

Appendix G
Ground Water Monitoring Program

APPENDIX G

Ground Water Monitoring Program

White Pine Energy Associates, LLC (WPEA) is committed to adopt the procedures outlined in the following ground water monitoring program should the White Pine Energy Station project be approved and implemented. The objective of this monitoring plan is to describe the water resources monitoring activities in response to the annual ground water withdrawal of 5,000 acre-feet (af) from the basin-fill aquifer in the Steptoe Valley, associated with the proposed White Pine Energy Station (the Station) to be located in Steptoe Valley, White Pine County, Nevada.

Although this demand for water would be the same for either the Proposed Action or Alternative 1, the demand would be met through the operation of two different well fields each consisting of eight water supply wells located in an approximate linear configuration on the valley floor, roughly parallel to U.S. 93 (see Chapter 2, *Description of Ground Water Resources*). Specifically, for the Proposed Action, the eight wells in the proposed well field are located at intervals of between approximately 1 and 3 miles extending from the proposed energy station location northward for approximately 12 miles. The eight wells in the proposed wellfield for Alternative 1 are located at intervals of between approximately 1 and 2.5 miles extending from the Alternative 1 energy station location south for approximately 5 miles.

The ground water monitoring program will be a part of the adaptive management plan, which will be incorporated in the Plan of Development or Construction, Operation, and Maintenance Plan that BLM will require from WPEA before a notice to proceed with construction is granted. The ground water monitoring program, which would be managed by WPEA, would document changes in ground water levels and provide early warning for unanticipated reductions in spring discharge at selected springs that could be caused by the ground water withdrawals for the Station. These reductions have the potential for adverse impacts to resources in the surrounding environment. The program also identifies the general procedures that would be followed in response to changes in measured ground water levels.

Certain parameters of this ground water monitoring program, including monitoring frequency and sample location will be initially established in consultation with the State Engineer. These parameters will be reviewed annually and may be reduced or expanded in scope upon the recommendation of the State Engineer and/or the Nevada Division of Environmental Protection.

Production Wells

Discharge rates and ground water levels will be measured in each of the production wells on a continuous or frequent basis, as is practical, using permanent recording devices. The water levels would be measured during pumping and non-pumping periods.

Depth to ground water will be measured in all production wells daily using pressure transducers or sounding probes. Each production well will be equipped with a flow meter to

record cumulative water production. Cumulative well production will be recorded at least monthly. All monitoring data will be entered into a project database maintained by White Pine Energy Associates, LLC.

Monitoring Wells

For the Proposed Action, a network of up to ten wells will be installed prior to Station start-up and monitored for water level change on a frequency that will be determined in coordination with appropriate agencies. For Alternative 1, up to four monitoring wells are anticipated to be installed and monitored. The general locations of the monitoring wells are identified for the Proposed Action in Figure G-1, and for Alternative 1 in Figure G-2. The specific locations of the monitoring wells will be determined based on physical access limitations and the specific characteristics (for example, depth and screen interval) and performance of the production wells, which will not be known until they are installed and tested. All of the monitoring wells are anticipated to be located on public land or property owned by WPEA.

The wells would be constructed with screen intervals sufficient to monitor both shallow (unconfined) ground water levels that could influence spring discharge, and deeper ground water that is more representative of existing water supply wells completed in the basin-fill aquifer system in Steptoe Valley. The specific locations and well construction details will be presented in a plan to the Office of the Nevada State Engineer upon completion and pump testing of the production wells.

Ground water levels will be measured on a frequency that will be determined in coordination with appropriate agencies, using dedicated recording devices in selected monitoring wells. For those monitoring wells without continuous monitoring instruments, water levels will be measured quarterly initially to establish seasonal variations, followed by semiannual or annual measurements after seasonal trends have been established.

White Pine Energy Associates may determine that additional monitoring well(s) should be installed in areas where there are no existing or proposed wells available for monitoring. These additional wells will be located and constructed in a cost-effective manner, while meeting the objectives of early-warning detection of impacts, if any, from proposed ground water extraction.

Initiation of ground water level monitoring will commence as soon as possible, recognizing the desire to obtain baseline data prior to ground water extraction.

Elevation Control

Ground surface and measuring point elevations will be measured at each production and monitoring well using a survey-grade GPS instrument. All elevation measurements will be added to the project database that contains ground water level data.

Springs

Selected springs in Steptoe Valley identified in Figure G-1 will be monitored quarterly. Monitoring will consist of measuring flow rate and photo-documenting general site conditions. Flow will be estimated for low flow conditions or where the flow is diffuse on the ground surface. Monitoring frequency may be reduced later as appropriate to semi-annually or annually.

Initiation of monitoring for springs will commence as soon as possible, recognizing the desire to obtain baseline data prior to ground water extraction. Monitoring data will be recorded using a standard format to be used for each monitoring event.

Water Quality

Ground water quality samples will be collected from all eight production wells and selected monitoring wells, and analyzed by a laboratory for major ions and trace elements.

Specifically, the following parameters will be measured in each water sample:

- **Field Parameters.** Water temperature, pH, oxidation-reduction potential (ORP) and specific conductance.
- **Common Ions.** Calcium, sodium, potassium, magnesium, chloride, fluoride, sulfate, bicarbonate, nitrate, total dissolved solids, and total suspended solids.
- **Trace Elements.** Arsenic, barium, copper, iron, lead, manganese, and zinc.

More extensive water quality analysis will be performed for the portion of water from the production wells used as potable water at the Station. Samples from this water will meet Safe Drinking Water requirements, as appropriate.

Ground water quality samples will be collected and analyzed quarterly from the selected monitoring wells and production wells for the first 2 years following start-up to establish seasonal variations. Thereafter, the wells will be sampled and analyzed at a maximum frequency of semiannually (spring and fall), or as required by drinking water requirements for public sources.

Frequency, sampling location, and water quality parameters will be reviewed annually and may be reduced or expanded in scope upon the recommendation the Nevada Division of Environmental Protection.

Ground water quality monitoring programs also will be conducted on the power plant site at the solid waste disposal facility and the evaporation pond. These two monitoring programs are described briefly in the following text.

The **ground water quality monitoring program for the solid waste disposal facility** will consist of eight wells. Three wells will be located upgradient of the disposal facility to obtain samples representative of background water quality. Five wells will be located downgradient of the disposal facility to ensure the detection of potential contaminants. Samples will be collected quarterly at the eight wells during project operation and into the post-closure period

and analyzed for a list of targeted elements of environmental concern associated with Powder River Basin coal. This ground water quality monitoring program and other environmental protection measures at the solid waste disposal facility are outlined in the Operations Plan, Closure Plan, and Post-Closure Plan (SRK Consulting, 2006b), *Permit Application White Pine Energy Station Class III Solid Waste Disposal Facility, White Pine County*.

The **ground water quality monitoring program for the evaporation pond** will consist of five wells. Two wells will be located upgradient of both the evaporation pond and the solid waste disposal facility to obtain samples representative of background water quality. Three wells will be located downgradient of the evaporation pond to ensure the detection of potential contaminants. Samples will be collected quarterly at the five wells during project operation and analyzed for a list of parameters specified in the evaporation pond permit issued by the Nevada Division of Environmental Protection's Bureau of Water Pollution Control. This ground water quality monitoring program and other environmental protection measures at the evaporation pond are outlined in SRK Consulting (2006a), *Evaporation Pond Design, Operation and Maintenance Manual, White Pine Energy Station White Pine County, Nevada*.

Reporting

In addition to updating the water resources project database on a regular basis, an annual summary report will be prepared by WPEA that summarizes all information collected during the previous calendar year, including an analysis of any trends in either ground water levels or spring discharge. This summary report will include all data collected under or as described in this Plan and will be submitted on an annual basis to the Office of the Nevada State Engineer, the Nevada Division of Environmental Protection, the US Bureau of Land Management, and White Pine County, Nevada.

Mitigation Actions

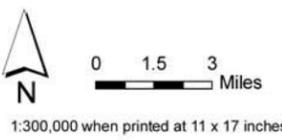
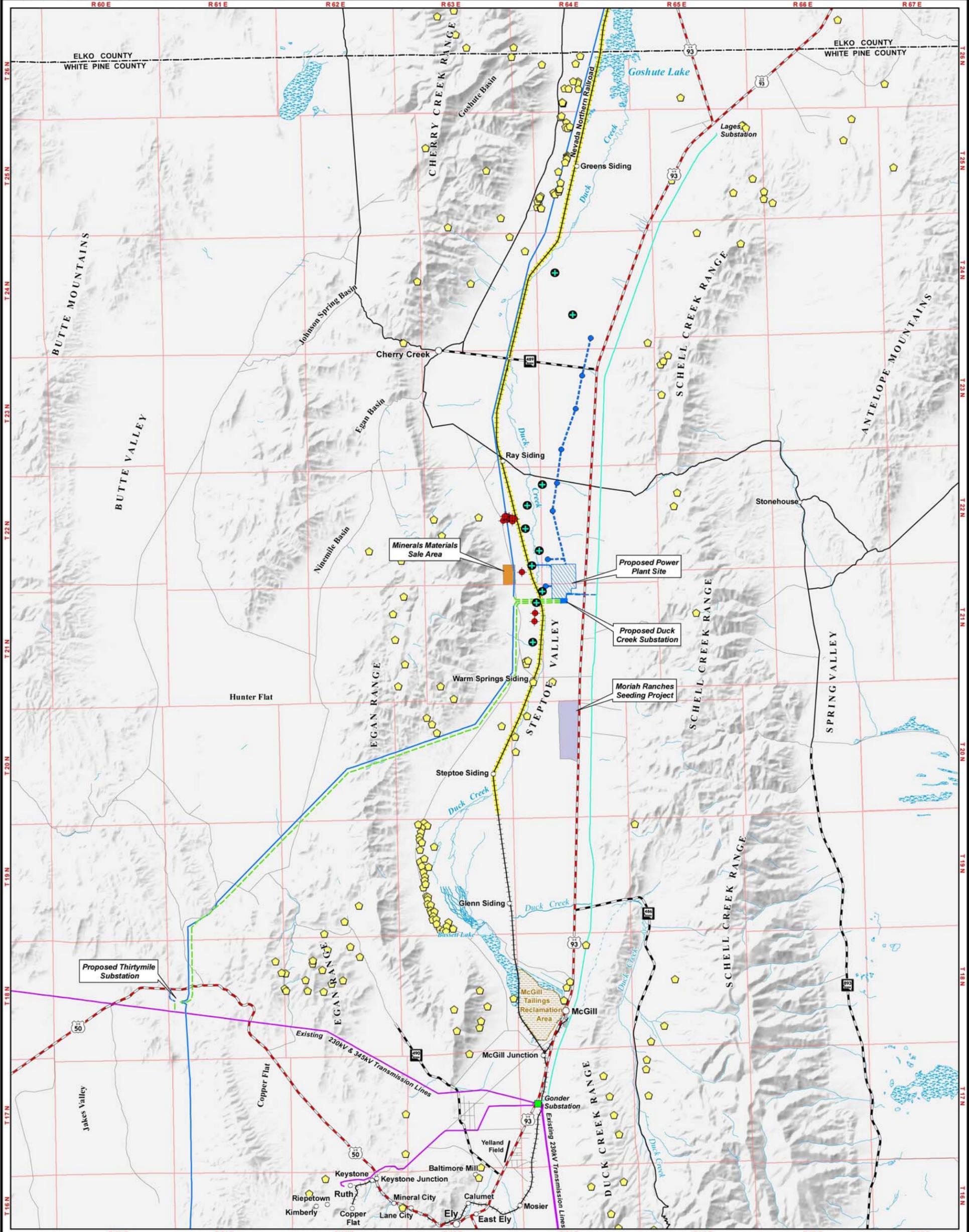
Upon completion of the water supply system to the Station, including all of the wells, piping and instrumentation, a comprehensive assessment of the potential production rates of each well would be conducted to develop an operational plan for the optimal pumping rates of each well in the well field. During full Station operation, should the pattern of ground water level decline in the monitoring wells indicate that the discharge from known springs may experience a potentially adverse reduction as a direct response to continued pumping and it is determined that the production well is the actual cause of that potential impact, action would be taken to adjust the amount and pattern of pumping in advance of spring discharge being adversely affected. Specifically, an alternative pumping distribution would be adopted to reduce the pattern of ground water level decline in the vicinity of the potentially affected springs in order to maintain spring discharge. The general locations of the monitoring wells have been identified to provide sufficient warning to enable time to adjust the pumping rates prior to known springs being affected.

Under both the Proposed Action and Alternative 1, a maximum of eight wells would be available to meet the annual water demand of 5,000 acre-feet. The average pumping rate would therefore be approximately 390 gallons per minute (gpm). Given what is currently

known about the aquifer, individual well yields on the order of 1,000 gpm should be attainable. Accordingly, not all eight wells would be needed if some of the wells had to decrease pumping to prevent known springs from being affected by project pumping. For example, if only six of the eight wells were to be used, then the average pumping rate would increase to approximately 515 gpm per well. This pumping rate should be attainable, but would need to be confirmed following well installation and testing.

However, should it be determined that no spatial or temporal combination of pumping required to meet the water demand of the Station could be achieved without resulting in a ground water level decline that could cause potentially adverse impacts to known springs, and it is determined that the production well is the actual cause of that potential impact, then WPEA would file applications with the appropriate agencies to obtain the necessary permits and approvals for the construction of alternative production wells and conveyance systems. In the interim, WPEA would work with the appropriate agencies, including the BLM, to mitigate the negative impact on the springs. Once alternative production wells and conveyance systems are in place, the water demand would be met using water from a combination of both existing and new wells in a manner that did not result in ground water level declines sufficient to cause adverse impacts to known springs.

Should drinking water standards be exceeded in any potable water sample from the production well system, the necessary steps would be taken to provide potable water to the Station. Should the necessary steps take an extended period of time to implement, bottled water will be brought to the Station for potable uses.



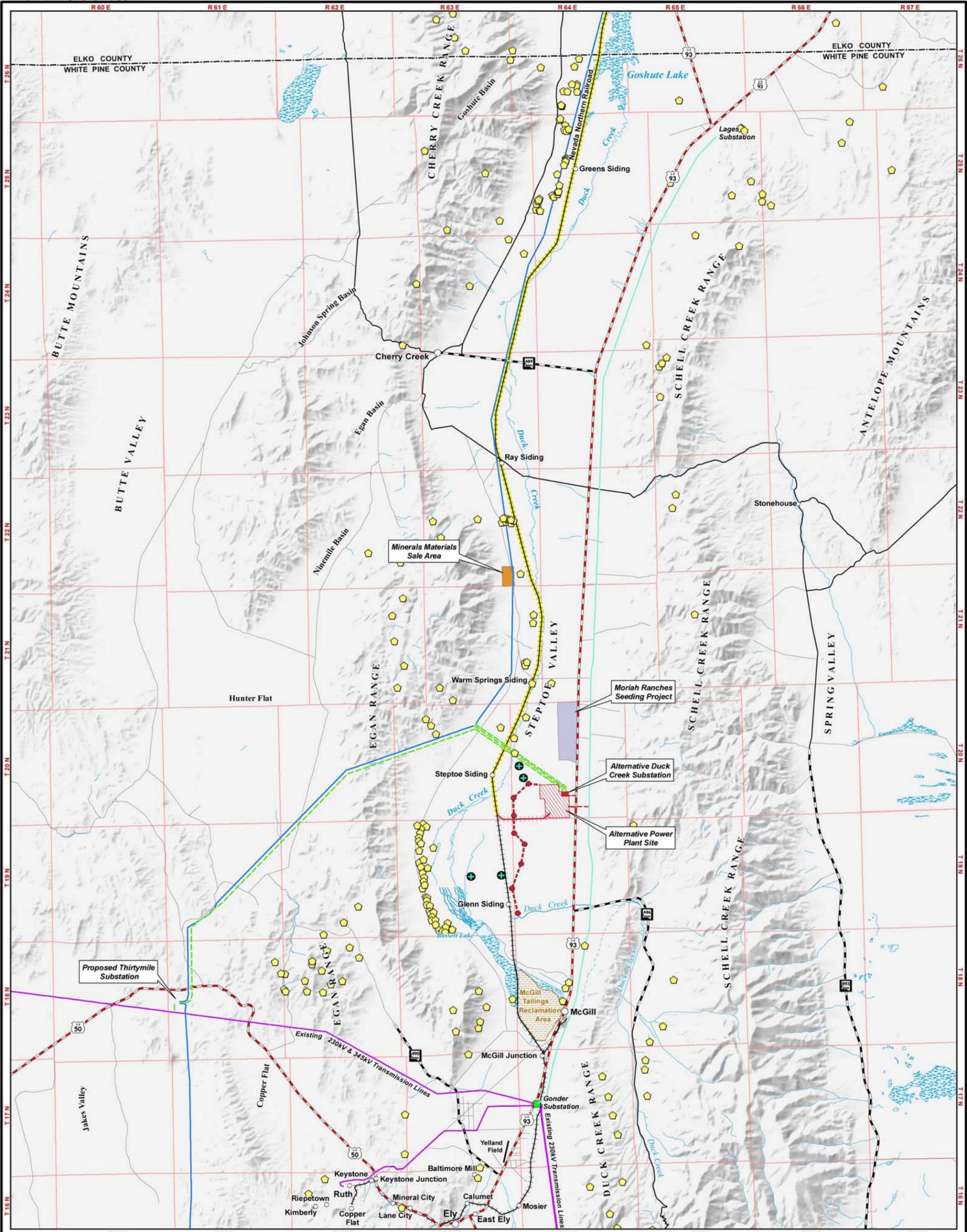
- Existing Electrical Features**
- Existing Substation
 - Existing Transmission Line
 - Existing Distribution Line
- Surface Water**
- Perennial Stream or River
 - Wetland
- Connected Action**
- SWIP Transmission Line
 - NNR Upgrade
- Common Project Features**
- Minerals Materials Sale Area
 - Moriah Ranches Seeding Project

- Proposed Action Project Features**
- Proposed Well Site
 - Proposed Water Pipeline/Distribution Line
 - Proposed Rail Spur
 - Proposed Transmission Line
 - Proposed Electric Distribution Line
 - Proposed Access Road
 - Proposed Substation Site
 - Proposed Power Plant Site

Proposed General Locations of Ground Water Level Monitoring Wells for the Proposed Action White Pine Energy Station Project

- Spring (Source: BLM, EDAAW)
- Potentially Affected Springs and Locations of Spring Monitoring (12 Total)
- + General Location of Ground Water Monitoring Well

Figure G-1



- Existing Electrical Features**
- Existing Substation
 - Existing Transmission Line
 - Existing Distribution Line
- Surface Water**
- Perennial Stream or River
 - Wetland
- Connected Action**
- SWIP Transmission Line
 - NNR Upgrade
- Common Project Features**
- Minerals Materials Sale Area
 - Moriah Ranches Seeding Project

- Alternative 1 Project Features**
- Proposed Well Site
 - Proposed Water Pipeline/ Distribution Line
 - Proposed Rail Spur
 - Proposed Transmission Line
 - Proposed Electric Distribution Line
 - Proposed Access Road
 - Proposed Substation Site
 - Proposed Power Plant Site

- Spring (Source: BLM, EDAW)
- General Location of Ground Water Monitoring Well

Proposed General Locations of Ground Water Level Monitoring Wells for Alternative 1 White Pine Energy Station Project

0 1.5 3 Miles
1:300,000 when printed at 11 x 17 inches

Figure G-2