

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ORDER NO. 90-106
NPDES NO. CA0029289

WASTE DISCHARGE REQUIREMENTS FOR:

U.S. DEPARTMENT OF ENERGY
and
LAWRENCE LIVERMORE NATIONAL LABORATORY
LIVERMORE, ALAMEDA COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region, finds that:

1. Lawrence Livermore National Laboratories (LLNL) operates a research facility under contractual agreements with the U.S. Department of Energy (DOE). LLNL and DOE are hereinafter both referred to as dischargers. For the purposes of this Order, DOE will be responsible for compliance in the event that LLNL fails to comply with the requirements of this Order.
2. By application dated April 27, 1990, the dischargers have applied for issuance of waste discharge requirements and a permit to discharge waste ground water under the National Pollutant Discharge Elimination System.
3. Hazardous materials have been used, stored, and disposed of on the property since it was first used by the federal government, in the 1940's as a Naval Air station, and later as a research facility for DOE and its predecessor, the U.S. Atomic Energy Commission.
4. Soil and ground water beneath the site are polluted with chemicals and solvents that have either current or historical usage onsite. These pollutants include trichloroethylene, 1,1,1-trichloroethane, tetrachloroethylene, 1,1-dichloroethylene, 1,1-dichloroethane, carbon tetrachloride and other halogenated and petroleum hydrocarbons.
5. Suspected sources of hazardous waste releases are from onsite landfills (a common means of disposing of waste during Navy use), spillage from outdoor storage facilities that existed throughout the site, leakage from underground storage tanks and pipelines, and past discharges to the LLNL storm drain system. Hazardous waste releases resulting from current research or maintenance activities is not presently ongoing.
6. More than 200 monitoring wells have been installed by the dischargers, both onsite and offsite. Ground water monitoring data indicate that ground water is polluted in several locations beneath the site and that a plume of polluted ground water extends offsite from the southwest, flowing in a northwesterly direction.
7. Volatile Organic Compounds (VOCs) in the ground water occur in large but relatively diffuse plumes that underlie about 85% of the LLNL site and cover a total of about 1.1 square miles. VOC plumes are about 30 to 100 ft thick and are rarely found below a depth of 200 ft. VOCs have migrated offsite in two areas, about 2,500 ft west of Vasco Road onto private property and about 800 ft south of the South East Corner Area onto DOE property used by Sandia Laboratories.

8. This permit covers several investigative and remedial activities that will generate polluted ground water as waste. These activities are proposed to be conducted in both onsite and offsite areas, and include:

Short Term Discharge

- a. Routine sampling -- 3 to 5 well bore volumes removed from monitoring wells prior to obtaining regular ground water samples for water quality analysis.
- b. Well development -- preparation of new monitoring wells.
- c. Hydraulic testing -- 1 hour to 2 day pump tests.

Long Term Discharges

- a. Pilot study pump test -- long term pump test to develop remedial design criteria.
- b. Remedial treatment -- subject to approval by EPA, but may consist of ground water extraction and treatment prior to discharge at effluent limitations set by this Order.

9. Waste generated from routine sampling, well development and hydraulic testing will reach maximum flows ranging from approximately 800 to 40,000 gallons per day (gpd). These activities will most likely occur on an intermittent basis, but if all three are conducted simultaneously, maximum flows may reach approximately 51,000 gpd.
10. Waste generated from the pilot study test discharge will be about 180,000 gpd and reach a maximum flow of 360,000 gpd when all three pilot systems are operating simultaneously. Of the 360,000 gallons, 144,000 will be discharged under separate Waste Discharge Requirements. When a permanent remedial alternative is selected by EPA, and if it consists of ground water extraction and treatment, remedial treatment may reach an anticipated maximum total flow of approximately 1,250,000 gallons per day.
11. Treated waste ground water will be discharged to the ground, to storm sewers which flow into Arroyo Seco or Arroyo Las Positas, or directly into the arroyos. When there is sufficient flow of storm water in the arroyos, treated ground water may flow through the Alameda Creek drainage and into San Francisco Bay north of the Dumbarton Bridge.
12. The portion of the Livermore-Amador Valley ground water basin which LLNL occupies, part of the Spring and Mocho I subbasins, is recognized as a ground water recharge area in the San Francisco Bay Basin Plan and in technical reports submitted by the dischargers. One goal of this Order is to maximize retention of discharged ground water within the Spring and Mocho I subbasins.
13. The dischargers are conducting studies to determine the rate or magnitude and locations of recharge which occur along Arroyo Seco and Arroyo Las Positas. A portion of the treated waste ground water that is discharged to the arroyos will recharge to the ground water system, but the effluent limits of this Order are anticipated to preclude adverse impacts on ground water in the Spring and Mocho I subbasins. The Board issued separate Waste Discharge Requirements (Order No. 88-075) for LLNL to operate percolation ponds. This allows for recharge to the ground water system of up to 144,000 gallons per day. The combined NPDES and percolation pond system will allow for complete recharge of effluent.

14. This Order will allow discharge of treated ground water either directly to the ground surface, or into the surface drainage system (surface drainage channels, storm drains, Arroyo Seco, or Arroyo Las Positas). Discharge from pilot study treatment systems will be allowed under this permit until a permanent remedial alternative is selected by EPA.
15. The Regional Board adopted a revised Water Quality Control Plan (Basin Plan) for the San Francisco Bay Region on December 17, 1986. The Basin Plan contains objectives and discharge prohibitions for the Livermore-Amador Valley and all of its subbasins.
16. The existing and potential beneficial uses for surface waters in the Livermore-Amador Valley ground water basin including Arroyo Mocho, Arroyo Seco, Arroyo Las Positas, Arroyo de la Laguna and their tributaries are:
 - a. Contact and non-contact water recreation,
 - b. Wildlife habitat,
 - c. Ground water recharge, and
 - d. Fish migration and spawning.
17. The existing and potential beneficial uses of the ground waters underlying the Livermore-Amador Valley ground water basins and its subbasins are:
 - a. Municipal and Domestic supply,
 - b. Industrial supply,
 - c. Industrial service supply, and
 - d. Agricultural supply.
18. The Basin Plan prohibits discharge of wastewater which has "particular characteristics of concern to beneficial uses":
 - a: "at any point where the wastewater does not receive a minimal initial dilution of at least 10:1 or onto any nontidal water, dead-end slough, similar confined water, or any immediate tributary thereof", and
 - b: "to Alameda Creek (watershed) when no natural flow occurs".
19. The Basin Plan allows for exemptions to the prohibitions referred to in Finding 18 above when it can be demonstrated that a net environmental benefit can be derived as a result of the discharge.
20. LLNL's discharge can be exempt from the Basin Plan prohibition because it is an integral part of a program to clean up contaminated ground water and thereby produces a net environmental benefit. Receiving water concentrations are expected to be below levels that would affect beneficial uses. Should studies indicate that chronic effects not currently anticipated, the Board will review the requirements of this Order based upon Receiving Water Limitations B.1.e.
21. The Basin Plan prohibits discharge of "all conservative toxic and deleterious substances, above those levels which can be achieved by a program acceptable to the Board, to waters of the Basin". The dischargers' ground water extraction and treatment system and associated operation, maintenance, and monitoring plan constitutes an acceptable control program for minimizing the discharge of toxicants to waters of the State.

22. Effluent limitations of this Order are based on the Basin Plan, State plans and policies, U.S. Environmental Protection Agency guidance, and best engineering and geologic judgment as to the best available technology that is economically achievable.
23. The issuance of waste discharge requirements for this discharge is exempt from the provisions of Chapter 3 (commencing with Section 21100) of Division 13 of the Public Resources Code (CEQA) pursuant to Section 13389 of the California Water Code.
24. The Board has notified the dischargers and interested agencies and persons of its intent to reissue waste discharge requirements for the discharge and has provided them with the opportunity for a public hearing and an opportunity to submit their written views and recommendations.
25. The Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED that the dischargers; in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, and the provisions of the Clean Water Act and regulations and guidelines adopted thereunder, shall comply with the following:

A. EFFLUENT LIMITATIONS

1. Any effluent discharged to the ground surface onsite shall:
 - a. not exceed 10,000 gallons per day,
 - b. be treated before discharge to meet concentrations of less than two times the action level for each compound specified by the California Department of Health Services, and
 - c. be less than 100 ppb of total volatile organic compounds
2. The effluent at the point(s) of discharge to Arroyo Seco, Arroyo Las Positas, surface drainage channels, and storm drains (as specified under Provision C.7 and C.8) shall not contain constituents in excess of the following:

Constituent	Units	Instantaneous Maximum
<u>Metals</u>		
Antimony	ug/l	1460
Arsenic	ug/l	20
Beryllium	ug/l	0.7
Boron	ug/l	7000
Cadmium	ug/l	5
Chromium +3	ug/l	2500
Chromium +6	ug/l	11
Copper	ug/l	20
Iron	ug/l	3000
Lead	ug/l	5.6
Manganese	ug/l	500
Mercury	ug/l	1
Nickel	ug/l	7.1
Selenium	ug/l	100

Silver	ug/l	2.3
Thallium	ug/l	130
Zinc	ug/l	58

Volatile Organic Compounds

Benzene	ug/l	0.7
Tetrachloroethylene	ug/l	4
Vinyl Chloride	ug/l	2

Total Volatile Organic Compounds	ug/l	5
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Total Volatile Organic Compounds include, but are not limited to:

Benzene, Bromoform, Carbon Tetrachloride, Chlorobenzene, Chlorodibromomethane, Chloroethane, Chloroform, 1,1-Dichloroethane, 1,2-Dichloroethane, Ethyl benzene, Tetrachloroethylene, Toluene, trans-1,2-Dichloroethylene, 1,1,1-Trichloroethane, Trichloroethylene, Trichlorofluoromethane, Xylene(s), Vinyl Chloride

Acid Extractable Organic Compounds

2,4-Dimethylphenol	ug/l	400
Phenol	ug/l	5
2,4,6-Trichlorophenol	ug/l	5

Base/Neutral Extractable Organic Compounds

1,2-Dichlorobenzene	ug/l	5
Naphthalene	ug/l	620
Phenanthrene	ug/l	5
Pyrene	ug/l	5

3. The pH of the discharge shall not exceed 8.5 nor be less than 6.5.
4. In any representative set of samples, the discharge of waste shall meet the following limit of quality:

TOXICITY: The survival of test fishes acceptable to the Executive Officer in 96-hour bioassays of the effluent as discharged shall be a median of 90% survival and a 90 percentile value of not less than 70% survival.

B. RECEIVING WATER LIMITATIONS

1. The discharge of wastes shall not cause the following conditions to exist in waters of the State at any place:
 - a. floating, suspended, or deposited macroscopic particulate matter or foam;
 - b. bottom deposits or aquatic growths;
 - c. alteration of temperature or apparent color beyond present natural background levels;
 - d. visible, floating, suspended, or deposited oil or other products of petroleum origin; and

- e. toxic or other deleterious substances to be present in concentrations or quantities which will cause deleterious effects on aquatic biota, wildlife, or water fowl, or which render any of these unfit for human consumption at levels created in the receiving water or as a result of biological concentrations.
2. The discharge of waste shall not cause the following limit to be exceeded in waters of the State in any place within one foot of the water surface:
 - pH: The pH shall not be depressed below 6.5 nor raised above 8.5, nor caused to vary from normal ambient pH levels by more than 0.5 pH units.
 3. This discharge shall not cause a violation of any applicable water quality standard for receiving waters adopted by the Board or the State Water Resources Control Board as required by the Federal Water Pollution Control Act and regulations adopted thereunder. If more stringent applicable water quality standards are promulgated or approved pursuant to Section 303 of the federal Water Pollution Control Act or amendments thereto, the Board will revise and modify this Order in accordance with the more stringent standards.

C. PROVISIONS

1. The dischargers shall comply with all sections of this Order immediately upon adoption. For the purpose of enforcing this Order, DOE shall be responsible for achieving full compliance with this Order within 60 days of the Executive Officer's determination that LLNL has failed to comply with the requirements of this Order.
2. The dischargers shall comply with the Self-Monitoring program as adopted by the Board and as may be amended by the Executive Officer.
3. Board Order No. 88-065 is hereby rescinded.
4. The dischargers shall notify the Board if the Self-Monitoring program results indicate, or if discharge or any activity (to include all site investigation activity) has occurred or will occur which would result in the discharge of any toxic pollutant which is not limited by this Order.
5. The dischargers shall identify and utilize treatment methods in addition, or as an alternative to, air stripping if effluent limits for metals, acid extractable organic compounds, and base/neutral extractable compounds, as stipulated in this Order, are exceeded.
6. Discharge of treated water ground water to the ground may occur only:
 - a. within LLNL legal site boundaries while conducting routine sampling, well development, or hydraulic testing,
 - b. if the total effluent volume does not exceed 10,000 gallons per day,
 - c. if the total VOC's in the discharge do not exceed concentrations of two times the action level for each compound specified by the California Department of Health Services, or does not exceed the limits under Effluent Limitation A.1, and

- d. in offsite areas while conducting routine sampling, well development, or hydraulic testing if it has been shown that the pumped water contains concentrations of VOC's less than those listed in Item A.2 and permission is obtained by the owners.
7. Discharge of treated waste ground water to the storm sewers may occur only:
 - a. within LLNL legal site boundaries,
 - b. in offsite areas if the discharge point to a waterway can be identified, and a receiving water sample point is established (if the new discharge point is downstream from all existing receiving water sample points) as discussed under item I.C., Part B, Self-Monitoring Program,
 - c. for any investigative or remedial activity that generates effluent at all volumes, and
 - d. if the discharge complies with all Effluent Limitations.
8. Discharge of treated waste ground water directly to Arroyo Seco and Arroyo Las Positas may occur:
 - a. in offsite or onsite areas,
 - b. for any investigative or remedial activity that generates effluent at all volumes, and
 - c. if the discharge complies with all Effluent Limitations.
9. Total discharge from all pilot study treatment systems shall not exceed about 360,000 gallons per day. Discharge from pilot studies will be allowed under this permit until a Record of Decision for final remediation has been reached
10. Effluent generated from Treatment System A shall not be discharged at any point of the arroyo that crosses or is upstream of the main body of the off site plume unless the channel is lined to prevent infiltration from the point of discharge downstream through the body of the plume. Discharge from Treatment System A will be managed under separate Waste Discharge Requirements.
11. Any discharge to a location other than the discharge point(s) specified in Provisions 6 through 8 of this Order, or discharge of any hazardous constituent, will require a modification to this Order or submission of a second NPDES application.
12. The dischargers shall comply with all items of the attached "Standard Provisions, Reporting Requirements, and Definitions" dated December, 1986 except items A.10, B.2, C.8, and C.11.
13. This Order expires August 18, 1995. The dischargers must file a report of waste discharge in accordance with Title 23, Chapter 3, Subchapter 9 of the California Administrative Code no later than 180 days in advance of such expiration date as application for issuance of new waste discharge requirements.

14. This Order is issued to the dischargers in support of investigation and cleanup activities undertaken pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act, as amended (CERCLA). Pursuant to CERCLA, all response actions taken by the dischargers must be consistent with all guidelines, rules, regulations, and criteria developed by the U.S. Environmental Protection Agency (EPA) pursuant to CERCLA. Issuance of this Order does not constitute approval by the State of California or EPA for any response activities. This Order is meant to facilitate the investigation of the extent of pollution, the evaluation of potential remedies, and the initiation of any selected remedy by specifying the manner in which waste ground water from monitoring well development and sampling, hydraulic testing, pilot studies, and from any selected remedy(s) may be discharged, contingent upon State of California and EPA approval of each specific action, as required by CERCLA and appropriate state law.
15. This Order shall serve as a National Pollutant Discharge Elimination System Permit pursuant to Section 402 of the Clean Water Act or amendments thereto and shall become effective 10 days after the date of its adoption provided the Regional Administrator, EPA, has no objection. If the Regional Administrator objects to its issuance, the permit shall not be effective until such objection is withdrawn.

I, Steven R. Ritchie, 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, San Francisco Bay Region, on August 15, 1990.



Steven R. Ritchie
Executive Officer

Attachments:

Standard Provisions & Reporting Requirements, Dec 1986
Self-Monitoring Program

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

SELF-MONITORING PROGRAM
FOR:

U.S. DEPARTMENT OF ENERGY

and

LAWRENCE LIVERMORE NATIONAL LABORATORY
LIVERMORE, ALAMEDA COUNTY

NPDES NO. CA0029289
ORDER NO 90-106

CONSISTS OF:

PART A, January 1987

and

PART B, Adopted August 15, 1990

PART B
U.S. DEPARTMENT OF ENERGY
and
LAWRENCE LIVERMORE NATIONAL LABORATORY
LIVERMORE, ALAMEDA COUNTY

I. DESCRIPTION OF SAMPLING STATIONS

A. INFLUENT

<u>Station</u>	<u>Description</u>
I-001	At a point in ground water extraction, collection and treatment, utilizing Treatment System A; immediately prior to treatment.
I-002	At a point in ground water extraction, collection and treatment, utilizing Treatment System B; immediately prior to treatment.
I-003	At a point in ground water extraction, collection and treatment, utilizing Treatment System C; immediately prior to treatment.
I-004 to I-XXX	At a point in ground water extraction and treatment that uses a single or multiple well treatment system, immediately prior to treatment. These points will be assigned by the dischargers to all monitoring or extraction wells for activities listed in Finding 8 of the Order when such activities are initiated. Once assigned, each number will be used in all future extraction events for the same well.

B. EFFLUENT

<u>Station</u>	<u>Description</u>
E-001	At a point in ground water extraction and treatment, using Treatment System A, immediately following treatment and prior to discharge to surface waters or drainage ways.
E-002	At a point in ground water extraction and treatment, using Treatment System B, immediately following treatment and prior to discharge to surface waters or drainage ways.
E-003	At a point in ground water extraction and treatment, using treatment System C, immediately following treatment and prior to discharge to surface waters or drainage ways.
E-004 to E-XXX	At a point in ground water extraction and treatment, using single or multiple well treatment systems, immediately following treatment and prior to discharge onto the ground, site storm drain systems, surface waters, or drainage ways. These points will be assigned by the dischargers to all monitoring or extraction wells for activities listed in Finding 8 and Provisions 5 to 7 when such activities are initiated. Once assigned, each number will be used in all future extraction events for the same well.

C. RECEIVING WATERS

<u>Station</u>	<u>Description</u>
R-001	At a point in the north flowing drainage ditch east of Vasco Road, between 50 and 100 feet downstream (north) from the effluent discharge point for Treatment System B.
R-002	At a point in Arroyo Seco between 50 and 100 feet downstream from the effluent discharge point for Treatment System C.
R-003 to R-XXX	At a point in Arroyo Las Positas, Arroyo Seco, or any surface drainage way between 50 and 100 feet from any effluent discharge point established by the dischargers.

II. SCHEDULE OF SAMPLING AND ANALYSIS

The schedule of sampling and analysis is provided in the attached Table 1.

III. MODIFICATIONS TO PART A

A. ADDITIONS

Add Section E.1.e.3) to read:

Stream gage height measurements and their conversion to stream flow measurements.

B. DELETIONS

Sections D.d.b., D.2.g., D.2.h., E.1.e.1), E.3., and E.4.

C. MODIFICATIONS

All items of Self-Monitoring Program Part A, dated January 1987 shall be complied with except for the following modifications:

1. Section D.2.a. shall be changed to read as follows:

Samples of effluent shall be collected on days coincident with effluent grab sampling unless otherwise stipulated. The Board or Executive Officer may approve an alternative sampling plan if it is demonstrated to the Board's satisfaction that expected treatment facility operating conditions warrant a deviation from the standard sampling plan.

2. Section D.2.e. shall be changed to read as follows:

If the instantaneous maximum limit is exceeded, the sampling facility shall be increased to daily until two samples collected on consecutive days show compliance with the instantaneous maximum limit.

Receiving water samples shall be collected at each station on each sampling day. Samples shall be collected within the discharge plume and downcurrent of the discharge point so as to be representative, unless otherwise stipulated.

4. In Section F.1., the phrase:

"... shall be maintained by the discharger and accessible (at the waste treatment plant) ..."

shall be changed to read as follows:

"... shall be maintained by the dischargers and accessible (at the dischargers' facility) ..."

5. Information requested in Section G.4.e. shall be prepared in a format similar to EPA form 3320-1 and shall be submitted to the EPA's Superfund Division Rather than the Enforcement Division.
6. The Annual Report required in Section G.5. shall be submitted in place of the end of the year monthly report.

I Steven R. Ritchie, Executive Officer, hereby certify that the foregoing Self-Monitoring Program:

1. Has been developed in accordance with the procedures set forth in this Regional Board's Resolution No. 73-16 in order to obtain data and document compliance with waste discharge requirements established in Regional Board Order No. 90-106,
2. Was adopted by the Board on August 15, 1990, and
3. May be reviewed at any time subsequent to the effective date upon written notice from the Executive Officer or request from the dischargers, and revisions will be ordered by the Executive Officer or Regional Board.



Steven R. Ritchie
Executive Officer

Attachments:
Table 1
Site Map

TABLE I (continued)
SCHEDULE FOR SAMPLING, MEASUREMENTS, AND ANALYSIS

Sampling Station	I001- I004- I003 IXXX		E001- E004- E003 EXXX		R001- R003- R002 RXXX								
	G	G	G	G	G	G							
Mercury (mg/l & kg/day)	I/S	I/S	I/S	I/S	I/S	I/S							
Nickel (mg/l & kg/day)	"	"	"	"	"	"							
Zinc (mg/l & kg/day)	"	"	"	"	"	"							
PHENOLIC COMPOUNDS (mg/l & kg/day)													
All Applicable Standard Observations			E	E	E	E							
Bottom Sediment Analyses and Observations													
Total Identifiable Chlorinated Hydrocarbons (mg/l & kg/day)													
EPA 601 (ug/l & kg/l)	W/M	W/M	D/W	D/W	D/W	W/M	W/M						
EPA 624 (ug/l & kg/l)	I/A*	I/A*	I/A*	I/A*	I/A*								
EPA 602 & 625 (ug/l & kg/l)	I/A	W/M	I/A	D/W	D/W	I/A	W/M						
Total Dissolved Solids & Chlorides (mg/l & kg/l)	Q	Q	Q	Q	Q	Q	Q						

* - When EPA 624 is performed, it is not necessary to perform EPA 601

LEGEND FOR TABLE

TYPES OF SAMPLES

- G = grab sample
- C-24 = composite sample - 24-hour
- C-X = composite sample - X hours
(used when discharge does not
continue for 24-hour period)
- Cont = continuous sampling
- DI = depth-integrated sample
- BS = bottom sediment sample
- O = observation

TYPES OF STATIONS

- I = intake and/or water supply stations
- A = treatment facility influent stations
- E = waste effluent stations
- C = receiving water stations
- P = treatment facilities perimeter stations
- L = basin and/or pond levee stations
- B = bottom sediment stations
- G = groundwater stations

FREQUENCY OF SAMPLING

- E = each occurrence
- H = once each hour
- D = once each day
- W = once each week
- M = once each month
- Y = once each year
- D/W = Daily for the first week, weekly thereafter
- W/M = Weekly for the first 4 weeks, monthly thereafter
- I/A = One sample during the first week of discharge, annually thereafter
- I/S = One sample during the first week of discharge, semi-annually thereafter
- 2/H = twice per hour
- 2/W = 2 days per week
- 5/W = 5 days per week
- 2/M = 2 days per month
- 2/Y = once in March and once in September
- Q = quarterly, once in March, June, Sept. and December
- 2H = every 2 hours
- 2D = every 2 days
- 2W = every 2 weeks
- 3M = every 3 months
- Cont = continuous

