A-2.3-1 SMA map for 2M-SMA-1.42 ..... A-5
Figure A-3.2-1 TAL exceedance plot for CDB-SMA-0.15 ..... A-8
Figure A-3.3-1 SMA map for CDB-SMA-0.15 ..... A-9
Figure A-4.2-1 TAL exceedance plot for CDV-SMA-2.3 ..... A-14
Figure A-4.3-1 SMA map for CDV-SMA-2.3 ..... A-15
Figure A-5.2-1 TAL exceedance plot for STRM-SMA-5.05 ..... A-18
Figure A-5.3-1 SMA map for STRM-SMA-5.05 ..... A-20
Figure A-6.2-1 TAL exceedance plot for W-SMA-10 ..... A-26
Figure A-6.3-1 SMA map for W-SMA-10 ..... A-27

A-1.0 INTRODUCTION

This appendix provides Site-specific information to support the alternative compliance requests for 17 site monitoring area (SMA)/Site combinations at Los Alamos National Laboratory (LANL or the Laboratory). The Laboratory has prepared this request pursuant to the requirements of the National Pollutant Discharge Elimination System (NPDES) Permit No. NM0030759 (hereafter, the Individual Permit or Permit). The information provided for each Site and SMA includes site descriptions, storm water monitoring results, developed and undeveloped sources of target action level (TAL) exceedances, and historical activities potentially related to TAL exceedances. Additional details on the specific information presented is provided below.

A-1.1 Site Description

Site descriptions identify the Sites regulated within the SMA and provide a brief history of industrial activities, environmental investigations and, if applicable, remediation activities. Sites within the SMA, but not included in this request, are also described.

A-1.2 Storm Water Monitoring Results

For each SMA the storm water monitoring results section describes the storm water data, date of sample collection, and comparison to the applicable TALs. The storm water monitoring results are plotted on graphs at the end of each SMA section. Organic and inorganic analytes/radionuclides are presented in different plots.

A-1.3 Developed and Undeveloped Sources of the TAL Exceedance in the SMA Landscape

This section provides detail on the percentage of each SMA that is developed and undeveloped to better understand the potential for developed and undeveloped sources that contribute to the TAL exceedance. A map is provided that delineates the developed and undeveloped areas in each SMA.

Also in this section, the TAL exceedances are evaluated against the appropriate storm water background values (BV), that is, “Bandelier Tuff background” for undeveloped landscapes or “developed background” for urban landscapes. BVs are expressed as upper tolerance limits (UTLs) using the approved U.S. Environmental Protection Agency (EPA) statistical method. UTLs for undeveloped landscapes were derived from storm water runoff in undeveloped reference watersheds are labeled “Bandelier Tuff Background” in the monitoring results plots for each SMA. UTLs for urban landscapes are labeled “Developed Background” in the monitoring results plots for each SMA.

A-1.4 Evaluation of Historical Industrial Activities and TAL Exceedance Constituents

For any constituents exceeding the TAL, an evaluation of historical industrial activities at each Site is provided to determine if TAL exceedance constituent(s) are known to be associated with industrial materials historically managed at the Site. The discussion is organized by Site and analyte. For any constituents exceeding the TAL, a summary of the results from soil and sediment samples collected at the Site during Compliance Order on Consent (Consent Order) or other previous investigations is provided and a determination is made of whether or not the TAL exceedance constituent is known to have been associated with industrial materials historically managed at the Site.

A-2.0 2M-SMA-1.42

A-2.1 Site Description

Solis Waste Management Unit (SWMU) 06-001 (a) is an inactive septic tank (structure 06-40) with a volume of approximately 840 gal. (the precise volume is not known) and the associated outfall area. The septic tank system served buildings 06-1 and 06-3 (currently a storage building). The septic tank is located approximately 400 ft north of Twomile Mesa Road and about 100 ft north of building 06-3. Building 06-1 included a laboratory and a carpenter shop. The laboratory was used in 1944 to develop analytical procedures for nonradioactive cobalt-tracer shots. Although no further information exists on the use of the laboratory, the carpenter shop may have later expanded into the laboratory space. In the late 1950s, silver soldering may have been done in the shop. The building was not used after the carpenter shop closed in the early 1980s. Building 06-3 contained a restroom, a darkroom, and a laboratory with a lead-lined sink. Building 06-3 was first used as a control bunker for explosives shots; it was remodeled in 1944 with explosion-proof fixtures. From 1945 to 1948, the building housed offices, and from 1948 to the early 1950s, the building had a firing control panel and a bridgewire-testing laboratory. In 1972, the building was remodeled into a printed-circuit shop, and it was later used as a silk-screen facility until the mid-1980s. Since the mid-1980s, building 06-3 has been used for storage.

The septic system outfall drained to Tributary A of Twomile Canyon. The system ceased to be used in December 1986, and its drainline was plugged in 1988. During a reconnaissance visit in 1992, the tank was located and found to be empty. Buildings 06-1 and 06-3 were demolished and removed in 2004. The septic system was left in place.

Consent Order investigations have not been performed at SWMU 06-001(a), and no decision-level data are available for this Site. Screening-level data are available from a Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) performed in 1994.

A-2.2 Storm Water Monitoring Results

SWMU 06-001(a) is monitored within 2M-SMA-1.42. Following the installation of baseline control measures, two baseline storm water samples were collected on August 21, 2011, and September 15, 2012. Analytical results from these samples yielded the following TAL exceedances (Figure A-2.2-1):

- Aluminum concentration of 794 µg/L (maximum TAL [MTAL] is 750 µg/L) and
- Gross-alpha activity of 51.8 pCi/L (average TAL [ATAL] is 15 pCi/L).

Following the installation of enhanced control measures, a corrective action storm water sample was collected on July 20, 2015. Analytical results from the corrective action monitoring sample yielded two TAL exceedances (Figure A-2.2-1):

- Aluminum concentration of 1900 µg/L (MTAL is 750 µg/L) and
- Gross-alpha activity of 16 pCi/L (ATAL is 15 pCi/L).

These 2015 TAL exceedances are the subject of the alternative compliance request for this SMA/Site.

A comparison of the 2011 baseline sample results and 2015 post-enhanced control installation sampling results indicates the gross-alpha activity was reduced by installing enhanced controls but is still slightly above the ATAL (1 pCi/L greater). The aluminum concentration was not reduced and actually increased, probably as a result of natural variability in sample results from sediment concentrations in storm water.

Aluminum and gross-alpha radioactivity are naturally present in sediment derived from Bandelier Tuff throughout the Pajarito Plateau (LANL 1998), including sediments in this SMA. Gross-alpha concentrations in storm water are directly correlated to suspended sediment concentrations (SSC) and are present in the smallest sediment size fraction (LANL 2007). Aluminum is present in the smallest SSC fraction as feldspars, these sediments partition to aqueous form as Al+3 in storm water (Kawano and Tomita 1996), and an increase in SSC can result in an increase in dissolved aluminum in storm water. Several variables such as storm intensity, antecedent moisture conditions, and installation of sediment retention best management practices (BMPs) affect SSC. It is not possible to eliminate SSC from storm water with the installation of BMPs because of the extended time it takes to settle silt and smaller-sized sediment fractions (<62.5 µm). Therefore, any storm water runoff generated from this SMA has the potential to exceed TALs for these constituents; the likely source of these constituents is natural background in sediment derived from tuff.

A-2.3 Developed and Undeveloped Sources of the TAL Exceedance in the SMA Landscape

2M-SMA-1.42 is a 0.005-acre watershed that consists of 100% undeveloped areas consisting of sparse grassland. The SMA primarily receives storm water run-on from landscape consisting of Bandelier Tuff sediment. (Figure A-2.3-1 shows the SMA map with the percentage of developed and undeveloped areas within the SMA).

The following bullet(s) summarize the comparison of TAL exceedance constituent(s) to potential developed and undeveloped landscape sources:

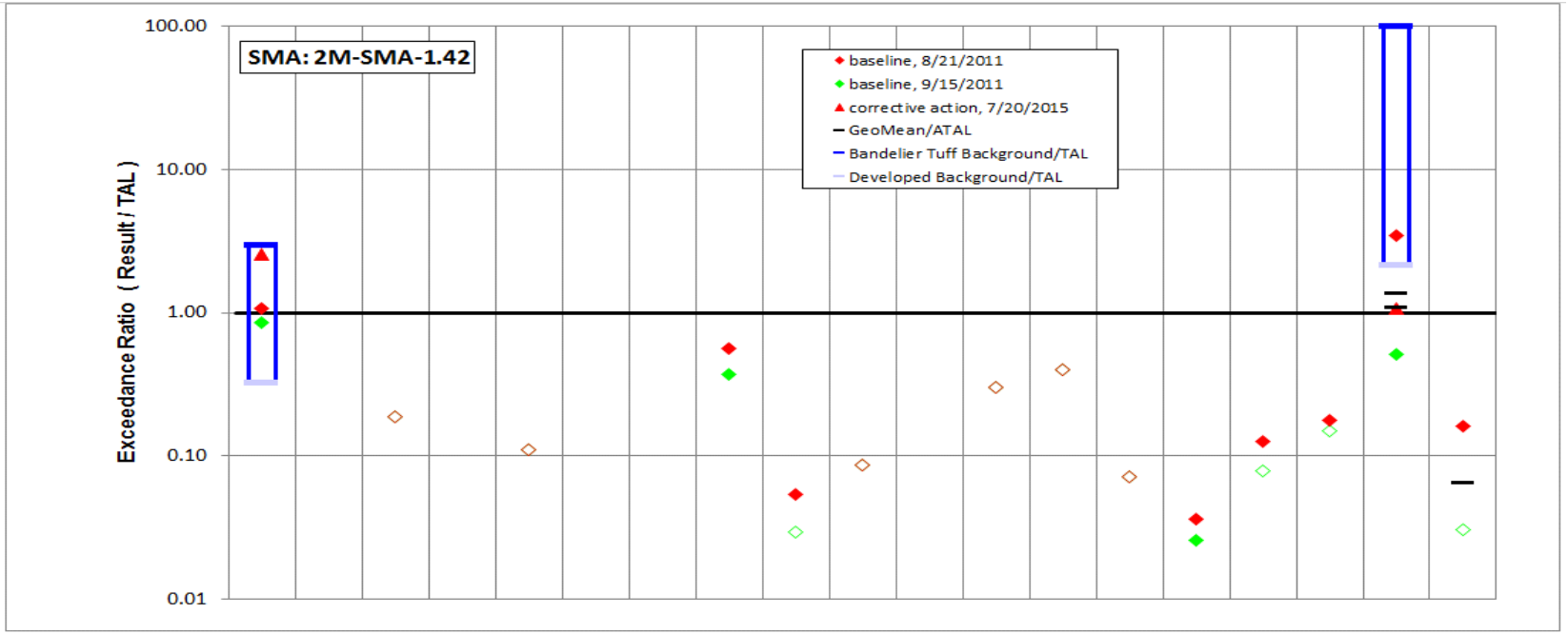
- Aluminum—The aluminum UTL from background storm water containing sediment derived from Bandelier Tuff is 2210 µg/L. The aluminum results from both 2011 and 2015 are less than this value.
- Gross alpha—The gross-alpha UTL for background storm water containing sediment derived from Bandelier Tuff is 1490 pCi/L. The gross-alpha results from both 2011 and 2015 are less than this value.

A-2.4 Evaluation of Historical Industrial Activities and TAL Exceedance Constituents

Site history and shallow (i.e., less than 3 ft below ground surface [bgs]) soil sampling data (where available) are used to determine whether the TAL exceedance constituent(s) may be related to historical industrial activities. The discussion is organized by Site and TAL exceedance constituent.

SWMU 06-001(a):

- Aluminum— Aluminum is not known to be associated with industrial materials historically managed at the Site. Aluminum was not detected above BVs in shallow soil and sediment samples collected during the 1994 RFI.
- Alpha-emitting radionuclides— Alpha-emitting radionuclides are not known to be associated with industrial materials historically managed at the Site. Shallow soil samples collected during the 1994 RFI were not analyzed for gross-alpha radioactivity or alpha-emitting radionuclides because these constituents are not associated with historical site activities.



	Aluminum	Antimony	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide, weak acid dissociable	**Gross alpha**	Radium-226 and Radium-228
std used in ratio calculations	MTAL	ATAL	ATAL	ATAL	MTAL	MTAL	ATAL	MTAL	MTAL	ATAL	MTAL	ATAL	MTAL	ATAL	ATAL	MTAL	ATAL	ATAL	ATAL
std value	750	640	9	5000	1	210	1000	4.3	17	0.77	170	5	0.5	6.3	100	42	0.01	15	30
unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	pCi/L	pCi/L
7/20/2015 result	**1900**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**16**	-
result / TAL	**2.5**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1.1**	-
9/15/2011 result	644	*1*	*1.7*	*15*	*0.11*	*2*	*2.9*	1.6	*0.5*	*0.066*	0.69	*1.5*	*0.2*	*0.45*	2.6	*3.3*	*0.002*	7.66	*0.916*
result / TAL	0.86	*0.002*	*0.19*	*0.003*	*0.11*	*0.01*	*0.003*	0.37	*0.029*	*0.086*	0.0041	*0.3*	*0.4*	*0.071*	0.026	*0.079*	*0.15*	0.51	*0.031*
8/21/2011 result	**794**	*1*	*1.7*	*15*	*0.11*	*2*	3.5	2.4	0.92	*0.066*	1.6	*1.5*	*0.2*	*0.45*	3.6	5.3	0.0018	**51.8**	4.88
result / TAL	**1.1**	*0.002*	*0.19*	*0.003*	*0.11*	*0.01*	0.0035	0.56	0.054	*0.086*	0.0094	*0.3*	*0.4*	*0.071*	0.036	0.13	0.18	**3.5**	0.16

Bold font indicates result>TAL or MQL; italic font and hollow symbols indicate undetected results; "-" is used if no analytical results were available.

Figure A-2.2-1 TAL exceedance plot for 2M-SMA-1.42

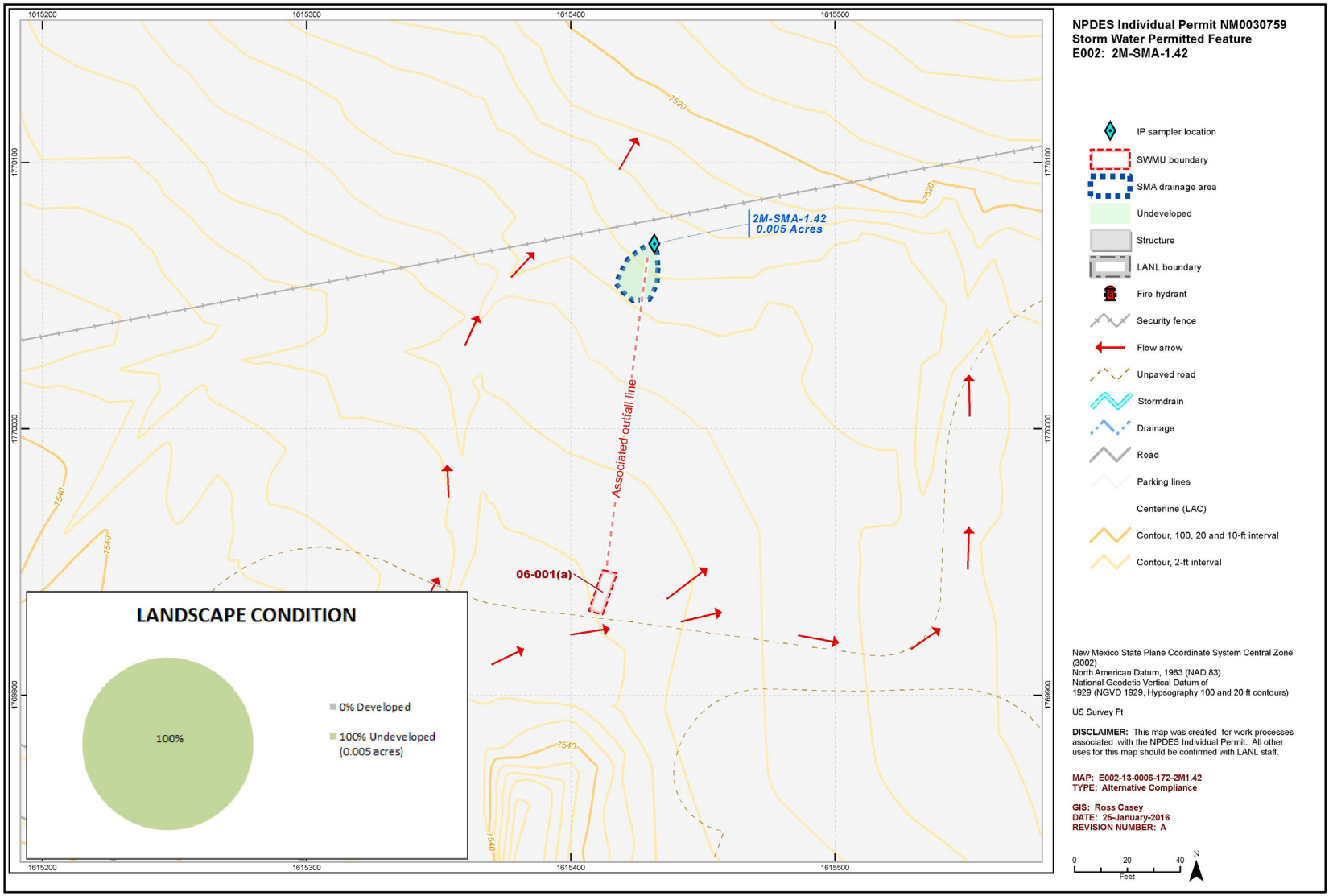


Figure A-2.3-1 SMA map for 2M-SMA-1.42

A-3.0 CDB-SMA-0.15

A-3.1 Site Description

SWMU 04-003(a) is a former outfall that was located approximately 15 ft southeast of former building 04-7 at former Technical Area 04 (TA-04) (now TA-52). Former building 04-7 operated from 1948 to 1955 and housed a darkroom and photoprocessing laboratory that discharged to the outfall. Discharges to the outfall flowed to a trench southeast of former building 04-7 that eventually discharged into Cañada del Buey. Portions of the trench have since been covered by buildings 52-114 and 52-115 and an asphalt parking lot. Beta activity was detected in the darkroom in 1955, and portions of the floor were removed to remediate the contamination. Building 04-7 underwent D&D in 1956.

Phase I Consent Order sampling is complete for SWMU 04-003(a). All detected constituent concentrations were below residential SSLs and SALs, except for one detection of a single polyaromatic hydrocarbons (PAH), which was below the industrial soil screening level (SSL). Nature and extent will be reevaluated under the supplemental investigation report for Upper Cañada del Buey Aggregate Area. It is anticipated this Site will be recommended for corrective action complete and will be eligible for a certificate of completion (COC) under the Consent Order after approval of the report by the New Mexico Environment Department (NMED).

Area of Concern (AOC) 04-004 is an area of potential soil contamination associated with the footprint of former building 04-7 at former TA-04 (now TA-52). Former building 04-7 operated from 1948 to 1955 and was used to develop film from 1948 to 1955. The former building housed a darkroom and photoprocessing laboratory and discharged to an outfall [SWMU 04-003(a)]. Building 04-7 underwent decontamination and decommissioning (D&D) in 1956.

Phase I Consent Order sampling is complete for AOC 04-004. All detected constituent concentrations were below residential SSLs and screening action levels (SALs). It is anticipated this Site will be recommended for corrective action complete and will be eligible for a COC under the Consent Order after approval of the supplemental investigation report by NMED.

A-3.2 Storm Water Monitoring Results

SWMUs 04-003(a) and AOC 04-004 are monitored within CDB-SMA-0.15. Following the installation of baseline control measures, a baseline storm water sample was collected on July 25, 2015. Analytical results from this sample yielded two TAL exceedances (Figure A-3.2-1):

- Aluminum concentration of 1250 µg/L (MTAL is 750 µg/L) and
- Copper concentration of 6.7 µg/L (MTAL is 4.3 µg/L).

These 2015 TAL exceedances are the subject of the alternative compliance request for this SMA/Site.

A-3.3 Developed and Undeveloped Sources of the TAL Exceedance in the SMA Landscape

CDB-SMA-0.15 is a 0.226-acre watershed that consists of 17% developed areas and 83% undeveloped areas. Developed areas consist of 0.04 acres of pavement. Undeveloped areas consist of 0.12 acres of piñon and juniper and 0.07 acres of sparse grassland (Figure A-3.3-1 shows the SMA map with the percentage of developed and undeveloped areas within the SMA).

The following bullet(s) summarize the comparison of TAL exceedance constituent(s) to potential developed and undeveloped landscape sources:

- Aluminum—The aluminum UTL from developed urban landscape storm water run-on is 245 µg/L; the aluminum UTL for background storm water containing sediment derived from Bandelier Tuff is 2210 µg/L. The aluminum result from 2015 is between these two values.
- Copper—The copper UTL from developed urban landscape storm water run-on is 32.3 µg/L; the copper UTL for background storm water containing sediment derived from Bandelier Tuff is 3.43 µg/L. The copper result from 2015 is between these two values.

A-3.4 Evaluation of Historical Industrial Activities and TAL Exceedance Constituents

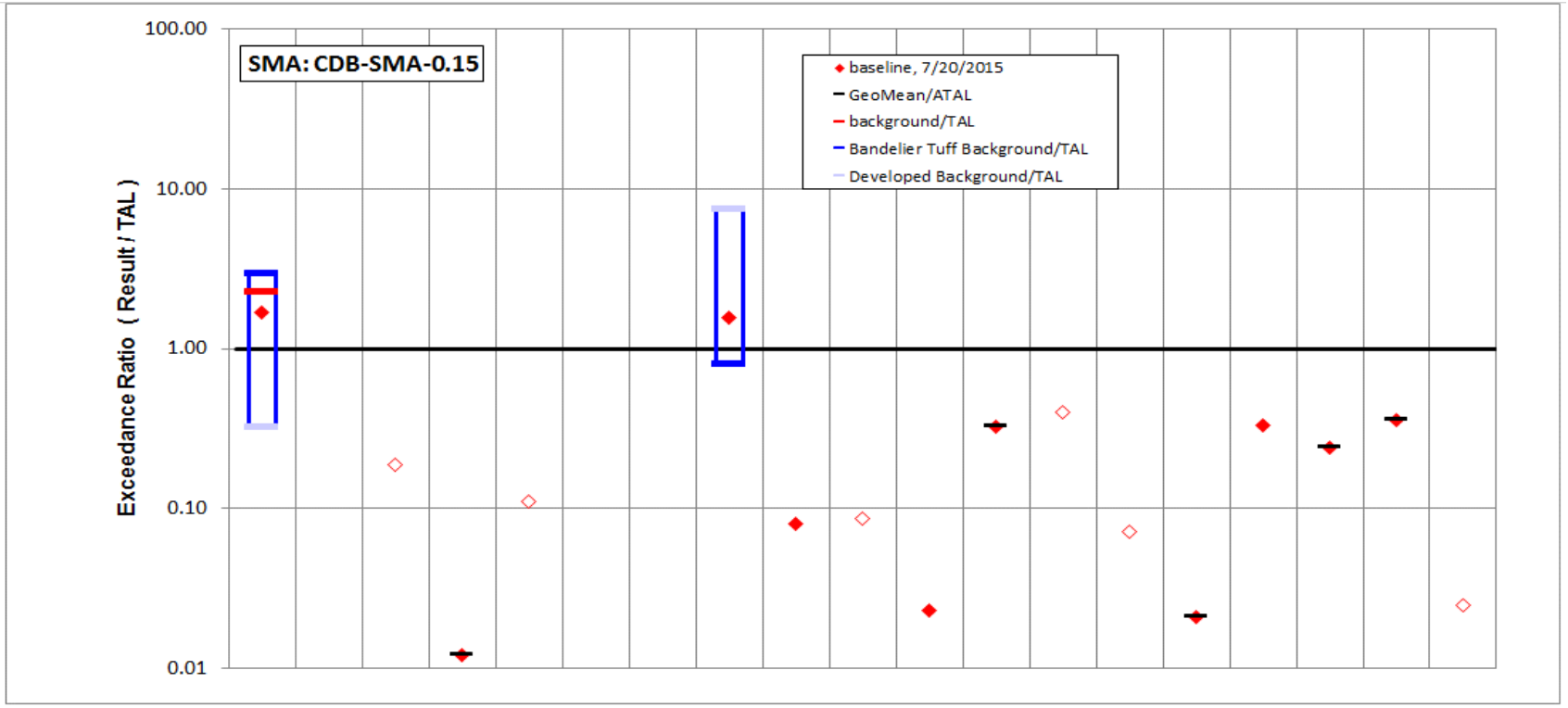
Site history and shallow (i.e., less than 3 ft bgs) soil sampling data (where available) are used to determine whether the TAL exceedance constituent(s) may be related to historical industrial activities. The discussion is organized by Site and TAL exceedance constituent.

SWMU 04-003(a):

- Aluminum and copper are not known to have been associated with industrial materials historically managed at the Site. Aluminum and copper were not detected above background values (BVs) in any of the 19 shallow (i.e., less than 3 ft bgs) 1998 RFI or 2010 Consent Order soil, sediment, and tuff samples.

AOC 04-004:

- Aluminum and copper are not known to have been associated with industrial materials historically managed at the Site. Aluminum was detected above the BV in 1 of 28 shallow 1998 RFI and 2010 Consent Order soil and tuff samples at a concentration 1.04 times the tuff BV. Copper was detected above the BV in 2 of 28 shallow soil and tuff samples at a maximum concentration of 2.4 times the soil BV.



	Aluminum	Antimony	Arsenic	Boron	Cadmium	Chromium	Cobalt	**Copper**	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide, weak acid dissociable	Gross alpha	Radium-226 and Radium-228
std used in ratio calculations	MTAL	ATAL	ATAL	ATAL	MTAL	MTAL	ATAL	MTAL	MTAL	ATAL	MTAL	ATAL	MTAL	ATAL	ATAL	MTAL	ATAL	ATAL	ATAL
std value	750	640	9	5000	1	210	1000	4.3	17	0.77	170	5	0.5	6.3	100	42	0.01	15	30
unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	pCi/L	pCi/L
7/20/2015 result	**1250**	*1*	*1.7*	61	*0.11*	*2*	*1*	**6.66**	1.36	*0.067*	3.9	1.62	*0.2*	*0.45*	2.11	13.9	0.0024	5.32	*0.75*
result / TAL	**1.7**	*0.002*	*0.19*	0.012	*0.11*	*0.01*	*0.001*	**1.5**	0.08	*0.087*	0.023	0.32	*0.4*	*0.071*	0.021	0.33	0.24	0.35	*0.025*

Bold font indicates result>TAL or MQL; italic font and hollow symbols indicate undetected results; "-" is used if no analytical results were available.

Figure A-3.2-1 TAL exceedance plot for CDB-SMA-0.15

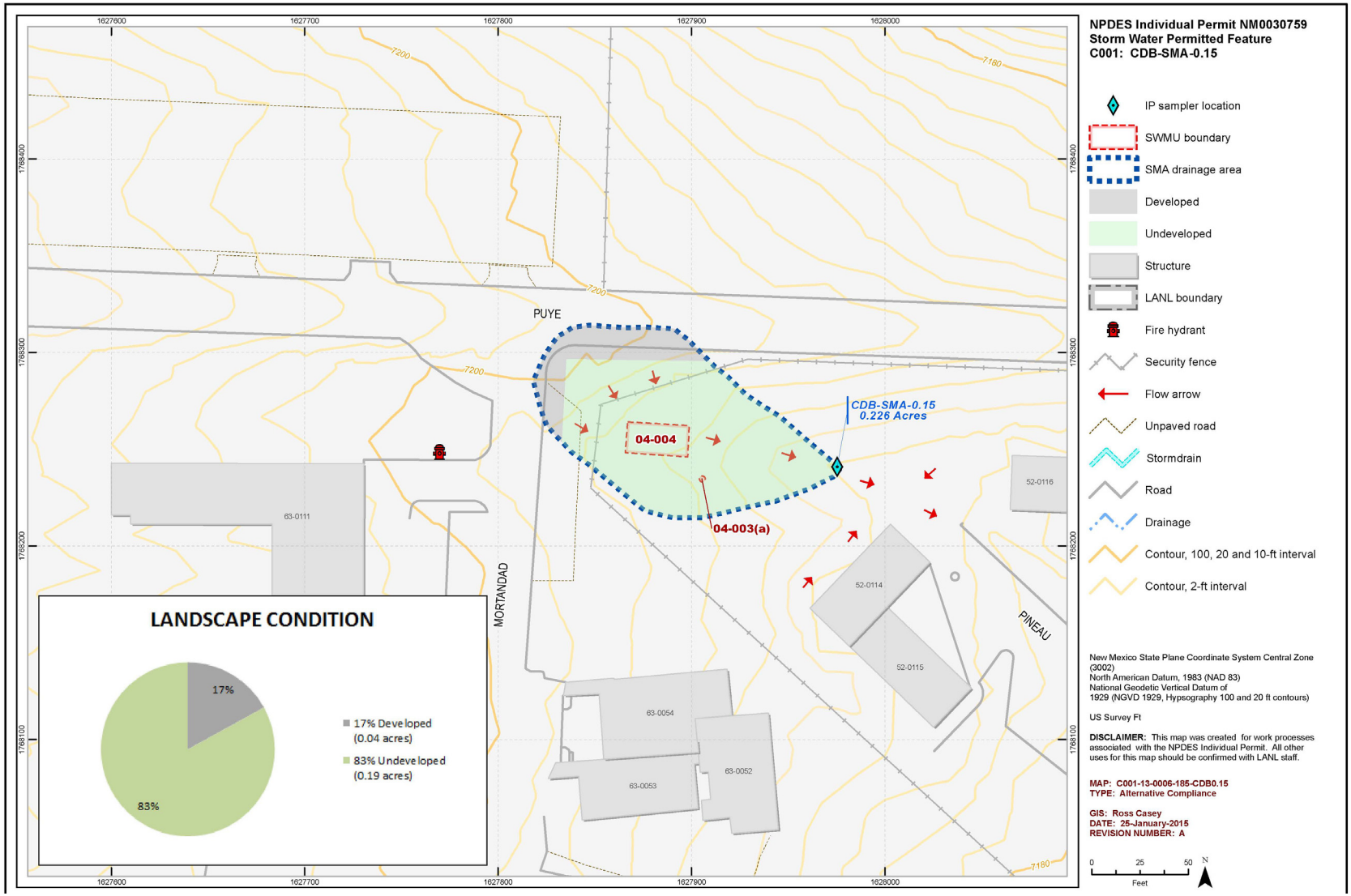


Figure A-3.3-1 SMA map for CDB-SMA-0.15

A-4.0 CDV-SMA-2.3

A-4.1 Site Description

SWMU 13-001 is an inactive firing site located east of former building 16-340. The firing site is associated with firing activities conducted at P-Site (former TA-13). The area contains shrapnel and debris, including firing cables, lead balls, and chunks of steel and copper.

Consent Order sampling is complete for SWMU 13-001. All detected inorganic and organic chemical concentrations and radionuclide activities from Consent Order samples were below residential SSLs, except for two detections of arsenic in two subsurface tuff samples. SWMU 13-001 was recommended for corrective action complete in the supplemental investigation report for S-Site Aggregate Area submitted to NMED in November 2015.SWMU 13-001 will be eligible for a COC upon approval of the report by NMED.

SWMU 13-002 is an inactive surface disposal area located east of former building 16-340. The disposal area contains debris and shrapnel associated with firing activities conducted at P-Site (former TA-13). A portion of the TA-16 wastewater treatment plant (WWTP) [Consolidated Unit 16-004(a)-99] is located above the southern tip of the surface disposal area.

Consent Order sampling is complete for SWMU 13-002. All detected inorganic and organic chemical concentrations from Consent Order samples were below residential SSLs. SWMU 13-002 was recommended for corrective action complete in the supplemental investigation report for S-Site Aggregate Area submitted to NMED in November 2015. SWMU 13-002 will be eligible for a COC upon approval of the report by NMED.

SWMU 16-003(n) consists of a former sump that was located on the exterior northeast wall of former building 16-342 at TA-16. Installed in the early 1950s, the sump was constructed of reinforced concrete and measured approximately 3.5 ft wide × 6.5 ft long × 3 ft deep. The sump received effluent from building 16-342, a high explosives– (HE-) processing building, and discharged to a former NPDES-permitted outfall (EPA 05A062) located in Fishladder Canyon, a tributary of Cañon de Valle. The outfall was removed from the Laboratory's NPDES permit effective July 31, 1996. Building 16-342, the sump, and drainlines were decommissioned in 1999 and underwent D&D in 2004 and 2005.

Consent Order sampling is complete for SWMU 16-003(n). SWMU 16-003(n) meets industrial risk levels. The Site was recommended for corrective action complete in the approved 2009 investigation report.

SWMU 16-003(o) consists of the six former HE sumps and an outfall associated with the former explosives synthesis building (structure 16-340) at TA-16. The sumps were connected to the former NPDES-permitted outfall via a 10-in. vitrified clay pipe (VCP), which originally discharged to a hill slope east of building 16-340. Building 16-340 was used to produce the plastics explosive PBX (plastic-bonded explosive). Volatile organic compounds (VOCs) were used in this preparation, but most VOCs were distilled during the processing. The remaining solvents historically were discharged with the wastewater to the sumps. In the late 1980s, a trough functioning as an air stripper was installed at the outfall and was designed to trap and volatilize residual solvents in the wastewater. The air stripper resembled a fish ladder, and it discharged approximately 250 ft east of the sumps into Fishladder Canyon, a tributary of Cañon de Valle. The outfall was removed from the Laboratory's NPDES permit on July 20, 1998. Building 16-340, the sumps, and drainlines were decommissioned in 1999 and underwent D&D in 2004 and 2005, when all aboveground and subsurface structures and contaminated soil were removed. Approximately 100 yd^3 of soil was removed from SWMU 16-003(o).

Consent Order sampling is complete for SWMU 16-003(o). SWMU 16-003(o) meets industrial risk levels. Alluvial wells downgradient of SWMU 16-003(o) continue to be monitored. The Site was recommended for corrective action complete in the approved 2009 investigation report.

SWMU 16-029(h) consists of an inactive outfall and two inactive/former drainlines (one known and one suspected) from the HE sump [AOC 16-003(p)], located on the south side of former building 16-478. The known drainline exits the southeast corner of the sump and extends 80 ft east of the sump to the rim of Cañon de Valle. This drainline discharged directly into Cañon de Valle before it was plugged in 1987. A second drainline is suspected to be present. The second drainline is reportedly a French drain that extends south of the sump. Former building 16-478 was used as a bunker, utility room, control room, and high-speed machining room for tests on experimental HE. When the building was removed in 2005, the sump was left in place. During the investigation activities conducted in 2009 and 2010, no evidence of the French drain was found.

Consent Order sampling is complete for SWMU 16-029(h). All detected inorganic and organic chemical concentrations and radionuclide activities from Consent Order samples were below residential SSLs, except for two detections of arsenic in two subsurface tuff samples. The supplemental investigation report for S-Site Aggregate Area submitted to NMED in November 2015 recommended additional sampling at SWMU 16-029(h) to determine the extent of arsenic contamination. SWMU 16-029(h) will be eligible for a COC following approval of the Phase II investigation report.

SWMU 16-031(h) consists of a former NPDES-permitted outfall (EPA04A134) located approximately 300 ft northeast of former building 16-340. The outfall received discharges only from the sink and floor drain of a utility room (engineering drawing ENG-C-14851) within former structure 16-478. The outfall received discharges only from the former utility room. Structure 16-478 (formerly structure 13-4) was used for photographing explosives tests and was later modified for testing the effects of machining HE remotely. In July 1995, building 16-478 was decommissioned and subsequently underwent D&D in 2005.

Consent Order sampling is complete for SWMU 16-031(h). All detected inorganic and organic chemical concentrations from Consent Order samples were below residential SSLs. SWMU 16-031(h) was recommended for corrective action complete in the supplemental investigation report for S-Site Aggregate Area submitted to NMED in November 2015. SWMU 16-031(h) will be eligible for a COC upon approval of the report by NMED.

A-4.2 Storm Water Monitoring Results

SWMUs 13-001, 13-002, 16-003(n), 16-003(o), 16-029(h), and 16-031(h) are monitored within CDV-SMA-2.3. Following the installation of baseline control measures, a baseline storm water sample was collected on July 20, 2015. Analytical results from these samples yielded one TAL exceedance (Figure A-4.2-1):

- Gross-alpha activity of 54.4 pCi/L (ATAL is 15 pCi/L).

This 2015 TAL exceedance is the subject of the alternative compliance request for this SMA/Site.

Gross-alpha radioactivity is naturally present in sediment derived from Bandelier Tuff throughout the Pajarito Plateau (LANL 1998), including sediments in this SMA. Gross-alpha radioactivity in storm water is directly correlated to SSC and is present in the smallest sediment size fraction (LANL 2007). Several variables such as storm intensity, antecedent moisture conditions, and installation of sediment retention BMPs affect SSC. It is not possible to eliminate SSC from storm water with the installation of BMPs because of the extended time it takes to settle silt and smaller-sized sediment fractions (<62.5 µm).

Therefore, any storm water runoff generated from this SMA has the potential to exceed TALs for gross radioactivity; the likely source of this constituent is natural background in sediment derived from tuff.

A-4.3 Developed and Undeveloped Sources of the TAL Exceedance in the SMA Landscape

CDV-SMA-2.3 is a 101.4-acre watershed that consists of 9.8% developed areas and 90.2% undeveloped areas. Developed areas consist of 2.78 acres of building and 7.12 acres of pavement. Undeveloped areas consist of 48.84 acres of ponderosa pine forest and 42.19 acres of fair grassland. The SMA receives storm water run-on from former industrially developed areas and undeveloped landscapes containing sediment derived from Bandelier Tuff (Figure A-4.3-1 shows the SMA map with the percentage of developed and undeveloped areas within the SMA).

The following bullet(s) summarize the comparison of TAL exceedance constituent(s) to potential developed and undeveloped landscape sources:

- Gross alpha —The gross-alpha UTL for storm water containing sediments derived from Bandelier Tuff is 1490 pCi/L, and the gross-alpha background storm water UTL for storm water run-on from a developed urban landscape is 32.5 pCi/L. The gross-alpha result from 2015 is between these values.

A-4.4 Evaluation of Historical Industrial Activities and TAL Exceedance Constituents

Site history and shallow (i.e., less than 3 ft bgs) soil sampling data (where available) are used to determine whether the TAL exceedance constituent(s) may be related to historical industrial activities. The discussion is organized by Site and TAL exceedance constituent.

SWMU 13-001:

- Alpha-emitting radionuclides are not known to be associated with industrial materials historically managed at the Site. Shallow soil and tuff samples collected during the 2010 Phase I Consent Order investigation were not analyzed for gross-alpha radioactivity but were analyzed for americium-241 and isotopic plutonium and isotopic uranium, both of which are alpha-emitting radionuclides. No alpha-emitting radionuclides were detected or detected above BVs and/or fallout values (FVs). Alpha-emitting radionuclides detected in Consent Order samples may be associated with the gross-alpha radioactivity detected in the IP sample; however, they are excluded from the definition of adjusted gross-alpha radioactivity and are not the source of the TAL exceedance.

SWMU 13-002:

- Alpha-emitting radionuclides are not known to be associated with industrial materials historically managed at the Site. None of the 15 shallow samples collected during the 1995 RFI, the 2005 investigation, and 2008 Phase II Consent Order investigation were analyzed for gross-alpha radioactivity but were analyzed for uranium isotopes, which are alpha-emitting radionuclides. No alpha-emitting radionuclides were detected or detected above BVs and/or FVs. Alpha-emitting radionuclides detected in Consent Order samples may be associated with the gross-alpha radioactivity detected in the Permit sample; however, they are excluded from the definition of adjusted gross-alpha radioactivity and are not the source of the TAL exceedance.

SWMU 16-003(n):

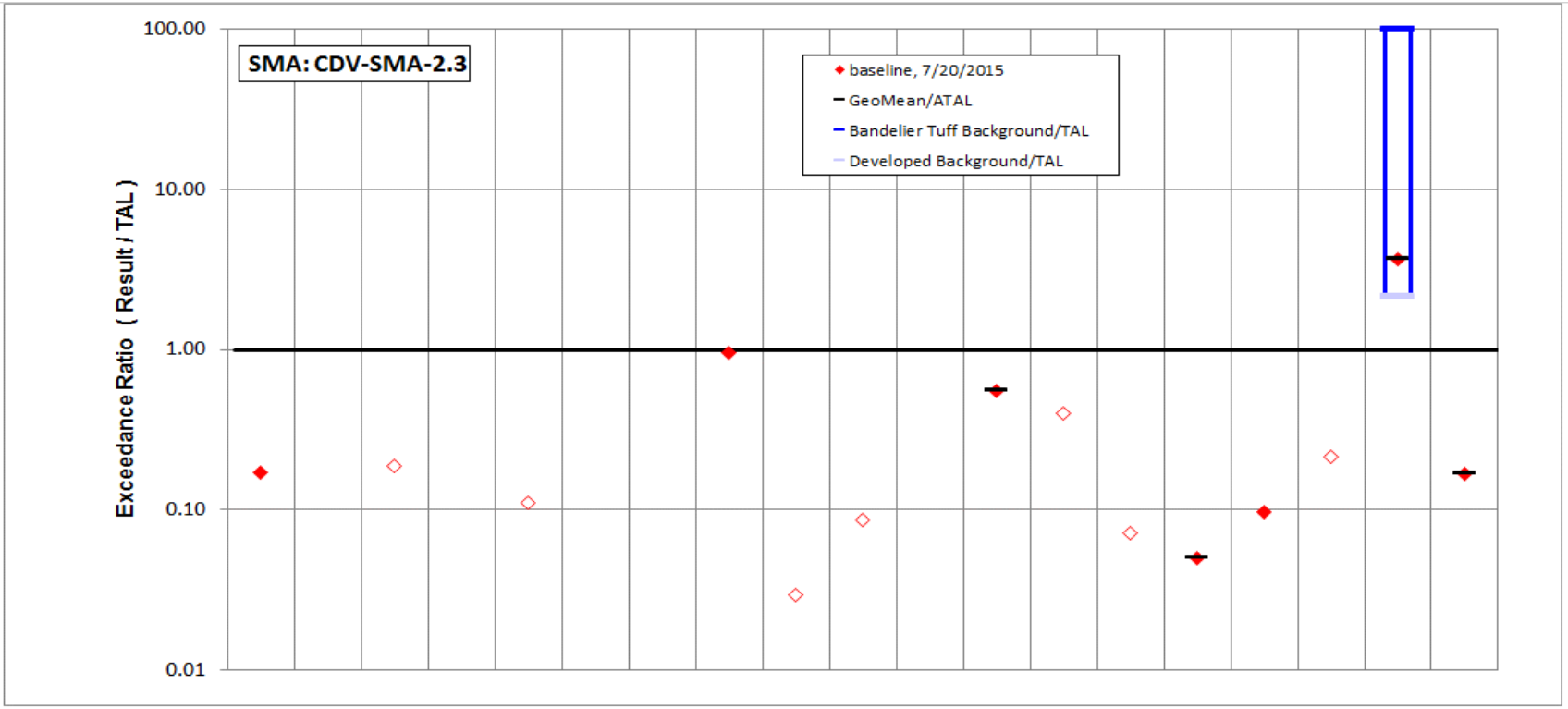
- Alpha-emitting radionuclides are not known to be associated with industrial materials historically managed at the Site. None of the 89 shallow samples collected during the 1995 RFI, the 2005 investigation, and 2008 Phase II Consent Order investigation were analyzed for gross-alpha radioactivity but were analyzed for uranium isotopes, which are alpha-emitting radionuclides. No alpha-emitting radionuclides were detected or detected above BVs and/or FVs. Alpha-emitting radionuclides detected in Consent Order samples may be associated with the gross-alpha radioactivity detected in the Permit sample; however, they are excluded from the definition of adjusted gross-alpha radioactivity and are not the source of the TAL exceedance.

SWMU 16-029(h):

- Alpha-emitting radionuclides are not known to be associated with industrial materials historically managed at the Site. Shallow soil and tuff samples collected during the 2010 Phase I Consent Order investigation were not analyzed for gross-alpha radioactivity but were analyzed for americium-241, isotopic plutonium and isotopic uranium, which are alpha-emitting radionuclides. Alpha-emitting radionuclides detected in Consent Order samples may be associated with the gross-alpha radioactivity detected in the Permit sample; however, they are excluded from the definition of adjusted gross-alpha radioactivity and are not the source of the TAL exceedance.

SWMU 16-031(h):

- Alpha-emitting radionuclides are not known to be associated with industrial materials historically managed at the Site. Shallow soil and tuff samples collected during the 2010 Phase I Consent Order investigation were not analyzed for gross-alpha radioactivity but were analyzed for americium-241, isotopic plutonium and isotopic uranium, which are alpha-emitting radionuclides. No alpha-emitting radionuclides were detected or detected above BVs and/or FVs. Alpha-emitting radionuclides detected in Consent Order samples may be associated with the gross-alpha radioactivity detected in the IP sample; however, they are excluded from the definition of adjusted gross-alpha radioactivity and are not the source of the TAL exceedance.



	Aluminum	Antimony	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide, weak acid dissociable	**Gross alpha**	Radium-226 and Radium-228
std used in ratio calculations	MTAL	ATAL	ATAL	ATAL	MTAL	MTAL	ATAL	MTAL	MTAL	ATAL	MTAL	ATAL	MTAL	ATAL	ATAL	MTAL	ATAL	ATAL	ATAL
std value	750	640	9	5000	1	210	1000	4.3	17	0.77	170	5	0.5	6.3	100	42	0.01	15	30
unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	pCi/L	pCi/L
7/20/2015 result	129	*1*	*1.7*	16.8	*0.11*	*2*	*1*	4.13	*0.5*	*0.067*	0.698	2.74	*0.2*	*0.45*	5.03	4.06	*0.002*	**54.4**	5.04
result / TAL	0.17	*0.002*	*0.19*	0.0034	*0.11*	*0.01*	*0.001*	0.96	*0.029*	*0.087*	0.0041	0.55	*0.4*	*0.071*	0.05	0.097	*0.21*	**3.6**	0.17

Bold font indicates result>TAL or MQL; italic font and hollow symbols indicate undetected results; "-" is used if no analytical results were available.

Figure A-4.2-1 TAL exceedance plot for CDV-SMA-2.3

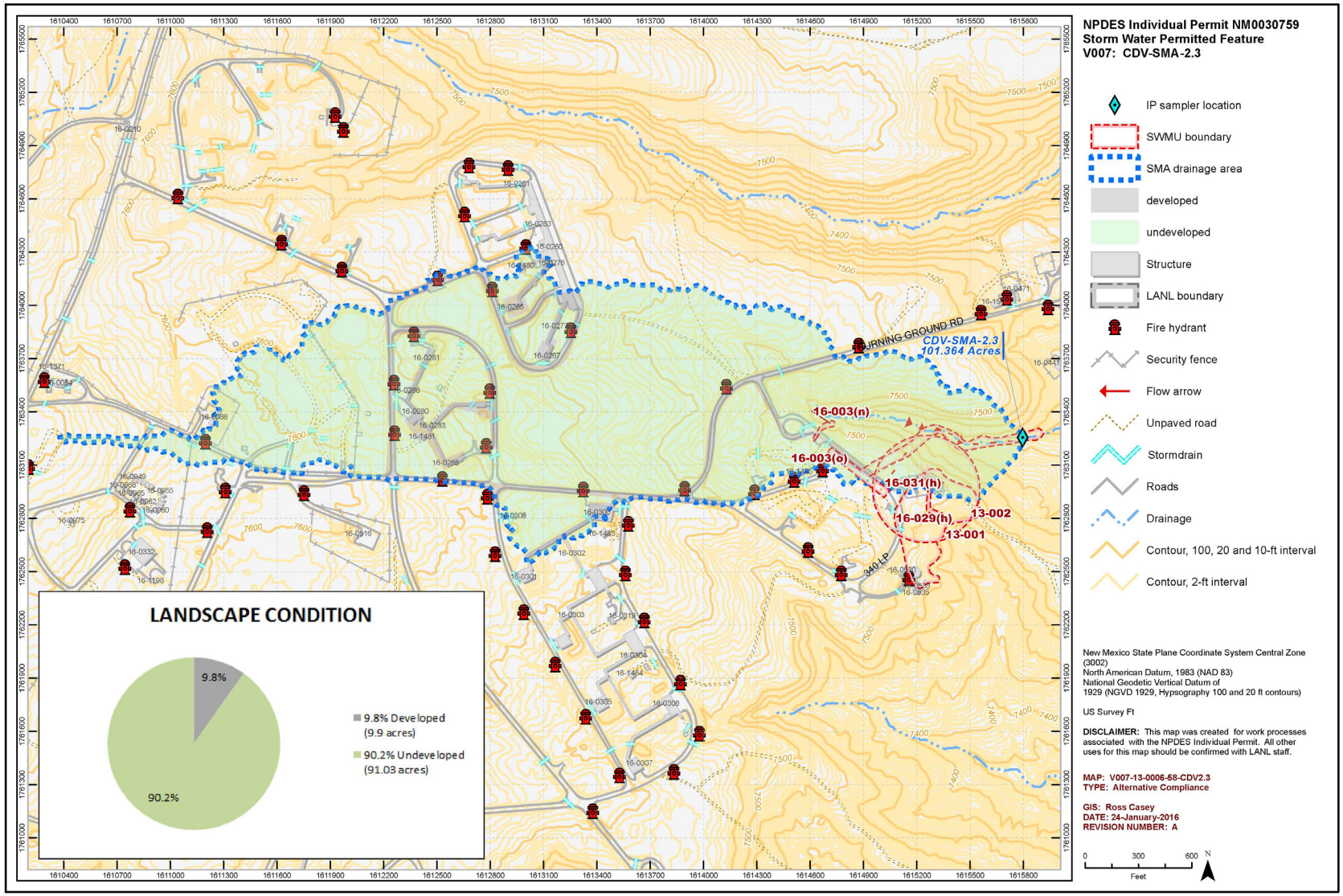


Figure A-4.3-1 SMA map for CDV-SMA-2.3

A-5.0 STRM-SMA-5.05

A-5.1 Site Description

SWMU 09-013 is Material Disposal Area (MDA) M, which consists of two surface disposal areas at TA-09: a main area and a smaller satellite area. The main area occupies about 3.2 acres and is located approximately 1600 ft southwest of building 22-120. The 150-ft-wide × 260-ft-long satellite area is located approximately 750 ft northwest of the main area. MDA M was created during the demolition of the Old Anchor Ranch East and West sites. Structures were flash burned to remove any HE residue and deposited over the MDA surface. Debris from the construction of current TA 08 and TA 09 facilities (1949 to 1965) and other sites (1960 to 1965) were also deposited at MDA M. Materials present at the MDA included metal debris, wood debris, laboratory appliances and fixtures, and metal and glass containers. The main disposal area was surrounded by an earthen berm that eroded through by surface-water runoff. MDA M has been inactive since 1965. All debris and contaminated soil were removed from MDA M during an expedited cleanup conducted in 1995 and 1996.

A Consent Order investigation has not been performed at SWMU 09-013, and no decision-level soil sampling data are available for this Site. Sampling was performed at the Site during a 1994 RFI and the 1995 and 1996 expedited cleanup.

A-5.2 Storm Water Monitoring Results

SWMU 09-013 is monitored within STRM-SMA-5.05. Following the installation of baseline control measures, a baseline storm water sample was collected on August 21, 2011. Analytical results from this sample yielded the following TAL exceedances (Figure A-5.2-1):

- Aluminum concentration of 1170 µg/L (MTAL is 750 µg/L),
- Gross-alpha activity of 24.5 pCi/L (ATAL is 15 pCi/L), and
- Polychlorinated biphenyl (PCB) concentration of 7 ng/L (ATAL is 0.6 ng/L).

Following the installation of enhanced control measures, a corrective action storm water sample was collected on August 2, 2015. Analytical results from these corrective action monitoring samples yielded one TAL exceedance (Figure A-5.2-1):

- PCB concentration of 2 ng/L (ATAL is 0.6 ng/L).

This 2015 TAL exceedance is the subject of the alternative compliance request for this SMA/Site.

A comparison of the 2011 baseline sample results and 2015 post–enhanced control installation sample results indicates that the PCB TAL exceedances were reduced by the installation of the enhanced controls.

A-5.3 Developed and Undeveloped Sources of the TAL Exceedance in the SMA Landscape

STRM-SMA-5.05 is a 2.0-acre watershed that consist of 100% undeveloped areas including 1.79 acres of grassland and 0.21 acres of ponderosa. The SMA receives runoff from the undeveloped, reclaimed MDA M area; following the 1995 to 1996 cleanup, the area was fully revegetated (Figure A-5.3-1 shows the SMA map with the percentage of developed and undeveloped areas within the SMA).

The following bullet(s) summarize the comparison of TAL exceedance constituent(s) to potential developed and undeveloped landscape sources:

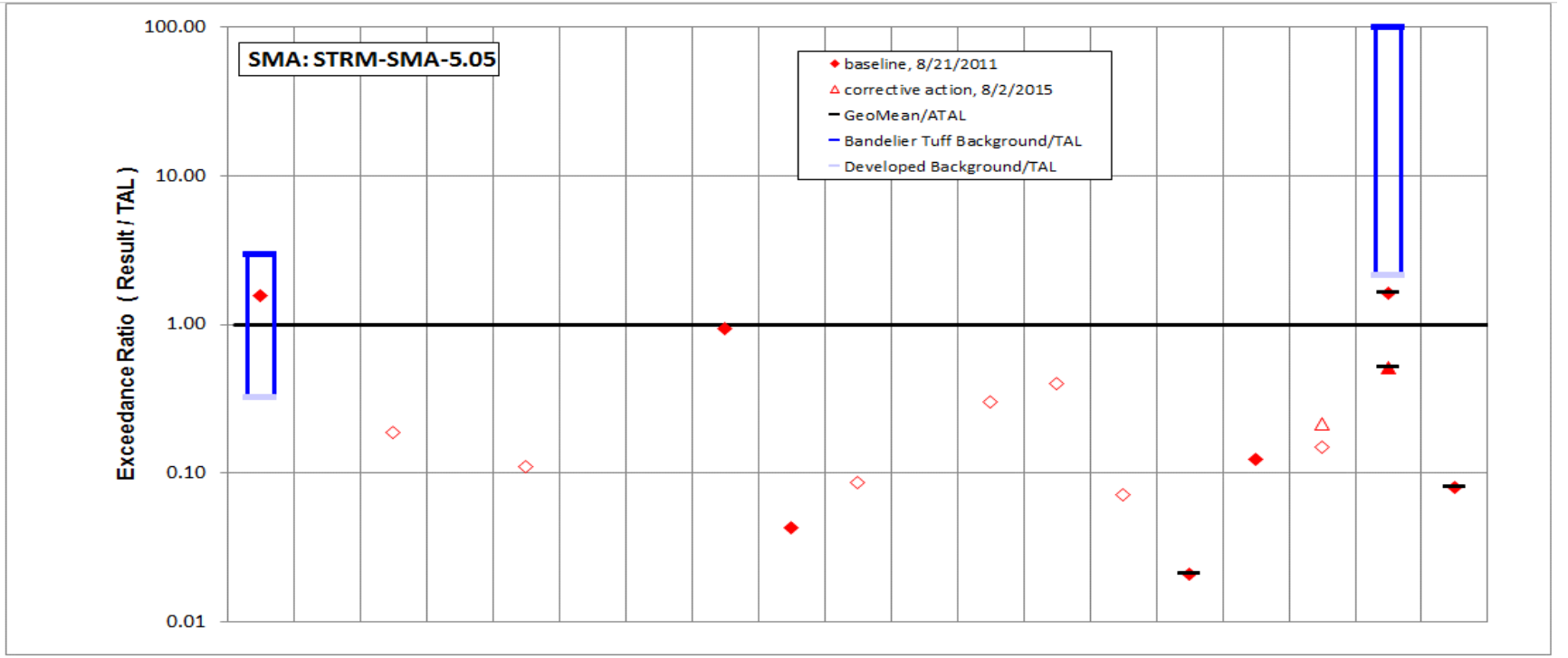
- PCBs —The PCB UTL for storm water containing sediment derived from Bandelier Tuff is 11.7 ng/L. The PCB results from both 2011 and 2015 are below this value.

A-5.4 Evaluation of Historical Industrial Activities and TAL Exceedance Constituents

Site history and shallow (i.e., less than 3 ft bgs) soil sampling data (where available) are used to determine whether the TAL exceedance constituent(s) may be related to historical industrial activities. The discussion is organized by Site and TAL exceedance constituent.

SWMU 09-013:

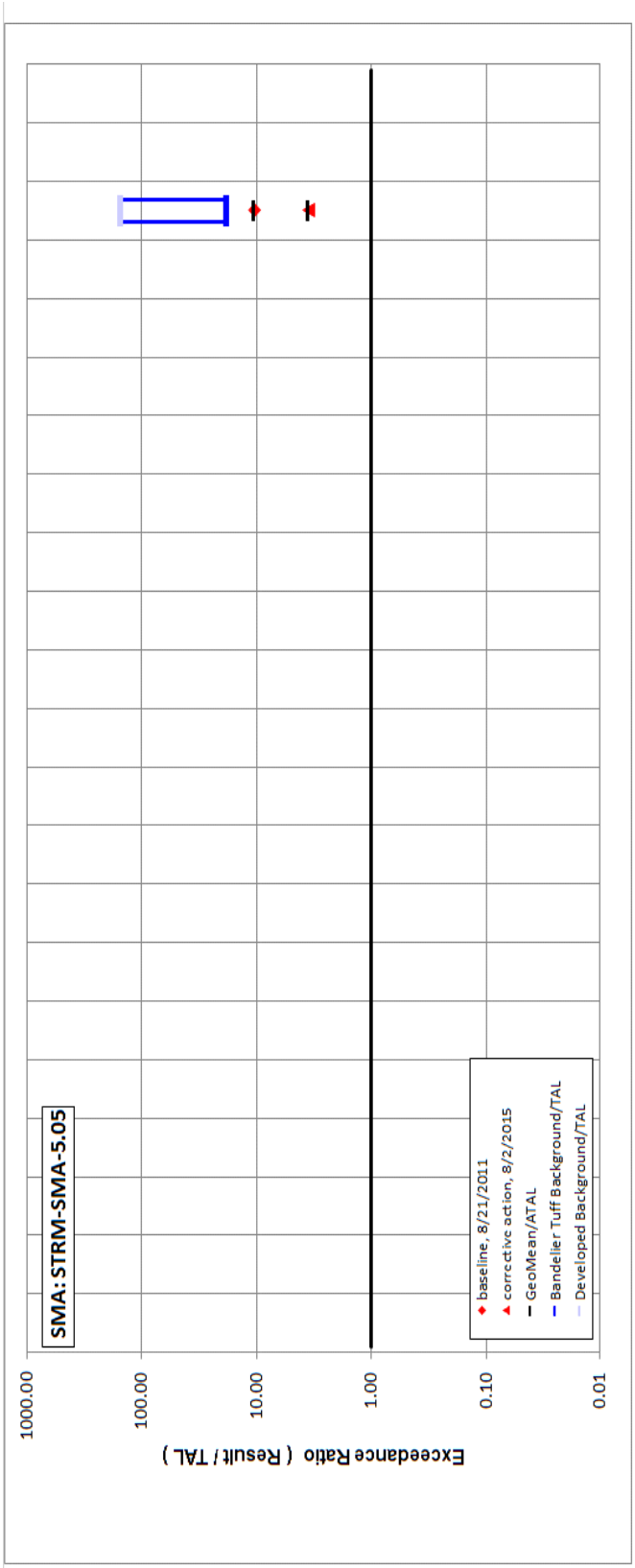
- PCBs are not known to have been associated with industrial materials historically managed at this Site but may have been present in small amounts as minor components of the materials managed at the Site. PCBs were detected in RFI samples with Aroclor-1254 above 1 mg/kg in two samples. The maximum concentration of Aroclor-1254 is 2.3 times the residential SSL. The PCB hotspots identified during the RFI were removed during the expedited cleanup, and confirmation samples were collected from grids. Three PCB mixtures (Aroclor-1248, Aroclor-1254, and Aroclor-1260) were detected in shallow (i.e., 0 to 3 ft bgs) expedited cleanup confirmation samples. Aroclor-1248 was detected in 5 of 11 shallow samples. The maximum concentration was 3% of the residential SSL. Aroclor-1254 was detected in 5 of 13 shallow. The maximum concentration was 3% of the residential SSL. Aroclor-1260 was detected in 5 of 13 shallow samples. The maximum concentration was 1% of the residential SSL. The RFI and expedited cleanup data are screening level only.



	Aluminum	Antimony	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide, weak acid dissociable	**Gross alpha**	Radium-226 and Radium-228
std used in ratio calculations	MTAL	ATAL	ATAL	ATAL	MTAL	MTAL	ATAL	MTAL	MTAL	ATAL	MTAL	ATAL	MTAL	ATAL	ATAL	MTAL	ATAL	ATAL	ATAL
std value	750	640	9	5000	1	210	1000	4.3	17	0.77	170	5	0.5	6.3	100	42	0.01	15	30
unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	pCi/L	pCi/L
8/2/2015 result	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*0.002*	7.66	-
result / TAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*0.21*	0.51	-
8/21/2011 result	**1170**	*1*	*1.7*	*15*	*0.11*	*2*	3.4	4	0.73	*0.066*	1.1	*1.5*	*0.2*	*0.45*	2.1	5.2	*0.002*	**24.5**	2.39
result / TAL	**1.6**	*0.002*	*0.19*	*0.003*	*0.11*	*0.01*	0.0034	0.93	0.043	*0.086*	0.0065	*0.3*	*0.4*	*0.071*	0.021	0.12	*0.15*	**1.6**	0.08

Bold font indicates result>TAL or MQL; italic font and hollow symbols indicate undetected results; "-" is used if no analytical results were available.

Figure A-5.2-1 TAL exceedance plot for STRM-SMA-5.05



	Aldrin	Benzo(a)pyrene	BHC[gamma-]	Chlordane (alpha/gamma)	Chlordane[alpha-]	Chlordane[gamma-]	DDD[4,4'-]	DDE[4,4'-]	DDT[4,4'-]	Dieldrin	Endosulfan I	Endosulfan II	Endrin	Heptachlor	Heptachlor Epoxide	Hexachlorobenzene	Pentachlorophenol	RDX	Tetrachlorodibenzo dioxin[2,3,7,8-]	**Total PCB**	Toxaphene (Technical Grade)	Trinitrotoluene [2,4,6-]
std used in ratio calculations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ATAL	-	-
std value	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6E-04	-	-
unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
8/2/2015 result	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.002**	-	-
result / TAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3.5**	-	-
8/21/2011 result	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.007**	-	-
result / TAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**10**	-	-

Bold font indicates result>TAL or MQL; italic font and hollow symbols indicate undetected results; "-" is used if no analytical results were available.

Figure A-5.2-1 (continued) TAL exceedance plot for STRM-SMA-5.05

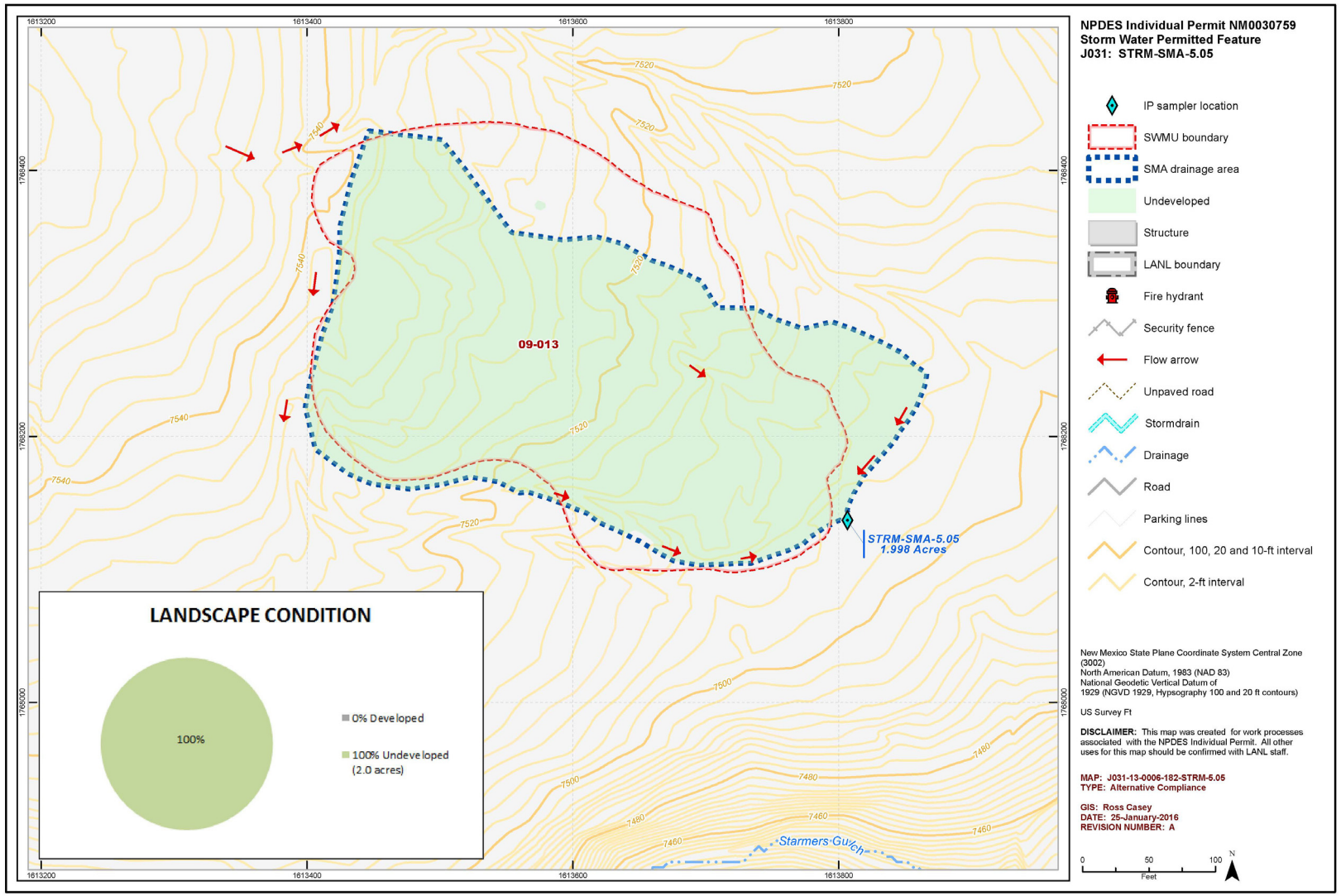


Figure A-5.3-1 SMA map for STRM-SMA-5.05

A-6.0 W-SMA-10

A-6.1 Site Description

SWMU 11-002 is a 30-ft-diameter burn area located east of the drop tower at the edge of its asphalt apron. Beginning in 1948, this area was used as an experimental burn area for components on or in assembled configurations with HE, propellants, and jet fuel. HE and propellant burns were conducted directly on the sand pad, and jet fuel was burned within an open-top steel containment tank. Burning activities continued through 1992.

SWMU 11-002 is deferred per Table IV-2 of the Consent Order; therefore, Consent Order sampling has not been conducted at the Site. No investigations were conducted before the Consent Order went into effect in 2005.

SWMU 11-005(a) is an active septic system located at TA-11 approximately 70 ft southwest of building 11-24. This septic system consists of a septic tank (structure 11-20), associated drainlines from buildings 11-1 and 11-4, and a tile drain field that extends to an outfall on a sloped area to the south of the septic tank. The septic system began operation in 1944. The drainline from building 11-1 has been plugged. Currently, discharge to the septic system comes only from a restroom in building 11-4. Building 11-1 is currently a storage area for electrical equipment but was originally used as a control building for the Betatron Facility (building 11-2) and the Cloud Chamber (building 11-3). Building 11-4 is currently the control building for the Vibration Test Facility (building 11-30), although it was historically used as a machine shop and photoprocessing facility. A memorandum from 1950 indicated a mercury spill occurred in building 11-4; however, the location, source, and extent of the spill are not known. The outflow drainline from SWMU 11-005(a) was plugged in 1992; since that time the septic tank has been pumped out regularly.

Phase I Consent Order sampling is complete for SWMU 11-005(a). All detected inorganic and organic chemical concentrations and radionuclide activities from Consent Order samples were below residential SSLs/SALs. SWMU 11-005(a) was recommended for corrective action complete in the supplemental investigation report for S-Site Aggregate Area submitted to NMED in November 2015. SWMU 11-005(a) will be eligible for a COC upon approval of the report by NMED.

SWMU 11-005(b) is an active septic system located at TA-11, approximately 70 ft south of building 11-3. This septic system consists of a septic tank (structure 11-43), an outlet drainline to an outfall to the south of the septic tank, and a drain field west of the drainline. The septic system serves restrooms added to the exterior of building 11-3 and was tied to a floor drain in the test room of building 11-3 until 1992 when the drain was plugged. Engineering drawings confirm the drainline for floor drains in building 11-24 was tied into the septic tank in 1992. Building 11-24 houses an office and light machine shop.

Phase I Consent Order sampling is complete for SWMU 11-005(b). All detected inorganic and organic chemical concentrations and radionuclide activities from Consent Order samples were below residential SSLs/SALs. SWMU 11-005(b) was recommended for corrective action complete in the supplemental investigation report for S-Site Aggregate Area submitted to NMED in November 2015. SWMU 11-005(b) will be eligible for a COC upon approval of the report by NMED.

SWMU 11-006(c) is one of three catch basins and its associated outfall located at TA-11 near the drop tower complex. The SWMU 11-006(c) catch basin is located on the southeast side of the drop tower complex and consists of a concrete basin (structure 11-51) measuring 6 ft × 4 ft × 2 ft and a former NPDES-permitted outfall (EPA05A096) that discharged into Water Canyon. Historically, SWMU 11-006(c) received washdown water from the concrete pad and asphalt apron at the base of the drop tower via an

HE sump [SWMU 11-006(a)]. Any HE particles remaining in the washdown water after it exited the sump were further filtered out in the catch basin. After exiting the catch basin, the remaining washdown water flowed through an asphalt-lined drainage channel to a natural drainage channel and the NPDES-permitted outfall. HE waste collected from the catch basin was disposed of at the TA-16 Burning Ground. The outfall was removed from the NPDES permit in May 1998 after drop tower operations ceased and discharges to the drainage channels stopped. Any storm water runoff collected in the catch basin since 1998 is pumped to the SWMU 11-006(d) basin.

Phase I Consent Order sampling is complete for SWMU 11-006(c). All detected inorganic and organic chemical concentrations and radionuclide activities from Consent Order samples were below residential SSLs/SALs. SWMU 11-006(c) was recommended for corrective action complete in the supplemental investigation report for S-Site Aggregate Area submitted to NMED in November 2015 SWMU 11-006(c) will be eligible for a COC upon approval of the report by NMED.

SWMU 11-006(d) is one of three catch basins and its associated outfall located at TA-11 near the drop tower complex. The SWMU 11-006(d) catch basin is located on the south side of the drop tower complex and consists of a concrete basin (structure 11–52) measuring 6 ft × 4 ft × 2 ft and a former NPDES-permitted outfall (EPA05A097) that discharged to Water Canyon. Historically, SWMU 11-006(d) received washdown water from the concrete pad and asphalt apron at the base of the drop tower via an HE sump [SWMU 11-006(a)]. Any HE particles remaining in the washdown water after it exited the sump were further filtered out in the catch basin. After exiting the catch basin, the remaining washdown water flowed through an asphalt-lined drainage to a natural drainage channel and then east into Water Canyon. HE waste collected from the catch basin was disposed of at the burning grounds at TA-16. Since drop tower operations ceased in 1998, this catch basin has collected only storm water runoff that drains to the outfall.

Phase I Consent Order sampling is complete for SWMU 11-006(d). All detected inorganic and organic chemical concentrations and radionuclide activities from Consent Order samples were below residential SSLs/SALs. SWMU 11-006(d) was recommended for corrective action complete in the supplemental investigation report for S-Site Aggregate Area submitted to NMED in November 2015. SWMU 11-006(d) will be eligible for a COC upon approval of the report by NMED.

SWMU 11-011(d) is an outfall located at TA-11 south of building 11-24, the air gun facility. The outfall consisted of a 4-in. steel pipe tied to floor drains the air gun facility. Originally, operations at building 11-24 consisted of acceleration and impact tests on full-scale warhead mockups. After World War II, building 11-24 was converted to an office and light machine shop. The drainline was tied into the SWMU 11-005(d) septic tank in 1992 and all discharges to the outfall ceased.

Phase I Consent Order sampling is complete for SWMU 11-011(d). All detected inorganic and organic chemical concentrations and radionuclide activities from Consent Order samples were below residential SSLs/SALs. SWMU 11-011(d) was recommended for corrective action complete in the supplemental investigation report for S-Site Aggregate Area submitted to NMED in November 2015. SWMU 11-011(d) will be eligible for a COC upon approval of the report by NMED.

AOC 11-003(b) is a former mortar impact area used as a target by the decommissioned air gun facility (building 11-24). This AOC is located immediately adjacent to the inactive drop tower complex at TA-11 (K-Site). The air gun facility was completed in 1956. The gun was used to launch experimental packages into targets located south of building 11-24. The targets, located 150–250 ft south of building 11-24, were 12-ft^2-, 12-in.-thick concrete slabs set in line with the gun bore. Firing into the targets tested various weapons packages designed to withstand extremes of acceleration and deceleration. Some devices contained HE and depleted uranium. On a single occasion in 1972, an impact test involved an inert mockup consisting of a 12-in.-diameter, hollow-steel sphere filled with steel or lead ball bearings

suspended in a graphite matrix. The sphere fractured upon impact, potentially leaving behind 0.5-in.-diameter steel or lead balls.

AOC 11-003(b) is deferred per Table IV-2 of the Consent Order; therefore, Consent Order sampling has not been conducted at the Site. No investigations were conducted before the Consent Order went into effect in 2005.

A-6.2 Storm Water Monitoring Results

SWMUs 11-002, 11-005(a), 11-005(b), 11-006(c), 11-006(d), and 11-011(d) and AOC 11-003(b) are monitored within W-SMA-10. Following the installation of baseline control measures, a baseline confirmation sample was collected on August 21, 2011. Inorganic analytical results from this baseline sample yielded the following TAL exceedance (Figure A-6.2-1):

- Gross-alpha activity of 106 pCi/L (ATAL is 15 pCi/L).

Following the installation of enhanced control measures, a corrective action storm water sample was collected on August 1, 2015. Analytical results from the corrective action monitoring sample yielded one TAL exceedance (Figure A-6.2-1):

- Gross-alpha activity of 77.8 pCi/L (ATAL is 15 pCi/L).

This 2015 TAL exceedance is the subject of the alternative compliance request for this SMA/Site.

A comparison of the 2011 baseline sample results and 2015 post-enhanced control installation sample results indicates that the detected gross-alpha activity was reduced by installing enhanced controls. Gross-alpha radioactivity is naturally present in sediment derived from Bandelier Tuff throughout the Pajarito Plateau (LANL 1998), including sediments in this SMA. Gross-alpha concentrations in storm water are directly correlated to SSC and are present in the smallest sediment-size fraction (LANL 2007). Several variables such as storm intensity, antecedent moisture conditions, and installation of sediment retention BMPs affect SSC. It is not possible to eliminate SSC from storm water with the installation of BMPs because of the extended time it takes to settle silt and smaller-sized sediment fractions (<62.5 µm). Therefore, any storm water runoff generated from this SMA has the potential to exceed TALs for gross radioactivity; the likely source of these constituents is natural background in sediment derived from tuff.

A-6.3 Developed and Undeveloped Sources of the TAL Exceedance in the SMA Landscape

W-SMA-10 is a 7.754-acre watershed that consists of 71% undeveloped areas and 29% developed areas. Undeveloped areas consists of 3.84 acres of sparse grassland, 1.08 acres of oak brush, and 0.58 acres of bare dirt. Developed areas consist of 0.23 acres of new base course, 1.72 acres of pavement, 0.23 acres of bare soil, and 0.11 acres of structures (Figure A-6.3-1 shows the SMA map with the percentage of developed and undeveloped areas within the SMA).

The following bullet(s) summarize the comparison of TAL exceedance constituent(s) to potential developed and undeveloped landscape sources:

- Gross alpha —The gross-alpha UTL for storm water containing sediments derived from Bandelier Tuff is 1490 pCi/L, and the gross-alpha background storm water UTL for storm water run-on from a developed urban landscape is 32.5 pCi/L. The gross-alpha results from both 2011 and 2015 are between these two values.

A-6.4 Evaluation of Historical Industrial Activities and TAL Exceedance Constituents

Site history and shallow (i.e., less than 3 ft bgs) soil sampling data (where available) are used to determine whether the TAL exceedance constituent(s) may be related to historical industrial activities. The discussion is organized by Site and TAL exceedance constituent.

SWMU 11-002:

- Alpha-emitting radionuclides are not known to be associated industrial materials historically managed at the Site. No investigations have been conducted at this Site.

Based on the Site history and sampling data, the Site is an unlikely source of the TAL exceedance.

SWMU 11-005(a):

- Alpha-emitting radionuclides are not known to be associated industrial materials historically managed at the Site. Consent Order samples were not analyzed for gross-alpha radioactivity but were analyzed for americium-241 and plutonium and uranium isotopes, which are alpha-emitting radionuclides. Alpha-emitting radionuclides detected in Consent Order samples may be associated with the gross-alpha radioactivity detected in the Permit sample; however, they are excluded from the definition of adjusted gross-alpha radioactivity and are not the source of the TAL exceedance.

Based on the Site history and Consent Order sampling data, SWMU 11-005(a) is an unlikely source of the TAL exceedance

SWMU 11-005(b):

- Alpha-emitting radionuclides are not known to be associated industrial materials historically managed at the Site. Shallow Consent Order samples were not analyzed for gross-alpha radioactivity but were analyzed for americium-241 and plutonium and uranium isotopes, which are alpha-emitting radionuclides. Alpha-emitting radionuclides detected in Consent Order samples may be associated with the gross-alpha radioactivity detected in the Permit sample; however, they are excluded from the definition of adjusted gross-alpha radioactivity and are not the source of the TAL exceedance.

Based on the Site history and Consent Order sampling data, SWMU 11-005(b) is an unlikely source of the TAL exceedance.

SWMU 11-006(c):

- Alpha-emitting radionuclides are not known to be associated industrial materials historically managed at the Site. Shallow Consent Order samples were not analyzed for gross-alpha radioactivity but were analyzed for americium-241 and plutonium and uranium isotopes, which are alpha-emitting radionuclides. Alpha-emitting radionuclides detected in Consent Order samples may be associated with the gross-alpha radioactivity detected in the IP sample; however, they are excluded from the definition of adjusted gross-alpha radioactivity and are not the source of the TAL exceedance.

Based on the Site history and Consent Order sampling data, SWMU 11-006(c) is an unlikely source of the TAL exceedance.

SWMU 11-006(d):

- Alpha-emitting radionuclides are not known to be associated industrial materials historically managed at the Site. Shallow Consent Order samples were not analyzed for gross-alpha radioactivity but were analyzed for americium-241 and plutonium and uranium isotopes, which are alpha-emitting radionuclides. Alpha-emitting radionuclides detected in Consent Order samples may be associated with the gross-alpha radioactivity detected in the Permit sample; however, they are excluded from the definition of adjusted gross-alpha radioactivity and are not the source of the TAL exceedance.

Based on the Site history and Consent Order sampling data, SWMU 11-006(d) is an unlikely source of the TAL exceedance.

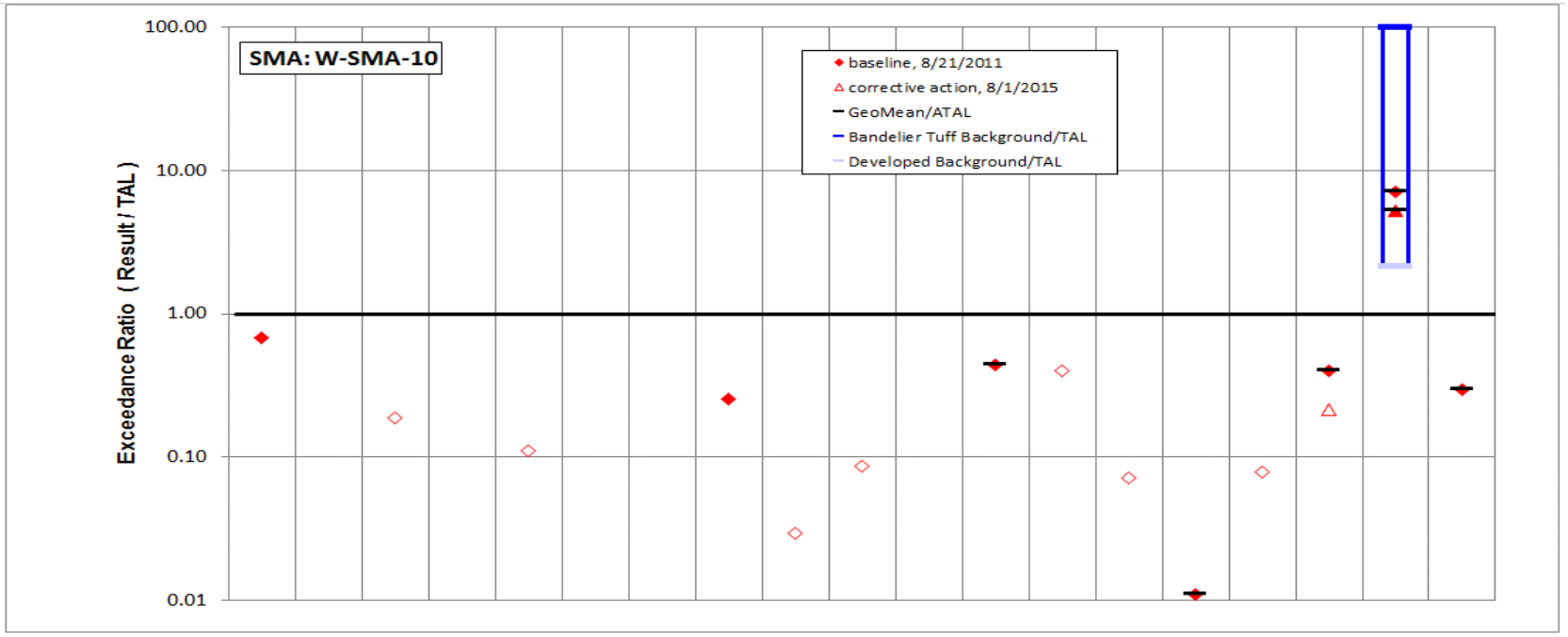
SWMU 11-011(d):

- Alpha-emitting radionuclides are not known to be associated industrial materials historically managed at the Site. Shallow Consent Order samples were not analyzed for gross-alpha radioactivity but were analyzed for americium-241 and plutonium and uranium isotopes, which are alpha-emitting radionuclides. Alpha-emitting radionuclides detected in Consent Order samples may be associated with the gross-alpha radioactivity detected in the Permit sample; however, they are excluded from the definition of adjusted gross-alpha radioactivity and are not the source of the TAL exceedance.

Based on the Site history and Consent Order sampling data, SWMU 11-011(d) is an unlikely source of the TAL exceedance.

AOC 11-003(b):

- Alpha-emitting radionuclides, including depleted uranium, are known to be associated with industrial materials historically used at the Site. No investigations have been conducted at this Site. Alpha-emitting radionuclides detected in Consent Order samples may be associated with the gross-alpha radioactivity detected in the storm water sample; however, they are excluded from the definition of adjusted gross-alpha radioactivity and are not the source of the TAL exceedance.



	Aluminum	Antimony	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Cyanide, weak acid dissociable	**Gross alpha**	Radium-226 and Radium-228
std used in ratio calculations	MTAL	ATAL	ATAL	ATAL	MTAL	MTAL	ATAL	MTAL	MTAL	ATAL	MTAL	ATAL	MTAL	ATAL	ATAL	MTAL	ATAL	ATAL	ATAL
std value	750	640	9	5000	1	210	1000	4.3	17	0.77	170	5	0.5	6.3	100	42	0.01	15	30
unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	pCi/L	pCi/L
8/1/2015 result	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*0.002*	**77.8**	-
result / TAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*0.21*	**5.2**	-
8/21/2011 result	512	*1*	*1.7*	*15*	*0.11*	*2*	*3.4*	1.1	*0.5*	*0.066*	*0.72*	2.2	*0.2*	*0.45*	1.1	*3.3*	0.004	**106**	8.79
result / TAL	0.68	*0.002*	*0.19*	*0.003*	*0.11*	*0.01*	*0.003*	0.26	*0.029*	*0.086*	*0.004*	0.44	*0.4*	*0.071*	0.011	*0.079*	0.4	**7.1**	0.29

Bold font indicates result>TAL or MQL; italic font and hollow symbols indicate undetected results; "-" is used if no analytical results were available.

Figure A-6.2-1 TAL exceedance plot for W-SMA-10

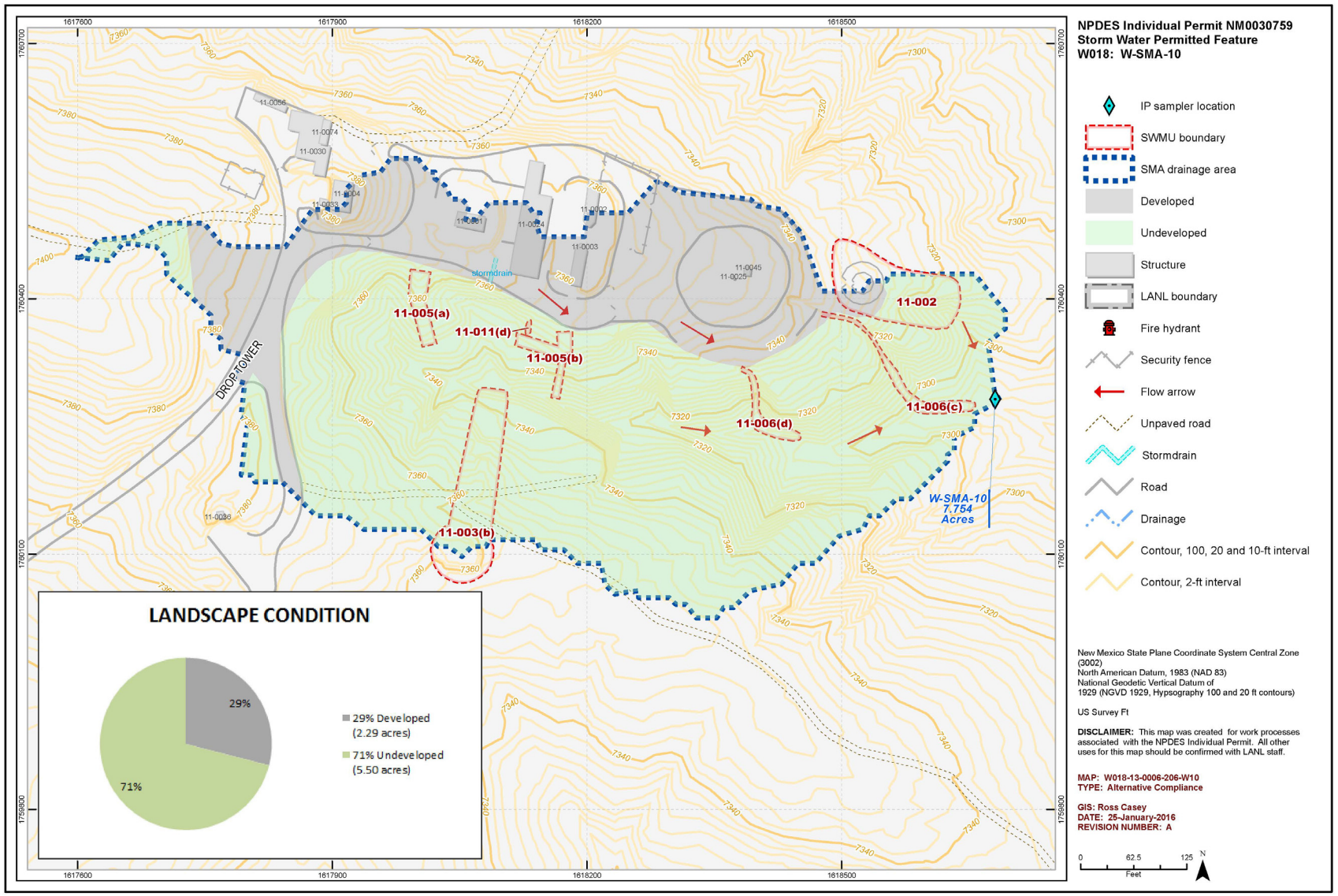


Figure A-6.3-1 SMA map for W-SMA-10

A-7.0 REFERENCES

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