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SOUTHEAST GEYSERS EFFLUENT PIPELINE AND INJECTION PROJECT

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KEY WORDS

pipeline, injection, The Geysers, steamfield, effluent, wastewater

PROJECT BACKGROUND AND STATUS

The geothermal steam resources at The Geysers in northern California are being depleted faster than originally anticipated. Of the 1,800 megawatts of installed generating capacity, a significant drop in output has occurred due to insufficient steam. Steam pressure in the reservoir has dropped from an original pressure of 500 psia to pressures below 100 psia in some areas.

The project consists of a 29-mile pipeline that will carry 7.8 million gallons per day of treated wastewater and lake make-up water to the southeast Geysers geothermal steamfield for injection into the reservoir. The injected fluid will increase the steam produced for power generation. The Lake County Sanitation District (LACOSAN) sees the project as a long-term environmentally-superior method of wastewater disposal for the communities of Clearlake, Lower Lake, and Middletown. The steam suppliers and power plant operators regard the project as a way to reduce the rate of decline in steam production and to augment power generation.

LACOSAN and the U.S. Bureau of Land Management have prepared a consolidated Environmental Impact Report and Environmental Impact Statement for the project. The Bureau of Land Management was the lead agency for the NEPA portion of this joint environmental document because it manages federal geothermal leases at The Geysers that will receive effluent. LACOSAN was the lead agency for the state CEQA portion of the environmental review because of the project's wastewater facility focus.

Final engineering plans and specifications have been completed, and ground was broken for the first segment of pipeline on October 6, 1995. Construction bidding for the remaining segments will occur during January-March 1996. Construction is expected to be underway concurrently at multiple locations throughout 1996, with completion and start-up expected in early 1997.

PROJECT OBJECTIVES

The objectives of the project are to reduce the decline in power production at The Geysers and to provide an environmentally-superior method of wastewater disposal.

Technical Objectives

- Construct a 29-mile, 20-inch diameter buried pipeline to carry 7.8 million gallons per day of treated wastewater and lake make-up water to the southeast Geysers geothermal steam field.
- Inject wastewater into The Geysers reservoir to increase steam production.

Expected Outcomes

- Up to 70 megawatts of additional power output capacity will result from the project. Annually, this could equate to as much as 625,000 Mwh of electricity.
- Power plant longevity will be extended.
- The 1991 California Regional Water Quality Control Board Cease and Desist Order and associated building moratorium will be lifted as a result of implementing treatment plant improvements and the disposal of wastewater into The Geysers reservoir.

APPROACH

LACOSAN will construct the effluent pipeline and upgrade the Middletown Wastewater Treatment Plant (MWTP) and the Southeast Regional Wastewater Treatment Plant (SRWTP). The public/private financing plan uses county wastewater funds, federal and state financial assistance, and Geysers operators' funding for construction. The Geysers operators will also spend additional funds on secondary pipelines and injection facilities within the Geysers steamfield.

The main effluent pipeline will be owned and operated by the Lake County Sanitation District up to the point of delivery. Unocal, Calpine, and NCPA will own and operate the final reach of pipeline, and the three lift pump stations in The Geysers. NCPA will use the effluent-based steam in its own power plants, and PG&E will purchase effluent-based steam from Unocal and Calpine for its power plants.

As shown in Figure 1, the pipeline will begin at the SRWTP north of the city of Clearlake and end in the southeast portion of The Geysers geothermal field, between PG&E's Unit 13, NCPA's power plants in southern Lake County, and the Unit 18 and 20 steam fields in Sonoma County. The project will also include a make-up water intake and piping from Clear Lake to the SRWTP treated effluent reservoir. The pipeline will also be connected to the MWTP and will receive effluent from this facility. Much of the distribution system piping and all of the injection wells are already in existence.

Treated effluent will come from the City of Clearlake and surrounding areas, including the communities of Lower Lake and Middletown. In the early years of operation, more make-up water will come from Clear Lake. As the volume of effluent increases in the pipeline from population growth, the volume of lake water will decrease.

RESEARCH RESULTS

Construction groundbreaking took place on October 6, 1995, and start-up of the pipeline is expected to occur in January 1997. The participants are planning an initial testing and evaluation phase that will include monitoring of all operational aspects and reporting of performance variances, if any, from predicted results.

FUTURE PLANS

The project schedule is shown in Figure 2.

INDUSTRY INTEREST AND TECHNOLOGY TRANSFER

Organization(s)	Type and Extent of Interest
Northern California Power Agency Calpine Corporation Unocal Geothermal and Power Operations Group Pacific Gas and Electric Company	Industrial partners

Additionally, the project receives and responds to numerous technology transfer inquiries from industry, academic, environmental, and other interest groups. Project staff regularly make presentations at various professional and public interest forums to disseminate project information.

REFERENCES

Southeast Regional Wastewater Treatment Plant Facilities Improvements Project and Geysers Effluent Pipeline Project Environmental Impact Report/Environmental Impact Statement, SCH EIR/EIS No. 86-021101, prepared by Environmental Science Associates, Inc.

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Figure 1
S.E. GEYSERS EFFLUENT PIPELINE

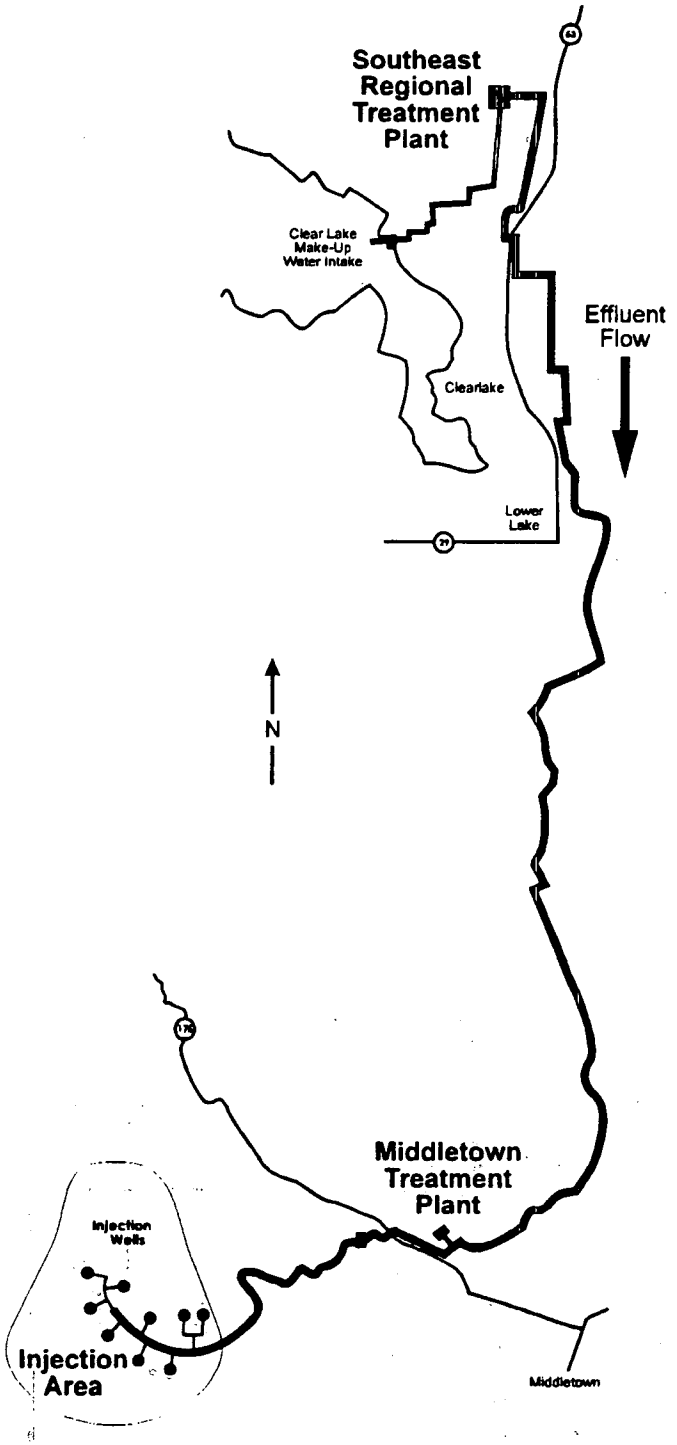

Figure 2
PROJECT SCHEDULE

	1995			1996												1997
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Reach 1: Clear Lake to SERTWP	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬						
SERTWP pump station					▬	▬	▬	▬	▬	▬	▬					
Lake pump station							▬	▬	▬	▬	▬	▬	▬			
Lake intake										▬	▬	▬				
Reaches 2-4: SERTWP to Middletown							▬	▬	▬	▬	▬	▬	▬			
Reach 5: Middletown to Geysers							▬	▬	▬	▬	▬	▬	▬			
Control system													▬	▬		
Final tests														▬	▬	
Start-up																▬