White Pine Power Project

WATER RESOURCES BASELINE

TECHNICAL REPORT

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Technical Report
For The
WHITE PINE POWER PROJECT

Prepared By
DAMES & MOORE

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SUMMARY

The White Pine Power Project (WPPP) is a proposed 1500 megawatt coal-fueled, steam-electric generating facility to be located in Wite Pine County, Nevada. In addition to the power generation system, the Project consists of a power transmission system, a water supply system, and a coal transportation system. As currently proposed, WPPP will be jointly owned by White Pine County and two private utilities. Project participants include eight Nevada entities and six California municipalities.

The preferred site for the WPPP Generating Station is the North Steptoe Valley Site. The Butte Valley Site and the Spring Valley Site are feasible alternatives to the preferred Site. The water supply system for each Site includes well fields located within the same valley except for the Butte Valley Site which will require additional well fields in Steptoe Valley. The preferred power transmission system for each Site includes two new transmission lines terminating in southern Nevada and one new transmission line terminating in or near White Pine County. The preferred coal transportation system includes a new and upgraded railroad from the Site to existing railroads in northern Nevada. An alternative system includes a new railroad from the Site to an existing railroad in southern Nevada.

This technical report, which includes baseline material for the WPPP Environmental Impact Statement (EIS), presents the results of field and literature studies. The technical report is intended to be a background document providing details of information summarized in the EIS. It also provides the basis for determining environmental impacts and mitigative measures.

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1.0 INTRODUCTION

This technical report describes the existing water resources on or near WPPP sites and well fields (Figure 1-1, Figure 1-2, Figure 1-3). This information will be summarized in the WPPP EIS.

The maximum water supply requirements for WPPP are estimated to be approximately 25,000 acre-feet per year (afy), mainly for power plant cooling purposes. The project water requirements will be met by development of groundwater resources within deep alluvial-filled valleys. The water supply will come from well fields in Steptoe Valley for the Steptoe Valley Site and from well fields in Spring Valley for the Spring Valley Site. Water from Steptoe Valley and Butte Valley will be combined for the Butte Valley Site.

2.0 SCOPE OF WORK

In order to obtain information on groundwater conditions in White Pine County (County) and to develop design criteria for the water supply system, the Los Angeles Department of Water and Power (LADWP) entered into an agreement with Leeds, Hill and Jewett, Inc. (LEEDSHILL) of San Francisco, California, to undertake certain groundwater-related studies. These studies were divided into three phases as follows:

a. Phase 1 consisted of a reconnaissance-level investigation to describe surface water and groundwater resources in the County which might provide the required water supply for WPPP and to establish a priority ranking of valleys for further investigation.

b. Phase 2 investigations were conducted to verify the preliminary findings of the Phase 1 studies through geophysical surveys and pumping tests on existing wells, in order to develop specific water supply plans for the eight Candidate Sites under consideration at that time.

c. Phase 3 included detailed assessments of ground water availability in Spring Valley and North

Steptoe Valley through more extensive geophysical investigation, test drilling, pumping tests and computer modeling studies of the potential effects of groundwater development and withdrawals for WPPP.

The specific scope of work for the Phase 3 investigations included (LEEDSHILL, 1983):

- Drilling and development of test and observation wells in Spring Valley and Steptoe Valley and pumping tests to evaluate aquifer characteristics.

- Field electrical-resistivity surveys in Spring Valley and Steptoe Valley.

- Development, calibration, verification and operation of groundwater models for Spring Valley and Steptoe Valley to assess potential drawdown effects due to groundwater withdrawals for WPPP.

Field studies were not carried out in Butte Valley. Based on the available information Butte Valley is less sensitive to impacts due to groundwater development than Spring Valley or Steptoe Valley and therefore was given a lower priority with respect to field verification of existing groundwater conditions.

The water resource baseline and the impact assessments (in the EIS) are based in part on the results of the LEEDSHILL studies for LADWP.

estimated consumptive use which includes evapotranspiration as losses from irrigated and non-irrigated lands is 84,500 afy (Table 4-3) (LEEDSHILL, 1983).

4.2.2.4 <u>Water Quality</u>

Samples obtained during the pumping test at the Steptoe Valley test site indicate that the water in the lower aquifer has a temperature of 65°F and a specific conductance of approximately 400 microhms/cm. These values differ from the monitored stock water wells located toward the center of the valley which have a temperature of about 50°F and a conductivity of 2000 microhms/cm. The reported water quality data for the production well and two observation wells at the North Steptoe Valley test site are summarized in Table 4-4.

4.3 SPRING VALLEY

4.3.1 <u>Geology</u>

Spring Valley is essentially a closed groundwater basin and includes a drainage area of approximately 1700 square miles in the eastern part of the County. The valley, however, does overlie the eastern Nevada regional carbonate aquifer. The valley is bounded on the west by the Schell Creek Range and by the Snake Range on the east. The Schell

Creek Range consists of predominantly Paleozoic limestone and dolomite with isolated remnants of Tertiary lava flows common. The carbonates contain solution cavities and are jointed which contribute to groundwater movement. The Snake Range consists primarily of Precambrian quartzite with some granodiorite stocks occurring in different locations. Both the quartzite and granodiorite are relatively impervious.

The depth of the unconsolidated alluvial, colluvial, and lacustrine materials, which comprise the valley fill in Spring Valley, is unknown, but is likely in excess of 1000 feet. In the geologic past, Spring Valley contained a large lake. Clay and other fine-grained sediments which were deposited in the lake can be found at a considerable depth below the present valley floor. It is reported that the fine lacustrine deposits in Spring Valley are as much as 300 feet thick (LEEDSHILL, 1981a). It is also reported that the lacustrine deposits are underlain by poorly-consolidated Tertiary and Quaternary sand, silt, and gravel which comprise a potentially good aquifer.

4.3.2 Hydrology

4.3.2.1 Surface Water

The mean annual runoff into Spring Valley is estimated by the USGS and NDCNR to be approximately 90,000 afy of which an estimated 30,000 afy wastes to the two playas located in the center of the valley.

Several small intermittent streams occur in the southern half of Spring Valley. These streams have their origin in the mountains and are fed by springs and direct surface runoff during snowmelt and periods of heavy rainfall. The only perennial stream in Spring Valley is Cleve Creek, located in the northern part of Spring Valley. The mean annual discharge of Cleve Creek is estimated to be approximately 6350 afy. Some thermal springs occur in Spring Valley, however, none of these are classified as hot springs.

Streamflow data for Spring Valley are limited to Cleve Creek and to single random measurements on several intermittent streams and springs. A summary of available data for Cleve Creek is presented in Table 4-5.

4.3.2.2 Groundwater

Both confined and unconfined conditions exist within the valley. Several flowing wells occur within the area east of Baking Powder Flat in the southern part of the valley, and at least one flowing well in the northern part of the valley (LEEDSHILL, 1981b).

The depth to the groundwater table within the valley floor varies from less than 10 feet to 100 feet or more. Much of the valley floor areas consists of playas. The USGS and NDCNR have estimated both groundwater recharge and discharge to be approximately 75,000 afy. The estimated mean annual discharge includes approximately 4000 afy, which flows from Spring Valley to Hamlin Valley. The perennial yield of the basin is estimated to be approximately 100,000 afy. This includes an estimated mean annual runoff from the mountains of 90,000 afy and an estimated 10,000 afy of direct precipitation on the alluvial fans. The apparent difference between the estimated mean annual recharge and the perennial yield includes some 25,000 afy of "rejected" recharge that flows onto the playas and evaporates (Rush and Kazmi, 1965). Calculated transmissivities for existing wells in Spring Valley are reported by LEEDSHILL (1981b) to range from about 3500 gpd/ft to 16,900 gpd/ft. Reported well yields range from about 400 gpm to 525 gpm.

To evaluate groundwater conditions within Spring Valley and to assess aquifer characteristics for design of a well field and for modeling, LEEDSHILL (1983) drilled and completed one production well and two observation wells at a site located along the western edge of Spring Valley, approximately seven miles north of the intersection of U.S. 50 and U.S. 293, and approximately one mile east of Highway 293

(Figure 1-3). The pumping test well configuration at the Spring Valley test site is shown on Figure 4-2, and the completion details for the production and two observation wells are listed in Table 4-6.

The Spring Valley test site is located on a gently-sloping beach terrace. The Schell Creek Mountains are located approximately three and one-half miles to the west and a local, northerly-flowing ephemeral stream is located three miles to the east.

In general, considerably more clay was encountered in the production and observation wells drilled at the Spring Valley test site than in those drilled at the Steptoe Valley site. In the pilot hole, which was drilled to a depth of 1000 feet at the production well location, the material encountered in the first 200 feet consisted of relatively clean sand and gravel. The sand and gravel are underlain by approximately 50 feet of relatively impermeable lacustrine clay, clayey sand, and clayey gravel. Relatively clean sand and gravel were again encountered from approximately 260 to 335 feet. Below 335 feet, the consolidated materials consisted of clayey and silty sand and gravel, interfingered with layers of clean sand and gravel (LEEDSHILL, 1983).

Comparison of water levels in monitoring wells completed at the test site above and below the clay layer, at a depth of about 200 feet, indicates an approximate two-foot difference in piezometric head elevations above and below the clay layer. At the test site, the piezometric head below the clay layer is approximately two feet above the static water level in the upper water table aquifer.

The transmissivity and storage coefficient of the upper water table aquifer at the Spring Valley test site are 38,000 gpd/ft and 0.069, respectively (LEEDSHILL, 1983). Calculated transmissivity for the lower confined aquifer zone ranged from 14,100 gpd/ft to 20,000 gpd/ft and the storage coefficient from 0.00012 to 0.00019.

4.3.2.3 Water Use

Existing groundwater development in Spring Valley is concentrated around the periphery of the valley, particularly along the east side of the valley south of U.S. Highway 6 and along the west side of the valley north of U.S. 6. The wells in both areas typically range in depth from 300 to 500 feet, although a few wells may exceed 900 feet. The majority of wells are reported to yield 450 gpm to 500 gpm (LEEDSHILL, 1981b). Only a few wells are located within the central portion of the valley.

Estimated groundwater withdrawals are approximately 18,500 afy. The major uses include irrigation (16,500 afy) and mining and energy development (1700 afy) (LEEDSHILL, 1981a). A summary of the estimated mean annual discharges from Spring Valley is presented in Table 4-7.

4.3.2.4 Water Quality

Water quality analyses for the production well and the deep observation well (2-B) at the Spring Valley test site and for two flowing artesian wells (Spring 4 and 5) are listed in Table 4-8. Spring 4 and Spring 5 are located approximately two miles to the east of the test site and are used for stock watering. The average ground water temperature at Spring 4 and Spring 5 is 45°F compared to 60°F in the production well at the Spring Valley test site. The specific conductance of water samples from Spring 4 and Spring 5 and the production and observation wells at the test sites ranges from 275 to 300 microhms/cm (LEEDSHILL, 1983).

Ground water in the area of the Shoshone Ponds has reported temperatures of 65°F to 70°F and specific conductance values ranging from 120 microhms/cm to 160 microhms/cm (LEEDSHILL, 1983).

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