Appendix H

Finding of Effect
(No Adverse Effect)

PINE CREEK MINE HYDROELECTRIC PROJECT
INYO COUNTY

FERC PROJECT No. 12532-002

FINDING OF EFFECT
(*No Adverse Effect*)

JRP Historical Consulting, LLC
2850 Spafford Street
Davis, CA 95618

October 14, 2015

PINE CREEK MINE HYDROELECTRIC PROJECT
INYO COUNTY

FINDING OF EFFECT
(No Adverse Effect)

Reviewed/Approved By:

Prepared By:

Rand F. Herbert
JRP Historical Consulting, LLC
2850 Spafford Street
Davis, CA 95618

Leslie Ann Trew
JRP Historical Consulting, LLC
2850 Spafford Street
Davis, CA 95618

October 14, 2015

CONTENTS

1. Introduction

This Finding of Effect (FOE) report identifies and applies the criteria of adverse effect, as set forth in Code of Federal Regulations (CFR) Title 36, Section 800.5, to Pine Creek Mine Hydroelectric Project (Project) in Inyo County, California. Pine Creek Mine, LLC contracted with JRP Historical Consulting, LLC (JRP) to prepare this FOE to assist Pine Creek Mine, LLC and the lead federal agency, the Federal Energy Regulatory Commission (FERC) in fulfilling their responsibilities as required by the National Historic Preservation Act (NHPA) of 1966 (as amended) (16 U.S.C., Section 470 (f) and its implementing regulations (36 CFR Part 800).

Project activities will occur on surface lands owned by Bishop Tungsten Development, LLC and underground lands with property rights (mining claims) in Bishop Tungsten Development, LLC subject to specific limitations authorized by Congress or adopted by the courts (FERC Project No. 12532-002). Pine Creek Mine LLC proposes to install a hydroelectric turbine within the adit, about 2500 linear feet underground from the Easy Go Service Utility Portal (see Project Description, **Section 2**). The architectural Area of Potential Effects (APE) for the project includes portions of Pine Creek Mine (see **Section 3** for a discussion of the APE).

JRP determined that Building 12, the Metals Lab, is eligible for listing in the National Register of Historic Places (NRHP) and the State Historic Preservation Officer (SHPO) concurred with this finding in 2015. See **Appendix A**.

This FOE is based on the "Cultural Resources Inventory and Evaluation Report for Pine Creek Mine Hydroelectric Project, Inyo County, California" prepared by JRP in April 2015. The DPR 523 form prepared as part of that report, attached in **Appendix B**, concludes that Pine Creek Mine had the potential to be considered significant under NRHP Criteria A and B, and CRHR Criteria 1 and 2, however, the complex lacked sufficient integrity to portray its significance under these criteria. Additionally, Building No. 12, the Metals Lab, is the only remaining building importantly associated with the mine's significance. This building is individually eligible for listing in the NRHP under Criteria A and B and the CRHR under Criteria 1 and 2, and retains sufficient integrity to its period of significance. JRP, in consultation with Pine Creek Mine LLC, developed the architectural APE for this project based on the boundaries of that previous work. This document applies the Criteria of Effect and Adverse Effect (36 CFR 800.5 et. seq.) to the historic resources potentially affected by the project, and finds that the project will not result in direct or indirect adverse effects to the historic resource, Pine Creek Mine Building 12 – Metals Lab.

2. Project Description

The proposed Project is situated in the Pine Creek and Morgan canyons in northern Inyo County, southwest of Bishop, California.[1] The project is located near the confluence of Morgan and Pine Creeks, two of many tributaries in the Owens River Basin, and is bounded on three sides by the John Muir Wilderness area within the Inyo National Forest (INF). It is situated within portions of Sections 5 and 8 of Township 7 South, Range 30 East, Mount Diablo Base and Meridian, as depicted on the 1994 Mount Tom USGS topographic quadrangle (**Figure 1**).

The proposed Project is located in an underground adit that surfaces at the Pine Creek Mine. The Project would use surface lands owned by Bishop Tungsten Development, LLC and underground lands with property rights (mining claims) in Bishop Tungsten Development, LLC subject to specific limitations authorized by Congress or adopted by the courts. The location of the Project activities (installation of a hydroelectric turbine) is 2,500 feet underground from the Easy-Go Portal, within the Easy-Go Adit of the Pine Creek Mine, along an existing mine access drift.

The proposed Project will develop hydroelectric generation from the hydraulic head and flow potential of the Easy-Go Adit tunnel at the Pine Creek Mine, which have been abandoned since tungsten mining ceased in 1990. The project will develop the head created by plugging the Easy-Go Adit. Aquifer and ground water sources draining through the mine tunnel system generate a total sustainable discharge averaging approximately 10 cubic feet per second (cfs). Employing a plug located at the outlet of the integrated workings, the water can be stored in the adit. This results in significant head pressure which, when combined with the total water flowing from the system, creates a potential hydroelectric energy source upon which the conceptual project design is based. Electricity will be generated when the hydraulic head is allowed to pass through a new turbine, which will be installed at the plug.

<u>Regulatory Context</u>

In March 2005, the Federal Energy Regulatory Commission (FERC) issued a preliminary permit for this project (FERC Project No. 12532), pending issuance of a hydroelectric license for the Project. As issuance of a license constitutes a federal Undertaking, the Project must comply with Section 106 of the National Historic Preservation Act of 1966 (as amended).

[1] The project description was provided by the project proponent.

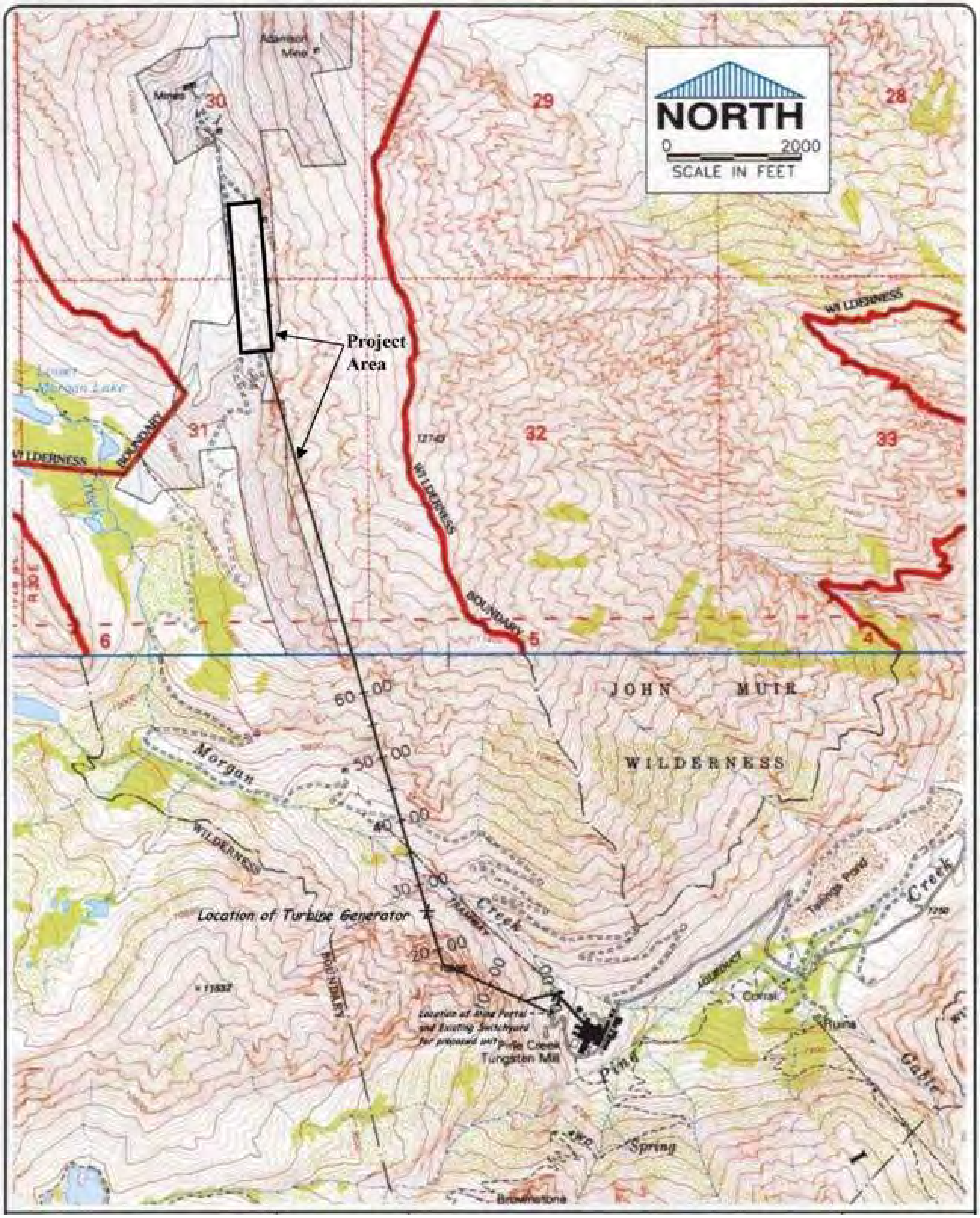

Figure 1: Project location and vicinity (disregard "Project Area").

In addition, the US Forest Service (USFS) has permitting authority to allow multiple uses of public lands located outside the wilderness area on USFS lands. The INF previously authorized various Special Use Permits and Operation Plans for the Pine Creek Mine. For the current Project, all activities will be carried out on private lands and within private underground mining claims, and utilizing existing County-owned haul and access roads between the Project area and town of Bishop.

Background

The Pine Creek Mine began operations in 1916. From 1937 until 1990, the mine was in nearly continuous production. In 1990, the mine suspended production due to low tungsten prices, though processing continued until 2000. In 2000, processing also was suspended and in 2011 the Mill and Processing Plant facilities were demolished in accordance with the existing Mine Reclamation Plan.

Mining originally began around 11,000 feet in elevation, but as reserves were depleted, it progressed downward into the ore body. In the 1940s, a tunnel was driven to gain access to the ore at 9,500 feet (1500 level/ Zero Adit). In 1962, a new adit was drilled at the 8,000-foot level (EZ-Go or Easy-Go Adit) near the milling facilities. Easy-Go is near 12,000 feet in length and oriented in a northwesterly direction.

The Easy-Go Adit, which provides primary access to the Project's bulkhead/plug, was opened in 1969 and used for production until 1990. Construction of the mine and mill resulted in significant moving of earth and alteration of the original ground surface and streambed. The only above-ground portion of the project is located within this previously disturbed area.

The tunnel plug is located within the Easy-Go Adit portion of the mine, approximately 2,700 feet from the portal entrance near the former mill site. The adit runs generally north from the portal and overburden is estimated at 1,200 feet. The plug was designed to retain approximately 2,000 feet of water head, and the plumbing within was designed to allow for proposed hydroelectric generation. Pine Creek proposes a non-peaking base load type of hydroelectric generation system with bypass capability resulting in the release of the historical average flow of water downstream.

In 2002, the Pine Creek Mine closed the mine plug and the mine backfilled with water. Water rose to a level of approximately 1,200 feet (between the Zero Adit and the Easy-Go Adit) where it was impounded until 2004, when Pine Creek drained the mine. It is no longer considered safe to freely access the adit beyond the plug as a result of the extended water storage.

Project Description

Although the Pine Creek Mine has operated for over nine decades, mine facilities related to the proposed project currently are inactive. As indicated above, the inactive mine tunnel system creates the opportunity to adapt an existing plug near the mouth of the Easy-Go Adit tunnel with existing discharge piping facilities to control flow and head potential through the mine tunnels and shafts to create hydroelectric power.

An existing concrete plug in the Easy-go Adit mine tunnel is capable of storing water up to 1,320 feet of gross head above the plug elevation. The plug is located at an elevation of approximately 8,080 feet above sea level. The plug is approximately 12 feet wide by 12 feet high by 30 feet thick, located 2,500 feet inside from the mine portal. Figure 2 shows a plan view of the existing tunnel course and the proximity of the tunnel plug to the mine portal.

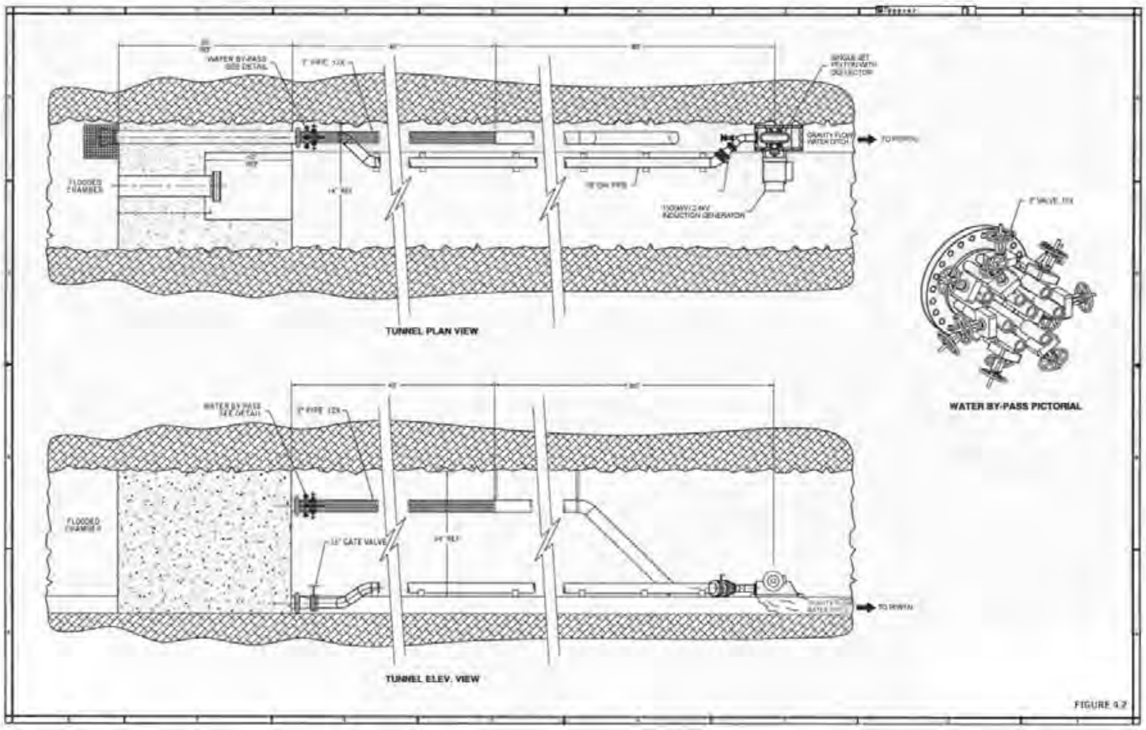

Figure 2: Plan view of existing tunnel plug.

The plug is not currently storing or diverting water inside the mine. Ground water draining from within the mine flows unimpeded through openings on the plug to a trench exiting the mine portal and thence to Morgan Creek. The proposed penstock for the installation would use either an existing 24 inch or 18 inch steel pipe through the existing plug. Figure 2 also shows the existing mine plug and proposed project penstock and turbine unit. Discharge from the generating facility will be into the existing mine water discharge conduit and eventually into the streambed of Morgan Creek, which is an ephemeral tributary of Pine Creek. The proposed project would use drainage water from the mine to generate renewable energy that could feed into the local distribution grid.

As indicated in **Figure 2**, all new generating facilities will be located entirely underground in the existing mine tunnel (within private mining claims) connected to the existing mine tunnel plug by a penstock approximately 30 feet long. The proposed site will have a total installed capacity of 1,500 kW with a design maximum head of 1,320 feet and an average discharge of 10 cfs. The proposed site will store up to 200 acre-feet of ground water within the mine and have a maximum underground water surface elevation of 9,400 feet above sea level.

The proposed Project would use the existing mine operation substation connections to the local utility. The existing substation facility at the site is sized for several times the expected output of the proposed development. The connecting substation is connected to a Southern California Edison owned substation and transmission line operating at 34.5 kV. An existing 500 MCM mine power line runs from the portal to the tunnel plug. This power line will be connected to the generator at the plant end and the other end connected to the owner owned substation off the main sub located 60 feet from the portal, at a voltage of 2.4 kV.

No new buildings or other facilities are proposed. No modifications to existing buildings are proposed. No ground disturbance of any kind is proposed. Manufacturing of all new generating facilities and substantial pre-assembly will occur off site and be trucked to the location. A portable crane will lift and position the wheeled generating equipment onto the existing railroad track for delivery to the plug location by a locomotive and for final assembly.

Haul routes for all new equipment will occur on existing County roads and mine access roads on private land designed for heavy equipment. No grading, widening or other improvement of any road is necessary. During construction there will be two staging areas, each approximately forty feet square, at the entrance to each portal. There are no areas proposed for any ground disturbance as existing facilities will be used.

Project operations and maintenance will be the primary activities that occur on project lands. This will include operating and maintaining the project powerhouse and associated facilities. Maintenance activities will include the tunnel and water conveyance maintenance.

3. Area of Potential Effects

JRP established the Architectural APE for this FOE based on the previous report dated April 2015. The APE includes the surface indications of the mining property that may be potentially affected by direct or indirect elements of the proposed project. The APE encompasses the original mine site located at an elevation of 11,300 feet; the mining village and original mill site near Morgan Lake; the switch back road and remains of the aerial tramway; Zero Portal, Easy-Go Adit; Mill Site; and tailing piles east of the main entrance. The State Historic Preservation Officer concurred with the APE (**Figure 3**).

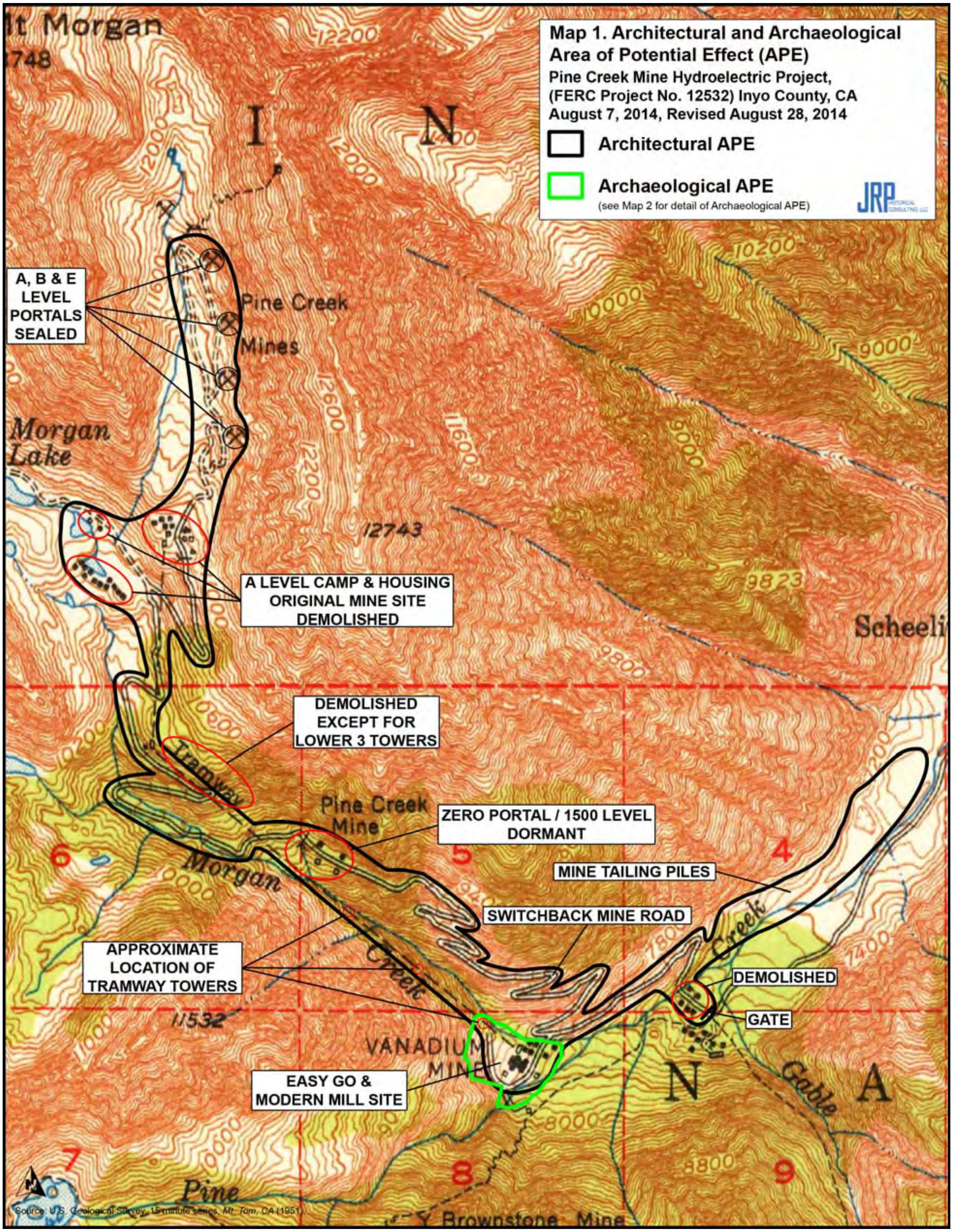

Figure 3: Architectural APE depicted by black line. Archeological APE depicted by Green line.

4. Public Participation

As part of the original study and report dated April 2015, JRP identified locally interested parties for this project and sent notification letters August 26, 2014. Recipients included the Eastern California Museum, Mono Basin Historical Society, Laws Railroad Museum and Historic Site, and the Bishop Chamber of Commerce. No responses were received. Pine Creek Mine LLC did not solicit public participation for this Finding of Effect analysis because it will not adversely affect any historic properties.

5. Description and Discussion of Significance of Historic Resource

5.1. Description

The Metals Lab, also known as Building No. 12, was constructed in 1941, has a rectangular footprint and a steeply pitched gable roof with a slight eave. An addition on the north has a hipped roof with exposed rafter ends and is covered by corrugated metal sheeting. The building is clad in corrugated metal sheeting. On the south side are two 9-light fixed pane windows, a single entry door, and an oversized roll-up door. On the west side is another 9-light fixed pane window and a 6-light fixed pane window. The addition has a single entry door with fixed glass and a two-sash horizontal sliding window. The north side has five smaller two-sash windows, and on the east side is a two-sash horizontal sliding window. Adjacent to the building is a concrete support for a penstock. See **Figures 4** and **5**.

Figure 4: Building No. 12 – Metals Lab (built 1941), Pond 5 (P5) and Pond 6 (P6) (built 2005); facing north, August 12, 2014.

Figure 5: No. 12 – Metals Lab (built 1941); facing south, August 12, 2014.

6. 5.2 Significance

For a complete discussion of the history and significance of the Pine Creek Tungsten Mine, please see the attached DPR 523 form in **Appendix B**. As noted, Building No. 12, the Metals Lab, is directly associated with mining engineer Ray Kurtak and his work on the APT process, and as such is individually eligible for listing in the NRHP under Criteria A and B and the CRHR under Criteria 1 and 2, and the logical period of significance under both Criterion A and B would be 1959-1960, between the time Kurtak developed, and Pine Creek Mine adopted, the APT process.

Building No. 12, the Metals Lab, currently retains integrity of location, design, setting, materials, and workmanship despite the addition to the rear and the personal door to the front. These added features do not significantly diminish the building's integrity. The addition is at the rear, and does not protrude above the building or significantly alter its size and massing. The personnel door on the south facing side does not significantly alter the appearance of the front of the building. Integrity of setting and association has been affected by the removal of buildings once located at this mine site. However, these changes do not affect the building's ability to convey its significance.

7. Finding of No Adverse Effect

This Finding of No Adverse Effect follows the guidelines for documentation in 36 CFR 800.11. The finding assesses effects of the project on Pine Creek Mine Building 12 – Metals Lab, which is individually eligible for listing in the National Register of Historic Places.

7.1. Defining Effects

The definition of effect is that contained within 36 CFR Part 800: "*Effect* means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." An adverse effect occurs "when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." (36 CFR 800.5(a)) An effect is noted in this document only when it poses the potential to alter the characteristics of the historic property that qualify it for inclusion in the NRHP.

The language of 36 CFR Part 800.5 also states:

> (1) *Criteria of adverse effect.* … Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.
>
> (2) *Examples of adverse effects.* Adverse effects on historic properties include, but are not limited to:
>
>> (i) Physical destruction of or damage to all or part of the property;
>>
>> (ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's standards for the treatment of historic properties (36 CFR part 68) and applicable guidelines;
>>
>> (iii) Removal of the property from its historic location;
>>
>> (iv) Change to the character of the property's use or of physical features within the property's setting that contributes to its historic significance;
>>
>> (v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;

(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and

(vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

A Finding of no adverse effect occurs when the undertaking's effects do not meet the criteria of adverse effects as defined above.

7.2. Analysis of Effects

This section assesses the effects of the project on the historic property, Pine Creek Mine Building 12 – Metals Lab (see **Table 1** below for a summary). The assessment provided below identifies the direct and indirect effects as defined in 36 CFR 800.5 (a)(2).

The project will have no adverse effects on Pine Creek Mine Building 12 – Metals Lab under 36 CFR 800.5(a)(2)(i). The proposed project will not demolish any part of the building.

The project does not propose to remove the historic resource from its historic location, or change the use of the property and therefore will not cause an adverse effect under 36 CFR 800.5(a)(2)(iii), (iv).

Under 36 CFR 800.5(a)(2)(v), the project will not cause an adverse effect because it does not introduce any visual elements that diminish the integrity of the historic property. This project intends to use existing discharge piping, and mine operation substation, while remaining activities will be underground within the mine tunnels; therefore, this project will not be visually intrusive and will not have an adverse effect.

The proposed project does not represent neglect of the historic property and does not constitute an adverse effect under 36 CFR 800.5(a)(2)(vi). The project will not construct or modifying any existing buildings or structures.

No components of the historic property will be transferred, leased, or sold under the proposed project; therefore, the project will not have an adverse effect under 36 CFR 800.5(a)(2)(vii).

Table 1: Analsysis of Effects on Building No. 12 at Pine Creek Mine

Examples of Adverse Effects (36 CFR Part 800.5)	**Project Effects**
Physical destruction of or damage to all or part of the property	Not Adverse because project does not destroy or demolish original materials
Alteration of the property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's standards for the treatment of historic properties (36 CFR part 68) and applicable guidelines	Not Adverse because the proposed project does not intend to build or modifying any existing buildings.
Removal of the property from its historic location	Not Adverse because location is unchanged
Change of the character of the property's use or of physical features within the property's setting, that contributes to its historic significance	Not Adverse because no such changes of use or physical features are contemplated
Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features	Not Adverse because the project does not introduce materials that are not already present at the building.
Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization	Not Adverse; does not apply to the project
Transfer, lease, or sale of property out of the Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance	Not Adverse; does not apply to the project

8. Conclusion

This study finds that the Pine Creek Mine Hydroelectric Project will have no adverse effect on Building No. 12 – Metals Lab, an historic resource individually eligible for listing in the NRHP. The proposed project actions have no adverse effects because they do not cause any direct or indirect effects as defined by 36 CFR Part 800. This project will not alter, demolish, or otherwise affect the ability of Pine Creek Mine Building No. 12 – Metals Lab to portray its significance, nor will the project damage or alter any of its character-defining features.

9. Preparers' Qualifications

Rand F. Herbert and Leslie Ann Trew of JRP Historical Consulting, LLC, prepared this report. Mr. Herbert, a principal at JRP with 38 years of experience conducting architectural history studies, holds an M.A.T. in History from the University of California, Davis. Ms. Trew holds an M.A. in History from the California State University, Sacramento. She has been with JRP since 2011 conducting historic survey and evaluation studies.

APPENDIX A

SHPO Correspondence

STATE OF CALIFORNIA – THE NATURAL RESOURCES AGENCY EDMUND G. BROWN, JR., *Governor*

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
1725 23rd Street, Suite 100
SACRAMENTO, CA 95816-7100
(916) 445-7000 Fax: (916) 445-7053
calshpo@parks.ca.gov
www.ohp.parks.ca.gov

May 29, 2015 In reply refer to: FERC_2013_0411_002

Craig N. Rossell, Vice President
Pine Creek Mine, LLC
9050 Pine Creek Road
Bishop, CA 93514

Re: Pine Creek Mine Hydroelectric Project (FERC No. 12532-002), Inyo County, California

Dear Mr. Rossell:

Thank you for your letter of April 27, 2015, continuing consultation on behalf of the Federal Energy Regulatory Commission (FERC) for the above-referenced project to comply with Section 106 of the National Historic Preservation Act of 1966 and it's implementing regulations at 36 CFR Part 800. FERC delegated Section 106 consultation authority to the Pine Creek Mine, LLC via its letter of March 27, 2013, retaining responsibility for all findings and determinations.

The undertaking proposes to use the groundwater discharge from within the existing Easy-Go Adit at Pine Creek Mine to generate hydroelectric power. The adit, located 2500 feet inside the mine, would be plugged to store the water. All generating facilities would be located in the existing mine adit, and would use the existing mine operations substation connections to the local utility. No new buildings or facilities are proposed, nor are any modifications to existing facilities. Existing access routes will be used to move pre-assembled equipment to the project site. No ground disturbance is anticipated.

In addition to your letter, the consultation package included a copy of the *Cultural Resources Inventory and Evaluation Report for Pine Creek Mine Hydroelectric Project (FERC Project No. 12532), Inyo County, California, Forest Service Heritage Report No. R2013050401778* (report), prepared by JRP Historical Consulting, LLC and Davis-King & Associates (March 2015). The report includes a prehistoric and historic context for the site, as well as well as evaluations of several resources in the area.

Your letter requests my comments on the Area of Potential Effect (APE) for the project, as well as concurrence with the determinations of eligibility for the evaluated resources. The architectural APE was defined as the original mine site located at an elevation of 11,300 feet; the mining village and original mill site near Morgan Lake; the switch back road and remains of the aerial tramway; Zero Portal , Easy-Go Adit; Mill Site; and tailing piles east of the main entrance down Pine Creek Canyon. The archaeological APE encompasses the Easy-Go Adit Utility Portal, two staging areas, the flat that encompasses the forma and extant mine buildings, and the transformer and substation features, and all areas that have the potential to be affected by construction and installation. A map of the APE is included in Appendix A of the report.

JRP surveyed the APE and prepared an evaluation of the Pine Creek Tungsten Mine, included in the report. The evaluation concluded that the Pine Creek Tungsten Mine may be eligible for the National Register of Historic Places (NRHP) under Criteria A and B and for the California Register of Historical Resources (CRHR) under Criteria 1 and 2, however it lacks sufficient integrity to portray its significance under these Criteria. The evaluation also concluded that Building No. 12, the Metals Lab, is significant under NRHP Criteria A and B and CRHR Criteria 1 and 2, and retains sufficient integrity. Therefore, Pine Creek Mine, LLC has determined, on behalf of FERC, that the Pine Creek Tungsten Mine is not eligible for the NRHP, and that Building No. 12 is eligible for listing on the NRHP for its significance under Criteria A and B.

After reviewing the information submitted with your letter, I offer the following comments:

- I agree that the Area of Potential Effect (APE) as represented in the attachments to your letter is appropriate. However, maps that include enough detail to understand the extent of the APE as well as the location and relationship of all items discussed in the project description would be helpful. More than one map would be necessary in this instance.
- I concur that the resources identified as the Pine Creek Tungsten Mine, as listed in the table attached to this letter, are not eligible for listing in the NRHP.
- I concur that Building No. 12, the Metals Lab, is eligible for listing in the NRHP under Criteria A and B.

Comments regarding the adequacy of the archaeological survey and Native American consultation will be issued separately and are forthcoming.

Thank you for considering historic properties during project planning. I look forward to continuing this consultation with you. If you have any questions, please contact Kathleen Forrest of my staff at (916) 445-7022 or email at kathleen.forrest@parks.ca.gov.

Sincerely,

Carol Roland-Nawi, Ph.D.

Carol Roland-Nawi, Ph.D.
State Historic Preservation Officer

Cc: Dr. Frank Winchell, FERC
Joseph Hassell, FERC
Diana Pietrasanta, Inyo National Forest

brought forward, and the Archaeological APE as proposed is depicted on the APE map and discussed in the enclosed report.

Survey Results

Pine Creek Mine, LLC requests that SHPO concur with the National Register of Historic Places eligibility determinations made for the Pine Creek Tungsten Mine and related resources as listed in the table below.

Extant Improvement	Built Date	Eligibility Code
Pine Creek Tungsten Mine	1919-1990	6Z
A – Main Portal Easy Go	1970	6Z
B – Easy Go Maintenance Portal	1970	6Z
C – Brownstone Portal	1974	6Z
1 – Bit Sharpener Building	1970	6Z
2 – Mine Engineering Building	1970	6Z
3 – Crusher/Dumber Building	1970	6Z
4 – Carpenter Building/Warehouse	1970	6Z
5 – Locomotive/Substation Building	1970	6Z
6 – Ore Bin	1970	6Z
7 – Clarifier Tank	1970	6Z
8 – Electrical Substation – SCE	1984	6Z
9a – Avalanche Warehouse	1970	6Z
9b – Old Warehouse	1941	6Z
10 – Residential/Former Office	1941	6Z
11 – Residential/Former Infirmary (moved ca. 1960)	1941	6Z
12 – Metals Lab	1941	3S
13 – Exempt Hydro P-13163	1980-82	6Z
14 – Mine Water Discharge (Surge Chamber)	2005	6Z
15 – New Maintenance Building	Ca. 1970-1980	6Z
16 – Front Entrance Bridge	2005	6Z
17 – Easy Go Access Road	1960	6Z
18 – Morgan Creek Road	1939	6Z

19 – Tramway Towers	1941	6Z
P0 – Mine Water Discharge Pipe	1970	6Z
P1 – Mine Water Discharge Pond	2005	6Z
P2 – Mine Water Discharge Pond	2005	6Z
P3 – Mine Water Discharge Pond	2005	6Z
P4 – Mine Water Discharge Pond	2005	6Z
P5 – Mine Water Discharge Pond	2005	6Z
P6 – Mine Water Discharge Pond	2005	6Z

Findings

In accordance with 36 CFR §800.4, Pine Creek Mine, LLC on behalf of the FERC is requesting your concurrence with the APE and with the findings of National Register eligibility as listed above in accordance with 36 CFR § 800.5.

If you have any questions, contact Jeff Francis at (714) 719-2681 or Shelly Davis-King at (209) 928-3443.

Sincerely,

Craig N. Rossell
Vice President
Pine Creek Mine, LLC

Attachments:

- "Cultural Resources Inventory and Evaluation Report for Pine Creek Mine Hydroelectric Project (FERC Project No. 12532) Inyo County, California," Prepared Jointly by JRP Historical Consulting, LLC and Davis-King & Associates, March 2015.

APPENDIX B

Pine Creek Mine DPR 523 Form

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # 14-10312
HRI # ____
Trinomial ____
NRHP Status Code 3S

Other Listings ____
Review Code ____ Reviewer ____ Date ____

 ***Resource Name or #** (Assigned by recorder) Pine Creek Tungsten Mine

P1. Other Identifier: Pine Creek Mine

***P2. Location:** ☐ **Not for Publication** ☒ **Unrestricted** ***a. County** Inyo

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Mt. Tom **Date** 1951 **T** 7S; **R** 30E; __ ¼ **of Sec** 5,6,8; MDM **B.M.**

c. Address ____ City Bishop Zip ____

d. UTM: (give more than one for large and/or linear resources) Zone ____; ____ mE/ ____ mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)

Mt.Tom Quad, T6S, R30E and T7S, R30E Sections 5, 6, & 8. Elevation between 7,800 ft and 11,600 ft, Inyo National Forest.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

Pine Creek Mine was first established in 1916 at an elevation of 11,600 feet. The sites associated with the early history of Pine Creek Mine have been demolished. These included buildings and structures near Lake Morgan. Most of the Aerial Tramway except three lower towers, visible from the mill site, have also been demolished. Additionally, the upper adits have been sealed (See APE map attached to HRIER and **Figure 15**) (Belec Interview, August 12, 2014). The site recorded on this DPR form dates between 1941 and 2005 and includes existing improvements consisting of mine buildings, roads and bridges, ponds, utility poles and substations located at the old mill site and Easy Go adit (**Photograph 1; Site Map and List**). (See Continuation Sheet.)

***P3b. Resource Attributes:** (List attributes and codes) HP8 (Industrial Building); HP9(Public Utility Bldg)

***P4. Resources Present:** ☒ Building ☒ Structure ☐ Object ☒ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5a. Photo or Drawing (Photo required for buildings, structures, and objects.)

P5b. Description of Photo: (View, date, accession #)
Photograph 1. Facing East, August 12, 2014

***P6. Date Constructed/Age and Sources:** ☒ Historic ☐ Prehistoric ☐ Both
1941-2005 (Jeff Francis, "List of Existing Improvements," 2013)

***P7. Owner and Address:**
Pine Creek Mine, LLC
9050 Pine Creek Road
Bishop, CA 93514

***P8. Recorded by:** (Name, affiliation, address)
Rand Herbert & Leslie Trew
JRP Historical Consulting, LLC
2850 Spafford Street
Davis, CA 95618

***P9. Date Recorded:** August 12-13, 2014

***P10. Survey Type:** (Describe)
Intensive

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") JRP Historical Consulting, LLC, "Cultural Resources Inventory and Evaluation Report for Pine Creek Mine Hydroelectric Project (FERC Project No. 12532) Inyo County, California," April 2015.

***Attachments:** ☐ None ☐ Location Map ☐ Sketch Map ☒ Continuation Sheet ☒ Building, Structure, and Object Record ☐ Archaeological Record ☐ District Record ☐ Linear Feature Record ☐ Milling Station Record ☐ Rock Art Record ☐ Artifact Record ☐ Photograph Record ☐Other (list) ____

***NRHP Status Code** 3S

***Resource Name or #** (Assigned by recorder) Pine Creek Tungsten Mine

B1. Historic Name: Pine Creek Tungsten Mine

B2. Common Name: Pine Creek Mine

B3. Original Use: Mine B4. Present Use: Inactive Mine

***B5. Architectural Style:** Industrial

***B6. Construction History:** (Construction date, alteration, and date of alterations)

For construction dates of existing improvements please refer to Figure 14. Building 11 (Residential/Former Infirmary) was moved ca. 1960 to its current location from where Building 15 (Maintenance Building) is located. Most demolition was done ca. 2000.

***B7. Moved?** ☐ **No** ☒ **Yes** ☐ **Unknown** **Date:** ________ **Original Location:** ________

***B8. Related Features:** ________

B9. Architect: ____ b. Builder: Pine Creek Mine

***B10. Significance: Theme** Tungsten Mining **Area** Invention and Science

Period of Significance 1959-1960 **Property Type** Mine **Applicable Criteria** A & B

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Pine Creek Tungsten Mine might be considered significant under National Register of Historic Places (NRHP) Criterion A and B and the California Register of Historical Resources (CRHR) Criterion 1 and 2, but lacks sufficient integrity to portray its significance under these criteria. Therefore, it does not meet the standards for listing in either the NRHP or CRHR, nor is it an historical resource for the purposes of the California Environmental Quality Act (CEQA). Additionally, Building No. 12, the Metals Lab, is the only remaining building importantly associated with the mine's significance. This building is individually eligible for listing in the NRHP under Criteria A and B and the CRHR under Criteria 1 and 2, and retains sufficient integrity to its period of significance. Therefore, it would be considered an historical resource for the purposes of CEQA. This property has been evaluated in accordance with Section 15064.5(a)(2)-(3) of the CEQA Guidelines, using the criteria outlined in Section 5024.1 of the California Public Resources Code. (See Continuations Sheet.)

B11. Additional Resource Attributes: (List attributes and codes) HP11 (Engineering Structure); HP18 (Train); HP19 (Bridge); HP20 (Canal/Aqueduct); HP37 (Highways/Trail)

***B12. References:**

Bateman, Paul C.

1945 *Pine Creek and Adamson Tungsten Mines, Inyo County, California, May 1945.* U.S. Geological Survey, Washington D.C.

Brown, Frances

1991 George Brown: A Man of the People. October, *The Album*, October. Accessed 15 November 2011 at http://www.owensvalleyhistory.com/george_brown/page67.html

See continuation sheet.

B13. Remarks:

***B14. Evaluator:** Leslie Ann Trew

***Date of Evaluation:** August 18, 2014

(This space reserved for official comments.)

P3a. Description (continued):

No. A – Main Portal Easy Go

The Easy Go Adit is a mine portal constructed in 1970 extending approximately two miles into the mountain. At the entrance is a locked metal gate closing off the mine. Water pipes come out of the mine carrying water that runs into the ponds and down into Morgan Creek. An arched corrugated metal structure covers the entrance to the mine and once completely enclosed the train tracks that run from the mine into the crusher building. The metal enclosure was partially destroyed by an avalanche ca. 2001, and the damaged portion was removed shortly after (**Photograph 4**).

No. B – Maintenance Portal, Easy Go

The Easy Go Maintenance Portal, constructed in 1970, is to the west of the Main Adit. It is a smaller tunnel into the mountain with a locked metal gate closing off the entrance to the mine. A cross braced metal structure shelters the entrance and train tracks extending from the mine portal. The structure is covered with scraps of corrugated metal sheeting. The mine tunnel appears to be braced by wood beyond the gate (**Photograph 5**).

No. C – Brownstone Portal

The Brownstone Portal, constructed in 1974, is west of the Easy Go Adit and Maintenance Portal. There are two tunnels going into the mountain, one is the adit and the other is the Powder Magazine. The Powder Magazine has a metal door closing off the area. There is a slatted metal vent between the door and a round metal pipe. The Brownstone Adit is blocked by a locked chain link fence and gate. This tunnel does not have any bracing on the interior (**Photograph 6**).

No. 1 – Bit Sharpener Building

The Bit Sharpener Building, constructed in 1970, has an L shaped footprint and a concrete slab foundation. It is a manufactured building with a cross gabled roof covered with corrugated metal sheeting and little or no eave. On the north side of the building is a large opening for vehicles and a single entry door with a small glass window. The windows are multi-paned industrial windows, and some have broken or missing panes. There is another single entry door on the south side, and the building is clad in corrugated metal siding. It is connected to the covered mine train tracks going into the crusher building (**Photograph 7**).

No. 2 – Mine Engineering Building

The Mine Engineering Building, constructed in 1970, has a generally rectangular footprint with the main section of the building covered by a gable roof. It has a concrete foundation. The west end has a two-story smooth concrete attachment with a corrugated metal gable roof at the northwest and a one-story shed roof addition to the southwest with a roll up garage door. The building is clad in metal siding with some galvanized Kaiser Steel on the edges. The windows are two-part hinged with metal sash. On the south side, there are two entrances on the first floor, and one entrance on the second floor with a small landing and stairs going to the ground. The stairway has an open railing with round metal handrails. A cantilevered metal awning covers the stoop of the two first floor entrances (**Photograph 8**). On the north side, there are two groups of evenly spaced windows (**Photograph 12**). The east side has irregular roofline covered with corrugated metal. There are louvered vents at the top of two sections and a window opening on the northwest side. There is a covered area attached to the southeast corner of the building (**Photograph 9**).

No. 3 – Crusher/Dumper Building

The Crusher/Dumper Building, built in 1970, is an irregular shape and built into the side of the mountain with a concrete foundation (**Photograph 10**). The train tracks covered by a sheltered metal structure lead to the ore dump and extend past the dump station about the length of ten ore cars to allow movement of emptied cars. The sections of track covered by the arched shelter are supported by steel cross bracing. The building steps down the mountain side. The building has five gable roof sections covered by corrugated metal. The building is clad in corrugated metal sheeting. There are long rectangular window openings covered with fiberglass sheets. There are two single entry doors on the west side, and one on the south side. The crusher building has a section that extends to a clarification tank on the east side (**Photograph 11**). There is a single entry door covered by a metal awning facing south and two large metal pipes coming out of this section connecting to the tank.

No. 4 – Carpenter Building/Warehouse

The Carpenter Building/Warehouse, constructed in 1970, is a Butler building attached to the covered train tracks going into Building No. 3 (**Photograph 12**). It has a generally rectangular footprint covered by a gable roof. There is an addition to the west side of the building with a shed roof. The building has a concrete foundation, and is clad in corrugated metal siding. There are two single entry doors on the north side, two barn door entrances, and a third large entrance with no door. There are three windows on the north side that are two part with aluminum sash. On the west side, there is a barn door entrance next to a two-story circular tank with a ladder and concrete containment wall. On the south side, there are six two-part aluminum sash windows with bars on the interior (**Photograph 13**).

No. 5 – Locomotive/Substation Building

Locomotive and Substation Building, constructed in 1970, has a rectangular footprint. It is a tall one-story building on a concrete slab. It has a low pitched salt box roof covered with metal. The building is clad in corrugated metal sheeting. Part of the sheeting is missing on the north side exposing the iron structure beams (**Photograph 14**). There are two large vehicle sized openings, one each on the east and west sides. The compressor tank and several pipes coming out of the building are on the northeast corner. At the north side of the building is located a service crane (see below, E4). On the south side is a substation with transformers, wooden electrical poles, and wire (**Photograph 15**).

No. 6 – Ore Bin with Elevator Round

Ore Bin with elevator, constructed in 1970, is a round building with a conical roof and concrete base. It is approximately seven stories high and has an exterior elevator shaft enclosed with corrugated metal sheeting (**Photograph 17**). The second-story is clad is corrugated metal, while the upper portion is smooth steel with exterior bracing. There is a grated metal walkway and machinery on the roof (**Photograph 16**). This ore bin was once connected directly to Building 3 (Crusher) and now stands alone.

No. 7 – Clarifier, Roofless Tank

The clarifier tank, constructed in 1970, is connected to the Crusher building. It is a large round tank with an open top (**Photograph 11**). There are several chambers within the tank. It would spin to separate rock particles from water coming from the mine before it was discharged into the creek.

No. 8 – Electrical Substation, SCE

The Electrical Substation, constructed in 1984, is primarily a steel structure supporting electrical equipment used in the transmission of power. It sits on top of a concrete pas and is surrounded by a chain link fence. There are wooden electrical poles supporting elevated electric cable lines (**Photograph 19**).

No. 9a – Avalanche Warehouse

The Avalanche Warehouse, constructed in 1970, has a square footprint and a concrete foundation. It is a tall one-story building with a shed roof covered with corrugated metal sheeting. The building has a steel frame clad in corrugated metal sheeting. On the north side, there is a small fixed six-pane window (**Photograph 20**). There is a concrete ramp leading to a vehicle entrance and a single entry metal door with a fixed single pane window adjacent to the vehicle entrance on the south side. Both are covered by a steel framed metal awning. There is another oversized entrance on the west side. The building is attached to No. 9b on the east side (**Photograph 21**).

No. 9b – Old Warehouse

The Old Warehouse, constructed in 1941, has a rectangular footprint and a shed roof with exposed rafter ends. It is a wood frame structure clad in corrugated metal sheeting. On the south side, there is a vehicle entrance with a roll up door and five replacement windows that are two-part vertical windows with plywood to the east covering the remaining opening of the old window space. There is single entrance door opening to a small wood platform with four stairs. On the east side, there are two windows and a single entry wood door. One window is a two-sash horizontal sliding replacement window. The other window is six-light, two sash wooden frame that slides horizontally (**Photograph 21**). There is an addition to the north side with a shed roof that has a slight overhanging eave. There is a metal entry door with a fixed pane on the east side. On the north, there are two six-light fixed windows and a large opening approximately 12 feet across adjacent to a single entry door (**Photograph 20**).

No. 10 – Residential/Former Office

The Residential/Former Office building, constructed in 1941, has a primarily rectangular footprint with a section extending on the west side (**Photograph 23**). The roof is slightly pitched shed with wide eaves and exposed rafters. The building is two story clad in horizontal shiplap on the second-story and vertical board on the first-story. The windows are double-pane two-sash replacements with faux muntins. There are windows wrapping around the first and second stories southwest corner. A concrete stair and stoop lead to a single entry door with eight-light window covered by a cantilevered awning on the west side (**Photograph 22**). On the southwest side, there is a deck enclosed with chain link fence adjacent to utility equipment covered by a shed roof and also enclosed by chain link fence. The north side of the building is against the hillside. On this side, the second story has several groupings of double-pane replacement windows with hinged windows above. There are two entry doors with full length glass opening to a concrete patio (**Photograph 24**). The building is attached to No. 11 by an enclosed hallway with a two part gable roof covered with corrugated metal sheeting. There is a single entrance door on the west and east sides of the hallway (**Photograph 25**).

No. 11 – Residential/Former Infirmary

The Residential/Former Infirmary building, constructed in 1941, has a rectangular footprint, and slight pitched shed roof with wide eaves and exposed rafters except on the north where they are boxed. The building is two story clad in horizontal shiplap on the second-story and vertical board on the first-story. The windows are double-pane two-sash replacement with faux muntins. On the south side, there is a raised deck on the second-story with metal railings and steel staircase (**Photograph 22**). There are two garage doors on the east side. On the north side, there is a two-sash horizontal sliding window adjacent to a cantilevered awning indicating an entry door was removed (**Photograph 25**). It was moved to this location ca. 1960s (Interview, Belec and Haeinni).

No. 12 – Metals Lab

The Metals Lab, constructed in 1941, has a rectangular footprint and a steeply pitched gable roof with a slight eave. An addition on the north has a hipped roof with exposed rafter ends and is covered by corrugated metal sheeting. The building is clad in corrugated metal sheeting. On the south side, there are two 9-light fixed pane windows, a single entry door, and an oversized roll-up door. On the west side, there is another 9-light fixed pane window and a 6-light fixed pane window (**Photograph 26**). The addition has a single entry door with fixed glass and a two-sash horizontal sliding window. The north side has five smaller two-sash windows, and on the east side, there is a two-sash horizontal sliding window. Adjacent to the building is a concrete support for a penstock (**Photograph 27**).

No. 13 – Exempt Hydro P-13163

Exempt Hydro Building, constructed in 1980-82 (Interview, Belec and Haeinni), has a rectangular footprint and a salt box roof. The building is steel framed and clad in metal sheeting. There is a single entrance door on both the north and south sides. Two penstocks from the mine run into the building on the north. There is a valve next to the buildings northwest corner (**Photograph 28**). A steel grated walking bridge passes on the south side and goes around the east side to the adjacent buildings entrance (**Photograph 29**). The adjacent building is similar in size and material. It has a rectangular footprint and salt box roof. The building is clad in steel sheeting and has a single entry door on the south side.

No. 14 – Mine Water Discharge – Surge Chamber

No. 14 is directly north and adjacent to the Metals Lab. It is a steel surge chamber partially buried in the ground (**Photograph 30**), and was installed in 2005.

No. 15 - Maintenance Building, New

The Maintenance Building is a tall rectangular Butler building with a slightly pitched gable roof. It has four oversized roll-up doors and a single entry door on the north side. There is a shed roof covering and office area on the buildings northeast corner. On the west side, there is a small gable roof shed with a sliding barn door. Both buildings are clad in corrugated metal sheeting. There is an oversized opening sealed with multiple kinds of material including metal and fiberglass sheeting and a newer window with multiple panes (**Photograph 31**). It sits on the location of Building 11 prior to its move.

No. 16 – Front Entrance Bridge

The front entrance bridge is a "pre-assembled steel" bridge approximately 100 feet long by 15 feet wide spanning the distance over Morgan Creek between Morgan Creek Road and Pine Creek Road. The bridge has metal grating on I-beams with cross members. Rebar is set at an angle across the decking for traction, and railings are welded steel canted outward (**Photograph 33**).

No. 17 – Easy Go Access Road

Easy Go Access Road, built in 1960, goes from the lower mill site to the upper area where the Easy Go adit and structures are located. It is a gravel road approximately 10 to 15 feet across. There is pressure treated wood cribbing along the mountain to hold back falling rock (**Photograph 16**).

No. 18 – Morgan Creek Road

No. 18 or Morgan Creek Road, built in 1939, is located across from the mill site on the other side of Morgan Creek. It is a gravel road that switches back and forth up the steep mountain side (**Photograph 37**). This road continues approximately 17 miles up to the upper mine portals, which are sealed, and Morgan Lake. There is pressure treated wood cribbing along the mountain acting as retaining walls. Access to this road by vehicles is currently prohibited by the Forest Service.

No. 19 – Tramway Towers, multiple

There are three tramway towers remaining of the 15 that were originally constructed in 1941. The towers are of varying heights. As originally described, they were between 27 and 120 feet high. They are large wooden crossed braced A-frame structures (**Photograph 4**).

No. P0 – Mine Water Discharge Pipe

No. P0 is the discharge pipe, installed in 1970, that carries water from the mine to P1. It comes out of the Easy Go Adit and goes under ground to a junction between the portal and the Bit Sharpener Building. It then goes around the Bit Sharpener Building to discharge into Pond P1.

No. P1, P2, P3, P4, P5, P6 – Mine Water Discharge Ponds

There are six ponds built in 2005 that the mine water flows through on the property. Pond 1 or P1 is located closest to Building No. 6. Mine water discharges directly into this first pond (**Photograph 18**). The water then flows down the mountain into P2, followed by P3, P4, P5, and finally into P6, which flows into the creek (**Photograph 26**). These ponds have pipes going between them under the roads. They are stocked with fish by the property owner's staff.

No. E1 – Ore Cars

Directly south of the Locomotive/Substation Building, there are four ore cars loaded with the last ore mined from Pine Creek. The ore cars are steel buckets with locking mechanisms on the front and back. The cars are moved via the locomotive tracks (**Photograph 15**).

No. E2 – Locomotive Railway Line

Railway tracks emerge from the Easy Go and Maintenance Portals and run between the buildings going to the Locomotive/Substation building and into the Crusher Building (**Photograph 12**). The Railway line is covered in some areas by Quonset metal sheeting structures. The Quonset once extended continuously from the Easy Go Adit to the Crusher Building (**Photograph 4**).

No. E3 – Ore Cars & Locomotives

Seven empty Ore Cars and two locomotives remain inside the Quonset of the Crusher Building (**Photograph 36**).

No. E4 – Crane, Maintenance

The Crane is located slightly north of the Locomotive building, and was constructed in 1970. It is a large steel structure with two I-beams at a 45 degree angle and cables with pulleys (**Photograph 15**).

No. E5 – Mine Compressor

The Mine Compressor is a steel tank located by the northeast corner of the Locomotive/Substation Building (**Photograph 15**). It was installed in 1970.

No. E6 – Power Poles & Lines

There are several wooden power poles with cables on the property running between the two power substations (**Photograph 15** and **Photograph 19**).

Tailing Ponds

The tailing ponds are located east of the mill site, and were the dumping ground for mine waste. They were constructed in 1941 (Kurtak 1998: 142). There are four total tailing ponds that extend east toward Rovana on the north side of the Creek (**Photograph 34**).

Aqueduct and Ditch

There is an earthen aqueduct going from Pine Creek leading down into a metal pipe that can be seen behind the Maintenance Building and along Morgan Creek Road after passing through the mine's gate. It was used to control storm water (**Photograph 32** and **Photograph 35**).

B10. Significance (continued):

The following discussion addresses the history of Pine Creek Mine in Inyo County, California from its founding to its closure, and places Pine Creek within the historic context of tungsten mining in the United States. It reviews key periods of development including the discovery, use, and industrial development of tungsten during World War I, the Great Depression, World War II, the Korean War and Government Stockpile Program, and Vietnam War. The mine underwent several stages of development under different ownership. The existing structures of the mine including the Easy Go Adit were primarily developed during and after World War II, and are located at an elevation of 8,063 feet. The history of tunneling into the mountain is a complicated tale, and begins in 1918 at the 11,300 foot level.

Early History of Tungsten and the Pine Creek Mine (1750s – 1914)

Tungsten was not commercially useful until early in the 20th century. Tungsten has the highest melting point of any metal at 3400º C, and is resistant to corrosion by acids. It is part of the wolframite and scheelite mineral groups, which were twice independently discovered in 1758 and 1781, respectively. At that time, no practical uses were known, because, as noted by metallurgical engineer W.P. Sykes, "no one had succeeded in overcoming the brittleness so typical of the unworked metal at room temperature." As metallurgical developments led to new fabrication methods, metallurgists discovered practical uses for tungsten. Commercial use of tungsten began in 1905, and it was primarily applied in fireproofing cloth used as curtains or drapery, as a mordant in dyeing, and in silk manufacture to add weight to the fabric. By 1908 it was used more extensively, as industries developed complicated technical and scientific methods of working the metal. This led to production of ductile tungsten wire and use of tungsten in production of steel alloys to increase their hardness. Tungsten wire was crucial for making practical incandescent lights, because its high melting point meant tungsten wire could withstand heat generated in light bulbs (*Engineering and Mining Journal* [*EMJ*], 11 November 1907:818; Kurtak 1998:6-7; Mathewson 1953:450-452; Ridge 1968:1553).

By 1910, production of tungsten in the US, by state, in order of importance, was in Colorado, California, and Arizona. The Atolia Mining Company in San Bernardino was the largest producer of tungsten in California, and maintained this status into 1940. In 1912, new uses for tungsten included its use in the Röntgen tube or x-ray, which "gave the ray operator an indestructible target, upon which the cathode rays may be more closely focused, resulting in shaper definition and shorter exposure." However, it was its use for projectiles and armaments that greatly increased demand during times of war (Department of the Interior, Bureau of Mines [DOI, BM] 1938:568-570; *EMJ*, 11 November 1907:818; *EMJ*, 27 January 1912:211).

Pine Creek deposits, located in the Sierra Nevada at an elevation of 11,400 feet, were first discovered by mineral surveyor M.B. Sherwin as a silver-lead deposit. However, the claim lapsed when the assay results were obtained (*EMJ*, 10 April 1926:6).

World War I and Aftermath (1914 - 1923)

World War I generated a high demand for resources, including tungsten. The price of tungsten climbed to unprecedented heights, and John Ridge, editor of *Ore Deposits in the United States*, noted that "the wartime boom reached a peak in April 1916 with some concentrates selling for $93.50 per short ton unit of [tungsten oxide] WO_2 at the mills." By 1918, California was a leading producer of tungsten with its primary output coming from the Atolia Mining Company. At this time, the mines of Inyo County were becoming large producers of tungsten (*EMJ*, 12 January 1918:90-93; *EMJ*, 16 February 1918:354; *EMJ*, 15 June 1918:1109; *EMJ*, 8 February 1919:285; Ridge 1968:1553).

With high prices and demand for tungsten in 1916, Standard Tungsten Company and Tungsten Mines Company developed claims in the Tungsten Hills west of Bishop. These two companies erected several mills with daily capacities of 30, 50 and 300 tons each, built roads, brought power in from Bishop Creek, and established a permanent camp later called Brown's Camp. This development encouraged continued prospecting around Bishop. On April 22nd 1916, Billie Vaughn and Arch Beauregard relocated the claims at Pine Creek. They began mining with a 6 x 15 Wilfey concentrating table, which was cut into three sections to fit onto mules for transport up the mountain. Historian Joseph Kurtak reported, "Once in place, a stream of water mixed with sand-sized material was run across the table surface which vibrated with a side-jerking motion," which "allowed minerals with high specific gravities such as molybdenite and scheelite to concentrate at one end of the table and worthless sand at the other." Vaughn and Beauregard screened ore across this table and packed it back down the mountain on mules, because they could not get heavy crushing equipment to the mine. They received financial support from Cooper Shapely and Fred Close to further develop the mine, and formed Pine Creek Tungsten Company in 1918 with Shapely as president. This company built a switch back road on the mountain to reach the mine, brought power to the site, and erected a mill with a 300 ton daily capacity, which was in operation by December of that year (*EMJ*, 29 April 1916:797; *EMJ*, 5 August 1916:271-272; *EMJ*, 12 August 1916:313; Knopf 1916:230-231). Kurtak noted that there was,

> a 2,200 ft. three-rail gravity tramway [, which] brought the ore from the mine portal down to the mill in small skips. Water came to the mill site via a 2,000 ft. pipeline from a dam built on one of the Morgan Lakes. In the mill a jaw crusher and ball mill ground the ore into sand-size grains. These were mixed with water and run across a system of five concentrating tables, similar in design to the original used by the Beauregards. The tabled concentrates were dried and bagged for shipment … (Kurtak 1998:28).

Pine Creek Tungsten Company drove the first tunnel into the mountain, into what was later called the south ore body. The mine operated at an elevation of 11,300 feet, and was the highest operating mine in California. Levels A and B and the Glory Hole were part of the mining operations in the south ore body. With the end of World War I and the import of cheaper Chinese concentrates, prices for US-produced tungsten fell, causing the market to collapse. Eventually all tungsten mines in the United States stopped production and shut down. The Pine Creek Tungsten Company went bankrupt in 1919 after processing only 4,371 tons of ore, and it was, as Kurtak noted, "barely enough to get the machinery running properly" (Kurtak 1998:27-28; Ridge 1968:1534).

The Great Depression (1924 – 1939)

Tungsten mines in China dominated the world market between 1919 and 1926, and the Federal Bureau of Mines at this time reported that "the principal uses of tungsten are in the manufacture of high-speed-tool steels, cemented tungsten carbides, stellites, and electric-light and radio-tube filaments; in the preparation of various chemicals, such as pigments; and in the tanning of white leather." A tariff of 200 percent was set to stimulate mining in the United States by raising the price of imported tungsten, and Pine Creek reopened under the ownership of Tungsten Products Company in 1924. They implemented improvements to the mine including a new adit at 11,000 feet, drilled below the upper adit originally constructed by Pine Creek Tungsten Company, to improve ore-handling. Mining was conducted by the operation of a glory hole or open pit, a mining technique that used a system of haulage ways beneath a block of ore. The *Engineering and Mining Journal* described machinery and techniques at the mine, reporting that "Ingersoll-Rand drills, No. 248 were used in adit work; Sullivan D.O. 33 and Denver Rock Drill No. 93, hand held drills, in glory hole work, and a No. 73 wet stopper for raising." The Journal also reported that there was a blacksmith shop with power sharpeners at the upper adit or B Level, and four 250-cu. ft. Ingersoll-Rand compressors driven by a 25-hp motor or short center belts at the lower adit or A Level (See Figure 1). Miners transported ore to the mill by an aerial tramway. A 10 x 20-inch jaw crusher crushed ore, and *EMJ* noted that "the crushed product [fell] upon a grizzly serving a 9 x 15-in. jaw crusher." The machinery for the mill was chosen based on its ability to be disassembled and moved up the steep mountain road. A camp, located at 10,500 feet, connected with the mine by a mountain road that terminated at 8,500 feet. Lumber to build the mill and other buildings was cut from mountain timber (DOI, BM 1938:568-570, 572; *EMJ*, 19 December 1925:969-972; *EMJ*, 10 April 1926:605-606).

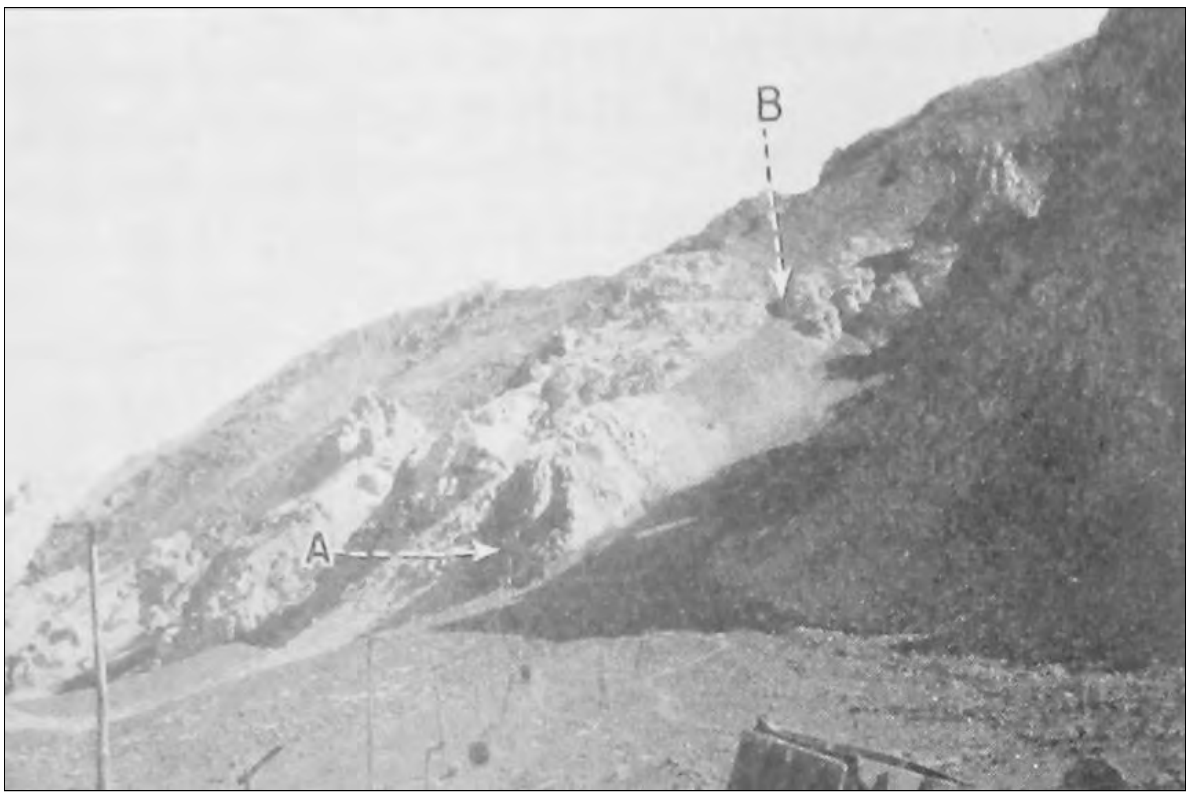

Figure 1. Outcrop of Tungsten deposit, showing upper and lower adits at B and A (Photograph from *Engineering and Mining Journal*, 10 April 1926:606).

For a time it seemed that the mine would operate for many years, but in November of 1926, heavy snows closed the mine. Tungsten Products Company considered building a camp and mill at a lower elevation and connecting the mine to the mill with an aerial tramway, but no such system was built under their ownership. In 1927, creditors of the Inyo Bank forced Tungsten Products Company into bankruptcy. The California Division of Mines noted that "between 1927 and 1936, the

[Pine Creek] mine was idle except for a brief period in 1933 when it was operated by Herbert Sillinger" (Division of Mines, Department of Natural Resources, State of California [DOM, DNR, CA] 1956:23; Kurtak 1998:34).

In the mid-1930s, business and industry in the United States struggled with development during the depths of the Great Depression, but worries about a war in Europe led to increased prices for tungsten. Additionally, the use of ultraviolet light to illuminate fluorescent scheelite while prospecting resulted in more claims and reopening of mines. Promoters approached the Union Carbide Corporation between 1927 and 1935 to purchase Pine Creek Mine. The price of tungsten did not rise high enough to pique their interest until 1935, and by December of that year Union Carbide, through their subsidiary U.S. Vanadium Corporation, acquired Pine Creek Mine. U.S. Vanadium repaired and upgraded buildings, structures, and equipment necessary for the production of tungsten. They also addressed issues with mining in the high Sierra not previously overcome by other operators. This included constructing a new access road to the mine. Before roads were built, mules transported supplies. Pine Creek utilized George Brown, a Paiute Indian, to transport materials necessary for the construction of power lines in 1937. He was a well-known "packer" used by several local mines to get equipment and supplies up the rough mountain side. Brown operated his packing business between 1930 and 1943. His "jumping off point" to the mines became known as Brown's Camp, which is located at the west end of Pine Creek Road. U.S. Vanadium completed a new mill with a 250-ton per day capacity at Pine Creek, but did not produce concentrates in 1937. Development of the mine and mill site continued over the next four years (DOI, BM 1938:568-570, 572; Kurtak 1998:38-41).

The Japanese invasion of China in 1937 led to fears that export of Chinese tungsten would end, which caused market prices to skyrocket and supplies to be scarce. The *Minerals Yearbook 1938* described this as a "frantic demand" for the metal, and reported that "production in the United States was the largest of record, except for the war years, 1916-1918 ... many new domestic producers appear[ed] during 1937, new properties were prospected and developed, old mines reopen[ed], and old dumps were worked." In California the largest producer was still Atolia Mining Company in San Bernardino County, which shipped 329 short tons of the 511 tons of tungsten concentrates from scheelite produced in the state (DOI, BM 1938:568-570, 572; Ridge 1968:1534-1535). Nevada was the largest producer of any state at this time (DOI, BM 1938:568-570, 572).

Tungsten Production During and After World War II (1939 - 1950)

The principal use of tungsten in 1940 was in manufacture of metal-cutting tools. Small quantities were needed for use in electric light and radio tube filaments, but the largest use, as noted by the Bureau of Mines, was "for military purposes, [where] tungsten was used as a core in armor-piercing bullets, as an erosion resistant liner in heavy ordnance, in armor plate, and in gun breeches" (DOI, BM 1941:615-622). Increased industrial activity caused by the beginning of World War II in Europe created a heavy demand for tungsten, and "universal armament activities in 1940 put further emphasis on the strategic nature of tungsten." Additionally, exports from China were diminished, and the bureau reported that "the search for domestic deposits of tungsten ores was greatly stimulated, and many small lots ranging from a few hundred pounds to several tons were produced from new or previously abandoned deposits." President Franklin D. Roosevelt (FDR) issued Proclamation No. 2413 regarding the export control of strategic products, which named several materials, including tungsten, as vital to defense and required export licenses. The United States government began to stockpile tungsten concentrates. Federal law fixed the price and sale of tungsten during World War II, and the bureau later stated, "the Bishop Tungsten area became as active as available manpower permitted." It added, "shipments of tungsten concentrates from domestic mines increased 24 percent from 1939 to a near all-time high of 5,319 short tons (60 percent WO_3) in 1940..." California's maximum shipment of tungsten concentrates was in 1943 at 3,871 short tons (DOI, BM 1940:617; FDR Library 2011: July 2nd, 1940; Ridge 1968:1534).

In the 1940s, U.S. Vanadium Corporation, as recorded by Paul Bateman of the US Geological Survey, mined "by means of 4 main levels, known as levels 250, A, C, and E, at elevations of 10,540; 10,070; and 11,370." They operated a mill with a 350 or 500 ton daily capacity at Pine Creek, and were constructing a mill with 1,200 to 1,300 ton daily capacity at a new site 3,000 feet below the mine portal at the junction of Pine and Morgan Creeks to replace the old mill, which is the site of the study area for this report (See Figure 2) (DOI, BM 1943; *EMJ*, November 1941). A three section aerial tramway 11,000 feet long connected the mine to the new mill (Bateman 1945:1; DOI, BM 1941:615-622; *EMJ*, November 1941:72). The *EMJ* described the process at Pine Creek in an article in November 1941:

> Ore is hauled by a 5-ton electric storage-battery locomotive, in 10-car trains, using 3-ton Granby-type side-dump cars, to a crushing plant at the mine portal consisting of a 20-in. gyratory crusher set to crush to 4-in. size at rate of 160 tons per hour. Crushed ore is conveyed by a … tramway … with a capacity of 100 tons an hour, to the new mill ... The buckets from the tramway discharge into a lower tramway bin, where the ore was fed by a pan feeder to a Symons 5½ ft. short-head crusher set to a ¼ inch opening. This crushed ore is conveyed to four 1,200-ton circular steel storage bins over a Merrick weightometer for recording tonnage. The mill had four sections, and "in each section the ore was fed to a 6x5-ft. March ball mill of the open-end type, in closed circuit with a 60-in. Akins classifier. The ore was ground to approximately 90 percent minus 60 mesh, and went to flotation machines at a pulp density of 25 percent solid (*EMJ*, November 1941:72).

Figure 2. Concentrating and chemical treatment plant of U.S. Vanadium Corp. at junction of Pine and Morgan Creeks, elevation 7,700 ft. (Photograph from *Engineering and Mining Journal*, November 1941: 72.) This photograph, looking southwest, was taken from Morgan Creek Road leading to the upper mining area.

Furthermore, the Bureau of Mines stated that "large tonnages of complex tungsten-molybdenum ore [were] blocked out, and a suitable method of separation [was] developed involving selective flotation, with chemical treatment of the flotation concentrates to raise the tungsten in the final product to the 60 percent range." A chemical plant on Pine Creek recovered tungsten with the use of continuous pressure autoclaves treating tungsten with steam and sodium carbonate to separate from the concentrates soluble sodium tungstate, which underwent a purification process to produce a marketable grade synthetic scheelite. The company treated concentrates from its own mine and also purchased low-grade flotation concentrates from other local mines including Brownstone, Tungstar, Adamson, and Hanging Valley mines. By this time Pine Creek was the nation's largest mill with the largest deposits in the world (DOI, BM 1941:615-622; *EMJ*, November 1941:72; Kurtak 1998:154-173; Pete Belec, August 12, 2014).

The federal government cancelled contracts to purchase tungsten concentrates at the end of World War II, and the price of tungsten declined "once again forcing curtailment or abandonment of most of the Bishop area properties." In 1945, Pine Creek did not produce any ore, but the Bureau of Mines noted that the "chemical plant … was operated part of January and from late July through December; as a consequence, production of concentrates was only half that in 1944." Pine Creek developed the Zero Level Tunnel at the end of the war in an effort to locate more ore bodies. It was drilled 1,500 feet below the A Level adit and intersected with the main ore body 6,500 feet into the mountain directly below A Level. The new adit also improved mining operations during inclement weather caused by heavy snows, because it became the main hauling level for ore and eliminated the upper portions of the tram. Other improvements to Pine Creek included the addition of a rotary nodulizing unit for scheelite concentrate to the treatment plant (DOI, BM 1947:660-665; Kurtak 1998:90-91; Ridge 1968:1534).

Korean War and Government Stockpile Program (1950 – 1958)

In June of 1950, North Korea invaded South Korea because of a dispute over the boundary set at the 38th parallel between the two countries. The United States sent troops to assist South Korea, and the federal government enacted the Defense Production Act that placed the United States on emergency military status. The hostilities in Korea, as with previous wars, substantially increased demand for tungsten, and, as the Bureau of Mines noted in its *Mineral Yearbook 1950,* "international bidding for tungsten concentrates forces the price up to a level higher than at any time since World War II." Additionally, Chinese exports dwindled, and a shortage of tungsten developed. In April of 1951, the General Services Administration (GSA) started a buying program for tungsten to satisfy demand. They announced that the government would purchase tungsten concentrates for five years at $65 per unit (one unit equals 20 lbs), or until 3,000,000 units totaling 60,000,000 pounds was stockpiled. California produced the most tungsten followed by North Carolina and Nevada. Between 1900 and 1950, California produced 39,429 short tons of tungsten concentrates, 30.17 percent of the national total for that period. Nevada, Colorado and Idaho were also important producers with Nevada close behind California at 38,566 short tons (DOI, BM 1953; *EMJ*, February 1951:97; *EMJ*, December 1951:131; Kurtak 1998:106).

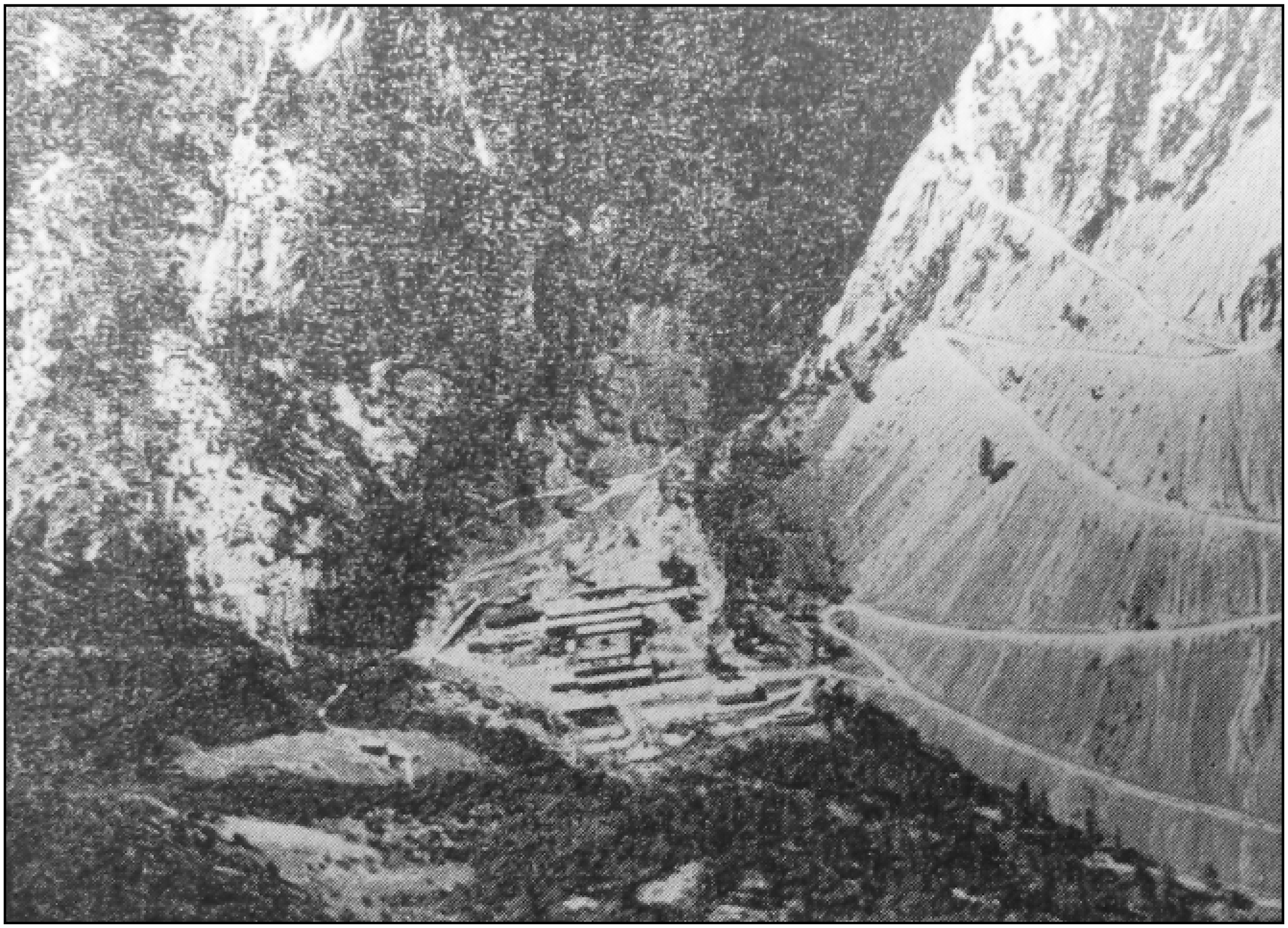

Figure 3. Largest US Producer of tungsten, United States Vanadium Co's Pine Creek mine, Bishop Calif., is expanding production to meet defense demands. Mill appears above, road leads up to Zero Tunnel, at 9,300 ft. elevation (Photograph from *Engineering and Mining Journal*, May 1951: 76).

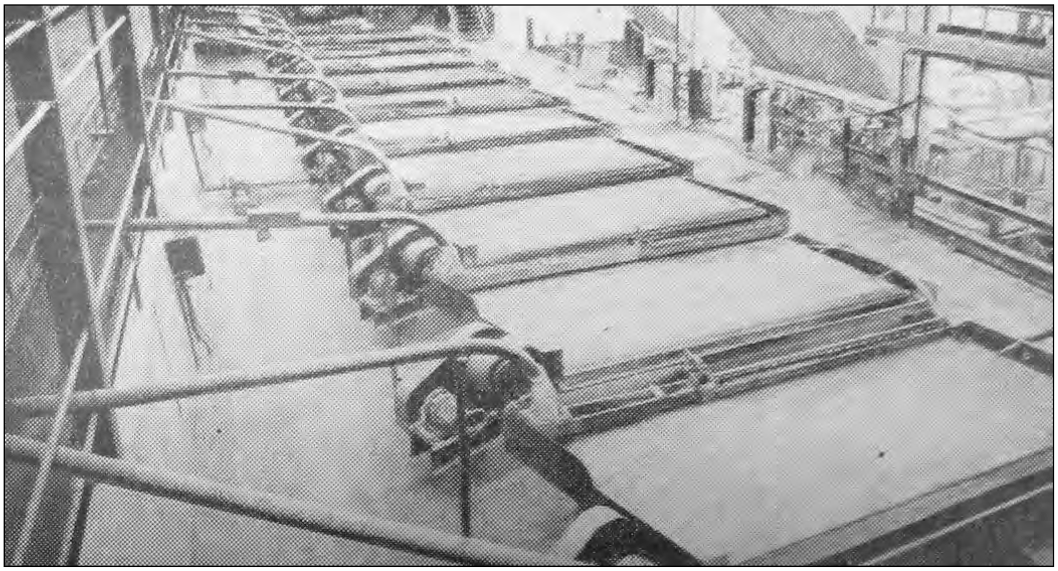

Figure 4. Tables separate coarse scheelite for regrinding, and make high-grade concentrate for shipment at Pine Creek (Photograph from *Engineering and Mining Journal*, May 1951:83.)

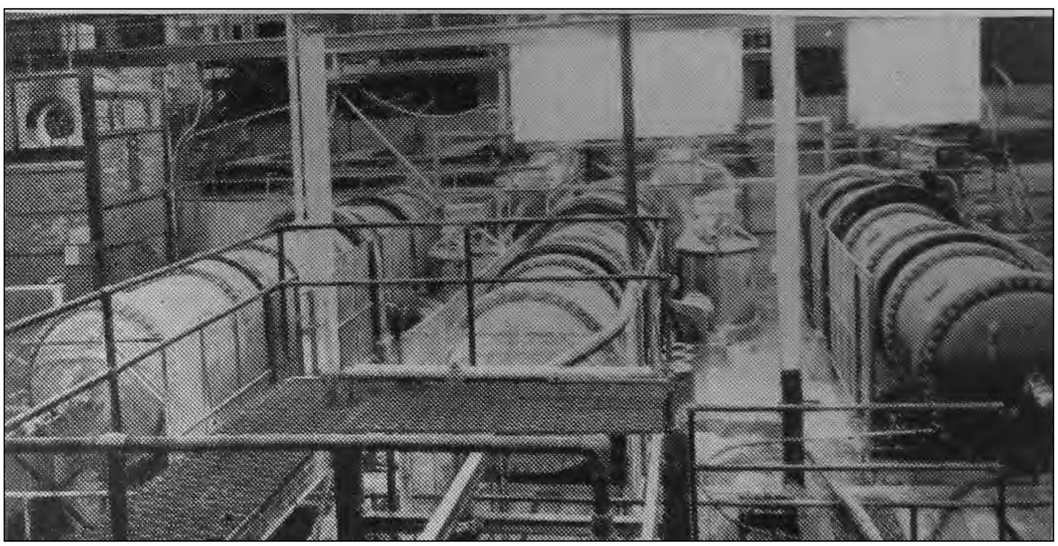

Figure 5. Chemical Plant at Pine Creek makes pure tungsten and molybdenum products from concentrates. These are pressure digesters (Photograph from *Engineering and Mining Journal*, May 1951:83.)

Pine Creek increased operations by 70 percent in 1949 producing and processing ore from its own mine and handling materials from other mines or sources. In 1950, Pine Creek was in first place amongst United States tungsten producers. An article in the *EMJ* described the existing machinery and buildings at the mine:

> Surface plant at Zero Portal: office building, containing engineering office, first-aid room, lamp room, wash and dry room, time office, shifters office, timber framing shed, electrical supply warehouse, oil storage.
>
> Primary Crushing Plant at Zero Portal: cars dumped with Differential Steel Car Co. rotary tipple into 150-ton coarse ore bin. Ore goes to 4 x 16 ft. Sheridan grizzly powered by 50-hp motor, which feeds 36 x 48-in. Traylor Type HB jaw crusher driven by 150-hp motor. Plus 3-in. crusher product fed to 1,000-ton

> storage bin at head of aerial tram loading station by a 30-in. 185-ft. conveyor belt. Tram buckets loaded by 30-in. Link-Belt heavy-duty apron feeder driven by 15-hp 56-rpm gear motors.
>
> Aerial Tram: operates between primary and secondary crusher plants; is 4,153 ft. long; supported by five wooden towers. Twenty six 20-cu ft. buckets ride system… (*EMJ*, May 1951:77).

The 1,000-ton mill and chemical plant, built in 1942, produced copper concentrates, molybdenum concentrate, a second molybdenum product, and a tungsten product using floatation and chemical treatments. The *EMJ* reported, "the process includes: secondary crushing of the ore at the foot of the aerial tram; fine grinding in a single stage; bulk sulphide floatation; separation of copper and molybdenum by floatation; floatation of scheelite with some powellite; chemical separation and purification of the tungsten and molybdenum…" (Figure 6).

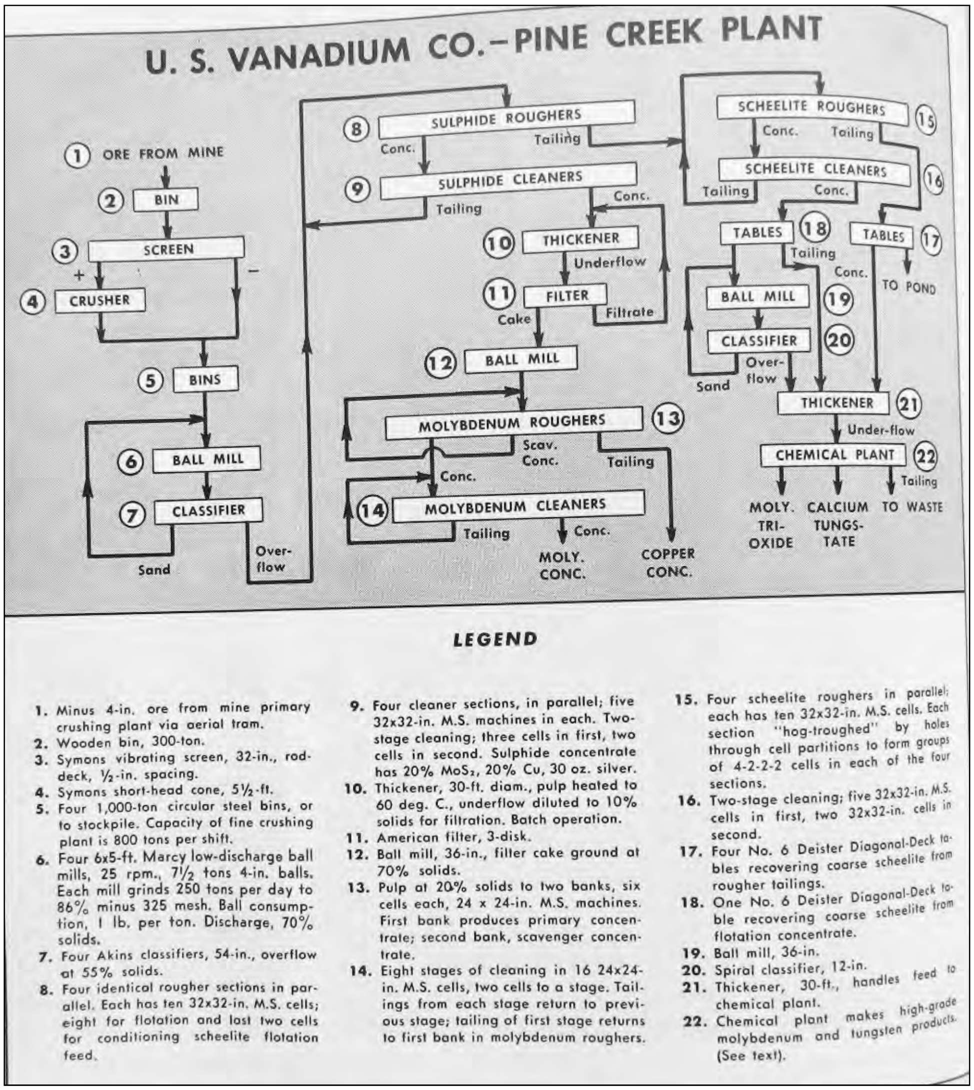

Figure 6. Mill flowsheet from *Engineering and Mining Journal*, May 1951:82.

By May of 1951, efforts at Pine Creek to increase production included enlarging Zero Tunnel from eight feet to twelve feet, driving a 1,500-ft. raise and ore pass to connect Zero Tunnel with older workings at higher elevations, mining upper workings (despite the difficulty to get ore down), and expanding the mill and chemical plant capacities. A separate crushing, conveying, and sampling plant were constructed at the Pine Creek mill site to process ores purchased from other mines. U.S. Vanadium hired vigorously to support increased production activities. Some of the employees were members of the

Paiute and Shoshone tribes that lived in the local area. The recruitment program doubled the number of employees, and created a housing shortage. The company built more houses at Rovana and Scheelite villages to accommodate new employees. Rovana Village was located near the mouth of Pine Creek at 5,000 feet in elevation; Scheelite Village was located near the mill. An avalanche in March of 1952 destroyed several houses in the Morgan Creek area, tore out a power substation and terminal for the aerial tramway, and crashed into the mill. The *EMJ* reported that the "15 month-old Mike Holmes, son of Tom Holmes, mine superintendent, was buried under 18 ft. of snow and debris when an avalanche destroyed the Holmes' house. Rescue workers found the boy two hours later unharmed and kept warm by two pet dachshunds." Operations at the mine stopped for only a month while everything was repaired. In 1955, the company completed the 1,500 ft. raise between adits (*EMJ*, May 1951:76-83; *EMJ*, May 1952:138; *EMJ*, February 1955:99; Kurtak 1998:107-11, 120-121; *Oakland Tribune*, 11 July 1976, 12D).

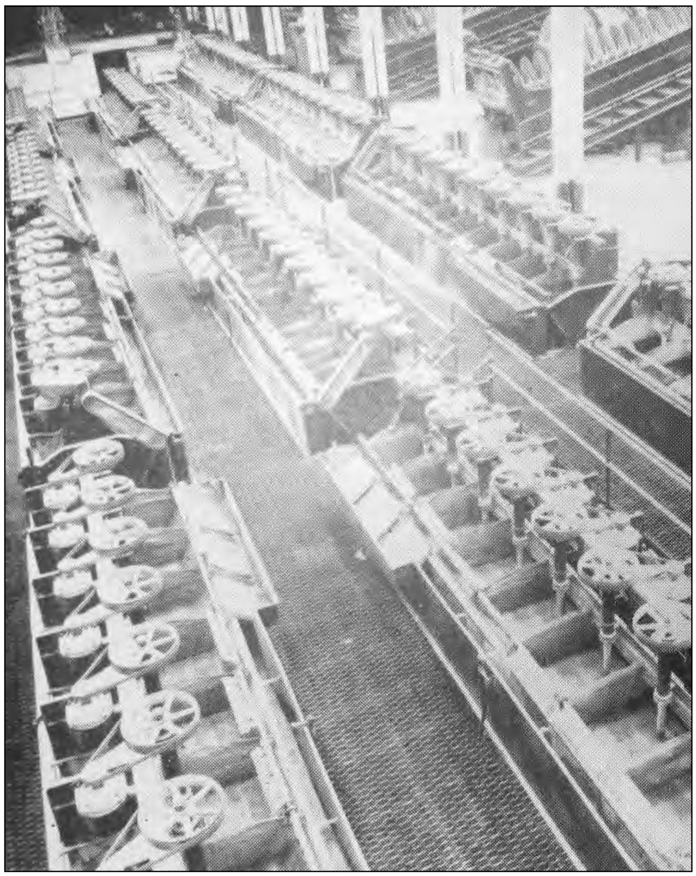

Figure 7. Flotation Section at Pine Creek uses M.S. machines, makes copper, molybdenum, and scheelite concentrate (Photograph from *Engineering and Mining Journal*, May 1951:83.)

The best production year for tungsten in the United States was 1955, but in June of 1956, the federal government reached its stockpile goals and ended its buying program in December of that year. Pine Creek was the only mine operating in the Bishop area at the end of 1957 (Kurtak 1998:107-11; Ridge 1968:1534).

Vietnam War (1958 - 1975)

Tungsten production and demand continued to fall through 1959, and only two mines produced tungsten in the United States in 1958 and 1959 - Pine Creek Mine in California and Climax Molybdenum Mine in Colorado. The tungsten market began to recover in 1960, largely because of the United States involvement in the Vietnam War. Asian imports declined and production in the United States accounted for 70 percent of domestic consumption. The development of new fabrication techniques and tools including arc-casting, electron-beam welders, and electron gun and plasma-jet spraying devices created additional uses for tungsten, and also aided domestic production and demand. However, for a period between December 1961 and September 1963, the tungsten market seemed to be in decline. Russia and China flooded the world market with tungsten, which caused a decrease in prices that undermined American producers. Prices dropped from $24-$26 a unit to $15-$16 a unit within two months, and by December 1962, prices fell to $8 per unit with an additional duty of $7.93 placed on domestic buyers. Concerns over whether the federal government would sell its tungsten reserves further depressed domestic market prices, but Russian and Chinese exports to Europe stopped, which allowed prices to recover and the outlook for domestic producers seem brighter. Again, tungsten was produced by only two mines in 1963, Pine Creek and Climax Molybdenum. Another supply shortage in 1964 caused prices and production to spike, but prices and demand stabilized between 1965 and 1968. Tungsten demand was stimulated by the war in Vietnam and the market for snow-tire studs, the federal government's stockpile sales policy, the absence of exports from China, and industrial activity in the US, Western Europe, and Japan (*EMJ*, February 1959:152; *EMJ*, February 1960:139;, *EMJ*, January 1962:123; *EMJ* February 1962:113; *EMJ*, February 1963:133; *EMJ*, February 1964:136-137; *EMJ*, March 1968:139; Kurtak 1998:111).

During this time, Pine Creek Tungsten Mine was, according to the *EMJ*, "the largest and most stable operation in the district." Pine Creek did well despite the slump in the early 1960s caused by the flood of tungsten from China and Russia, because of the high demand for ammonium paratungstate (APT) produced from a process unique to the company. Ray Kurtak discovered the process working in the metallurgical laboratory at Pine Creek in the late 1950s. The process for APT was implemented in 1959 by adding two steps to Pine Creek's milling procedure (See Figure 8), and was reported by the *EMJ* as the "first direct method for preparing pure tungstate from scheelite ore sources." The building of a full-scale APT plant at a site adjacent to the mill in Pine Creek Canyon was done in 1959 and took eight months to complete, and the first product was shipped in January of 1960. The APT plant was designed by chemical engineer Lew Twichell in New York, and final design and construction was completed by Bob Klotzback, Carl Jealous, and Mal Twichell. According to Kurtak, "The success of the product, like the earlier scheelite process, put the company into the forefront of the U.S. tungsten market … In honor of this pioneering work, Union Carbide received the K.C. Li award … in recognition of contributions that advanced tungsten technology" (*EMJ*, October 1956:103,135; Kurtak 1998:132).

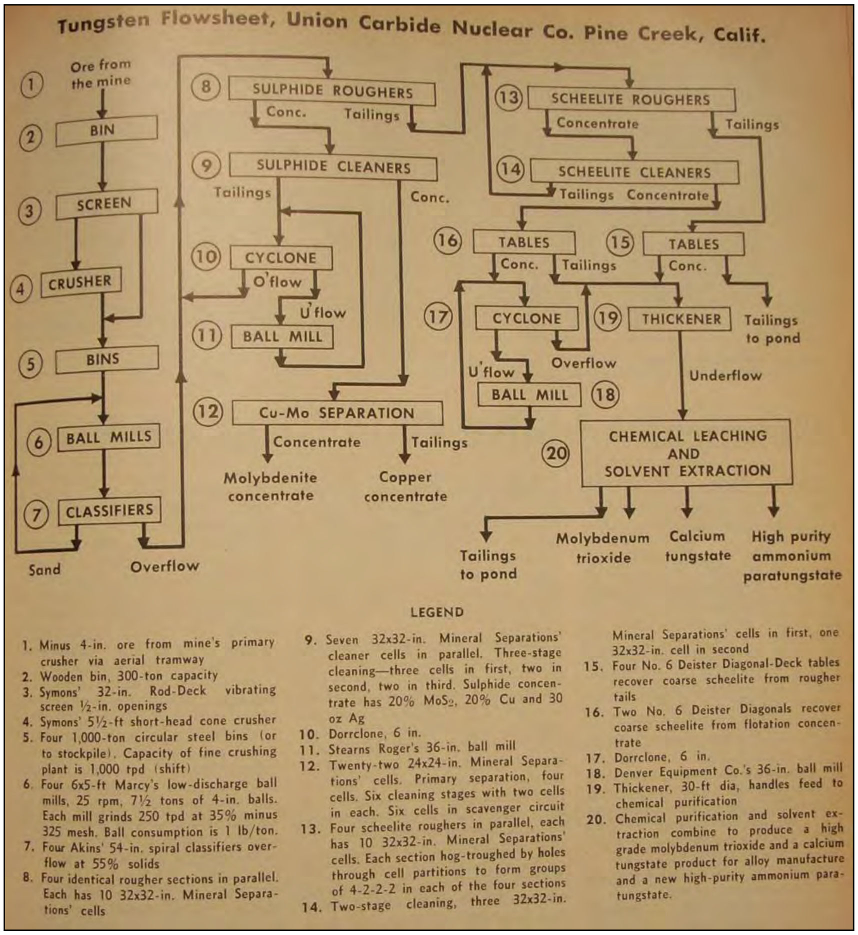

Figure 8. Mill flowsheet from *Engineering and Mining Journal*, October 1959:103.

Ore grades dropped as the mine's resources were depleted, so the company made plans to drill below Zero Tunnel in 1958 to see what ore, if any, extended further down. In the fall of 1960, miners started cutting the new Easy Go tunnel, which got its name for the labor saving improvements it created. The first 5,000 feet of the Easy Go were relatively simple to dig, but after a long weekend a cave-in occurred at the back of the tunnel, which left a large void and mud and water streaming everywhere. To correct the situation and move forward with the Easy Go, Kurtak noted that,

> A pilot tunnel was driven for some 200 feet around the bad ground and timbered every foot of the way. Once the pilot tunnel had reached solid ground beyond, miners worked back through the weak ground, trying to stabilize it. Men worked in diver's wet suits as protection from the ice-cold water flowing everywhere. Concrete and chemical grouts were used with no avail. Stabilization was finally achieved through the use of steel I-beams set on three-foot centers. Wooden lagging was installed between the sets to prevent rock from coming in at the sides (Kurtak 1998:136).

Further drilling of the Easy Go drained water out of Zero tunnel, because Easy Go intercepted with the fracture system that conveyed water through the mountain. As Kurtak explained, "At peak runoff, up to 8,000 gallons of water per minute would flow from the Easy Go portal, but the engineers had planned ahead for this, using knowledge gained from Zero level experience. A drainage ditch was excavated to handle the flow as the tunnel advanced." Once finished, miners delivered ore directly to the mill from Easy Go without the use of the aerial tramway, and they no longer needed to commute up the mountain. John Ridge, editor of *Ore Deposits in the United States*, reported in 1966 that, "the new Easygoing [sic] Tunnel has intercepted an ore body at an elevation of 8,100 feet. From elevation 8,100 feet to about 9,200 feet, the known part of this ore body consists of tactite confined in a south-plunging trough on the quartz-monozite contact south of and below the Main ore body." The company completed the Easy Go tunnel in 1970; it was two miles long and 60 feet below the ore body. Kurtak noted that in order "to mine the ore, two raises -- one a manway and the other for ore, were driven 1,300 feet up to the Zero Level. The connection was excellent, coming within two feet. An ore zone extending vertically for some 3,400 vertical feet could now be accessed through one tunnel." With the completion of Easy Go, the aerial tramway shut down. Zero Level facilities were abandoned and then permanently removed in the 1980s (Kurtak 1998:133-136; Ridge 1968:1534-1535).

The Decline and Closure of the Mine (1975 – 1990)

With a new process for creating marketable tungsten products out of low grade concentrates and completion of the Easy Go Tunnel, the decade of the 1970s started on a golden note. However by 1975, the future did not look so promising for Pine Creek Mine. Kurtak stated that Pine Creek's "massive tactite ore bodies had 'bottomed out' after extending three mining levels and nearly 3,400 feet below the original discovery point." He added that "there were no indications of ore beneath the Easy Go level and high-grade rock at the north end of the mine, used to sweeten the lower grade ores, was running out." The company tried to locate additional ore bodies in 1977 and 1983, but was unsuccessful. Tungsten prices hit a record high of $165 per short ton unit in May of 1977. This influenced Union Carbide to return to mining places once deserted for safety reasons, which eventually caused caving in the depths of the mine. It became a serious problem by 1978, noted Kurtak, who stated "… the caving began to threaten the integrity of a major raise connecting Zero and A Levels. In an effort to stabilize the caving, a raise was driven to the surface above A Level. Then over 100,000 tons of surface-waste rock were dumped down the raise, …which…was…1,400 feet deep." The company stabilized caving in the mine, but high grade ore was lost. In the 1980s, China returned to producing tungsten and flooded the market with ore. Additionally, demand for carbide bits went down, because exploration subsided in the oil and mining businesses. These factors led to the collapse of the tungsten market. Decreases in ore grades coupled with an increase in operational costs and the market collapse eventually caused the closure of Pine Creek. Union Carbide closed the mine in 1982, and sold its mining assets in 1986 to several former executives. The new owners formed Strategic Minerals Corporation or Stratcor, which later became U.S. Tungsten Corporation, and reopened Pine Creek Mine for a final time in 1988. However, mining operations ceased in 1990 because of a depressed market. The mill continued to process stockpiled ore until it closed in 1994 (*EMJ*, March 1978:158-160; Kurtak 1998:146-153).

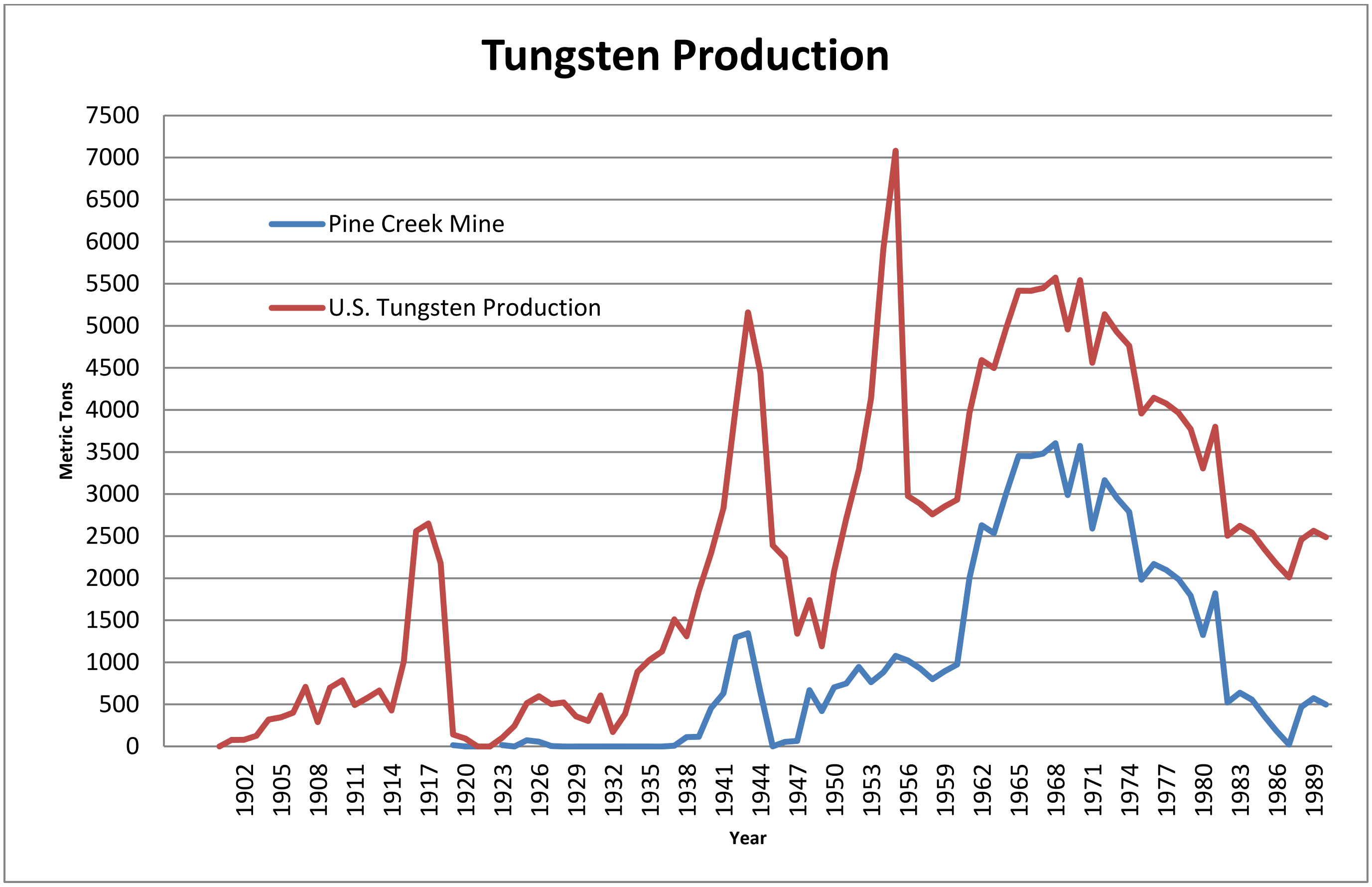

Figure 9. Tungsten Production (Kurtak 1998:198-1999; USGS 2012). USGS provided information for Tungsten production in the United States in two categories "Primary Production" and "Secondary Production," which were added together to create a total production number used for this table. Pine Creek Mine production information furnished by Kurtak was listed in Units of WO_3, which was converted into metric tons for use in this table.

Figure 10. Pine Creek Mill Site at junction of Pine and Morgan Creeks ca. 1959 (Photograph provided by Pine Creek Mine LLC).

Figure 11. Pine Creek Mine facing northwest (Photograph provided by Brian Schmalz May 27, 2012, http://calitrails.files.wordpress.com/2012/05/pinecreek-mine.jpg). The Easy Go adit is near the crusher building (built 1970) in the center of this image.

Evaluation

Taken as a complex, the Pine Creek Tungsten Mine has significance under Criteria A and B, but lacks sufficient integrity to meet the criteria for listing in the National Register of Historic Places. One building, however, the mine's Building No. 12, Metals Lab, appears to meet the criteria for listing in the National Register and California Register under Criteria A and 1, and B and 2, as explained below.

Application of National Register / California Register Criteria

Under NRHP Criteria A or CRHR Criteria 1, Pine Creek Tungsten Mine appears to meet the criteria for listing in the National Register and the California Register under the themes of invention and science for the discovery of the first direct process for creating ammonium paratungstate (APT), which created marketable tungsten products out of low grade concentrates and increased the available ore. This process was unique to Pine Creek for several years, and then became a practice shared with other Tungsten mines worldwide. Pine Creek processed ore from other mines for many years following the implementation of the APT process. This, combined with demand generated by the Korean and Vietnam Wars, made Pine Creek the largest producer and supplier of tungsten. The success of the mine was closely tied with war as Tungsten was a strategic metal.

Under NRHP Criterion B or CRHR Criterion 2, this property is significant for its association with Ray Kurtak, the metallurgical engineer who discovered the process for APT unique to Pine Creek in the late 1950s working in the metallurgical laboratory (Building No. 12). The process for APT was implemented in 1959 by adding two steps to Pine Creek's milling procedure, and was reported by the *Engineering and Mining Journal* as the "first direct method for preparing pure tungstate from scheelite ore sources." The building of a full-scale APT plant at a site adjacent to the mill (now demolished) was done in 1959 and took eight months to complete, and the first product was shipped in January of 1960. As noted above by Ray Kurtak's son, a mining historian, "The success of the product… put the company into the forefront of the U.S. tungsten market…In honor of this pioneering work, Union Carbide received the K.C. Li award … in recognition of contributions that advanced tungsten technology" (*EMJ*, October 1956:103,135; Kurtak 1998:132). It is the development of this process that imbues Building No. 12 with its historical significance.

This property, nor any of its individual elements, is not significant as an important example of a type, period, or method of construction, and thus does not meet the standard under NRHP Criterion C or CRHR Criterion 3. Buildings surveyed at the mine site are simple, modern industrial buildings, often of a "Butler" type, quickly assembled, and primarily made of steel framing clad in corrugated metal sheeting. Buildings with distinct functions like the Crusher/Dumper Building and Ore Bin may have been uniquely designed in terms of their form for this site, but are not significant to the history of mining or Pine Creek Mine and were built after the period of significance.

Under NRHP Criterion D or CRHR Criterion 4, this property is not a significant or likely source of important information about historic construction materials, technologies, and mining or milling processes. Buildings of this type and style, mining tungsten, and the process for APT are all well documented.

Building No. 12, the Metals Lab, is directly associated with Ray Kurtak and his work on the APT process, and as such is individually eligible for listing in the NRHP under Criteria A and B and the CRHR under Criteria 1 and 2, and the logical period of significance under both Criterion A and B would be 1959-1960, between the time Ray Kurtak developed and Pine Creek Mine adopted the APT process.

Integrity

Integrity is the ability of a property to convey its historic significance, in the case of mining properties National Park Register *Bulletin 42* states,

> the passage of time, exposure to a harsh environment, abandonment, vandalism, and neglect often combine to cause the deterioration of individual mining property components…However, the property may still exhibit a labyrinth of paths, roads, shaft openings, trash heaps, and fragments of industrial activity like standing head frames and large tailings piles. Although these individual components may

appear to lack distinction, the combined impact of these separate components may enable the property to convey the collective image of a historically significant mining operation. In essence, the whole of this property will be greater than the sum of its parts (NPS: 19).

Pine Creek retains integrity of location and association, because it remains in its original location and retains its association with mining. It does not, however, evoke the feeling of an active mining property.

Mine and mill sites experience evolution of development over the course of their active lifespan, and mining "plants found in an unaltered state are rare.," noted the NPS. "Thus, contemporary evaluation of a mill's integrity should not only be based on its conformance with an original construction plan, but also on its ability to illustrate the property's evolution through time" (NPS: 20). Pine Creek's original mill site and housing quarters have all been demolished. In some cases, sites were destroyed by avalanches, but all upper mining and milling structures have been completely removed in anticipation of an environmental restoration plan. As the mine evolved, it moved down the mountain to lower elevations to operate its milling equipment at safer places with easier access. The tramway towers and the Easy Go Adit are illustrations of this development and evolution at Pine Creek. As the NPS states, "Mining operations were designed to follow established mine engineering practices that involved the flow of ore from the mine to the mill to the refinery. The engineering flow chart is essential in understanding integrity of design" (NPS: 20). Reviewing the mining flow chart established in 1959, after the implementation of the APT process, reveals integral parts of the mining process that are no longer reflected at Pine Creek because of demolition of the mill and other important processing facilities. All the equipment and buildings that housed the parts of the process discussed in the flow chart between stages 6 and 20 are no longer evident at Pine Creek Mine (see **Figure 8**). The location of the mill is only evident by the grading of the earth (see **Photograph 18**). Pine Creek does not have integrity of design, because of the loss of the mill building and equipment as illustrated by the flow sheet and by an undated property map. The only remaining building importantly associated with the APT process is Building No. 12, the Metals Lab (see **Figure 15**; **Table 2**; **Table 1**).

Pine Creek Mine also has slightly diminished integrity of setting, because of the addition of ponds. These were added in 2005 after the mine shut down, and are not associated with the mine's historic significance (see **Figure 14**). They slightly diminish the industrial feeling of the mine site as well.

National Park Service *Bulletin 42* states that to retain "integrity of materials requires evidence that sympathetic materials have been used during the course of previous repair or restoration of mining properties" (NPS: 21). Pine Creek does not retain integrity of materials. It is evident that the extant buildings dating to the original construction period of the mill site have been altered by the replacement and removal of doors and windows. In some cases, window replacements have altered the opening size and shape, as seen on buildings No. 9a and 9b. Windows have also been replaced on buildings No. 10 and No. 11. Doors have been added, removed, and replaced on buildings No. 9a, 9b, 10, and 12 (See **Photograph 21**, **Photograph 22**, **Photograph 25**, and **Photograph 26**). Most buildings that remain were built in 1970 during Pine Creek's peak operational period and outside any logical period of significance (see **Figure 9** and **Figure 14**).

Bulletin 42 concludes that overall integrity "will frequently hinge not so much on the condition of extent buildings, but rather on the degree to which the overall mining system remains intact and visible. ... If clear physical evidence of a complete system remains intact, deterioration of individual aspects of the system may not eliminate the overall integrity of the resource (NPS: 21)." Pine Creek Mine may retain some evidence of an overall mining system as demonstrated by the mill grading and foundations for minor buildings like the Carpenter and Machine shops that were adjacent to No. 9a and 9b (see **Photograph 37**). Pine Creek Mine, as a whole, does not retain sufficient integrity to the period of significance as required for listing in the NRHP or CRHR, because very little remains that conveys the mine's historical significance.

Pine Creek, while a large producer, is not significant as a tungsten mine, because its mining processes were like other subterranean mines. Most remaining improvements do not date to the period of significance (1959-60), and are not individually eligible for listing in the NRHP or CRHR (**Table 1**). Pine Creek's significance lies with the mill and buildings associated with the APT process, of which only Building 12 survives to convey that history.

Extant Improvement	Built Date
A – Main Portal Easy Go	**1970**
B – Easy Go Maintenance Portal	**1970**
C – Brownstone Portal	**1974**
1 – Bit Sharpener Building	**1970**
2 – Mine Engineering Building	**1970**
3 – Crusher/Dumber Building	**1970**
4 – Carpenter Building/Warehouse	**1970**
5 – Locomotive/Substation Building	**1970**
6 – Ore Bin	**1970**
7 – Clarifier Tank	**1970**
8 – Electrical Substation – SCE	**1984**
9a – Avalanche Warehouse	**1970**
13 – Exempt Hydro P-13163	**1980-82**
14 – Mine Water Discharge (Surge Chamber)	**2005**
15 – New Maintenance Building	**Ca. 1970-1980**
16 – Front Entrance Bridge	**2005**
17 – Easy Go Access Road	**1960**
P0 – Mine Water Discharge Pipe	**1970**
P1 – Mine Water Discharge Pond	**2005**
P2 – Mine Water Discharge Pond	**2005**
P3 – Mine Water Discharge Pond	**2005**
P4 – Mine Water Discharge Pond	**2005**
P5 – Mine Water Discharge Pond	**2005**
P6 – Mine Water Discharge Pond	**2005**

Table 1. List of Existing Improvements not associated with period of significance.

Table 2 identifies extant buildings that existed during the period of significance. The method for APT developed in the Metals lab (Building 12) was tested at a pilot plant in Pine Creek Canyon that is now demolished and completely removed. The mill site does not clearly illustrate the significance of the APT process, because nothing remains of the mill building. Buildings 9b, 10 and 11, Morgan Creek Road, tramway towers, and tailing ponds, dating to the period of significance, do not convey the historical significance, therefore they could not be included in a historic district. Additionally, these buildings are not individually elibible for listing in the NRHP or CRHR.

Extant Improvements	Built Date
9b – Old Warehouse	**1941**
10 – Residential/Former Office	**1941**
11 – Residential/Former Infirmary (moved ca. 1960)	**1941**
12 – Metals Lab	**1941**
18 – Morgan Creek Road	**1939**
19 – Tramway Towers	**1941**
Tailing Ponds (1thru 4)	**1941**

Table 2. List of Existing Improvements associated with the period of significance.

Building No. 12, the Metals Lab, retains integrity of location, design, setting, materials, and workmanship despite the addition to the rear and the personal door to the front. These added features do not significantly diminish the building's integrity. The addition is in the back, and does not protrude above the building or significantly alter its size and massing. The personal door on the south facing side does not significantly alter the appearance of the front of the building. Integrity of setting and association have been affected by the removal of buildings once located at this mine site. However, these changes do not affect the buildings ability to convey its significance (See **Photograph 2**; **Photograph 3**).

Photograph 2. Building 12 – Metals Lab; facing north; August 12, 2014.

Photograph 3. Building 12, taken from Pine Creek mill at Junction of Pine and Morgan Creek Ca. 1959 (Photograph provided by Pine Creek Mine LLC).

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Photographs (continued):

Photograph 4: No. A - Easy Go Adit (built 1970) and Structure 19 – Tramway Towers tramway towers (built1941); facing north, August 12, 2014.

Photographs (continued):

Photograph 5: No. B – Easy Go Maintenance Portal (built 1970); facing northwest, August 12, 2014.

Photograph 6: No. C – Brownstone Adit and Powder Magazine (built 1974); facing west, August 12, 2014.

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Photographs (continued):

Photograph 7: No. 1 – Bit Sharpener Building (built 1970); facing south, August 12, 2014.

Photograph 8: No. 2 – Mine Engineering Building (built 1970); facing north, August 12, 2014.

Photographs (continued):

Photograph 9: No. 2 – Mine Engineering Building (built 1970); facing west, August 12, 2014.

Photograph 10: No. 3 – Crusher/Dumper Building (built 1970); facing north, August 12, 2014.

Photographs (continued):

Photograph 11: No. 3 – Crusher/Dumper Building (built 1970) and Building 7, Clarifier Tank (built 1970); facing southwest, August 13, 2014.

Photograph 12: No. 2 – Mine Engineering Building (built 1970), No. 4 – Carpenter/Warehouse Building (built 1970), E2 – Locomotive Railway Line (built 1970); facing east, August 12, 2014.

Photographs (continued):

Photograph 13: No. 4 – Carpenter/Warehouse Building and covered tracks to No. 3 (built 1970); facing north, August 12, 2014.

Photograph 14: No. 5 – Locomotive/Substation Building and No. B – Easy Go Maintenance Portal (built 1970); facing east, August 12, 2014.

Photographs (continued):

Photograph 15: No. 5 – Locomotive/Substation Building (built 1970), E1 - Ore Carts, E4 – Crane (1970), E5 – Mine Compressor (1970), and E6 – Power Pole and Lines; facing west, August 12, 2014.

Photograph 16: No. 6 – Ore Bin with Elevator and No. 3 – Crusher/Dumper Building (built 1970); facing east, August 12, 2014.

Photographs (continued):

Photograph 17: No. 6 – Ore Bin with Elevator (built 1970); facing west, August 12, 2014.

Photographs (continued):

Photograph 18: No. 6 – Ore Bin (built 1970), Pond 1(P1); Pond 3 (P3), Pond 4 (P4) (built 2005), No. 8 – Electrical Substation, No. 9a – Avalanche Warehouse, No. 9b – Old Warehouse, No. 15 – Maintenance Building, No. 12 – Metals Lab, No. 17 – Easy Go Access Road, No. 18 – Morgan Creek Road; facing southeast, August 12, 2014.

Photograph 19: No. 8 – Electrical Substation (built 1984), SCE and No's 9a (built 1970) and 9b (built 1941) behind; facing southwest, August 12, 2014.

Photographs (continued):

Photograph 20: No. 9a – Avalanche Warehouse (built 1970), No. 9b – Old Warehouse (built 1941), Pond 4 (P4) (built 2005); facing east, August 12, 2014.

Photograph 21: No. 9b – Old Warehouse (built 1941), No. 9a – Avalanche Warehouse (built 1970); facing west, August 12, 2014.

Photographs (continued):

Photograph 22: No. 11 – Residential/Former Infirmary (built 1941), No. 10 – Moved Residential/Former Office (built 1941); facing west, August 13, 2014.

Photograph 23: No. 11 – Residential/Former Infirmary (built 1941), No. 10 – Residential/Former Office (built 1941); facing north, August 12, 2014.

Photographs (continued):

Photograph 24: No. 10 – Residential/Former Office (built 1941) and modern Pond 5 (P5) (built 2005); facing southwest, August 13, 2014.

Photograph 25: No. 11 – Residential/Former Infirmary (built 1941) and connecting hallway moved to this site the 1960s; facing southwest, August 13, 2014.

Photographs (continued):

Photograph 26: No. 12 – Metals Lab (built 1941), Pond 5 (P5) and Pond 6 (P6) (built 2005); facing north, August 12, 2014.

Photograph 27: No. 12 – Metals Lab (built 1941); facing south, August 12, 2014.

Photographs (continued):

Photograph 28: No. 13 – Exempt Hydro P-13163 (installed 1980-82) and No. 14 – Mine Water Discharge (Steel Surge Chamber, installed 2005); facing southeast, August 12, 2014.

Photograph 29: No. 13 – Exempt Hydro P-13163(built 1980-82); facing north, August 12, 2014.

Photographs (continued):

Photograph 30: No. 13 – Exempt Hydro P-13163(built 1980-82) and No. 14 – Mine Water Discharge (Steel Surge Chamber, installed 2005); facing east, August 12, 2014.

Photograph 31: No. 15 – New Maintenance Butler Building and storage shed; facing east, August 12, 2014.

Photographs (continued):

Photograph 32: Earthen Drainage Ditch and No. 15- Maintenance Building; facing east, August 13, 2014.

Photograph 33: No. 16 – Front Entrance Bridge (built 2005) and No. 15 – Maintenance Building; facing south, August 12, 2014.

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Photographs (continued):

Photograph 34: Tailing Pond 1 (built 1941); facing east, August 13, 2014.

Photograph 35: Storm water drainage and Morgan Creek Road; facing southwest, August 13, 2014.

Photographs (continued):

Photograph 36: Interior of shelter section leading to No. 3 – Crusher/Dumper Building (built 1970); facing north, August 13, 2014.

Photograph 37: No. 18 – Morgan Creek Road (built 1939), switching back and forth along mountain side, Foundations of Carpenter and Machine Shops; facing northeast; August 13, 2014.

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Site Map:

Figure 12. Existing Improvements at Pine Creek taken from Morgan Creek Road, provided by Jeff Francis, Pacifica Development Inc.

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Site Map:

Figure 13. Existing Improvements at Pine Creek, provided by Jeff Francis, Pacifica Development Inc. The area between Adit A, Building 1 and Building 2 was enclosed until 2002.

List of Existing Improvements
At the Pine Creek Mine Facility
July 25, 2013

No.	Description/Purpose	Type	Location	Year	MIS Pg
A	Main Portal Easy Go	Tunnel - Steel Shoring	Main Portal	1970	134
B	Maintenance Portal - Easy Go	Tunnel - Steel Shoring	Main Portal	1970	136
C	Brownstone Portal	Tunnel Brownstone	Upper Level SW	1974	
1	Bit Sharpener Building	Single Story - Steel	Main Portal	1970	
2	Mine Engineering Building	Two Story - Steel	Main Portal	1970	136
3	Crusher/Dumper Building	Multi-Story - Steel	Main Portal	1970	136
4	Carpenter Building/Warehouse	Single Story - Steel	Main Portal	1970	136
5	Locomotive/Substation Bldg	Single Story - Steel	Maintenance Portal	1970	136
6	Ore Bin w/ Elevator - Round	Three Story - Steel	Mid-Level	1970	136
7	Clarifier - Roofless Tank	Single Story - Steel	Crusher/Mid-Level	1970	136
8	Electrical Substation - SCE	Fenced Area	Lower Mid-Level	1984	
9a	Avalanche Warehouse	Single Story - Steel	Lower Mill Site Area	1970	
9b	Old Warehouse	Single Steel/Wood	Lower Mill Site Area	1941	
10	Residential / Former Office	Two Story - Wood	Lower Front Area	1941	
11	Residential / Former Infirmary	Two Story - Wood	Lower Front Area	1941	
12	Metals Lab	Single Story - Steel	Lower Front Area	1941	
13	Exempt Hydro P-13163	Single Story - Steel	Lower Front Area	1941	
14	Mine Water Discharge	Surge Chamber - Steel	Lower Front Area	2005	
15	Maintenance Building - New	Single Story - Steel	Lower Front Area		
16	Front Entrance Bridge	Pre-Assembled Steel	Lower Front Area	2005	

Page 2 of 2

List of Existing Improvements
At the Pine Creek Mine Facility
July 25, 2013

No.	Description/Purpose	Type	Location	Year	MIS Pg
17	Easy Go Access Road	Graded Access Road	Upper Mill Site Area	1960	
18	Morgan Creek Road	Graded Access Road	Morgan Creek Canyon	1939	
19	Tramway Towers - Multiple	Wood Timber Trusses	Morgan Creek to Zero	1940's	
P0	Mine Water Discharge Pipe	Steel Conduit Pipe	Upper Mill Site Area	1970	
P1	Mine Water Discharge Ponds	Concrete Lined (6 count)	Lower Mill Site Area	2005	
P2	Mine Water Discharge Ponds	Concrete Lined (6 count)	Lower Mill Site Area	2005	
P3	Mine Water Discharge Ponds	Concrete Lined (6 count)	Lower Mill Site Area	2005	
P4	Mine Water Discharge Ponds	Concrete Lined (6 count)	Lower Mill Site Area	2005	
P5	Mine Water Discharge Ponds	Concrete Lined (6 count)	Lower Mill Site Area	2005	
P6	Mine Water Discharge Ponds	Concrete Lined (6 count)	Lower Mill Site Area	2005	

Existing Mining & Other Equipment

E1	Ore Cars – Loaded	Mining Equipment	Maintenance Portal	1999
E2	Locomotive Railway Line	Mining Equipment	Main / Maint. Portals	1970
E3	Ore Cars & Locomotives	Mining Equipment	Crusher Building	1999
E4	Crane – Maintenance	Maintenance Equipment	Maintenance Portal	1970
E5	Mine Compressor	Mining Equipment	Maintenance Portal	1970
E6	Power Poles & Lines	Utilities – Electric	Upper/Lower Site	

Figure 14. Existing Improvements at Pine Creek, provided by Jeff Francis, Pacifica Development Inc.

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
CONTINUATION SHEET

Primary # 14-10312
HRI #
Trinomial

***Resource Name or #** (Assigned by recorder) Pine Creek Tungsten Mine

***Recorded by** R. Herbert & L. Trew *Date August 12-13, 2014 ☒ Continuation ☐ Update

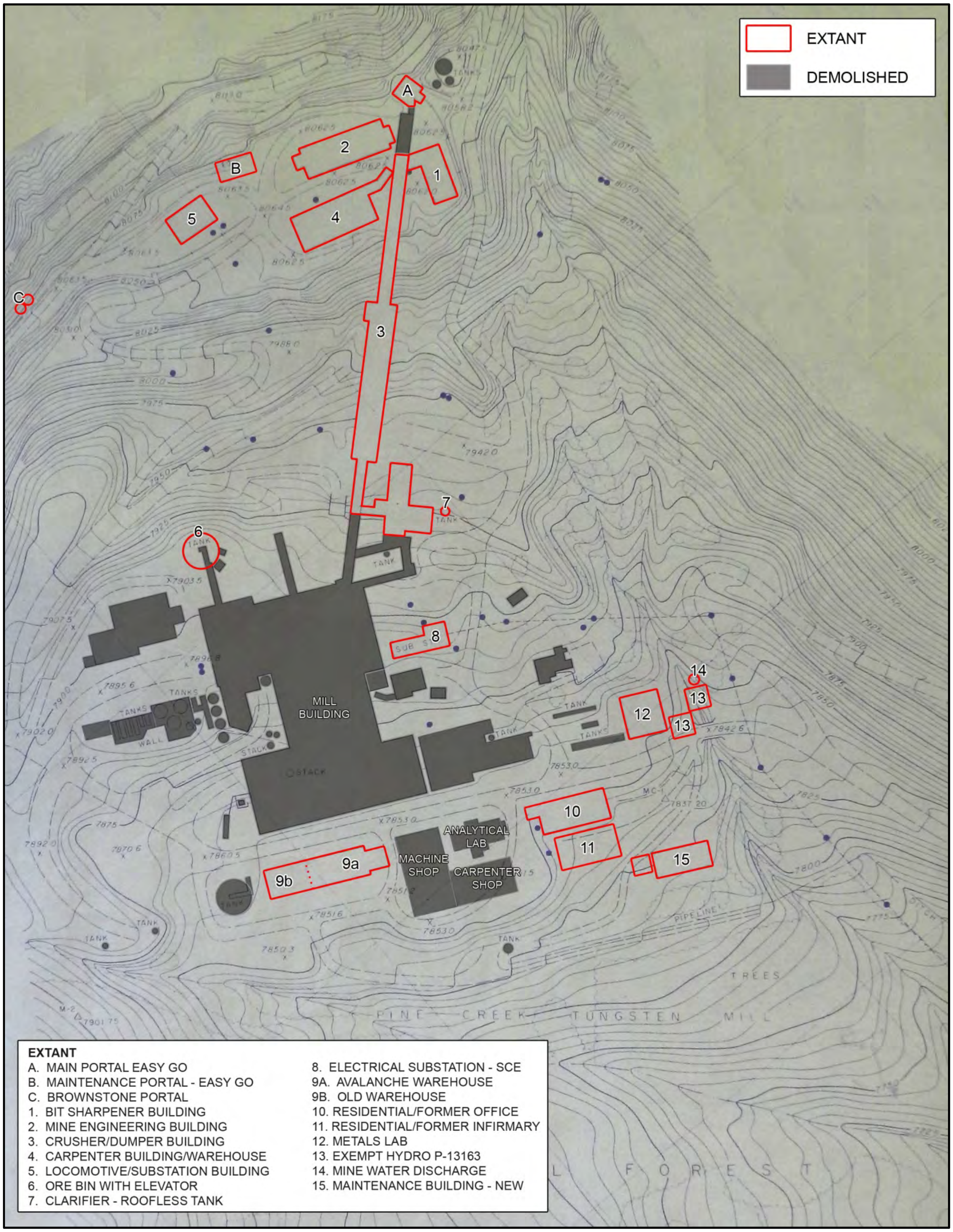

Figure 15. Mill Site near Easy Go showing extant and demolished buildings (Base map, "Pine Creek Mine, Inyo County, California, Property Map," no date; provided by Pine Creek Mine).