

California Regional Water Quality Control Board
North Coast Region

ORDER NO. R1-2005-0070
ID NO. 1B86002RSON

WASTE DISCHARGE REQUIREMENTS

FOR

GEYSERS POWER COMPANY, LLC

CALPINE CORPORATION

AT

THE GEYSERS

Sonoma County

The California Regional Water Quality Control Board, North Coast Region, (hereinafter Regional Water Board), finds that:

1. Geysers Power Company, LLC, (hereinafter Discharger), an indirect, wholly owned subsidiary of the Calpine Corporation, is engaged in geothermal well drilling and exploration; transportation of geothermal steam to power plants; disposal of geothermal steam condensate from the power plants; injection of treated wastewater from Lake County Special Districts, Southeast Regional Wastewater System (LCSDSRWS) and The City of Santa Rosa, and surface water from Clear Lake and local streams, power plant gray water, and storm water retained within the power plant facilities into the geothermal reservoir at The Geysers Known Geothermal Resources Area (The Geysers), in Sonoma County.
2. The Geysers is located in northeastern Sonoma County, approximately 12 miles northeast of Healdsburg and 10 miles east of Cloverdale, in an unincorporated area of Sonoma County zoned Resources and Rural Development (see Attachment "1"). The existing and expanded operations will be conducted on lands located in T11N, R9W, Sections 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, and 24; T11N, R8W, Section 6, 7, 8, 18, 17, 19, 20, 21, 27, 28, 29, 30, 33, and 34; and T10N, R8W, Section 3 MDB&M (see Attachment "2"). This area is located within the Big Sulphur Creek Watershed, and is tributary to the Russian River. Portions of the Geysers steamfield are located in the Central Valley Region (Region 5). This Order covers only those activities and discharges conducted within or affecting water quality within the North Coast Region (Region 1).
3. Waste Discharge Requirements Order No. R1-2002-0014 currently regulates geothermal operations including geothermal well drilling and exploration, transportation of steam, operation of the geothermal power plants, and disposal of steam condensate and treated wastewater into the geothermal reservoir at the

Geysers. Waste Discharge Requirements Order No. R1-2001-78 currently regulates similar activities within the Geysers Power Company, LLC's Aidlin Power Plant area. This Order combines the requirements contained within Orders R1-2002-0014 and R1-2001-78, for the purpose of regulatory consistency throughout The Geysers geothermal field.

4. Order No R1-2001-78 includes provisions regulating three drilling waste disposal sumps which the Discharger constructed, filled with geothermal well drilling cuttings, capped and graded, and replanted to prevent erosion in compliance with Order No. R1-2001-78.
1. Wastes produced during site preparation and during geothermal well drilling operations consist of silt, soil, rock cuttings, drilling muds with additives, oil, and associated wastewater. The Discharger disposes of all hazardous wastes associated with site preparation and operations into an appropriate offsite Class I Solid Waste Management Unit. The Discharger disposes of all non-hazardous drilling mud and cuttings associated with site preparation and operations in a Class II Waste Management Unit operated by the Discharger on property owned by the U.S. Department of the Interior, Bureau of Land Management, 55 Leslie Street, Ukiah, CA 95482 and in the Geothermal Drilling Mud and Cuttings Disposal Area Waste Management Unit located on property owned by Lakoma Fame Land Management, c/o Don Emerson, P.O. Box 69, Cobb, CA 95426, and Gordon D. Horner, 4025 Sears Road, Columbus, GE 31907. The Class II Waste Management Unit is regulated under Waste Discharge Requirements Order No. R1-2001-79.
2. The Discharger currently injects advanced treated tertiary wastewater from The City of Santa Rosa, LCSDSRWS disinfected secondary – 23 treated effluent and surface water from Clear Lake, surface water from local streams, and power plant gray water into the geothermal reservoir at The Geysers. The Discharger proposes to begin also injecting advanced treated tertiary wastewater from the City of Santa Rosa into the geothermal reservoir in the Aidlin field, following construction of a conveyance pipeline and injection network.

Geothermal Steam Condensate

1. The geothermal wells in The Geysers geothermal area produce dry steam. The Discharger transports this steam from the geothermal wells via large diameter insulated piping to 19 power plants operated by the Discharger both in the Region 1 and Region 5 portions of the Geysers property. At the power plants, the steam is directed through turbines to generate approximately 800 mega watts of electricity and is condensed to form geothermal steam condensate.

Existing on-site support facilities include administrative offices, warehouses, steam field repair and maintenance shops, drilling equipment storage yards, a geothermal steam and injection fluid pipeline system, and a road transportation system.

8. Geothermal steam condensate produced during geothermal power generation is known to contain ammonia, which can be toxic to aquatic life present in streams in the development area. The geothermal steam condensate is also known to contain boron that can be deleterious to irrigated agriculture located downstream of the development area. The steam condensate may also contain various other compounds and metals which have the potential to adversely impact surface water quality. Storm water runoff from the power plant site can also be toxic to aquatic life and it is contained onsite and injected back into the geothermal reservoir.
9. The Discharger meters, transports, and injects the geothermal steam condensate into the subsurface steam-producing geothermal reservoir. Geothermal steam condensate can also be used as a water source for drilling mud and other drilling related activities, earthwork compaction at the geothermal construction sites, and for fire protection.

Electrical Generation Attributed to Wastewater

10. The Geysers geothermal reservoir receives approximately 9.0 million gallons per day (mgd) from LCSDSRWS and 11 mgd from the City of Santa Rosa for a total of 20 mgd of treated wastewater. The Discharger estimates recovery rates could yield 246,000 kilowatt-hours (kWh) of electricity per million gallons of injected water. Using this relationship, The Geysers will generate 1,748,000,000 kWh of electricity per year attributed to wastewater. Comparing the 131,400,000 kWh energy consumption for the Geysers pump stations with the energy production results in a net energy gain of approximately 1,616,000,000 kWh per year.

Fluid Depletion of the Geothermal Reservoir and Power Plant Operations

11. Expanded geothermal development in The Geysers area has led to a steady rate of decline of geothermal reservoir steam pressures. This has led to a corresponding reduction of power plant operation and electrical generation. Only about 22-percent of the steam mass produced is recovered as geothermal steam condensate for injection back into the underlying geothermal reservoir. However, steam producers have found that managed injection of condensate and water from other sources can improve steam reservoir pressures, steam production, and hence electricity production.
1. Historically, without large quantities of available water supply for injection into the geothermal reservoir, Calpine experienced a substantial reduction of steam pressures in the geothermal reservoir supplying the power plants. During the mid-1990's concerns were raised regarding the future viability of the steam field for electrical generation. Concurrent with a decrease in steam pressure, steam quality decreased, with an increase in non-condensable gases placing an increasing burden on the air abatement systems. In addition, there were insufficient quantities of clean water to operate and cool the air abatement burner systems.

Aidlin Geothermal Project

2. Aidlin Power Plant initiated commercial electricity generation in 1989. From the time of initial startup of the power plant, until the year 2000, Calpine supplemented its injection fluids during the winter months with approximately 500-1000 gallons per minute (720,000 to 1,440,000 gallons per day (gpd)) of surface waters pumped from Alder Creek, in accordance with California Department of Fish and Game (CDFG) Streambed Alteration Agreements 942-94 and 943-94.
14. On August 18, 1997, the National Marine Fisheries Services listed steelhead trout (*Oncorhynchus mykiss*) as a threatened species. Subsequently, the CDFG identified Squaw Creek and its tributaries, including Alder Creek, as an important steelhead trout spawning area. As a result of this determination, Calpine was no longer allowed to extract water from Alder Creek.
15. Without the available surface water supply, Calpine substantially reduced the volume of injection into the steam fields, lacked adequate water to efficiently operate the condensation towers, and no longer had sufficient quantities of clean water to operate and cool the air abatement burner systems. Consequently, steam pressures in the geothermal reservoir supplying the Aidlin Power Plant have dropped to the point where future viability of the Aidlin Power Plant for electrical generation beyond the year 2005 is in question.
16. The Discharger is proposing to construct a new 18,000 linear-foot aboveground steel pipeline to transport and use up to 1.44 mgd of advanced tertiary treated wastewater from the City of Santa Rosa. The 6 to 8-inch diameter pipeline will extend from the Abril 2 Geothermal Well Pad (injection well OF27 A-2) located in the main geothermal field to the nearby Aidlin geothermal field, Aidlin A Pad and will continue up the hill to the Aidlin Power Plant for use in the condensation towers and air abatement systems. The pipeline will provide a year-round water source to sustain the existing Aidlin Power Plant.
17. The discharger will construct the pipeline along segments of an existing private jeep trail known as Seven Mile Road and an unimproved hunting access road, as well as cross-country in two locations. The first cross-country section will traverse wildlands administered by the State Lands Commission, and the second area will cross Squaw Creek and will continue into the Aidlin geothermal project area. The pipeline will clear span Squaw Creek and no construction activities will occur in the creek. The pipeline will be anchored onto wooden or cast concrete sleepers, spaced every 20 to 30 feet, and staked in place. Pipeline installation will not require any grading, clearing, or grubbing.

**Injection of LCSDSRWS
Treated Wastewater**

18. The California Regional Water Quality Control Board, Central Valley Region, adopted Waste Discharge Requirement Order No. 96-166, which regulates the treated effluent from LCSDSRWS.
19. The Discharger, in partnership with LCSDSRWS and the Northern California Power Agency (NCPA), has constructed and successfully operated a pipeline to deliver a current makeup of 50-percent treated wastewater and 50-percent supplemental Clear Lake water for injection into the underlying geothermal reservoir in The Geysers). NCPA is responsible for the operation of the pipeline from the intake side of the pump station located at the intersection of Bear Canyon Road and Highway 175 (Point-of-Delivery) located in Region 5 to the pipeline manifold at NCPA's sedimentation basin located in Region 1. The Discharger, under this Order, is responsible for the operation of the pipeline from NCPA's sedimentation basin to the northwest in the geothermal field and branches thereto. The pipeline was upgraded in 2004 to a design capacity of 9.0 mgd, with approximately 1/3 of the recycled water injected into the geothermal reservoir by the Discharger in Region 5, approximately 1/3 of the flow is injected by NCPA in Regions 1 and 5, and approximately 1/3 of the flow is injected by the Discharger in Region 1, which is covered by this permit. NCPA currently injects recycled wastewater in compliance with Waste Discharge Requirements Order No. 97-44.
1. Currently, approximately 9.0 mgd of imported water from LCSDSRWS is injected into the geothermal reservoir. Of this, the Discharger is injecting approximately 3.0 mgd in the Units 18 and 20 areas located in Region 1. This treated wastewater is separated from tertiary treated wastewater using a triple valve system. The triple valve system consists of two manual gate valves with an automated control valve between the two gate valves. These valves will normally be in the closed position. The Discharger is not proposing to inject any of this water in the Aidlin steamfield area.

**Injection of the City of Santa Rosa,
Laguna Subregional Wastewater Treatment Plant's
Treated Wastewater**

21. North Coast Regional Water Board Waste Discharge Requirements Order No. R1-2000-03 is in effect for the City of Santa Rosa, Laguna Subregional Wastewater Treatment, Reuse, and Disposal facilities and operation of the pipeline including the Termination Reservoir. The wastewater treatment plant is designed to treat up to 21.3 mgd of wastewater to disinfected tertiary treatment standards and serves a population of 202,500 persons in the communities of Cotati, Rohnert Park, Santa Rosa, Sebastopol, and the unincorporated South Park County Sanitation District. Order No. R1-2000-03 also regulates existing irrigation of approximately 6,236 acres of urban and agricultural land and the

discharge to surface waters during the allowable discharge period (October 1 through May 14).

22. The City of Santa Rosa has entered into a contractual agreement with Geysers Power Company, LLC, which obligates the City to provide 4,015 million gallons of treated wastewater each year to Geysers Power Company, LLC. This translates to an average daily delivery of 11 mgd, with a range of between 9 and 12.1 mgd. The pipeline has a design capacity of 12.1 mgd, and an ultimate capacity of up to 19.5 mgd. The Discharger is responsible for the operation and injection of the treated wastewater into the geothermal reservoir once the water exits the Termination Reservoir discharge flange (Point-of-Delivery).
1. Union Oil Company of California, NEC Acquisition Company, and Thermal Power Company and the City of Santa Rosa have entered into a contractual agreement detailed in the *Construction and Operating Agreement Santa Rosa Geysers Recharge Project*, dated April 14, 1998 for activities that could affect water quality and distribution system performance in The Geysers in the event of a release. The Discharger is a successor to Union Oil Company of California, NEC Acquisition Company, and Thermal Power Company under Amendment No. 2 to Asset Purchase Agreement dated March 19, 1999. The *Construction and Operating Agreement Santa Rosa Geysers Recharge Project*, is the responsibility of the Discharger for the activities that could affect water quality and distribution system performance in The Geysers in the event of a release:
 - a. Geysers Power Company, LLC has agreed to construct the pipeline and related facilities from the Point-of-Delivery to The Geysers steamfield and The Geysers injection system.
 - b. Each party shall apply for and secure all necessary permits and licenses necessary for completion of its portion of the project.
 - c. Each party shall operate, maintain, and replace as necessary that portion of the project which it constructs.
 - d. The City has agreed to deliver the Annual Amount to the Point-of-Delivery, unless authorized by the Joint Oversight Committee.
 - e. Geysers Power Company, LLC has agreed to accept the Annual Amount of water at the point-of-delivery.
 - f. The water shall be treated to meet the requirements of the California Department of Health Services: Title 22 of the California Code of Regulations for tertiary wastewater treatment, or its substitute regulation.
 - g. If the water delivered by the City does not meet the requirements set forth in *Water Quality Standards for Geysers Power Company, LLC Acceptance and CITY Delivery*, Geysers Power Company, LLC may:
 - i) accept the water delivered;

- i) require the City to supply water exclusively from the Laguna Wastewater Treatment Plant which meets the requirement set forth in *Water Quality Standards for Geysers Power Company, LLC Acceptance and CITY Delivery* until the water quality problem is corrected; or
 - ii) reject the water reserving all remedies provided by this Agreement and by law.
- h. The Joint Oversight Committee shall be responsible for the periodic review and/or modification of the of the water quality parameters in *Water Quality Standards for Geysers Power Company, LLC Acceptance and CITY Delivery*. The Joint Oversight Committee shall establish sampling protocol.
- i. Both parties shall comply with all applicable federal, state, and local laws and the rules and regulations of any federal, state, local or other government agency having jurisdiction over the activities and operations conducted pursuant to this Agreement.

**LCSDSRWS and City of Santa Rosa,
Laguna Subregional Wastewater Treatment Plant Treated Effluent
and Handling Procedures**

24. LCSDSRWS produces disinfected secondary–23 treated effluent as defined by Title 22, Division 4, Chapter 3, section 60301.225 found in the California Code of Regulations and in compliance with Waste Discharge Requirements Order No. 96-166 issued by the California Regional Water Quality Control Board, Central Valley Region. The City of Santa Rosa, Laguna Subregional Wastewater Treatment Plant produces disinfected tertiary treated effluent as defined by Title 22, Division 4, Chapter 3, section 60301.230 found in the California Code of Regulations and in compliance with Waste Discharge Requirements Order No. R1-2000-03 issued by the California Regional Water Quality Control Board, North Coast Region. All recycled water will be used in compliance with Title 22, Division 4, Articles 3 and 4 in the California Code of Regulations. Reclaimed wastewater contact with the general public is highly unlikely because the public is excluded from The Geysers steamfield.

**Injection Well Regulation by the California Division of Oil, Gas, and
Geothermal Resources**

25. The California Division of Oil, Gas, and Geothermal Resources (DOGGR), District No. G3, Santa Rosa Office, under the authority of Title 14, Chapter 4, Subchapter 4 for State-Wide Geothermal Regulations, regulates geothermal and geothermal injection wells. Section 1724.6, Article 3, Subchapter 1, Chapter 4, Title 14 requires all proponents of underground injection and disposal projects to submit project information to DOGGR for evaluation and subsequent approval. Specifically, DOGGR regulates the installation, conversion of geothermal wells, well use, injection reporting, and integrity testing and liquid monitoring of geothermal injection wells. This agency's primary responsibility for injection wells is to ensure the protection of all aquifers containing useable water and

surface water from contamination. This Order allows discharge only to injection wells that have received approval from DOGGR.

Steamfield Injectate Distribution System

26. The Discharger is responsible for the operation and maintenance of an injectate (effluent) distribution system from the Termination Reservoir at the top of Pine Flat Road to the injection wells (see Attachment "2"). The recycled water distribution system consists of 21 miles of 6 to 36-inch diameter pipeline, a pump station to elevate the water to higher elevations in The Geysers, a one million gallon storage/surge protection tank, and approximately 38 existing injection wells. In addition, the LCSDSRWS pipeline is connected to the pipeline carrying Santa Rosa's treated wastewater using a triple valve system to maximize flexibility for recharge. However, these valves will normally be closed to avoid mixing of the two treated water systems.
27. Geothermal reservoir conditions constantly change and the use of geothermal wells for injection depends on many variables. Depending on maintenance schedules, power generation demands, well function, geothermal reservoir response, and many other variables, The Geysers distribution pipeline and injection system may distribute up to 16 mgd of treated effluent from the City of Santa Rosa, and 3.0 mgd from LCSDSRWS. Existing and proposed injection wells include but are not limited to:

Existing Injection Wells and Unit No.

Proposed Injection Wells and Unit No.

Aidlin8	1	CA 1862-6	3
Aidlin 11	1	CA 1862-6	3
CA 1862-16	3	GDC 8812	7&8
GDC 26	5&6	DX 5	7&8
GDC 53-13	5&6	OF 51B12	7&8
GDC 53A-13	5&6	OS 87A-2	7&8
GDC 88-12	5&6	LF 16	9&10
SB 15	5&6	DX 14	11
DX 10	7&8	DX 19	11
OS 3	7&8	OS 13	11
OS 21	7&8	CMHC 6	12
OF27 A-2	7&8	LF 03	12
OF 45A-12	7&8	GDC 19	14
OS 11	7&8	DX 45	17
LF 02	9&10	DX 48	17
LF 23	9&10	BEF 85A-28	18
LF 15	9&10	D&V 4	18
DX 61	11	GDCF 36-28	18
OS 12	11	GDCF 36-2	20
OS 16	11		
DX 19	11		
CMHC 2	12		

DX 26	12
DX 24	12
GDC 05	14
GDC 08	14
GDC 18	14
GDCF 117A-19	14
DX 72	17
DX 47	17
D&V 11	18
D&V 73-33	18
BEF 42B-33	20
GDC 17-28	20
GDC 21	20
GDC 36-28	20
GDCF 65-29	20

Project Summation and Purpose

28. The Discharger currently injects geothermal steam condensate and storm water, LCSDSRWS reclaimed disinfected secondary-23 treated wastewater, supplemental surface water from Clear Lake and local streams, an insignificant amount of power plant gray water, and City of Santa Rosa reclaimed disinfected tertiary treated wastewater into the geothermal reservoir for the beneficial purpose of improved steam reservoir pressures, steam production, and electricity production.

The Discharger proposes to construct and begin operating a pipeline to convey tertiary treated effluent from the main Geysers steamfield to the Aidlin steamfield area, and to inject this tertiary treated effluent into the Aidlin steamfield, in order to increase the steam (and, thus, electrical) generation capacity of this steamfield.

Site Description

1. The Geysers and Aidlin steamfield sites and surrounding areas are rural and are primarily used for geothermal steam and energy production and hunting. Vegetation consists of chaparral, oak woodlands, grassy, and coniferous forest areas. The area consists of steep northwest to southeast trending mountainous terrain ranging in elevation from 1,000 to 3,800 feet above sea level.
2. The steamfields receive approximately 60 inches of annual precipitation with some years exceeding 114 inches of precipitation. The area experiences several snowstorms each year. The area has received up to 18 inches of precipitation in a 24-hour period. Approximately 85-percent of the storm events occur between the months of November and April.
31. Geologic units within the steamfield areas include Quaternary alluvium, colluvium, and landslide deposits; and Late Jurassic to Late Cretaceous

Franciscan Complex. The Franciscan Complex is comprised of slightly metamorphosed, folded, faulted, and sheared greywacke, shale, conglomerates, chert, and metavolcanic rocks, as well as metamorphosed ultra-basic rocks consisting of serpentinite. The Franciscan Complex can be divided into the nonreservoir and reservoir rocks. The nonreservoir rocks have low porosity and permeability and are essentially nonwaterbearing. The reservoir rocks, with high temperature and high fracture permeability, are saturated with water and steam. A zone of nearly impermeable rock marks the transition zone between the nonreservoir and reservoir rocks. This zone has been postulated to cap the reservoir and serve as a barrier to reservoir recharge. Several areas within The Geysers have undergone hydrothermal alteration and minor mineralization.

32. Franciscan Complex rocks at The Geysers geothermal field have been intruded by a silicic batholith approximately two million years old, which trends northwest to southeast through the heart of the geothermal field. The depth to the batholith ranges from 3,000 feet to over 7,000 feet and slopes down to the northwest.
1. Several inactive northwest to southeast trending faults cut the area. Active regional faults outside the steamfield include the San Andreas, Rodgers Creek-Healdsburg, Maacama, and Big Valley and Collayomi Fault Zones approximately 30 miles, 11 miles, 6 miles, and 5 miles away, respectively. The Rogers Creek-Healdsburg and Maacama Faults could generate a magnitude 7 earthquake. The Big Valley and Collayomi Fault is smaller. The area is seismically active with numerous relatively small earthquakes (magnitude of less than 1 to 3) occurring on a daily basis related to the withdrawal of geothermal fluids and injection of fluids.

Surface Water

34. The area is within the Big Sulphur Creek and Squaw Creek watersheds of the Russian River Hydrologic Unit.
35. The beneficial uses of Squaw Creek and Big Sulphur Creek include:
 - a. domestic supply
 - b. agricultural supply
 - c. industrial supply
 - d. groundwater recharge
 - e. freshwater replenishment
 - f. water contact recreation
 - g. non-contact water recreation
 - h. sport fishing
 - i. warm freshwater habitat
 - j. cold freshwater habitat
 - k. preservation of areas of special biological significance
 - l. wildlife habitat
 - m. preservation of rare and endangered species
 - n. fish migration
 - o. fish spawning

36. The beneficial uses of the Russian River include:
- a. municipal and domestic supply
 - b. agricultural supply
 - c. industrial supply
 - d. groundwater recharge
 - e. freshwater replenishment
 - f. navigation
 - g. hydropower generation
 - h. water contact recreation
 - i. non-contact water recreation
 - j. sport fishing
 - k. warm freshwater habitat
 - l. cold freshwater habitat
 - m. preservation of areas of special biological significance
 - n. wildlife habitat
 - o. preservation of rare and endangered species
 - p. fish migration
 - gg. fish spawning
37. The Russian River has been included on the Clean Water Act section 303(d) list as an impaired water body due to excessive sediment and elevated water temperature. A Total Maximum Daily Load (TMDL) and Attainment Strategy has been scheduled for completion by the Regional Water Board in the Year 2011. The TMDL lists impairments of the beneficial uses for the Russian River and its tributaries and sets objectives and targets for the reduction of those impairments to the maximum extent possible. The intent of the TMDL is to restore, enhance, and protect the beneficial uses that are being impaired.

Groundwater

38. Beneficial uses of areal groundwaters include:
- a. domestic water supply
 - b. industrial supply
39. On May 19, 1998, the State Water Resources Control Board adopted Resolution No. 88-63, a Policy Entitled "Sources of Drinking Water," which states that all surface and groundwaters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply and should be so designated by the Regional Water Boards, with certain exceptions. For example, State Water Resources Control Board Resolution No. 88-63 provides for exceptions where the aquifer is regulated as a geothermal energy producing source or has been exempted administratively pursuant to 40 Code of Federal Regulations (CFR), section 146.4 for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR, section 261.3.

40. Primary shallow groundwater resources in The Geysers area occur as small, localized, perched aquifers in Franciscan Complex nonreservoir rocks and along slide planes in Quaternary landslide deposits. These waters express themselves as predominately low yielding springs and seeps of non-potable and potable water. The geothermal reservoir is located from approximately 1,500 to over 12,000 feet below ground surface, and contains hot, pressurized, highly mineralized, non-potable water, and steam.
41. The proposed Calpine design will have no impacts to groundwater from construction and operation of the distribution pipelines or the injection wells. No regional groundwater aquifers of significant yield have been reported in the Mayacamas Mountains near The Geysers. Available evidence indicates that groundwater in the volcanic rocks at Cobb Mountain does not mix with the groundwater from the steamfield. The contact between the Cobb Mountain volcanics and the Franciscan Complex is a planar surface sloping about 7 degrees to the northeast. Groundwaters flow along this contact surface over the nearly impermeable Franciscan Complex. A reservoir cap effectively seals the steamfield from the overlying groundwater. No further mixing is likely.
42. The Geysers injection wells take water under a vacuum at the wellhead. Water is piped to the injection well, and when entering the well typically falls thousands of feet down a steel cased well. Geothermal injection wells are cased to prevent well bridging due to formation sloughing. Additionally, the liquid water is heavier than the steam and will not rise to the surface until it flashes to steam. In addition, the California Division of Oil, Gas and Geothermal Resources regulations require that measurements be made in the injection wells to insure integrity of the casing and to measure the depth of the standing water level. This is to insure that water cannot flow from the injection well at depths shallow enough to affect groundwater resources.

California Environmental Quality Act Compliance

43. A joint Environmental Impact Statement and Environmental Impact Report (Lake County EIR) was prepared and certified by Lake County and the United States Bureau of Land Management on September 20, 1994, for modifications to be made to the LCSDSRWS, construction of the pipeline, and delivery of treated wastewater to the underlying geothermal reservoir at The Geysers to satisfy the requirements of the CEQA and NEPA. The Regional Water Board has considered the environmental effects of the quantity and distribution of Lake County wastewater at The Geysers as set forth in the EIR/EIS, including the following significant and/or potentially significant impacts on water quality:
 - a. Failure of the Geysers Effluent Pipeline could result in a spill of injection water and related wash-out at the discharge point.
 - b. The Geysers Effluent Pipeline could experience slow leaks that could contaminate local groundwater.

44. The following mitigation measures, which have either been required by Lake County or US Bureau of Land Management, addressed in the Central Valley Regional Water Quality Control Board's Waste Discharge Requirements Order No. 96-165, or required in this Order, will minimize the above-mentioned significant environmental impacts:
 - a. Impacts caused by failure of The Geysers Effluent Pipeline will be minimized through the use of isolation valves at approximately two mile intervals and at stream crossings, and automatic equipment to shut down pump stations in the event of pipeline failure. Impacts from failures will also be mitigated through compliance with effluent limits for the Southeast Regional Wastewater Treatment Plant effluent established in Waste Discharge Requirements Order No. 96-166, adopted by the California Regional Water Quality Control Board, Central Valley Region.
 - b. Groundwater contamination caused by slow leaks from the pipeline will be mitigated through compliance with effluent limitations contained in Waste Discharge Requirements Order No. 96-166, adopted by the California Regional Water Quality Control Board, Central Valley Region, and by prohibiting releases of injection water from the pipeline. Additionally, as part of the project, the Discharger proposes to encase the pipeline where its alignment passes within 100 feet of domestic wells.
45. For the injection of Santa Rosa's treated wastewater and the expansion of LCSDSRWS treated effluent discharge area, the City of Santa Rosa prepared, certified and adopted between July 31, 1996 through February 31, 2001, an Environmental Impact Report (Santa Rosa EIR) with 53 addenda. The addendum entitled *Santa Rosa Geysers Recharge Project, Calpine Addendum* (the Addendum) pertains to the Geysers Recharge Project in The Geysers and details the delivery of treated wastewater to the underlying geothermal reservoir to satisfy the requirements of the CEQA. The City of Santa Rosa adopted the Addendum on July 6, 2000. As stated in the Santa Rosa EIR, the project may have the following significant or potentially significant impacts on water quality:
 - a. Withdrawal and injection of fluids into the geothermal reservoir may lead to increased seismic activity in The Geysers steamfield.
 - b. The Geysers steamfield component may cause flooding due to rupture.
 - c. The Geysers Steamfield component could experience slow leaks that could contaminate local ground water.
46. The Regional Water Board has reviewed the Santa Rosa EIR and addenda, including the Addendum, and finds that the above-identified significant impacts will be mitigated to less than significant levels by the following mitigation measures, some of which have been incorporated into the project as a change or alteration or required by this Order.

- a. Prior to injection of reclaimed wastewater, the local seismic network will be maintained by Calpine and upgraded around wells proposed for injection. Additional seismic detection equipment with improved seismic software has been installed in Cobb and Anderson Springs. Injection will be adjusted to lessen seismic events and biennial reports will be produced containing planned operational responses.
 - b. Flooding impacts caused by failure of The Geysers effluent pipeline will be minimized through the use of isolation valves. Impacts from failures will also be mitigated through compliance with effluent limits for the City of Santa Rosa, Laguna Subregional Wastewater Treatment, Reuse, and Disposal Facilities established in Waste Discharge Requirements Order No. R1-2000-2, adopted by the California Regional Water Quality Control Board, North Coast Region.
 - c. Groundwater contamination caused by slow leaks from the pipeline will be mitigated by compliance with effluent limitations contained in Waste Discharge Requirements Order No. R1-2000-03, adopted by the California Regional Water Quality Control Board, North Coast Region, and by prohibiting releases of injection water from the pipeline.
1. For the expanded use of up to 1.4 mgd of Santa Rosa's treated wastewater in the existing Aidlin geothermal area and construction of a new 18,000-foot aboveground pipeline, the Sonoma County Permit and Resource Management Department (PRMD) prepared, certified, and adopted a Subsequent Mitigated Negative Declaration titled *Aidlin Recycled Water Pipeline* on May 25, 2005. The Sonoma County PRMD used the tiering concept and the Subsequent Mitigated Negative Declaration is tiered upon the Incremental Recycled Water Program (IRWP) Program Environmental Impact Report (PEIR) that the City of Santa Rosa certified in November of 2003. Santa Rosa also prepared an Addendum to the PEIR, which was certified and used to adopt the IRWP Master Plan in March of 2004. The Subsequent Mitigated Negative Declaration identified the following less than significant with mitigation incorporation or less than significant impacts on water quality:
 - a. Construction of the pipeline could have a substantial adverse effect on riparian habitat along Squaw Creek.
 - b. The pipeline could interfere with the movement of fish in Squaw Creek.
 - c. The project could violate water quality standards or waste discharge requirements.
 - d. The project could alter the course of a stream and result in on or off-site erosion and sedimentation.
 - e. Injection of treated water could result in strong seismic ground shaking.
 - f. Landslides in the area may damage the pipeline.

1. The Regional Water Board has reviewed the Subsequent Mitigated Negative Declaration and finds that the impacts will be mitigated to less than significant levels by the following mitigation measures, some of which have been incorporated into the project as a change or alteration or required by this Order.
 - . No construction will occur within the riparian zone. The pipeline will span the Squaw Creek and be lifted into place using a crane.
 - . Migratory salmonids are found in Squaw Creek. The project does not include any work within Squaw Creek and the pipeline will span the creek.
 - c. The North Coast Regional Water Quality Control Board will update Waste Discharge Requirements for the Aidlin Power Plant which covers the proposed project area. The water conveyed by the pipeline will be tertiary treated wastewater.
 - d. The project will not alter the existing drainage pattern on the site. The pipeline will span Squaw Creek without altering its channel or banks. Proposed construction will utilize Best Management Practices to reduce on or off-site erosion and sedimentation.
 - e. The IRWP EIR found that an increase in deep well injection from 11 to 25 mgd at the larger Geysers steamfield would likely increase the incidence of larger induced seismicity for earthquakes in the communities of Anderson Springs, Cobb and other small communities in Lake County. This project would not increase injections by 14 mgd, but would merely facilitate the injection of an additional 1.44 mgd at Aidlin, which is located at the western edge of The Geysers steamfield at a considerable distance from Anderson Springs, Cobb and other small communities in Lake County. It is predicted that the frequency of larger earthquakes in Anderson Springs, Cobb and other small communities in Lake County would minimally increase. However, these potential increases will have a less than significant induced seismicity impact with respect to these communities because of the low water volume and great distance from these communities. GPC shall reduce the effects of induced seismicity from injection at The Geysers steamfield to the extent feasible through determining which injection wells are more susceptible to felt induced seismicity. Injection at wells that produce felt induced seismicity will be decreased and injection will increase at injection wells located farther from residences and/or produce fewer seismic events. Success of redistribution of water and any other modifications in operations in reducing seismic events shall be continually evaluated so the program can become more effective.
 - f. The pipeline shall be installed on a sliding support and saddle system.

Notification

49. The Regional Water Board has notified the Discharger and interested agencies and persons of its intent to prescribe Waste Discharge Requirements for the discharge and has provided them with an opportunity to submit their written comments and recommendations.
50. The Regional Water Board, in a public meeting, heard and considered all comments pertaining to the discharge.

THEREFORE, IT IS HEREBY ORDERED that Order Nos. R1-2002-0014 and R1-2001-78 are hereby rescinded and that the Discharger, in order to meet the provisions of the Basin Plan, California Water Code and regulations adopted thereunder, shall comply with the following:

A. DISCHARGE PROHIBITIONS (INJECTION FLUIDS)

1. The discharge of any waste not specifically regulated by this Order is prohibited.
2. Creation of a condition of pollution, contamination, or nuisance, as defined by Section 13050 of the California Water Code (CWC), is prohibited.
3. The discharge of domestic waste, treated or untreated, to surface waters is prohibited.
4. The discharge of injection fluids (domestic waste, condensate, treated effluent) to soils, surface waters, or surface water drainage courses is prohibited. Injection fluids can be used for fire fighting and soil compaction.
5. The use of geothermal fluids for purposes other than those specified within this Order is prohibited. Specifically, the use of geothermal fluids on access roads, well pads, or other developed project locations for dust control is prohibited.
1. Effluent from the Lake County Special Districts, Southeast Regional Wastewater System shall be treated to the requirements of the California Department of Health Services: Title 22, California Code of Regulations for disinfected secondary-23 treated wastewater, or its substitute regulation.
7. Effluent from the City of Santa Rosa shall be treated to the requirements of the California Department of Health Services: Title 22, California Code of Regulations for disinfected tertiary wastewater treatment, or its substitute regulation.
8. The discharge shall be limited to injection into the geothermal reservoir except where the Executive Officer has approved other uses of recycled wastewater in compliance with Title 22, California Code of Regulations.
9. The Discharger may use alternate injection wells as it sees fit provided that DOGGR and/or BLM have approved the use of these wells and the Discharger has notified the Executive Officer.

B. DISCHARGE SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF THE GEYSERS AND AIDLIN DISTRIBUTION PIPELINE SYSTEM

All construction and maintenance activities shall comply with the following:

- a. All trench and/or excavation spoils shall be disposed of in stable areas as determined by a qualified engineer.
- b. All trench and/or excavation spoils shall be limited to inert materials that have not contacted geothermal solid or liquid wastes.
- c. All trench and/or excavation spoils shall be placed at slopes not to exceed 3:1.
- d. All construction and/or maintenance spoils shall be adequately protected from erosion using applicable Best Management techniques by no later than October 15th of each year and shall be maintained throughout the wet weather season.
- e. The Discharger shall implement appropriate Best Management techniques to control run-on to all construction and/or maintenance spoils by no later than October 15th of each year, and shall maintain these controls throughout the wet weather season.
- f. Total volume of disposed spoils shall be reported for each spoils disposal area.
- g. All disposal areas shall be located on a map.

C. GENERAL PROVISIONS

1. A copy of this Order shall be kept at the discharge facility for reference by operating personnel at all times. Key operating personnel shall be familiar with its contents.
2. Within six months of adoption of this permit, the Discharger shall submit in writing to the Executive Officer of the Regional Water Board (Executive Officer), a Spill Response, Monitoring, and Cleanup Plan addressing spills from The Geysers distribution pipeline.
3. In the event of overlap or conflict between Waste Discharge Requirements Orders Nos. 99-35, 95-5, and 95-6, this permit will regulate construction activities associated with road construction, drill site preparation, well drilling, well re-working, well abandonment, and modification to the wastewater injection distribution system; of any circulation loss during the construction of a well at depths less than 300 feet; monitoring of injection fluids and spills; and notification and reporting.

4. Severability

Provisions of these waste discharge requirements are severable. If any provision of these requirements is found invalid, the remainder of these requirements shall not be affected.

5. Operation and Maintenance

The Discharger shall maintain in good working order and operate as efficiently as possible any facility or control system installed by the Discharger to achieve compliance with the waste discharge requirements.

6. Change in Discharge

The Discharger shall promptly report to the Regional Water Board any material change in the character, location, or volume of the discharge.

7. Change in Ownership

In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the Discharger, the Discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be forwarded to the Regional Water Board:

- a. existence of this Order, and
- b. the status of the Discharger's annual fee account.

8. Vested Rights

This Order does not convey any property rights of any sort or any exclusive privileges. The requirements prescribed herein do not authorize the commission of any act causing injury to persons or property, nor protect the Discharger from his liability under federal, state, or local laws, nor create a vested right for the Discharger to continue the waste discharge.

9. Monitoring

The Discharger shall comply with the Contingency Planning and Notification Requirements Order No. 74-151 and the Monitoring and Reporting Program No. R1-2005-0070 and any modifications to these documents as specified by the Executive Officer. Such documents are attached to this Order and incorporated herein. Chemical, bacteriological, and bioassay analyses shall be conducted at a laboratory certified for such analyses by the State Department of Health Services.

- a. Order No. 74-151 requires immediate incident reporting of unintentional or accidental spills (including Emergency Response actions) and diligent action to abate the effects of the discharge. Written confirmation of the incident is required within two weeks of notification.

- b. General Monitoring and Reporting Provisions require sampling and analysis performance criteria in addition to compliance reporting criteria and timeframes.

10. Inspections

In accordance with provisions of Water Code section 13267(c), the Discharger shall permit authorized staff of the Regional Water Board:

- a. entry upon premises in which an effluent source is located or in which any required records are kept;
- b. access to copy any records required to be kept under terms and conditions of this Order;
- c. inspection of monitoring equipment or records; and
- d. sampling of any discharge.

11. Noncompliance

In the event the Discharger is unable to comply with any of the conditions of this Order due to:

- a. breakdown of waste treatment equipment;
- b. accidents caused by human error or negligence; or
- c. other causes such as acts of nature,

The Discharger shall notify the Executive Officer by telephone as soon as he/she or his/her agents have knowledge of the incident and confirm this notification in writing within two weeks of the telephone notification. The written notification shall include pertinent information explaining reasons for the noncompliance and shall indicate the steps taken to correct the problem and the dates thereof, and the steps being taken to prevent the problem from recurring.

12. Revision of Requirements

The Regional Water Board will review this Order periodically and may revise requirements when necessary.

Certification

I, Catherine Kuhlman, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, North Coast Region, on August 10, 2005.

Catherine Kuhlman
Executive Officer