Manual for Built Resources

Bonneville Power Administration

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Prepared for
Bonneville Power Administration
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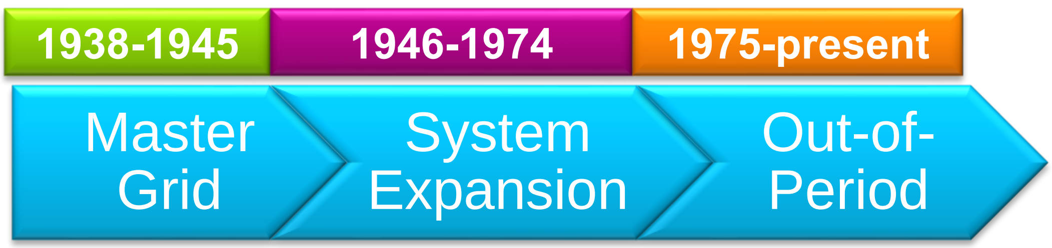
Acronyms and Abbreviations

ACHP	Advisory Council on Historic Preservation
ANSI	American National Standards Institute
BPA	Bonneville Power Administration
CFR	Code of Federal Regulations
FRP	fiber-reinforced-plastic
FSPC	Federal Standard Paint Color system
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HAZMAT	Hazardous Materials
ILS	Intensive Level Survey
kV	kilovolt
low-e	low emissivity
MBR	Manual for Built Resources
MOA	Memorandum of Agreement
MPDF	Multiple Property Documentation Form
NARA	National Archives & Records Administration
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NWM	BPA Facilities Planning and Projects
PA	Programmatic Agreement
RAS	Remedial Action Scheme
SCADA	Supervisor Control and Data Acquisition
SHPO	State Historic Preservation Office
SOI	Secretary of the Interior
THPO	Tribal Historic Preservation Officer

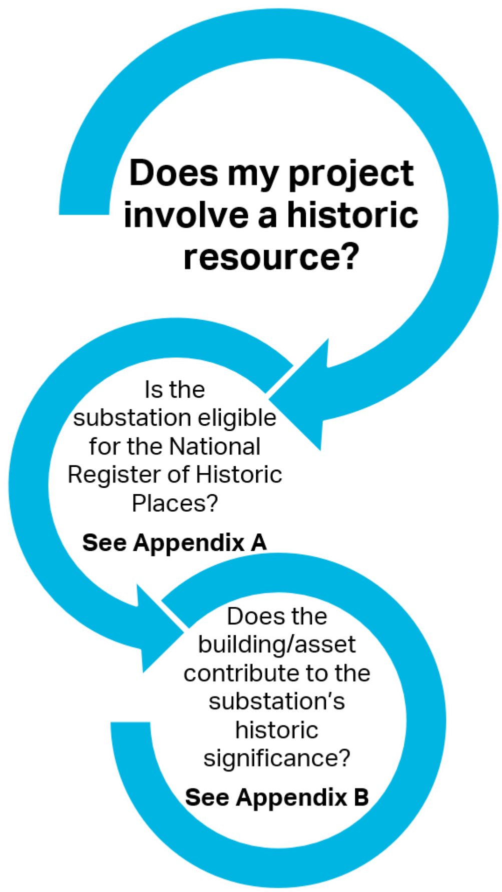
Executive Summary

This Manual for Built Resources (MBR) provides an overview of Bonneville Power Administration's (BPA's) inventory of historic resources (those built before 1975), summarizes BPA's significant historic properties, and provides a guide for how to manage and maintain historic properties under BPA's jurisdiction. BPA intends for the MBR to correspond with a Programmatic Agreement to be developed and signed by BPA and the Oregon, Washington, Idaho, and Montana State Historic Preservation Offices that documents historic review procedures for frequently occurring activities at BPA's historic properties.

The MBR includes a summary of BPA's inventory of historic substations in Oregon, Washington, Idaho, Montana, and Wyoming. Each substation was built during BPA's Master Grid (1938-1945) or System Expansion (1946-1974) eras, contains a variety of buildings and structures and is evaluated for National Register of Historic Places (NRHP) eligibility as a historic district. A summary of BPA's inventory of historic microwave radio station sites is included in an MBR addendum to this report. The historic property evaluations are consistent with the (BPA) Pacific Northwest Transmission System Multiple Property Documentation Form (MPDF) as a framework for evaluation (Kramer 2012).



The MBR was developed to assist BPA engineers and architects in planning site-specific approaches to projects that optimize compliance with the National Environmental Policy Act (NEPA) and Section 106 of the National Historic Preservation Act (NHPA)(54 United States Code (U.S.C.) § 300101 et seq.). Users must first determine if a project involves a historic resource (Built before 1975), then determine if the substation is eligible for the National Register of Historic Places (NRHP) (See Appendix A), and whether the building/asset contributes to the substation's historic significance (See Appendix B). Answering these questions determines the appropriate treatment options and level of review. Recommended treatment approaches are included that follow the Secretary of the Interior's (SOI's) *Standards for the Treatment of Historic Properties* (Grimmer 2017). A tiered summary of treatment approaches shows the necessary agency regulatory reviews for various projects that involve historic properties.



The MBR is also a component of BPA's preservation program to protect BPA-owned National Register listed and/or eligible properties and demonstrates BPA's preservation efforts under Section 110 of the NHPA (54 U.S.C. §§ 306101(a) and 306102). BPA is consulting with the Oregon, Washington, Idaho, and Montana, State Historic Preservation Offices (SHPOs) as part of the MBR effort.

BPA retained AECOM in 2017 to prepare this MBR as part of a larger preservation planning project for BPA's historic substations.

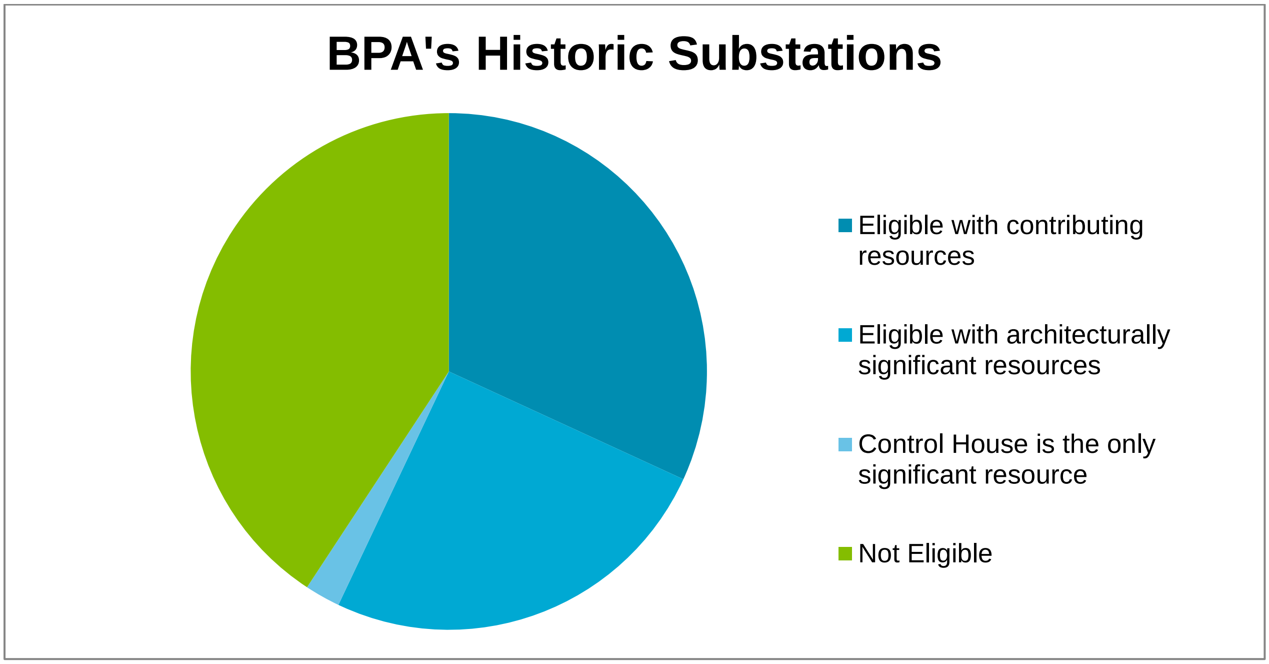
The following table lists the NRHP-eligible substations and individual resources. The two subsequent graphics illustrate the eligibility of the substations and their resources. For a list of BPA's historic microwave radio station sites and their NRHP eligibility, see the MBR addendum to this report.

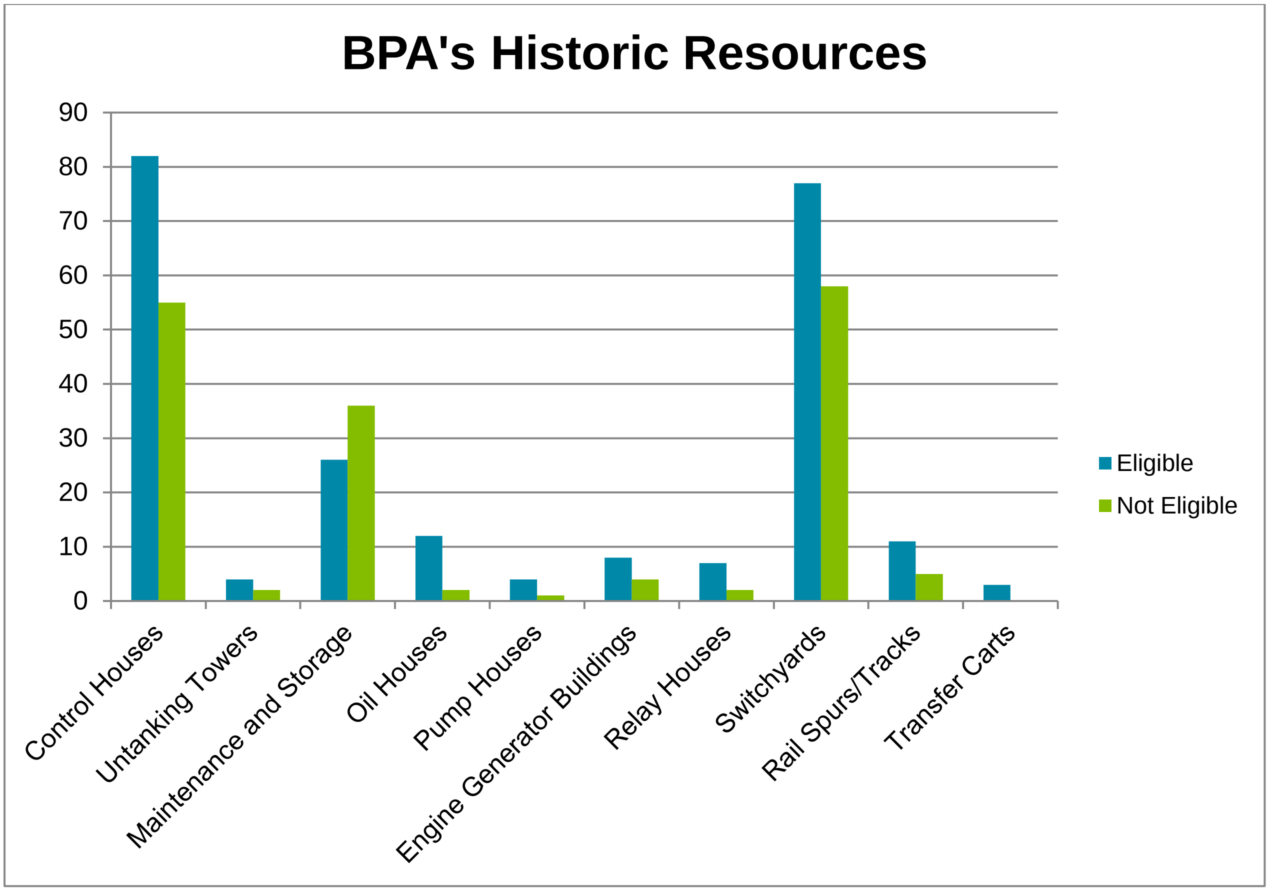
NRHP-Eligible Substations

NAME	YEAR	PERIOD	ELIGIBILITY	DISTRICT	REGION	COUNTY	STATE
Adair	1969	System Expansion	Eligible	Salem	South	BENTON	OR
Albany	1954	System Expansion	Eligible	Eugene	South	LINN	OR
Alcoa	1940	Master Grid	Control House only	Longview	South	CLARK	WA
Allston	1969	System Expansion	Eligible	Longview	South	COLUMBIA	OR
Alvey	1950	System Expansion	Eligible	Eugene	South	LANE	OR
Anaconda	1953	System Expansion	Eligible	Kalispell	East	DEER LODGE	MT
Bellingham	1954	System Expansion	Eligible	Snohomish	North	WHATCOM	WA
Big Eddy/Starr	1956	System Expansion	Eligible	The Dalles	South	WASCO	OR
Boundary	1967	System Expansion	Eligible	Spokane	East	PEND OREILLE	WA
Burnt Woods	1954	System Expansion	Eligible	Eugene	South	BENTON	OR
Cardwell	1963	System Expansion	Eligible	Longview	South	COWLITZ	WA
Centralia	1950	System Expansion	Eligible	Olympia	North	LEWIS	WA
Chehalis	1941	Master Grid	Eligible	Olympia	North	LEWIS	WA
Chemawa	1954	System Expansion	Eligible	Salem	South	MARION	OR
Chief Joseph	1958	System Expansion	Eligible	Wenatchee	North	DOUGLAS	WA
Clarkston	1958	System Expansion	Eligible	Spokane	East	WHITMAN	WA
Columbia	1945	Master Grid	Eligible	Wenatchee	North	DOUGLAS	WA
Conkelley	1958	System Expansion	Eligible	Kalispell	East	FLATHEAD	MT
Covington	1942	Master Grid	Eligible	Covington	North	KING	WA
Detroit	1952	System Expansion	Eligible	Salem	South	MARION	OR
Driscoll	1966	System Expansion	Eligible	Longview	South	CLATSOP	OR
Dworshak	1973	System Expansion	Eligible	Spokane	East	CLEARWATER	ID
Eugene	1941	Master Grid	Eligible	Eugene	South	LANE	OR
Fairview	1958	System Expansion	Eligible	Eugene	South	COOS	OR
Gardiner	1963	System Expansion	Eligible	Eugene	South	DOUGLAS	OR
Goldendale	1957	System Expansion	Eligible	The Dalles	South	KLICKITAT	WA
Grandview	1947	System Expansion	Eligible	Tri-Cities	East	YAKIMA	WA
Hanford	1970	System Expansion	Eligible	Tri-Cities	East	BENTON	WA
Hot Springs	1953	System Expansion	Eligible	Kalispell	East	SANDERS	MT
Intalco	1966	System Expansion	Eligible	Snohomish	North	WHATCOM	WA
Ione	1949	System Expansion	Eligible	Tri-Cities	East	MORROW	OR
John Day	1968	System Expansion	Eligible	The Dalles	South	SHERMAN	OR
Keeler	1956	System Expansion	Eligible	Salem	South	WASHINGTON	OR
Kerr	1948	System Expansion	Eligible	Kalispell	East	LAKE	MT
La Grande	1952	System Expansion	Eligible	Tri-Cities	East	UNION	OR
Lane	1966	System Expansion	Eligible	Eugene	South	LANE	OR
Langlois	1957	System Expansion	Eligible	Eugene	South	CURRY	OR

NAME	YEAR	PERIOD	ELIGIBILITY	DISTRICT	REGION	COUNTY	STATE
Little Goose	1970	System Expansion	Eligible	Spokane	East	WHITMAN	WA
Lookout Point	1954	System Expansion	Eligible	Eugene	South	LANE	OR
Marion	1970	System Expansion	Eligible	Salem	South	MARION	OR
Maupin	1974	System Expansion	Eligible	The Dalles	South	WASCO	OR
McNary	1954	System Expansion	Eligible	Tri-Cities	East	UMATILLA	OR
Midway	1941	Master Grid	Eligible	Tri-Cities	East	BENTON	WA
Monmouth	1954	System Expansion	Eligible	Salem	South	POLK	OR
Moxee	1954	System Expansion	Eligible	Tri-Cities	East	YAKIMA	WA
Murray	1972	System Expansion	Eligible	Snohomish	North	SNOHOMISH	WA
North Bonneville	1941	Master Grid	Eligible	Longview	South	SKAMANIA	WA
Oregon City	1941	Master Grid	Eligible	Salem	South	WASHINGTON	OR
Ostrander	1970	System Expansion	Eligible	Longview	South	CLACKAMAS	OR
Paul	1971	System Expansion	Eligible	Olympia	North	LEWIS	WA
Port Angeles	1950	System Expansion	Eligible	Olympia	North	CLALLAM	WA
Potholes	1958	System Expansion	Control House only	Wenatchee	North	GRANT	WA
Potlatch	1960	System Expansion	Eligible	Olympia	North	MASON	WA
Reedsport	1957	System Expansion	Eligible	Eugene	South	DOUGLAS	OR
Republic	1953	System Expansion	Eligible	Spokane	East	FERRY	WA
Reston	1960	System Expansion	Eligible	Eugene	South	DOUGLAS	OR
Richland	1949	System Expansion	Eligible	Tri-Cities	East	BENTON	WA
Ross	1940	Master Grid	Eligible	Longview	South	CLARK	WA
Roundup	1954	System Expansion	Eligible	Tri-Cities	East	UMATILLA	OR
Sacheen	1973	System Expansion	Eligible	Spokane	East	PEND OREILLE	WA
Salem	1942	Master Grid	Eligible	Salem	South	POLK	OR
Sandpoint	1950	System Expansion	Eligible	Spokane	East	BONNER	ID
Santiam	1954	System Expansion	Eligible	Salem	South	LINN	OR
Scooteney	1953	System Expansion	Eligible	Tri-Cities	East	FRANKLIN	WA
Sickler	1968	System Expansion	Eligible	Wenatchee	North	DOUGLAS	WA
St. Johns	1941	Master Grid	Eligible	Longview	South	MULTNOMAH	OR
Tacoma	1942	Master Grid	Eligible	Covington	North	PIERCE	WA
Tahkenitch	1963	System Expansion	Eligible	Eugene	South	DOUGLAS	OR
Timber	1955	System Expansion	Eligible	Salem	South	WASHINGTON	OR
Toledo	1958	System Expansion	Eligible	Eugene	South	LINCOLN	OR
Troutdale	1942	Master Grid	Control House only	Longview	South	MULTNOMAH	OR
Troy	1953	System Expansion	Eligible	Kalispell	East	LINCOLN	MT
Unity	1967	System Expansion	Eligible	Idaho Falls	East	CASSIA	ID
Valhalla	1953	System Expansion	Eligible	Wenatchee	North	CHELAN	WA
Vantage	1963	System Expansion	Eligible	Wenatchee	North	GRANT	WA
Wagner Lake	1974	System Expansion	Eligible	Spokane	East	LINCOLN	WA
Walla Walla	1941	Master Grid	Eligible	Tri-Cities	East	WALLA WALLA	WA

NAME	YEAR	PERIOD	ELIGIBILITY	DISTRICT	REGION	COUNTY	STATE
Walton	1949	System Expansion	Eligible	Eugene	South	LANE	OR
Wendson	1973	System Expansion	Eligible	Eugene	South	LANE	OR
Wren	1947	System Expansion	Eligible	Eugene	South	BENTON	OR




BPA's Historic Resources
90
80
70
60
50
40
30
20
10
0
Control Houses
Untanking Towers
Maintenance and Storage
Oil Houses
Pump Houses
Engine Generator Buildings
Relay Houses
Switchyards
Rail Spurs/Tracks
Transfer Carts
Eligible
Not Eligible

1. INTRODUCTION

The Bonneville Power Administration's (BPA's) Pacific Northwest Transmission System is composed of a historically significant hydroelectric power transmission network located throughout Oregon, Washington, Idaho, Montana, and Wyoming. The system contains built resources that include substations, microwave radio stations, transmission lines, maintenance headquarters, control centers, and testing facilities.

BPA Facilities Planning and Projects (NWM) mission is to maintain and create new Agency assets in accordance with organizational objectives to support BPA's core business; make risk-informed decisions to maximize the value of our facilities and services while improving safety and environmental stewardship; and continuously improve awareness of asset management activities in order to execute day-to-day operations in a cost-effective manner.

This section lays out the purpose and uses of this manual and discusses how the manual serves as an extension of BPA's asset and facility management program mission.

1.1 Purpose

This Manual for Built Resources (MBR) provides an overview of BPA's inventory of historic substations (i.e., those built before 1975), summarizes BPA's significant historic properties, and provides a guide for how to effectively manage and maintain historic properties under BPA's jurisdiction. The Microwave Radio Stations MBR addendum to this report summarizes BPA's inventory of historic microwave radio station sites with recommendations for this property type. BPA intends for the MBR to correspond with a Programmatic Agreement to be developed and signed by BPA and the Oregon, Washington, Idaho, and Montana State Historic Preservation Offices that documents historic review procedures for frequently occurring activities at BPA's historic properties. BPA intends to use the MBR to identify historically significant substations and contributing historic resources and inform the process for modifying contributing resources. The purpose of the MBR is to:

- Facilitate project planning for major and minor substation projects;
- Streamline project regulatory review and compliance;
- Save time, money, and resources through efficiency gains; and
- Preserve BPA's historic properties.

The MBR acknowledges BPA's need to balance historic preservation priorities with cost efficiencies and functionality. The MBR provides strategies for achieving this balance in a variety of scenarios.

The MBR provides a summarized inventory and overview of BPA's significant historic assets.[1] The MBR is based on the Intensive Level Survey (ILS) of each historic substation. The ILS evaluated the appearance, significance, and historic integrity of each substation as a potential historic district and evaluated its assets as contributing and non-contributing elements of the district.

The MBR is designed to assist BPA in developing site-specific approaches for BPA facilities projects to comply with Section 106 of the National Historic Preservation Act (NHPA)(54 U.S.C. § 306108) as implemented in 36 Code of Federal Regulations (C.F.R.) Part 800. It identifies character-defining features of the various substation property types and provides specific guidance on proposed maintenance, repair, and modification projects and measures to avoid, minimize, and/or resolve potential adverse effects. The MBR does not provide a detailed scope for every possible undertaking[2] BPA may plan for historic properties, outline the complete area of effects to those undertakings, nor analyze or estimate costs for maintaining and/or upgrading historic resources. However, it provides general treatment guidelines to reduce uncertainties among common existing, planned, and potential future facility improvement projects

[1] The MBR refers to the terms historic properties, historic resources, and historic assets. BPA most commonly uses the term historic assets in their publications but all three are used to discuss their historic facilities.

[2] An undertaking for the purposes of this document and Section106 of the NHPA is considered any federal project, activity, or program either funded, permitted, licensed, or approved by a federal agency (NPS 2018).

that may affect historic properties. BPA is providing the MBR to the Oregon, Washington, Idaho, and Montana, State Historic Preservation Offices (SHPOs) for review as part of the effort. Training with district maintenance staff will follow the publishing of the MBR.

The MBR is also a component of BPA's preservation program to protect BPA-owned National Register eligible and listed historic properties and demonstrates BPA's efforts to comply with Section 110 of the NHPA (54 U.S.C. §§ 306101(a) and 306102). Consistent with Section 110, the MBR creates a tool for BPA to use in meeting the Secretary of the Interior's (SOI) Standards and Guidelines for Federal Agency Historic Preservation Programs (63 FR 79 (April 24, 1998)) by:

- Giving historic properties full consideration when planning or considering approval of any action that might affect such properties;
- Consulting with knowledgeable and concerned parties outside the agency about its historic preservation-related activities;
- Managing and maintaining historic properties under its jurisdiction or control in a manner that considers the preservation of their historic, architectural, archaeological, and cultural values; and
- Giving priority to the use of historic properties to carry out agency missions.

The MBR begins with a summary of the development and evolution of BPA and its historic substations (**Section 2,** BRIEF HISTORY OF THE BONNEVILLE POWER ADMINISTRATION) and then describes the historic significance of the substations, individually and collectively (**Section 3, HISTORIC SIGNIFICANCE**). It also identifies the historic substation assets (**Section 4, HISTORIC ASSETS**), explains the regulatory process for asset maintenance (**Section 5, REGULATORY PROCESS**), and provides general and specific treatment recommendations for existing, planned, and potential facility improvement projects (**Section 6**

GENERAL TREATMENT RECOMMENDATIONS and **Section 7, SPECIFIC TREATMENT RECOMMENDATIONS**). Guidance for the specific treatment recommendations is based on the SOI's Standards for the Treatment of Historic Properties. **Section 8, DISCOVERY OF ARTIFACTS OR HUMAN REMAINS** provides a sample intake form and internal BPA contact information. Lastly, **Section 9, PRESERVATION BRIEFS** and **Section 10 Preservation Tech Notes** include electronic hyperlinks to relevant Preservation Briefs and Tech Notes from the National Park Service (NPS) related to preserving, rehabilitating, and restoring historic buildings.

Using the MBR will assist the BPA with identifying and evaluating work that could adversely affect the BPA's historic substation assets while simplifying the process of making effect findings pursuant to Section 106. This facilitates BPA's completion of a critical and potentially time-consuming portion of the Section 106 process. Furthermore, by simplifying the Section 106 consultation process, the MBR streamlines substation project planning and execution. In addition, the MBR's comprehensive and detailed recommendations for anticipated substation work will likely reduce the incidence of adverse effects as the MBR provides ways to avoid or minimize potential effects. Where adverse effects are unavoidable, the MBR's mitigation options will guide swift resolution of those effects. It should be noted that the MBR only addresses BPA's built environment resources. Project effects to archaeological resources require a separate agency Section 106 screening process.

The MBR is not meant to hinder BPA in the event of an emergency. BPA's procedures for taking historic properties into account when responding to a disaster or emergency are documented in Section 5.4.

By its inherent nature and function, the BPA Transmission System is ***dynamic, constantly being upgraded, expanded and changed*** *in response to energy, economic, and other needs.*

1.2 How to Use the MBR

The MBR serves two key audiences: (1) facilities project/program managers and maintenance staff responsible for facility improvement projects, and (2) cultural resource professionals that oversee compliance with regulatory processes for historic properties. There are several steps to using this MBR for facility improvement projects:

1. Verify whether a substation has been determined eligible for the National Register of Historic Places (NRHP) (APPENDIX A: BPA HISTORIC SUBSTATION ELIGIBILITY INDEX). If the substation is evaluated as not eligible, work on that substation is exempt from consultation beyond BPA's environmental screening. However, if the substation has been determined eligible for the NRHP, additional screening by BPA cultural resources staff meeting the Secretary of the Interior (SOI) professional qualification standards for Architectural History and consultation with the SHPO may be necessary.
2. Identify the "contributing" or "non-contributing" status of a particular substation asset (**APPENDIX B: BPA HISTORIC SUBSTATION ASSETS INDEX**). If the asset is evaluated as "not eligible/non-contributing," work is generally exempt from consultation beyond BPA's screening, as long as it does not affect the overall historic district. Work planned for eligible/contributing assets is likely to require additional review by SOI-qualified BPA cultural resources staff and consultation with the SHPO.

3. Use MBR **sections 6 and 7** to determine the general and specific guidelines for the treatment of historic substations and their assets. Section 6 provides general guidelines for the treatment of historic properties based on the SOI's *Standards for the Treatment of Historic Properties*. Section 7 provides specific standards drawn from these guidelines and includes three treatment categories for facility improvement projects. All projects fall into one of these tiered categories:

   Activities Exempt from Review,

   Activities Requiring BPA Review, and

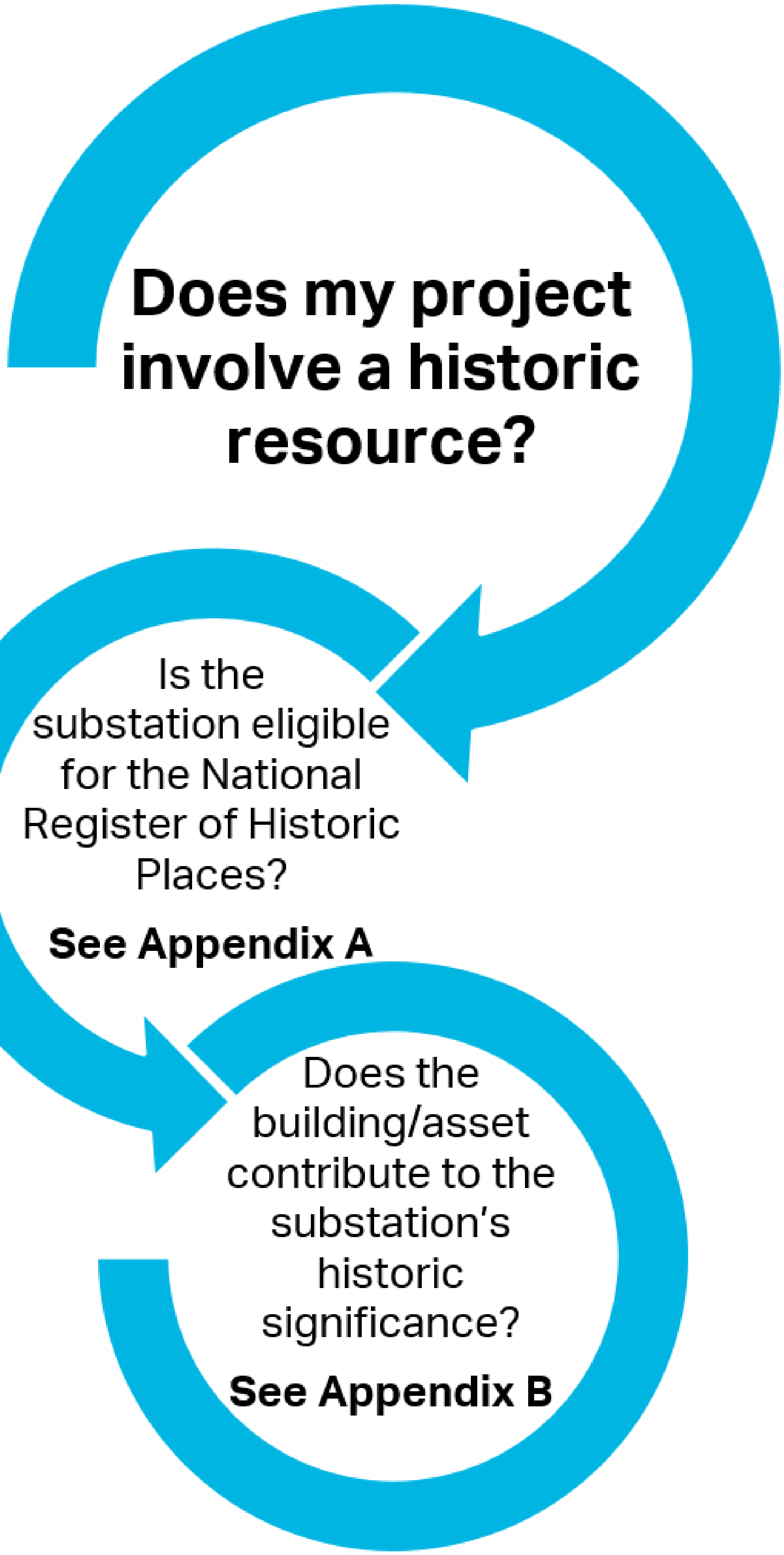
   Activities Requiring SHPO Consultation.

   Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

4. See **Section 9** for electronic hyperlinks to NPS Preservation Briefs for supplemental treatment guidance. Whether a project requires screening or consultation, the guidelines established in the MBR will assist in streamlining the planning and execution of facility improvement projects by outlining how certain historic buildings, sites, settings, and their features should and should not be treated to reduce the likelihood of an adverse effect and minimize the need for comments and revisions to projects as well as SHPO/BPA consultation.

5. Consult a BPA historian when uncertainty exists over the applicable project category or treatment approach.

6. Consult a BPA archaeologist to determine if actions require a separate archaeological screening process.


Does my project involve a historic resource?
Is the substation eligible for the National Register of Historic Places?
See Appendix A
Does the building/asset contribute to the substation's historic significance?
See Appendix B

2. BRIEF HISTORY OF THE BONNEVILLE POWER ADMINISTRATION

The BPA, part of the U.S. Department of Energy, is a nonprofit federal power administration that markets wholesale hydroelectric energy throughout the Pacific Northwest. BPA's transmission system, which provides nearly one-third of the region's electric power, operates primarily in Idaho, Oregon, western Montana, and Washington, as well as sections of California, Nevada, Utah, and Wyoming, and interconnects with systems in British Columbia, Canada (BPA 2017). A more detailed discussion of BPA's history and development is found in Curran (1998), Kramer (2010), and Kramer (2012).

The BPA was created in 1937 by an Act of Congress as part of President Franklin Roosevelt's "New Deal" to market power from Bonneville Dam, the Columbia River's first federal dam. In 1938, BPA's first administrator James Dalmage Ross (1872-1939) proposed a "Master Grid" transmission network to connect Bonneville Dam and the newer Grand Coulee Dam with the Portland, Oregon and Puget Sound, Washington areas. The Master Grid plan linked Pasco, Yakima, Spokane, and Ellensburg, Washington via a 230-kilovolt (kV) circuit loop. The network also linked to Washington and Oregon coastal areas and extended south through Oregon's Willamette Valley to the California border through radiating 115-kV lines designed to deliver smaller loads (Curran 1998:1; Kramer 2012:2). In May 1938, Congress's first appropriation of $3.5 million enabled BPA to begin Master Grid network construction.

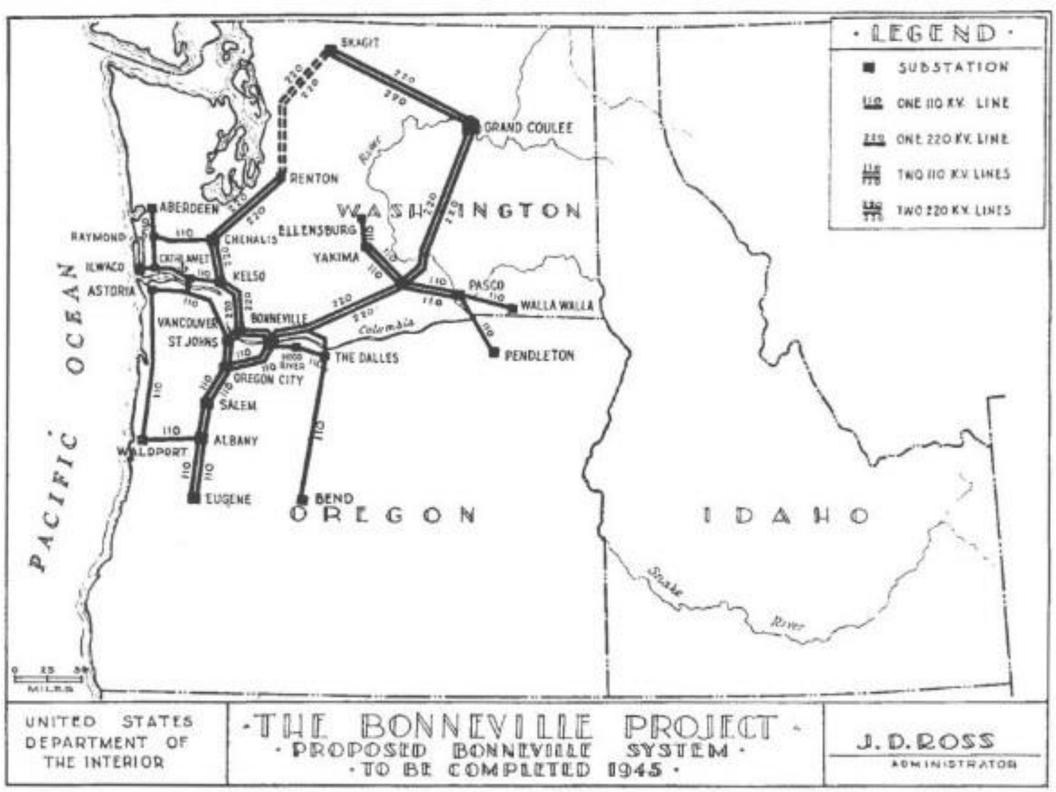


Figure 1. Proposed Bonneville System (BPA 1938:51)

Master Grid Period (1938-1945)

During the Master Grid Period (1938-1945), BPA built 3,000 circuit miles of transmission lines and interconnected with existing public, private, and municipal distribution systems. The system supplied inexpensive Columbia River power to rural communities and attracted major industries to the region (Curran 1998:2, 58).

The Master Grid functioned through a network of high-voltage lines as well as numerous substations and related facilities (Kramer 2012:2). During World War II, the Master Grid network advanced the region's significant wartime industries by supplying power to support shipyard production and to aluminum manufacturing sites for aircraft construction. BPA also powered the Hanford site, where the U.S. produced plutonium used in the atomic bombs dropped on Japan in 1945 (Kramer 2010:5). After the war and the defense industry's decline, BPA power facilitated development of regional agriculture and industry, including timber (Kramer 2010:5). During the Master Grid Period, BPA built about 55 substations; however, some are no longer owned by BPA (Curran 1998:116).

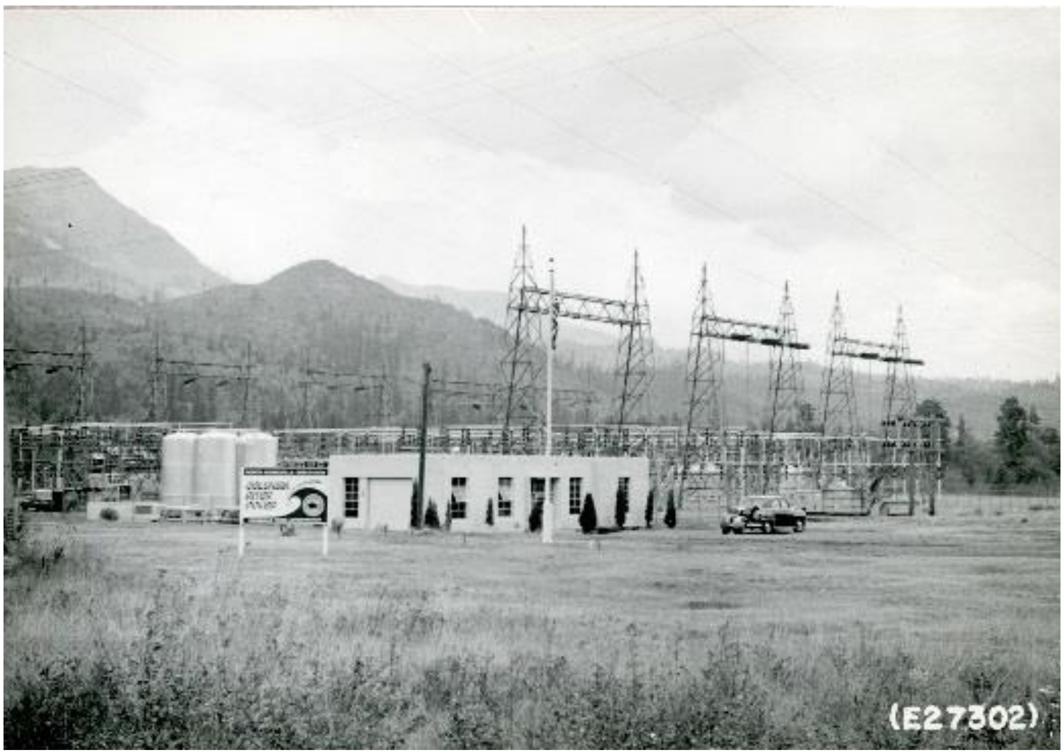


Figure 2. North Bonneville Substation (1951)

System Expansion Period (1946-1974)

During the System Expansion Period (1946-1974), BPA connected new power generation facilities on the Columbia River and its tributaries to help accommodate the region's post-war growth. The Columbia River Treaty (1966) between the U.S. and Canada and development of the Pacific Northwest-Pacific Southwest Intertie enabled BPA to further expand its network and begin marketing excess power to southern California (Kramer 2010:5; Kramer 2012:3). The System Expansion Period ends with the dedication of the Dittmer Control Center's computer-based management systems for power transmission and implementation of Public Law 93-454 that transformed BPA's funding and operation (Kramer 2012:3).

BPA Historic Properties

BPA's two principal historic property types are transmission lines and substations. Microwave radio stations are a secondary historic property type that provides communications functions critical to BPA's grid operations. BPA strategically located substations to direct and control electrical power flow, alternate voltages, and serve as delivery points (Curran 1998:52-53). Substations placed near generating sources such as dams substantially increased transmission voltage. BPA also installed substations that interconnected with other power distribution systems or “where lower-voltage federal ‘finger lines’ disconnected from the main grid.” Midway Substation, halfway between Bonneville and Grand Coulee, regulated voltage along the 234-mile line (Curran 1998:59).

Typical substation buildings are control houses, which contain vital operating equipment; untanking towers, where oil transformers and circuit breakers were cleaned and serviced; oil houses, to hold pumping equipment; condenser buildings, to hold synchronous condensers; storage/shop, materials storage, vehicle maintenance and system repair buildings; and administrative buildings, for regional and/or district headquarters and offices (Kramer 2012). If the substation had only one building, it was a control house. Substations also held transformers, circuit breakers, and capacitors in the switchyard. In a switchyard, buses (aluminum tubes) carry high voltage currents between the yard equipment. Giant steel towers supporting conductor cables serve as the end of line for transmission lines entering the substation (Curran 1998:53).

BPA’s microwave/radio system, established in the 1950s, consisted of “radio station” antenna towers and station buildings erected at high-ground sites, such as ridges and mountain peaks; associated equipment installed at end locations, such as control centers and substations; and devices carried in mobile field units. The radio stations provided instantaneous communication between end locations and with field crews involved in construction or maintenance activities. The newly activated microwave circuits enhanced data transmission functions for power line fault location, supervisory (remote) control of substations, telemetering, and others. The system also integrated communication and controls between BPA and other members of the Northwest Power Pool, an organization of the region's major electrical utilities

BPA’s Standardized Architectural Designs

During the Master Grid Period, BPA prepared basic substation designs comprising standard units with “the design of a specific substation merely requiring the combining of the units involved into one coordinated whole” (BPA 1939:56). The first “unit,” the control house, included “an office for public contact and separate rooms for station service and communication equipment, batteries and controls” (BPA 1939:56). BPA selected construction materials based on durability, safety and expense and incorporated landscaping as an integral part of substation design to “achieve natural, dignified, and pleasing structures” (BPA 1939:57).

Contrasting with the Master Grid Period, the built resources of the System Expansion Period reflected a greater variety of architectural designs. Reflective of the architectural movements of the time, the Streamline Moderne designs of the Master Grid Period became less prominent as the Minimal Traditional and early Modern styles were introduced in the 1940s and 1950s. During the last decade of the System Expansion Period, from 1965 to 1974, BPA applied a series of modern architectural concepts to substation design. Developed by the architecture firm of Stanton, Boles, Maguire and Church, the concepts embodied the period’s modern architectural trends for commercial and industrial buildings. These trends promoted simplification and streamlining, shedding “pretense toward ornamentation in favor of creative use of materials, with exposed aggregate panels, aluminum windows, and simple, boxy forms” (Kramer 2012).

Figure 3. Conkelley Substation (1968)

BPA also issued guidelines for incorporation of their “beautility” program principles. These “Appearance Program Practices” included: 1) site selection to satisfy both engineering and aesthetic considerations; 2) transitions zones to “blend the station into the landscape;” 3) streamlined yard structures with lower profiles; 4) a color system to “unify substation composition,” 5) incorporation of general and accent lighting; 6) “line approaches” to improve the appearance of elements visible to the public; and 7) use of architect-designed buildings (BPA 1966). BPA hired regional architecture firms for new building designs, including Stanton Boles, Maguire and Church, Ralph Appleman, Barnard and Holloway, and H. Zinder. BPA architects, including Dean Wright, George Poole, M. Hartford, C. Tetherow, and Charles Lovett modified and applied these designs to other control house buildings, and also created their own designs for new standard building types.

Figure 4. Murray Substation under construction (1971)

Since its inception, BPA has continually adapted to evolving regional and national priorities by incorporating new electric distribution and management technologies through system upgrades and expansion (Kramer 2012:ii).

Detailed histories for individual substations are provided in substation evaluation reports.

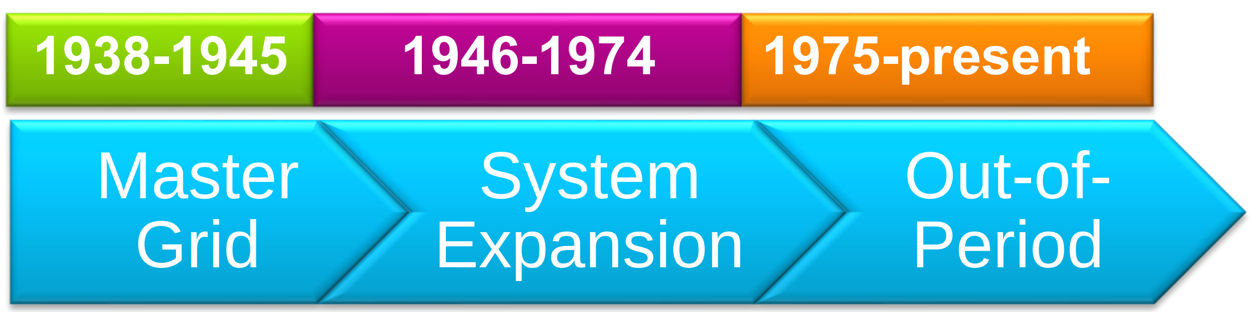
3. HISTORIC SIGNIFICANCE

Since the BPA was created in 1937, it has served an integral role in the development of communities and industries throughout the Pacific Northwest. President Franklin Roosevelt's "New Deal" included a plan to market power from Bonneville Dam, the Columbia River's first federal dam. The construction of the BPA's "Master Grid" transmission network (1938-1945) allowed for the transmission of inexpensive power from the Bonneville and Grand Coulee Dams in Oregon and Washington to urban and rural communities. The network also attracted major industries to the region (Curran 1998:1-2, 58; Kramer 2012:2). During the BPA's first years, it played an important role in national defense, supplying electricity that brought massive industrial development to the region and supporting the U.S. war effort. After World War II, as defense industries closed or converted to peacetime uses, BPA power continued to facilitate the significant development of the region's aluminum, agriculture, and timber industries.

The BPA transmission system is historically significant as the region's primary distributor of electrical power. The system developed in conjunction with community and economic growth throughout the Pacific Northwest and has made significant contributions to the broader history of electrical transmission.

3.1 Period of Significance

BPA's Period of Significance consists of the Master Grid (1938-1945) and System Expansion (1946-1974) periods. Resources constructed during the Master Grid period represent BPA's initial development to provide hydropower from the Bonneville and Grand Coulee Dams to the region, enable rural electrification, and support the World War II-era defense industry. The System Expansion period encompasses BPA's efforts to support population growth and the development of a new industrial base during the Pacific Northwest's postwar expansion (Kramer 2012:39). The Period of Significance ends at 1974 with the dedication of the Dittmer Control Center's computer-based management systems for power transmission and implementation of Public Law 93-454 that transformed BPA's funding and operation (Kramer 2012:3). Substations/assets constructed after 1974 are considered out-of-period and are not treated as historic resources.



3.2 Role of the Multiple Property Documentation Form in Determining Eligibility

The Multiple Property Documentation Form (MPDF) developed by Kramer (2012) provides the framework for evaluating BPA's historic properties and individual assets. The MPDF establishes the historic context for these properties, justifies the periods of significance, defines the associated property types, and identifies how these property types should be evaluated. Property types are categorized as either "eligible" or "ineligible" for the NRHP. An ILS of BPA's historic substations in 2017 used the MPDF to determine the NRHP eligibility of all substations and their assets.

The NRHP is the official list of historic properties recognized as significant to the history of the U.S. at the national, state, or local level. A property is eligible for the NRHP if it meets one of four criteria (listed below) and maintains sufficient historic integrity based on its location, setting, design, materials, workmanship, feeling, and association (see Section 5.1 for information on evaluating historic integrity). In order to be recognized as significant, a property must:

A. be associated with events that have made a significant contribution to the broad patterns of our history;

B. be associated with the life of a person significant in our past;

C. embody the distinctive characteristics of a type, period or method of construction, or represent the work of a master or display high artistic values; or

D. yield, or be likely to yield, information important in prehistory or history (NPS 1997:2).

During the ILS, BPA historic substations and assets found to be significant and retaining historic integrity were determined to be eligible for the NRHP under Criteria A and/or C. Criterion B and D are generally not considered applicable to BPA's historic resources.

Criterion A

Criterion A includes properties that are "…associated with events that have made a significant contribution to the broad patterns of our history." BPA's transmission system represents a massive investment of capital over a period of more than 70 years, creating one of the largest unified electrical transmission networks in the world, a system that today accounts for more than 50 percent of the power distribution in BPA's multi-state service area. Integral to virtually every aspect of economic development in the region, BPA substations, as constructed and modified between 1938 and 1974 and retaining sufficient integrity as defined by the MPDF, are eligible for inclusion in the NRHP under Criterion A for their association with the following areas of significance: (Kramer 2012:37).

AGRICULTURE: association with the expansion or development of irrigation, agricultural production, animal husbandry, or the processing or storage of food stuffs.

This area relates to the BPA's role in the establishment of rural electrical cooperatives and expanded irrigation uses that significantly transformed and expanded agriculture in rural areas.

COMMERCE: association with the development of goods, services and commodities.

INDUSTRY: association with the development of industry, manufacturing, and labor to produce, extract or process goods or services.

BPA's role in the development of regional Commerce and Industry is most clearly demonstrated by its powering of World War II-era shipyards and aluminum plants and, later, supplying power to the postwar aluminum industry. BPA also influenced the development and expansion of sawmills, mineral processing, and other industries dependent upon the availability of low-cost BPA power. These patterns of events reaffirmed BPA as a substantial and enduring economic force in the Pacific Northwest.

POLITICS/GOVERNMENT: association with federal programs or activities, political issues, or the development or expansion of government impacts.

BPA's pivotal role in the development and expansion of public power in the Pacific Northwest is significant, both through the federal Columbia River Power System as well as the establishment and operation of dozens of local public utility districts, rural co-operatives, and municipally owned utilities.

Criterion C

BPA substations/assets are significant under Criterion C for their architectural character and embodiment of BPA's standardized designs in substation development. Individual buildings, particularly control houses, are reflective of the architectural styles employed by BPA during its historic development, including the Streamline Moderne style of 1940s and 1950s, the modernistic buildings in the 1950s and 1960s, and

BPA's "beautility" design concepts of the late 1960s and 1970s. BPA's rapid system expansion necessitated the use of standardized utilitarian designs. Select smaller, utilitarian control houses exemplify BPA's standard aluminum control house types and reflect BPA's expansion in rural areas.

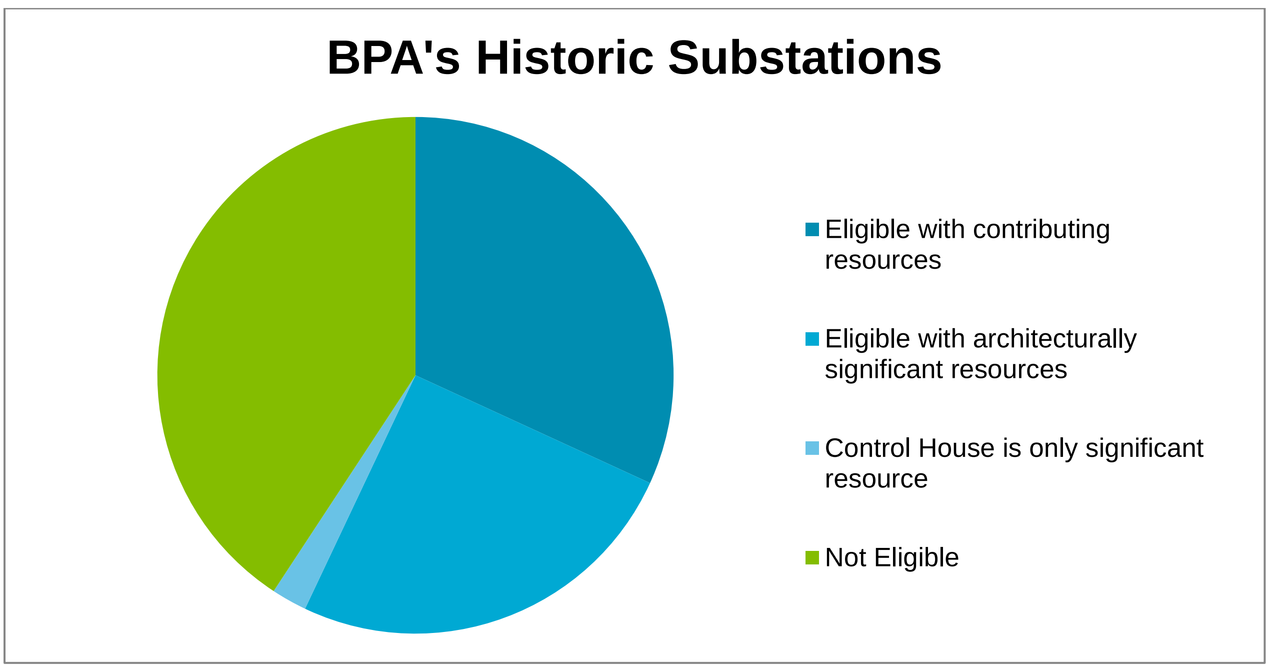
Later substations/assets may also reflect technological advances appropriately evaluated under Criterion C in the area of Engineering (Kramer 2010:109). This area of significance relates to the development of the Master Grid in the 1940s, as well as the later innovations associated with the design and construction of the Pacific Northwest-Pacific Southwest Intertie and the computerized control systems that culminated with the construction of the Dittmer Control Center.

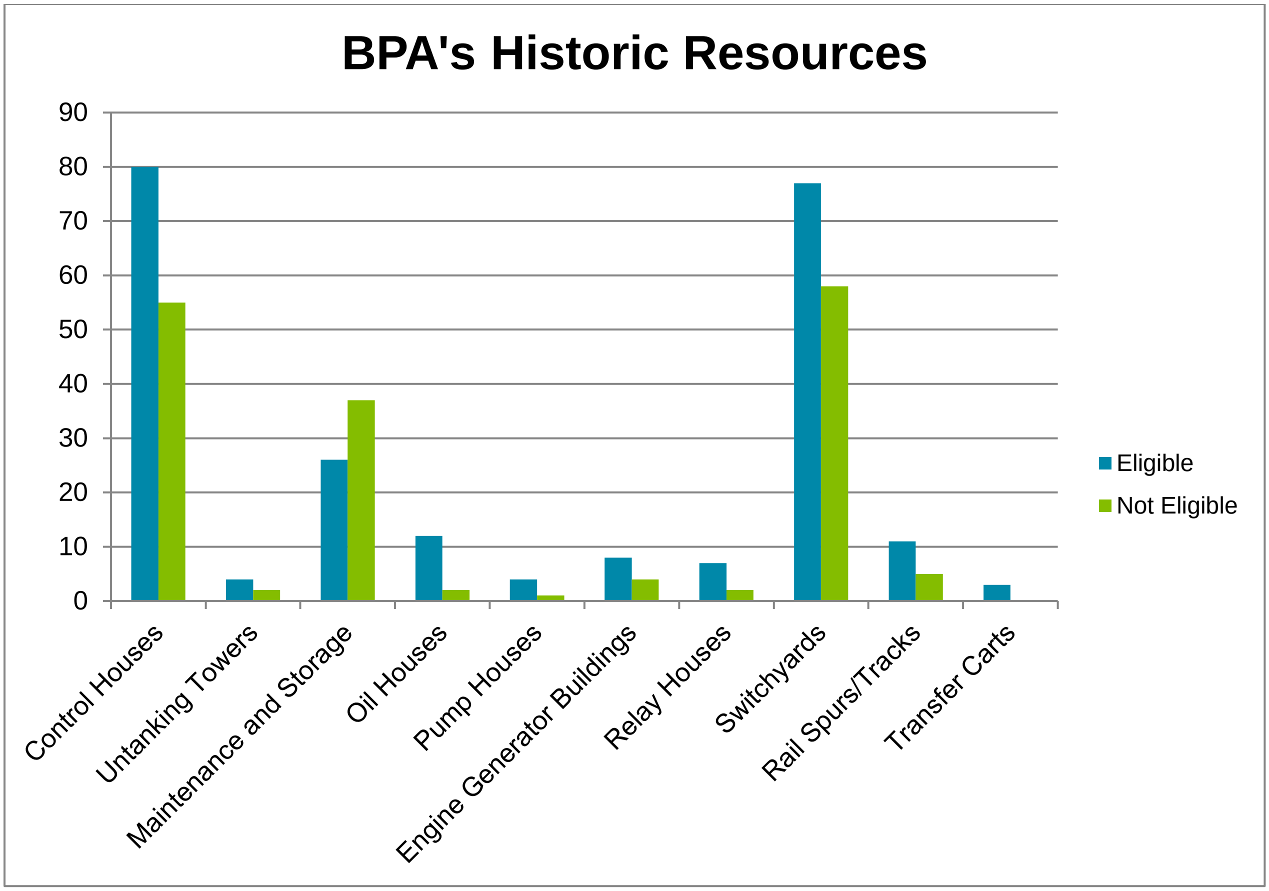
3.3 Intensive Level Survey of Historic Substations

BPA has completed an Intensive Level Survey (ILS) of historic substations built between 1938 and 1974 in Oregon, Washington, Idaho, Montana, and Wyoming. Each substation contains a variety of buildings and structures (assets) and is evaluated for National Register of Historic Places (NRHP) eligibility as a historic district within the larger BPA transmission system. Individual historic period assets are evaluated as either contributing or non-contributing to each district. Some assets are also individually eligible for the NRHP. The historic property evaluations follow the (BPA) Pacific Northwest Transmission System Multiple Property Documentation Form (MPDF) as a framework for evaluation (Kramer 2012).

As a result of the ILS, BPA has completed eligibility determinations for all 135 substations in its current ownership built prior to 1975. Within BPA's substation portfolio, 77 substations are eligible for the NRHP as historic districts, and 58 are not eligible. One district, the Covington Substation is listed in the NRHP. Within the eligible substation historic districts, 36 assets are historically significant for their architectural design. Three individually eligible control houses – Alcoa, Potholes, and Troutdale – are architecturally significant but stand alone as individually eligible resources in districts that are not eligible. The maps provided in Figures 5-9 show NRHP-eligibility for substations built during the period of significance in BPA's North, South, and East Operations and Management regions (Note: No California BPA resources were built during the Period of Significance).

The individual substation ILS reports are available upon request from BPA cultural resource managers. Treatment recommendations are provided for eligible substations and individually eligible assets in Section 6 and Section 7.





The ILS incorporated research from BPA's repositories of scanned historic architectural drawings, photographs, and aerial images, as well as published and unpublished works documenting BPA's history, including books, videos, and maps. BPA's annual reports were reviewed for every year during the period of significance to glean information about development trends within BPA's transmission system, as well as updates for specific substations. Online newspaper articles supplemented the research with information relevant to the development and growth of each substation and its associated industries and communities. Contextual information was added to the ILS reports about significant trends related to specific substations, such as BPA's role in the Pacific Northwest aluminum industry and Beautility design trends BPA employed during the late 1960s and early 1970s. BPA cultural resources staff has gathered and continue to collect agency reports and documents that aid in the historical research process, such as paint schematics, design manuals, maps, and legislation documents.

The ILS closely analyzed BPA's applied standardized design programs used during the Master Grid and System Expansion periods. Almost all of BPA's historic control houses followed standardized architectural designs identified with a number, such as Type 110, Type 144, Type 190, or the Type 2000 series. These designs, particularly for smaller utilitarian control houses, sometimes included plans for expansions or modifications. The ILS analyzed original architectural drawings and artists renditions of BPA's type designs help identify the character defining features of these buildings and assess integrity in a comparative context. Resources that display exceptional integrity were found to be individually eligible under Criterion C as representative examples of their respective design types and BPA's implementation of its architectural programs.

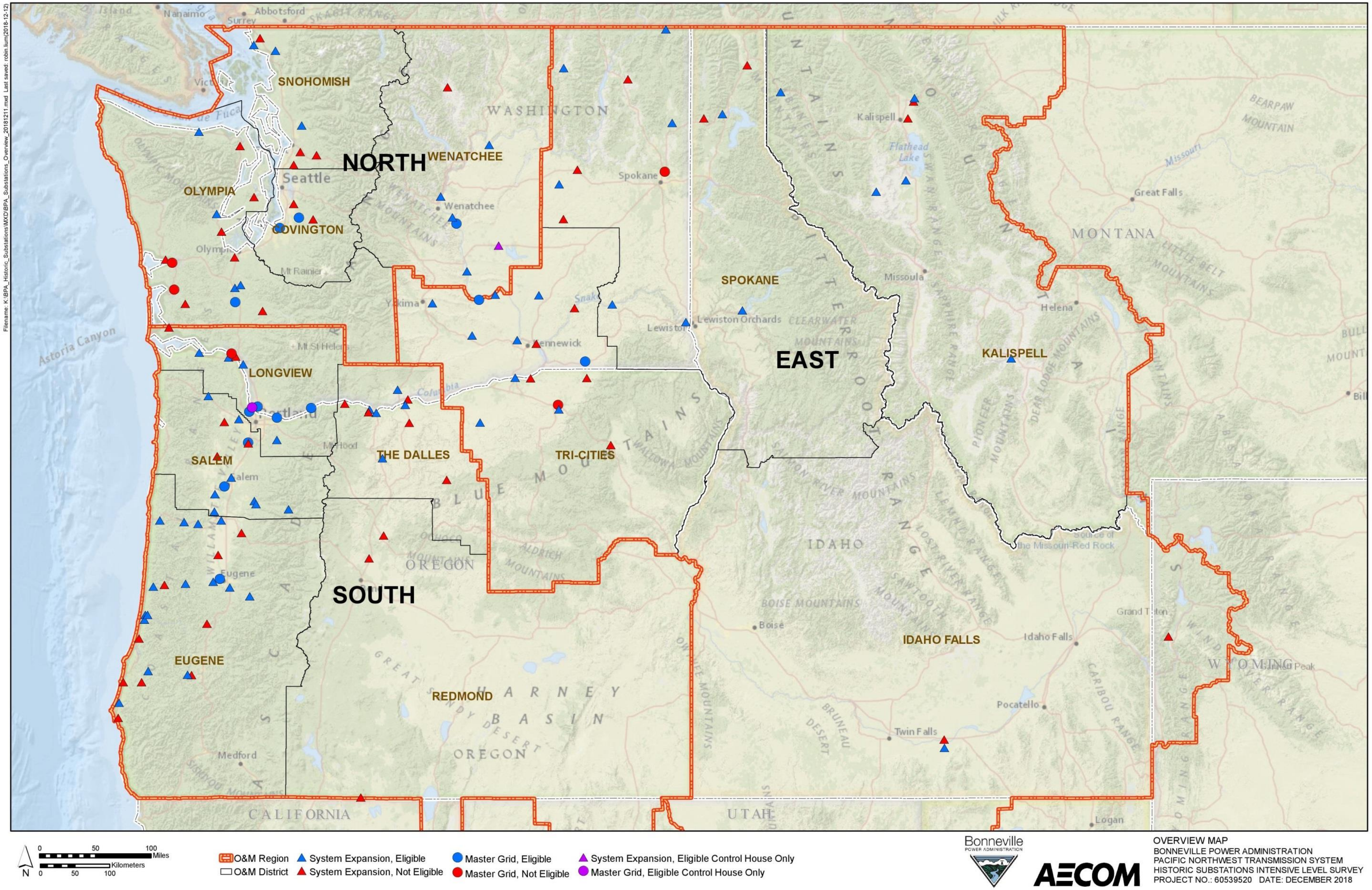


Figure 5. Overall Map of BPA Historic Substations

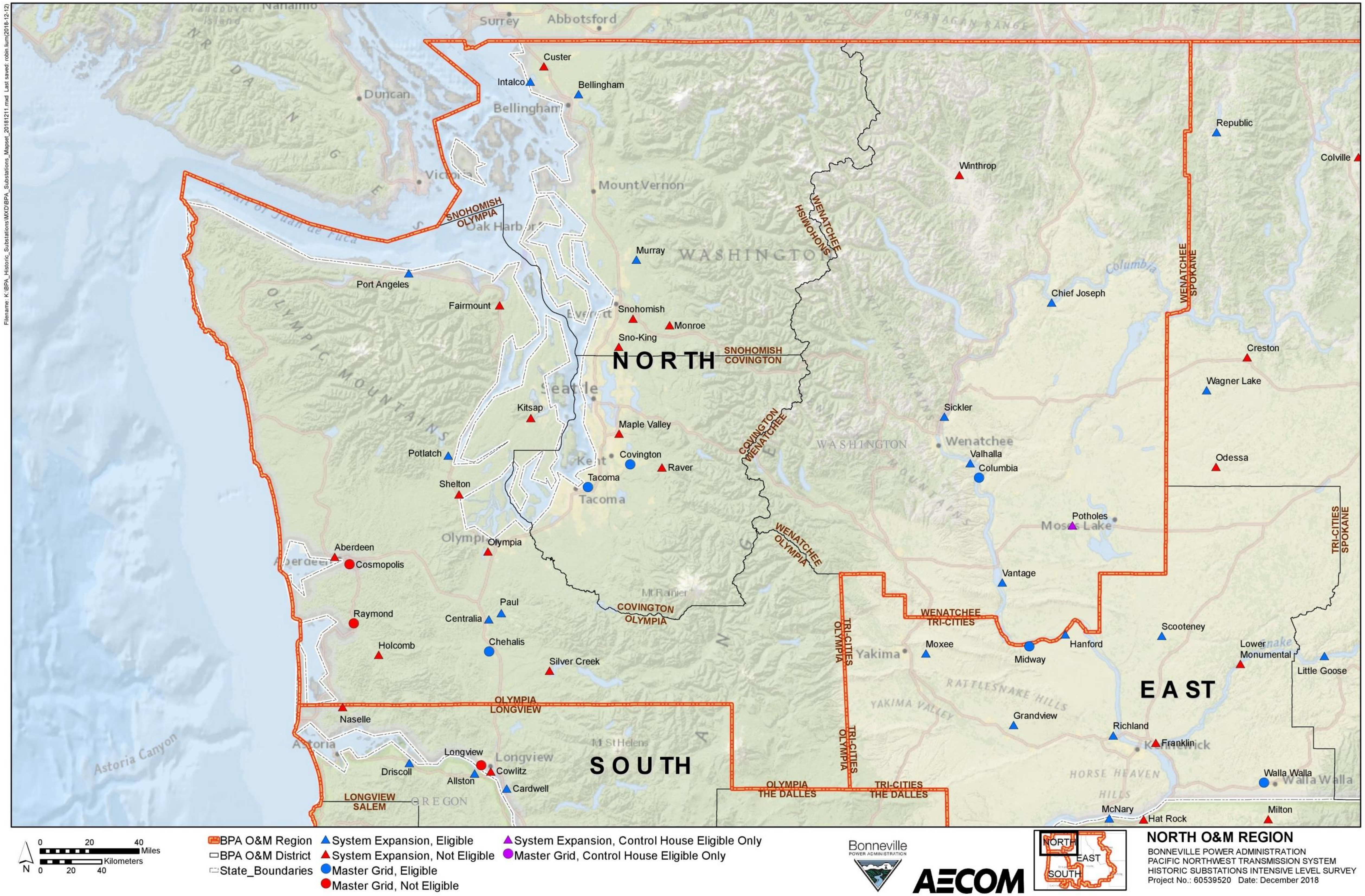


Figure 6. Historic BPA Substations in North Region

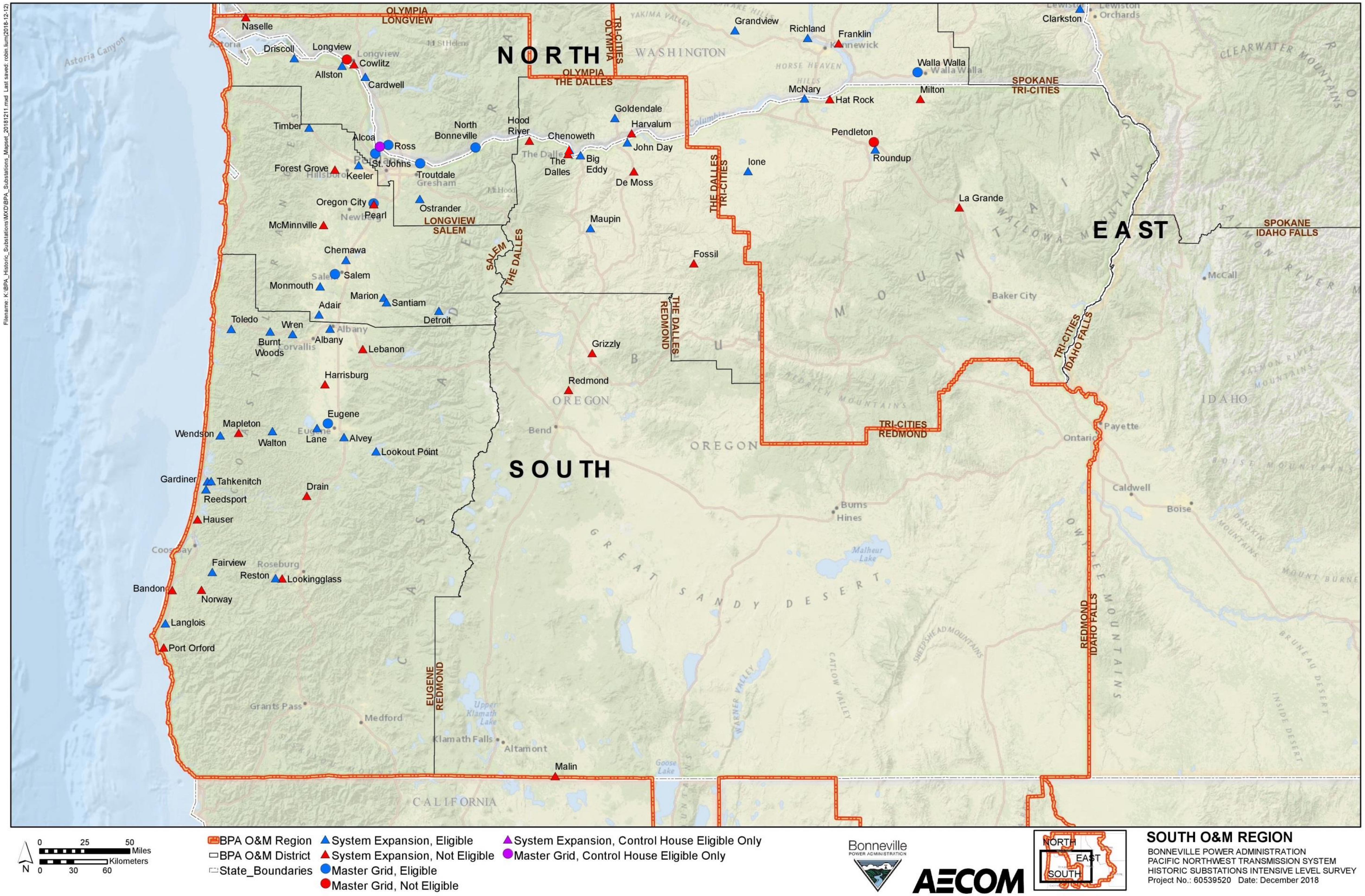


Figure 7. Historic BPA Substations in South Region

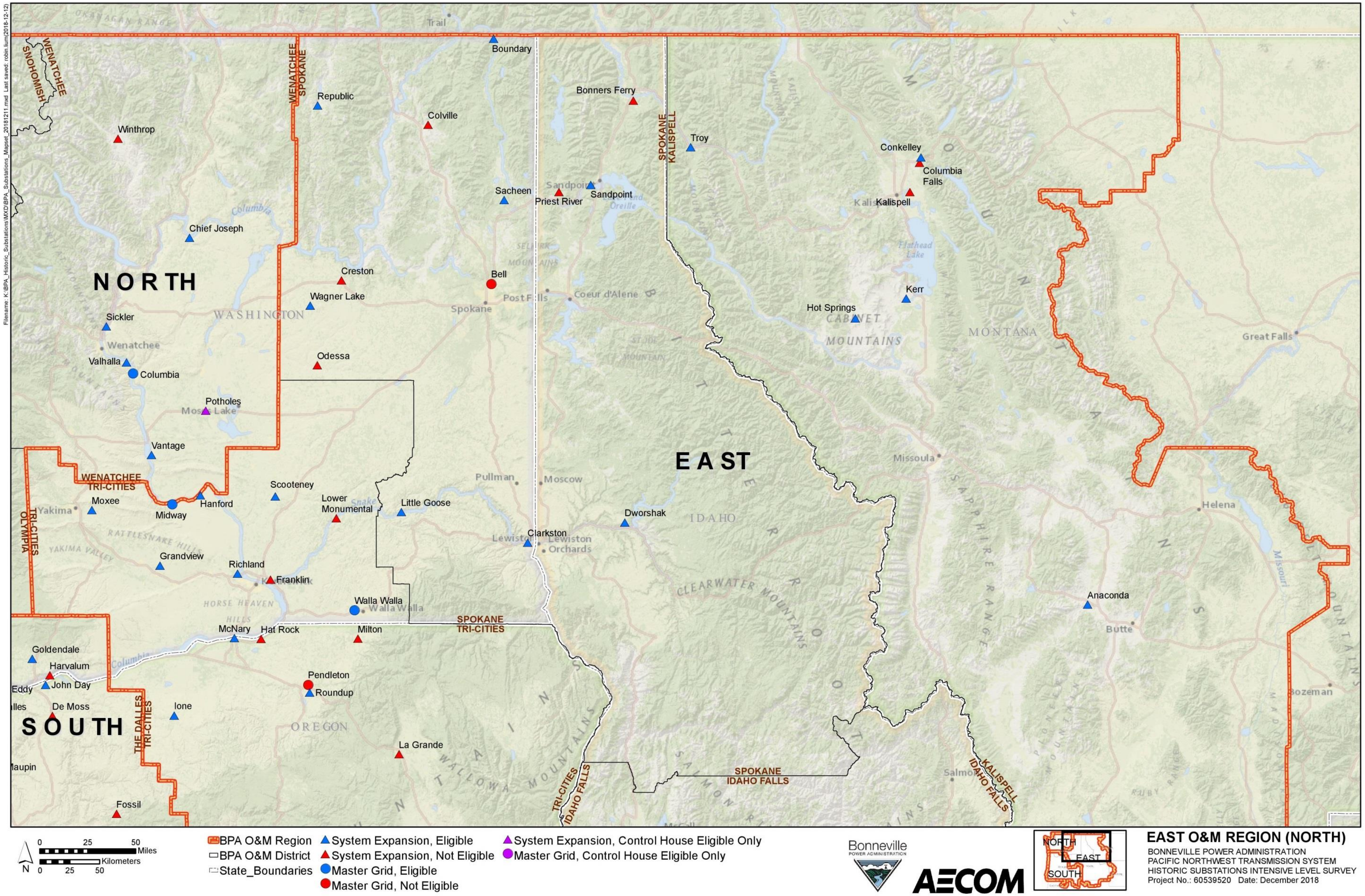


Figure 8. Historic BPA Substations in East Region (North)

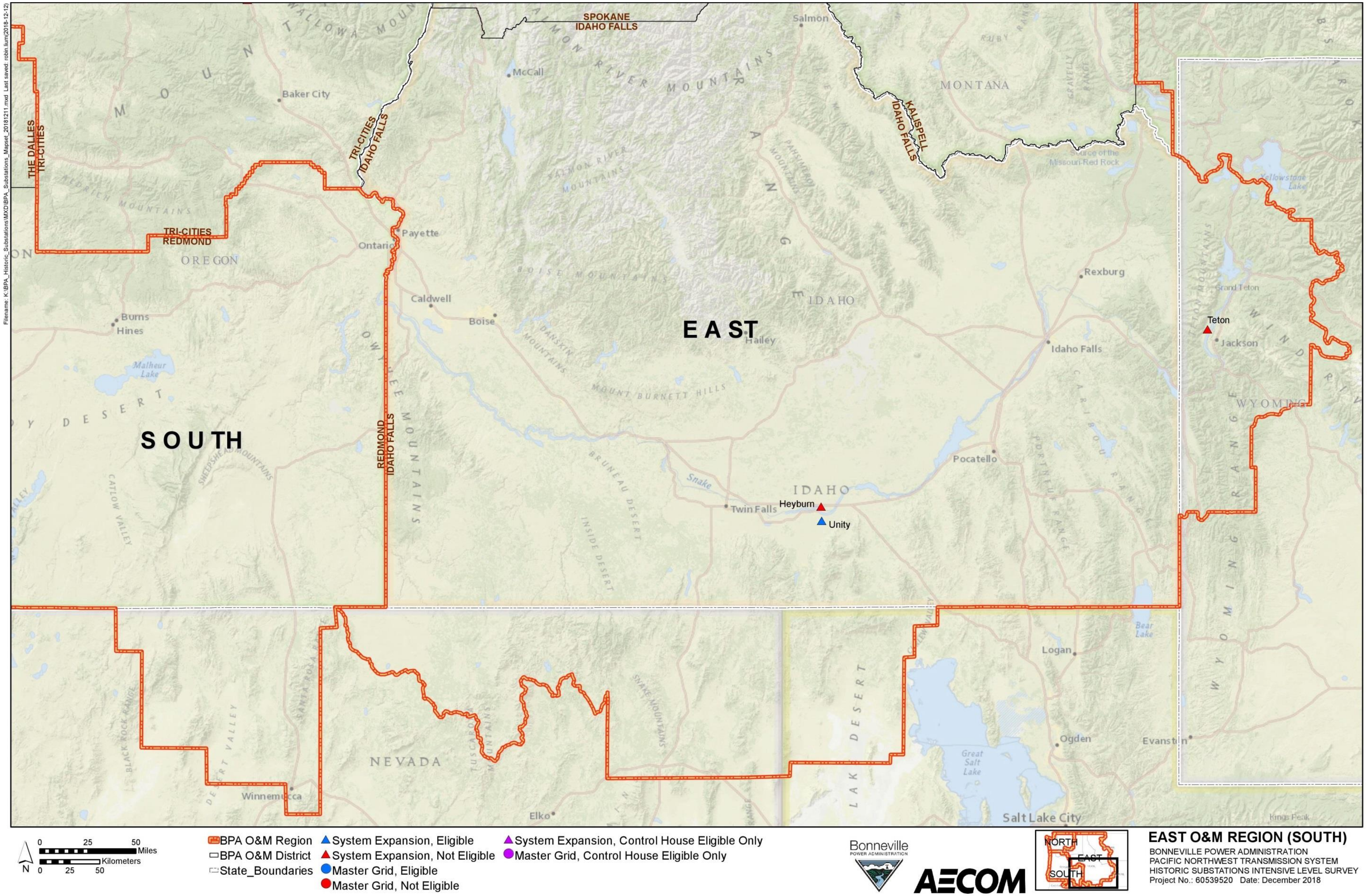


Figure 9. Historic BPA Substations in East Region (South)

4. HISTORIC ASSETS

This section describes the character-defining features of BPA's historic assets and development trends, including the typical architectural styles and design types found within the substations during BPA's Period of Significance. A table of artists' renditions of existing BPA Control Houses is included in Section 6.2. A list of associated eligible/contributing historic assets appears for each substation. The subsections below group BPA assets that follow common historic architectural trends. Many of BPA's assets fall under specific design types developed as part of BPA's architecture program.

4.1 Master Grid Period (1938-1945)

Construction during the Master Grid Period reflects the initial development of BPA's transmission grid and the implementation of BPA's standardized architectural designs and reoccurring stylistic themes. This section includes discussions of control houses, brick buildings, untanking towers, and oil houses, as well as other buildings/structures such as maintenance and storage buildings, pump houses, switchyards, rails and transfer carts, and cable tunnels.

Of BPA's 19 substations built during the Master Grid Period, 13 are eligible for the NRHP as historic districts. The Alcoa, Potholes, and Troutdale Substation Control Houses are also individually eligible, although the substations are not eligible as historic districts.

Table 1. NRHP-Eligible Master Grid Substations

Substation	Date	District	Region	State
Alcoa*	1940	Longview	South	WA
Chehalis	1941	Olympia	North	WA
Columbia	1945	Wenatchee	North	WA
Covington	1942	Covington	North	WA
Eugene	1941	Eugene	South	OR
Midway	1941	Tri-Cities	East	WA
North Bonneville	1941	Longview	South	WA
Oregon City	1941	Salem	South	OR
Ross Complex	1940	Longview	South	WA
Salem	1942	Salem	South	OR
St. Johns	1941	Longview	South	OR
Tacoma	1942	Covington	North	WA
Troutdale*	1943	Longview	South	OR
Walla Walla	1941	Tri-Cities	East	WA

*Control house eligible only

4.1.1 Concrete Streamline Moderne Control Houses (1939-1945)

Nearly all Master Grid substation control houses have one story with either a basement or large crawl space, and feature symmetrical facades, flat roofs, and large multi-pane steel windows. Their simplified classical architectural style is typical of 1930s and early 1940s government buildings. Most Master Grid period control houses had reinforced concrete construction with stucco siding. Two control houses and one maintenance building from that period have steel frame construction with brick cladding. Some of the period's smaller control houses have wood frame construction with wood or aluminum siding and hipped metal roofs. Exterior detail is minimal and consists mostly of brass, cast stone, and glass block elements. Larger substations have more extensive interior architectural details, including brass radiator grilles and light fixtures, marble wainscot and granite window sills. Most have metal lath and plaster over structural tile walls and asphalt tile floors with some interiors illuminated by skylights.

Table 2. Eligible Assets – Master Grid Concrete Streamline Moderne Style Control Houses

Substation	Asset	Date	BPA Design	District	Region	State
Alcoa	Z-950 CONTROL HOUSE	1941	Type 155	Longview	South	WA
Chehalis	Z-959 CONTROL HOUSE	1941	Type 110	Olympia	North	WA
Columbia	Z-962 CONTROL HOUSE	1945	Type 110	Wenatchee	North	WA
Covington	Z-964 CONTROL HOUSE	1942	Type 110	Covington	North	WA
Eugene	Z-940 CONTROL HOUSE	1941	Type 100	Eugene	South	OR
Midway	Z-972 CONTROL HOUSE	1941	Type 110	Tri-Cities	East	WA
North Bonneville	Z-974 CONTROL HOUSE	1941	Type 130	Longview	South	WA
Oregon City	Z-980 CONTROL HOUSE	1943	Type 120	Salem	South	OR
Ross Complex	Z-987 CONTROL HOUSE	1939	Type 109	Longview	South	WA
Salem	Z-936 CONTROL HOUSE / UNTANKING TOWER	1942	Type 105	Salem	South	OR
St. Johns	Z-900 CONTROL HOUSE	1941	Type 110	Longview	South	OR
Walla Walla	Z-884 CONTROL HOUSE	1941	Type 130	Tri-Cities	East	WA

Figure 10. Eugene Substation Control House

4.1.2 Brick Buildings

Two Master Grid substations contain brick-clad buildings. One includes a brick control house (Troutdale) and the other a brick control house and a brick maintenance building (Tacoma). Aside from the distinctive exterior brick cladding, these buildings convey Streamline Moderne architectural style features similar to the concrete buildings from the same era.

Table 3. Eligible Assets – Master Grid Brick Buildings

Substation	Asset	Date	BPA Design	District	Region	State
Tacoma	Z-892 CONTROL HOUSE	1942	Type 150	Covington	North	WA
Tacoma	Z-890 MAINTENANCE	1942	N/A	Covington	North	WA
Troutdale	Z-888 CONTROL HOUSE	1943	Type 150	Longview	South	OR

Figure 11. Tacoma Substation Control House

4.1.3 Untanking Towers

Untanking towers are industrial buildings constructed by BPA to facilitate the on-site maintenance and repair of switchyard equipment at their respective substations (Bruce 1992:5). The untanking towers typically contain the mechanical equipment used to “untank” power transformers, circuit breakers, and other oil-immersed heavy equipment (Curran 1998:99). Untanking towers, like many Master Grid control houses, were constructed in the Streamline Moderne style, but were designed expressly to accommodate specialized equipment. The buildings were around 50 feet tall with full-height interior spaces used for cleaning and servicing large equipment (Curran 1998:55-56). The concrete walls and giant overhead doors display enormous banks of multi-pane steel windows. The interiors historically contained cranes and rigging equipment operated from a crow’s nest located near the ceiling of the tower. The floors contained rails that extended from the transformer pads in the switchyards to the building for transporting equipment (Bruce 1992:5). Untanking towers are a rare resource type, as very few of these buildings remain.

Table 4. Eligible Assets – Master Grid Untanking Towers

Substation	Asset	Date	District	Region	State
Chehalis	Z-960 UNTANKING TOWER	1941	Olympia	North	WA
Covington	Z-965 UNTANKING TOWER	1942	Covington	North	WA
Midway	Z-973 UNTANKING TOWER	1941	Tri-Cities	East	WA
Ross Complex	Z-990 AMPERE BUILDING (UNTANKING TOWER)	1940	Longview	South	WA
Salem	Z-936 CONTROL HOUSE / UNTANKING TOWER	1942	Salem	South	OR

Figure 12. Salem Substation Untanking Tower

4.1.4 Oil Houses

Master Grid oil houses were also constructed in the Streamline Moderne style but were typically small and semi-subterranean. They often feature a poured concrete exterior finished with a concrete-stucco-like texture, flat roof, and multi-light steel and/or glass block windows.

Table 5. Eligible Assets – Master Grid Oil Houses

Substation	Asset	Date	District	Region	State
Columbia	Z-963 STORAGE - OLD OIL HOUSE	1945	Wenatchee	North	WA
North Bonneville	Z-975 STORAGE - OLD OIL HOUSE	1941	Longview	South	WA
Ross Complex	Z-988 STORAGE - OLD OIL HOUSE	1940	Longview	South	WA
Salem	Z-935 OIL HOUSE	1942	Salem	South	OR
St. Johns	Z-899 STORAGE - OLD OIL HOUSE	1941	Longview	South	OR

Figure 13. North Bonneville Substation Oil House

4.1.5 Other Buildings and Structures

Maintenance and Storage Buildings

Many Master Grid substations have maintenance and storage buildings. However, no eligible/contributing assets of this type were built prior to 1946. Therefore, these assets are included in the System Expansion subsection for this asset type (Section 4.2.7.1).

The following Master Grid substations contain eligible maintenance and storage buildings constructed during the System Expansion period (Section 4.2.7.1):

- Columbia
- Covington
- Eugene
- Midway
- Ross Complex
- Salem
- St. Johns
- Walla Walla

Figure 14. Walla Walla Substation Maintenance Building

Pump Houses

Pump houses were built at BPA's Master Grid and System Expansion substations, but all were constructed during the System Expansion Period. They are typically small buildings designed to house pumps. The pumps were used to empty and replace oil from equipment, such as circuit breakers or transformers, during standard filtering and maintenance operations. Pump houses at Master Grid substations commonly display simple concrete block construction, flat roofs, and minimal architectural details.

Two eligible/contributing pump houses were constructed at Master Grid substations (Oregon City and Walla Walla) during the System Expansion Period. Since no eligible/contributing pump houses were constructed during the Master Grid Period, these assets are included with other System Expansion Period buildings in Section 4.2.7.

Figure 15. Oregon City Substation Pump House

Switchyards

Within a substation, a switchyard features a complex arrangement of individual elements that function collectively as the substation's connection to the overall grid as the start and end point of named transmission lines. Switchyards are "designed to control power flow and transform voltages for distribution," and then supply low voltage distribution and/or high voltage transmission lines (Curran 1998:111). The BPA MPDF further describes the role of switchyards within a substation:

> The primary purpose of most substations is to modulate line voltage, stepping it up or down, and, in some cases, feeding distribution lines that connect to consumers (in BPA's case, other utilities or large industrial users). All switchyards include switching mechanisms or circuit breakers that allow line segments to be energized or switched off for maintenance, or automatically as the result of a fault. Substations are typically arrayed around a switchyard, a steel superstructure and buss-construct framing a series of large metal box-like transformers at ground level. Each named line (or circuit) consists of multiple conductors that arrive at the site as one transmission line "terminates" and another begins. Bushings, capacitors, and other electrical equipment are installed within the switchyard to modulate or control power flow (Kramer 2012).

Character-defining features of a switchyard include a vertical superstructure of steel, typically latticework, with dead-end towers, conductors, circuit breakers, insulators, transmission towers, and other electrical equipment that connect transmission lines to a series of grade-mounted transformers, circuit breakers, and switches. Figures 16-18 display photographs identifying the various features of a switchyard.

BPA's earlier switchyards, including those constructed during the Master Grid Period through the early 1950s, may contain elements that are not found in the later System Expansion switchyards. These features include a rectangular box-like steel superstructure, oil circuit breakers, and oil storage tanks.

Nearly all switchyards contain small portable prefabricated aluminum storage sheds to hold oil absorbents and other storage. According to the MPDF, these ubiquitous assets are not considered potentially contributing historic resources due to lack of foundation, temporary nature, and small size (i.e., less than 100 square feet).

No table is provided for the Master Grid switchyards, because this property type is present at each of the eligible Master Grid substation districts in Oregon and Washington. In total, there are 13 eligible switchyards from the Master Grid Period.

Figure 16. St. Johns Substation Switchyard with Lattice Superstructure

Figure 17. Switchyard features

Figure 18. Switchyard features (continued)

Rails and Transfer Carts

The railroad spurs and transfer tracks present at some early Master Grid switchyards are steel rails that lie at surface level and connect power transformer sites to switchyard maintenance areas or untanking towers. Transfer tracks were installed as part of substation development to transport power transformers and other heavy equipment on transfer carts for routine maintenance and installation. A few substations had railroad spur and transfer tracks that diverted from a main railroad line to the substation. Though not previously identified in the MPDF, the transfer track is part of the complex arrangement of assets that functioned within substations and contribute to the overall substation setting. Therefore, they are generally evaluated as contributing to NRHP-eligible substations.

Unused transfer track rails and transfer carts are a visual element that demonstrates how BPA staff moved and serviced transformers at historic substations during the Master Grid and early System Expansion periods. BPA used standard gauge tracks (4 feet 8 ½ inches) to connect to railroad spurs and distinctive broad gauge tracks (9 feet 7 5/8 inches) built only within BPA substations. The rails are supported by wood ties set in crushed rock ballast and covered with asphalt, exposing the rails, cribs (open space around rail) and trench drains.

BPA used steel transfer carts to carry transformers and other heavy loads on fixed transfer tracks from the switchyard into substation maintenance areas and/or untanking towers (Curran 1998:111). The transfer cart was integral to the transfer track's function and the maintenance of switchyard equipment. Transfer carts have flat open steel decks that rest on wheel rail conveyors to glide along the transfer tracks. Though not previously identified in the MPDF or BPA's asset database, transfer carts located within substation boundaries are generally evaluated as contributing to NRHP-eligible substations.

Table 6. Eligible Assets – Master Grid Rails and Transfer Carts

Substation	Asset	Date	District	Region	State
Chehalis	TRANSFER TRACK	1945	Olympia	North	WA
Chehalis	TRANSFER CART	1945	Olympia	North	WA
Midway	Z-0000 RAILROAD	1941	Tri-Cities	East	WA
Midway	TRANSFER CART	1941	Tri-Cities	East	WA
Oregon City	Z-0000 RAILROAD	1943	Salem	South	OR
Salem	Z-8175 RAILROAD	1942	Salem	South	OR
St. Johns	RAILROAD	1941	Longview	South	OR
St. Johns	TRANSFER CART	1941	Longview	South	OR

Figure 19. Midway Substation Railroad

Cable Tunnels

Many substations contain a cable tunnel that houses multiple cables extending from a switchyard to a control house basement. Although it is more common at System Expansion substations, some Master Grid control houses have interior basement doors for accessing the concrete-lined underground cable tunnels. The tunnel exits via a stairway into the switchyard. Cable runs are also used to install cable between a control house and a switchyard.

BPA considers cable tunnels to be underground contributing features of a switchyard, but the ILS did not evaluate them as individual resources. The MPDF does not address cable tunnels, although they are frequently (not exclusively) considered BPA assets. Many substations contain a cable tunnel that houses multiple cables extending from a switchyard to a control house basement. Several control houses have interior basement doors for accessing the concrete-lined underground cable tunnels. The tunnel exits via a stairway into the switchyard. Although they are not evaluated as individual historic resources, cable tunnels constitute an important underground characteristic of the switchyard and alterations to these elements could still adversely affect the switchyard and would require review under Section 106.

Figure 20. Cable tunnel and cable run at Midway Substation (left) and St Johns Substation (right)

4.2 System Expansion Period (1946-1974)

During the System Expansion Period, BPA introduced Modernism, modularity, rapid expansion, and increasingly standardized plans and repeated designs into substation development. The System Expansion Period is characterized by the influence of Modernism and the Minimal Traditional, Modern, International, and Contemporary architectural styles. During this period, BPA intensified its use of concrete in building construction and minimized its application of architectural details.

The construction of smaller utilitarian control houses and associated buildings marked BPA's rapid expansion during this period. These aluminum buildings convey BPA's repeated application of standardized control house designs for swift construction throughout BPA's transmission system.

Many of BPA's earliest and smallest System Expansion control houses were constructed of wood (Type 161 buildings). Intended for temporary use, none of the wooden control houses remain.

Of BPA's 116 substations built during the System Expansion Period, 65 are eligible for the NRHP as historic districts. The Potholes Substation Control House is also individually eligible, although the substation is not eligible as a historic district.

Table 7. NRHP-Eligible System Expansion Substations

Substation	Date	District	Region	State
Adair	1969	Salem	South	OR
Albany	1954	Eugene	South	OR
Allston	1969	Longview	South	OR
Alvey	1950	Eugene	South	OR

Substation	Date	District	Region	State
Anaconda	1953	Kalispell	East	MT
Bellingham	1954	Snohomish	North	WA
Big Eddy	1956	The Dalles	South	OR
Boundary	1967	Spokane	East	WA
Burnt Woods	1954	Eugene	South	OR
Cardwell	1963	Longview	South	WA
Centralia	1950	Olympia	North	WA
Chemawa	1954	Salem	South	OR
Chief Joseph	1958	Wenatchee	North	WA
Clarkston	1958	Spokane	East	WA
Conkelley	1968	Kalispell	East	MT
Detroit	1952	Salem	South	OR
Driscoll	1966	Longview	South	OR
Dworshak	1973	Spokane	East	ID
Fairview	1958	Eugene	South	OR
Gardiner	1963	Eugene	South	OR
Goldendale	1957	The Dalles	South	WA
Grandview	1947	Tri-Cities	East	WA
Hanford	1970	Tri-Cities	East	WA
Hot Springs	1953	Kalispell	East	MT
Intalco	1966	Snohomish	North	WA
Ione	1949	Tri-Cities	East	OR
John Day	1968	The Dalles	South	OR
Keeler	1956	Salem	South	OR
Kerr	1948	Kalispell	East	MT
Lane	1966	Eugene	South	OR
Langlois	1957	Eugene	South	OR
Little Goose	1970	Spokane	East	WA
Lookout Point	1954	Eugene	South	OR
Marion	1970	Salem	South	OR
Maupin	1974	The Dalles	South	OR
McNary	1954	Tri-Cities	East	OR

Substation	Date	District	Region	State
Monmouth	1954	Salem	South	OR
Moxee	1954	Tri-Cities	East	WA
Murray	1972	Snohomish	North	WA
Ostrander	1970	Longview	South	OR
Paul	1971	Olympia	North	WA
Port Angeles	1950	Olympia	North	WA
Potlatch	1960	Olympia	North	WA
Reedsport	1957	Eugene	South	OR
Republic	1953	Spokane	East	WA
Reston	1960	Eugene	South	OR
Richland	1949	Tri-Cities	East	WA
Roundup	1954	Tri-Cities	East	OR
Sacheen	1973	Spokane	East	WA
Sandpoint	1950	Spokane	East	ID
Santiam	1954	Salem	South	OR
Scooteney	1953	Tri-Cities	East	WA
Sickler	1968	Wenatchee	North	WA
Tahkenitch	1963	Eugene	South	OR
Timber	1955	Salem	South	OR
Toledo	1958	Eugene	South	OR
Troy	1953	Kalispell	East	MT
Unity	1967	Idaho Falls	East	ID
Valhalla	1953	Wenatchee	North	WA
Vantage	1963	Wenatchee	North	WA
Wagner Lake	1974	Spokane	East	WA
Walton	1949	Eugene	South	OR
Wendson	1973	Eugene	South	OR
Wren	1947	Eugene	South	OR

4.2.1 Concrete Streamline Moderne Control Houses (1946-1953)

Concrete Streamline Moderne control houses constructed during the System Expansion Period have the same plan and design types as those constructed during the Master Grid Period. These control houses had one story with either a basement or large crawl space, and featured symmetrical facades, flat roofs, and large multi-pane steel sash windows in a simplified classical architectural style typical of government buildings during this period. Most had reinforced concrete construction with stucco siding. Exterior decoration was minimal and consisted mostly of brass, cast stone, and glass block elements. Larger substations had more extensive interior architectural details, including brass radiator grilles and light fixtures, marble wainscot, and granite window sills. Most had metal lath and plaster over structural tile walls and asphalt tile floors with some exhibiting interior spaces illuminated by skylights.

Table 8. Eligible Assets – System Expansion Streamline Moderne Style Control Houses

Substation	Asset	Date	BPA Design	District	Region	State
Port Angeles	Z-982 CONTROL HOUSE	1950	Type 100-2	Olympia	North	WA
Valhalla	Z-886 CONTROL HOUSE	1953	Type 135	Wenatchee	North	WA

Figure 21. Valhalla Substation Control House

4.2.2 Oil Houses

During the System Expansion period, BPA continued to implement the same semi-subterranean concrete design for oil houses used during the Master Grid period. However, utilitarian above-ground designs became more prominent and typically featured steel-frame construction, vertical inverted seam aluminum siding, front gable roof, and multi-light steel windows.

Table 9. Eligible Assets – System Expansion Oil Houses

Substation	Asset	Date	Material	District	Region	State
Port Angeles	Z-983 OIL HOUSE	1950	Concrete	Olympia	North	WA
Valhalla	Z-885 OIL HOUSE	1953	Concrete	Wenatchee	North	WA
Chief Joseph	Z-828 OIL HOUSE	1956	Aluminum	Wenatchee	North	WA
Fairview	Z-381 OIL HOUSE	1958	Aluminum	Eugene	South	OR
Franklin	Z-967 OIL HOUSE	1953	Concrete	Tri-Cities	East	WA
Keeler	Z-817 OIL HOUSE	1957	Aluminum	Salem	South	OR
Olympia	Z-1201 OIL HOUSE	1956	Concrete	Olympia	North	WA

Substation	Asset	Date	Material	District	Region	State
Santiam	Z-842 OIL HOUSE	1954	Concrete	Salem	South	OR
Starr Complex	Z-821 OIL HOUSE	1956	Aluminum	The Dalles	South	OR

Figure 22. Chief Joseph Substation Oil House

4.2.3 Minimal Traditional Buildings (1953-1968)

Minimal Traditional-style buildings became a common control house design during the System Expansion Period. These buildings typically featured a one-story rectangular plan, concrete construction, gable or hipped roof, and minimal architectural details.

Table 10. Eligible Assets – System Expansion Minimal Traditional Buildings

Substation	Asset	Date	BPA Design	District	Region	State
Albany	Z-939 CONTROL HOUSE	1954	None	Eugene	South	OR
Cardwell	Z-756 CONTROL HOUSE	1963	Type 144-1	Longview	South	WA
Driscoll	Z-724 CONTROL HOUSE	1968	Type 2007	Longview	South	OR
Grandview	Z-852 CONTROL HOUSE	1954	Type 143	Tri-Cities	East	WA
Lookout Point	Z-832 CONTROL HOUSE	1954	Type 166	Eugene	South	OR
Reedsport	Z-804 CONTROL HOUSE	1957	Type 165-1	Eugene	South	OR
Roundup	Z-844 CONTROL HOUSE	1954	Type 165	Tri-Cities	East	OR
Tahkenitch	Z-753 CONTROL HOUSE	1963	Type 144-1	Eugene	South	OR

Figure 23. Roundup Substation Control House

4.2.4 Early Modern Concrete Buildings (1953-1964)

During the System Expansion Period, Modernism influenced control house designs. BPA's early iterations of Modern-style control houses were one-story concrete buildings with asymmetrical plans and minimal decorative features. The designs emphasized clean lines, basic forms, and rectangular shapes. The Little Goose Control House, though constructed in 1970, features design characteristics best aligned with this grouping.

Table 11. Eligible Assets – System Expansion Early Modern Concrete Buildings

Substation	Asset	Date	BPA Design	District	Region	State
Anaconda	Z-951 CONTROL HOUSE	1953	Type 145	Kalispell	East	MT
Bellingham	Z-840 CONTROL HOUSE	1955	Type 111	Snohomish	North	WA
Chemawa	Z-934 CONTROL HOUSE	1954	Type 125	Salem	South	OR
Chief Joseph	Z-829 CONTROL HOUSE	1956	Type 187	Wenatchee	North	WA
Fairview	Z-807 CONTROL HOUSE	1958	Type 111	Eugene	South	OR
Hot Springs	Z-968 CONTROL HOUSE	1953	Type 145	Kalispell	East	MT
Keeler	Z-818 CONTROL HOUSE	1957	Type 121	Salem	South	OR
Little Goose	Z-707 CONTROL HOUSE	1970	Type 2012	Spokane	East	WA
McNary	Z-836 CONTROL HOUSE	1954	Type 185	Tri-Cities	East	OR
Moxee	Z-855 CONTROL HOUSE	1954	Type 111-1	Tri-Cities	East	WA
Potholes	Z-800 CONTROL HOUSE	1958	Type 113	Wenatchee	North	WA
Santiam	Z-843 CONTROL HOUSE	1954	Type 126	Salem	South	OR

Substation	Asset	Date	BPA Design	District	Region	State
Starr Complex	Z-824 BIG EDDY 230KV CONTROL HOUSE	1956	Type 186	The Dalles	South	OR
Toledo	Z-808 CONTROL HOUSE	1958	Type 112	Eugene	South	OR
Vantage	Z-754 CONTROL HOUSE	1964	Type 115	Wenatchee	North	WA

Figure 24. Fairview Substation Control House

Figure 25. Little Goose Substation Control House

4.2.5 Modern Beautility Inspired Buildings (1965-1974)

During the late System Expansion Period, modern and “beautility” inspired designs became more common for control houses and maintenance facilities. These designs featured simple boxy forms, unified color schemes, creative uses of materials, exposed aggregate panels, general and accent lighting, and other design elements intended to better incorporate the substation into the existing landscape. Architect-designed buildings also became more common. Following broader architectural trends, BPA’s designed control houses express International, Brutalist, and Contemporary architectural styles.

International

The International architectural style became a prominent design for BPA control houses and maintenance facilities during the mid- to late 1960s. International architectural style is characterized by asymmetrical horizontal lines, a flat roof, curtainwall construction, a smooth unornamented surface, and flush window openings.

Table 12. Eligible Assets – System Expansion International Style Buildings

Substation	Asset	Date	BPA Design	District	Region	State
Boundary	Z-741 CONTROL HOUSE	1967	Type 2009	Spokane	East	WA
Conkelley	Z-722 CONTROL HOUSE	1968	Type 2005	Kalispell	East	MT
Intalco	Z-748 CONTROL HOUSE	1966	Type 181	Snohomish	North	WA
John Day	Z-723 MAINTENANCE	1968	N/A	The Dalles	South	OR
John Day	Z-737 CONTROL HOUSE	1968	Type 2000	The Dalles	South	WA
Lane	Z-742 CONTROL HOUSE	1966	Type 2002	Eugene	South	OR
Sickler	Z-713 CONTROL HOUSE	1969	Type 2006	Wenatchee	North	WA
Starr Complex	Z-704 CELILO DC CONVERTER STATION CONTROL HOUSE	1970	Type 907	The Dalles	South	OR

Figure 26. John Day Substation Control House

Modern/Brutalist

The Modern/Brutalist architectural style became another popular design for control houses and maintenance buildings in 1970-1971. The style is characterized by its concrete construction, repeated modular narrow windows, limited applied detail, and simple form.

Table 13. Eligible Assets – System Expansion Modern/Brutalist Style Buildings

Substation	Asset	Date	BPA Design	District	Region	State
Alston	Z-710 CONTROL HOUSE / MAINTENANCE	1969	Type 2010	Longview	South	OR
Marion	Z-709 CONTROL HOUSE / MAINTENANCE	1970	Type 2008	Salem	South	OR
Ostrander	Z-711 CONTROL HOUSE/MAINTENANCE	1970	Type 2008	Longview	South	OR
Ross Complex	Z-695 DITTMER CONTROL CENTER	1971	N/A	Longview	South	WA

Figure 27. Alston Substation Control House

Figure 28. Dittmer Control Center, Ross Complex

Modern Contemporary

The Modern Contemporary architectural style reflects BPA's emphasis on beautility from the mid-1960s to early 1970s. Represented in a few control houses and maintenance buildings, the Modern Contemporary architectural style is typically expressed through its asymmetrical form, exposed steel structural elements, low-pitched cross gable roof with wide airplane eave overhangs, glazed gables, glass and brick materials, recessed entrance, and interior circular staircase.

Table 14. Eligible Assets – System Expansion Modern/Contemporary Style Buildings

Substation	Asset	Date	District	Region	State
Hanford	Z-703 CONTROL HOUSE / MAINTENANCE	1970	Tri-Cities	East	WA
Murray	Z-699 CONTROL HOUSE	1972	Snohomish	North	WA
Paul	Z-702 CONTROL HOUSE / MAINTENANCE	1971	Olympia	North	WA

Figure 29. Paul Substation Control House/Maintenance Building

4.2.6 Utilitarian Aluminum Control Houses (1948-1969)

The Utilitarian aluminum control house is the most common design applied during the System Expansion Period, particularly for small, rural substations. This design epitomizes BPA's repeated use of design types. BPA also designed several modifications to these control house types to increase the square footage as needed. The modular aluminum control houses are relatively small with a Utilitarian architectural style characterized by an emphasis on function over design, minimal applied detail, one-story form, and simple entrances and windows.

Table 15. Eligible Assets – System Expansion Utilitarian Aluminum Control Houses

Substation	Asset	Date	BPA Design	District	Region	State
Adair	Z-465 CONTROL HOUSE	1969	Type 193	Salem	South	OR
Burnt Woods	Z-213 CONTROL HOUSE	1954	Type 191	Eugene	South	OR
Centralia	Z-50 CONTROL HOUSE	1966	Type 190	Olympia	North	WA
Clarkston	Z-292 CONTROL HOUSE	1958	Type 192	Spokane	East	WA
Detroit	Z-77 CONTROL HOUSE	1952	Type 190	Salem	South	OR
Gardiner	Z-363 CONTROL HOUSE	1964	Type 193	Eugene	South	OR
Goldendale	Z-301 CONTROL HOUSE	1957	Type 192	The Dalles	South	WA
Ione	Z-117 CONTROL HOUSE	1950	Type 190	Tri-Cities	East	OR
Kerr	Z-130 CONTROL HOUSE	1948	Type 161	Kalispell	East	MT
Langlois	Z-291 CONTROL HOUSE	1957	Type 192	Eugene	South	OR
Maupin	Z-521 CONTROL HOUSE	1974	Type 193	The Dalles	South	OR
Monmouth	Z-179 CONTROL HOUSE	1954	Type 190	Salem	South	OR
Potlatch	Z-323 CONTROL HOUSE	1961	Type 193	Spokane	East	ID
Republic	Z-236 CONTROL HOUSE	1953	Type 192	Spokane	East	WA

Substation	Asset	Date	BPA Design	District	Region	State
Reston	Z-326 CONTROL HOUSE	1960	Type 193	Eugene	South	OR
Richland	Z-162 CONTROL HOUSE	1949	Type-190	Tri-Cities	East	WA
Sandpoint	Z-89 CONTROL HOUSE	1950	Type 190	Spokane	East	ID
Scooteney	Z-199 CONTROL HOUSE	1953	Type 162	Tri-Cities	East	WA
Timber	Z-245 CONTROL HOUSE	1955	Type 192	Salem	South	OR
Troy	Z-238 CONTROL HOUSE	1954	Type 192	Kalispell	East	MT
Unity	Z-391 CONTROL HOUSE	1969	Type 193	Idaho Falls	East	ID
Walton	Z-20 CONTROL HOUSE	1949	Type 190	Eugene	South	OR
Wren	Z-87 CONTROL HOUSE	1961	Type 190	Eugene	South	OR

Figure 30. Clarkston Substation Control House

4.2.7 Utilitarian Control Houses (1970-present)

Beginning in the 1970s, BPA transitioned from the standardized design types for its Utilitarian-style control houses, to designs with more architectural variation. Although BPA's 1970s Utilitarian-style control houses displayed features common to standardized Utilitarian-style models, such as emphasis on function over design, minimal applied detail, one-story form, and simple entrances and windows, no two designs were repeated. The 1970s designs reflect an emphasis on inexpensive, durable materials, such as corrugated metal, and minimal architectural details. This shift also marked a distinct contrast with the beautility inspired buildings constructed during the same period.

Table 16. Eligible Assets – System Expansion 1970s Utilitarian Control Houses

Substation	Asset	Date	District	Region	State
Dworshak	Z-692 CONTROL HOUSE	1973	Spokane	East	ID

Substation	Asset	Date	District	Region	State
Sacheen	Z-685 CONTROL HOUSE	1973	Spokane	East	WA
Wagner Lake	Z-516 CONTROL HOUSE	1974	Spokane	East	WA
Wendson	Z-689 CONTROL HOUSE	1973	Eugene	South	OR

Figure 31. Dworshak Substation Control House

4.2.8 Other

Control houses and pump houses smaller than 100 square feet contribute to the substation as a whole and were evaluated as resources, but aluminum storage sheds (i.e. oil absorbent buildings), crates, and outhouses were not.

Maintenance and Storage Buildings

Maintenance and storage buildings are common in System Expansion period substations. They vary in size and architectural complexity but reflect Utilitarian-style inspirations. Maintenance buildings are typically larger and more architecturally complex than the smaller prefabricated aluminum buildings.

The ILS did not evaluate aluminum storage sheds (i.e. oil absorbent buildings), crates, or outhouses. Only permanent storage and shop buildings of substantial size are covered by the MPDF and MBR unless buildings of smaller size contribute significantly to the integrity of the substation as a whole (Kramer 2012 F-59).

The eligible/contributing maintenance and storage buildings constructed at Master Grid substations during the System Expansion period are listed below.

Table 17. Eligible Assets – System Expansion Maintenance and Storage Buildings

Substation	Asset	Date	Material	District	Region	State
Alvey	Z-945 CSE BUILDING	1951	Concrete Block	Eugene	South	OR
Alvey	Z-944 MAINTENANCE	1952	Corrugated Metal	Eugene	South	OR
Alvey	Z-943 AUTOMOTIVE SHOP	1953	Concrete Block	Eugene	South	OR

Substation	Asset	Date	Material	District	Region	State
Alvey	Z-771 AUTOMOTIVE STORAGE	1959	Corrugated Metal	Eugene	South	OR
Anaconda	Z-330 STORAGE	1957	Aluminum	Kalispell	East	MT
Anaconda	Z-684 MAINTENANCE / VEHICLE STORAGE T-SHAPED	1974	Wood	Kalispell	East	MT
Columbia	Z-750 MAINTENANCE	1965	Concrete	Wenatchee	North	WA
Conkelley	Z-427 STORAGE	1970	Aluminum	Kalispell	East	MT
Conkelley	Z-696 MAINTENANCE	1973	Corrugated Metal	Kalispell	East	MT
Covington	Z-966 HMEM SHOP	1953	Concrete	Covington	North	WA
Covington	Z-778 COMMUNICATION BUILDING	1958	Concrete Block	Covington	North	WA
Covington	Z-770 AUTOMOTIVE STORAGE	1959	Steel	Covington	North	WA
Covington	Z-766 MAINTENANCE WAREHOUSE	1960	Corrugated Metal	Covington	North	WA
Covington	Z-409 STORAGE	1967	Aluminum	Covington	North	WA
Eugene	Z-941 STORAGE	1952	Concrete Block	Eugene	South	OR
Eugene	Z-287 STORAGE SHED	1952	Aluminum	Eugene	South	OR
Fairview	Z-378 STORAGE	1958	Aluminum	Eugene	South	OR
Hot Springs	Z-837 AUTOMOTIVE SHOP	1954	Corrugated Metal	Kalispell	East	MT
Little Goose	Z-694 MAINTENANCE	1970	Corrugated Metal	Spokane	East	WA
McNary	Z-452 STORAGE	1968	Corrugated Metal	Tri-Cities	East	OR
Midway	Z-626 FLAMMABLE STORAGE	1954	Corrugated Metal	Tri-Cities	East	WA
Port Angeles	Z-984 MAINTENANCE	1950	Concrete	Olympia	North	WA
Ross Complex	Z-996 BLACKSMITH SHOP (Medium Voltage Testing)	1953	Concrete Block	Longview	South	WA
Ross Complex	Z-760 HIGH VOLTAGE LAB	1961	Corrugated Metal	Longview	South	WA
Ross Complex	Z-503 FOG TEST CHAMBER	1972	Aluminum	Longview	South	WA
Ross Complex	Z-700 CAREY TEST LAB	1972	Corrugated Metal	Longview	South	WA
Salem	Z-816 MAINTENANCE	1956	Corrugated Metal	Salem	South	OR
St. Johns	Z-898 STORAGE	1951	Concrete Block	Longview	South	OR
Vantage	Z-725 MAINTENANCE	1968	Concrete	Wenatchee	North	WA
Walla Walla	Z-883 MAINTENANCE	1953	Concrete Block	Tri-Cities	East	WA

Figure 32. Conkelley Substation Maintenance Building

Figure 33. Carey Test Lab, Ross Complex

Pump Houses

Pump houses built during BPA's System Expansion Period typically consist of small buildings designed to house pumps that empty and replace oil from equipment such as circuit breakers or transformers during standard filtering and maintenance operations. Assets of this type display simple construction, flat or nearly flat shed roofs, and minimal architectural details. Materials include concrete block used at Master Grid substations (built during the System Expansion Period), and aluminum vertical panel siding with inverted seams used at System Expansion substations. The MPDF qualifies "only permanent storage and shop buildings of substantial size (i.e., more than 100 square feet)" as potential historic resources "unless buildings of smaller size contribute significantly to the integrity of the substation as a whole" (Kramer

2012). Although some pump houses and control houses are less than 100 sq. feet, they are still considered potentially eligible historic assets that serve important functions within the substation.

Table 18. Eligible Assets – Pump Houses

Substation	Asset	Date	Material	District	Region	State
Hot Springs	Z-294 PUMP HOUSE/FRESH WATER	1956	Aluminum	Kalispell	East	MT
Hot Springs	Z-316 PUMP HOUSE/FIRE	1958	Aluminum	Kalispell	East	MT
Oregon City	Z-981 PUMP HOUSE	1953	Concrete Block	Salem	South	OR
Walla Walla	Z-853 PUMP HOUSE	1954	Concrete Block	Tri-Cities	East	WA

Figure 34. Walla Walla Pump House

Figure 35. Hot Springs Substation Pump House/Fire

Engine Generator Building

Although the MPDF does not provide guidance on evaluating engine generator buildings, these Utilitarian metal vault-like structures serve an important role in housing equipment that provides substations with back-up power. When constructed during the overall Period of Significance (1938-1974), these engine generator buildings generally contribute to an eligible substation (Pinyerd 2018).

One eligible/contributing engine generator building was constructed at Master Grid substations (Covington) during the System Expansion Period.

Table 19. Eligible Assets – Engine Generator Buildings

Substation	Asset	Date	District	Region	State
Alvey	Z-312 ENGINE GENERATOR BUILDING	1957	Eugene	South	OR
Anaconda	Z-510 ENGINE GENERATOR / STORAGE BUILDING	1973	Kalispell	East	MT
Chemawa	Z-359 ENGINE GENERATOR BUILDING	1963	Salem	South	OR
Dworshak	Z-508 ENGINE GENERATOR BUILDING	1973	Spokane	East	ID
Little Goose	Z-497 ENGINE GENERATOR BUILDING	1973	Spokane	East	WA
Starr Complex	Z-285 BIG EDDY 230KV ENGINE GENERATOR BUILDING	1956	The Dalles	South	OR
Vantage	Z-545 ENGINE GENERATOR BUILDING	1974	Wenatchee	North	WA

Figure 36. Dworshak Substation Engine Generator Building

Relay Houses

Although the MPDF does not provide guidance on evaluating relay houses, these structures epitomize BPA's System Expansion development. Not common at historic substations, their design is often similar to the Utilitarian or Modern/Utilitarian style. They are typified by their simple one-story or one-story with basement form, concrete or aluminum panel walls, minimal applied detail, and simple entrances and windows.

Table 20. Eligible Assets – System Expansion Relay Houses

Substation	Asset	Date	Material	District	Region	State
Chief Joseph	Z-827 RELAY HOUSE #1	1956	Concrete	Wenatchee	North	WA
Chief Joseph	Z-701 RELAY HOUSE #2	1972	Corrugated Metal	Wenatchee	North	WA
McNary	Z-834 RELAY HOUSE #1	1954	Concrete	Tri-Cities	East	OR
McNary	Z-826 RELAY HOUSE #2	1956	Concrete	Tri-Cities	East	OR
McNary	Z-825 RELAY HOUSE #3	1956	Concrete	Tri-Cities	East	OR
Starr Complex	Z-823 BIG EDDY 230KV RELAY HOUSE #1	1956	Concrete	The Dalles	South	OR
Starr Complex	Z-822 BIG EDDY 230KV RELAY HOUSE #2	1956	Concrete	The Dalles	South	OR

Figure 37. Chief Joseph Substation Relay House #1

Switchyards

Switchyards constructed during the System Expansion Period generally have the same function and equipment as those constructed during the Master Grid Period. The switchyard sizes vary greatly. System Expansion switchyards usually have larger transmission towers, because of increased voltages; use of gas circuit breakers instead of oil; and eliminate the presence of oil tanks.

No table is provided for the System Expansion switchyards, because this property type is present at each of the eligible System Expansion substation districts in Oregon, Washington, Idaho, Montana, and Wyoming. In total, there are 65 eligible switchyards from the System Expansion Period.

Figure 38. Chief Joseph Substation Switchyard

Rails and Transfer Carts

The railroad spurs and transfer tracks present at some early System Expansion switchyards are steel rails that lie at surface level and connect power transformer sites to switchyard maintenance areas or untanking towers. Transfer tracks were installed as part of substation development to transport power transformers and other heavy equipment on transfer carts for routine maintenance and installation. A few substations had railroad spur and transfer tracks that diverted from a main railroad line to the substation. Though not previously identified in the MPDF, the transfer track is part of the complex arrangement of assets that functioned within substations and contribute to the overall substation setting. Therefore, they are generally evaluated as contributing to NRHP-eligible substations.

Unused transfer track rails and transfer carts are a visual element that demonstrates how BPA staff moved and serviced transformers at historic substations during the Master Grid and early System Expansion periods. BPA used standard gauge tracks (4 feet 8 ½ inches) to connect to railroad spurs and distinctive broad gauge tracks (9 feet 7 5/8 inches) built only within BPA substations. The rails are supported by wood ties set in crushed rock ballast and covered with asphalt, exposing the rails, cribs (open space around rail) and trench drains.

BPA used steel transfer carts to carry transformers and other heavy loads on fixed transfer tracks from the switchyard into substation maintenance areas and/or untanking towers (Curran 1998:111). The transfer cart was integral to the transfer track's function and the maintenance of switchyard equipment. Transfer carts have flat open steel decks that rest on wheel rail conveyors to glide along the transfer tracks. Though not previously identified in the MPDF or BPA's asset database, transfer carts located within substation boundaries are generally evaluated as contributing to NRHP-eligible substations.

Table 21. Eligible Assets – System Expansion Rails and Transfer Carts

Substation	Asset	Date	District	Region	State
Alvey	Z-0000 TRANSFER TRACK	1952	Eugene	South	OR
Alvey	TRANSFER CART	1952	Eugene	South	OR
Anaconda	Z-8575 RAILROAD SPUR & TRANSFER TRACK	1953	Kalispell	East	MT
Chemawa	Z-8190 RAILROAD	1954	Salem	South	OR
Chief Joseph	TRANSFER TRACK	1956	Wenatchee	North	WA
Conkelley	TRANSFER TRACK	1966	Kalispell	East	MT
Covington	TRANSFER TRACK	1942	Covington	North	WA

Figure 39. Alvey Substation Transfer Cart and Rails

Cable Tunnels

Many System Expansion substations contain a cable tunnel or cable run that houses multiple cables extending from a switchyard to a control house basement. Several control houses have interior basement doors for accessing the concrete-lined underground cable tunnels. The tunnel exits via a stairway into the switchyard. For the purposes of BPA's evaluation of historic resources, cable tunnels constitute an underground characteristic of the switchyard and are not evaluated as individual historic resources.

Figure 40. Boundary Substation Control House basement cable room and entrance to cable tunnel

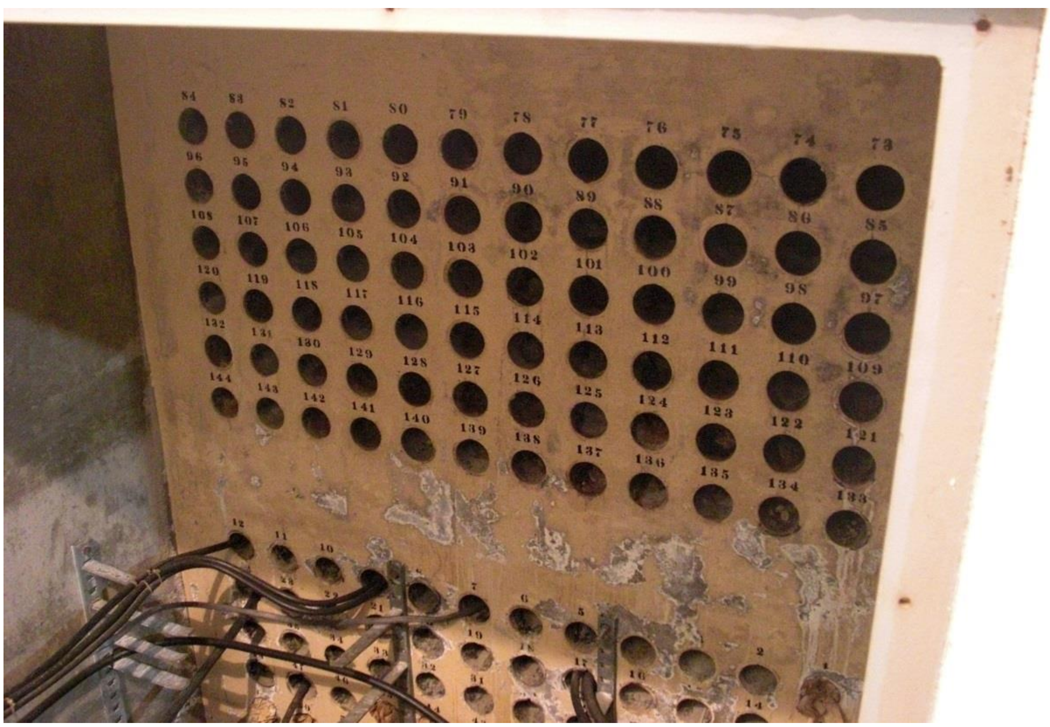


Figure 41. Anaconda Substation cable pull in control house

5. REGULATORY PROCESS

The BPA's consideration of historic properties is primarily driven by compliance with two federal regulatory processes: NEPA (40 C.F.R. Part 1508) as implemented by the BPA through the Department of Energy's procedures for NEPA compliance in 10 C.F.R. 1021 and Sections 106 of the NHPA (36 C.F.R. Part 800).

5.1 Historic Integrity

NEPA and Section 106 are concerned with project effects on cultural resources and historic properties.

Historic integrity is the authenticity of a property's historic identity, evidenced by the survival of physical elements that existed during the property's prehistoric or historic period that are defining of the property's character and convey its significance (NPS 1997). The NPS recognizes seven aspects or qualities that, in various combinations, define integrity:

1. Location: The place where the historic property was constructed or the place where the historic event occurred.
2. Design: The combination of elements that create the form, plan, space, structure, and style of a property.
3. Setting: The physical environment of a historic property.
4. Materials: The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.
5. Workmanship: The physical evidence of the crafts of a particular culture or people during any given period in history.
6. Feeling: A property's expression of the aesthetic or historic sense of a particular period of time.
7. Association: The direct link between an important historic event or person and a historic property.

Overall, historic properties either retain or do not retain aspects of integrity. The NPS provides the following guidance on assessing the integrity of historic properties:

> All properties change over time. It is not necessary for a property to retain all its historic physical features or characteristics. The property must retain, however, the essential physical features that enable it to convey its historic identity. The essential physical features are those features that define both why a property is significant and when it was significant (NPS 1997:46).

The retention of certain aspects of integrity that express a property's **character-defining features** is paramount for a historic property to convey its significance based on why, where, and when the property is significant (Grimmer 2017). Character-defining features establish a property's most recognizable visual qualities. Protecting character-defining features is critical to retaining historic integrity and is a component of the regulatory review process.

5.2 NEPA Compliance

NEPA requires consideration of cultural resources/historic properties in the environmental review of a federal action's impacts on the human environment. Federal agencies must consider whether a federal action may "significantly affect the quality of the human environment," with respect to the proximity of historic resources (40 C.F.R. 1508.27(b)(3)), and the degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the NRHP (40 C.F.R. 1508.27(b)(8)). With early and proper coordination, the Section 106 process can run concurrently with the NEPA requirements for consideration of cultural resources.

5.3 Section 106 Compliance

Section 106 requires federal agencies to take into account the effects of their undertakings on historic properties. A federal undertaking is a project, activity, or program either funded, permitted, licensed, or approved by a federal agency (36 C.F.R. 800.16(y)).

The intention of the Section 106 process is to balance historic preservation concerns with the needs of federal agencies by conducting consultation early in the planning process with the agency and other parties with an interest in the potential effects of the proposed actions on historic properties. The goal of consultation is to identify historic properties potentially affected, assess effects, and seek ways to avoid, minimize, or mitigate adverse effects on historic properties (36 CFR 800.1(a)).

36 C.F.R. Part 800 (Protection of Historic Properties) governs the Section 106 process and outlines how federal agencies are to consult with SHPOs, Tribal Historic Preservation Officers (THPOs), Tribes, Native Hawaiian Organizations, parties with a demonstrated interest in the undertaking, and the public; identify historic properties; determine whether and how such properties may be affected; and resolve adverse effects. The process for Section 106 compliance is shown in the diagram below (NPS 2018). BPA's cultural resource specialists direct the Section 106 process for BPA's undertakings, including consultation with SHPOs, THPOs, and other consulting parties; effect determinations; agreement documents; and developing and executing mitigation treatments for adverse effects to historic properties.

When using this manual, BPA staff should focus on the implications of each level of review. Under the different categories of reviews (See Section 1.2), exempt activities, for instance, are activities that the BPA considers to have no potential to affect historic properties and do not require any additional steps under Section 106 (see 36 CFR 800.3(a)(2)). Some activities listed in the exempt category may also qualify as a categorical exclusion under NEPA (Subpart D, 10 C.F.R. Part 1021). Final decisions regarding the level of agency review should be coordinated between the BPA NEPA compliance officer and Federal Preservation Officer so that reviews under NEPA and NHPA occur concurrently.

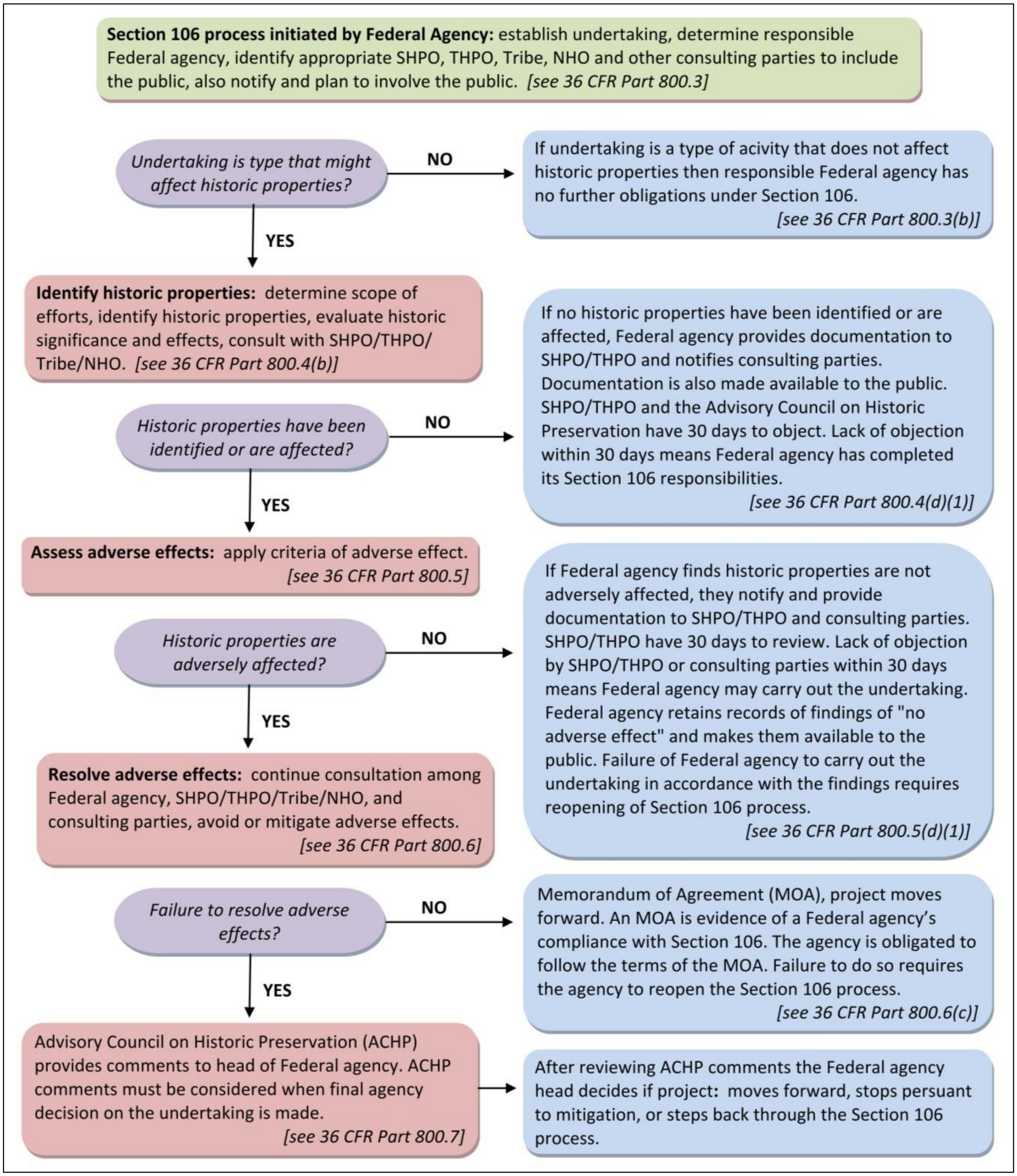


Figure 42. Section 106 Process Diagram (NPS 2018)

5.3.1 Adverse Effects

An adverse effect occurs when a project may directly or indirectly diminish the integrity of a historic property by altering any of the characteristics that qualify that property for inclusion in the NRHP. Specifically, if the project diminishes the integrity of a property's location, design, setting, materials, workmanship, feeling, and/or association, then there is an adverse effect. Examples of adverse effects include:

- Physical destruction or damage;
- Alterations inconsistent with the SOI's Standards for the Treatment of Historic Properties;
- Relocation of a historic property;
- Change in the character of a historic property's use or setting;
- Introduction of incompatible visual, atmospheric, or audible elements;
- Neglect and deterioration; and
- Transfer, lease, or sale out of federal control without adequate preservation restrictions

Adverse effects do not cause a project to terminate or stop, but they do require a consultation and mitigation approach as part of the Section 106 process, managed through a Memorandum of Agreement (MOA) or Programmatic Agreement (PA) to resolve adverse effects. Due to the additional steps in the Section 106 process required to resolve adverse effects, it is important for project staff to work with BPA cultural resource staff early in project planning so as to identify opportunities to potentially avoid and minimize effects.

5.3.2 Mitigation

Mitigation is a way to resolve, offset, or compensate for an adverse effect or a change in a historic property's qualifying characteristics when adverse effects to historic properties cannot be avoided in a practical or feasible manner. Mitigation treatments are agreed upon during the Section 106 consultation process and stipulated in Section 106 agreement documents (MOAs and PAs). Mitigation treatment is generally related to and commensurate with the nature and scale of the undertaking and its effects upon the historic property.

Mitigation may involve a variety of treatment actions. The Advisory Council on Historic Preservation (ACHP) and SHPOs encourage Section 106 consulting parties to examine creative and alternative mitigation options when working to resolve adverse effects to historic properties. While mitigation does not have to be site-specific, it should relate to the location or region of the affected property. Furthermore, when considering research or interpretation treatment options, it is important to explore new historic themes or tell a familiar story from a different perspective.

Key questions to consider in determining appropriate mitigation actions include:

- What is the public interest?
- Is it meaningful?
- Will it enhance the preservation and management of historic properties in a region?
- Will it be readily accessible?
- Is it feasible?
- Is it verifiable?

BPA has already completed and is currently undergoing mitigation for adverse effects to historic properties, including the demolition of significant buildings, decommissioning of historic substations, and rebuilding of historic transmission lines.

Executed mitigation treatments that have been effective include the following:

- Historic American Building Survey (HABS) and Historic American Engineering Record (HAER) documentation with large format photography.
- Albums with archival quality historic photographs and captions donated to local historical societies, museums, and universities.
- Funding and materials for creating an exhibit about rural electrification and the development of power in Idaho's panhandle.
- Inadvertent discovery plans for encountering cultural resources not previously identified during an undertaking.

- Published online articles and/or historical essays.
- BPA registration and attendance at historic preservation focused trainings or conferences.
- Financial support and materials to state programs, historical societies, and museums to support planning processes and technical program development.
- Development of a traveling exhibit on the High Voltage Direct Current Test Center Complex
- Oral history of BPA field staff in the south region.
- Create interpretative panels or other interpretive materials, such as signs and posters

Some current mitigation treatments have posed unexpected challenges or resulted in lessons learned. For example, to mitigate for adverse effects caused by the Bonneville – Hood River transmission line rebuild, BPA has worked on designing a mobile exhibit to interpret BPA's Master Grid transmission system with stipulations to display the exhibit at a minimum of three local public venues. The logistics of transporting the planned large exhibit and coordinating with the exhibit schedules and plans of various venues has proved challenging.

To mitigate for the demolition of the Sandpoint Substation Maintenance Building in Idaho, BPA provided funding for nomination of another historic property to the NRHP, the Co-op Gas and Supply Complex, which would become the future home of the Bonner County History Museum. Based on the limited number of historic BPA assets in the Idaho panhandle, it was not feasible to nominate another BPA asset. Although the action provided funding for a resource unrelated to BPA, it supported a preservation effort by the local historical society that was commensurate with the undertaking and was effective mitigation.

Possible Mitigation Actions

Suggested mitigation actions for future undertakings that may have adverse effects on historic properties are listed below. This list, which may be augmented, was developed through consultation with BPA's cultural resource specialists, facility management team, SHPOs, AECOM, and other consultants.

Develop Historic Contexts for themes relevant to BPA, such as:

- BPA historic radio stations
- BPA historic transmission lines
- BPA and World War II Industry (aluminum and other metals)
- Rural electrification/partnerships with PUDs
- Hydroelectric power generation in the Pacific Northwest
- Technologies developed by BPA
- BPA and industrial architecture/landscapes

Develop interpretation of significant BPA historic properties and themes in the following ways:

- Create informative and interactive maps
- Develop digitized annotated albums of historical photographs
- Publish historical feature essays through Oregon Encyclopedia, History Link, or similar online repositories
- Incorporate 3-D models of buildings and spaces in exhibits
- Tell a familiar story in a new way from a different perspective

Publish articles, biographies, videos, or podcasts relevant to BPA's history, such as:

- History/Biography of BPA's first administrator J.D. Ross
- History/Biography of BPA's World War II-era administrator Paul J. Raver
- History/Biography of BPA Architect Dean Wright, active in BPA's architecture program from the 1940s through 1980s.
- History/Biography of other BPA architects, including George Poole, M. Hartford, C. Tetherow, and/or Charles Lovett
- The art (and artists) of BPA, including Annual Report covers and World War II-era propaganda posters

- Oral Histories of BPA staff present during the historic period
- The stories of women, minorities, and marginalized communities who were actively involved in BPA's history
- BPA's role in the Pacific Northwest aluminum industry
- BPA's Master Grid
- BPA's System Expansion
- Rural Electrification
- The Pacific Northwest-Pacific Southwest Intertie
- BPA's Testing Stations
- Beautility design trends
- Site-specific substation and power development

Document and designate significant historic properties in the following ways:

- National Register of Historic Places nominations of significant historic properties, such as:
    - Salem Control House and Untanking Tower
    - Alvey Control House
- Historic American Engineering Record documentation for significant resource types, such as untanking towers
- Create 3-D models of buildings and spaces using photographs and/or 3-D scanning
- Use Lidar data to record long linear resources, using video as part of the field inventory

Improve BPA's historic resources programs in the following ways:

- ILS of BPA Historic Transmission Lines
- ILS of BPA Historic Microwave Radio Stations
- Develop programmatic agreements with the SHPOs for:
    - Historic Substations
    - Historic Transmission Lines
    - Historic Microwave Radio Stations
    - Linear Resources (irrigation, railroads, roads) affected by BPA funded Fish and Wildlife Projects
- Organize and digitize BPA files at NARA and make digital files available to the public
- Create an artifact storage, inventory, and labeling system
- Create an inventory and reuse program for historic features such as windows, doors, lighting, and hardware
- Create a geographic information system cultural resources database
- Establish and implement a salvage program

Prioritize preservation of significant historic properties in the following ways:

- Develop a restoration or deferred maintenance program for historic features, such as:
    - Window re-glazing
    - Restoring/replicating character-defining entrance lights
    - Restoring historic paint colors
- Develop standardized design specifications for treatment applications common to specific design types, such as:
    - Handrail replacements
    - Window security/inoperability
    - Energy efficiency upgrades
    - Seismic upgrades
    - Asbestos or lead paint abatement
    - Paint colors
- Create an adaptive-reuse plan for obsolete buildings and assets

Contribute to educational and advocacy programs in the following ways:

- Employ a graduate student historian intern
- Give a guest lecture to a class or field school
- Create an NPS Teaching with Historic Places lesson plan and make it available to local schools
- Host a tour of Ross Substation or other BPA facility for a historic preservation, public history, or architecture group.
- Attend and present at conferences
- Organize and/or host a training program, such as a National Preservation Institute, ACHP course, or historic window workshop

Financially support the historic preservation field in the following ways:

- Scholarship funding for field school, conference, or training participation
- Preservation advocacy group sponsorship
- Program development support for historical societies or museums
- Program development support for Pacific Northwest Preservation Field School or similar organization

5.4 Responding to Emergencies

BPA categorizes emergencies as either exigent or non-exigent. BPA defines exigent emergencies as events that pose immediate threat of damage to human life or property. Emergency transmission infrastructure repairs and emergency facilities repairs required to mitigate an immediate threat of damage to human life will be performed without prior review or consultation to the extent required to mitigate the risk. Repairs will be limited to only those needed to mitigate the threat and a BPA archaeologist will assess any adverse effects to the historic property and contact consulting parties within (5) business days. Non-exigent emergencies have the near-term probability of damage to human life or property high enough to constitute a hazard but not an immediate threat to human life or property. BPA will contact the consulting parties as soon as possible for guidance prior to addressing the non-exigent emergency. If the threat escalates to become exigent prior to receiving a response from consulting parties then the threat will be mitigated without further delay. Repairs will be limited to only those needed to mitigate the threat and a BPA archaeologist will assess any adverse effects to the historic property and contact consulting parties within (5) business days.

6. GENERAL TREATMENT RECOMMENDATIONS

This section provides an overview of the SOI's Standards for the Treatment of Historic Properties including their intent, organization, and application to the treatment of identified historic BPA assets. Section 6.1 summarizes the key facets of the standards and how they guide treatment options and consultation. Section 6.2 examines standardized architectural designs that BPA used during the Master Grid and System Expansion periods and details how the designs provide a framework for planning alterations. Section 6.3 identifies other historical records associated with these assets, such as drawings and photographs, which may assist project planning and execution.

6.1 The Secretary of the Interior's Standards for the Treatment of Historic Properties

Under the NHPA, the SOI is responsible for establishing professional standards and for providing guidance on the preservation of the nation's historic properties. Aligning with the SOI standards, the NPS has developed specific guidelines for work on any historic properties and for the consultation process (Grimmer 2017). NPS Preservation Briefs offer supplemental guidance on appropriate treatment options for historic buildings and features. Section 9 provides hyperlinks to relevant NPS Preservation Briefs.

The SOI standards provide four approaches to the treatment of historic properties: **Preservation, Rehabilitation, Restoration, and Reconstruction.** These approaches may be applied to a variety of asset types, including buildings, sites, structures, objects, and districts.[3] The rehabilitation treatment, based on the tenets of the preservation treatment, is the most appropriate approach for BPA assets, because it provides the greatest flexibility in treatment options to adapt and respond to BPA's needs and advancements in power transmission.

Preservation

The NPS defines preservation as "the act or process of applying measures necessary to sustain the existing form, integrity, and materials of a historic property (Grimmer 2017)." Preservation is an appropriate treatment approach when:

- the property's distinctive materials, features, and spaces are essentially intact and thus convey the historic significance without extensive repair or replacement;
- when depiction at a particular period of time is not appropriate; and
- when a continuing or new use does not require additions or extensive alterations.

Work, including preliminary measures to protect and stabilize the property, generally focuses on the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New exterior additions are not within the scope of this treatment; the limited sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties more functional is appropriate for a preservation project.

Standards for Preservation

1. A property will be used as it was historically or be given a new use that maximizes the retention of distinctive materials, features, spaces, and spatial relationships. Where a treatment and use have not been identified, a property will be protected and, if necessary, stabilized until additional work may be undertaken.

[3] The treatment standards, developed in 1992, were codified as 36 Code of Federal Regulations (CFR) Part 68 in the July 12, 1995, Federal Register (Vol. 60, No. 133). They replaced the 1978 and 1983 versions of 36 CFR Part 68, entitled The Secretary of the Interior's Standards for Historic Preservation Projects. The revised Guidelines replace the Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings, published in 1995 to accompany the treatment Standards.

2. The historic character of a property will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.
3. Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate and conserve existing historic materials and features will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.
4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.
5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.
6. The existing condition of historic features will be evaluated to determine the appropriate level of intervention needed. Where the severity of deterioration requires repair or limited replacement of a distinctive feature, the new material will match the old in composition, design, color, and texture.
7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.
8. Archaeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

Rehabilitation

Rehabilitation provides the most flexibility for adapting historic properties while retaining character-defining features. Rehabilitation "makes possible a compatible use through repair, alterations, and additions while preserving those portions or features that convey its historical, cultural, or architectural values" (NPS 2017). Historic buildings' materials and character-defining features are protected in the same manner as they would be for a preservation treatment approach. The primary difference between the two treatment options is that rehabilitation allows for greater latitude for the replacement of extensively deteriorated, damaged or missing features using the same material or a compatible substitute (Grimmer 2017:77). Repair should always be the primary treatment option, but if not possible, replacement with historic stock is the next best alternative. If no historic replacement materials are available, in-kind replacement is a suitable alternative. In-kind replacement requires replacement with material that matches in terms of type, style, dimension, texture, and detailing. Rehabilitation is also the only treatment approach that allows for the construction of new additions, if it is necessary for the continued use or new use of the historic resource.

Sustainability should be considered a component of the rehabilitation approach, focusing on the retention and repair of historic features (See Section 7.9 for specific guidelines) (Grimmer 2017:79). Depending on the proposed new use of a building, rehabilitation may trigger certain code upgrades. When a new use is to be applied to a building, further consideration of code deficiencies is necessary.

The SOI Standards for Rehabilitation below are to be applied taking into consideration the economic and technical feasibility of each project:

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.
2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.

4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.
5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a historic property shall be preserved.
6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.
7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.
8. Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.
9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

Restoration

The NPS defines restoration as:

> The act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. The limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a restoration project (NPS 2017).

Restoration is an appropriate treatment approach when:

- the property's design, architectural, or historical significance during a particular period of time outweighs the potential loss of extant materials, features, spaces, and finishes that characterize other historical periods;
- when there is substantial physical and documentary evidence for the work; and
- when contemporary alterations and additions are not planned.

The BPA is less likely to engage in restoration work, but project teams should consider restoration as an appropriate treatment when architectural features have been removed or unexpectedly damaged, and restoration aligns with a project's priorities.

The SOI Standards for Restoration are available at: https://www.nps.gov/tps/standards/four-treatments/treatment-restoration.htm.

Reconstruction

The NPS defines reconstruction as:

> The act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location. This treatment standard

establishes a limited framework for recreating a vanished or non-surviving historic property with new materials, primarily for interpretive purposes (NPS 2017).

Reconstruction is appropriate when a contemporary depiction is required to understand and interpret a property's historic value (including the re-creation of missing components in a historic district or site); when no other property with the same associative value has survived; and when sufficient historical documentation exists to ensure an accurate reproduction. It is unlikely this treatment would be considered and implemented for BPA projects.

The SOI Standards for Reconstruction are available at: https://www.nps.gov/tps/standards/four-treatments/treatment-reconstruction.htm.

6.2 Compatibility with BPA's Standardized Designs

BPA's standardized architectural designs used throughout the Master Grid and System Expansion periods provide a framework for designing building alterations that are consistent with original building designs and their character-defining features. Almost all BPA control houses were based on BPA standardized designs. These designs illustrate the original appearance of built resources and in some cases indicate how BPA planned for anticipated design modifications (Figure 43). The architectural plans and artists renditions of these designs (Figures 44-46) help identify the character defining features of these buildings and how appropriate and historically compatible alterations and or additions may be incorporated.

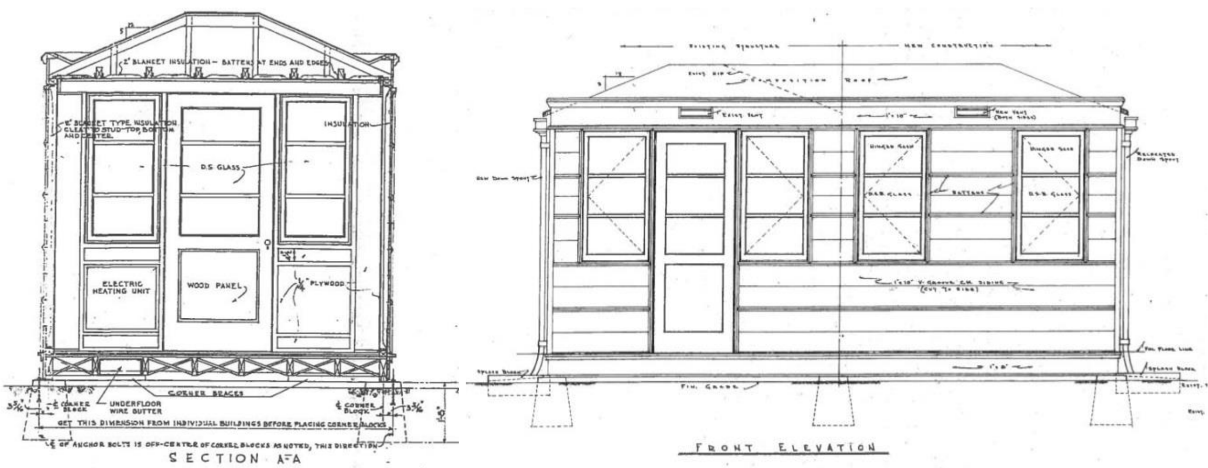


Figure 43. Type 161 Control House (left) enlarged to Type 161R Control House (right)

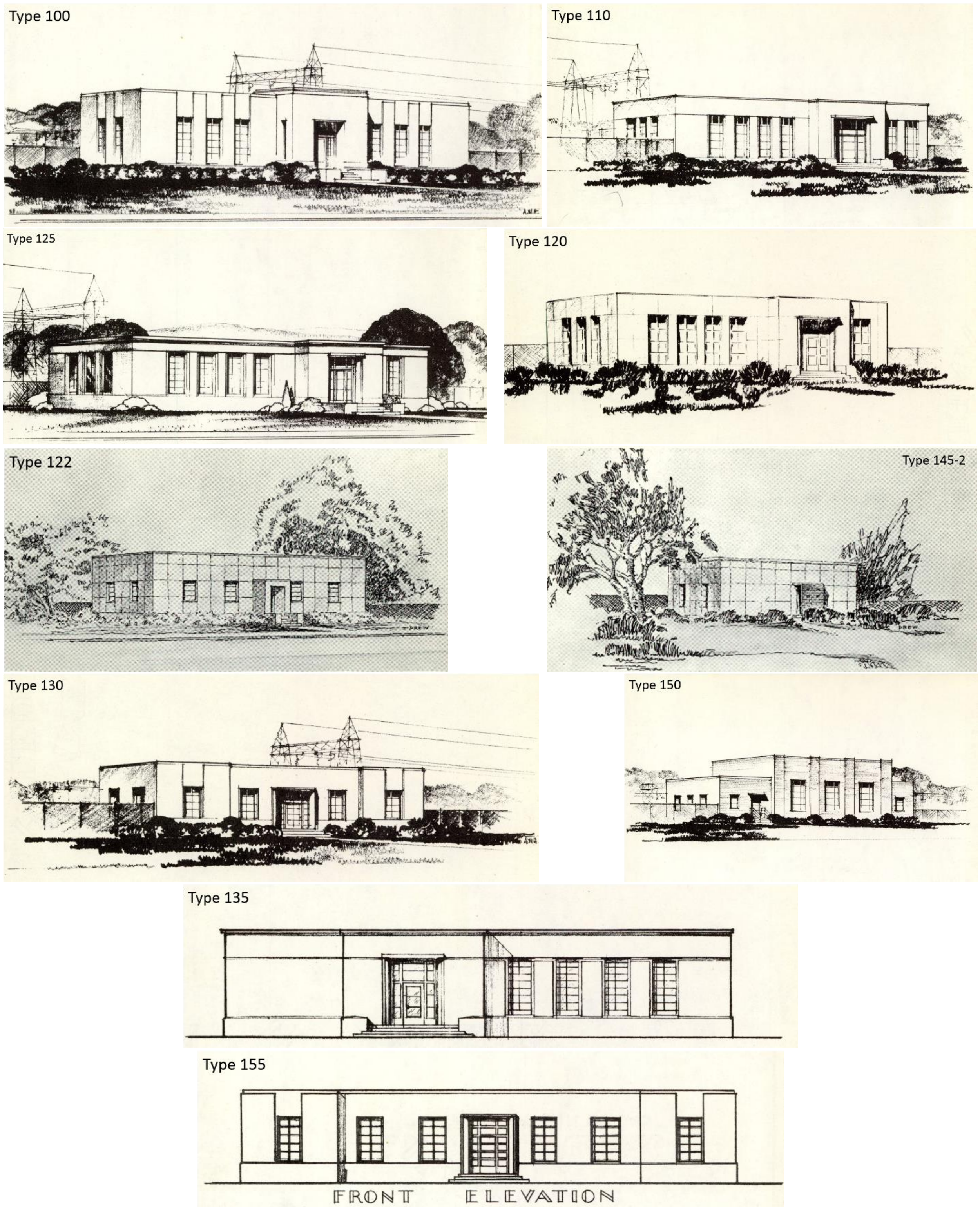


Figure 44. Control House Types

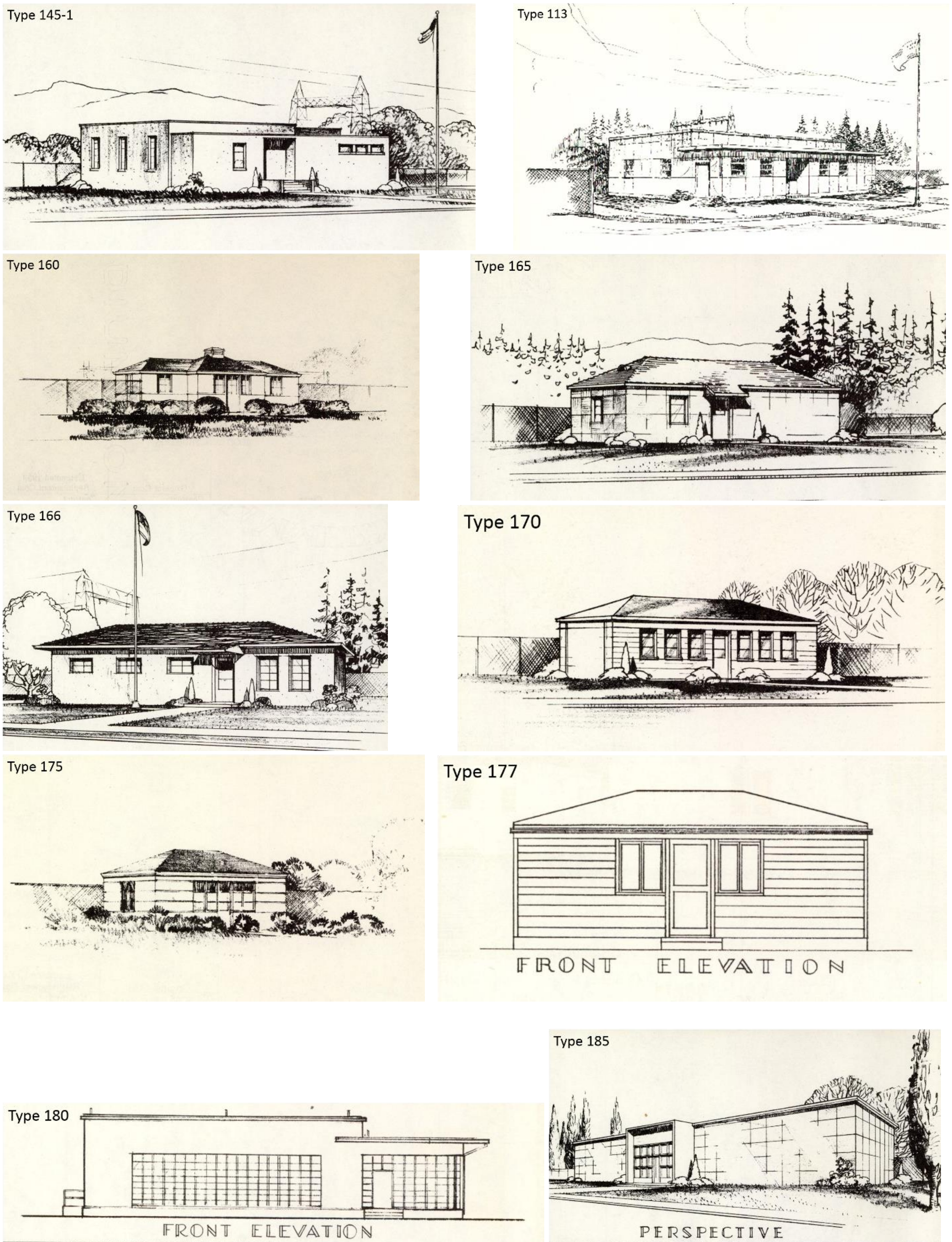


Figure 45. Control House Types (continued)

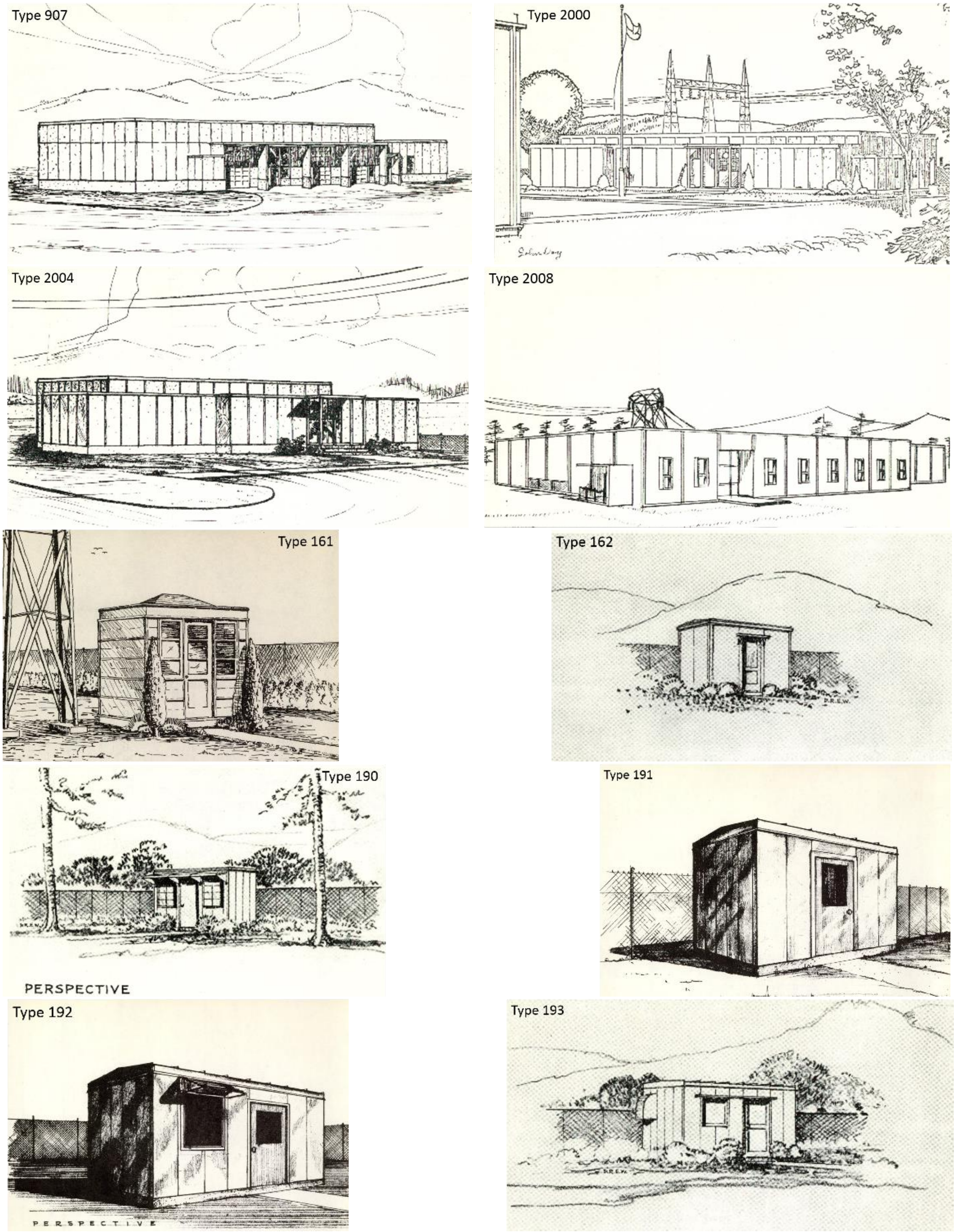


Figure 46. Control House Types (continued)

6.3 Historic Research and Previous Documentation

BPA retains a repository of architectural drawings, aerials, historic, and recent photographs that may be helpful in planning modifications to historic assets. The historic substation ILS evaluation reports contain a selection of the above research materials relevant to each substation, which are referenced throughout the evaluation reports and provided in appendices. BPA's full repositories of documentation and research are available as described below.

BPA sources include scanned architectural drawings. In addition, the BPA library houses a variety of published and unpublished works documenting BPA's history, including books, videos, annual reports, maps, and photographs. The BPA library is open to the public, and research items may be available through request.

BPA's librarians have gathered and scanned historical photographs and aerial images from the National Archives & Records Administration (NARA) repository in Seattle, Washington. This information is stored digitally at the BPA library and in BPA cultural resource specialists' electronic files. Additional research on specific substations, construction projects, or BPA programs may also be in BPA's NARA archives.

During the ILS research process, BPA's consultant collected historical newspaper articles relevant to the development and growth of each substation. Digital copies of these articles have been provided to BPA cultural resources staff.

BPA cultural resources staff has gathered and continues to collect agency reports and documents that aid in the historical research process, such as paint schematics, design manuals, maps, and legislation documents. Consider offering similar documents and reports created before 1975 to cultural resources or library staff before discarding such materials, as these can be helpful research and reference sources.

Cultural resources staff also keeps on file previously completed cultural resource reports and related administrative records that may help staff to understand how consulting parties have participated in previous Section 106 cases. Sometimes these documents provide indications as to how the agency has made determinations of eligibility and findings of project effects thus allowing staff to understand potential latitude in agency decision making when considering strategies to avoid, minimize, and/or resolve adverse effects. Certain information in these reports may be confidential and access to them should be coordinated with BPA cultural resources staff.

7. SPECIFIC TREATMENT RECOMMENDATIONS

The following subsections provide specific treatment recommendations for potential facility improvement projects. Each subsection focuses on a specific type of action and includes a variety of projects. Some projects may apply to multiple action types and have their treatment recommendations included in each relevant subsection. The treatment activities are categorized as building and site maintenance (Section 7.1), exterior and interior alterations (Section 7.2), additions to existing buildings (Section 7.3), decommissioning or demolition of buildings (Section 7.4), new building construction (Section 7.5), site alterations (Section 7.6), and sustainability (Section 7.7). Each section contains subsections relating to specific types of projects and includes appropriate and inappropriate treatment examples when applicable. These examples illustrate the importance of following the SOI Standards and associated guidelines, which are summarized in Section 6.1.

Each section begins with summaries of the standards for the treatment of specific features or materials, types of projects, or types of assets. The summaries are followed by identification of the types of activities that may occur and whether a project requires screening by a BPA historian or screening and consultation with the SHPO. Treatment actions are recommended per best management practices.

The treatment recommendations for Master Grid and System Expansion assets are similar; in some cases identical. As described in Section 4, these assets are distinguishable in terms of their character-defining features and rarity within the BPA system. There are far fewer Master Grid assets than System Expansion assets within the BPA system. As a result, the treatment of Master Grid assets often requires greater scrutiny and more specific treatment recommendations than System Expansion assets.

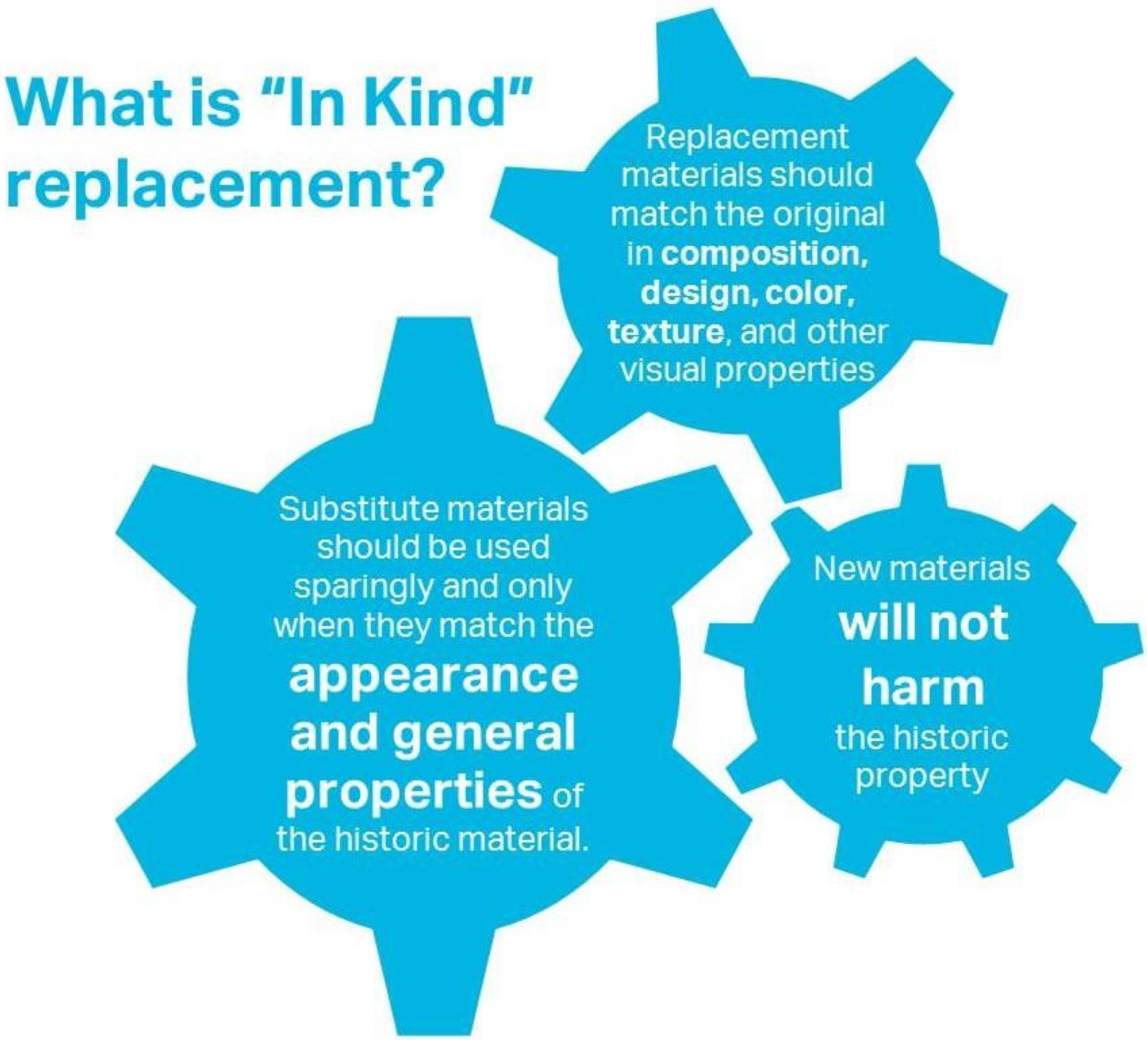
Safety

All facility improvement projects, including maintenance activities, should be undertaken with safety as a priority. Personal protective equipment and training appropriate to each task should be incorporated into every project. In addition to BPA's normal safety procedures, it is important to be aware of health issues more commonly encountered with older buildings, such as lead-based paint, asbestos, and rodent or bird droppings.

Each project activity is divided into different review categories including exempt activities, activities requiring screening, and activities requiring consultation. Final decisions regarding the level of agency review should be coordinated between the BPA NEPA compliance officer and Federal Preservation Officer so that reviews under NEPA and NHPA occur concurrently.

7.1 Maintenance

Appropriate maintenance, as outlined by the SOI Standards and associated guidelines, facilitates the continued preservation of historic properties. This type of maintenance is based on trained professionals using proper tools and techniques to retain and repair durable historic building materials. All maintenance projects should be conducted in such a way that the historic building's character-defining exterior features, interior spaces, features, and finishes as well as the key characteristics of the site and setting are preserved or any impacts are reduced as much as possible (Grimmer 2017:71). The application of untested masonry consolidates and use of improper repair techniques or untrained personnel may cause further damage to historic materials. The removal and replacement of historic materials should only be conducted when repair is infeasible as their removal may adversely affect the overall historic character of the asset. For additional guidance on cleaning and repairing historic buildings, refer to the hyperlink to NPS Preservation Briefs in Section 9.



All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- Cleaning or repairing building features such as doors, windows, entrances, steps, and architectural features with appropriate tools, methods, and personnel (Repairs **must not** involve the replacement of historic materials)

- Cleaning or repairing exterior lighting or electrical fixtures
- Light bulb replacement (NEPA categorical exclusion)
- Maintaining, repairing, or upgrading communication equipment within the same footprint
- Exterior and interior painting according to designated BPA color schemes (See Appendix C) or of same color (NEPA categorical exclusion)
- Plumbing modifications (NEPA categorical exclusion)
- Cleaning or repairing roadways and pedestrian pathways
- Repair and in-kind utility upgrade of switchyard equipment

Activities requiring screening

- Exterior cleaning methods that follow the treatment recommendation in Preservation Brief #6 (See Section 9)
- Exterior cleaning or applying water repellent treatments to masonry buildings according to treatment recommendation in Preservation Brief #1 (Section 9)
- Repointing mortar joints in brick buildings according to treatment recommendations in Preservation Brief #2 (See Section 9)
- Repair or thermal upgrading of original steel windows following treatment guidelines in Preservation Brief #13 (See Section 9)
- Cleaning of historic concrete that follows the treatment recommendations in Preservation Brief #15 (See Section 9)
- The preservation, maintenance, and repair of historic stucco following the treatment guidelines in Preservation Brief #22 (See Section 9)
- Maintenance of small- and medium-sized historic buildings according to the treatment recommendations in Preservation Brief #47 (See Section 9)
- Replacement of roadways and pedestrian pathways
- Exterior and interior painting that differs from the designated BPA color schemes (See Appendix C)
- Repair of building foundations or footings
- Mechanical upgrades that would visibly alter the character defining features of a building, site, or setting
- Cleaning or applying water repellent treatments to masonry buildings in a manner that does not follow the treatment recommendations in Preservation Brief #1 (See Section 9)
- Repointing mortar joints in masonry buildings in a manner that does not follow the treatment recommendations in Preservation Brief #2 (See Section 9)
- Cleaning methods that do not follow the treatment recommendations in Preservation Brief #6 (See Section 9)
- Repair or thermal upgrading of original steel windows in a manner that does not follow the treatment guidelines in Preservation Brief #13 (Section 9)
- Cleaning of historic concrete in a manner that does not follow the treatment recommendations in Preservation Brief #15 (See Section 9)
- The preservation and repair of historic stucco in a manner that does not follow the treatment guidelines in Preservation Brief #22 (See Section 9)
- Maintenance of small- and medium-sized historic buildings in a manner that does not follow the treatment recommendations in Preservation Brief #47 (See Section 9)

Activities requiring consultation

- Any actions that would not meet the SOI Standards for Rehabilitation
- Activities that do not follow the recommendations in the NPS Preservation Briefs

7.2 Exterior/Interior Building Alterations

According to the SOI Standards for Rehabilitation, "The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided." Although the character defining features of a property should be preserved, additions and alterations are allowed under certain circumstances. The SOI Standards for Rehabilitation state:

> New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale and architectural features to protect the historic integrity of the property and its environment… New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired (Grimmer 2017:viii).

The following subsections summarize the appropriate treatment options for some exterior and interior alterations according to the SOI Standards for Rehabilitation.

Total replacement of any design element *with incompatible/non-historically based designs* ***adversely impacts integrity***. [4]

7.2.1 Windows

The functional and decorative features of windows that are character-defining features of a historic building should be retained and preserved through routine maintenance and repairs. Altering the appearance of historic, character-defining windows noticeably changes the overall appearance of a building and should be avoided. Alterations include, but are not limited to, replacement of materials, finishes, or colors that noticeably change the sash, depth of reveal, and muntin configuration; changing the reflectivity and color of glazing; changing the appearance of the frame; and obscuring historic features (Grimmer 2017:46-48). Alterations to and replacement of historic windows and their features may be appropriate if specific guidelines are followed. For instance, if a window has become deteriorated, it should be repaired as opposed to replaced. If windows are missing or are deteriorated beyond repair, replacement of the entire window may be justified. The covering or removal of existing transom windows should be avoided. For additional guidance on the repair and thermal upgrading of historic steel windows, refer to the hyperlink for Preservation Brief #13 in Section 9.

Window Maintenance and Repairs

Preserving historic steel windows requires routine maintenance, as corroded metal and deteriorated glazing compound can impact overall condition and cause safety risks. Maintenance, minor and moderate repairs, and weatherization measures can be completed in place, but major repairs may require the removal of a window unit or units to a workshop for off-site work. Preservation Brief #13 recommends techniques, tools, products, and procedures for steel window maintenance and repairs.

[4] Design elements contribute to the overall design and appearance of a building and/or landscape. Design elements include but are not limited to size, form, material, color, and texture.

Maintenance measures include removing dirt and grease from metal; cleaning and lubricating or replacing hinges and other hardware; replacing missing screws and bolts; removing flaking paint, priming and painting, caulking surrounds, and installing weather-stripping.

Repair measures include removing rust and corrosion, aligning bent or bowed metal sections, patching depressions, splicing in new metal sections, replacing glass, and glazing compound,

Window Replacement

Window replacements should be considered only as a last resort for windows that are deteriorated beyond repair, or when the unavailability of replacement components renders repair impossible. When replacement is appropriate, durable, repairable, recyclable, compatible[5], and energy-efficient windows that match the appearance, size, design, proportion and profile of the historic windows should be installed. For less significant windows, compatible new windows may be acceptable.

[5] Compatible windows are similar to those being replaced in terms of size, design, proportion, profile, and material. Certain materials such as a type of glass, wood or metal may no longer be available or it may not be possible to reproduce a specific window design or size. If so, a substitute material or design that is similar, but not an exact match may be considered compatible and appropriate.

Figure 47. Untanking Tower Door, Midway Substation

The examples below demonstrate the replacement of windows in a compatible (Shelton Control House) and incompatible (Snohomish Control House) manner.

Compatible Window Replacement

Incompatible Window Replacement

Shelton Control House (2017) | Snohomish Control House (2017)

Shelton Control House (1965)

The windows at the Shelton Control House were replaced in-kind, retaining the size, materials, orientation, and number of lights.

Snohomish Control House (1950)

The replacement windows installed in the Snohomish Control House varied from the original metal windows in terms of material (vinyl), operation, and number of lights. The use of modern materials and the alterations to the window design diminishes the building's integrity of design, materials, integrity, workmanship, and feeling.

Untanking Tower Windows/Doors

Designed in the Streamline Moderne style, untanking towers feature giant overhead doors that display enormous banks of multi-light steel sash windows. These windows and doors are iconic character-defining features and exceptionally rare within the BPA network. Window glazing holds these windows in place and establishes a weather barrier. The deterioration of window glazing is typical after decades of use. Routine maintenance can prolong the stability of glazing but must eventually be replaced. Window glazing deterioration may eventually create a safety hazard once it is no longer able to securely hold the glass in place. At this point, there are multiple treatment options. To optimize the retention of historic integrity, subject windows should be repaired, and new window glazing applied. Alternatives treatments include the installation of a protective mesh over the glass to secure it in place or replacing the glass with Plexiglas units. Both options would diminish the integrity of materials, designs, workmanship and feeling and may result in an adverse effect. The entire door may be replaced with a new roll-up door, but this would result in a greater loss of historic integrity and an adverse effect (Figure 48).

Figure 48. The Midway Untanking Tower with its original distinctive door retains overall integrity, while the new roll-up door diminishes the integrity of the Bell Untanking Tower.

Storm Windows

Interior or exterior storm windows or panels may be installed if they are compatible with existing historic windows. Storm windows should either match the existing window configuration or be of a one-over-one pane configuration that will not obscure the window's characteristics (Grimmer et. al. 2011: 4-7; Grimmer 2017:46-48).

Window Glazing and Films

Retrofitting historic windows with high-performance glazing, tints, or clear film is considered appropriate if the window's historic character is maintained. Clear, low-emissivity (low-e) glass or film without noticeable color may be installed in historically clear windows to reduce solar heat gain. Removable window tint films may be installed on window interiors. Heavily tinted glass or reflective coatings should be avoided if they would negatively impact the historic character of the building. To improve daylighting for historically dark tinted windows, the application of a slightly lighter shade of the same color tint for glazing panels is appropriate. The use of clear glazing or significantly lighter colored film or tint than the original should be avoided.

Figure 49. Covington Untanking Tower with removable interior window tint

Retrofitting Historic Steel and Curtain-Wall Systems

Historic steel and curtain-wall window systems may be retrofitted to improve thermal performance if their historical character is not compromised. Curtain-wall components should not be removed if they can be stabilized, repaired, or conserved (Grimmer et. al. 2011:4-7; Grimmer 2017:54).

Figure 50. Alvey Control House with steel windows

Modifying Operable Windows to be Inoperable

For security purposes, some windows may need to be modified to ensure they are no longer operable. This can be accomplished by affixing minimal hardware in a non-invasive manner that does not damage historic features (Figure 51).

Figure 51. Non-obtrusive window modifications that inhibit operability without diminishing integrity

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- In-kind replacement of hardware, screens, and weather stripping
- Cleaning, painting, or repairing windows with appropriate tools, methods, and personnel (repairs **cannot** involve the replacement of historic materials)
- In-kind replacement of broken or missing glass and installing new glazing compound
- Application of weather stripping or caulking to windows to make weather tight

Activities requiring screening

- In-kind replacement of non-original windows
- Replacement of window features such as hardware, screens, and weather stripping, using materials that are of a different type, scale or material than the existing material
- Moderate and major repairs such as patching depressions, rust-removal using abrasive, chemical, or heat and pressure cleaning methods
- Alterations to window framing or splicing in new metal sections
- Installation of window film glazing, metal screens on the exterior of windows, metal bars on interior window hinges, and inserting screws into windows to make them inoperable
- Addition of interior or exterior storm windows or panels that are compatible with existing historic windows
- Application of high-performance glazing, tinting, or clear film to historic windows
- Retrofitting of historic steel and curtain-wall window systems

Activities requiring consultation

- Replacement of historic windows or features using materials that are of a different type, scale or material than the existing material
- Any actions that would not meet the SOI's Standards for Rehabilitation

7.2.2 Entrances

The functional and decorative features of entrances and porches that are important to the overall historic character of a historic building should be retained and preserved. Entrance and porch features include, but are not limited to, materials, doors, transom windows, pilasters, columns, lighting fixtures, stairs, roofs, and projecting canopies. The removal of features should be avoided if they can be stabilized, repaired, or conserved (Grimmer 2017:49-50).

Alterations to entrances may be necessary to improve security or accessibility, including boarding entrance windows or replacing doors. These alterations should retain the original door openings and key characteristics, such as recessed openings and transom door lights, and sidelight windows.

Repair or replacement activities on entrances that include multi-light windows, such as untanking tower doors should follow the treatment recommendations outlined in Section 7.2.1.

Figure 52. John Day Control House

Exterior Doors

Historic exterior doors with large panes of glass may be a security issue for substations as was the case at the Bellingham Control House. To preserve the historic character of the original doors and provide necessary security upgrades, the larger panes were removed and replaced with smaller ones surrounded by wood trim to denote the size and shape of the original configuration (Figure 53 and Figure 54).

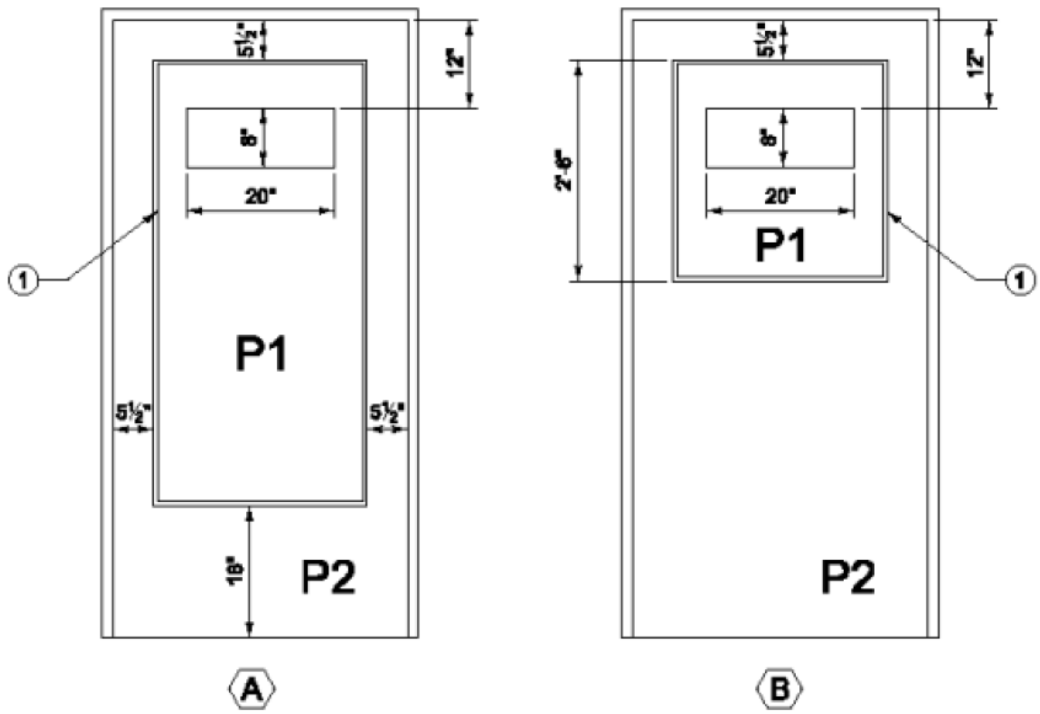


Figure 53. Door modification plans for Bellingham Control House

Figure 54. Modified Bellingham Control House front door

Storm Entrances/Wind Tunnels

The installation of a storm entrance or wind tunnels in a historic asset may be a necessary safety upgrade and can be performed in a manner to minimize the effect on historic materials. For example, plans for the installation of wind tunnels at the side and back doors of the Raver Control House were previously determined to have no adverse effect. An adverse effect was avoided because the wind tunnels were positioned out of view of the public right-of-way, were anchored to the railing and deck (not the exterior of the control house), and matched the exterior cladding of the building.

The examples below demonstrate how the addition of a storm entrance can be conducted in a compatible (Aberdeen Control House) and incompatible (La Grande Control House) manner.

Compatible Storm Entrance

Aberdeen Control House

The Aberdeen Control House's storm entrance is compatible in terms of size, design, and materials, creating a natural transition between the new construction and the existing building.

Incompatible Storm Entrance

La Grande Control House

The La Grande's Control House's storm entrance features a highly disparate primary material that diminishes the Control House's integrity of design, materials, and workmanship.

Stairs and Handrails

Stairs and handrails act as important functional and decorative features of entrances that define the overall historic character of a building. The removal of entrances and porches as well as their features should be avoided unless necessary to stabilize, repair, or conserve them. Repairs of extensively deteriorated features may include limited in-kind replacement or replacement with a suitable substitute when surviving prototypes or documentary or physical evidence exists. The new work should match the old in material, design, scale, color, and finish. Upgrades to stairways to meet life-safety codes should be done in a manner to avoid inappropriate alterations or damaging or destroying character defining spaces, features, or finishes (Grimmer 2017:50, 110, 152).

Figure 55. Midway Untanking Tower Handrails

The examples below demonstrate how the design of stairs and/or handrails can be conducted in a compatible (Snohomish Substation) and incompatible manner (Chemawa Control House).

Compatible Handrail

Snohomish Control House (compatible)

The design of the new stairs and handrail at the Snohomish Control House has allowed for the retention of the historic handrail while meeting modern safety requirements. The new handrail matches the old in terms of material, design, scale, color, and finish, but is still differentiated.

Incompatible Handrail

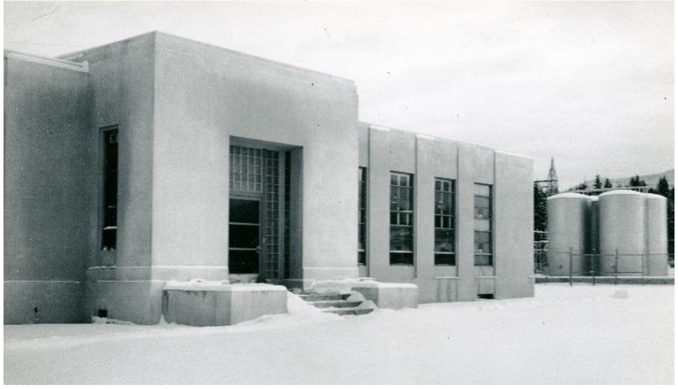
Chemawa Control House (incompatible)

The design for the new wood stairs and handrails at the Chemawa Control House is inconsistent with the character-defining features of the Control House. The new design does not incorporate the historic materials, design, color, or finish.

Ramps

The construction of access ramps should be done in an unobtrusive manner that retains the historic relationship between the building and site and be compatible with the historic character of the property. The SOI Standards and associated guidelines recommend working with specialists in accessibility and historic preservation to determine the most compatible solutions for complying with access requirements. The visual impact of new access ramps can be minimized by installing a ramp at a secondary elevation and/or screening it with plantings. If the addition of a ramp substantially diminishes the historic character, installation of a gradual slope or grade to the sidewalk may be an appropriate alternative (Grimmer 2017:70, 142, 148). For additional guidance on making historic properties accessible refer to the hyperlink for Preservation Brief #32 in Section 9.

Ramp Addition



Port Angeles Control House (compatible)

Although the Control House has undergone multiple additions and alteration since its original construction, its entrance once featured wide concrete steps mimicking the building's form

Ramp Addition

Port Angeles Control House (2017)

The design of the new ramp incorporated materials consistent with the Control House. However, its highly visible placement at the main entrance diminished the integrity of design

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- Installing card readers on exterior pedestrian doors (NEPA categorical exclusion)
- Running surface-mounted conduit from card readers through floors or ceilings from door locations to security racks located near existing communication racks (NEPA categorical exclusion)
- Installing additional security hardware, such as motion detectors, glass break detectors, interior visitor keypads, security cameras, and new interior door hardware (NEPA categorical exclusion)
- Cleaning or repairing stairs, handrails, guardrails, access ladders or lighting fixtures (repairs **cannot** involve the replacement of historic materials)

- Slight modifications to stair landings (NEPA categorical exclusion)

Activities requiring screening

- In-kind replacement of non-original features such as windows, doors, awnings, stairs, handrails, lighting fixtures, and security cameras
- In-kind replacement of non-original exterior siding
- In-kind replacement of non-original storm entries
- In-kind replacement of non-original fire rated exterior doors
- In-kind replacement of non-original safety and utility features such as guardrails, access hatches, utility doors, and electronic monitoring equipment
- In-kind replacement of non-original safety and utility features such as stairs, handrails, guardrails, access ladders or lighting fixtures
- Replacement of non-original interior or exterior light fixtures (NEPA categorical exclusion)
- Replacement of non-original exterior doors (NEPA categorical exclusion)
- Modifications of existing handrails (NEPA categorical exclusion)
- In-kind replacement of historic siding materials
- In-kind replacement of historic exterior lighting fixtures
- In-kind replacement of historic storm entries
- In-kind replacement of historic stairs, handrails, and entryway features such as planters and decorative elements
- Alterations to window framing
- Installation of bird protection netting to non-historic or non-contributing assets
- Replacement of visible features associated with historic assets using materials that are of a different type, scale, or material than the existing material

Activities requiring consultation

- Replacement of historic building features, using materials that are of a different type, scale, or material than the existing material
- Replacement of a historic exterior door with fire rated door
- Replacement of a historic untanking tower door with roll-up door
- Replacement of historic siding using materials that are of a different type, scale, or material than the existing material
- Replacement of historic windows using materials that are of a different type, scale, or material than the existing material
- Replacement of historic exterior lighting fixtures using materials that are of a different type, design, scale, or material than the existing material
- Replacement of historic storm entries using materials that are of a different type, design, scale or material than the existing material
- Replacement of historic stairs, handrails, and entryway features such as planters and decorative elements using materials that are of a different type, design, scale, or material than the existing material
- Installation of bird protection netting to historic assets
- Addition of exterior safety or utility features such as guardrails, access ladders or lighting fixtures
- Any actions that would not meet the SOI’s Standards for Rehabilitation

7.2.3 Roofs

Roofs and their functional and decorative features are important to defining the overall character of a building. Such features include the roof form, roofing material, size, color, patterning, parapets, and dormers. These resources should be retained and preserved (Grimmer 2017:44-45). Where feasible, deteriorated historic materials and features should be repaired instead of replaced. Roof forms play a critical role in the evaluation of the integrity of design. Similar to building footprints, roof forms are important elements that should “remain visible” per the MPDF. Their presence is a key aspect to retaining overall integrity. Furthermore, both aspects of the building’s design are considered “more character-defining than materials" (Kramer 2012:53-54). For additional guidance on the treatment of roofing for historic buildings refer to the hyperlink for Preservation Brief #4 in Section 9.

The examples below demonstrate how alterations to roofing materials and roof form can adversely affect the integrity of a historic resource.

Compatible Roofing Material

Pendleton Control House (c. 1942)

The original corrugated metal roofing panels shares the utilitarian design principles expressed with the metal panel siding and simple fenestration.

Cowlitz Control House (1959)

The original asphalt shingles were common for the time period and the Minimal Traditional architectural style.

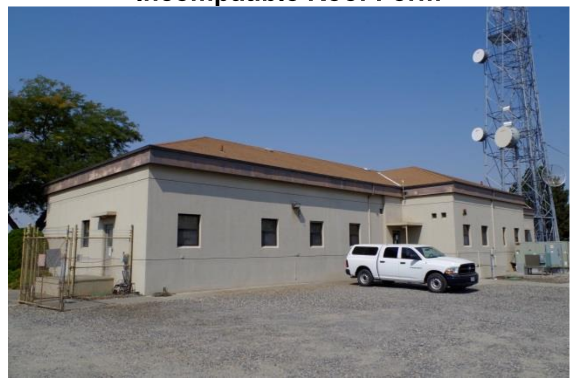
Incompatible Roofing Material

Pendleton Control House (2017)

The replacement of the corrugated metal panels with wood shingles drasticaly alters the building’s appearance, diminishing its integrity of design, materials, workmanship, and feeling.

Cowlitz Control House (2017)

The replacement of asphalt shingles with the out-of-period standing seam aluminum panels diminishes the building’s integrity of design, materials, workmanship, and feeling.

Compatible Roof Form	**Incompatible Roof Form**
	
Columbia Control House A new membrane roof was installed on the building without changing the historic flat roof form or overall appearance.	Franklin Control House. The new roof and fascia alter the historic roof form and diminish the building's integrity of design.
	
Sno-King Control House (1965) The original two-level flat roof depicted above was typical of Modern architecture at the time of construction.	Sno-King Control House (2017) The alteration in roof form from flat to gable is a significant alteration to a character defining feature, diminishing the integrity of design, materials, workmanship, and feeling.

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- In-kind replacement of roofing materials including finishes, flashing, and gutter systems (NEPA categorical exclusion)

- Installing additional security hardware, such as motion detectors, glass break detectors, interior visitor keypads, security cameras, and new interior door hardware (NEPA categorical exclusion)
- Installation of new HVAC systems or components that are not visible from the exterior
- Replacing HVAC equipment with new equipment installed in the same location or within 5 feet of the previous location (HVAC systems or components should cause no damage to building features or obscure exterior views of the building more than the previous system) (NEPA categorical exclusion)
- Replacing solar panels (NEPA categorical exclusion)

Activities requiring screening

- Replacement of visible features associated with a historic property, using materials that are of a different type, scale or material than the existing material
- In-kind replacement of historic exterior lighting fixtures
- Repair, replacement or installation of an HVAC unit and/or equipment that follows the treatment recommendations in Preservation Brief #24 (See Section 9)
- Addition of HVAC systems or components to a building
- Installation of a solar device on a non-historic or non-contributing building
- Replacement of a historic microwave or radio antenna tower or associated components with modern materials and components
- Installation of bird protection netting to non-historic or non-contributing assets
- Repair, replacement or installation of an HVAC unit and/or equipment that does not follow the treatment recommendations in Preservation Brief #24 (See Section 9)

Activities requiring consultation

- Alterations to roof forms
- Replacement of historic roofing materials using materials that are of a different type, scale or material than the existing material
- Additions or modifications to identified historic assets
- Replacement of historic exterior lighting fixtures using materials that are of a different type, design, scale or material than the existing material
- Installation of a solar device on a historic building
- Addition of a microwave or radio antenna tower to a historic building
- Installation of bird protection netting to historic assets
- Any actions that would not meet the SOIs Standards for Rehabilitation
- Activities that do not follow recommendations in Preservation Briefs

7.2.4 Exterior Cladding and Details

A building's exterior, consisting of its cladding fenestration, architectural details, and materials, is integral in reflecting key aspects of its integrity. BPA's substations feature a variety of exterior cladding materials including concrete, aluminum, wood, stucco, and curtainwall with insulated asbestos panels. Many substation buildings were constructed of concrete and featured decorative elements composed of concrete (Figure 56). Aluminum is another common building material among BPA assets, particularly the modular Utilitarian buildings.

Many of BPA's earliest and smallest System Expansion control houses were constructed of wood (Type 161 buildings). Intended for temporary use, no assets of this type remain. However, wood has continued to be used for structural and decorative elements. Stucco and stucco-like materials have commonly been applied to building exteriors. All of these materials contribute to the overall integrity of their associated assets and substations.

Routine maintenance is a key aspect to the preservation of historic materials. If building components and or features become deteriorated they should be retained and preserved, if feasible (Grimmer 2017:44-45). Concrete exteriors should be maintained through cleaning and possible patching of cracks but are unlikely to require replacement. If repair is not a viable option, in-kind replacement is an appropriate treatment option, such as replacing aluminum panels. New materials may be substituted for original materials when they are identical in appearance, such as replacing an asbestos panel with a newer composite panel. Replacing features and/or components using materials that are of a different type, design, scale, or surface texture can diminish integrity and is not recommended.

Figure 56. Midway Control House Dentils Detail

In-kind Replacement of Deteriorated Materials

As shown below, a deteriorated concrete support bent at the Custer Maintenance Building was replaced with in-kind materials and careful attention to the original design and workmanship. The completed replacement element, as shown below, is nearly identical in appearance.

Custer Maintenance Building (1969)

Replaced concrete support bent at Custer Maintenance Building

Figure 57. In-kind Concrete Bent Replacement at Custer Maintenance Building

Exterior Cladding

The examples below demonstrate how the introduction of incompatible exterior cladding can adversely affect the integrity of a historic asset. Such alterations may not only affect the integrity of materials but also diminish the integrity of design, workmanship, and feeling.

Compatible Exterior Cladding

Pendleton Control House (c. 1942)

The original aluminum panel siding shares the utilitarian design principles expressed with the corrugated metal roofing and simple fenestration.

Incompatible Exterior Cladding

Pendleton Control House (2017)

The replacement of the aluminum panel siding with horizontal wood boards drasticaly alters the building's appearance, diminishing its integrity of design, materials, workmanship and feeling.

McMinnville Control House (1951)

McMinnville Control House (2017)

Although the replacement horizontal vinyl siding is similar in appearance it is not an in-kind material or reflective of the time period. This significant change in materials diminishes the building's integrity of design, materials, workmanship, and feeling.

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- Installing additional security hardware, such as motion detectors, glass break detectors, interior visitor keypads, security cameras, and new interior door hardware (NEPA categorical exclusion)

Activities requiring screening

- In-kind replacement of non-original features such as windows, doors, awnings, stairs and handrails, sidewalks, lighting fixtures, security cameras, satellite dishes, and radio and microwave antenna towers
- In-kind replacement of non-original exterior siding
- Replacement of visible features associated with a historic property, using materials that are of a different type, scale or material than the existing material
- In-kind replacement of historic siding materials
- Replacement of a historic microwave or radio antenna tower or associated components with modern materials and components
- Stabilization or replacement of building foundation or footings
- Seismic upgrades that follow the treatment recommendations in Preservation Brief #41 (See Section 9)

Activities requiring consultation

- Replacement of historic siding using materials that are of a different type, scale or material than the existing material
- Removal and/or replacement of any features or components that contribute to the historic character of a property that could be repaired and retained
- Seismic upgrades that do not follow the treatment recommendation in Preservation Brief #41 (See Section 9)
- Any actions that would not meet the SOI's Standards for rehabilitation

7.2.5 Exterior Lighting

Exterior lighting if often considered a design characteristic of a historic building. Light fixtures can illuminate a building's setting, pathways, form, architectural details, and prominent features such as entrances. They may also display the architectural style of the building such as Streamline Moderne, Utilitarian, and Modern (Figure 58-Figure 60). Original lighting fixtures and those that emulate the architectural style of the building should be repaired and retained instead of replaced. If lighting fixtures have deteriorated beyond the point of repair, it is appropriate to replace them. Preferably, they should be replaced with historic stock fixtures from BPA's inventory of historic fixtures and parts. If none are available, they should be replaced in-kind. Replacements should be sympathetic to the original design of the fixture and the building overall. Unsympathetic modern replacements may result in an adverse effect.

Figure 58 Streamline Moderne-Style Light Fixture, Roundup Control House

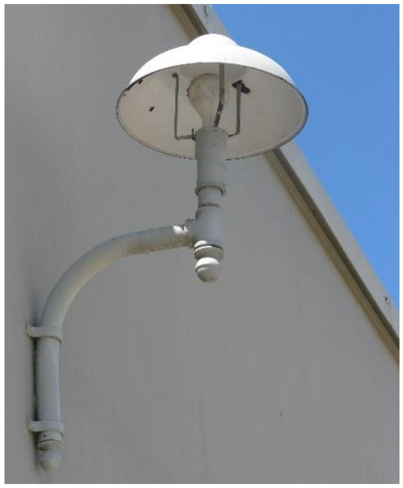


Figure 59 Utilitarian-Style Light Fixture, Midway Untanking Tower

Figure 60 Modern-Style Glass Globe Light Fixtures, John Day Control House

The examples below demonstrate how the introduction of incompatible lighting can adversely affect the integrity of a historic asset. The installation of the modern lighting diminished the building's integrity of design and feeling. This adverse effect could have been avoided with the installation of lighting fixtures from the period of construction or of similar design and materials.

Compatible Lighting

Utilitarian-Style Lighting Fixture, Midway Substation

Incompatible Lighting

Alvey Automotive Shop

The modern lighting installed to the exterior is incompatible and diminishes the integrity of design and materials. A more appropriate replacement would be similar to those installed at the Midway Substation.

Streamline Moderne-Style Lighting Fixture, Roundup Substation

Ross Control House

The modern lighting fixture above the main entrance creates a sharp contrast with the historic door, sidelights, transom window, and the interior lights visible in the background. A lighting fixture like the one from the Roundup Substation (left) would be more sympathetic to the overall design.

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

Activities requiring screening

- In-kind replacement of non-original lighting fixtures
- In-kind replacement of historic exterior lighting fixtures

Activities requiring consultation

- Replacement of historic exterior lighting fixtures using materials that are of a different type, design, scale or material than the existing material
- Any actions that would not meet the SOI’s Standards for Rehabilitation

7.2.6 Interior Spaces, Features, and Finishes

During the Master Grid period, BPA prepared basic substation designs with control houses that included “an office for public contact and separate rooms for station service and communication equipment, batteries and controls” (BPA 1939:56). Interior spaces of System Expansion control houses were similar. However, the many of the modular Utilitarian-style control houses featured a singular room containing all necessary equipment. Control rooms and offices are often the most reflective of the building’s design principles as they commonly comprise the main interior spaces and were areas open to public viewing when allowed. Some kitchens and bathrooms reflect some of the overall design features with lighting fixtures, hardware, and decorative features such as window trim. Other spaces such as battery rooms, storage rooms, communication rooms and maintenance shops typically are more utilitarian in design. Spaces that are most reflective of the building's exterior design and period of construction should be retained. Areas that do not portray representative design features or have previously been refurbished in a more contemporary style are more suitable for alterations.

Figure 61. Albany Control House Communications Room

Interior floor plans, spaces, features, and finishes that are important in defining the overall character of the building should be retained and preserved. The MPDF states the following about interior spaces:

> Interior elements of the control house, especially non-public "back of house' operations areas are generally not a consideration in the evaluation of integrity under Criterion A. While not an eligibility determinate, good practice dictates that original material should be conserved and retained wherever possible. This is especially true of public, or formerly public areas such as the building lobby or reception area, when such are present. Changes to the operations/equipment areas of control houses, where practical, should retain original material but technological upgrade related to operational efficiency does not reduce integrity under Criterion A (Kramer 2012).

Significant characteristics include but are not limited to: size, configuration, proportion, and relationship of rooms and corridors; the relationship of features to spaces; and the spaces themselves, such control rooms, battery rooms, offices, kitchens, and bathrooms. Significant features and finishes consist of color, texture, patterns and are represented in components such as columns, plaster walls and ceilings, floors, trim, mantels, paneling, light fixtures, hardware, decorative radiators, ornamental grills and registers, windows, and doors. Structural components such as wood, metal, or concrete exposed columns, beams, and trusses and exposed load-bearing brick, concrete, and wood walls can also be significant.

Historic interior features and finishes should not be replaced if the deteriorated portion of the feature can be repaired or retained. Removal is only appropriate if interior features or finishes cannot be stabilized, repaired, or conserved. The installation of new materials that obscure or damage character-defining features or finishes should be avoided (Grimmer 2017:60-62). If the replacement of a historical material is necessary it should be replaced in-kind.

Interior Features

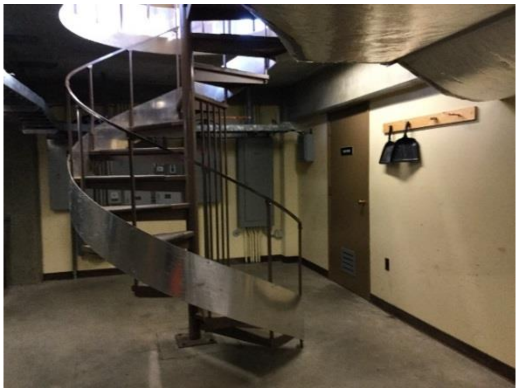

Midway Control House Metal Dome Light


Conkelley Control House Glass Globe Light Fixture


Chehalis Control House Window Sill

Alcoa Control House Clock


Hanford Control House Circular Stairwell


Hanford Control House Circular Stairwell


Port Angeles Control House Door Handle

North Bonneville Control House Light Switch

Ross Control House Register

Midway Control House Register

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- Replacement of interior doors (NEPA categorical exclusion)
- Running surface-mounted conduit from card readers through floors or ceilings from door locations to security racks located near existing communication racks (NEPA categorical exclusion)
- Installing new security racks/enclosures to interior walls or floors (NEPA categorical exclusion)
- Installing interior fire-rated doors with card readers and/or replacing the door handles within access tunnels between the control house and substation yard (NEPA categorical exclusion)
- Installing additional security hardware, such as motion detectors, glass break detectors, interior visitor keypads, security cameras, and new interior door hardware (NEPA categorical exclusion)
- Installing new equipment racks, new cabinets, phone systems, radios, meters, disconnects, switches, power circuit breakers, capacitive voltage transformers, bus ties, inter and intra-net equipment, and associated wiring (NEPA categorical exclusion)

Activities requiring screening

- In-kind replacement of non-original features such as windows, exterior doors, stairs and handrails, lighting fixtures, security cameras, columns, ceilings, floors, trim, mantels, and hardware.
- Modifications of non-original handrails (NEPA categorical exclusion)
- Replacement of visible features associated with a historic property, using materials that are of a different type, scale, or material than the existing material
- Alterations to window framing, interior molding or wainscoting
- Remodeling of interior spaces
- Reuse of an obsolete but contributing asset

Activities requiring consultation

- Removal and/or replacement of any features or components that contribute to the historic character of a property that could be repaired and retained
- Any actions that would not meet the SOI's Standards for Rehabilitation

7.2.7 Electrical and Plumbing Systems

The visible features of early mechanical systems that are important in defining the overall historic character of the building should be retained and preserved. Such features include but are not limited to radiators, vents, fans, grilles, and plumbing and lighting fixtures. Mechanical systems should only be replaced if its components cannot be upgraded and retained. Examples of such upgrades include repairing mechanical systems by augmenting or upgrading system components (new pipes and ducts), rewiring, or adding new compressors or boilers (Grimmer 2017:58-59).

Figure 62. Hot Water Tank, Alston Control House

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- Upgrade electronic equipment required for operation and maintenance of BPA's transmission grid including communication, meter, and relay equipment as well as Remedial Action Scheme (RAS) and Supervisor Control and Data Acquisition (SCADA) system upgrades (NEPA categorical exclusion)
- Installing new equipment racks, new cabinets, phone systems, radios, meters, disconnects, switches, power circuit breakers, capacitive voltage transformers, bus ties, inter and intra-net equipment, and associated wiring (NEPA categorical exclusion)

Activities requiring screening

- Replacement of non-original plumbing and septic systems or their components
- Introduction of modern plumbing and septic systems or their components
- Replacement of historic plumbing and septic systems or their components

Activities requiring consultation

- Any actions that would not meet the SOI's Standards for Rehabilitation

7.2.8 Heating, Ventilation, and Air Conditioning (HVAC)

The Secretary of Interior Standards outlines several recommendations for the introduction and replacement of HVAC systems in historic buildings. The installation of an HVAC system is appropriate if the historic character of the building and site is retained. New HVAC systems should be high efficiency and ductless when appropriate. Ducted systems may damage the historic building materials. The installation of new metal ductwork that is visible from the exterior or adversely impacts the historic character of the interior space should be avoided. Interior ductwork should remain exposed where appropriate, such as in industrial spaces or when concealing it would destroy the historic fabric. Likewise, the installation of through-the-wall air conditioners should be avoided as they damage historical materials and negatively impact the building's historic character. New HVAC equipment should be placed where it will operate efficiently and effectively, be minimally visible, and will not negatively impact the historic character of the building or its site. If HVAC equipment is to be installed on a roof it should be positioned to minimize its visibility to reduce its negative impact on the historic character of the building and its site (Grimmer 2017:10-13). For additional guidance refer to the link to Preservation Brief #24 in Section 9.

The examples below demonstrate the compatible and incompatible addition and installation of an HVAC unit.

Compatible HVAC Addition

Goldendale Control House

Incopmatible HVAC Addition

Lebanon Control House

The Goldendale Control House's HVAC unit was discreetly installed on the rear elevation. Its size and location minimize the impact on the building's integrity.

The Lebanon Control House's HVAC unit is a very large model, particularly in relation to the size of the Control House. Its position on the side elevation is highly visible. Both the size and location of the unit diminish the Control House's integrity of design and feeling.

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- Installation of new HVAC systems or components that are not visible from the exterior
- Replacing HVAC equipment with new equipment installed in the same location or within 5 feet of the previous location. HVAC systems or components should cause no damage to building features or obscure exterior views of the building more than the previous system (NEPA categorical exclusion)
- Installing new concrete pads for exterior HVAC units (NEPA categorical exclusion)

Activities requiring screening

- Repair, replacement or installation of an HVAC unit and/or equipment that follows the treatment recommendations in Preservation Brief #24 (See Section 9)
- Widening existing holes or cutting holes in the exterior building wall near the existing HVAC equipment to accommodate the new size or shape of the replacement equipment (NEPA categorical exclusion)
- Replacing ductwork, wiring, and other electrical related equipment inside the building or facility (NEPA categorical exclusion)
- Addition of HVAC systems or components to a building
- Replacement of an HVAC system that is no longer functional or efficient and cannot be repaired or improved to increase efficiency
- Repair, replacement or installation of an HVAC unit and/or equipment that does not follow the treatment recommendations in Preservation Brief #24 (See Section 9)

Activities requiring consultation

- Removal and/or replacement of a functional and efficient HVAC that can be repaired or improved to increase efficiency
- Any actions that would not meet the SOI's Standards for Rehabilitation
- Activities that do not follow treatment recommendations in Preservation Brief #24

7.2.9 Safety

All projects conducted to adhere to life-safety codes should be completed in a manner that preserves character-defining exterior features, interior spaces, interior features, and finishes as well as features of the site and setting or minimizes the impact as much as possible (Grimmer 2017:53-65). The following subsections summarize the appropriate treatment options for certain safety upgrades according to the SOI Standards and associated guidelines.

Seismic Upgrades

When seismic upgrades are deemed necessary, the installation of structural reinforcement should be conducted in manner that reduces a building's seismic vulnerabilities and minimizes the impact on historic character-defining features.

Common approaches to seismic retrofits can be visually intrusive. Historically sensitive retrofit decisions are often specific to each building and require consultation with historic preservation specialists and SHPOs. Historic features and materials, both structural and non-structural, should be retained and preserved. Structural features include the construction materials as well as the type of system and its features such as posts, beams, columns, and walls (Grimmer 2017:121, 123). Seismic retrofit systems should work in concert with the inherent strengths of the historic structural system, be visually unobtrusive and compatible in design, and limit damage to historic features and materials. For additional guidance on seismic upgrades in historic buildings refer to the link to Preservation Brief #41 in Section 9.

BPA has previously identified historic buildings in need of seismic updates and outlined multiple approaches based on the structural design of the individual buildings. Seismic upgrades for the Driscoll Control House have been completed. Strengthening of the concrete masonry unit structure was conducted at the roof level to access connections between the exterior walls and roof diaphragm. This approach avoided impacting the exterior face of the walls. However, it did require the removal of portions of the roofing and sheathing. Due to the age and condition of this roof, it was necessary to replace it. The seismic upgrades allowed for the retention of the original cladding and avoided external structural elements that would have covered portions of the original materials and possibly diminish the building's overall integrity.

Planning for the seismic retrofit of the Troutdale Control House has considered three approaches for the unreinforced brick building. The most historically sensitive option (Option C) involves installing a fiber-reinforced-plastic (FRP) and steel frame system on the interior of the perimeter walls. This approach would alter the building's interior but preserve the exterior materials and appearance.

Figure 63. Steel frame structural retrofit on building interior (Troutdale Control House Seismic Upgrade Option C)

Another approach (Option B), installing a concealed FRP system behind newly created brick infill pilasters at the building's central portions and corners. The new brick would be selected to match the original color, coursing, and grout. This option could avoid adversely impacting the building if the SOI standards are carefully followed.

Figure 64 Troutdale Control House

Figure 65. Concrete brick infill concealing seismic retrofit (Troutdale Control House Seismic Upgrade Option B)

The option least sensitive to preserving historic character (Option A) involves infilling portions of the brick exterior walls with new concrete piers designed as pilasters. This approach would substantially alter the building's exterior appearance and could adversely impact the building's historic character.

Figure 66. Concrete pilaster infill seismic retrofit (Troutdale Control House Seismic Upgrade Option A)

HAZMAT (hazardous materials) Abatement for Lead and Asbestos

Lead paint and asbestos in historic buildings requires abatement or encapsulation. Building materials should only be removed after testing has been completed to identify hazardous materials and using the least damaging abatement methods. To safely remove lead paint, the use of a poultice, to which paint adheres, is recommended. When environmental regulations do not require paint removal, coatings that encapsulate the paint are recommended. Some life-safety codes allow for greater leniency with historic properties. Consultation with BPA's NWM team for code concerns early in the planning process will limit negative impacts on the historic character (Grimmer 2017:23, 32, 71). For additional guidance on exterior paint problems on historic woodwork see the hyperlink for Preservation Brief #10 in Section 9.

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- Asbestos or lead paint removal of electrical, plumbing, or HVAC elements that does not change or impact other historic features

Activities requiring screening

- Safe lead paint removal or encapsulation
- Encapsulation or removal of interior asbestos materials
- In-kind replacement of visible historic features and materials

Activities requiring consultation

- Replacement of visible historic features using materials that are of a different type, scale or material than the existing material
- Asbestos or lead paint removal that harms visible features that qualify a historic asset's NRHP eligibility
- Seismic upgrades

7.2.10 Security

Historic properties may require security upgrades to comply with North American Electric Reliability Corporation Critical Infrastructure Plan Reliability Standards for the Bulk Electric Systems of North America. All alterations of and additions to historic buildings, sites, and settings for security upgrades should be conducted in a manner that prevents the destruction of historic materials, features or spatial relationships that characterize the property.

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- Installing card readers on exterior pedestrian doors (NEPA categorical exclusion)
- Running surface-mounted conduit from card readers through floors or ceilings from door locations to security racks located near existing communication racks (NEPA categorical exclusion)
- Installing new security racks/enclosures to interior walls or floors (NEPA categorical exclusion)
- Installing fire-rated doors with card readers and/or replacing the door handles within access tunnels (which includes some cable tunnels) between the control house and substation switchyard (NEPA categorical exclusion)
- Replacement of interior doors (NEPA categorical exclusion)

Activities requiring screening

- In-kind replacement of non-original security features such as lighting fixtures, fences, and gates
- Replacement of non-original exterior doors (NEPA categorical exclusion)

- Replacement of historic safety features with modern materials such as lighting fixtures, interior or exterior walls, fences, and gates
- Installation of window film glazing, metal screens on the exterior of windows, metal bars on interior window hinges, and inserting screws into windows to make them inoperable
- Introduction of security cameras, modern fire rated doors, and lighting fixtures
- Installing additional security hardware, such as motion detectors, glass break detectors, interior visitor keypads, security cameras, and new interior door hardware (NEPA categorical exclusion)

Activities requiring consultation
- Construction of new interior or exterior security walls, fences, and gates
- Any actions that would not meet the SOI's Standards for Rehabilitation

7.3 Additions

The SOI's Standards for the Treatment of Historic Properties state that

> New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale and architectural features to protect the historic integrity of the property and its environment… New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired (Grimmer 2017:viii).

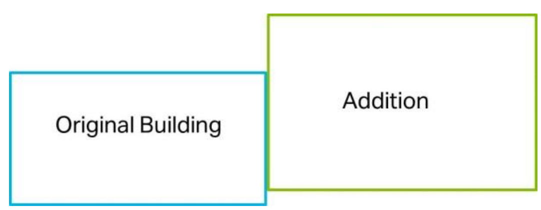
A new exterior addition to a historic property is appropriate only after it has been determined that non-significant interior spaces cannot be altered to accommodate the new or continuing use. The design and construction of a new addition must preserve the building's historic character, form, and significant materials and features. Additionally, it must be compatible in terms of massing, size, scale, and design, yet still differentiated. The placement of a new addition with a setback makes it subordinate to the historic building and reduces the impact on historic character. For some building types, it is common practice to design an addition for the rear or another secondary elevation. However, this approach can be complicated for BPA's control houses, because the public-facing entrance and switchyard-facing rear can both be viewed as primary elevations, so scale and form are important to consider.

For additional information regarding the preservation concerns of new exterior additions to historic buildings refer to the link to Preservation Brief #14 in Section 9.

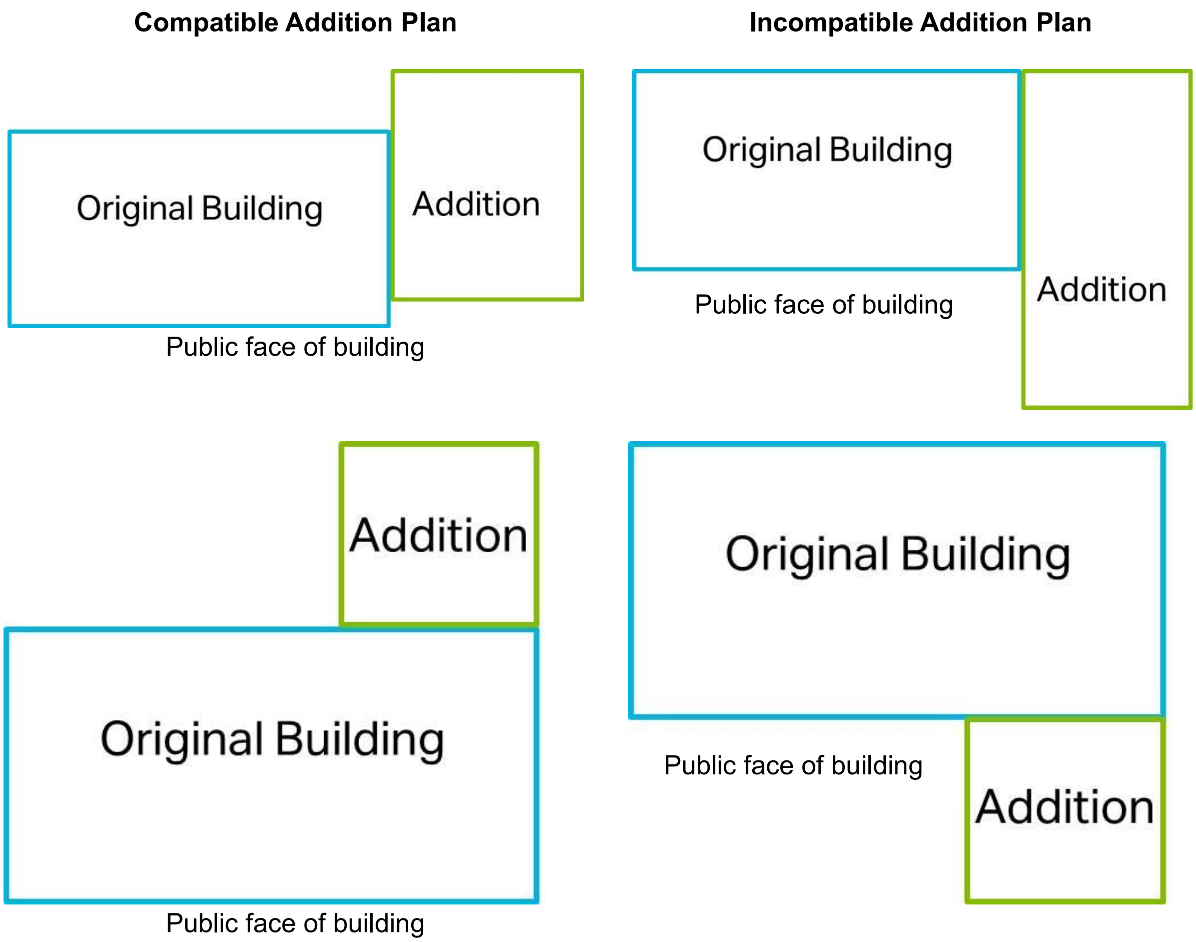
Compatible Addition Plan

Public face of building

Incompatible Addition Plan



Public face of building



BPA's standardized control house designs were frequently used during the System Expansion development period, particularly the Utilitarian-style models. Due to the small size of the Utilitarian models, these buildings are often altered and rarely retain integrity as excellent examples of their type. These smaller utilitarian control houses can be expanded using the historic standardized designs for additions. Changes beyond those parameters overpower the simplicity of the original design and have an adverse effect on the asset.

Figure 67. Aberdeen Control House in 1951 and 2017; multiple additions and alterations have diminished the building's integrity of design, materials, and workmanship.

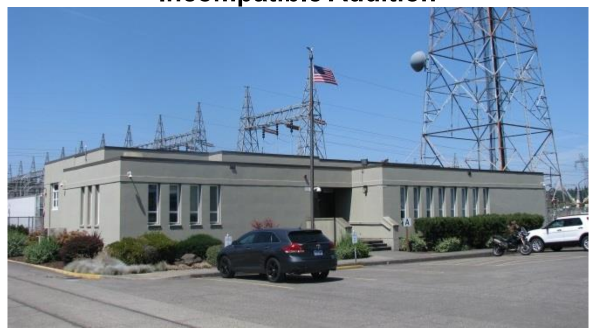
Below are examples of appropriate and inappropriate additions to BPA historic properties. The photographs illustrate how these alterations can be performed to minimize the impact on a building's historic character or diminish its historic integrity.

Compatible Addition

Port Angeles Control House

The 1974 addition (left) is set back and has a lower roof height to display the building's original form. The hip roof modifies the original flat roof form. However, due to the size of the building, sensitively placed addition, retention of original windows, and distinctive glass block entry, the building retains overall integrity.

Incompatible Addition



Snohomish Control House

The 1978 and 2014 additions dominate the building's appearance, particularly the front façade, so that it no longer conveys characteristics typical of its original Streamline Moderne architecutral style.

Monmouth Control House

The small addition is compatible in terms of massing, size, scale, and architectural features.

Lebanon Control House

Despite the addition's compatibility in terms of architectural features, its size is nearly equal to the original building's square footage.

Compatible Addition

Centralia Control House

The small addition is compatible in terms of massing, size, scale, and architectural features.

Richland Control House

Although consisting of two larger additions, they were conducted during the Period of Significance and maintain the original design features and materials.

Hood River Control House

This modification extended the length of the building but otherwise matched the existing form and materials.

Incompatible Addition

Raver Control House

Despite the addition's compatibility in terms of architectural features, its size is nearly equal to the original building's square footage, and the color does not match BPA's historic paint palette.

Redmond Control House

Although compatible in terms of design, this addition greatly diminished the original design by altering the building's form and fenestration.

DeMoss Control House

Although compatible in terms of form, material, and architectural features, the addition's square footage is larger than the original building's.

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- None

Activities requiring screening

- Additions to non-historic assets or assets not considered eligible per the MPDF
- New exterior additions to historic buildings that follow the treatment recommendation in Preservation Brief #14 (See Section 9)

Activities requiring consultation

- Additions or modifications to identified historic assets such as new spaces/rooms, entrances, canopies, stairways, and ramps
- Any actions that would not meet the SOI's Standards for Rehabilitation
- New exterior additions to historic buildings that do not follow the treatment recommendations in Preservation Brief #14 (See Section 9)

7.4 Demolitions/Decommissioning

When assets such as oil houses and rail spurs or entire substations no longer serve their original purpose, decommissioning is an option. If these assets cannot be repurposed for an alternative use or transferred to another utility, demolition may be viable after consultation with the SHPO. The decommissioning or demolishing of an individual historic asset can significantly diminish the integrity of a substation. Individual assets contribute to the overall historical significance of a substation in terms of its association to the operation of the substation as well as its physical position within the site and setting. The demolition of a substation constitutes an irrevocable loss of a historic asset but may still be allowed through mediation. The decommissioning or demolition of an individual asset or entire substation would likely result in a significant adverse effect but may still be allowable after consultation with the SHPO.

Substations also include assets that are either out of period (built after 1974) or of a temporary nature (lacking a foundation and/or less than 100 square feet) and are not considered historic properties per the MPDF. These assets include oil absorbent and storage sheds, and outhouses. Alterations to these assets, including removing or installing new buildings would not result in an adverse effect, given these activities do not diminish the integrity of a substation's contributing historic assets.

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- Removal of aluminum frame oil absorbent and storage sheds, and outhouses; given they are less than 100 square feet and lack a concrete foundation

Activities requiring screening

- Demolition or decommissioning of non-historic assets or assets not considered eligible per the MPDF

Activities requiring consultation

- Divestment or transfer of ownership to a non-federal entity
- Demolition or decommissioning of identified historic assets such as control houses, oil houses, relay houses, storage buildings, maintenance buildings, and railroad tracks and spurs

7.5 New Building Construction

If an existing building is unable to successfully meet the requirements of a new or continuing use, an addition or new construction may be an acceptable alternative. New buildings, like additions, must achieve a balance between compatibility and differentiation to preserve the historic character of the historic building, site, and setting. It must be compatible in terms of historic materials, features, size, scale, proportion, and massing, yet still noticeable differentiated so that it is not confused as historic. A new building that is identical to or in sharp contrast to the historic building is considered incompatible. This balance can be achieved by using the same forms, materials, and color range of the historic building and incorporating a similar alignment, rhythm, and size of the window and door openings. To maintain the historic character of the site, a new building should not destroy historic material, features, or spatial relationships that characterize the property. New construction should serve a secondary role to the historic structure. The construction of a new building must be conducted in manner that, if later removed, the historic property, its site, and setting would be unimpaired (Grimmer 2017:26, 76, 79, 157).

Substations also include assets that are either out-of-period (built after 1974) or of a temporary nature (lacking a foundation and/or less than 100 square feet) and are not considered historic assets per the MPDF. These assets include oil absorbent and storage sheds, and outhouses. Alterations to these assets, including removing or installing new buildings would not result in an adverse effect, given these activities do not diminish the integrity of a substation's contributing historic assets.

The examples below demonstrate how the design and placement of a newly constructed building can be done in a compatible (Custer Vehicle Storage) and incompatible (Silver Creek Control House) manner.

Compatible New Construction

Custer Vehicle Storage

The Custer Vehicle Storage Building (left) strikes a balance between compatibility and differentiation. Its materials, forms, colors, and design are compatible with the adjacent historic building, but distinct enough to avoid confusion over the period of construction.

Incompatible New Construction

Silver Creek Control House

The new Silver Creek Control House overpowers the adjacent historic control house in terms of scale, diminishing its integrity of setting, feeling, and association. Additionally, the new design and building materials establish a stark contrast with the historic asset.

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- None

Activities requiring screening

- Construction or addition of buildings/structures of a temporary nature (i.e., lacking a foundation and/or less than 100 square feet) that are not considered historic assets per the MPDF

Activities requiring consultation

- Construction of any new building/structure of a permanent nature within the boundaries of a historic substation

7.6 Site Alterations

Features of building sites that are important in defining its overall historic character should be retained and preserved. Such features include, but are not limited to: switchyard and communications equipment, railroad spurs and transfer tracks, walls, fences, security gates, and steps; circulation systems such as pedestrian paths, roads, and parking lots; vegetation such as lawns, shrubs and hedges; landforms, such as hills, terraces and berms; decorative elements, such as monuments and flag poles; and water features such as fountains. These features and their relationship to existing historic buildings should be retained and preserved. The removal or relocation of buildings or landscape features deteriorates the historic relationship between substation components and should be avoided (Grimmer 2017:63-65). If not avoidable, these actions may be permissible following screening by a BPA historian and/or the SHPO.

Railroad Spurs and Transfer Tracks

The railroad spur and transfer track rail systems located at multiple substations are no longer used and have become a tripping hazard. Over time, the pavement and trench drains adjacent to or under the transfer track have deteriorated, often exposing the rails and creating narrow potholes near the rail crib. Abandoning the rails in place by filling the crib (space between the rails) with gravel, asphalt or concrete would leave the top of the rails exposed as a historic visual element while reducing the risk of slips, trips, and falls. The removal or complete coverage of these rare transfer track rails could result in an adverse effect.

A tripping hazard was identified with the transfer track at the Covington Substation. Instead of removing the tracks, the rails were to be abandoned in place and the crib was filled with concrete to the top of the rails (Figure 68 and Figure 69). This would leave the tops of the rails exposed to denote their historic location and relation to other assets within the substation.

Figure 68. Covington transfer track

Figure 69. Proposed modification to infill transfer track

All projects fall into one of these tiered categories:

Activities Exempt from Review,

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA cultural resource specialist (see **Section 8** for BPA internal contact information) who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA cultural resource specialist and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

Exempt Activities

- Cleaning, repairing, or in-kind replacement of roadways, pedestrian paths, driveways or parking lots
- Cleaning or repairing lighting or electrical fixtures
- Cleaning or repairing historic security gates or fences
- Cleaning or repairing non-original security gates and fences
- Upgrade electronic equipment required for operation and maintenance of BPA's transmission grid including communication, meter, and relay equipment as well as RAS and SCADA system upgrades (NEPA categorical exclusion)
- Installing new equipment racks, new cabinets, phone systems, radios, meters, disconnects, switches, power circuit breakers, capacitive voltage transformers, bus ties, inter and intra-net equipment, and associated wiring (NEPA categorical exclusion)
- Replacing solar panels (NEPA categorical exclusion)
- In-kind replacement of vegetation
- Repair and in-kind utility upgrade of switchyard equipment

Activities requiring screening

- In-kind replacement of non-original security gates and fences

- In-kind replacement of non-original communication equipment
- Replacement of non-original lighting fixtures
- Replacement of non-original storm drains and their components
- Replacement of historic landscape features such as lighting, seating, flagpoles, monuments, plaques, water features, walls, fences, gates, and structures, using materials that are of a different type, scale, or material than the existing material
- Alterations to spatial organization of a site
- Alterations to a site's circulation routes and size such as pedestrian pathways and roadways
- Replacement of historic storm drains and their components, using materials that are of a different type, scale, or material than the existing material
- Introducing or installing additional storm drains in a site
- Installation of a solar device within the historic boundaries of a site
- Installation of a microwave or radio antenna tower within the historic boundaries of a site
- Replacement of historic communication equipment with modern components
- Introduction of communication equipment to a site
- Upgrade or expansion of a switchyard and its associated components

Activities requiring consultation

- Expansion of roadways, driveways, parking lots or pedestrian pathways
- Relocation or removal of identified assets
- Additions to or modifications of identified historic assets
- Any new construction within the boundaries of a historic substation
- Expansion of security gates or fences
- Any actions that would not meet the SOI's Standards for Rehabilitation

> *Reductions in switchyard scope or removal of equipment, as the result of changing use patterns, do not adversely affect character providing more than* ***50% of the original scope*** *of the facility survives.*

7.7 Sustainability

The SOI Standards and associated guidelines have multiple recommendations for improving the sustainability of historic buildings. The following subsections provide summaries for specific projects to enhance sustainability. For additional guidance on improving energy efficiency in historic buildings refer to the link to Preservation Brief #3 in Section 9. See Section 7.2 for all relevant tiered treatment options for facility improvement projects.

7.7.1 Windows

The SOI Standards and associated guidelines provide recommendations on how to improve sustainability through the maintenance and replacement of windows in historic buildings. These standards recommend that windows undergo routine maintenance to ensure they are functioning property. Weather stripping and caulking should be applied to make the window weather tight when appropriate; reopening historically operable interior transom windows can improve air flow and cross ventilation (Grimmer 2017:4-7). The covering or removal of existing transom windows should be avoided when possible. Section 7.2.1 provides additional recommendations on the treatment of windows.

Storm Windows

Interior or exterior storm windows or panels may be applied if they are compatible with existing historic windows. Storm windows should either match the existing window configuration or be of a one-over-one pane configuration that will not obscure the window's characteristics (Grimmer 2017:4-7, 46-48).

Window Glazing and Films

Retrofitting historic windows with high-performance glazing or clear film is considered appropriate if the window's historic character is maintained. Clear, low-emissivity (low-e) glass or film without noticeable color may be installed in historically clear windows to reduce solar heat gain. The application of tinted glass or reflective coatings should be avoided if they would negatively impact the historic character of the building. To improve daylighting for historically dark tinted windows, the application of a slightly lighter shade of the same color tint for glazing panels is appropriate. The use of clear glazing or significantly lighter colored film or tint than the original should be avoided.

Retrofitting Historic Steel and Curtain-Wall Systems

Historic steel and curtain-wall window systems may be retrofitted to improve thermal performance if their historical character is not compromised. Curtain-wall components should not be removed if they can be stabilized, repaired, or conserved (Grimmer 2017:4-7, 54).

7.7.2 Replacing HVAC Systems in a Historic Property

If an HVAC system is currently in place, it should be retained and maintained if it is functional and efficient. Prior to the installation of a replacement system, certain measures can be taken to improve an existing system such as retro-commissioning and the introduction of programmable thermostats, attic and ceiling fans, and louvers and vents where appropriate and compatible with the existing equipment. The installation of an HVAC system is appropriate if the historic character of the building and site is retained. The guidelines for introducing an HVAC system to a historic property listed in Section 7.2.8 should also be followed for the replacement of an HVAC system.

7.7.3 Solar Technology

The installation of a solar device on a historic property can be appropriate if it is positioned in a compatible location on the site or on a non-historic building or addition where it will have a minimal impact on the historic property. A solar device should only be installed on a historic building if all other locations have been investigated and determined to be infeasible. Installations on a historic building must be done in a manner that does not negatively impact the building's historic character or damage historic materials. Its installation must also be reversible. To minimize the negative impact of installing a solar device on a historic building, it should be oriented at a low-profile so that it is not visible or minimally visible from the public right-of way. Visibility can be reduced by installing roof panels horizontally and either flat or parallel to the roof. On flat roofs with parapets or other roof features, solar devices should be set back to use these historic features as screens to minimize their visual impact. Visibility can also be reduced by placing solar devices on a secondary slope of a roof or in an area not in view from the public right-of-way (Grimmer 2011:14-15).

7.7.4 Lighting

Energy efficient lighting or energy efficient lamps in existing light fixtures can help reduce energy consumption. Sensors regulating light sources can also increase energy efficiency (Grimmer 2011:2).

Track lighting can be replaced with LED lights to improve energy efficiency while maintaining the historic appearance and character of the original fixtures.

Figure 70. Original light fixtures (left) in the Oregon City Control House converted to LED lights (right).

7.7.5 Reuse of Obsolete but Contributing Assets

According to the SOI's Standards for Rehabilitation, a property may be repurposed if the required alterations require minimal changes to the defining characteristics of the building, its site, and environment (Grimmer 2017:viii). (See Section 7.3 for additional guidelines regarding alterations).

7.8 Paint

The Historic BPA Paint Color Index (Appendix C) provides guidance on historically-appropriate paint projects at BPA's substations to help maintain the appearance of historic resources that are eligible for the National Register of Historic Places (NRHP). By locating a substation in the Index (Appendix C, Table 1), BPA personnel may determine the appropriate paint color to use in historic substation paint projects. Each color in the index includes a federal standard color number, a representational sample of the color, and information on its historic use. Current BPA policy is to only match historic paint colors for building exteriors. Matching historic paint colors is not required for building interiors, signage, furniture or switchyard equipment.

The Index was developed by reviewing records and paint sample books that BPA used between 1950 and 1981 (information related to specific pre-1950 paint colors was unavailable). At times, these resources were explicit in terms of the application of paint colors and at other times vague. Paint sample books included brief handwritten notes next to paint chips, indicating specific uses such as dead-end towers or more generic uses such as "walls" or "signs." Based on the publication dates of paint sample books, BPA memos, and revisions to BPA painting policies, five time periods associated with paint application have emerged. Colors associated with each time period are included at the end of the Index. The identified time periods are:

- 1950-1955 (Table 23) **Error! Reference source not found.**– BPA's earliest standard paint s cheme. This scheme is recommended for all substations built prior to 1956, including those built during the Master Grid era 1938-1945.
- 1956-1965 (Table 24) – BPA's first revision of Federal Standard colors selected.
- 1966-1974 (Table 25) – Scheme A and additional identified colors.
- 1975-1980 (Table 26) – Scheme B.
- 1981-present (Table 27) – Scheme C.

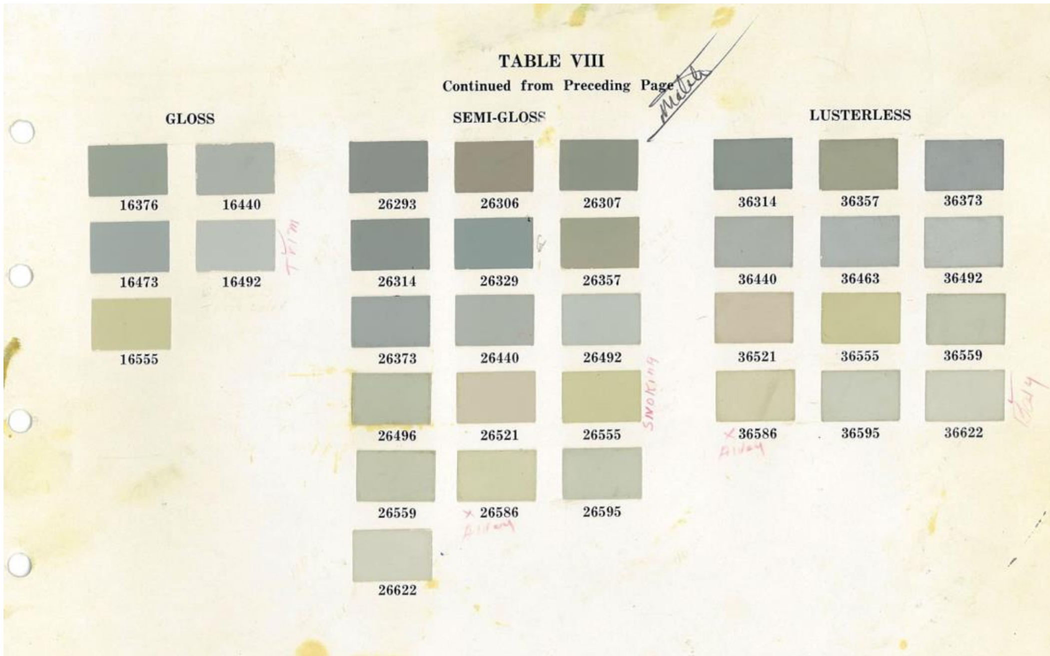


Figure 71. Page with hand-written notes from BPA's copy of Federal Standard No. 595 Colors for Ready Mixed Paints, 1956.

Figure 71: Sickler Substation, showing building and dead-end towers painted "BPA-1" Blue, 1970.

8. DISCOVERY OF ARTIFACTS OR HUMAN REMAINS

This section provides information about how to handle the discovery and notification procedures for artifacts, including historic or Native American archaeological resources and human skeleton remains, as well as “artifacts” associated with BPA’s history.

8.1 BPA Artifacts

BPA is developing an intake form for staff to share information with BPA historians or cultural resources staff about materials and equipment no longer in use at BPA facilities that could be reused at another substation or incorporated into an interpretive exhibit. Contact information for BPAs cultural resources staff is provided below.

Contacts:

Tama Tochihara
BPA Historian, Environmental Planning & Analysis
(503) 230-3972
tktochihara@bpa.gov

Sunshine Schmidt
BPA Federal Preservation Officer
srclark@bpa.gov
(503) 230-5075

8.2 Inadvertent Discovery Procedure for Archaeological Resources and Human Remains

Under federal law, the BPA has the responsibility to protect cultural resources that are inadvertently discovered on federally owned land or during federal undertakings (see 36 C.F.R. 800.13). BPA employs the following Inadvertent Discovery of Cultural Resources Procedure to be used by all BPA staff and contractors working on BPA funded projects that, through the course of their work, might inadvertently discover cultural resources.

Inadvertent Discovery

If your work brings you into contact with any of the following cultural resources:

- Native American cultural artifacts (e.g., flakes, arrowheads, stone tools, bone tools, pottery)
- Historic era artifacts (e.g., building foundations, homesteads, shipwrecks, mining camps)
- Human skeletal remains and bone fragments

You must immediately discontinue all ground-disturbing activity. Do not touch or move the objects and maintain the confidentiality of the site.

Follow the procedures below, complete the BPA Cultural Resources Discovery Report, and await further direction from BPA’s Cultural Resources Staff.

Cultural Resources Discovery Procedure

- Stop any ground disturbing activity immediately. This may be a crime scene. When bone fragments or possible Native American artifacts are found, study the objects WITHOUT disturbing, touching, or moving them. Removing bone fragments, artifacts, and other items from any archaeological site, without proper authorization, is against the law. Violators could be charged in state or federal court resulting in a fine or imprisonment, depending on the level of conduct.

- Contact BPA cultural resources staff immediately. Beginning with office phone numbers, continue calling down the list in order until you speak with someone. If no one on the list is available to take your call and it is during regular business hours, contact Michelle Bennett (503) 230-3900 or Erin Marshall (503) 230-5159. Should no one be available by office phone, please contact cultural resources staff on their cell phones.

Name	Office #	Cell #	Email Address	Mailing Address
Sunshine Schmidt Kevin Cannell	(503) 230-5015 (503) 230-4454	(503) 804-1815 (503) 459-7686	srclark@bpa.gov kgcannell@bpa.gov	Bonneville Power Administration 905 NE 11th Ave Portland, OR 97232

- Contact your direct supervisor and the project manager.
- Immediately complete the ***Cultural Resource Discovery Report*** *form* (Appendix D) and send/e-mail to ALL of the BPA cultural resources staff listed above.
- ***Do not draw attention to the area with any obvious flagging or markers*.** Maintain confidentiality concerning the discovery of the cultural resource, and do not discuss with anyone other than the contact people listed above as required by the BPA Cultural Resource Discovery Report *Statement of Confidentiality*.
- ***Only*** after following the checklist, completing the Cultural Resource Discovery Report form, and obtaining approval from your supervisor, should work continue on your work task or project.
- If you are a supervisor, you should obtain guidance from BPA's cultural resources staff (listed above). This protects the artifacts and sites, and limits BPA's liability and your personal liability.

Statement of Confidentiality

When dealing with or working around culturally sensitive sites, be aware that their significance and importance is unparalleled in Western society and that they hold great spiritual meaning for Native Americans. Also, federal law protects cultural resources whether it is Native American cultural objects, historic era artifacts or human skeletal remains. Therefore, it is imperative that the location of any sites be privileged information and closely held. Do not share information with anyone who might pass on knowledge of this site to thieves/collectors. These measures are not only for the sanctity of the site and Native Americans, but for BPA's and your own legal liability as well.

9. PRESERVATION BRIEFS

The NPS maintains a series of Preservation Briefs that provide detailed guidance on preserving, rehabilitating, and restoring historic buildings. These NPS publications recommend methods and approaches for resolving common issues with historic buildings that are consistent with preserving their historic character. A list of Preservation Briefs relevant to the BPA's MBR is provided below with links to the online publications.

Preservation Briefs:

#1. Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings, by Robert C. Mack, FAIA, and Anne E. Grimmer, 2000. https://www.nps.gov/tps/how-to-preserve/briefs/1-cleaning-water-repellent.htm

#2. Repointing Mortar Joints in Historic Masonry Buildings, by Robert C. Mack, FAI, and John P. Speweik, 1998. https://www.nps.gov/tps/how-to-preserve/briefs/2-repoint-mortar-joints.htm

#3. Improving Energy Efficiency in Historic Buildings, by Jo Ellen Hensley and Antonio Aguilar, 2011**.** https://www.nps.gov/tps/how-to-preserve/briefs/3-improve-energy-efficiency.htm

#4. Roofing for Historic Buildings, by Sarah M. Sweetser, 1978. https://www.nps.gov/tps/how-to-preserve/briefs/4-roofing.htm

#6. Dangers of Abrasive Cleaning to Historic Buildings, by Anne E. Grimmer, 1979. https://www.nps.gov/tps/how-to-preserve/briefs/6-dangers-abrasive-cleaning.htm

#10. Exterior Paint Problems on Historic Woodwork, by Kay D. Weeks and David W. Look, AIA, 1982. https://www.nps.gov/tps/how-to-preserve/briefs/10-paint-problems.htm

#13. The Repair and Thermal Upgrading of Historic Steel Windows, by Sharon C. Park, AIA, 1984. https://www.nps.gov/tps/how-to-preserve/briefs/13-steel-windows.htm

#14. New Exterior Additions to Historic Buildings: Preservation Concerns, by Anne E. Grimmer and Kay D. Weeks, 2010. https://www.nps.gov/tps/how-to-preserve/briefs/14-exterior-additions.htm

#15. Preservation of Historic Concrete, by Paul Gaudette and Deborah Slayton, 2007. https://www.nps.gov/tps/how-to-preserve/briefs/15-concrete.htm

#16. The Use of Substitute Materials on Historic Building Exteriors, by Sharon C. Park, AIA, 1988. https://www.nps.gov/tps/how-to-preserve/briefs/16-substitute-materials.htm

#17. Architectural Character: Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving their Character, by Lee H. Nelson, FAIA, 1988. https://www.nps.gov/tps/how-to-preserve/briefs/17-architectural-character.htm

#22. The Preservation and Repair of Historic Stucco, by Anne E. Grimmer, 1990. https://www.nps.gov/tps/how-to-preserve/briefs/22-stucco.htm

#24. Heating, Ventilation, and Cooling Historic Buildings: Problems and Recommended Approaches, by Sharon C. Park, AIA, 1991. https://www.nps.gov/tps/how-to-preserve/briefs/24-heat-vent-cool.htm

#25. The Preservation of Historic Signs, by Michael J Auer, 1991. https://www.nps.gov/tps/how-to-preserve/briefs/25-signs.htm

#32. Making Historic Properties Accessible, by Thomas C. Jester and Sharon C. Park, AIA, 1993. https://www.nps.gov/tps/how-to-preserve/briefs/32-accessibility.htm

#38. Removing Graffiti from Historic Masonry, by Martin E. Weaver, 1995. https://www.nps.gov/tps/how-to-preserve/briefs/38-remove-graffiti.htm

#39. Holding the Line: Controlling Unwanted Moisture in Historic Buildings, by Sharon C. Park, AIA, 1996.https://www.nps.gov/tps/how-to-preserve/briefs/39-control-unwanted-moisture.htm

#41. The Seismic Rehabilitation of Historic Buildings, by Antonio Aguilar, 2016. https://www.nps.gov/tps/how-to-preserve/briefs/41-seismic-rehabilitation.htm

#42. The Maintenance, Repair and Replacement of Historic Cast Stone, by Richard Pieper, 2001. https://www.nps.gov/tps/how-to-preserve/briefs/42-cast-stone.htm

#47. Maintaining the Exteriors of Small and Medium Size Historic Buildings, by Sharon C. Park, FAIA, 2007. https://www.nps.gov/tps/how-to-preserve/briefs/47-maintaining-exteriors.htm

10. PRESERVATION TECH NOTES

The NPS maintains a series of Preservation Tech Notes that provide practical information on the appropriate practices and innovative techniques for maintaining and preserving cultural resources. These NPS publications recommend methods and approaches for resolving common issues with historic buildings that are consistent with preserving their historic character. A list of Preservation Tech Notes relevant to the BPA's MBR is provided below with links to the online publications.

Preservation Tech Notes:

Doors

#1. Historic Garage and Carriage Doors: Rehabilitation Solutions, by Bonnie Halda, AIA, 1989. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Doors01.pdf

Historic Interior Spaces

#1. Preserving Historic Corridors in Open Office Plans, by Christina Henry, 1985. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Interior01.pdf

#2. Preserving Historic Office Building Corridors, by Thomas Keohan, 1989. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Interior02.pdf

#3. Preserving Historic Corridor Doors and Glazing in High-Rise Buildings, by Chad Randl, 2001. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Interior03.pdf

Masonry

#4. Non-destructive Evaluation Techniques for Masonry Construction, by Marilyn E. Kaplan, Marie Ennis, and Edmund P. Meade, 1997. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Masonry04.pdf

Metals

#2. Restoring Metal Roof Cornices, by Richard Pieper, 1990. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Metals02.pdf

Temporary Protection

#2. Specifying Temporary Protection of Historic Interiors During Construction and Repair, by Dale H. Frens, 1993. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Protection02.pdf

#3. Protecting a Historic Structure during Adjacent Construction, by Chad Randl, 2001. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Protection03.pdf

Windows

#1. Planning Approaches to Window Preservation, by Charles Fisher, 1984. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Windows01.pdf

#2. Installing Insulating Glass in Existing Steel Windows, by Charles Fisher, 1984. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Windows02.pdf

#5. Interior Metal Storm Windows, by Laura Muckenfuss and Charles Fisher, 1984. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Windows05.pdf

#7. Window Awnings, by Laura Muckenfuss and Charles Fisher, 1984. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Windows07.pdf

#9. Interior Storm Windows: Magnetic Seal, by Charles Fisher, 1984. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Windows09.pdf

#12. Aluminum Replacements for steel Industrial Sash, by Charles E. Fisher, 1986. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Windows12.pdf

#15. Interior Storms for Steel Casement Windows, by Charles E. Fisher and Christina Henry, 1986. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Windows15.pdf

#17. Repair and Retrofitting Industrial Steel Windows, by Robert M. Powers, 1989. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Windows17.pdf

#19. Repairing Steel Casement Windows, by Chad Randl, 2002. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Windows19.pdf

#22. Maintenance and Repair of Historic Aluminum Windows, by Kaaren R. Staveteig, 2008. https://www.nps.gov/tps/how-to-preserve/tech-notes/Tech-Notes-Windows22.pdf

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APPENDIX A: BPA HISTORIC SUBSTATION ELIGIBILITY INDEX

BPA Historic Substation NRHP-Eligibility Index

NAME	STATE	YEAR	PERIOD	ELIGIBILITY	DISTRICT	REGION	COUNTY
Aberdeen	WA	1950	System Expansion	Not Eligible	Olympia	North	GRAYS HARBOR
Adair	OR	1969	System Expansion	Eligible	Salem	South	BENTON
Albany	OR	1954	System Expansion	Eligible	Eugene	South	LINN
Alcoa	WA	1940	Master Grid	Control House only	Longview	South	CLARK
Alston	OR	1969	System Expansion	Eligible	Longview	South	COLUMBIA
Alvey	OR	1950	System Expansion	Eligible	Eugene	South	LANE
Anaconda	MT	1953	System Expansion	Eligible	Kalispell	East	DEER LODGE
Bandon	OR	1950	System Expansion	Not Eligible	Eugene	South	COOS
Bell	WA	1942	Master Grid	Not Eligible	Spokane	East	SPOKANE
Bellingham	WA	1954	System Expansion	Eligible	Snohomish	North	WHATCOM
Big Eddy/Starr	OR	1956	System Expansion	Eligible	The Dalles	South	WASCO
Bonners Ferry	ID	1951	System Expansion	Not Eligible	Spokane	East	BOUNDARY
Boundary	WA	1967	System Expansion	Eligible	Spokane	East	PEND OREILLE
Burnt Woods	OR	1954	System Expansion	Eligible	Eugene	South	BENTON
Cardwell	WA	1963	System Expansion	Eligible	Longview	South	COWLITZ
Centralia	WA	1950	System Expansion	Eligible	Olympia	North	LEWIS
Chehalis	WA	1941	Master Grid	Eligible	Olympia	North	LEWIS
Chemawa	OR	1954	System Expansion	Eligible	Salem	South	MARION
Chenoweth	OR	1957	System Expansion	Not Eligible	The Dalles	South	WASCO
Chief Joseph	WA	1958	System Expansion	Eligible	Wenatchee	North	DOUGLAS
Clarkston	WA	1958	System Expansion	Eligible	Spokane	East	WHITMAN
Columbia	WA	1945	Master Grid	Eligible	Wenatchee	North	DOUGLAS
Columbia Falls	MT	1955	System Expansion	Not Eligible	Kalispell	East	FLATHEAD
Colville	WA	1972	System Expansion	Not Eligible	Spokane	East	STEVENS
Conkelley	MT	1958	System Expansion	Eligible	Kalispell	East	FLATHEAD
Cosmopolis	WA	1942	Master Grid	Not Eligible	Olympia	North	GRAYS HARBOR
Covington	WA	1942	Master Grid	Eligible	Covington	North	KING
Cowlitz	WA	1946	System Expansion	Not Eligible	Longview	South	COWLITZ
Creston	WA	1947	System Expansion	Not Eligible	Spokane	East	LINCOLN
Custer	WA	1967	System Expansion	Not Eligible	Snohomish	North	WHATCOM

NAME	STATE	YEAR	PERIOD	ELIGIBILITY	DISTRICT	REGION	COUNTY
De Moss	OR	1958	System Expansion	Not Eligible	The Dalles	South	SHERMAN
Detroit	OR	1952	System Expansion	Eligible	Salem	South	MARION
Drain	OR	1948	System Expansion	Not Eligible	Eugene	South	DOUGLAS
Driscoll	OR	1966	System Expansion	Eligible	Longview	South	CLATSOP
Dworshak	ID	1973	System Expansion	Eligible	Spokane	East	CLEARWATER
Eugene	OR	1941	Master Grid	Eligible	Eugene	South	LANE
Fairmount	WA	1958	System Expansion	Not Eligible	Olympia	North	JEFFERSON
Fairview	OR	1958	System Expansion	Eligible	Eugene	South	COOS
Forest Grove	OR	1946	System Expansion	Not Eligible	Salem	South	WASHINGTON
Fossil	OR	1961	System Expansion	Not Eligible	The Dalles	South	WHEELER
Franklin	WA	1948	System Expansion	Not Eligible	Tri-Cities	East	FRANKLIN
Gardiner	OR	1963	System Expansion	Eligible	Eugene	South	DOUGLAS
Goldendale	WA	1957	System Expansion	Eligible	The Dalles	South	KLICKITAT
Grandview	WA	1947	System Expansion	Eligible	Tri-Cities	East	YAKIMA
Grizzly	OR	1967	System Expansion	Not Eligible	Redmond	South	JEFFERSON
Hanford	WA	1970	System Expansion	Eligible	Tri-Cities	East	BENTON
Harrisburg	OR	1946	System Expansion	Not Eligible	Eugene	South	LINN
Harvalum	WA	1971	System Expansion	Not Eligible	The Dalles	South	KLICKITAT
Hat Rock	OR	1971	System Expansion	Not Eligible	Tri-Cities	East	UMATILLA
Hauser	OR	1954	System Expansion	Not Eligible	Eugene	South	COOS
Heyburn	ID	1963	System Expansion	Not Eligible	Idaho Falls	East	MINIDOKA
Holcomb	WA	1955	System Expansion	Not Eligible	Olympia	North	PACIFIC
Hood River	OR	1946	System Expansion	Not Eligible	The Dalles	South	HOOD RIVER
Hot Springs	MT	1953	System Expansion	Eligible	Kalispell	East	SANDERS
Intalco	WA	1966	System Expansion	Eligible	Snohomish	North	WHATCOM
Ione	OR	1949	System Expansion	Eligible	Tri-Cities	East	MORROW
John Day	OR	1968	System Expansion	Eligible	The Dalles	South	SHERMAN
Kalispell	MT	1948	System Expansion	Not Eligible	Kalispell	East	FLATHEAD
Keeler	OR	1956	System Expansion	Eligible	Salem	South	WASHINGTON

NAME	STATE	YEAR	PERIOD	ELIGIBILITY	DISTRICT	REGION	COUNTY
Kerr	MT	1948	System Expansion	Eligible	Kalispell	East	LAKE
Kitsap	WA	1955	System Expansion	Not Eligible	Olympia	North	KITSAP
La Grande	OR	1952	System Expansion	Eligible	Tri-Cities	East	UNION
Lane	OR	1966	System Expansion	Eligible	Eugene	South	LANE
Langlois	OR	1957	System Expansion	Eligible	Eugene	South	CURRY
Lebanon	OR	1950	System Expansion	Not Eligible	Eugene	South	LINN
Little Goose	WA	1970	System Expansion	Eligible	Spokane	East	WHITMAN
Longview	WA	1941	Master Grid	Not Eligible	Longview	South	COWLITZ
Lookingglass	OR	1951	System Expansion	Not Eligible	Eugene	South	DOUGLAS
Lookout Point	OR	1954	System Expansion	Eligible	Eugene	South	LANE
Lower Monumental	WA	1967	System Expansion	Not Eligible	Tri-Cities	East	WALLA WALLA
Malin	OR	1967	System Expansion	Not Eligible	Redmond	South	KLAMATH
Maple Valley	WA	1961	System Expansion	Not Eligible	Covington	North	KING
Mapleton	OR	1948	System Expansion	Not Eligible	Eugene	South	LANE
Marion	OR	1970	System Expansion	Eligible	Salem	South	MARION
Maupin	OR	1974	System Expansion	Eligible	The Dalles	South	WASCO
McMinnville	OR	1951	System Expansion	Not Eligible	Salem	South	YAMHILL
McNary	OR	1954	System Expansion	Eligible	Tri-Cities	East	UMATILLA
Midway	WA	1941	Master Grid	Eligible	Tri-Cities	East	BENTON
Milton	OR	1946	System Expansion	Not Eligible	Tri-Cities	East	UMATILLA
Monmouth	OR	1954	System Expansion	Eligible	Salem	South	POLK
Monroe	WA	1970	System Expansion	Not Eligible	Snohomish	North	SNOHOMISH
Moxee	WA	1954	System Expansion	Eligible	Tri-Cities	East	YAKIMA
Murray	WA	1972	System Expansion	Eligible	Snohomish	North	SNOHOMISH
Naselle	WA	1949	System Expansion	Not Eligible	Longview	South	PACIFIC
North Bonneville	WA	1941	Master Grid	Eligible	Longview	South	SKAMANIA
Norway	OR	1950	System Expansion	Not Eligible	Eugene	South	COOS
Odessa	WA	1961	System Expansion	Not Eligible	Spokane	East	LINCOLN
Olympia	WA	1949	System Expansion	Not Eligible	Olympia	North	THURSTON

NAME	STATE	YEAR	PERIOD	ELIGIBILITY	DISTRICT	REGION	COUNTY
Oregon City	OR	1941	Master Grid	Eligible	Salem	South	WASHINGTON
Ostrander	OR	1970	System Expansion	Eligible	Longview	South	CLACKAMAS
Paul	WA	1971	System Expansion	Eligible	Olympia	North	LEWIS
Pearl	OR	1968	System Expansion	Not Eligible	Salem	South	CLACKAMAS
Pendleton	OR	1941	Master Grid	Not Eligible	Tri-Cities	East	UMATILLA
Port Angeles	WA	1950	System Expansion	Eligible	Olympia	North	CLALLAM
Port Orford	OR	1952	System Expansion	Not Eligible	Eugene	South	CURRY
Potholes	WA	1958	System Expansion	Control House only	Wenatchee	North	GRANT
Potlatch	WA	1960	System Expansion	Eligible	Olympia	North	MASON
Priest River	ID	1974	System Expansion	Not Eligible	Spokane	East	BONNER
Raver	WA	1968	System Expansion	Not Eligible	Covington	North	KING
Raymond	WA	1940	Master Grid	Not Eligible	Olympia	North	PACIFIC
Redmond	OR	1952	System Expansion	Not Eligible	Redmond	South	DESCHUTES
Reedsport	OR	1957	System Expansion	Eligible	Eugene	South	DOUGLAS
Republic	WA	1953	System Expansion	Eligible	Spokane	East	FERRY
Reston	OR	1960	System Expansion	Eligible	Eugene	South	DOUGLAS
Richland	WA	1949	System Expansion	Eligible	Tri-Cities	East	BENTON
Ross	WA	1940	Master Grid	Eligible	Longview	South	CLARK
Roundup	OR	1954	System Expansion	Eligible	Tri-Cities	East	UMATILLA
Sacheen	WA	1973	System Expansion	Eligible	Spokane	East	PEND OREILLE
Salem	OR	1942	Master Grid	Eligible	Salem	South	POLK
Sandpoint	ID	1950	System Expansion	Eligible	Spokane	East	BONNER
Santiam	OR	1954	System Expansion	Eligible	Salem	South	LINN
Scooteney	WA	1953	System Expansion	Eligible	Tri-Cities	East	FRANKLIN
Shelton	WA	1947	System Expansion	Not Eligible	Olympia	North	MASON
Sickler	WA	1968	System Expansion	Eligible	Wenatchee	North	DOUGLAS
Silver Creek	WA	1958	System Expansion	Not Eligible	Olympia	North	LEWIS
Snohomish	WA	1947	System Expansion	Not Eligible	Snohomish	North	SNOHOMISH
Sno-King	WA	1965	System Expansion	Not Eligible	Snohomish	North	SNOHOMISH
St. Johns	OR	1941	Master Grid	Eligible	Longview	South	MULTNOMAH
Tacoma	WA	1942	Master Grid	Eligible	Covington	North	PIERCE
Tahkenitch	OR	1963	System Expansion	Eligible	Eugene	South	DOUGLAS

NAME	STATE	YEAR	PERIOD	ELIGIBILITY	DISTRICT	REGION	COUNTY
Teton	WY	1968	System Expansion	Not Eligible	Idaho Falls	East	TETON
The Dalles	OR	1941	System Expansion	Not Eligible	The Dalles	South	WASCO
Timber	OR	1955	System Expansion	Eligible	Salem	South	WASHINGTON
Toledo	OR	1958	System Expansion	Eligible	Eugene	South	LINCOLN
Troutdale	OR	1942	Master Grid	Control House only	Longview	South	MULTNOMAH
Troy	MT	1953	System Expansion	Eligible	Kalispell	East	LINCOLN
Unity	ID	1967	System Expansion	Eligible	Idaho Falls	East	CASSIA
Valhalla	WA	1953	System Expansion	Eligible	Wenatchee	North	CHELAN
Vantage	WA	1963	System Expansion	Eligible	Wenatchee	North	GRANT
Wagner Lake	WA	1974	System Expansion	Eligible	Spokane	East	LINCOLN
Walla Walla	WA	1941	Master Grid	Eligible	Tri-Cities	East	WALLA WALLA
Walton	OR	1949	System Expansion	Eligible	Eugene	South	LANE
Wendson	OR	1973	System Expansion	Eligible	Eugene	South	LANE
Winthrop	WA	1974	System Expansion	Not Eligible	Wenatchee	North	OKANOGAN
Wren	OR	1947	System Expansion	Eligible	Eugene	South	BENTON

APPENDIX B: BPA HISTORIC SUBSTATION ASSETS INDEX

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Aberdeen Substation	WA	Z-53 CONTROL HOUSE	1950	System Expansion	Historic/Non-Contributing	Utilitarian	Type 170	Aluminum
Aberdeen Substation	WA	Z-1385 OIL ABSORBENTS BUILDING	1984	System Expansion	Not a historic resource per MPDF			
Aberdeen Substation	WA	Z-1386 STORAGE	1984	System Expansion	Not a historic resource per MPDF			
Adair Substation	OR	Z-465 CONTROL HOUSE	1969	System Expansion	Historic/Contributing	Utilitarian	Type 193	Aluminum
Albany Substation	OR	Z-939 CONTROL HOUSE	1954	System Expansion	Historic/Contributing	Minimal Traditional		Asbestos Cement
Albany Substation	OR	Z-151 MAINTENANCE	1951	System Expansion	Historic/Non-Contributing	Utilitarian		Vinyl
Alcoa Substation	WA	Z-950 CONTROL HOUSE	1941	Master Grid	Individually Eligible	Streamline Moderne	Type 155	Concrete
Allston Substation	OR	Z-7010 STORAGE SHED	1991	System Expansion	Not a historic resource per MPDF		Type C	
Allston Substation	OR	Z-1224 POLE EQUIPMENT STORAGE	1991	System Expansion	Out of Period/Non-contributing			
Allston Substation	OR	Z-1337 CONTROL HOUSE 115KV (RELAY HOUSE - 115KV)	1996	System Expansion	Out of Period/Non-contributing			
Allston Substation	OR	Z-0000 CONTROL CABLE TUNNEL - 1	1969	System Expansion	Feature of switchyard			
Allston Substation	OR	Z-0000 CONTROL CABLE TUNNEL - 2	1969	System Expansion	Feature of switchyard			
Alston Substation	OR	Z-710 CONTROL HOUSE / MAINTENANCE	1969	System Expansion	Historic/Contributing; Individually Eligible	Modern/Brutalist	Type 2010	Concrete
Alvey Substation & Maintenance HQ	OR	Z-0948 CONTROL HOUSE	1952	System Expansion	Historic/Contributing; Individually Eligible	International	Type 180	Steel
Alvey Substation & Maintenance HQ	OR	Z-945 CSE BUILDING	1951	System Expansion	Historic/Contributing	Utilitarian		Concrete Block
Alvey Substation & Maintenance HQ	OR	Z-0000 TRANSFER TRACK	1952	System Expansion	Historic/Contributing	Utilitarian	Rails	Steel
Alvey Substation & Maintenance HQ	OR	Z-944 MAINTENANCE	1952	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Alvey Substation & Maintenance HQ	OR	Z-943 AUTOMOTIVE SHOP	1953	System Expansion	Historic/Contributing	Utilitarian		Concrete Block
Alvey Substation & Maintenance HQ	OR	Z-312 ENGINE GENERATOR BUILDING	1957	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Alvey Substation & Maintenance HQ	OR	Z-771 AUTOMOTIVE STORAGE	1959	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Alvey Substation & Maintenance HQ	OR	Z-0000 STORAGE SHED	1962	System Expansion	Not a historic resource per MPDF			
Alvey Substation & Maintenance HQ	OR	Z-7914 STORAGE - HAZARDOUS MATERIALS	1993	System Expansion	Not a historic resource per MPDF			
Alvey Substation & Maintenance HQ	OR	Z-7913 STORAGE	1997	System Expansion	Not a historic resource per MPDF			
Alvey Substation & Maintenance HQ	OR	Z-1521 OEP SHED	2014	System Expansion	Not a historic resource per MPDF			
Alvey Substation & Maintenance HQ	OR	Z-630 MAINTENANCE STORAGE	1980	System Expansion	Out of Period/Non-contributing			
Alvey Substation & Maintenance HQ	OR	Z-622 FLAMMABLE STORAGE	1986	System Expansion	Out of Period/Non-contributing			
Alvey Substation & Maintenance HQ	OR	Z-606 MAINTENANCE HEADQUARTERS	1989	System Expansion	Out of Period/Non-contributing			

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Alvey Substation & Maintenance HQ	OR	Z-607 HMEM GARAGE	1989	System Expansion	Out of Period/Non-contributing			
Alvey Substation & Maintenance HQ	OR	Z-608 TOOL ROOM STORAGE	1989	System Expansion	Out of Period/Non-contributing			
Alvey Substation & Maintenance HQ	OR	Z-1336 MODULAR BUILDING	1992	System Expansion	Out of Period/Non-contributing			
Alvey Substation & Maintenance HQ	OR	Z-1325 RELAY HOUSE - 500KV	1994	System Expansion	Out of Period/Non-contributing			
Anaconda Substation	MT	Z-0951 CONTROL HOUSE	1953	System Expansion	Historic/Contributing; Individually Eligible	Modern	Type 145	Concrete Block
Anaconda Substation	MT	Z-8575 Railroad Spur & Transfer Track	1953	System Expansion	Historic/Contributing	Utilitarian	Rails	Steel
Anaconda Substation	MT	Z-0330 STORAGE	1957	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Anaconda Substation	MT	Z-0510 ENGINE GENERATOR / STORAGE BUILDING	1973	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Anaconda Substation	MT	Z-0684 MAINTENANCE / VEHICLE STORAGE T-SHAPED	1974	System Expansion	Historic/Contributing	Utilitarian		Wood
Bandon Substation	OR	Z-12 CONTROL HOUSE	1951	System Expansion	Historic/Non-Contributing	Utilitarian	Type 190	Aluminum
Bandon Substation	OR	Z-1263 OIL ABSORBANT BUILDING	1993	System Expansion	Not a historic resource per MPDF			
Bell Substation	WA	TRANSFER TRACK	1942	Master Grid	Historic/Non-contributing	Utilitarian	Rails	Steel
Bell Substation	WA	Z-0954 CONTROL HOUSE	1942	Master Grid	Historic/Non-contributing	Streamline Moderne	Type 110	Concrete
Bell Substation	WA	Z-0957 REGIONAL OFFICE / STORAGE	1942	Master Grid	Historic/Non-contributing	Utilitarian		Corrugated Metal
Bell Substation	WA	Z-0961 UNTANKING TOWER	1942	Master Grid	Historic/Non-contributing	Utilitarian	Untanking Tower	Corrugated Metal
Bell Substation	WA	Z-0958 AUTOMOTIVE SHOP - TLM BUILDING	1949	Master Grid	Historic/Non-contributing	Utilitarian		Concrete Block
Bell Substation	WA	Z-0831 MAINTENANCE HEADQUARTERS	1954	Master Grid	Historic/Non-contributing	Utilitarian		Corrugated Metal
Bell Substation	WA	Z-0830 COLD STORAGE	1955	Master Grid	Historic/Non-contributing	Utilitarian		Corrugated Metal
Bell Substation	WA	Z-0269 ENGINE GENERATOR BUILDING	1956	Master Grid	Historic/Non-contributing	Utilitarian	Type 193	Aluminum
Bell Substation	WA	Z-1456 TLM POLE YARD BUILDING	1970	Master Grid	Historic/Non-contributing	Utilitarian		Corrugated Metal
Bell Substation	WA	Z-0647 FLAMMABLE STORAGE	1978	Master Grid	Out of Period/Non-contributing			
Bell Substation	WA	Z-0634 TLM COLD STORAGE	1981	Master Grid	Out of Period/Non-contributing			
Bell Substation	WA	Z-1166 STORAGE	1988	Master Grid	Out of Period/Non-contributing			
Bell Substation	WA	Z-1350 TRANSPORTATION BUILDING	1999	Master Grid	Out of Period/Non-contributing			
Bell Substation	WA	Z-1412 HMEM COLD STORAGE	2001	Master Grid	Out of Period/Non-contributing			
Bell Substation	WA	Z-1413 CONTROL HOUSE / 500KV	2004	Master Grid	Out of Period/Non-contributing			
Bell Substation	WA	Z-1419 SUBSTATION MAINTENANCE PARTS STORAGE	2005	Master Grid	Out of Period/Non-contributing			
Bell Substation	WA	Z-1328 ENGINE GENERATOR STORAGE BUILDING	2013	Master Grid	Out of Period/Non-contributing			
Bell Substation	WA	Z-1484 HMEM GARAGE	2013	Master Grid	Out of Period/Non-contributing			
Bellingham Substation	WA	Z-840 CONTROL HOUSE	1955	System Expansion	Historic/Contributing	Modern	Type 111	Concrete
Bellingham Substation	WA	Z-8956 STORAGE - SRU #1	1968	System Expansion	Not a historic resource per MPDF			
Bellingham Substation	WA	Z-8957 STORAGE - SRU #2	1968	System Expansion	Not a historic resource per MPDF			
Bellingham Substation	WA	Z-8958 STORAGE - SRU #4	1968	System Expansion	Not a historic resource per MPDF			
Bellingham Substation	WA	Z-553 ENGINE GENERATOR BUILDING	1976	System Expansion	Out of Period/Non-contributing			
Bellingham Substation	WA	Z-7855 Sanitary Sewer	1999	System Expansion	Out of Period/Non-contributing			
Bellingham Substation	WA	Z-0000 Storm Sewer	2000	System Expansion	Out of Period/Non-contributing			
Bonners Ferry Substation	ID	Z-0043 CONTROL HOUSE	1952	System Expansion	Historic/Non-Contributing	Utilitarian	Type 190	Aluminum
Boundary Substation	WA	Z-0741 CONTROL HOUSE	1967	System Expansion	Historic/Contributing	International	Type 2009	Asbestos Cement

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Burnt Woods Substation	OR	Z-213 CONTROL HOUSE	1954	System Expansion	Historic/Contributing; Individually Eligible	Utilitarian	Type 191	Aluminum
Cardwell Substation	WA	Z-756 CONTROL HOUSE	1963	System Expansion	Historic/Contributing; Individually Eligible	Minimal Traditional	Type 144-1	Concrete Block
Cardwell Substation	WA	Z-7512 STORAGE	1963	System Expansion	Not a historic resource per MPDF			
Centralia Substation	WA	Z-50 CONTROL HOUSE	1966	System Expansion	Historic/Contributing	Utilitarian	Type 190	Aluminum
Centralia Substation	WA	Z-9010 OIL ABSORBANT BUILDING	1980	System Expansion	Not a historic resource per MPDF			
Chehalis Substation	WA	Z-960 UNTANKING TOWER	1941	Master Grid	Historic/Contributing; Individually Eligible	Streamline Moderne	Untanking Tower	Concrete
Chehalis Substation	WA	Z-959 CONTROL HOUSE	1941	Master Grid	Historic/Contributing; Individually Eligible	Streamline Moderne	Type 110	Concrete
Chehalis Substation	WA	TRANSFER TRACK	1941	Master Grid	Historic/Contributing	Utilitarian	Rails	Steel
Chehalis Substation	WA	Z-0000 STORAGE SHED	1980	Master Grid	Not a historic resource per MPDF			
Chehalis Substation	WA	Z-0000 STORAGE #3	1980	Master Grid	Not a historic resource per MPDF			
Chehalis Substation	WA	Z-9012 STORAGE	1980	Master Grid	Not a historic resource per MPDF			
Chehalis Substation	WA	Z-0000 STORAGE #2	1990	Master Grid	Not a historic resource per MPDF			
Chehalis Substation	WA	Z-0000 STORAGE #4	1990	Master Grid	Not a historic resource per MPDF			
Chehalis Substation	WA	Z-0000 STORAGE - HAZARDOUS MATERIALS	1990	Master Grid	Not a historic resource per MPDF			
Chehalis Substation	WA	Z-0000 STORAGE #1	1990	Master Grid	Not a historic resource per MPDF			
Chehalis Substation	WA	Z-343 STORAGE	1990	Master Grid	Not a historic resource per MPDF			
Chehalis Substation	WA	Z-345 STORAGE	1990	Master Grid	Not a historic resource per MPDF			
Chehalis Substation	WA	Z-1234 COMPRESSOR HOUSE	1990	Master Grid	Not a historic resource per MPDF			
Chehalis Substation	WA	Z-518 ENGINE GENERATOR BUILDING	1976	Master Grid	Out of Period/Non-contributing			
Chehalis Substation	WA	Z-651 VEHICLE STORAGE	1978	Master Grid	Out of Period/Non-contributing			
Chehalis Substation	WA	Z-1161 AUTOMOTIVE STORAGE	1987	Master Grid	Out of Period/Non-contributing			
Chehalis Substation	WA	Z-1233 TRACTOR STORAGE	1989	Master Grid	Out of Period/Non-contributing			
Chehalis Substation	WA	Z-1455 POLE BARN	1996	Master Grid	Out of Period/Non-contributing			
Chemawa Substation & Maintenance HQ	OR	Z-934 CONTROL HOUSE	1954	System Expansion	Historic/Contributing	Modern	Type 125	Concrete
Chemawa Substation & Maintenance HQ	OR	Z-8190 Railroad	1954	System Expansion	Historic/Contributing	Utilitarian	Rails	Steel
Chemawa Substation & Maintenance HQ	OR	Z-359 ENGINE GENERATOR BUILDING	1963	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Chemawa Substation & Maintenance HQ	OR	Z-667 STORAGE	1977	System Expansion	Out of Period/Non-contributing			
Chemawa Substation & Maintenance HQ	OR	Z-670 O&M HEADQUARTERS BUILDING	1977	System Expansion	Out of Period/Non-contributing			
Chemawa Substation & Maintenance HQ	OR	Z-623 VEHICLE STORAGE	1982	System Expansion	Out of Period/Non-contributing			
Chemawa Substation & Maintenance HQ	OR	Z-1286 FLAMMABLE STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Chemawa Substation & Maintenance HQ	OR	Z-1287 VEHICLE STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Chemawa Substation & Maintenance HQ	OR	Z-1303 VEHICLE STORAGE	1995	System Expansion	Out of Period/Non-contributing			

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Chemawa Substation & Maintenance HQ	OR	Z-1410 TLM STORAGE	1995	System Expansion	Out of Period/Non-contributing			
Chemawa Substation & Maintenance HQ	OR	Z-5240 STORAGE	1995	System Expansion	Out of Period/Non-contributing			
Chemawa Substation & Maintenance HQ	OR	Z-9128 FUELING STATION	1995	System Expansion	Out of Period/Non-contributing			
Chemawa Substation & Maintenance HQ	OR	Z-9127 WASH RACK	2014	System Expansion	Out of Period/Non-contributing			
Chemawa Substation & Maintenance HQ	OR	Z-8183 Cable Tunnel	1954	System Expansion	Feature of switchyard			
Chenoweth Substation	OR	CONTROL HOUSE	1958	System Expansion	Historic/Non-contributing	Minimal Traditional	Type 144	Concrete Block
Chief Joseph Substation	WA	Z-829 CONTROL HOUSE	1956	System Expansion	Historic/Contributing	Modern	Type 187	Concrete
Chief Joseph Substation	WA	Z-828 STORAGE (OLD OIL HOUSE)	1956	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Chief Joseph Substation	WA	Z-827 RELAY HOUSE #1	1956	System Expansion	Historic/Contributing	Utilitarian		Concrete
Chief Joseph Substation	WA	TRANSFER TRACK	1956	System Expansion	Historic/Contributing	Utilitarian	Rails	Steel
Chief Joseph Substation	WA	Z-701 RELAY HOUSE #2	1972	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Chief Joseph Substation	WA	Z-779 MAINTENANCE	1957	System Expansion	Historic/Non-Contributing	Utilitarian		Composite
Chief Joseph Substation	WA	Z-6009 SHED	1985	System Expansion	Out of Period/Non-contributing			
Chief Joseph Substation	WA	Z-7815 Cable Tunnel	1956	System Expansion	Feature of switchyard			
Clarkston Substation	WA	Z-292 CONTROL HOUSE	1958	System Expansion	Historic/Contributing; Individually Eligible	Utilitarian	Type 192	Aluminum
Columbia Falls Substation	MT	Z-688 CONTROL HOUSE - 115 KV	1973	System Expansion	Historic/Non-contributing	Utilitarian		Corrugated Metal
Columbia Falls Substation	MT	Z-1167 CONTROL HOUSE - 230 KV	1986	System Expansion	Out of Period/Non-contributing			
Columbia Substation	WA	Z-962 CONTROL HOUSE	1945	Master Grid	Historic/Contributing; Individually Eligible	Streamline Moderne	Type 110	Concrete
Columbia Substation	WA	Z-963 STORAGE (OLD OIL HOUSE)	1945	Master Grid	Historic/Contributing	Utilitarian	Oil House	Concrete
Columbia Substation	WA	Z-750 MAINTENANCE	1965	Master Grid	Historic/Contributing	Utilitarian		Concrete
Colville Substation	WA	Z-0697 CONTROL HOUSE	1972	System Expansion	Historic/Non-Contributing	Utilitarian		Corrugated Metal
Conkelley Substation	MT	Z-722 CONTROL HOUSE	1968	System Expansion	Historic/Contributing; Individually Eligible	International	Type 2005	Asbestos Cement
Conkelley Substation	MT	TRANSFER TRACK	1966	System Expansion	Historic/Contributing	Utilitarian	Rails	Steel
Conkelley Substation	MT	Z-427 STORAGE	1970	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Conkelley Substation	MT	Z-696 MAINTENANCE	1973	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Cosmopolis Substation	WA	Z-54 CONTROL HOUSE	1942	Master Grid	Historic/Non-contributing	Minimal Traditional	Type 160-1 A	Aluminum
Cosmopolis Substation	WA	Z-1483 STORAGE	1971	Master Grid	Not a historic resource per MPDF			
Cosmopolis Substation	WA	Z-9041 OIL ABSORBENTS BUILDING	1971	Master Grid	Not a historic resource per MPDF			
Cosmopolis Substation	WA	Z-1470 RADIO	2010	Master Grid	Out of Period/Non-contributing			
Covington Substation & Maintenance HQ	WA	Z-0965 UNTANKING TOWER	1942	Master Grid	Historic/Contributing	Streamline Moderne	Untanking Tower	Concrete
Covington Substation & Maintenance HQ	WA	Z-0964 CONTROL HOUSE	1942	Master Grid	Historic/Contributing	Streamline Moderne	Type 110	Concrete
Covington Substation & Maintenance HQ	WA	Z-0966 HMEM SHOP	1953	Master Grid	Historic/Contributing	Utilitarian		Concrete
Covington Substation & Maintenance HQ	WA	Z-0778 COMMUNICATION BUILDING	1958	Master Grid	Historic/Contributing	Utilitarian		Concrete Block

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Covington Substation & Maintenance HQ	WA	Z-0770 AUTOMOTIVE STORAGE	1959	Master Grid	Historic/Contributing	Utilitarian		Steel
Covington Substation & Maintenance HQ	WA	Z-0766 MAINTENANCE WAREHOUSE	1960	Master Grid	Historic/Contributing	Utilitarian		Corrugated Metal
Covington Substation & Maintenance HQ	WA	Z-0409 STORAGE	1967	Master Grid	Historic/Contributing	Utilitarian		Aluminum
Covington Substation & Maintenance HQ	WA	Z-0517 ENGINE GENERATOR BUILDING	1974	Master Grid	Historic/Contributing	Utilitarian		Aluminum
Covington Substation & Maintenance HQ	WA	Z-1079 AUTOMOTIVE STORAGE	1945	Master Grid	Historic/Non-contributing	Quonset Hut		Aluminum
Covington Substation & Maintenance HQ	WA	Z-7836 TLM Vehicle Canopy	1971	Master Grid	Historic/Non-Contributing	Utilitarian		Wood
Covington Substation & Maintenance HQ	WA	Z-8959 STORAGE - HERBICIDES	1967	Master Grid	Not a historic resource per MPDF			
Covington Substation & Maintenance HQ	WA	Z-9033 OLD FUEL DISP	1967	Master Grid	Not a historic resource per MPDF			
Covington Substation & Maintenance HQ	WA	Z-7835 STORAGE CONTAINER NEAR CH	1971	Master Grid	Not a historic resource per MPDF			
Covington Substation & Maintenance HQ	WA	Z-7888 STORAGE - SUB MAINT HAZMAT RR	1980	Master Grid	Out of Period/Non-contributing			
Covington Substation & Maintenance HQ	WA	Z-9023 STORAGE	1980	Master Grid	Out of Period/Non-contributing			
Covington Substation & Maintenance HQ	WA	Z-9030 STORAGE	1980	Master Grid	Out of Period/Non-contributing			
Covington Substation & Maintenance HQ	WA	Z-9092 STORAGE CONTAINER	1990	Master Grid	Out of Period/Non-contributing			
Covington Substation & Maintenance HQ	WA	Z-9093 STORAGE CONTAINER	1990	Master Grid	Out of Period/Non-contributing			
Covington Substation & Maintenance HQ	WA	Z-1298 PSC & SPC OFFICE	1996	Master Grid	Out of Period/Non-contributing			
Covington Substation & Maintenance HQ	WA	Z-9032 STORAGE	1999	Master Grid	Out of Period/Non-contributing			
Covington Substation & Maintenance HQ	WA	Z-0045 SPC MAINTENANCE SHOP	2004	Master Grid	Out of Period/Non-contributing			
Covington Substation & Maintenance HQ	WA	Z-1448 DISTRICT OFFICE	2009	Master Grid	Out of Period/Non-contributing			
Covington Substation & Maintenance HQ	WA	Z-7380 FUELING STATION	2011	Master Grid	Out of Period/Non-contributing			
Cowlitz Substation	WA	Z-48 CONTROL HOUSE	1946	System Expansion	Historic/Non-contributing	Modern/Utilitarian	Type 160	Aluminum
Creston Substation	WA	CONTROL HOUSE	1947	System Expansion	Historic/Non-Contributing	Utilitarian	Type 161	Corrugated Metal
Creston Substation	WA	Z-1351 CONTROL HOUSE	2003	System Expansion	Out of Period/Non-contributing		Type 161	
Custer Substation & Maintenance HQ	WA	Z-738 CONTROL HOUSE	1967	System Expansion	Historic/Non-contributing	International	Type 2000	Asbestos Cement
Custer Substation & Maintenance HQ	WA	Z-719 MAINTENANCE	1969	System Expansion	Historic/Non-contributing	International	Type 907	Asbestos Cement

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Custer Substation & Maintenance HQ	WA	Z-1219 VEHICLE STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Custer Substation & Maintenance HQ	WA	Z-1243 STORAGE - HAZARDOUS MATERIALS	1990	System Expansion	Out of Period/Non-contributing			
Custer Substation & Maintenance HQ	WA	Z-1302 VEHICLE STORAGE	1996	System Expansion	Out of Period/Non-contributing			
De Moss Substation	OR	Z-286 CONTROL HOUSE	1958	System Expansion	Historic/Non-Contributing	Utilitarian	Type 192	Aluminum
De Moss Substation	OR	Z-1491 CONTROL HOUSE	2012	System Expansion	Out of Period/Non-contributing			
Detroit Substation	OR	Z-77 CONTROL HOUSE	1952	System Expansion	Historic/Contributing	Utilitarian	Type 190	Aluminum
Drain Substation	OR	Z-15 CONTROL HOUSE	1948	System Expansion	Historic/Non-contributing	Utilitarian	Type 177	Aluminum
Driscoll Substation	OR	Z-724 CONTROL HOUSE	1968	System Expansion	Historic/Contributing	Modern/Utilitarian	Type 2007 - this type is not mentioned in the report	Concrete
Dworshak Substation	ID	Z-692 CONTROL HOUSE	1973	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Dworshak Substation	ID	Z-693 MAINTENANCE	1973	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Dworshak Substation	ID	Z-508 ENGINE GENERATOR BUILDING	1973	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Dworshak Substation	ID	Z-0000 STORAGE SHED	1973	System Expansion	Not a historic resource per MPDF			
Dworshak Substation	ID	Z-1427 CAP STATION STORAGE BUILDING	2005	System Expansion	Out of Period/Non-contributing			
Ellensburg Substation	WA	Z-851 OFFICE/COMMUNICATIONS BUILDING	1964	Master Grid	Historic/Non-contributing	Minimal Traditional		Concrete
Ellensburg Substation	WA	Z-0000 CONTROL HOUSE	2015	Master Grid	Out of Period/Non-contributing			
Eugene Substation	OR	Z-940 CONTROL HOUSE	1941	Master Grid	Historic/Contributing; Individually Eligible	Streamline Moderne	Type 100	Concrete
Eugene Substation	OR	Z-941 STORAGE	1952	Master Grid	Historic/Contributing	Utilitarian	Type 1	Concrete Block
Eugene Substation	OR	Z-287 STORAGE SHED	1952	Master Grid	Historic/Contributing	Utilitarian	Type 6'-8"x8'-0"	Aluminum
Fairmount Substation	WA	Z-1246 STORAGE	1958	System Expansion	Historic/Non-contributing	Utilitarian		Aluminum
Fairmount Substation	WA	Z-777 CONTROL HOUSE	1958	System Expansion	Historic/Non-contributing	Minimal Traditional	Type 113	Concrete
Fairmount Substation	WA	Z-0000 STORAGE - CONEX	1965	System Expansion	Not a historic resource per MPDF			
Fairmount Substation	WA	Z-9019 STORAGE SHED	1988	System Expansion	Not a historic resource per MPDF			
Fairview Substation	OR	Z-807 CONTROL HOUSE	1958	System Expansion	Historic/Contributing; Individually Eligible	Modern	Type 111	Concrete
Fairview Substation	OR	Z-378 STORAGE	1958	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Fairview Substation	OR	Z-381 STORAGE (OLD OIL HOUSE)	1958	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Forest Grove Substation	OR	Z-735 CONTROL HOUSE	1968	System Expansion	Historic/Non-contributing	Minimal Traditional	Type 144-1	Concrete
Fossil Substation	OR	Z-331 CONTROL HOUSE	1961	System Expansion	Historic/Non-contributing	Utilitarian	Type 193	Aluminum
Franklin Substation	WA	Z-967 STORAGE - OLD OIL HOUSE	1953	System Expansion	Historic/Non-contributing	Utilitarian	Oil House	Concrete
Franklin Substation	WA	Z-854 CONTROL HOUSE	1953	System Expansion	Historic/Non-contributing	Modern	Type 125	Concrete
Franklin Substation	WA	Z-270 ENGINE GENERATOR BUILDING	1956	System Expansion	Historic/Non-contributing	Utilitarian		Aluminum
Franklin Substation	WA	Z-1382 MAINTENANCE BUILDING - FMW SHOP	1982	System Expansion	Out of Period/Non-contributing			
Franklin Substation	WA	Z-1170 CHEMICAL STORAGE	1989	System Expansion	Out of Period/Non-contributing			
Franklin Substation	WA	Z-1381 FMW OFFICE	1991	System Expansion	Out of Period/Non-contributing			
Franklin Substation	WA	Z-8760 CABLE TUNNEL	1953	System Expansion	Feature of switchyard			
Gardiner Substation	OR	Z-363 CONTROL HOUSE	1964	System Expansion	Historic/Contributing; Individually Eligible	Utilitarian	Type 193	Aluminum

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Gardiner Substation	OR	Z-7754 STORAGE SHED	1964	System Expansion	Not a historic resource per MPDF			
Gardiner Substation	OR	Z-7755 STORAGE SHED	1995	System Expansion	Not a historic resource per MPDF			
Goldendale Substation	WA	Z-301 CONTROL HOUSE	1958	System Expansion	Historic/Contributing; Individually Eligible	Utilitarian	Type 192	Aluminum
Grandview Substation	WA	Z-852 CONTROL HOUSE	1954	System Expansion	Historic/Contributing	Minimal Traditional	Type 143	Concrete Block
Grizzly Substation	OR	Z-740 CONTROL HOUSE	1967	System Expansion	Historic/Non-contributing	Modern	Type 2003	Asbestos Cement
Grizzly Substation	OR	Z-730 MAINTENANCE	1968	System Expansion	Historic/Non-contributing	Utilitarian	Type 906	Concrete
Hanford Substation	WA	Z-703 CONTROL HOUSE / MAINTENANCE	1970	System Expansion	Historic/Contributing; Individually Eligible	Modern/Contemporary		Brick
Hanford Substation	WA	Z-7001 ENGINE GENERATOR BUILDING	1992	System Expansion	Out of Period/Non-contributing			
Harrisburg Substation	OR	Z-23 CONTROL HOUSE	1946	System Expansion	Historic/Non-contributing	Utilitarian	Type 161	Corrugated Metal
Harrisburg Substation	OR	Z-1489 CONTROL HOUSE	2012	System Expansion	Out of Period/Non-contributing			
Harvalum Substation	WA	Z-1391 CONTROL HOUSE/SUBSTATION	1964	System Expansion	Historic/Non-contributing	Utilitarian		Concrete Block
Hat Rock Substation	OR	Z-480 CONTROL HOUSE	1971	System Expansion	Historic/Non-contributing	Utilitarian		Aluminum
Hauser Substation	OR	Z-233 CONTROL HOUSE	1954	System Expansion	Historic/Non-contributing	Utilitarian	Type 192	Aluminum
Heyburn Substation	ID	Z-0751 CONTROL HOUSE	1958	System Expansion	Historic/Non-contributing	Utilitarian		Concrete Block
Heyburn Substation	ID	Z-1171 CHEMICAL STORAGE	1988	System Expansion	Out of Period/Non-contributing			
Heyburn Substation	ID	Z-0001 STORAGE BUILDING	2013	System Expansion	Out of Period/Non-contributing			
Holcomb Substation	WA	Z-250 CONTROL HOUSE	1956	System Expansion	Historic/Non-contributing	Utilitarian	Type 162	Corrugated Metal
Holcomb Substation	WA	Z-9044 STORAGE	1997	System Expansion	Out of Period/Non-contributing			
Hood River Substation	OR	Z-468 CONTROL HOUSE	1969	System Expansion	Historic/Non-contributing	Utilitarian	Type 193	Aluminum
Hot Springs Substation	MT	Z-968 CONTROL HOUSE	1953	System Expansion	Historic/Contributing; Individually Eligible	Modern	Type 145	Composite
Hot Springs Substation	MT	Z-837 AUTOMOTIVE SHOP	1954	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Hot Springs Substation	MT	Z-294 PUMP HOUSE / FRESH WATER	1956	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Hot Springs Substation	MT	Z-316 PUMP HOUSE / FIRE	1958	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Hot Springs Substation	MT	Z-560 STORAGE / MOWER	1975	System Expansion	Out of Period/Non-contributing			
Hot Springs Substation	MT	Z-1010 STORAGE / FLAMMABLE	1984	System Expansion	Out of Period/Non-contributing			
Intalco Substation	WA	Z-748 CONTROL HOUSE	1966	System Expansion	Historic/Contributing	International	Type 181	Asbestos Cement
Intalco Substation	WA	Z-1220 MAINTENANCE / VEHICLE STORAGE	1991	System Expansion	Out of Period/Non-contributing			
Intalco Substation	WA	Z-1485 BATTERY HOUSE	2011	System Expansion	Out of Period/Non-contributing			
Ione Substation	OR	Z-117 CONTROL HOUSE	1950	System Expansion	Historic/Contributing	Utilitarian	Type 190	Aluminum
John Day Substation	OR	Z-737 CONTROL HOUSE	1968	System Expansion	Historic/Contributing; Individually Eligible	International	Type 2000	Asbestos Cement
John Day Substation	OR	Z-723 MAINTENANCE	1968	System Expansion	Historic/Contributing	International		Asbestos Cement
John Day Substation	OR	Z-1446 230KV YARD CONTROL HOUSE	2007	System Expansion	Out of Period/Non-contributing			
John Day Substation	OR	Z-8427 Cable Tunnel	1968	System Expansion	Feature of switchyard			
Kalispell Substation	MT	Z-1176 STORAGE	1966	System Expansion	Historic/Contributing	Utilitarian		Concrete Block
Kalispell Substation	MT	Z-7174 STORAGE SHED	1960	System Expansion	Historic/Non-contributing	Utilitarian		Wood Sheet
Kalispell Substation	MT	Z-968 CONTROL HOUSE	1968	System Expansion	Historic/Non-contributing	Modern		Concrete
Kalispell Substation	MT	Z-627 VEHICLE STORAGE	1982	System Expansion	Out of Period/Non-contributing			
Kalispell Substation	MT	Z-1517 CONTROL HOUSE	2014	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-818 CONTROL HOUSE	1957	System Expansion	Historic/Non-Contributing	Modern	Type 121	Concrete

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Keeler Substation	OR	Z-817 OIL HOUSE	1957	System Expansion	Historic/Non-Contributing	Utilitarian		Aluminum
Keeler Substation	OR	Z-629 MAINTENANCE	1981	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-5110 STORAGE SHED	1983	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-999 FLAMMABLE STORAGE	1986	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-1288 VEHICLE / EQUIPMENT STORAGE	1994	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-1289 CONTROL BUILDING / VALVE HALL	1994	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-1310 MATERIAL STORAGE	1996	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-1314 FIBER OPTIC	1996	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-8137 CONTROL CABLE TUNNEL	1955	System Expansion	Feature of switchyard			
Kerr Substation	MT	Z-130 CONTROL HOUSE	1948	System Expansion	Historic/Contributing	Utilitarian	Type 161	Aluminum
Kitsap Substation	WA	Z-833 CONTROL HOUSE	1954	System Expansion	Historic/Non-contributing	Minimal Traditional	Type 145-2	Concrete
Kitsap Substation	WA	Z-0000 Railroad	1954	System Expansion	Historic/Non-contributing	Utilitarian	Rails	Steel
Kitsap Substation	WA	Z-321 STORAGE	1958	System Expansion	Not a historic resource per MPDF			
Kitsap Substation	WA	Z-9006 STORAGE SHED	1980	System Expansion	Not a historic resource per MPDF			
Kitsap Substation	WA	Z-9007 STORAGE SHED	1980	System Expansion	Not a historic resource per MPDF			
Kitsap Substation	WA	Z-9009 STORAGE SHED	1990	System Expansion	Not a historic resource per MPDF			
Kitsap Substation	WA	Z-358 OPERATING STORAGE SHED	1990	System Expansion	Out of Period/Non-contributing			
La Grande Substation	OR	Z-757 CONTROL HOUSE	1962	System Expansion	Historic/Contributing	Minimal Traditional	Type 144-1	Concrete
Lane Substation	OR	Z-742 CONTROL HOUSE	1966	System Expansion	Historic/Contributing	International	Type 2002	Asbestos Cement
Lane Substation	OR	Z-8342 Cable Tunnel	1966	System Expansion	Feature of switchyard			
Langlois Substation	OR	Z-291 CONTROL HOUSE	1958	System Expansion	Historic/Contributing; Individually Eligible	Utilitarian	Type 192	Aluminum
Langlois Substation	OR	Z-1225 STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Lebanon Substation	OR	Z-1 CONTROL HOUSE	1950	System Expansion	Historic/Non-contributing	Utilitarian	Type 190	Aluminum
Lebanon Substation	OR	Z-7688 OIL ABSORBENT BUILDING	1950	System Expansion	Not a historic resource per MPDF			
Little Goose Substation	WA	Z-707 CONTROL HOUSE	1970	System Expansion	Historic/Contributing; Individually Eligible	Modern	Type 2012	Concrete
Little Goose Substation	WA	Z-694 MAINTENANCE	1970	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Little Goose Substation	WA	Z-497 ENGINE GENERATOR BUILDING	1973	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Longview Substation	WA	Z-970 UNTANKING TOWER	1941	System Expansion	Historic/Non-contributing	Streamline Moderne	Untanking Tower	Concrete
Longview Substation	WA	Z-8101 Fences and Gates	1948	System Expansion	Historic/Non-contributing			
Longview Substation	WA	Z-969 CONTROL HOUSE	1948	System Expansion	Historic/Non-contributing	Streamline Moderne	Type 107	Concrete
Longview Substation	WA	Z-7904 Railroad	1949	System Expansion	Historic/Non-contributing	Utilitarian	Rails	Steel
Longview Substation	WA	Z-649 FLAMMABLE STORAGE	1978	System Expansion	Out of Period/Non-contributing			
Longview Substation	WA	Z-650 VEHICLE STORAGE	1978	System Expansion	Out of Period/Non-contributing			
Longview Substation	WA	Z-1175 CHEMICAL STORAGE	1987	System Expansion	Out of Period/Non-contributing			
Longview Substation	WA	Z-1389 OIL SPILL RESPONSE STORAGE	1995	System Expansion	Out of Period/Non-contributing			
Longview Substation	WA	Z-0000 CONTROL CABLE TUNNEL	1948	System Expansion	Feature of switchyard	Utilitarian		
Lookingglass Substation	OR	Z-14 CONTROL HOUSE	1951	System Expansion	Historic/Non-contributing	Utilitarian	Type 190	Aluminum
Lookout Point Substation	OR	Z-832 CONTROL HOUSE	1954	System Expansion	Historic/Contributing; Individually Eligible	Minimal Traditional	Type 166	Concrete
Lower Monumental Substation	WA	Z-726 CONTROL HOUSE	1968	System Expansion	Historic/Non-contributing	Modern	2000s - no specified type	Concrete

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Lower Monumental Substation	WA	Z-727 MAINTENANCE	1968	System Expansion	Historic/Non-contributing	Utilitarian		Concrete
De Moss Substation	OR	Z-286 CONTROL HOUSE	1958	System Expansion	Historic/Non-Contributing	Utilitarian	Type 192	Aluminum
De Moss Substation	OR	Z-1491 CONTROL HOUSE	2012	System Expansion	Out of Period/Non-contributing			
Detroit Substation	OR	Z-77 CONTROL HOUSE	1952	System Expansion	Historic/Contributing	Utilitarian	Type 190	Aluminum
Drain Substation	OR	Z-15 CONTROL HOUSE	1948	System Expansion	Historic/Non-contributing	Utilitarian	Type 177	Aluminum
Driscoll Substation	OR	Z-724 CONTROL HOUSE	1968	System Expansion	Historic/Contributing	Modern/Utilitarian	Type 2007 - this type is not mentioned in the report	Concrete
Dworshak Substation	ID	Z-692 CONTROL HOUSE	1973	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Dworshak Substation	ID	Z-693 MAINTENANCE	1973	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Dworshak Substation	ID	Z-508 ENGINE GENERATOR BUILDING	1973	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Dworshak Substation	ID	Z-0000 STORAGE SHED	1973	System Expansion	Not a historic resource per MPDF			
Dworshak Substation	ID	Z-1427 CAP STATION STORAGE BUILDING	2005	System Expansion	Out of Period/Non-contributing			
Ellensburg Substation	WA	Z-851 OFFICE/COMMUNICATIONS BUILDING	1964	Master Grid	Historic/Non-contributing	Minimal Traditional		Concrete
Ellensburg Substation	WA	Z-0000 CONTROL HOUSE	2015	Master Grid	Out of Period/Non-contributing			
Eugene Substation	OR	Z-940 CONTROL HOUSE	1941	Master Grid	Historic/Contributing; Individually Eligible	Streamline Moderne	Type 100	Concrete
Eugene Substation	OR	Z-941 STORAGE	1952	Master Grid	Historic/Contributing	Utilitarian	Type 1	Concrete Block
Eugene Substation	OR	Z-287 STORAGE SHED	1952	Master Grid	Historic/Contributing	Utilitarian	Type 6'-8"x8'-0"	Aluminum
Fairmount Substation	WA	Z-1246 STORAGE	1958	System Expansion	Historic/Non-contributing	Utilitarian		Aluminum
Fairmount Substation	WA	Z-777 CONTROL HOUSE	1958	System Expansion	Historic/Non-contributing	Minimal Traditional	Type 113	Concrete
Fairmount Substation	WA	Z-0000 STORAGE - CONEX	1965	System Expansion	Not a historic resource per MPDF			
Fairmount Substation	WA	Z-9019 STORAGE SHED	1988	System Expansion	Not a historic resource per MPDF			
Fairview Substation	OR	Z-807 CONTROL HOUSE	1958	System Expansion	Historic/Contributing; Individually Eligible	Modern	Type 111	Concrete
Fairview Substation	OR	Z-378 STORAGE	1958	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Fairview Substation	OR	Z-381 STORAGE (OLD OIL HOUSE)	1958	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Forest Grove Substation	OR	Z-735 CONTROL HOUSE	1968	System Expansion	Historic/Non-contributing	Minimal Traditional	Type 144-1	Concrete
Fossil Substation	OR	Z-331 CONTROL HOUSE	1961	System Expansion	Historic/Non-contributing	Utilitarian	Type 193	Aluminum
Franklin Substation	WA	Z-967 STORAGE - OLD OIL HOUSE	1953	System Expansion	Historic/Non-contributing	Utilitarian	Oil House	Concrete
Franklin Substation	WA	Z-854 CONTROL HOUSE	1953	System Expansion	Historic/Non-contributing	Modern	Type 125	Concrete
Franklin Substation	WA	Z-270 ENGINE GENERATOR BUILDING	1956	System Expansion	Historic/Non-contributing	Utilitarian		Aluminum
Franklin Substation	WA	Z-1382 MAINTENANCE BUILDING - FMW SHOP	1982	System Expansion	Out of Period/Non-contributing			
Franklin Substation	WA	Z-1170 CHEMICAL STORAGE	1989	System Expansion	Out of Period/Non-contributing			
Franklin Substation	WA	Z-1381 FMW OFFICE	1991	System Expansion	Out of Period/Non-contributing			
Franklin Substation	WA	Z-8760 CABLE TUNNEL	1953	System Expansion	Feature of switchyard			
Gardiner Substation	OR	Z-363 CONTROL HOUSE	1964	System Expansion	Historic/Contributing; Individually Eligible	Utilitarian	Type 193	Aluminum
Gardiner Substation	OR	Z-7754 STORAGE SHED	1964	System Expansion	Not a historic resource per MPDF			
Gardiner Substation	OR	Z-7755 STORAGE SHED	1995	System Expansion	Not a historic resource per MPDF			
Goldendale Substation	WA	Z-301 CONTROL HOUSE	1958	System Expansion	Historic/Contributing; Individually Eligible	Utilitarian	Type 192	Aluminum

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Grandview Substation	WA	Z-852 CONTROL HOUSE	1954	System Expansion	Historic/Contributing	Minimal Traditional	Type 143	Concrete Block
Grizzly Substation	OR	Z-740 CONTROL HOUSE	1967	System Expansion	Historic/Non-contributing	Modern	Type 2003	Asbestos Cement
Grizzly Substation	OR	Z-730 MAINTENANCE	1968	System Expansion	Historic/Non-contributing	Utilitarian	Type 906	Concrete
Hanford Substation	WA	Z-703 CONTROL HOUSE / MAINTENANCE	1970	System Expansion	Historic/Contributing; Individually Eligible	Modern/Contemporary		Brick
Hanford Substation	WA	Z-7001 ENGINE GENERATOR BUILDING	1992	System Expansion	Out of Period/Non-contributing			
Harrisburg Substation	OR	Z-23 CONTROL HOUSE	1946	System Expansion	Historic/Non-contributing	Utilitarian	Type 161	Corrugated Metal
Harrisburg Substation	OR	Z-1489 CONTROL HOUSE	2012	System Expansion	Out of Period/Non-contributing			
Harvalum Substation	WA	Z-1391 CONTROL HOUSE/SUBSTATION	1964	System Expansion	Historic/Non-contributing	Utilitarian		Concrete Block
Hat Rock Substation	OR	Z-480 CONTROL HOUSE	1971	System Expansion	Historic/Non-contributing	Utilitarian		Aluminum
Hauser Substation	OR	Z-233 CONTROL HOUSE	1954	System Expansion	Historic/Non-contributing	Utilitarian	Type 192	Aluminum
Heyburn Substation	ID	Z-0751 CONTROL HOUSE	1958	System Expansion	Historic/Non-contributing	Utilitarian		Concrete Block
Heyburn Substation	ID	Z-1171 CHEMICAL STORAGE	1988	System Expansion	Out of Period/Non-contributing			
Heyburn Substation	ID	Z-0001 STORAGE BUILDING	2013	System Expansion	Out of Period/Non-contributing			
Holcomb Substation	WA	Z-250 CONTROL HOUSE	1956	System Expansion	Historic/Non-contributing	Utilitarian	Type 162	Corrugated Metal
Holcomb Substation	WA	Z-9044 STORAGE	1997	System Expansion	Out of Period/Non-contributing			
Hood River Substation	OR	Z-468 CONTROL HOUSE	1969	System Expansion	Historic/Non-contributing	Utilitarian	Type 193	Aluminum
Hot Springs Substation	MT	Z-968 CONTROL HOUSE	1953	System Expansion	Historic/Contributing; Individually Eligible	Modern	Type 145	Composite
Hot Springs Substation	MT	Z-837 AUTOMOTIVE SHOP	1954	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Hot Springs Substation	MT	Z-294 PUMP HOUSE / FRESH WATER	1956	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Hot Springs Substation	MT	Z-316 PUMP HOUSE / FIRE	1958	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Hot Springs Substation	MT	Z-560 STORAGE / MOWER	1975	System Expansion	Out of Period/Non-contributing			
Hot Springs Substation	MT	Z-1010 STORAGE / FLAMMABLE	1984	System Expansion	Out of Period/Non-contributing			
Intalco Substation	WA	Z-748 CONTROL HOUSE	1966	System Expansion	Historic/Contributing	International	Type 181	Asbestos Cement
Intalco Substation	WA	Z-1220 MAINTENANCE / VEHICLE STORAGE	1991	System Expansion	Out of Period/Non-contributing			
Intalco Substation	WA	Z-1485 BATTERY HOUSE	2011	System Expansion	Out of Period/Non-contributing			
Ione Substation	OR	Z-117 CONTROL HOUSE	1950	System Expansion	Historic/Contributing	Utilitarian	Type 190	Aluminum
John Day Substation	OR	Z-737 CONTROL HOUSE	1968	System Expansion	Historic/Contributing; Individually Eligible	International	Type 2000	Asbestos Cement
John Day Substation	OR	Z-723 MAINTENANCE	1968	System Expansion	Historic/Contributing	International		Asbestos Cement
John Day Substation	OR	Z-1446 230KV YARD CONTROL HOUSE	2007	System Expansion	Out of Period/Non-contributing			
John Day Substation	OR	Z-8427 Cable Tunnel	1968	System Expansion	Feature of switchyard			
Kalispell Substation	MT	Z-1176 STORAGE	1966	System Expansion	Historic/Contributing	Utilitarian		Concrete Block
Kalispell Substation	MT	Z-7174 STORAGE SHED	1960	System Expansion	Historic/Non-contributing	Utilitarian		Wood Sheet
Kalispell Substation	MT	Z-968 CONTROL HOUSE	1968	System Expansion	Historic/Non-contributing	Modern		Concrete
Kalispell Substation	MT	Z-627 VEHICLE STORAGE	1982	System Expansion	Out of Period/Non-contributing			
Kalispell Substation	MT	Z-1517 CONTROL HOUSE	2014	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-818 CONTROL HOUSE	1957	System Expansion	Historic/Non-Contributing	Modern	Type 121	Concrete
Keeler Substation	OR	Z-817 OIL HOUSE	1957	System Expansion	Historic/Non-Contributing	Utilitarian		Aluminum
Keeler Substation	OR	Z-629 MAINTENANCE	1981	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-5110 STORAGE SHED	1983	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-999 FLAMMABLE STORAGE	1986	System Expansion	Out of Period/Non-contributing			

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Keeler Substation	OR	Z-1288 VEHICLE / EQUIPMENT STORAGE	1994	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-1289 CONTROL BUILDING / VALVE HALL	1994	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-1310 MATERIAL STORAGE	1996	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-1314 FIBER OPTIC	1996	System Expansion	Out of Period/Non-contributing			
Keeler Substation	OR	Z-8137 CONTROL CABLE TUNNEL	1955	System Expansion	Feature of switchyard			
Kerr Substation	MT	Z-130 CONTROL HOUSE	1948	System Expansion	Historic/Contributing	Utilitarian	Type 161	Aluminum
Kitsap Substation	WA	Z-833 CONTROL HOUSE	1954	System Expansion	Historic/Non-contributing	Minimal Traditional	Type 145-2	Concrete
Kitsap Substation	WA	Z-0000 Railroad	1954	System Expansion	Historic/Non-contributing	Utilitarian	Rails	Steel
Kitsap Substation	WA	Z-321 STORAGE	1958	System Expansion	Not a historic resource per MPDF			
Kitsap Substation	WA	Z-9006 STORAGE SHED	1980	System Expansion	Not a historic resource per MPDF			
Kitsap Substation	WA	Z-9007 STORAGE SHED	1980	System Expansion	Not a historic resource per MPDF			
Kitsap Substation	WA	Z-9009 STORAGE SHED	1990	System Expansion	Not a historic resource per MPDF			
Kitsap Substation	WA	Z-358 OPERATING STORAGE SHED	1990	System Expansion	Out of Period/Non-contributing			
La Grande Substation	OR	Z-757 CONTROL HOUSE	1962	System Expansion	Historic/Contributing	Minimal Traditional	Type 144-1	Concrete
Lane Substation	OR	Z-742 CONTROL HOUSE	1966	System Expansion	Historic/Contributing	International	Type 2002	Asbestos Cement
Lane Substation	OR	Z-8342 Cable Tunnel	1966	System Expansion	Feature of switchyard			
Langlois Substation	OR	Z-291 CONTROL HOUSE	1958	System Expansion	Historic/Contributing; Individually Eligible	Utilitarian	Type 192	Aluminum
Langlois Substation	OR	Z-1225 STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Lebanon Substation	OR	Z-1 CONTROL HOUSE	1950	System Expansion	Historic/Non-contributing	Utilitarian	Type 190	Aluminum
Lebanon Substation	OR	Z-7688 OIL ABSORBENT BUILDING	1950	System Expansion	Not a historic resource per MPDF			
Little Goose Substation	WA	Z-707 CONTROL HOUSE	1970	System Expansion	Historic/Contributing; Individually Eligible	Modern	Type 2012	Concrete
Little Goose Substation	WA	Z-694 MAINTENANCE	1970	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Little Goose Substation	WA	Z-497 ENGINE GENERATOR BUILDING	1973	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Longview Substation	WA	Z-970 UNTANKING TOWER	1941	System Expansion	Historic/Non-contributing	Streamline Moderne	Untanking Tower	Concrete
Longview Substation	WA	Z-8101 Fences and Gates	1948	System Expansion	Historic/Non-contributing			
Longview Substation	WA	Z-969 CONTROL HOUSE	1948	System Expansion	Historic/Non-contributing	Streamline Moderne	Type 107	Concrete
Longview Substation	WA	Z-7904 Railroad	1949	System Expansion	Historic/Non-contributing	Utilitarian	Rails	Steel
Longview Substation	WA	Z-649 FLAMMABLE STORAGE	1978	System Expansion	Out of Period/Non-contributing			
Longview Substation	WA	Z-650 VEHICLE STORAGE	1978	System Expansion	Out of Period/Non-contributing			
Longview Substation	WA	Z-1175 CHEMICAL STORAGE	1987	System Expansion	Out of Period/Non-contributing			
Longview Substation	WA	Z-1389 OIL SPILL RESPONSE STORAGE	1995	System Expansion	Out of Period/Non-contributing			
Longview Substation	WA	Z-0000 CONTROL CABLE TUNNEL	1948	System Expansion	Feature of switchyard	Utilitarian		
Lookingglass Substation	OR	Z-14 CONTROL HOUSE	1951	System Expansion	Historic/Non-contributing	Utilitarian	Type 190	Aluminum
Lookout Point Substation	OR	Z-832 CONTROL HOUSE	1954	System Expansion	Historic/Contributing; Individually Eligible	Minimal Traditional	Type 166	Concrete
Lower Monumental Substation	WA	Z-726 CONTROL HOUSE	1968	System Expansion	Historic/Non-contributing	Modern	2000s - no specified type	Concrete
Lower Monumental Substation	WA	Z-727 MAINTENANCE	1968	System Expansion	Historic/Non-contributing	Utilitarian		Concrete
Malin Substation	OR	Z-739 CONTROL HOUSE	1966	System Expansion	Historic/Non-contributing	Modern	Type 2009	Concrete
Malin Substation	OR	Z-729 MAINTENANCE	1968	System Expansion	Historic/Non-contributing	Utilitarian	Type 908	Concrete

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Maple Valley Substation	WA	Z-758 CONTROL HOUSE	1961	System Expansion	Historic/Non-contributing	Minimal Traditional	Type 113-1	Concrete
Maple Valley Substation	WA	Z-9173 STORAGE	1991	System Expansion	Not a historic resource per MPDF			
Maple Valley Substation	WA	Z-1195 MAINTENANCE STORAGE	1989	System Expansion	Out of Period/Non-contributing			
Maple Valley Substation	WA	Z-1248 MAINTENANCE STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Maple Valley Substation	WA	Z-1259 SVC BUILDING / VALVE HALL	1993	System Expansion	Out of Period/Non-contributing			
Mapleton Substation	OR	Z-7 CONTROL HOUSE	1949	System Expansion	Historic/Non-contributing	Utilitarian	Type 190	Aluminum
Mapleton Substation	OR	Z-1260 OIL ABSORBENT BUILDING	1993	System Expansion	Not a historic resource per MPDF			
Marion Substation	OR	Z-709 CONTROL HOUSE / MAINTENANCE	1970	System Expansion	Historic/Contributing	Modern/Brutalist	Type 2008	Concrete
Marion Substation	OR	Z-8152 Cable Tunnel	1970	System Expansion	Feature of switchyard			
Maupin Substation	OR	Z-521 CONTROL HOUSE	1974	System Expansion	Historic/Contributing	Utilitarian	Type 193	Aluminum
McMinnville Substation	OR	Z-26 CONTROL HOUSE	1950	System Expansion	Historic/Non-contributing	Minimal Traditional	Type 173	Vinyl
McMinnville Substation	OR	Z-6011 STORAGE SHED	1950	System Expansion	Historic/Non-contributing	Utilitarian		Wood Sheet
McMinnville Substation	OR	Z-0000 STORAGE SHED	2013	System Expansion	Out of Period/Non-contributing			
McNary Substation	OR	Z-836 CONTROL HOUSE	1954	System Expansion	Historic/Contributing	Modern	Type 185	Concrete
McNary Substation	OR	Z-834 RELAY HOUSE #1	1954	System Expansion	Historic/Contributing	Utilitarian		Concrete
McNary Substation	OR	Z-825 RELAY HOUSE #3	1956	System Expansion	Historic/Contributing	Utilitarian		Concrete
McNary Substation	OR	Z-826 RELAY HOUSE #2	1956	System Expansion	Historic/Contributing	Utilitarian		Concrete
McNary Substation	OR	Z-452 STORAGE	1968	System Expansion	Not a historic resource per MPDF	Utilitarian		Corrugated Metal
McNary Substation	OR	Z-1111 CHLORINATOR BUILDING	1983	System Expansion	Out of Period/Non-contributing			
McNary Substation	OR	Z-1301 EQUIPMENT STORAGE BUILDING	1995	System Expansion	Out of Period/Non-contributing			
McNary Substation	OR	Z-1394 RELAY HOUSE #4	2002	System Expansion	Out of Period/Non-contributing			
McNary Substation	OR	Z-0000 ATV STORAGE	2014	System Expansion	Out of Period/Non-contributing			
McNary Substation	OR	Z-1497 MAINTENANCE HEADQUARTERS	2014	System Expansion	Out of Period/Non-contributing			
McNary Substation	OR	Z-1498 MAINTENANCE SHOP	2014	System Expansion	Out of Period/Non-contributing			
McNary Substation	OR	Z-1499 VEHICLE STORAGE	2014	System Expansion	Out of Period/Non-contributing			
McNary Substation	OR	Z-1533 HAZMAT BUILDING	2015	System Expansion	Out of Period/Non-contributing			
McNary Substation	OR	Z-7820 Cable Tunnel	1954	System Expansion	Feature of switchyard			
Midway Substation	WA	Z-973 UNTANKING TOWER	1941	Master Grid	Historic/Contributing; Individually Eligible	Streamline Moderne	Untanking Tower	Concrete
Midway Substation	WA	Z-972 CONTROL HOUSE	1941	Master Grid	Historic/Contributing; Individually Eligible	Streamline Moderne	Type 110	Concrete
Midway Substation	WA	Z-0000 Railroad	1941	Master Grid	Historic/Contributing	Utilitarian	Rails	Steel
Midway Substation	WA	Z-626 FLAMMABLE STORAGE	1954	Master Grid	Historic/Contributing	Quonset		Corrugated Metal
Midway Substation	WA	Z-554 ENGINE GENERATOR BUILDING	1975	Master Grid	Not a historic resource per MPDF			
Midway Substation	WA	Z-0000 STORAGE SHED	1985	Master Grid	Not a historic resource per MPDF			
Midway Substation	WA	Z-7003 STORAGE SHED	1985	Master Grid	Not a historic resource per MPDF			
Midway Substation	WA	Z-0000 Cable Tunnel	1941	Master Grid	Feature of switchyard			
Midway Substation	WA	Z-6008 STORAGE BUILDING	1956	Master Grid	Historic/Non-Contributing	Utilitarian		Aluminum
Milton Substation	OR	Z-173 CONTROL HOUSE	1950	System Expansion	Historic/Non-contributing	Utilitarian	Type 161	Aluminum
Monmouth Substation	OR	Z-179 CONTROL HOUSE	1954	System Expansion	Historic/Contributing	Utilitarian	Type 190	Aluminum
Monmouth Substation	OR	Z-7389 OIL ABSORBENTS BUILDING	1954	System Expansion	Not a historic resource per MPDF			
Monroe Substation	WA	Z-7768 Switchyard	1968	System Expansion	Historic/Non-contributing	Utilitarian		Steel
Monroe Substation	**WA**	Z-7768 Switchyard	1968	System Expansion	Historic/Non-contributing	Utilitarian		Steel

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Monroe Substation	WA	Z-708 CONTROL HOUSE	1970	System Expansion	Historic/Non-contributing	Modern/Brutalist	Type 2008	Concrete
Moxee Substation	WA	Z-855 CONTROL HOUSE	1954	System Expansion	Historic/Contributing; Individually Eligible	Modern	Type 111-1	Concrete Block
Murray Substation	WA	Z-699 CONTROL HOUSE	1972	System Expansion	Historic/Contributing; Individually Eligible	Modern/Contemporary		Brick
Naselle Substation	WA	Z-34 CONTROL HOUSE	1949	System Expansion	Historic/Non-contributing	Modern/Utilitarian	Type 175	Aluminum
Naselle Substation	WA	Z-9028 STORAGE	1962	System Expansion	Not a historic resource per MPDF			
Naselle Substation	WA	Z-9050 STORAGE	1962	System Expansion	Not a historic resource per MPDF			
Naselle Substation	WA	Z-9051 STORAGE	1962	System Expansion	Not a historic resource per MPDF			
North Bonneville Substation	WA	Z-974 CONTROL HOUSE	1941	Master Grid	Historic/Contributing; Individually Eligible	Streamline Moderne	Type 130	Concrete
North Bonneville Substation	WA	Z-975 STORAGE - OLD OIL HOUSE	1941	Master Grid	Historic/Contributing	Utilitarian	Oil House	Concrete
North Bonneville Substation	WA	Z-7532 STORAGE	1941	Master Grid	Not a historic resource per MPDF			
North Bonneville Substation	WA	Z-0000 Cable Tunnel	1941	Master Grid	Feature of switchyard			
Norway Substation [Ret]	OR	Z-13 CONTROL HOUSE	1951	System Expansion	Historic/Non-contributing	Utilitarian	Type 190	Aluminum
Norway Substation [Ret]	OR	Z-1265 OIL ABSORBANT BUILDING	1993	System Expansion	Not a historic resource per MPDF			
Odessa Substation	WA	Z-336 CONTROL HOUSE	1962	System Expansion	Historic/Non-contributing	Utilitarian	Type 193	Aluminum
Olympia Substation & Maintenance HQ	WA	TRANSFER TRACK	1951	System Expansion	Historic/Non-contributing	Utilitarian	Rails	Steel
Olympia Substation & Maintenance HQ	WA	Z-976 CONTROL HOUSE	1951	System Expansion	Historic/Non-contributing	Streamline Moderne	Type 110	Concrete
Olympia Substation & Maintenance HQ	WA	Z-979 MAINTENANCE TLM WAREHOUSE	1952	System Expansion	Historic/Non-contributing	Utilitarian		Corrugated Metal
Olympia Substation & Maintenance HQ	WA	Z-845 STORAGE	1953	System Expansion	Historic/Non-contributing	Utilitarian		Concrete Block
Olympia Substation & Maintenance HQ	WA	Z-1201 STORAGE (OLD OIL HOUSE)	1956	System Expansion	Historic/Non-contributing	Utilitarian	Oil House	Concrete
Olympia Substation & Maintenance HQ	WA	Z-749 MAINTENANCE / SUBSTATION	1965	System Expansion	Historic/Non-contributing	Utilitarian		Composite
Olympia Substation & Maintenance HQ	WA	Z-698 RELAY HOUSE	1972	System Expansion	Historic/Non-contributing	Utilitarian		Corrugated Metal
Olympia Substation & Maintenance HQ	WA	Z-1232 MAINTENANCE / COMPRESSOR	1950	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-1229 PARTS STORAGE	1951	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-1230 PARTS STORAGE	1951	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-1231 STORAGE	1951	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-8970 STORAGE - 500kV SRU3	1953	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-9042 STORAGE - HAZARDOUS MATERIALS	1980	System Expansion	Not a historic resource per MPDF			

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Olympia Substation & Maintenance HQ	WA	Z-9080 STORAGE - HAZARDOUS MATERIALS	1980	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-9089 STORAGE - HAZARDOUS MATERIALS	1980	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-9090 STORAGE - HAZARDOUS MATERIALS	1980	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-9098 STORAGE - HAZARDOUS MATERIALS	1980	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-1228 STORAGE	1990	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-7743 Enclosure w/ Power/Ventilation	1990	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-7759 STORAGE - 500kV Squat Box	1990	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-9136 STORAGE	1995	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-9137 STORAGE	1995	System Expansion	Not a historic resource per MPDF			
Olympia Substation & Maintenance HQ	WA	Z-1307 VEHICLE STORAGE	1977	System Expansion	Out of Period/Non-contributing			
Olympia Substation & Maintenance HQ	WA	Z-656 VEHICLE STORAGE	1977	System Expansion	Out of Period/Non-contributing			
Olympia Substation & Maintenance HQ	WA	Z-1273 TLM VEHICLE STORAGE	1992	System Expansion	Out of Period/Non-contributing			
Olympia Substation & Maintenance HQ	WA	Z-1274 STORAGE - VEHICLE	1992	System Expansion	Out of Period/Non-contributing			
Olympia Substation & Maintenance HQ	WA	Z-1275 MAINTENANCE HEADQUARTERS	1992	System Expansion	Out of Period/Non-contributing			
Olympia Substation & Maintenance HQ	WA	Z-1276 TOXIC WASTE STORAGE	1992	System Expansion	Out of Period/Non-contributing			
Olympia Substation & Maintenance HQ	WA	Z-1277 HMEM SHOP	1992	System Expansion	Out of Period/Non-contributing			
Olympia Substation & Maintenance HQ	WA	Z-1278 OPERATORS VEHICLE STORAGE	1992	System Expansion	Out of Period/Non-contributing			
Olympia Substation & Maintenance HQ	WA	Z-7772 Site Development	1992	System Expansion	Out of Period/Non-contributing			
Oregon City Substation	OR	Z-0000 Railroad	1943	Master Grid	Historic/Contributing	Utilitarian	Rails	Steel
Oregon City Substation	OR	Z-980 CONTROL HOUSE	1943	Master Grid	Historic/Contributing	Streamline Moderne	Type 120	Concrete
Oregon City Substation	OR	Z-981 PUMP HOUSE	1953	Master Grid	Historic/Contributing	Utilitarian		Concrete Block
Ostrander Substation	OR	Z-711 CONTROL HOUSE/MAINTENANCE	1970	System Expansion	Historic/Contributing; Individually Eligible	Modern/Brutalist	Type 2008	Concrete
Ostrander Substation	OR	Z-7014 FLAMMABLE STORAGE	1993	System Expansion	Not a historic resource per MPDF			
Ostrander Substation	OR	Z-7015 STORAGE SHED	1993	System Expansion	Not a historic resource per MPDF			
Ostrander Substation	OR	Z-0000 Cable Tunnel	1970	System Expansion	Feature of switchyard			
Paul Substation	WA	Z-702 CONTROL HOUSE / MAINTENANCE	1971	System Expansion	Historic/Contributing; Individually Eligible	Modern/Contemporary		Brick

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Paul Substation	WA	Z-7789 Switchyard	1971	System Expansion	Historic/Contributing	Utilitarian		Steel
Paul Substation	WA	Z-1223 POLE VEHICLE STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Paul Substation	WA	Z-7159 Landscaping	1971	System Expansion	Historic/Contributing	Landscape		Landscape
Pearl Substation	OR	Z-716 CONTROL HOUSE / MAINTENANCE	1968	System Expansion	Historic/Non-contributing	International		Aluminum
Pearl Substation	OR	Z-635 RELAY HOUSE	1981	System Expansion	Out of Period/Non-contributing			
Pendleton Substation	OR	Z-174 CONTROL HOUSE	1942	Master Grid	Historic/Non-contributing	Minimal Traditional		Aluminum
Port Angeles Substation & Maintenance HQ	WA	Z-7790 Switchyard	1950	System Expansion	Historic/Contributing	Utilitarian		Steel
Port Angeles Substation & Maintenance HQ	WA	Z-982 CONTROL HOUSE	1950	System Expansion	Historic/Contributing	Streamline Moderne	Type 100-2	Concrete
Port Angeles Substation & Maintenance HQ	WA	Z-983 OIL HOUSE	1950	System Expansion	Historic/Contributing	Utilitarian	Oil House	Concrete
Port Angeles Substation & Maintenance HQ	WA	Z-984 MAINTENANCE	1950	System Expansion	Historic/Contributing	Utilitarian		Concrete
Port Angeles Substation & Maintenance HQ	WA	Z-9082 OIL ABSORBENTS	1979	System Expansion	Not a historic resource per MPDF			
Port Angeles Substation & Maintenance HQ	WA	Z-9083 OIL ABSORBENTS	1979	System Expansion	Not a historic resource per MPDF			
Port Angeles Substation & Maintenance HQ	WA	Z-0000 STORAGE - CONEX	1980	System Expansion	Not a historic resource per MPDF			
Port Angeles Substation & Maintenance HQ	WA	Z-1250 EMERGENCY LINE STORAGE	1990	System Expansion	Not a historic resource per MPDF			
Port Angeles Substation & Maintenance HQ	WA	Z-9081 OIL ABSORBENTS	1990	System Expansion	Not a historic resource per MPDF			
Port Angeles Substation & Maintenance HQ	WA	Z-1004 RELAY HOUSE	1979	System Expansion	Out of Period/Non-contributing			
Port Angeles Substation & Maintenance HQ	WA	Z-1050 ENGINE GENERATOR BUILDING	1979	System Expansion	Out of Period/Non-contributing			
Port Angeles Substation & Maintenance HQ	WA	Z-1231 STORAGE - HAZARDOUS MATERIALS	1990	System Expansion	Out of Period/Non-contributing			
Port Angeles Substation & Maintenance HQ	WA	Z-1249 STORAGE - HAZARDOUS MATERIALS	1990	System Expansion	Out of Period/Non-contributing			
Port Angeles Substation & Maintenance HQ	WA	Z-1251 EMERGENCY LINE MATERIAL STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Port Angeles Substation & Maintenance HQ	WA	Z-9174 FLAMMABLE STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Port Angeles Substation & Maintenance HQ	WA	Z-1368 VEHICLE STORAGE	2000	System Expansion	Out of Period/Non-contributing			
Port Angeles Substation & Maintenance HQ	WA	Z-9004 STORAGE - HAZARDOUS MATERIALS	2014	System Expansion	Out of Period/Non-contributing			
Port Angeles Substation & Maintenance HQ	WA	Z-0000 Cable Tunnel	1950	System Expansion	Feature of switchyard			
Port Orford Substation	OR	Z-189 CONTROL HOUSE	1953	System Expansion	Historic/Non-contributing	Utilitarian	Type 162	Corrugated Metal
Port Orford Substation	OR	Z-1226 STORAGE	1990	System Expansion	Not a historic resource per MPDF			
Potholes Substation	WA	Z-0000 Cable Tunnel	1959	System Expansion	Feature of switchyard			

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Potholes Substation	WA	Z-800 CONTROL HOUSE	1958	System Expansion	Individually Eligible	Modern	Type 113	Concrete
Potlatch Substation	WA	Z-323 CONTROL HOUSE	1961	System Expansion	Historic/Contributing	Utilitarian	Type 193	Aluminum
Potlatch Substation	WA	Z-1067 METER HOUSE	1983	System Expansion	Not a historic resource per MPDF			
Potlatch Substation	WA	Z-9025 STORAGE - HAZARDOUS MATERIAL	1997	System Expansion	Not a historic resource per MPDF			
Priest River Substation	ID	Z-0544 CONTROL HOUSE	1974	System Expansion	Historic/Non-contributing	Utilitarian		Aluminum
Raver Substation	WA	Z-0715 CONTROL HOUSE	1968	System Expansion	Historic/Non-contributing	International	Type 2004	Asbestos Cement
Raver Substation	WA	Z-0714 MAINTENANCE	1968	System Expansion	Historic/Non-contributing	International		Asbestos Cement
Raver Substation	WA	Z-0715A CONTROL HOUSE - East Annex	2015	System Expansion	Out of Period/Non-contributing			
Raymond Substation	WA	Z-0985 CONTROL HOUSE	1941	Master Grid	Historic/Non-contributing	Streamline Moderne	Type 100-1	Concrete
Raymond Substation	WA	Z-0481 STORAGE	1970	Master Grid	Historic/Non-contributing	Utilitarian		Concrete Block
Raymond Substation	WA	Z-9144 Vehicle Bridge - Wooden	1994	Master Grid	Out of Period/Non-contributing			
Redmond Substation & Maintenance HQ	OR	Z-986 CONTROL HOUSE	1953	System Expansion	Historic/Non-contributing	Modern	Type 145-2	Concrete Block
Redmond Substation & Maintenance HQ	OR	Z-718 MAINTENANCE HEADQUARTERS	1967	System Expansion	Historic/Non-contributing	Modern	Type 910	Wood Sheet
Redmond Substation & Maintenance HQ	OR	Z-717 HELIPORT	1969	System Expansion	Historic/Non-contributing	Modern	Heliport	Wood Sheet
Redmond Substation & Maintenance HQ	OR	Z-1150 WASHOUT BUILDING	1987	System Expansion	Out of Period/Non-contributing			
Redmond Substation & Maintenance HQ	OR	Z-1173 FLAMMABLE STORAGE	1987	System Expansion	Out of Period/Non-contributing			
Redmond Substation & Maintenance HQ	OR	Z-1359 STORAGE	1988	System Expansion	Out of Period/Non-contributing			
Redmond Substation & Maintenance HQ	OR	Z-6005 STORAGE	1988	System Expansion	Out of Period/Non-contributing			
Redmond Substation & Maintenance HQ	OR	Z-7781 VEHICLE WASH RACK	1988	System Expansion	Out of Period/Non-contributing			
Redmond Substation & Maintenance HQ	OR	Z-1326 STORAGE (NW TLM GARAGE)	1992	System Expansion	Out of Period/Non-contributing			
Redmond Substation & Maintenance HQ	OR	Z-1435 REGIONAL OFFICE	1995	System Expansion	Out of Period/Non-contributing			
Reedsport Substation	OR	Z-804 CONTROL HOUSE	1957	System Expansion	Historic/Contributing	Minimal Traditional	Type 165-1	Concrete
Republic Substation	WA	Z-0236 CONTROL HOUSE	1953	System Expansion	Historic/Contributing	Utilitarian	Type 192	Aluminum
Reston Substation	OR	Z-326 CONTROL HOUSE	1961	System Expansion	Historic/Contributing	Utilitarian	Type 193	Aluminum
Richland Substation	WA	Z-162 CONTROL HOUSE	1949	System Expansion	Historic/Contributing	Utilitarian	Type-190	Aluminum
Ross Complex	WA	Z-695 DITTMER CONTROL CENTER	1971	Master Grid	Historic/Contributing; Individually Eligible	Modern/Brutalist		Concrete
Ross Complex	WA	Z-987 CONTROL HOUSE / ROSS	1939	Master Grid	Historic/Contributing	Streamline Moderne	Type 109	Concrete
Ross Complex	WA	Z-988 STORAGE - OLD OIL HOUSE	1940	Master Grid	Historic/Contributing	Utilitarian	Oil House	Concrete
Ross Complex	WA	Z-993 DOB #1	1941	Master Grid	Historic/Contributing	Streamline Moderne		Concrete
Ross Complex	WA	Z-996 BLACKSMITH SHOP (Medium Voltage Testing)	1953	Master Grid	Historic/Contributing	Utilitarian		Concrete Block
Ross Complex	WA	Z-271 CONTROL HOUSE / 345KV	1958	Master Grid	Historic/Contributing	Utilitarian		Aluminum
Ross Complex	WA	Z-760 HIGH VOLTAGE LAB	1961	Master Grid	Historic/Contributing	Utilitarian		Corrugated Metal
Ross Complex	WA	Z-814 FLAMMABLE STORAGE - according to HRA eval, built date is 1980	1969	Master Grid	Historic/Contributing	Utilitarian		Corrugated Metal

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Ross Complex	WA	Z-503 FOG TEST CHAMBER	1972	Master Grid	Historic/Contributing	Utilitarian		Aluminum
Ross Complex	WA	Z-700 CAREY TEST LAB	1972	Master Grid	Historic/Contributing	Utilitarian		Corrugated Metal
Ross Complex	WA	Z-992 COMPLEX COMMUNICATION BUILDING	1943	Master Grid	Historic/Non-contributing	Utilitarian		Concrete
Ross Complex	WA	Z-998 SERVICE STATION (Storage)	1946	Master Grid	Historic/Non-contributing	Utilitarian		Wood Sheet
Ross Complex	WA	Z-258 SHIPPING DOCK	1953	Master Grid	Historic/Non-contributing	Utilitarian		Corrugated Metal
Ross Complex	WA	Z-765 PLANT SERVICES ANNEX BLDG	1960	Master Grid	Historic/Non-contributing	Utilitarian		Corrugated Metal
Ross Complex	WA	Z-339 MOTOR GENERATOR/HV LAB	1961	Master Grid	Historic/Non-contributing	Utilitarian		Corrugated Metal
Ross Complex	WA	Z-638 LOAN POOL STORAGE (Old Capacitor Lab)	1961	Master Grid	Historic/Non-contributing	Utilitarian		Corrugated Metal
Ross Complex	WA	Z-761 Utility/Disp Bldg (Investment Recover Center)	1961	Master Grid	Historic/Non-contributing	Utilitarian		Corrugated Metal
Ross Complex	WA	Z-350 WAREHOUSE GAS CYLINDER STORAGE	1963	Master Grid	Historic/Non-contributing	Utilitarian		Corrugated Metal
Ross Complex	WA	Z-367 LANDSCAPERS STORAGE BUILDING	1963	Master Grid	Historic/Non-contributing	Utilitarian		Aluminum
Ross Complex	WA	Z-759 ROSS WAREHOUSE (Warehouse/Switchboard Shop)	1963	Master Grid	Historic/Non-contributing	Utilitarian		Corrugated Metal
Ross Complex	WA	Z-482 EXPLOSIVES STORAGE	1969	Master Grid	Historic/Non-contributing	Utilitarian		Aluminum
Ross Complex	WA	Z-1369 STORAGE GARAGE NO 1	1970	Master Grid	Historic/Non-contributing	Utilitarian		Concrete
Ross Complex	WA	Z-1370 STORAGE GARAGE NO 2	1970	Master Grid	Historic/Non-contributing	Utilitarian		Wood Sheet
Ross Complex	WA	Z-691 CONSTRUCTION MAINTENANCE (TLM Building)	1973	Master Grid	Historic/Non-contributing	Utilitarian		Corrugated Metal
Ross Complex	WA	Z-665 STORAGE SHED (Old Surge Gen Bldg)	1976	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-666 TRUCK SCALES	1976	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-669 PARTS WAREHOUSE	1976	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-671 PLANT SERVICES BUILDING	1976	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-768 - SURGE GENERATOR BUILDING (Control)	1976	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-654 SOLAR ED BUILDING	1978	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-502 STORAGE BUILDING (502)	1980	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-640 PLASMA TORCH BUILDING	1980	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-5001 STORAGE BUILDING (5001)	1980	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-5003 STORAGE BUILDING (5003)	1980	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-610 CONSTRUCTION SERVICES BUILDING	1982	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-686 MANGAN HIGH VOLTAGE LAB	1982	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-687 MAINTENANCE SHED	1982	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-611 STORAGE (String Equipment)	1986	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-610A CONSTRUCTION SERVICES STORAGE BUILDING	1988	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1072 STORAGE	1990	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1255 HAZARDOUS MATERIAL BUILDING	1990	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1253 EQUIPMENT STORAGE LAB	1991	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1306 TECHNICAL TRAINING CENTER	1991	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1252 PENTA STORAGE BUILDING	1992	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1334 PCB LAB (Annex Modular)	1992	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-5006 WAREHOUSE OFFICE MODULAR	1992	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1332 HIGH CURRENT TEST LAB (Modular Office)	1994	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1304 TTPH OFFICE BUILDING (High Voltage Modular)	1995	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1305 WAREHOUSE MODULAR	1995	Master Grid	Out of Period/Non-contributing			

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Ross Complex	WA	Z-1346 HIGH CURRENT BUILDING (Lab - NW Storage Bldg)	1995	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1371 FUEL ISLAND (Station)	1995	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1053 BUILDING	1996	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1280 VEHICLE STORAGE BUILDING / NW AREA	1996	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-5002 STORAGE BUILDING (5002)	1996	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-992A STORAGE BUILDING (992a)	1996	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1331 DITTMER MODULAR	1998	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1333 MODULAR EMERGENCY SCHEDULING CENTER	1998	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1296 TLM EQUIP STORAGE BUILDING	1999	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1349 VEHICLE STORAGE SHED	1999	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1361 WASHRACK	1999	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1417 POLE BARN STRUCTURE FOR IRC STORAGE (Investment Recover Center Storage)	2003	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1425 GUARD POST STATION NO 5	2005	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-5000 AIR COMPRESSOR STORAGE BUILDING	2006	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1449 LOAN POOL STORAGE BLDG (Bronto Storage)	2009	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-7804 TLM WAREHOUSE STORAGE 1	2011	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-7805 TLM WAREHOUSE STORAGE 2	2011	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1306A Storage Unit by Technical Training Center	2011	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1306B Storage Unit by Technical Training Center	2011	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1306C Storage Unit by Technical Training Center	2011	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1306D Storage Unit by Technical Training Center	2011	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-9005 - Tank Farm	2013	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1091 PAINT THINNER BUILDING - Left One	2014	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1348 NORTH YARD STORAGE WAREHOUSE	2014	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-9130 FLAMMABLE STORAGE - Right One	2014	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1197 FLAMMABLE STORAGE LOCKER	2015	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1540 N2 GENERATOR BUILDING	2015	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-1542 STORAGE - SECURALL	2015	Master Grid	Out of Period/Non-contributing			
Ross Complex	WA	Z-991 AMPERE BUILDING (South)	1939	Master Grid	Historic/Contributing Part of Untanking tower	Streamline Moderne		Concrete
Ross Complex	WA	Z-989 AMPERE BUILDING (North)	1940	Master Grid	Historic/Contributing Part of Untanking tower	Streamline Moderne		Concrete
Ross Complex	WA	Z-990 AMPERE BUILDING (Untanking Tower)	1940	Master Grid	Historic/Contributing Part of Untanking tower	Streamline Moderne	Untanking Tower	Concrete
Ross Complex	WA	Z-995 AMPERE ANNEX	1943	Master Grid	Historic/Contributing Part of Untanking tower	Streamline Moderne		Concrete
Roundup Substation	OR	Z-844 CONTROL HOUSE	1954	System Expansion	Historic/Contributing	Minimal Traditional	Type 165	Concrete Block
Sacheen Substation	WA	Z-0685 CONTROL HOUSE	1974	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Salem Substation	OR	Z-936 CONTROL HOUSE	1942	Master Grid	Historic/Contributing; Individually Eligible	Streamline Moderne	Type 105	Concrete
Salem Substation	OR	Z-935 OIL HOUSE	1942	Master Grid	Historic/Contributing	Utilitarian	Oil House	Concrete
Salem Substation	OR	Z-8175 Railroad	1942	Master Grid	Historic/Contributing	Utilitarian	Rails	Steel

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Salem Substation	OR	Z-816 MAINTENANCE	1956	Master Grid	Historic/Contributing	Utilitarian	Type 902	Corrugated Metal
Salem Substation	OR	Z-0000 STORAGE SHED	1962	Master Grid	Not a historic resource per MPDF			
Sandpoint Substation	ID	Z-0089 CONTROL HOUSE	1950	System Expansion	Historic/Contributing; Individually Eligible	Utilitarian	Type 190	Aluminum
Santiam Substation	OR	Z-842 OIL HOUSE	1954	System Expansion	Historic/Contributing	Utilitarian	Oil House	Concrete
Santiam Substation	OR	Z-843 CONTROL HOUSE	1954	System Expansion	Historic/Contributing	Modern	Type 126	Concrete
Santiam Substation	OR	Z-8121 Cable Tunnel	1954	System Expansion	Feature of switchyard			
Scooteney Substation	WA	Z-199 CONTROL HOUSE	1953	System Expansion	Historic/Contributing	Utilitarian	Type 162	Corrugated Metal
Shelton Substation	WA	Z-815 CONTROL HOUSE	1957	System Expansion	Historic/Non-contributing	Minimal Traditional	Type 122	Concrete
Shelton Substation	WA	Z-8952 STORAGE - SRU #2	1968	System Expansion	Not a historic resource per MPDF			
Shelton Substation	WA	Z-8954 STORAGE - SRU #4	1968	System Expansion	Not a historic resource per MPDF			
Shelton Substation	WA	Z-8953 STORAGE - SRU #3	1976	System Expansion	Not a historic resource per MPDF			
Shelton Substation	WA	Z-9035 STORAGE - SRU #1	1976	System Expansion	Not a historic resource per MPDF			
Shelton Substation	WA	Z-643 STORAGE	1976	System Expansion	Out of Period/Non-contributing			
Sickler Substation	WA	Z-713 CONTROL HOUSE	1969	System Expansion	Historic/Contributing; Individually Eligible	International	Type 2006	Asbestos Cement
Sickler Substation	WA	Z-7104 Landscaping	1975	System Expansion	Not a historic resource per MPDF			
Sickler Substation	WA	Z-7828 STORAGE - WASTE	1985	System Expansion	Not a historic resource per MPDF			
Sickler Substation	WA	Z-7829 STORAGE - FLAMMABLE	1995	System Expansion	Not a historic resource per MPDF			
Sickler Substation	WA	Z-7830 STORAGE - SRU #1	1995	System Expansion	Not a historic resource per MPDF			
Sickler Substation	WA	Z-534 ENGINE GENERATOR BUILDING	1975	System Expansion	Out of Period/Non-contributing			
Sickler Substation	WA	Z-673 MAINTENANCE	1975	System Expansion	Out of Period/Non-contributing			
Sickler Substation	WA	Z-1059 STORAGE	1985	System Expansion	Out of Period/Non-contributing			
Silver Creek Substation	WA	Z-308 CONTROL HOUSE	1958	System Expansion	Historic/Non-contributing	Utilitarian	Type 192	Aluminum
Silver Creek Substation	WA	Z-404 STORAGE	1966	System Expansion	Not a historic resource per MPDF			
Silver Creek Substation	WA	Z-9027 OIL ABSORBENT BUILDING	1970	System Expansion	Not a historic resource per MPDF			
Silver Creek Substation	WA	Z-9088 OIL ABSORBENT BUILDING	1970	System Expansion	Not a historic resource per MPDF			
Silver Creek Substation	WA	Z-9120 STORAGE	1970	System Expansion	Not a historic resource per MPDF			
Silver Creek Substation	WA	Z-9121 STORAGE	1970	System Expansion	Not a historic resource per MPDF			
Silver Creek Substation	WA	Z-1487 CONTROL HOUSE	2012	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-897 CONTROL HOUSE	1950	System Expansion	Historic/Non-contributing	Streamline Moderne/Contemporary	Type 110	Concrete Block
Snohomish Substation & Maintenance HQ	WA	Z-410 ENGINE GENERATOR BUILDING	1950	System Expansion	Historic/Non-contributing	Utilitarian		Aluminum
Snohomish Substation & Maintenance HQ	WA	Z-661 VEHICLE STORAGE / OPERATORS	1950	System Expansion	Historic/Non-contributing	Utilitarian		Concrete
Snohomish Substation & Maintenance HQ	WA	Z-690 MAINTENANCE / COMMUNICATION	1950	System Expansion	Historic/Non-contributing	Utilitarian		Concrete Block
Snohomish Substation & Maintenance HQ	WA	Z-895 CONDENSER BUILDING	1950	System Expansion	Historic/Non-contributing	Utilitarian		Concrete
Snohomish Substation & Maintenance HQ	WA	Z-841 MAINTENANCE HQ TLM / HMEM SHOP	1971	System Expansion	Historic/Non-contributing	Utilitarian		Corrugated Metal
Snohomish Substation & Maintenance HQ	WA	Z-9156 STORAGE	1960	System Expansion	Not a historic resource per MPDF			

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Snohomish Substation & Maintenance HQ	WA	Z-1239 STORAGE	1980	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-1240 VEHICLE STORAGE/TLM	1983	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-1237 STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-1238 TRACTOR STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-1242 MAINTENANCE STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-8979 STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-8993 STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-9152 STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-9153 STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-9159 STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-9162 STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-9163 STORAGE	1990	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-9088 REGIONAL OFFICE	1994	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-1297 VEHICLE STORAGE / MAINTENANCE	1995	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-1330 STORAGE BUILDING - VEHICLE	1996	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-1452 WAREHOUSE	2010	System Expansion	Out of Period/Non-contributing			
Snohomish Substation & Maintenance HQ	WA	Z-8978 Cable Tunnel	1950	System Expansion	Feature of switchyard			
Sno-King Substation	WA	Z-747 CONTROL HOUSE	1965	System Expansion	Historic/Non-contributing	Minimal Traditional	Type 113	Concrete
Sno-King Substation	WA	Z-1236 STORAGE	1980	System Expansion	Not a historic resource per MPDF			
Sno-King Substation	WA	Z-8986 STORAGE	1980	System Expansion	Not a historic resource per MPDF			
Sno-King Substation	WA	Z-8987 STORAGE	1980	System Expansion	Not a historic resource per MPDF			
St. Johns Substation	OR	Z-900 CONTROL HOUSE	1941	Master Grid	Historic/Contributing; Individually Eligible	Streamline Moderne	Type 110	Concrete
St. Johns Substation	OR	Z-899 STORAGE - OLD OIL HOUSE	1941	Master Grid	Historic/Contributing	Utilitarian	Oil House	Concrete Block
St. Johns Substation	OR	Railroad	1941	Master Grid	Historic/Contributing	Utilitarian	Rails	Steel
St. Johns Substation	OR	Z-898 STORAGE	1951	Master Grid	Historic/Contributing	Utilitarian	Type 1	Concrete Block
Starr Complex	OR	Z-704 CELILO DC CONVERTER STATION CONTROL HOUSE	1970	System Expansion	Historic/Contributing; Individually Eligible	Modern		Brick
Starr Complex	OR	Z-821 BIG EDDY 230KV OIL HOUSE	1956	System Expansion	Historic/Contributing	Utilitarian		Aluminum

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Starr Complex	OR	Z-822 BIG EDDY 230KV RELAY HOUSE #2	1956	System Expansion	Historic/Contributing	Utilitarian		Concrete
Starr Complex	OR	Z-824 BIG EDDY 230KV CONTROL HOUSE	1956	System Expansion	Historic/Contributing	Modern	Type 186	Concrete
Starr Complex	OR	Z-823 BIG EDDY 230KV RELAY HOUSE #1	1956	System Expansion	Historic/Contributing	Utilitarian		Concrete
Starr Complex	OR	Z-285 BIG EDDY 230KV ENGINE GENERATOR BUILDING	1957	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Starr Complex	OR	Z-819 THE DALLES MAINTENANCE HQ STORAGE	1956	System Expansion	Historic/Non-contributing	Utilitarian		Corrugated Metal
Starr Complex	OR	Z-820 THE DALLES MAINTENANCE HQ HEADQUARTERS PSC & SPC	1956	System Expansion	Historic/Non-contributing	Utilitarian		Corrugated Metal
Starr Complex	OR	Z-403 THE DALLES MAINTENANCE HQ COLD STORAGE	1965	System Expansion	Historic/Non-contributing	Utilitarian		Corrugated Metal
Starr Complex	OR	Z-483 CELILO DC CONVERTER STATION PUMP HOUSE/RIVER WATER	1970	System Expansion	Historic/Non-contributing	Utilitarian		Aluminum
Starr Complex	OR	Z-683 THE DALLES MAINTENANCE HQ MAINTENANCE	1974	System Expansion	Historic/Non-contributing	Utilitarian		Corrugated Metal
Starr Complex	OR	Z-1338 BIG EDDY 230KV STORAGE	1979	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-605 CELILO DC CONVERTER STATION CONTROL HOUSE - VALVE HALL GP 7 & 8	1985	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-617 CELILO DC CONVERTER STATION MAINTENANCE HEADQUARTERS	1987	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1198 BIG EDDY 500KV CONTROL HOUSE	1987	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1200 CELILO DC CONVERTER STATION STORAGE - HAZARDOUS MATERIALS	1987	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-0000 CELILO MRTB & GRTS CONTROL BUILDING	1989	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-612 THE DALLES MAINTENANCE HQ HERBICIDE FLAMMABLE STORAGE	1989	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1207 CELILO DC CONVERTER STATION CONTROL/MAINTENANCE - STA SERV FEEDER 4SWIT	1989	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1208 CELILO DC CONVERTER STATION CONTROL/MAINTENANCE - STA SERV FEEDER 5	1989	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1211 CELILO DC CONVERTER STATION POTABLE WELL HOUSE	1989	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1339 CELILO DC CONVERTER STATION CONV 1 & 2 VALVE HALL	1989	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1340 CELILO DC CONVERTER STATION RELAY HOUSE - AC SWITCH YARD	1989	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1341 CELILO DC CONVERTER STATION RELAY HOUSE - AC FILTER SWITCH YARD	1989	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1343 CELILO DC CONVERTER STATION CONV 1& 2 POWER PANELS	1989	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1404 CELILO DC CONVERTER STATION COVERED PARKING	1989	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-6004 CELILO DC CONVERTER STATION STORAGE SHED	1989	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1205 CELILO DC CONVERTER STATION EQUIPMENT STORAGE BUILDING	1990	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1269 THE DALLES MAINTENANCE HQ TLM STORAGE BUILDING (POLE)	1993	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-6000 BIG EDDY 230KV STORAGE	1993	System Expansion	Out of Period/Non-contributing			

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Starr Complex	OR	Z-1324 THE DALLES MAINTENANCE HQ OPERATORS	1994	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-9131 THE DALLES MAINTENANCE HQ WASHRACK	1999	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1383 THE DALLES MAINTENANCE HQ HMEM GARAGE	2002	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1403 THE DALLES MAINTENANCE HQ GUARD SHACK	2002	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1407 CELILO DC CONVERTER STATION MAIN COOLING BUILDING 3 & 4	2002	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1405 CELILO DC CONVERTER STATION EQUIPMENT STORAGE BUILDING	2003	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1406 CELILO DC CONVERTER STATION MAIN COOLING BUILDING 1 & 2	2004	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-7531 BIG EDDY 230KV STORAGE #2	2013	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1551 CELILO DC-1 CONVERTER	2015	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-1552 CELILO DC-1 CONVERTER	2015	System Expansion	Out of Period/Non-contributing			
Starr Complex	OR	Z-8424 CELILO DC CONVERTER STATION CABLE TUNNEL	1956	System Expansion	Feature of switchyard			
Starr Complex	OR	Z-7814 BIG EDDY 230KV CABLE TUNNEL	1956	System Expansion	Feature of switchyard			
Tacoma Substation	WA	Z-892 CONTROL HOUSE	1943	Master Grid	Historic/Contributing; Individually Eligible	Streamline Moderne	Type 150	Brick
Tacoma Substation	WA	Z-9097 STORAGE	1983	Master Grid	Out of Period/Non-contributing			
Tacoma Substation	WA	Z-9095 STORAGE	1990	Master Grid	Out of Period/Non-contributing			
Tacoma Substation	WA	Z-9096 STORAGE	1990	Master Grid	Out of Period/Non-contributing			
Tacoma Substation	WA	Z-890 MAINTENANCE	1943	Master Grid	Historic/Contributing	Utilitarian		Brick
Tahkenitch Substation	OR	Z-753 CONTROL HOUSE	1963	System Expansion	Historic/Contributing	Minimal Traditional	Type 144-1	Concrete
Tahkenitch Substation	OR	Z-0000 STORAGE #1	1983	System Expansion	Not a historic resource per MPDF			
Tahkenitch Substation	OR	Z-0000 STORAGE #2	1983	System Expansion	Not a historic resource per MPDF			
Tahkenitch Substation	OR	Z-1266 OIL ABSORBENT BUILDING	1993	System Expansion	Not a historic resource per MPDF			
Teton Substation	WY	Z-0454 CONTROL HOUSE	1969	System Expansion	Historic/Non-contributing	Utilitarian		Aluminum
The Dalles Substation	OR	Z-123 SUBSTATION BATHROOM BUILDING	1948	System Expansion	Historic/Non-contributing	Utilitarian	Type 161	Vinyl
The Dalles Substation	OR	Z-302 CONTROL HOUSE	1959	System Expansion	Historic/Non-contributing	Utilitarian	Type 192	Aluminum
Timber Substation	OR	Z-245 CONTROL HOUSE	1954	System Expansion	Historic/Contributing	Utilitarian	Type 192	Aluminum
Toledo Substation	OR	Z-808 CONTROL HOUSE	1958	System Expansion	Historic/Contributing; Individually Eligible	Modern	Type 112	Concrete
Toledo Substation	OR	Z-0000 STORAGE	1979	System Expansion	Not a historic resource per MPDF			
Toledo Substation	OR	Z-1300 MAINTENANCE STORAGE	1979	System Expansion	Not a historic resource per MPDF			
Troutdale Substation	OR	Z-8083 Site - Railroad	1942	Master Grid	Historic/Non-contributing	Utilitarian	Rails	Steel
Troutdale Substation	OR	Z-309 ENGINE GENERATOR BUILDING	1958	Master Grid	Historic/Non-contributing	Utilitarian		Aluminum
Troutdale Substation	OR	Z-706 RELAY HOUSE	1969	Master Grid	Historic/Non-contributing	Utilitarian		Asbestos Cement
Troutdale Substation	OR	Z-5101 MAINTENANCE STORAGE	1978	Master Grid	Out of Period/Non-contributing			
Troutdale Substation	OR	Z-888 CONTROL HOUSE	1943	Master Grid	Individually Eligible	Streamline Moderne	Type 150	Brick
Troy Substation	MT	Z-238 CONTROL HOUSE	1954	System Expansion	Historic/Contributing	Utilitarian	Type 192	Aluminum
Unity Substation	ID	Z-0391 CONTROL HOUSE	1969	System Expansion	Historic/Contributing	Utilitarian	Type 193	Aluminum
Valhalla Substation	WA	Z-886 CONTROL HOUSE	1953	System Expansion	Historic/Contributing	Streamline Moderne	Type 135	Concrete
Valhalla Substation	WA	Z-885 OIL HOUSE	1953	System Expansion	Historic/Contributing	Utilitarian	Oil House	Concrete
Valhalla Substation	WA	Z-0000 Cable Tunnel	1953	System Expansion	Feature of switchyard			

SUBSTATION NAME	STATE	ASSET NAME	YEAR BUILT	PERIOD	ELIGIBILITY	STYLE	STANDARD TYPE	MATERIALS
Vantage Substation	WA	Z-754 CONTROL HOUSE	1964	System Expansion	Historic/Contributing	Modern	Type 115	Concrete
Vantage Substation	WA	Z-725 MAINTENANCE	1968	System Expansion	Historic/Contributing	Utilitarian		Concrete
Vantage Substation	WA	Z-545 ENGINE GENERATOR BUILDING	1974	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Vantage Substation	WA	Z-411 STORAGE	1967	System Expansion	Not a historic resource per MPDF			
Wagner Lake Substation	WA	Z-516 CONTROL HOUSE	1973	System Expansion	Historic/Contributing	Utilitarian		Aluminum
Walla Walla Substation (BPA)	WA	Z-884 CONTROL HOUSE	1941	Master Grid	Historic/Contributing; Individually Eligible	Streamline Moderne	Type 130	Concrete
Walla Walla Substation (BPA)	WA	Z-883 MAINTENANCE	1953	Master Grid	Historic/Contributing	Utilitarian		Concrete Block
Walla Walla Substation (BPA)	WA	Z-853 PUMP HOUSE	1954	Master Grid	Historic/Contributing	Utilitarian		Concrete Block
Walton Substation	OR	Z-20 CONTROL HOUSE	1950	System Expansion	Historic/Contributing; Individually Eligible	Utilitarian	Type 190	Aluminum
Wendson Substation	OR	Z-689 CONTROL HOUSE	1973	System Expansion	Historic/Contributing	Utilitarian		Corrugated Metal
Wendson Substation	OR	Z-0000 PUMP HOUSE	1973	System Expansion	Not a historic resource per MPDF			
Wendson Substation	OR	Z-1262 OIL ABSORBENT BUILDING	1993	System Expansion	Not a historic resource per MPDF			
Wendson Substation	OR	Z-1264 OIL ABSORBENT BUILDING	1993	System Expansion	Not a historic resource per MPDF			
Wendson Substation	OR	Z-7235 FIBER HUT	2002	System Expansion	Out of Period/Non-contributing			
Winthrop Substation	WA	Z-542 CONTROL HOUSE	1974	System Expansion	Historic/Non-contributing	Utilitarian		Corrugated Metal
Wren Substation	OR	Z-87 CONTROL HOUSE	1961	System Expansion	Historic/Contributing	Utilitarian	Type 190	Aluminum

APPENDIX C: HISTORIC BPA PAINT COLOR INDEX

Introduction

The Historic BPA Paint Color Index guides the application of paint colors to help maintain the appearance of historic BPA resources that are eligible for the National Register of Historic Places (NRHP). Each color in the index includes a federal standard color number, a representational sample of the color, and information on its historic use. The Index was developed by reviewing records and paint sample books that BPA used between 1950 and 1981 (information related to specific pre-1950 paint colors was unavailable). At times, these resources were explicit in terms of the application of paint colors and at other times vague. Paint sample books included brief handwritten notes next to paint chips, indicating specific uses such as dead-end towers or more generic uses such as “walls” or “signs.” Based on the publication dates of paint sample books, BPA memos, and revisions to BPA painting policies, five time periods associated with paint application have emerged. Colors associated with each time period are included at the end of the Index. The identified time periods are:

- 1950-1955 (Table 2) **Error! Reference source not found.**– BPA’s earliest standard paint s cheme. This scheme is recommended for all substations built prior to 1956, including those built during the Master Grid era 1938-1945.
- 1956-1965 (Table 3) – BPA’s first revision of Federal Standard colors selected.
- 1966-1974 (Table 4) – Scheme A and additional identified colors.
- 1975-1980 (Table 5) – Scheme B.
- 1981-present (Table 6) – Scheme C.

Federal Standard Paint Color Codes

BPA’s historic paint color schemes are based primarily on the Federal Standard Paint Color system (FSPC). The FSPC was developed during World War II to enable the United States government to provide consistent specifications to nationally- and internationally-based military subcontractors. In 1943, the U.S. Army Resources and Production Division established 72 standard paint colors and three basic sheens. The government augmented the FSPC in 1950 by issuing federal specification TT-C-595 colors. Designed for ready-mixed paints, the TT-C-5995 set not only expanded the FSPC scheme but established a four-digit code for each federal standard color. In 1956, the five-digit code system was introduced as FS-C-595 and corresponded to a paint’s sheen, color, and pigment information. The FSPC was updated in 1968 (FED-STD-595A), 1994 (FED-STD-595B), and 2008 (FED-STD-595C), and replaced in 2017 by SAE International’s AMS-STD-595. The updates generally provided additional colors and occasionally retired others.

Each digit in the FSPC five-digit code conveys information about the paint’s composition:

- The first number indicates the sheen, with 1 for gloss, 2 for semi-gloss, and 3 for flat (lusterless). The same color could have up to three FSPC codes depending upon its sheen. For example, Bonneville Gray is coded as FS-16314 (gloss), FS-26314 (semi-gloss), and FS-36314 (flat).
- The second number corresponds to the color classification group (0-8). These color groups include (0) brown, (1) red, (2) orange, (3) yellow, (4) green, (5) blue, (6) grey, (7) other, and (8) fluorescent.
- The last three numbers reflect the color intensity.

BPA’s Historic Painting Schemes

By 1950, BPA had incorporated the FSPC into its substation paint schemes, as well as other colors that later became part of the FSPC. By 1955, BPA had selected 23 federal standard colors from a total of 358 available (Miller 1955). Until the mid-1960s, BPA typically painted substation buildings in two different shades of gray with one for the base color and one for trim. Prior to 1956, Engineers Light Grey (FS-26555) was generally used for exterior base and Maritime Engine Grey (FS-26306) for exterior trim. By 1960, these colors were discontinued and replaced with two unspecified shades of gray coded as FS-36622 for exterior base and FS-16492 for exterior trim.

In 1966, BPA adopted a new substation paint scheme for new and existing substations as part of its "beautility" system appearance planning program. The architectural firm of Stanton, Boles, Maguire, and Church developed standards for this appearance planning program based on BPA station siting policy and the locations of existing substations. The firm recommended that Because all stations could not be effectively hidden, the firm recommended that color be used to make the public aware of the components that compose a substation (Perlas 1981:1). Thus, the new paint scheme was designed to accentuate the functional components of the substation, simplify visual elements in an ordered appearance, and overall, be visually less objectionable (Perlas 1981:1). The new paint scheme, Scheme A, consisted of twelve BPA colors, labeled 1 – 12, each of which corresponded to a Federal Standard number.

In 1974, the architectural firm of Boles, Maguire, and Hoch submitted a study reviewing BPA's color scheme. The firm concluded Scheme A was appropriate for substations in high visibility areas, but a secondary paint scheme was necessary for substations in more rural areas to allow them to blend into their natural settings. BPA's new focus on harmonizing substations and transmission lines with the natural environment led to the modification of Scheme A and introduction of Scheme B, a supplemental color scheme for facilities in rural areas. Scheme B consisted of nine earth tone colors that incorporated some Scheme A colors (Perlas 1981:6). In light of Boles, Maguire and Hoch's 1974 study and BPA's paint policy at the time, BPA identified four primary functions served by paint:

1. Protection against rust and corrosion
2. Increased safety through a color-coded system for air, oil, and electrical lines
3. Identification of yard areas through use of particular colors
4. Attractive visual composition (Perlas 1981:1)

In 1975, BPA issued interim instructions for implementing its color schemes. BPA reaffirmed the use of Schemes A and B and also initiated a visual survey checklist to help personnel select paint colors for new and existing facilities. Scheme A, which BPA called an "accentuating treatment," was intended for use at all BPA substations except those in forested areas, where use of Scheme B's earth tone colors was more appropriate. In 1980, BPA implemented a new policy that retained Schemes A and B and created Scheme C, a new streamlined and economical scheme for low profile properties.[6] Scheme C included four distinct colors not used in either Scheme A or B. These colors consisted of stainless steel (C-1), yellowish gray (C-2), medium olive (C-3), and light gray (C-4). At low-profile locations where BPA applied Scheme C, only one Scheme C color was used throughout a particular property. At these locations, paint was primarily used for protection against rust and corrosion, thus leaving aluminum and galvanized surfaces generally unpainted.

Using the Historic BPA Paint Color Index

The index may be used to determine colors for paint projects involving historic BPA substations that have been determined eligible for the NRHP. Current BPA policy is to only match historic paint colors for building exteriors. Matching historic paint colors is not required for building interiors, signage, furniture or switchyard equipment.

Directions

1. Use the NRHP Eligible BPA Substations table below (Table 1) to locate the substation (listed alphabetically in Column 1) and identify the recommended paint scheme (Column 3). If the Control

[6] Although each paint scheme consisted of a certain set of colors, some additional colors were applied at substations for building interiors and switchyard equipment.

House is the only eligible resource (noted in Column 2), use of historic paint colors is not required for other buildings.

2. Go to the appropriate table for paint scheme information (Table 2 – 1950 Scheme; Table 3 – 1956 Scheme; Table 4 – Scheme A; Table 5 – Scheme B; Table 6 – Scheme C). Use these tables to identify the planned use (e.g. exterior walls) and determine the recommended paint for the project. If a specific application (e.g. building/structure/object) is not listed, select a paint color in close approximation to the existing color. Historic interior and equipment colors are included for reference only and are not required per current BPA policy.
3. Note the Federal Standard number (Column 4) and color "Name" (Column 2) applicable to the paint recommended for the project.
4. Request Federal Standard paint colors at Sherwin-Williams paint stores. For all exteriors, BPA's policy is to use Sherwin-Williams Super Paint and Sherwin-Williams Pro Industrial line of water-based primers and top coats. BPA's required level of sheen is typically flat or eggshell for the field and semi-gloss for the trim. The level of sheen used historically may not match current BPA policy. When a Sherwin-Williams paint store is not available, refer to a Federal Standard 595C fan deck (often available at paint stores) and request color-matching at an available paint supplier.

Table 1. NRHP Eligible BPA Substations

(1) NAME	(2) ELIGIBILITY	(3) RECOMMENDED PAINT SCHEME	(4) YR BUILT	(5) DISTRICT	(6) REGION	(7) STATE
Adair	Eligible	Scheme A (Table 4)	1969	Salem	South	OR
Albany	Eligible	1950 Scheme (Table 2)	1954	Eugene	South	OR
Alcoa	Control House only	1950 Scheme (Table 2)	1940	Longview	South	WA
Allston	Eligible	Scheme A (Table 4)	1969	Longview	South	OR
Alvey	Eligible	FS-36586; FS-26586 (Table 3)	1950	Eugene	South	OR
Anaconda	Eligible	1950 Scheme (Table 2)	1953	Kalispell	East	MT
Bellingham	Eligible	1950 Scheme (Table 2)	1954	Snohomish	North	WA
Big Eddy/Starr	Eligible	1956 Scheme (Table 3)	1956	The Dalles	South	OR
Boundary	Eligible	Scheme A (Table 4)	1967	Spokane	East	WA
Burnt Woods	Eligible	1950 Scheme (Table 2)	1954	Eugene	South	OR
Cardwell	Eligible	1956 Scheme (Table 3)	1963	Longview	South	WA
Centralia	Eligible	1950 Scheme (Table 2)	1950	Olympia	North	WA
Chehalis	Eligible	1950 Scheme (Table 2)	1941	Olympia	North	WA
Chemawa	Eligible	FS-34554 (Table 3)	1954	Salem	South	OR
Chief Joseph	Eligible	1956 Scheme (Table 3)	1958	Wenatchee	North	WA
Clarkston	Eligible	1956 Scheme (Table 3)	1958	Spokane	East	WA
Columbia	Eligible	1950 Scheme (Table 2)	1945	Wenatchee	North	WA
Conkelley	Eligible	1956 Scheme (Table 3)	1958	Kalispell	East	MT
Covington	Eligible	1950 Scheme (Table 2)	1942	Covington	North	WA
Detroit	Eligible	1950 Scheme (Table 2)	1952	Salem	South	OR
Driscoll	Eligible	Scheme A (Table 4)	1966	Longview	South	OR
Dworshak	Eligible	Scheme A (Table 4)	1973	Spokane	East	ID

(1) NAME	(2) ELIGIBILITY	(3) RECOMMENDED PAINT SCHEME	(4) YR BUILT	(5) DISTRICT	(6) REGION	(7) STATE
Eugene	Eligible	1950 Scheme (Table 2)	1941	Eugene	South	OR
Fairview	Eligible	1956 Scheme (Table 3)	1958	Eugene	South	OR
Gardiner	Eligible	1956 Scheme (Table 3)	1963	Eugene	South	OR
Goldendale	Eligible	1956 Scheme (Table 3)	1957	The Dalles	South	WA
Grandview	Eligible	1950 Scheme (Table 2)	1947	Tri-Cities	East	WA
Hanford	Eligible	Scheme A (Table 4)	1967	Tri-Cities	East	WA
Hot Springs	Eligible	1950 Scheme (Table 2)	1953	Kalispell	East	MT
Intalco	Eligible	Scheme A (Table 4)	1966	Snohomish	North	WA
Ione	Eligible	1950 Scheme (Table 2)	1949	Tri-Cities	East	OR
John Day	Eligible	Scheme A (Table 4)	1968	The Dalles	South	OR
Keeler	Eligible	1956 Scheme (Table 3)	1956	Salem	South	OR
Kerr	Eligible	1950 Scheme (Table 2)	1948	Kalispell	East	MT
La Grande	Eligible	1950 Scheme (Table 2)	1952	Tri-Cities	East	OR
Lane	Eligible	Scheme A (Table 4)	1966	Eugene	South	OR
Langlois	Eligible	1956 Scheme (Table 3)	1957	Eugene	South	OR
Little Goose	Eligible	Scheme A (Table 4)	1970	Spokane	East	WA
Lookout Point	Eligible	1950 Scheme (Table 2)	1954	Eugene	South	OR
Marion	Eligible	Scheme A (Table 4)	1970	Salem	South	OR
Maupin	Eligible	Scheme A (Table 4)	1974	The Dalles	South	OR
McNary	Eligible	1950 Scheme (Table 2)	1954	Tri-Cities	East	OR
Midway	Eligible	1950 Scheme (Table 2)	1941	Tri-Cities	East	WA
Monmouth	Eligible	1950 Scheme (Table 2)	1954	Salem	South	OR
Moxee	Eligible	1950 Scheme (Table 2)	1954	Tri-Cities	East	WA
Murray	Eligible	Scheme A (Table 4)	1972	Snohomish	North	WA
North Bonneville	Eligible	1950 Scheme (Table 2)	1941	Longview	South	WA
Oregon City	Eligible	1950 Scheme (Table 2)	1941	Salem	South	OR
Ostrander	Eligible	Scheme A (Table 4)	1970	Longview	South	OR
Paul	Eligible	Scheme A (Table 4)	1971	Olympia	North	WA
Port Angeles	Eligible	1950 Scheme (Table 2)	1950	Olympia	North	WA
Potholes	Control House only	1956 Scheme (Table 3)	1958	Wenatchee	North	WA
Potlatch	Eligible	1956 Scheme (Table 3)	1960	Olympia	North	WA
Reedsport	Eligible	1956 Scheme (Table 3)	1957	Eugene	South	OR
Republic	Eligible	1950 Scheme (Table 2)	1953	Spokane	East	WA
Reston	Eligible	1956 Scheme (Table 3)	1960	Eugene	South	OR
Richland	Eligible	1950 Scheme (Table 2)	1949	Tri-Cities	East	WA
Ross	Eligible	1950 Scheme (Table 2)	1940	Longview	South	WA
Roundup	Eligible	1950 Scheme (Table 2)	1954	Tri-Cities	East	OR
Sacheen	Eligible	Scheme A (Table 4)	1973	Spokane	East	WA
Salem	Eligible	1950 Scheme (Table 2)	1942	Salem	South	OR

(1) NAME	(2) ELIGIBILITY	(3) RECOMMENDED PAINT SCHEME	(4) YR BUILT	(5) DISTRICT	(6) REGION	(7) STATE
Sandpoint	Eligible	1950 Scheme (Table 2)	1950	Spokane	East	ID
Santiam	Eligible	1950 Scheme (Table 2)	1954	Salem	South	OR
Scooteney	Eligible	1950 Scheme (Table 2)	1953	Tri-Cities	East	WA
Sickler	Eligible	Scheme A (Table 4)	1968	Wenatchee	North	WA
St. Johns	Eligible	1950 Scheme (Table 2)	1941	Longview	South	OR
Tacoma	Eligible	1950 Scheme (Table 2)	1942	Covington	North	WA
Tahkenitch	Eligible	1956 Scheme (Table 3)	1963	Eugene	South	OR
Timber	Eligible	1956 Scheme (Table 3)	1955	Salem	South	OR
Toledo	Eligible	1956 Scheme (Table 3)	1958	Eugene	South	OR
Troutdale	Control House only	1950 Scheme (Table 2)	1942	Longview	South	OR
Troy	Eligible	1950 Scheme (Table 2)	1953	Kalispell	East	MT
Unity	Eligible	Scheme A (Table 4)	1967	Idaho Falls	East	ID
Valhalla	Eligible	1950 Scheme (Table 2)	1953	Wenatchee	North	WA
Vantage	Eligible	1956 Scheme (Table 3)	1963	Wenatchee	North	WA
Wagner Lake	Eligible	Scheme A (Table 5)	1974	Spokane	East	WA
Walla Walla	Eligible	1950 Scheme (Table 2)	1941	Tri-Cities	East	WA
Walton	Eligible	1950 Scheme (Table 2)	1949	Eugene	South	OR
Wendson	Eligible	Scheme A (Table 4)	1973	Eugene	South	OR
Wren	Eligible	1950 Scheme (Table 2)	1947	Eugene	South	OR

Table 2. 1950 Scheme (Historic Paints c. 1950-1955)

(1) Use	(2) Name	(3) Color	(4) Federal Standard	(5) Type
1950: **Exterior walls**; (discontinued by 1956) BPA notes Sno-King Body Color	Engineers Light Gray		FS-26555	Semi-gloss
1950: **Exterior trim** (discontinued by 1956)	Maritime Engine Gray		FS-26306	Semi-gloss
1950: **Control House walls**	No Name - Lusterless Green Series		FS-34672	Lusterless

(1) Use	**(2) Name**	**(3) Color**	**(4) Federal Standard**	**(5) Type**
1950: **"Base & View Control House"** – Notes from BPA	Light Gray Green (Lusterless Green Series)		FS-34424	Lusterless
1950: **Interior trim**	No Name		FS-24491	Semi-gloss
1950: **Ceilings**	No Name		FS-37778	Lusterless
1950: **Stationary equipment and benches**	No Name		FS-24172	Semi-gloss
1950: **First aid cabinets and stations**	No Name - Gloss Green Series		FS-14187	Gloss
1950: **Steam gauge boards and oil house piping**	No Name - Gloss Green Series		FS-14260	Gloss
1950: **Oxygen cylinders**	Ashburn Green		1465 (Old Fed No.)	

(1) Use	(2) Name	(3) Color	(4) Federal Standard	(5) Type
1950: **Roof drain lines & vent lines (sewage lines)**	No Name - Gloss Green Series		1430 (Old Fed. No.)	
1950: **Steam lines**	No Name - Gloss Gray Series		FS-16376	Gloss
1950: **Steam return lines**	No Name - Gloss Gray Series		FS-16187	Gloss
1950: **Air lines**	Gloss-Miscellaneous Series		FS-10371	Gloss
1950: **Water lines and propane tanks**	Aluminum/Silver		FS-17178	Gloss
1950: **"Fire lines, etc."**	Bright Red/Insignia Red		FS-11136	Gloss
1950: **Electric panels, signs**	No Name - Gloss Blue Series		FS-15123	Gloss

(1) Use	(2) Name	(3) Color	(4) Federal Standard	(5) Type
1950: **Electrical outlets and switches**	No Name		FS-12246	Gloss
1950: **Oil house valves and hand wheels**	No Name		FS-13695	Gloss
1950: **"SWBD Panels"**	Sage Green		FS-24525	Lacquer (Spraying)
1950: Unknown use	Orange Yellow		FS-13538	Gloss
1950: Unknown use	No Name - Gloss Gray Series		FS-16307	Gloss
1950: Unknown use	No Name – Gloss Brown Series		FS-22144	Semi-gloss
1950: Unknown use	No Name – Semi-gloss Gray Series		FS-26357	Gloss

(1) Use	(2) Name	(3) Color	(4) Federal Standard	(5) Type
1950: **Chlorine cylinders** (no longer present at BPA facilities)	No Name - From Gloss Brown Series		FS-10049	Gloss

Table 3. 1956 Scheme (Historic Paints c. 1956-1965)

(1) Use	(2) Name	(3) Color	(4) Federal Standard	(5) Type
1956: **Exterior walls**	Gray		FS-36622	Lusterless
1956: **Exterior trim**	No Name		FS-16492	Gloss
1956: **Exterior walls** (Alvey); suggested by BPA	No Name		FS-36586	Lusterless
1956: **Exterior trim** (Alvey); suggested by BPA	No Name		FS-26586	Semi-gloss
1956: **Body and trim colors**. Used at Chemawa (acrylic on walls and gloss enamel on trim)	Sky		FS-34554	Lusterless

(1) Use	(2) Name	(3) Color	(4) Federal Standard	(5) Type
1956: **Substation equipment**	Bonneville Grey (American National Standards Institute (ANSI) No. 60)		FS-16314	Gloss
1956: **Ceilings**	No Name		FS-37778	Lusterless
1956: **Ceilings**	Insignia White		FS-27875	Semi-gloss
1956: **Interior walls, desk-tops, bookshelves**	No Name - Lusterless Green Series		FS-24672	Semi-gloss
1956: **Interior trim**	No Name		FS-14491	Gloss
1956: **Floors**	No Name - Gloss Gray Series		FS-16187	Gloss
Pre-1966: **Meter panels**	Cordoba Gray			

(1) Use	(2) Name	(3) Color	(4) Federal Standard	(5) Type
1956: **Signs**	Dark Blue		FS-15102	Gloss
1956: **Signs**	No Name		FS-11105	Gloss
1956: **Compressed air tanks, signs**	Aviation White/Insignia White		FS-17875	Gloss
1956: **CO2 tanks**	Black		FS-17038	Gloss
1956: **GSA furniture**	No Name		FS-26134	Semi-gloss
1956: No use identified (BPA noted "new color")	No Name		FS-23617	Semi-gloss
1956: No use identified	No Name		FS-26132	Semi-gloss

Table 4. Scheme A (Accentuating Colors, established 1966, and other identified colors, 1966-1974)

(1) Use	(2) Name	(3) Color	(4) Federal Standard	(5) Type
Dead-end and microwave towers (if grouped with yard)**; select building exteriors (Sickler, Conkelley)**	Blue (BPA-1)		FS-15107	Silicone Alkyd Gloss Enamel
Disconnect switch racks, angle iron bus supports, yard lighting pedestals, PT and CT racks (Silicone Alkyd Gloss Enamel)**; Concrete #2 (switch support); Masonry supports & racks** (Acrylic Emulsion)	Light Olive Gray (BPA-2)		FS-16350	Silicone Alkyd Gloss Enamel; Acrylic Emulsion
Bus Pedestals	Light Yellow Brown (BPA-3)		FS-10260	Silicone Alkyd Gloss Enamel
PCB cabinets and air tanks (when mounted under control cabinet)**. Oil storage tanks**	Light Olive (BPA-4)		FS-14255	Silicone Alkyd Gloss Enamel
PCB metal-clad enclosures, frame and/or skid base, main tank, oil drain valves, linkage housing, selected corona shields, bushing flanges and hatch plates	Strong Brown (BPA-5)		FS-10115	Silicone Alkyd Gloss Enamel
Transformer body, radiator and cab.	Brownish Orange (BPA-6)		FS-12160	Silicone Alkyd Gloss Enamel

Building exteriors, capacitors, racks, and capacitor houses, condenser housing (Silicone Alkyd Gloss Enamel)**; Masonry racks and surfaces** (Acrylic Emulsion)	Yellowish Gray (BPA-7)		FS-16360	Silicone Alkyd Gloss Enamel; Acrylic Emulsion
Bushing caps for power circuit breakers and transformers	Bright Red/Insignia Red (BPA-8)		FS-11136	Silicone Alkyd Gloss Enamel
Oil storage tanks (Replaced by No. 4 Light Olive by 1981)	Light Olive Green (BPA-9)			
Fabric fence (Silicone Alkyd Gloss Enamel)**; Control, relay and meter panels** (Lacquer (Spraying)	Light Gray Olive (BPA-10)		FS-16160	Silicone Alkyd Gloss Enamel
Building Interiors; preferred color for desert setting	Light Gray (BPA-11)			
Building Interiors (Interior Enamel Gloss and Semi-gloss)**; Control, relay, and meter panels** (Lacquer Spraying)	Sage Green (BPA-12)		FS-24525	Lacquer (Spraying); Interior Enamel Gloss and Semi-gloss
Building interiors (Replaced BPA-11 by 1981)	Off White (BPA-14)		FS-27780	Semi-gloss

c. 1969: **Marking Airway Towers**	Aviation Orange (International Orange)		FS-12197	Gloss

Table 5. Scheme B (Earth Tone Colors to Harmonize with Natural Settings, established 1975)

(1) Use	**(2) Name**	**(3) Color**	**(4) Federal Standard**	**(5) Type**
Dead-end and microwave towers (if grouped with yard); **Disconnect switch racks, angle iron bus supports, yard lighting pedestals, PT and CT racks**	Spruce Green		FS-14159	Silicone Alkyd Gloss Enamel & Stainless-Steel Acrylic Emulsion
Bus Pedestals, PCB Cabinets and Air Tanks when mounted under cabinet, oil storage tanks (Silicone Alkyd Gloss Enamel); **Masonry support racks** (Acrylic Emulsion); Preferred color for mountain setting	Medium Olive (BPA-15)		FS-14201	Silicone Alkyd Gloss Enamel
PCB metal-clad enclosures, frame and/or skid base, main tank, oil drain valves and linkage housing, selected corona shields, bushing flanges and hatch plates	Olive Gray		FS-16165	Silicone Alkyd Gloss Enamel
Transformer body, radiator and cabinet	Olive Drab		FS-14064	Silicone Alkyd Gloss Enamel

(1) Use	(2) Name	(3) Color	(4) Federal Standard	(5) Type
Building exteriors, capacitors, racks, and capacitor houses, condenser housing (Silicone Alkyd Gloss Enamel); **Masonry racks and surfaces** (Acrylic Emulsion)	Yellowish Gray (BPA-7)		FS-16360	Silicone Alkyd Gloss Enamel
Power circuit breaker and transformer bushing caps	Bright Red/Insignia Red (BPA-8)		FS-11136	Silicone Alkyd Gloss Enamel
Fabric fence (Silicone Alkyd Gloss Enamel) **Control, relay and meter panels** (Lacquer (Spraying)	Light Gray Olive (BPA-10)		FS-16160	Silicone Alkyd Gloss Enamel; Lacquer Spraying
Building interiors (Interior Enamel Gloss and Semi-gloss); **Control, relay, and meter panels** (Lacquer Spraying)	Sage Green (BPA-12)		FS-24525	Lacquer (Spraying) Semi-gloss
Building interiors (Replaced BPA-11 by 1981)	Off White (BPA-14)		FS-27780	Interior Enamel: semi-gloss and gloss

Table 6. Scheme C (Streamlined Color Option In lieu of Scheme A or B, established 1981)

(1) Use	(2) Name	(3) Color	(4) Federal Standard	(5) Type
Industrial areas or extremely high contamination environment	Stainless Steel (C-1)		FS-26132	Stainless Steel Acrylic Emulsion Semi-gloss
Desert/Plains/ Agricultural environment	Yellowish Gray (C-2; BPA-7)		FS-16360	Silicone Alkyd Gloss Enamel; Acrylic Emulsion
Forest/Mountain Environment	Medium Olive (C-3; BPA-15)		FS-14201	Silicone Alkyd Gloss Enamel; Acrylic Emulsion
Industrial setting with no special requirements	Light Gray (C-4; BPA-16; ANSI No. 70)			Silicone Alkyd Gloss Enamel
Power circuit breaker and transformer bushing caps	Bright Red/Insignia Red		FS-11136	Gloss
Building Interiors (preferred color for desert setting and suggested as one of two streamlined color options)	Light Gray (BPA-11)			
Control, relay, and meter panels (Lacquer Spraying) **Building interiors** (Interior Enamel Gloss and Semi-gloss)	Sage Green		FS-14525; FS-24525	Gloss, Semi-gloss

(1) Use	(2) Name	(3) Color	(4) Federal Standard	(5) Type
Building interiors (Replaced BPA-11 by 1981)	Off White (BPA-14)		FS-27780	Semi-gloss

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APPENDIX D: CULTURAL RESOURCE DISCOVERY REPORT

BONNEVILLE POWER ADMINISTRATION
CULTURAL RESOURCES DISCOVERY REPORT
CONFIDENTIAL

Name of BPA Archaeologist contacted:____ *Date:*_________________

Name of person filling out this form:____ *Date:*_________________
*Phone Number:*______________________________ *Email Address:*____________________________________
Project Name: ___________________________ *Project Description:*____________________________________

Who discovered the materials*?*
Name: ____________________________________ *Phone # (req.):* ____________________________________
Direct Supervisor: ____________________________ *Phone # (req.):* ____________________________________
Project Manager: ____________________________ *Phone # (req.):* ____________________________________

Property Owner of Discovery Site*:*
Federal Agency: ____________________________
State of: ____________________________________ *State Agency:* ____________________________________
City: ______________________________________
County: ____________________________________
Private Landowner: __________________________ *Phone #:* ______________________________________
Address: ____
Street City State Zip
BPA Region: ____ *District:* ______________________
If on a BPA ROW, Name Transmission Line: __________________________ *Closest Tower #:* _______________

Nearest Major Cross Roads/Intersection*:* ____

State of*:* _________ ***County of****:* ________________ ***Nearest Town****:* ______________________________

Location*:*
Township: _________ *Range:* ________ *Section:* _________ *¼ Section:* NW NE SW SE

Describe access to site*:* ____
___
___

Describe the event(s) that resulted in the discovery*:* ____
___
___

Describe what, to the best of your knowledge, was discovered:____
___
___

Have you removed potential cultural resources during or after discovery*?* Yes No

If so, describe the item(s) and indicate how they were removed or disturbed, and where they are now:
___
___
___

Initials of CR Staff and Date Received: ________________________ *(Updated March 2015)*

STATEMENT OF CONFIDENTIALITY

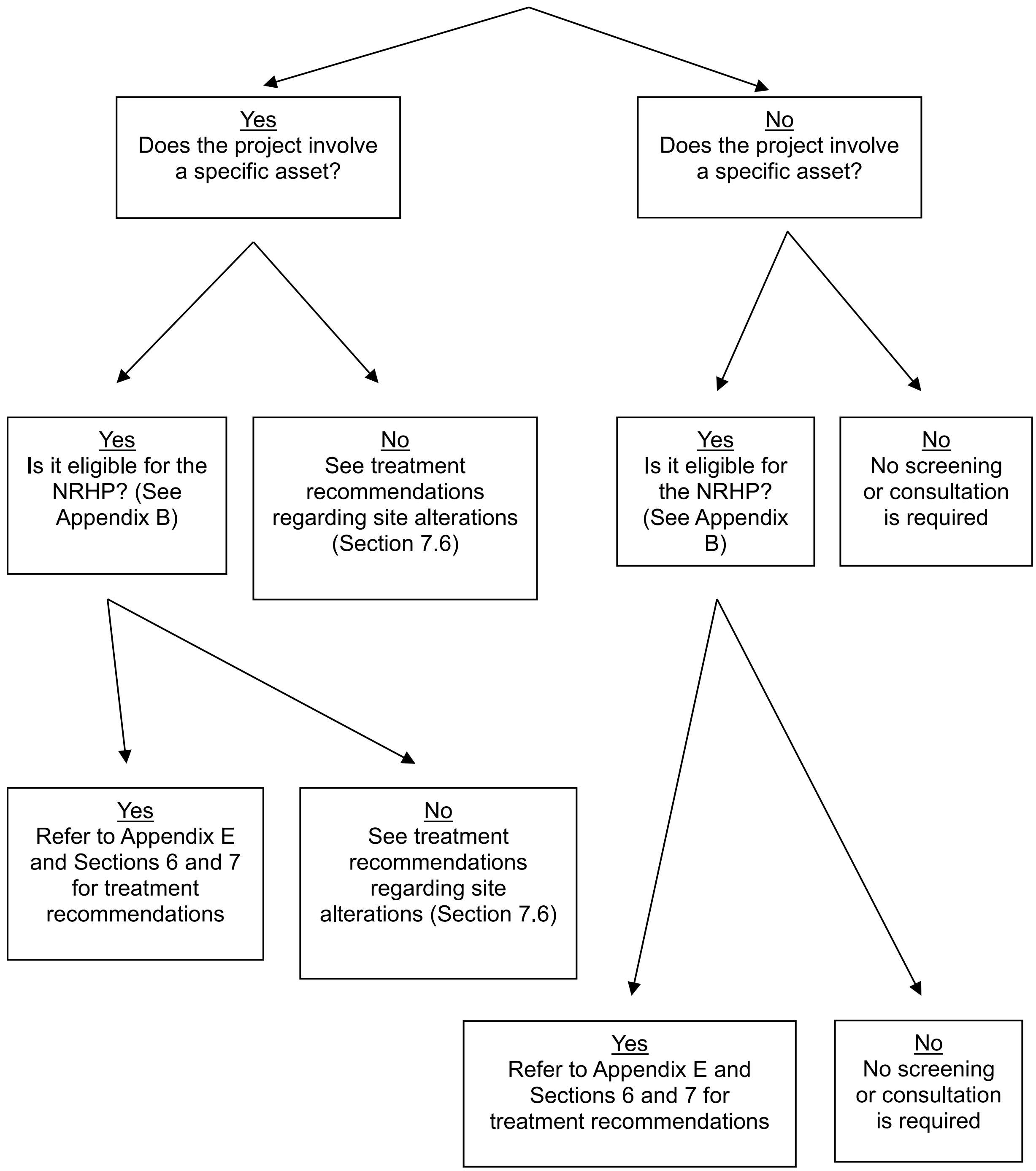
When dealing with or working around culturally sensitive sites, be aware that their significance and importance is unparalleled in Western society and that they hold great spiritual meaning for Native Americans. Also, federal law protects cultural resources whether it is Native American cultural objects, historic era artifacts or human skeletal remains. Therefore it is imperative that the location of any sites be privileged information and closely held. Do not share information with anyone who might pass on knowledge of this site to thieves/collectors. These measures are not only for the sanctity of the site and Native Americans, but for BPA's and your own legal liability as well.

Please send completed form to one of BPA's Archaeologists at:
Bonneville Power Administration, KEC-4 Cultural Resources, 905 NE 11th Ave. Portland, OR 97232
FAX (503) 230-5699

APPENDIX E: FACILITY IMPROVEMENT PROJECTS FLOW CHART

Facility Improvement Projects Flow Chart

Is the substation eligible for the NRHP? (See Appendix A)



Manual for Built Resources Microwave Radio Sites Addendum

Bonneville Power Administration

February 2020

Prepared for
Bonneville Power Administration
Portland, Oregon

Contract No. 75476

Prepared by AECOM
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Portland, OR 97211

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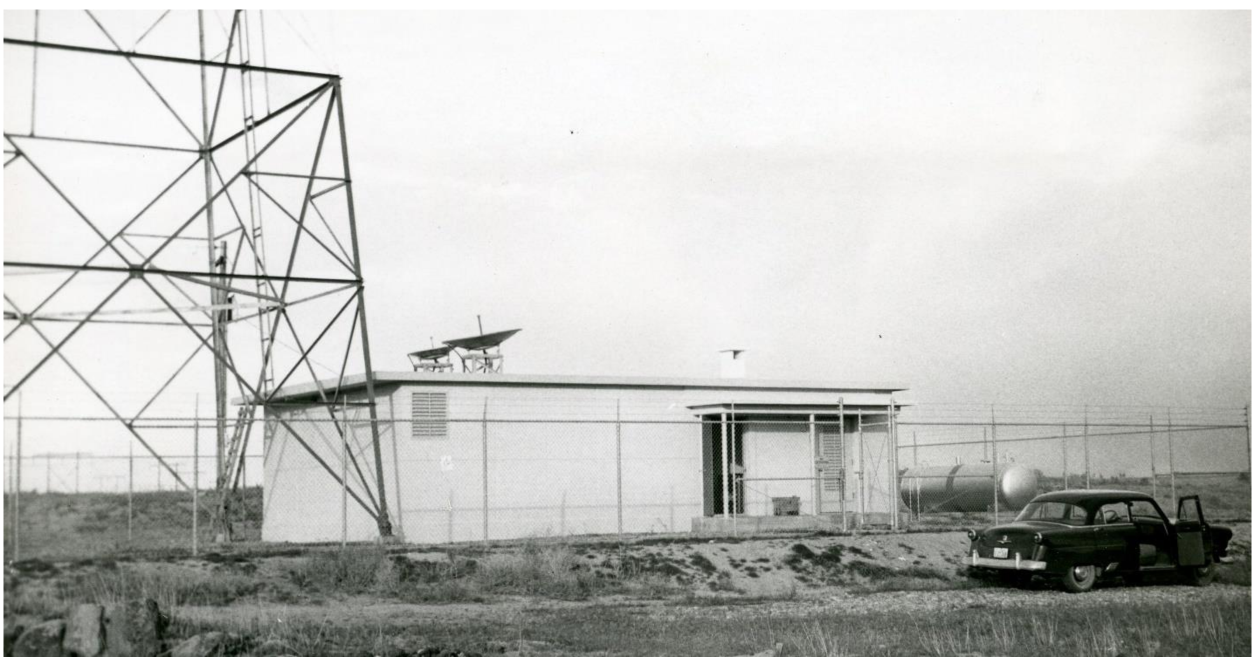

Above Image: Foster Creek Microwave Radio Station, 1954 (NARA:FosterCreekMWNARAbox30-003)

Cover Image: Rockdale Microwave Radio Station, 1954 (NARA:Rockdale2NARAbox21of52-008)

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1. Introduction

This Manual for Built Resources (MBR) addendum provides specific guidance for historic built resources associated with BPA's microwave communication network. BPA's current microwave communication network consists of 117 microwave radio stations (VFA 2019). Of these, 53 were built between 1950 and 1974 and 28 are eligible for inclusion in the in the National Register of Historic Places (NRHP).

The guidance focuses primarily on microwave sites that have been determined eligible for the NRHP but also includes historic passive repeaters, which, although unevaluated, BPA treats as eligible. The MBR guidance does not apply to microwave radio stations that are not eligible for the NRHP. A complete list of BPA's eligible microwave sites is in Section 2 (Table 1).

BPA's consideration of historic properties is primarily driven by compliance with two federal regulatory processes: National Environmental Protection Act (NEPA) (40 C.F.R. Part 1508) as implemented by BPA through the Department of Energy's procedures for NEPA compliance in 10 C.F.R. 1021 and Section 106 of the National Historic Preservation Act (NHPA) (36 C.F.R. Part 800). The MBR, including this addendum, provides treatment guidance to help BPA navigate these regulatory processes.

1.1 How to Use the MBR Addendum

To use this MBR Addendum for project activities at historic microwave radio stations:

1. Determine if the microwave radio station is eligible for the NRHP (Section 2, Table 1). Passive repeater sites are unevaluated but currently treated as eligible.
2. Review the treatment guidelines relevant to your project. All projects fall into one of these tiered categories:

   Activities Exempt from Review

   Activities Requiring BPA Review, and

   Activities Requiring SHPO Consultation
3. Consult with a BPA cultural resources specialist when necessary or when uncertainty exists about the treatment approach.

   BPA Cultural Resources Staff Contacts:

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   tktochihara@bpa.gov

   Sunshine Schmidt
   BPA Federal Preservation Officer
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   (503) 230-5075

1.2 Reference Documents

Three key documents support this MBR Addendum:

- **BPA Pacific Northwest Transmission System Multiple Property Documentation Form (MPDF)** (Kramer 2012). The MPDF provides the framework for evaluating BPA's historic properties for inclusion in the NRHP. It establishes the historic context and period of significance for the BPA Pacific Northwest Transmission System (1938-1974).

- **BPA Microwave Radio Stations Historic Resources Technical Report** (AECOM 2019a). In 2019, BPA evaluated all its microwave radio stations built during the historic period for eligibility for inclusion in the NRHP. The historic resources technical report provides a thorough overview of BPA's microwave communication history, the variety of antenna tower and station building types/designs, and site forms that justify BPA's determinations of eligibility. The report references the MPDF but provides an enhanced evaluation framework with integrity considerations specific to BPA's microwave radio stations.
- **BPA Manual for Built Resources** (AECOM 2019b). The overarching MBR document provides an overview of Bonneville Power Administration's (BPA's) inventory of historic resources (those built before 1975), summarizes BPA's significant historic properties, and provides a guide for how to manage and maintain historic properties under BPA's jurisdiction. The MBR focuses mainly on historic substations but provides general treatment guidance that is applicable to all historic resources. BPA intends for the MBR to correspond with a Programmatic Agreement to be developed and signed by BPA and the Oregon, Washington, Idaho, and Montana State Historic Preservation Offices that documents historic review procedures for frequently occurring activities at BPA's historic properties.

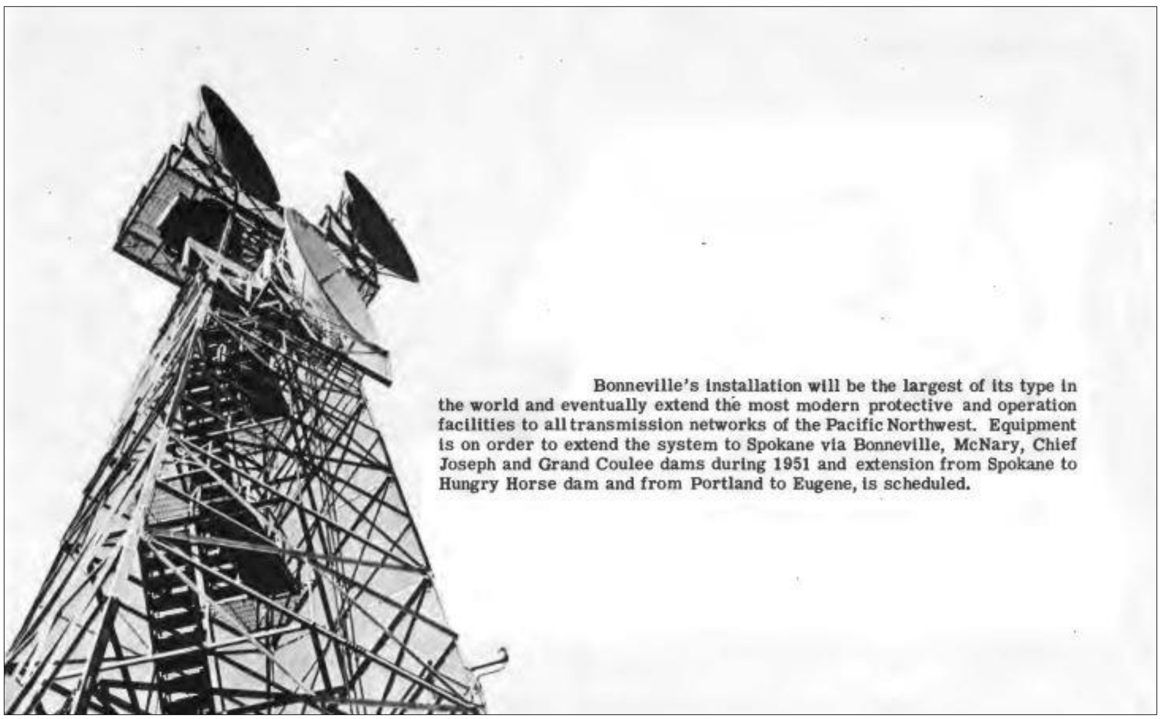

Figure 1. BPA's 1950 Annual Report stated that the new microwave communication system "will be the largest of its type in the world and eventually extend the most modern protective and operation facilities to all transmission networks of the Pacific Northwest" (BPA 1950a:44).

2. Historic Significance and Eligibility

Beginning in the 1950s, BPA pioneered the Pacific Northwest's first large-scale microwave radio communication system, which greatly enhanced the power grid's capacity, reliability, and cost-effectiveness; and facilitated operations for the region's interconnected power pool. BPA's microwave radio network operated in parallel to the transmission grid, enabling system communication and remote operational control (Kramer 2012:F-67, Figures 1 and 2). As BPA expanded its communication system during the 1950s and 1960s, "[T]he result was what amounted to a secondary region-wide network that worked in parallel with the transmission system throughout BPA's service area" (Kramer 2012:E-22). The Pacific Northwest – Southwest Intertie, the nation's largest single transmission project, incorporated the construction of 22 new radio stations to provide coverage for the area. By 1974, the entire microwave radio station was connected to BPA's central Dittmer Control Center.

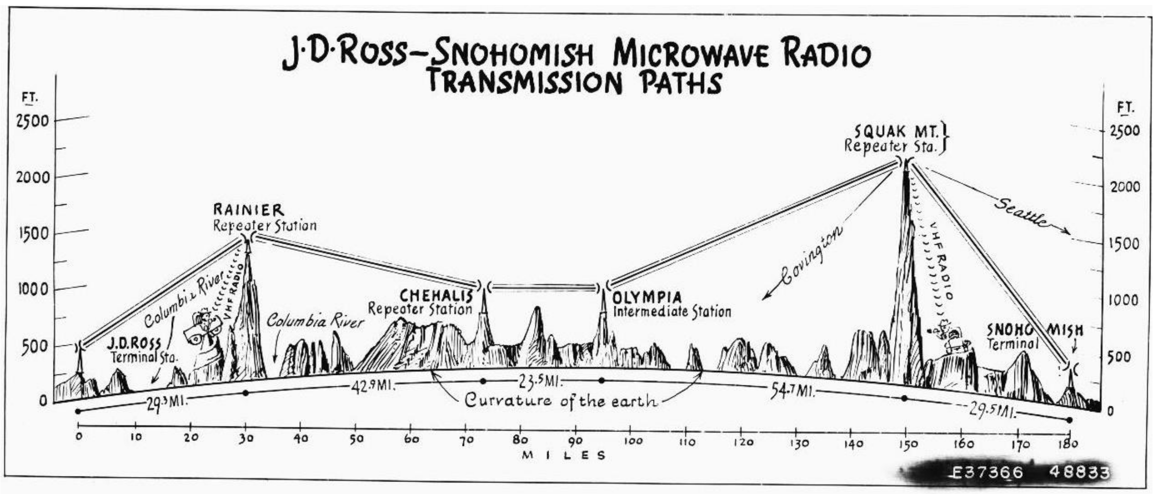

Figure 2. Ross-Snohomish Microwave Radio Transmission Paths

To support community planning and development, BPA's microwave-based network substantially enhanced the power grid's capacity, reliability, and cost-effectiveness, which supported regional community development and industrial expansion. Microwave communication service correlated with BPA's system expansion, including significant extensions to remote areas in Southwest Oregon, and east to Idaho and Montana.

BPA's microwave-based communication system operated in conjunction with the power transmission system, to provide advanced system communication and remote operational control (Kramer 2012:F-67). BPA's radio stations are "key operational elements within the BPA Transmission System" that are "integral to the centralized operation of the BPA Transmission System" (Kramer 2012:F-67). Microwave radio stations are significant for their association with the design, construction, and operation of the BPA transmission system in the Northwest between 1938 and 1974 (Kramer 2012:F-68). Significant historic themes for BPA's microwave radio stations include:

- Initial establishment using Philco and Federal Telecommunications Laboratories equipment in early 1950s.
- Enhanced integration with the Northwest Power Pool members.
- Environmental adaptations to function in harsh and isolated conditions.
- Southwest Oregon system installed in 1953.
- System upgrades using Lenkurt equipment in 1963.
- Pacific Northwest – Southwest Intertie connection in 1968.
- Service extensions to Idaho and Montana regions 1968-1971.
- Applications of BPA's "Beautility" principles in late 1960s and early 1970s.
- System monitoring and support to computer-based Dittmer control center (1974).

To be eligible for the NRHP, sites must convey historic significance and integrity. Integrity is the authenticity of a property's historic identity, evidenced by the survival of physical elements that existed during the property's prehistoric or historic period that are defining of the property's character and convey its significance (NPS 1997). Seven aspects of integrity are considered for historic resources: location, design, setting, materials, workmanship, feeling, and association.

2.1 Microwave Radio Stations (1950-1973)

Each microwave radio station functions as a "repeater," which is a combined receiver/ transmitter facility enabling two-way microwave signals to cover longer distances thus enhancing system operability. Microwaves are a specific type of radio wave that are short, travel in a straight line at the speed of light, and do not follow the curvature of the earth. For these reasons, BPA's radio stations are generally located on high ground, situated atop mountains and buttes, thereby creating microwave links between end locations and with mobile field crews that are beyond "line of sight" propagation range.

BPA's microwave radio stations contain three fundamental elements: 1) line of sight to other communication sites, 2) station buildings, and 3) antenna towers. The antennas relay transmissions between radio facilities at control centers and substations, and with mobile field units. Station buildings house microwave equipment, power-generating units, and other station equipment.

Antenna towers range from steel lattice-work structures visually similar to "derricks" in form (i.e., tapering upward from a wide base to a narrow top), as well as monopole towers. Stations also have outdoor electrical and switching equipment, creating a complex, multi-component character (Figures 3 and 4).

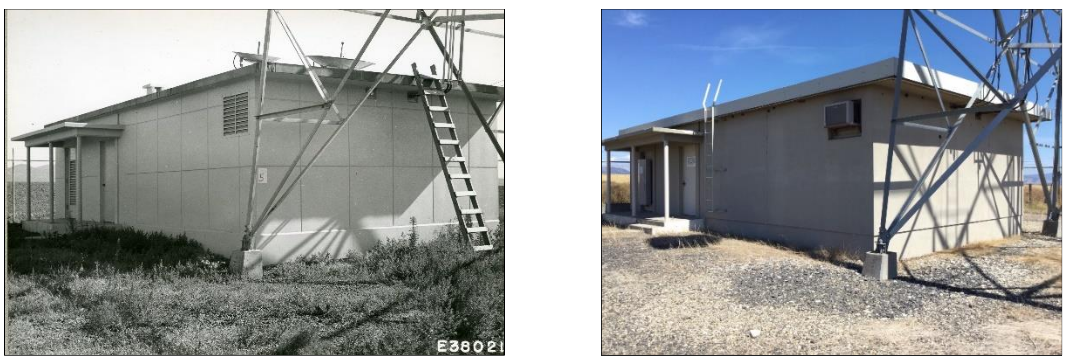

Figure 3. Plum Microwave Radio Station in 1954 (left, NARA: PlumNARAbox20of52-001) and c. 2019 (right).

Figure 4. Type 1504 Leneve Microwave Radio Station Building, 1963 (NARA:LeneveNARAbox15of52-002)

The NRHP eligibility of BPA's microwave radio stations constructed during the period of significance are listed below in Table 1.

Table 1. Microwave Radio Stations built 1950-1974 with NRHP Eligibility Determination

Microwave Radio Station/ Z-No.	Year Built	Building Type	Tower Type	BPA District	State	NRHP Eligibility
Applegate Butte Z-440	1968	Armadillo	3-Leg Lattice Steel	Redmond	OR	Not Eligible
Augspurger Mountain Z-862	1953	Type 1612	4-Leg Lattice Steel	Longview	WA	Eligible
Beverly Z-1393	1953	Type 1606	4-Leg Lattice Steel	Wenatchee	WA	Eligible
Biddle Butte Z-864	1953	Type 1608	4-Leg Lattice Steel	Longview	WA	Not Eligible
Blacktail Peak Z-1401	1968	Modern (shared building)	4-Leg Lattice Steel	Kalispell	MT	Eligible
Bradford Island Z-874	1953	Type 1604	Mounted to Transmission Tower	Longview	OR	Not Eligible
Buck Butte Z-459	1968	Armadillo	3-Leg Lattice Steel	Redmond	OR	Not Eligible
Chehalis Z-865	1950	Type 1600	4-Leg Lattice Steel	Olympia	WA	Eligible
Coburg Z-942	1954	Type 1610	3-Leg Lattice Steel	Eugene	OR	Not Eligible
Davenport Z-867	1955	Type 1606	4-Leg Lattice Steel	Spokane	WA	Eligible
Del Rio Z-373	1953	Type 1606	4-Leg Lattice Steel	Wenatchee	WA	Not Eligible
Easton Z-859	1954	Type 1612	4-Leg Lattice Steel	Wenatchee	WA	Eligible
Foster Creek Z-7641	1953	Type 1606	4-Leg Lattice Steel	Wenatchee	WA	Eligible
Goodwin Peak Z-240	1953	Type 1503	4-Leg Lattice Steel	Eugene	OR	Eligible
Grand Coulee Z-869	1953	Type 1607	No Tower (Roof Mounted)	Wenatchee	WA	Eligible
Grizzly Mountain Z-433	1968	Armadillo	3-Leg Lattice Steel	Redmond	OR	Not Eligible
Hall Ridge Z-523	1973	Type 1136	3-Leg Lattice Steel	Salem	OR	Eligible
Hampton Butte Z-278	1968	Type 1503	3-Leg Lattice Steel	Redmond	OR	Not Eligible
Hungry Horse Z-489	1971	Armadillo	4-Leg Lattice Steel	Kalispell	MT	Not Eligible
Indian Mountain Z-435	1968	Armadillo	3- and 4-Leg Lattice Steel	Redmond	OR	Not Eligible
Kahlotus Z-457	1968	Armadillo	4-Leg Lattice Steel	Tri-Cities	WA	Not Eligible

Microwave Radio Station/ Z-No.	Year Built	Building Type	Tower Type	BPA District	State	NRHP Eligibility
Kennewick Z-870	1955	Type 1607	4-Leg Lattice Steel	Tri-Cities	WA	Not Eligible
Kenyon Mountain Z-762	1961	Type 1530	4-Leg Lattice Steel	Eugene	OR	Not Eligible
Leneve Z-212	1953	Type 1504	Guyed Lattice Steel	Eugene	OR	Not Eligible
Lookout Mounain Z-414	1966	Utilitarian	4-Leg Lattice Steel	Snohomish	WA	Not Eligible
Malaga Z-841	1955	Type 1607	4-Leg Lattice Steel	Wenatchee	WA	Eligible
Marys Peak Z-764	1961	Type 1530	Wood Monopole	Eugene	OR	Eligible
Metaline Z-458	1968	Armadillo	4-Leg Lattice Steel	Spokane	WA	Not Eligible
Mt. Hebo Z-317	1958	Type 1504	3-Leg Lattice Steel	Salem	OR	Not Eligible
Mt. Spokane Z-873	1953	Type 1612	4-Leg Lattice Steel	Spokane	WA	Not Eligible
North Bend Z-857	1954	Type 1612	4-Leg Lattice Steel	Covington	WA	Eligible
Noti Z-241	1954	Type 1503	4-Leg Lattice Steel	Eugene	OR	Eligible
Olympia Z-74	1951	Utilitarian	4-Leg Lattice Steel	Olympia	WA	Not Eligible
Pine Mountain Z-434	1968	Armadillo	3-Leg Lattice Steel	Redmond	OR	Not Eligible
Plum Z-876	1953	Type 1606	4-Leg Lattice Steel	Spokane	WA	Eligible
Prospect Hill Z-937	1953	Type 1610	3-Leg Lattice Steel	Salem	OR	Not Eligible
Rainier Z-887	1950	Type 1600	4-Leg Lattice Steel	Longview	WA	Eligible
Rockdale Z-858	1955	Type 1612	4-Leg Lattice Steel	Covington	WA	Eligible
Roosevelt Z-878	1953	Type 1606	4-Leg Lattice Steel	Tri-Cities	WA	Eligible
Ross Z-181	1950	Type 190	4-Leg Lattice Steel	Longview	WA	Not Eligible
Scott Mountain Z-763	1959	Type 1530	4-Leg Lattice Steel	Eugene	OR	Not Eligible
Shaniko Z-432	1968	Armadillo	3-Leg Lattice Steel	The Dalles	OR	Not Eligible
Squak Mountain Z-879	1950	Type 1602	4-Leg Lattice Steel	Covington	WA	Eligible
Sunnyside Z-262	1956	Type 1502	4-Leg Lattice Steel	Tri-cities	WA	Not Eligible
Swan Lake Point Z-348	1969	Armadillo	3-Leg Lattice Steel	Redmond	OR	Not Eligible
Tacoma Z-866	1956	Modern	4-Leg Lattice Steel	Covington	WA	Not Eligible

Microwave Radio Station/ Z-No.	Year Built	Building Type	Tower Type	BPA District	State	NRHP Eligibility
Teakean Butte Z-495	1971	Armadillo	4-Leg Lattice Steel	Spokane	ID	Not Eligible
Teanaway Z-860	1954	Type 1610	4-Leg Lattice Steel	Wenatchee	WA	Eligible
Troutdale Z-880	1953	Type 1605	4-Leg Lattice Steel	Longview	OR	Eligible
Wasco Z-881	1953	Type 1603	4-Leg Lattice Steel	The Dalles	OR	Eligible
Waterville Z-882	1953	Type 1606	4-Leg Lattice Steel	Wenatchee	WA	Eligible
West Portland Z-856	1954	Type 1610	4-Leg Lattice Steel	Longview	OR	Not Eligible

2.2 Station Buildings (1950-1973)

Most of BPA's building assets fall under specific design types developed as part of BPA's architecture program. In general, BPA's historic microwave radio station buildings follow a standardized architectural design or were prefabricated by a manufacturer and installed on site. Station buildings include metal, manufactured, volumes, site-built concrete block, precast panel and other "vault" structures with a variety of roof and finish types. Most station buildings are small, utilitarian volumes, with little exterior detail.

2.2.1 Early Modern Concrete-Block Buildings (1950)

The earliest microwave radio stations, built in 1950, are constructed of concrete block, and display exterior features representative of an early Modern architectural style common during the 1950s. Style elements include an emphasis on clean lines, basic low-slung forms, rectangular plans, flat roofs, and cantilevered canopies (Table 2, Figure 5).

Table 2. Eligible Microwave Radio Stations with an Early Modern Concrete-Block Building

Microwave Radio Station	Asset No.	Year Built	BPA Design	District	Region	State
Chehalis	Z-0865	1950	1600	Olympia	North	WA
Rainier	Z-887	1950	1600	Longview	South	WA
Squak Mountain	Z-879	1950	1602	Covington	North	WA

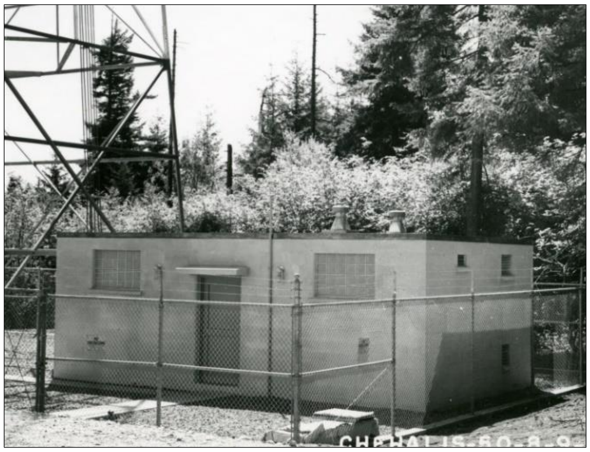

Figure 5. Type 1600 Chehalis Microwave Radio Station Building, 1950 (left, NARA:ChehalisMWNARABox17-008).Two-story Early Modern Type 1602 Building at Squak Mountain Microwave Radio Station, 1951, (right, NARA:Squak2NARAbox27of52-014).

2.2.2 Modern Concrete Buildings (1953-1956)

Modern concrete buildings are BPA's most common architecture application for historic microwave radio stations. These buildings display features that reflect the Modern architectural style, such as an emphasis on clean lines, basic forms, rectangular shapes, and flat roofs.

Constructed between 1953 and 1956, BPA's Modern concrete microwave radio buildings are similar to, but smaller than, BPA's substation control houses built during the same time period. Architectural drawings show that the buildings featured walls of concrete block and/or poured concrete covered with a smooth concrete and plaster finish scored to display an approximate 3-foot- by 3-foot-square grid pattern. The nearly flat roof is finished with built-up roofing material and includes metal flashing. Most of the buildings have two asymmetrically located doors that provide separate entrances to the control and engine generator rooms, although some variations have only one door. Concrete canopies supported by metal poles shelter the entries. The size and entrance placement sometimes vary, but the buildings otherwise share the same characteristics (Table 3, Figures 6 and 7).

Common alterations include infilling one of the doors, covering the exterior grid with a flat stucco finish, or installing new vents, air conditioning units, or other equipment on the exterior walls.

Table 3. Eligible Microwave Radio Stations with a Modern Concrete Building

Microwave Radio Station	Asset No.	Date	BPA Design	District	Region	State
Augspurger Mountain	Z-862	1953	1612	Longview	South	WA
Beverly	Z-440	1953	1606	Wenatchee	North	OR
Davenport	Z-373	1955	1606	Spokane	East	WA
Easton	Z-859	1954	1612	Wenatchee	North	WA
Foster Creek	Z-7641	1953	1606	Wenatchee	North	WA
Grand Coulee	Z-869	1953	1607	Wenatchee	North	WA
Malaga	Z-841	1955	1607	Wenatchee	North	WA
North Bend	Z-857	1954	1612	Covington	North	WA
Plum	Z-876	1953	1606	Spokane	North	WA

Rockdale	Z-858	1955	1612	Covington	North	WA
Roosevelt	Z-878	1953	1606	Tri-Cities	East	WA
Teanaway	Z-860	1954	1610	Wenatchee	North	WA
Troutdale	Z-880	1953	1605	Longview	South	OR
Wasco	Z-881	1953	1603	The Dalles	South	OR
Waterville	Z-882	1953	1606	Wenatchee	North	WA

Figure 6. Two-story Type 1612 Building at Easton Microwave Radio Station (built 1954), 1974 (BPA Library).

Figure 7. Type 1610 Teanaway Microwave Radio Station Building under construction, 1954 (NARA: TeanawayNARAbox27of52-005).

2.2.3 Utilitarian Concrete Buildings (1961, 1968)

Utilitarian design elements applicable to BPA's concrete microwave radio station buildings include an emphasis on function over design, limited applied detail, one-story form, simple entrances, and lack of fenestration (Table 4, Figure 8).

Table 4. Eligible Microwave Radio Stations with a Utilitarian Concrete Building

Microwave Radio Station	Asset No.	Year Built	BPA Design	District	Region	State
Mary's Peak	Z-764	1961	1530	Eugene	South	OR
Blacktail Peak	Z-1401	1968	No Type	Kalispell	East	MT

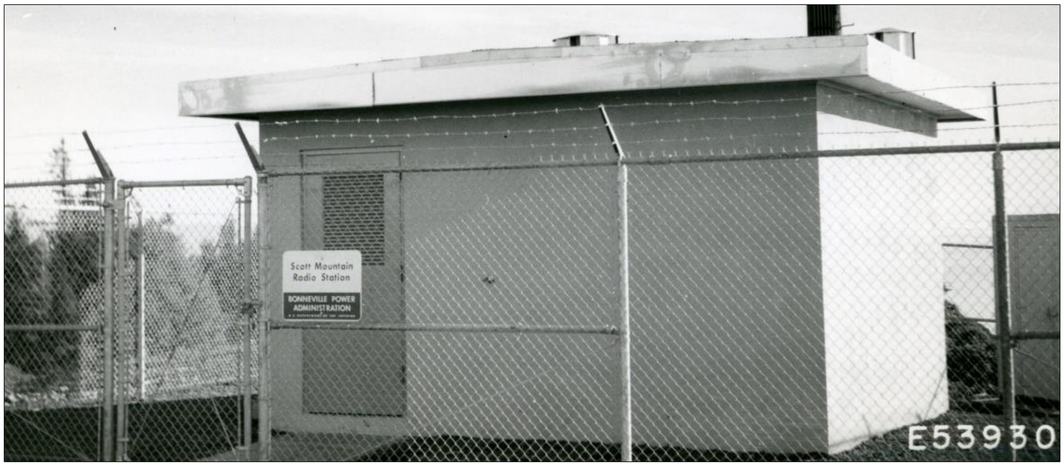

Figure 8. Type 1530 Scott Mountain Microwave Radio Station Building, 1960 (NARA:ScottMtNARAbox25of52-005).

2.2.4 Utilitarian Aluminum Buildings (1950-1973)

Utilitarian aluminum microwave radio station buildings were built throughout the historic period and continue to be constructed today. The utilitarian design emphasizes function over design, limited applied detail, one-story form, and simple entrances. These small rectangular buildings are constructed of metal panels with a nearly flat roof finished with standing-seam metal panels and metal coping.

The buildings generally have two flush-metal doors on the front elevation, providing access to separate rooms for emergency power and radio equipment. They are similar in style and construction to the smallest and most utilitarian aluminum control houses built at BPA's substations during the 1960s. The buildings lack fenestration, but the exterior may contain vents, vent hoods, exhaust pipes, wall-mounted heating, ventilation, and air conditioning units, utility boxes, or other equipment (Table 5, Figure 9).

Table 5. Eligible Microwave Radio Stations with a Utilitarian Aluminum Building

Microwave Radio Station	Asset No.	Year Built	BPA Design	District	Region	State
Goodwin Peak	Z-240	1953	1503	Eugene	South	OR
Noti	Z-241	1954	1503	Eugene	South	OR
Leneve	Z-212	1958	1504	Eugene	South	OR
Hall Ridge	Z-523	1973	1136-1	Salem	South	OR

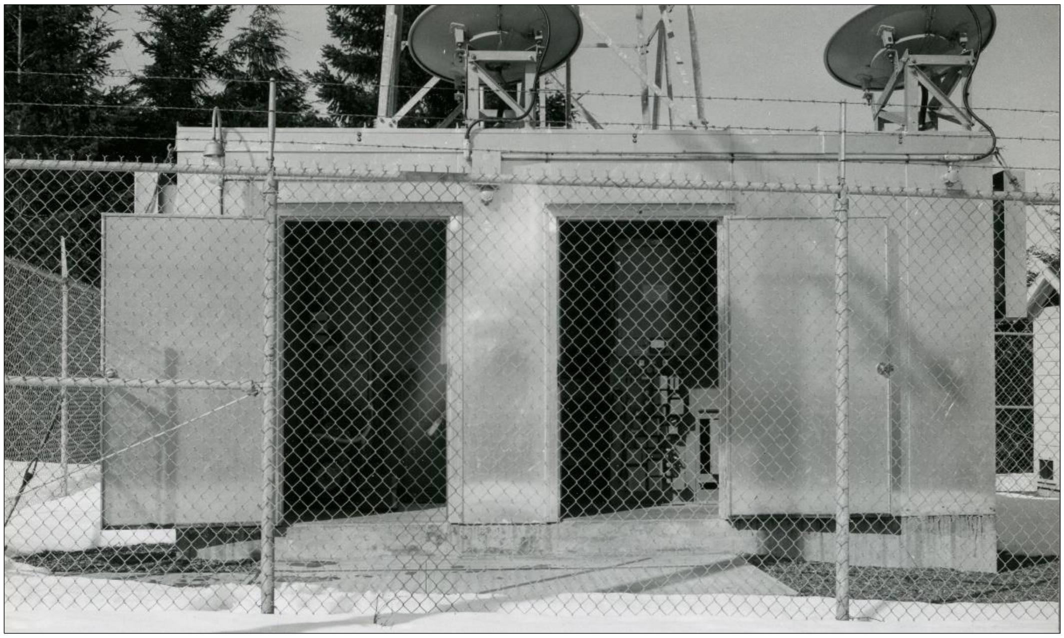

Figure 9. Type 1503 Noti Microwave Radio Station Building with Engine Generator Room on Left and Radio Room on Right, 1956 (NARA:NotiMWNARAbox19of52-008).

2.3 Antenna Towers (1950-1973)

BPA's first microwave radio link, between Ross and Snohomish, transmitted and received microwave impulses using parabolic antennas measuring 6 to 10 feet in diameter. They were configured directionally, and at elevations to provide line-of-sight transmission (BPA 1950b:4). VHF whip antennas were also used for mobile-unit communications. In exceptional cases, like the Easton microwave radio station, BPA mounted microwave antennas on a transmission line tower instead of erecting a dedicated antenna tower (Strong et al. 1957:660).

Antenna towers range from steel lattice-work structures visually similar to "derricks" in form (i.e., tapering upward from a wide base to a narrow top), as well as monopole towers. BPA initially mounted the antennas on standard prefabricated U.S. Forest Service lookout towers measuring 50 to 150 feet high. (Stevens and Stringfield 1950:12). By 1957, BPA's radio station network included 33 standard, 8 guyed, 4 specially designed, and 3 heavy-duty antenna towers (Strong et al. 1957:661). As the towers became more specialized, they were either monopole (wood or metal) construction, with heights ranging up to 80 feet, or three- and four-leg lattice steel construction, ranging up to 175 feet in height. The height of many BPA's towers was within the 25- to 30-foot range, which was often sufficient to keep the antennas above nearby obstructions (BPA 1977:V-26).

2.3.1 Steel Lattice (1950-1973)

BPA erected steel lattice towers throughout the historic period, with the largest concentration built in the late 1960s.The structures have three or four legs and may have an internal staircase or be supported by guy wires. Lattice towers are composed of triangular (three-leg) or square (four-leg) bases positioned on concrete footings. Steel poles join to form each corner of the structure and are interconnected by repetitive horizontal and diagonal steel cross braces that form the lattice framework. The structures can accommodate multiple antennas attached at varying heights and angles to optimize communications and ensure line of sight for microwave transmission (Figure 10).

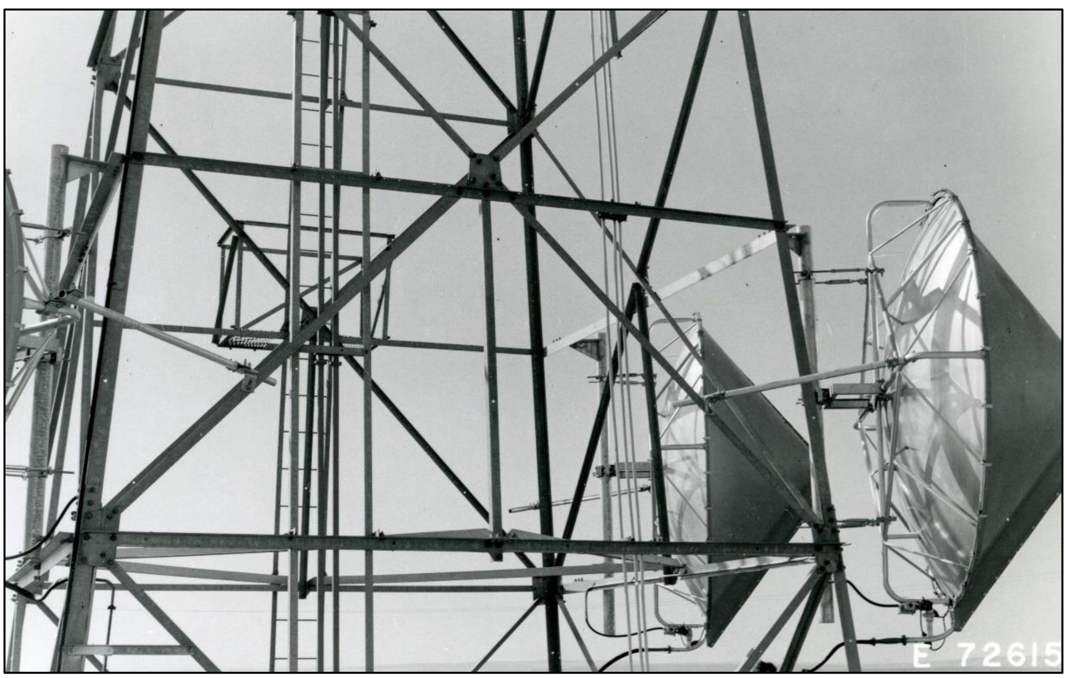

Figure 10. Steel Lattice Tower at Wasco Microwave Radio Station, 1964 (NARA:WascoMWNARAbox30of52-002).

Four-leg Steel Lattice (1950-1973)

BPA's four-leg steel lattice towers are the most prevalent antenna tower type. Four-leg steel lattice towers are steel structures with square bases positioned on four concrete footings. In general, the structures taper towards the top to provide a broader base for support. Steel access ladders are typically attached to one side of the structure (Table 6, Figure 11).

Table 6. Eligible Microwave Radio Stations with a Four-leg Steel Lattice Tower

Microwave Radio Station	Year Built	District	Region	State
Augspurger Mountain	1953	Longview	South	WA
Blacktail Peak	1968	Kalispell	East	MT
Davenport	1955	Wenatchee	East	WA
Easton	1954	Wenatchee	North	WA
Foster Creek	1953	Wenatchee	North	WA
Goodwin Peak	1953	Eugene	South	OR
Hall Ridge	1973	Salem	South	OR
Malaga	1955	Wenatchee	North	WA
North Bend	1954	Covington	North	WA
Noti	1954	Eugene	South	OR
Plum	1953	Spokane	North	WA
Rainier	1950	Longview	South	WA
Rockdale	1955	Covington	North	WA
Roosevelt	1953	Tri-Cities	East	WA
Squak Mountain	1950	Covington	North	WA
Teanaway	1954	Wenatchee	North	WA
Troutdale	1953	Longview	South	OR
Wasco	1953	The Dalles	South	OR
Waterville	1953	Wenatchee	North	WA

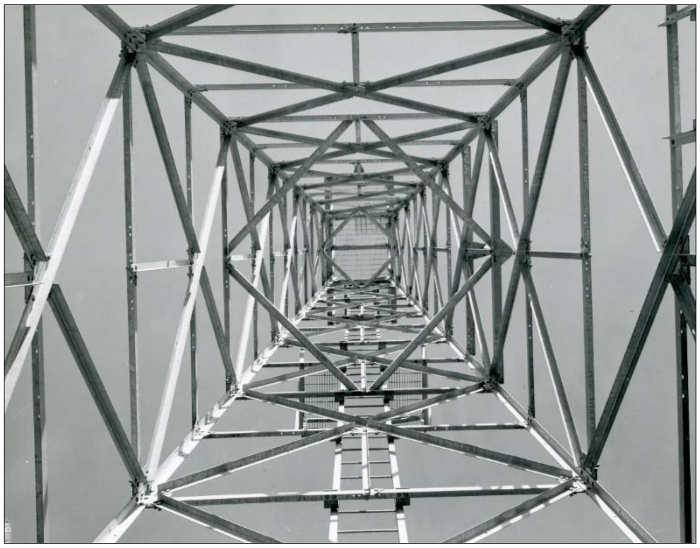 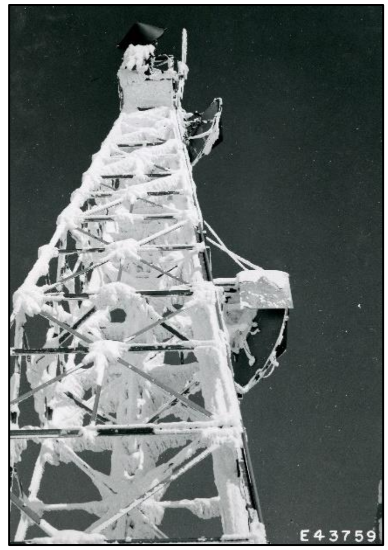

Figure 11. Four-Leg Steel Lattice Tower at Augsburger Microwave Radio Station, 1952 (left, NARA:AuspurgerMW1NARAbox7-003) and 1957 (right, NARA: AuspurgerMW3NARAbox7-033).

Three-leg Steel Lattice (1953-1973)

BPA's three-leg steel lattice towers are composed of triangular steel structures positioned on three concrete footings. These structures are otherwise identical in construction the BPA's four-leg steel lattice towers (Table 7, Figure 12).

Table 7. Eligible Microwave Radio Stations with a Three-Leg Steel Lattice Tower

Microwave Radio Station	Year Built	District	Region	State
Hall Ridge	1973	Salem	South	OR

Figure 12. Three-leg Steel Lattice tower at Hall Ridge Microwave Radio Station.

Four-leg Steel Lattice with Internal Staircase (1950-1953)

Four-leg steel lattice towers with internal staircases are generally the tallest and widest towers in the BPA radio network. Nearly identical to other four-leg steel-lattice towers in terms of materials and design, these structures feature a series of staircases and platforms within the framework of the tower to provide access at varying heights. The towers were utilized in environments that required additional strength due to wind loads or additional height to reach the line-of-sight requirement (Table 8, Figure 13).

Table 8. Eligible Microwave Radio Stations with a Four-leg Steel Lattice Tower and Internal Staircase

Microwave Radio Station	Year Built	District	Region	State
Beverly	1953	Wenatchee	North	WA
Chehalis	1950	Olympia	North	WA

Figure 13. Four-leg Steel Lattice Tower with Internal Staircase at Beverly Microwave Radio Station, nd. (NARA:BeverlyMWNARAbox10-013).

Steel Lattice Tower with Guyed Wires (1953, 1968)

BPA used steel lattice towers with guy wires to provide diagonal tension support and extra stability to withstand lateral loads from high winds. Steel lattice towers with guy wires consist of tall and narrow lattice steel structures with square bases positioned on concrete foundations and supported by a series of diagonal tension cables (guy wires) securing the tower to the ground (Table 9, Figure 14).

Table 9. Eligible Microwave Radio Stations with a Steel Lattice Tower with Guyed Wires

Microwave Radio Station	Year Built	District	Region	State
Blacktail Peak	1968	Kalispell	East	MT
Leneve	1953	Eugene	South	OR

Figure 14. Four-leg steel Lattice Tower with Guyed Wires at Leneve Microwave Rado Station, 1961 (NARA:LeneveNARAbox15of52-003).

2.3.2 Wood Monopole (1961)

Wood monopole towers consist of single wood poles set into the ground to secure their position. Wood poles used for BPA transmission line structures were typically installed to a depth of 10 percent of its aboveground height plus 2 feet (BPA Drawings 1946, Table 10, Figure 15).

Table 10. Eligible Microwave Radio Stations with a Wood Monopole Tower

Microwave Radio Station	Year Built	District	Region	State
Marys Peak	1961	Eugene	South	OR

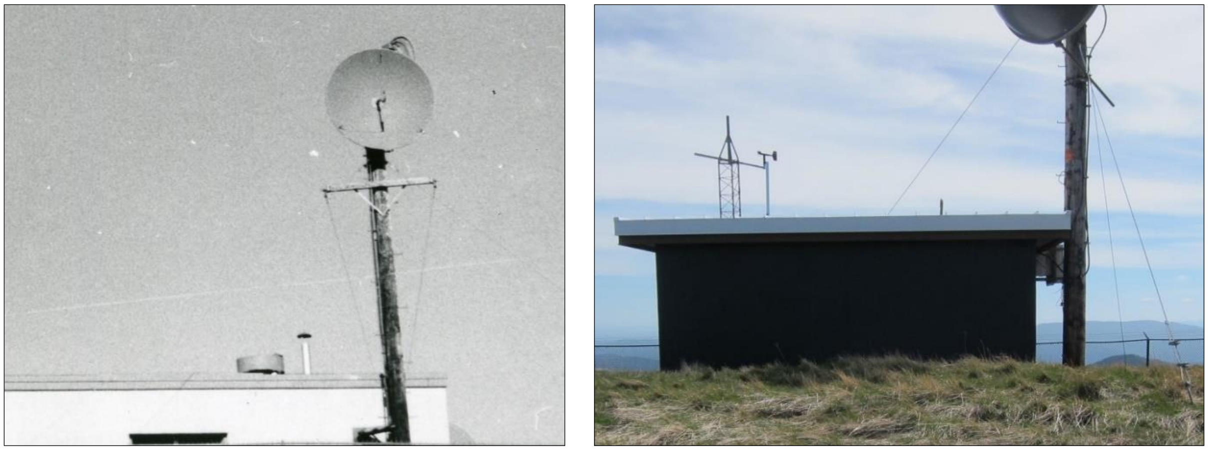

Figure 15. Wood monopole tower at Mary's Peak Microwave Radio Station in 1960 (left, NARA: MarysPeakNARAbox16of52-005, cropped) and 2019 (right).

2.4 Passive Repeaters (1950-1973)

The passive repeater is a secondary communication system feature that helps close microwave links where topography obstacles in the signal path block direct line-of-sight transmission between radio station antennas (Figure 16). The passive repeater is an aluminum reflective panel mounted on either a self-supporting steel or wood structure, transmission line or communications tower, or building. Passive repeaters are located intermittently between microwave radio station sites or substations. A passive repeater requires neither an on-site power source, such as a transmission line or generator, nor an independent microwave transmission source. Passive repeater sites therefore require no station building to house equipment.

Figure 16. Driscoll Passive Repeater in 1967 (left, NARA: DriscollNARAbox26-005) and c. 2016 (right).

Historically, passive repeaters have required infrequent maintenance, approximately every 2 years, thereby reducing the degree of accessibility required, and making access roads generally unnecessary (BPA 1977:V-26-V29). Current BPA staff indicate that maintenance does not occur unless a signal issue arises, and that inactive passive repeaters and structures have likely been or are intended to be removed.

Due to their low maintenance requirements, active passive repeaters generally remain as constructed and are unlikely to be altered. Therefore, BPA assumes active passive repeaters that contain historic built features retain integrity. **BPA treats the sites with historic stand-alone structures as eligible for the NRHP as a component of BPA's historic transmission network.** Further investigation is required to formerly evaluate these resources. Passive repeaters that are not stand-alone and are attached to other resources are considered a feature of that resource.

3. Treatment Recommendations for Microwave Radio Stations and Passive Repeaters

Specific treatment recommendations are provided for potential facility improvement projects that may occur at microwave radio and passive repeater stations. Treatment recommendations for more general facility improvement projects that are relevant to microwave radio stations, such as site and building/structure maintenance, alterations, and additions are in Section 7 of the MBR and its relevant subsections.

To comply with Section 106 of the NHPA, agencies must consider how federal undertakings may affect a historic property's integrity and NRHP-eligibility. The following guidance is provided for project planners to understand how various activities may impact historic integrity and ultimately, the historic review process required for their projects.

All projects fall into one of these tiered categories:

Activities Exempt from Review

Activities Requiring BPA Review, and

Activities Requiring SHPO Consultation.

Exempt activities (green) do not require review by a BPA historian or consultation with the SHPO. However, all three categories may still require archeological review. Activities requiring screening (yellow) must be reviewed by a BPA historian who will determine whether consultation with the SHPO is necessary before the activity can proceed. Activities requiring SHPO consultation (red) necessitate Section 106 review with a BPA historian and the SHPO. All activities under the green, yellow, and red categories require NEPA review.

The following subsections begin with summaries of standard treatment recommendations for various project types and resources at historic microwave radio stations and passive repeater sites. The summaries are followed by a categorized list of project activities that may occur and the level of cultural resources screening and consultation required. Treatment guidance is recommended per best management practices.

3.1 Microwave Radio Stations

BPA's Microwave Radio Stations contain, at a minimum, an antenna tower and station building—essential features that characterize the site.

The removal and/or replacement of a tower or station building at an NRHP-eligible microwave radio station (Figure 17) adversely affects the site due to the loss of key features and will require Section 106 consultation. The removal of secondary features, such as an oil tank, engine generator building, or latrine is less likely to adversely affect the site, but still require screening by a BPA historian.

The addition of a new station building, even if the original remains onsite, adversely impacts the site as it alters the historic spatial organization and expression of historic function, workmanship, and technology. The construction of a new station building replaces the function of the original building, regardless of whether it remains onsite. In these situations, BPA will eventually demolish the obsolete building.

Exterior building alterations such as the addition of storm entrances and snow shields, replacing doors or changing door configurations, installing HVAC equipment, or drilling into or penetrating exterior walls for equipment upgrades (Figure 18) do not necessarily result in an adverse effect but these actions do require screening by a BPA historian. Similarly, it may be suitable for original buildings and towers to be moved within the site boundary without diminishing integrity. Interior modifications, especially upgrades to internal operational equipment for improved efficiency or function, do not require cultural resources screening or consultation.

Additions to microwave radio stations require consultation but do not necessarily result in an adverse effect, provided they are designed using compatible methods and materials that meet the *Secretary of the Interior's Standards for Rehabilitation* (36 CFR Part 67, NPS 2019). Changes to scale and building form, or the use of new exterior cladding materials that change the appearance of the station building may diminish integrity and adversely affect the resource.

The following activities are specific to proposed projects at microwave radio stations but do not encompass all possible actions. If a specific activity is not listed below see Section 7 or a BPA historian for additional guidance.

Microwave Radio Station Activities

Exempt Activities

- Cleaning or repairing microwave radio station components
- In-kind replacement of antenna tower equipment
- In-kind replacement of antennas
- Replacement of interior equipment

Activities requiring screening

- Removal or replacement propane tank, latrine, or engine generator building
- Alterations to building entrances and windows
- Widening existing holes in building exteriors for new equipment
- Creating holes in building exteriors for new equipment
- Addition of new equipment to exterior of buildings
- Addition of new equipment to antenna towers
- Replacement of a non-historic antenna tower (less than 50 years old)
- Addition of an antenna tower
- Moving original buildings and towers within the site boundary

Activities requiring consultation

- Construction of a new building, structure or antenna tower
- Removal or replacement of a building
- Removal or replacement of a historic antenna tower
- Additions to station buildings
- Sale or transfer of site ownership
- Any actions that would not meet the SOI's Standards for rehabilitation

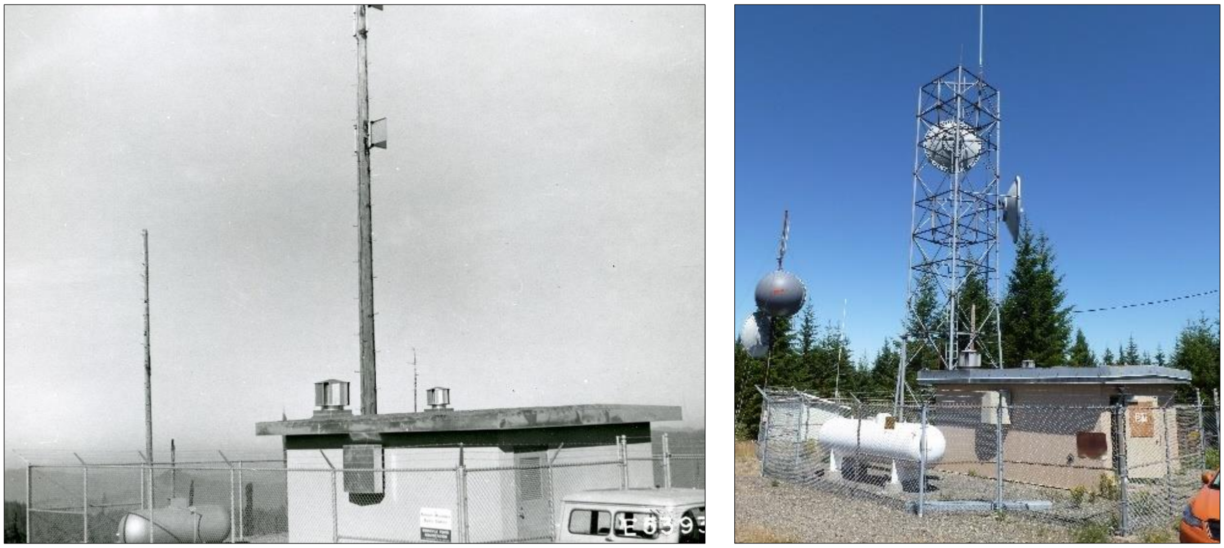

Figure 17. Kenyon Mountain Microwave Radio Station original monopole antenna tower circa 1960 (left, NARA:KenyonNARAbox14of52-002); replacement four-leg lattice steel antenna tower circa 2012 (right).

Figure 18. Penetration of the north wall of the Waterville Station Building to bond the ground bar to the outside grounding.

3.2 Passive Repeater Sites

Any replacement or removal of elements of a stand-alone passive repeater station requires screening by a BPA historian and may require further evaluation to determine eligibility for inclusion in the NRHP. The following activities are specific to proposed projects at passive repeater stations but do not encompass all possible actions. If a specific activity is not listed below see Section 7 or a BPA historian for additional guidance.

Passive Repeater Activities

Exempt Activities

- Cleaning or repairing passive repeater components (Repairs **must not** involve the replacement of historic materials)

Activities requiring screening

- In-kind replacement of passive repeater equipment or components
- Additions to a passive repeater structure

Activities requiring consultation

- Replacement of passive repeater components using materials that are of a different type, scale or material than the existing material
- Replacement of a passive repeater structure
- Removal of a passive repeater structure
- Sale or transfer of site ownership
- Any actions that would not meet the SOI's Standards for rehabilitation

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