U.S. Environmental Protection Agency Region 9

Draft Sampling and Analysis Plan

For

NPDES General Permit - CAG2800000
Compliance Monitoring
of
Offshore Oil Production Platforms
Outer Continental Shelf, Southern California

January 2016

Prepared For

USEPA Region 9, CWA Compliance & Permits Office, WTR-5

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1.0 INTRODUCTION

This sampling and analysis plan was prepared for the US Environmental Protection Agency Region 9 Compliance and Permits Offices (EPA) and describes the procedures for the collection, handling and analysis of produced water samples from offshore oil platforms that discharge in federal waters offshore of southern California. These facilities are regulated under a National Pollutant Discharge Elimination System (NPDES) General Permit CAG 280000 (Attachment A) and sample analysis is specified in the Final Modification to the General Permit (Attachment B) effective December 30, 2009.

A Memorandum of Agreement (MOA) between the U. S. Environmental Protection Agency (EPA) Region 9 and Department of the Interior, Bureau of Safety and Environmental Enforcement (BSEE), Pacific Outer Continental Shelf (OCS) Region establishes a cooperative effort by EPA and the Pacific OCS Region to monitor activities related to oil and gas exploration, development and production on OCS offshore of southern California. An annual work plan establishes the roles, responsibilities and the inspection and sampling activities to assess compliance with the National Pollutant Discharge Elimination System (NPDES) permit in place during Federal Fiscal Year 2016 (Attachment C).

Under this agreement BSEE is to collect produced water samples for the EPA to determine if contaminants exceed the NPDES permit limits. Samplers/inspectors from the EPA/BSEE will conduct annual compliance inspections and collect samples of produced water for chemical and toxicity testing as follows:

Description	Parameter
Six Platforms Discharging Produced Water	Oil and Grease, and other parameters by platform as set forth in Appendix C of General Permit No. CAG280000, and as modified on November 24, 2009
All Platforms Discharging Produced Water	Red abalone (larval development) toxicity testing
All Platforms	Records and equipment

The EPA Region 9 Laboratory will provide the sampling supplies and be responsible for both the chemical and toxicity testing. Staff from BSEE will collect and ship the samples to the EPA Region 9 Laboratory. The EPA Laboratory will either analyze or sub-contract the samples for analysis at another laboratory. Sampling will occur as weather permits throughout the year with coordination with the EPA Region Sample Control Coordinator for the toxicity testing and chemical analyses. Exact dates will be determined and based on access to transportation to and from the platforms (crew boats and helicopters), weather conditions, and the spawn cycles for

organisms used for toxicity tests. Sample analysis shall be scheduled at least once week in advance of collection.

The analytical results from all samples will be reported to the CWA Standards and Permits Office and BSEE to: 1) monitor permit constituents present in produced water, 2) determine the quantity of constituents in the produced water, 3) determine the toxicity of the produced water and drilling fluids and 4) determine compliance with current permits.

2.0 BACKGROUND

2.1 Location and Site Description

The offshore oil and gas facilities that discharge produced water in federal waters in southern California under this permit are listed in Table 4-1. Figures 2-1, 2-2 and 2-3 show the general location of the Outer Continental Shelf (OCS) platforms.

2.2 Operational History

The oil and gas facilities are authorized by EPA Region 9 to discharge waste to federal waters off southern California under NPDES Permit (CAG 2800000). The types of operations that currently occur include exploratory, production, and development operations. All facilities are involved in production, developmental drilling, well completion, and well treatment operations at some point during the operation at the oil platform. Production operations are those operations involving active recovery of hydrocarbons from production formations (and can include drilling of production wells once a hydrocarbon reserve has been defined). Development operations are those operations that are engaged in the drilling and completion of production wells. These operations may occur prior to or simultaneously with production operations.

The facilities are authorized to discharge 20 types of waste streams during normal operations. Produced water is the primary aqueous discharge, and it is discharged continually during production. Produced water is the water trapped within the petroleum-bearing formation that is brought to the surface during oil and gas production. This water is contaminated with petroleum and must be separated. Separation occurs with primary treatment by mechanical gravity separation and with secondary treatment by air or gas flotation.

2.3 Previous Investigations and Regulatory Involvement

The Federal Water Pollution Control Act of 1972, as amended by the Clean Water Act (the Act) of 1977 and the Water Quality Act of 1987 gives the EPA the authority to regulate the discharge of pollutants to waters of the United States. The Act

provides broadly-defined authority to: establish the NPDES Permit Program, define pollution control technologies, establish effluent limitations, and obtain information through reporting and compliance inspections, and take enforcement actions when violations of the Act occur.

Under Section 402 of the Act, dischargers of pollutants are issued permits that set specific limits and operating conditions to be met by the permit holder. Section 308 authorizes inspections and monitoring to determine whether NPDES permit conditions are being met. The Section provides for self-monitoring and EPA monitoring. EPA monitoring may consist of evaluating the self-monitoring or conducting monitoring independently.

According to the Act, EPA may conduct an inspection whenever there is an existing NPDES permit, or where a discharge exists or is likely to exist and no permit has been issued. In 1989, a Memorandum of Agreement work plan (MOA) between the U.S. EPA Region 9 and BSEE was formed to authorize BSEE and EPA to conduct routine monitoring of California OCS oil and gas production facilities. Under this agreement, either BSEE or EPA staff have collected produced water samples and drilling mud samples annually from various operating oil platforms from 1990-2013 (except for 1996). Produced water samples have been analysed for various organic and inorganic compounds in the oil platforms NPDES permits, including oil and grease, total phenolic compounds, and metals. Drilling mud samples have been analysed using acute mysid toxicity tests. Results from these sampling inspections have been used to determine if the facilities were in compliance with the limits specified by the NPDES permit. In September 1999, samples were first collected for aquatic toxicity tests, using red abalone.

General Permit CAG280000 (Attachment A) became effective in December of 2004 for all offshore oil platforms that discharge in federal waters in Region 9. All parties involved (e.g. California Coastal Commission, environmental groups, County of Santa Barbara, USEPA, BSEE) approved and the permit is published in the Federal Register. The general permit included a provision for a reasonable potential study. Results of this study are included in the Final Permit Modification effective December 2009 (Attachment B).

3.0 SAMPLING LOCATIONS

BSEE decides which platforms to sample and when with input from the CWA Compliance Office. BSEE will travel to the platforms via helicopter or crew boat depending on weather conditions; perform the records and visual inspections, as well as collect, pack and ship produced water samples. The sampling schedule will remain unannounced to the offshore oil platform permit holders. All oil platforms have a produced water discharge sampling point, which is a spigot line after the separation process. BSEE will sample at each facility's designated NPDES sampling point.

4.0 RATIONALE FOR ANALYSIS

The analysis required for each OCS platform as a result of the reasonable potential study is presented in the Final Permit Modification effective December 2009 (Attachment B). Table 4-1 identifies the analytes, chemical preservatives, container, number of containers necessary to samples each platform.

5.0 REQUEST FOR ANALYSIS

The EPA Region 9 Laboratory, Richmond, CA will perform all analyses except for oil and grease and drilling mud toxicity. Oil and grease analyses will be performed by C&T Berkeley, California and the Drilling Fluid Toxicity, will be performed by Aquatic Bioassay & Consulting Laboratories, Inc.., Ventura, California. Both the Region 9 Laboratory and C&T are certified under the National Environmental Laboratory Accreditation Program for the 2016 calendar year for the requested chemical testing. ABC Laboratories is certified by the California State Environmental Laboratory Accreditation Program for the requested testing biological toxicity testing until August of 2016.

Quality Assurance Manuals and Standard Operating Procedures for all laboratories are available from the EPA Region 9 Quality Assurance Officer upon request upon request. Sample collection may occur throughout the year as inspections are unannounced. Specific collection dates will vary as, weather conditions, access to transportation (helicopter or boat) and platform operations further impact the schedule.

5.1 Chemistry

BSEE will collect produced water samples at six offshore oil platforms. A single grab sample will be collected for each parameter, not including QC samples. Samples for chemical testing should be shipped the same day whenever possible, but may be held overnight when refrigerated to 4°C ± 2°C when necessary. Table 4-2 identifies the method of analysis, standard operating procedure, method detection limits, reporting limits and permit limits for each analyte by platform.

5.2 Biology

5.2.1 Produced Water

Since the permit limit (action level) is applicable after dilution at the edge of the 100 meter mixing zone, each facility has a different dilution factor which is determined by methods in Appendix A of the permit using discharge parameters that are representative of normal activity. The dilution factor will be based upon platform-specific discharge parameters in the prior quarter.

Produced water toxicity testing will occur according to EPA Region 9 Laboratory SOP#1004 for red abalone larval development. Produced water samples will be taken at each offshore oil platform actively discharging once in 2014. A grab sample will be collected for the toxicity analysis as specified in the permit. Samples should be placed on ice and shipped the same day as collected for priority overnight delivery. Scheduling for abalone toxicity tests must be a minimum of 1 week in advance to ensure the availability of abalone, and the relatively short sample hold time (36 hours).

5.2.2 Drilling Fluids

Drilling fluids/mud acute mysid toxicity testing will be performed in accordance with 40 CFR Appendix 2 to Subpart A of Part 435 Drilling Fluid Toxicity, by a subcontract lab. Drilling fluids/mud samples will be taken by BSEE as opportunity presents throughout the year. A grab sample will be collected for as specified in the permit. A single 500 mL aliquot of sample is sufficient for analysis. Samples shall be maintained refrigerated prior to testing and shipped to the laboratory as soon as possible.

6.0 SAMPLE COLLECTION AND ANALYSIS

6.1 Sample Collection

The produced water samples will be taken at each facility's designated discharge sampling point. This is the point in the discharge subsequent to all treatment processes and prior to entry into the Pacific Ocean. The sampling point is a typically a spigot in the pipe leading from the treatment process. All samples will be collected as discrete samples. Discrete (grab) samples are defined in the NPDES permits as an individual sample collected in less than 15 minutes. Prior to collecting a sample, the sampler will confirm that the produced water discharge location is actively discharging. Occasionally, production is shut down and it is important to check in with the Head Operator of the facility to confirm that conditions are representative of the nature of the discharge. After confirmation of normal operations, the sampler will open the NPDES sample point to allow it to purge for 1-2 minutes prior to sampling. All sample containers will be placed directly into a cooler with ice except when too hot to place on ice without breakage. Given the highly buffered nature of the matrix and the potential for off-gassing, all necessary chemical preservation will be performed in a hood upon receipt at the Region 9 Laboratory.

6.1.1 Organic Analyses

Oil and grease samples are collected in two (separate) 500 mL glass jars, filled to near the top allowing some headspace for acidification with hydrochloric acid to a pH < 2, capped and chilled to 4°C with ice. Polynuclear aromatic hydrocarbons (PAHs) are also collected two (separate) 500 mL glass jars, filled to near the top allowing

some headspace for shipping. No chemical preservation is necessary for PAHs, just chill to 4°C with ice and ship to the laboratory for overnight delivery as soon as possible. Volatile organic compound (VOC) samples will be collected in 3 separate 40 mL vials. The VOA vials will be filled without visible headspace; however, the produced water temperature may be high during collection, and form air bubbles during cooling. Each vial will be checked for air bubbles by slapping it inverted against the palm of the hand. If air bubbles can be seen, the sampler will refill another vial. No chemical preservation is performed on the VOC sample as it will effervesce and release VOCs. Just chill to 4°C with ice, and ship to the laboratory for overnight delivery.

6.1.2 Inorganic Analyses

Ammonia samples will be collected by filling a 250 mL polyethylene bottle with sample and preserving with concentrated H_2S0_4 to pH < 2, and chilled to 4°C. Sulfide samples will be collected by filling a 500 mL polyethylene bottle and adding 1 mL of 2N zinc acetate, mixing (cap and invert 3 times) and then adding NaOH to pH > 9, and chilled to 4°C. For metals, a 500 mL polyethylene bottle will be filled, leaving enough airspace for preservation. The sample bottles will be preserved with concentrated (Trace metal grade) nitric acid to a pH < 2. The following metals will be analysed: arsenic, cadmium, copper, lead, manganese, mercury, nickel, selenium, silver, and zinc. Samples shall be shipped to the laboratory on ice as soon as possible for overnight priority delivery whenever possible.

6.1.3 WET Toxicity Samples

For whole effluent toxicity (WET) tests, red abalone larval development, two 40 mL glass VOA vial will be filled with produced water at each platform. The VOA vials will be sealed in a manner so as to reduce air bubbles; however, the produced water temperature may be high during collection, and form air bubbles during cooling. Each vial will be checked for air bubbles by slapping it inverted against the palm of the hand. If air bubbles can be seen, the sampler will refill another vial. Keep samples chilled with ice immediately after collection and during all stages of transport.

6.1.4 Drilling Fluid Samples

For acute mysid toxicity testing on drilling fluids/mud, one 500 mL wide mouth glass jar should be filled with minimal headspace. Keep samples chilled with ice immediately after collection and during all stages of transport.

6.2 Quality Control Samples

For chemical testing, BSEE will collect double volume for laboratory quality control sample (QC) purposes once for every 20 samples collected. BSEE staff will determine where (what platforms) QC samples will be obtained as the additional

volume, and weight are considerable when travelling by helicopter. The QC sample will be designated on both the bottles and in the chain-of-custody record. A temperature blank shall be included in each cooler to record the temperature upon receipt.

A field duplicate sample will be collected for each analysis type, at a frequency of one per ten platforms sampled. Again, BSEE staff will make the determination in the field as to the QC samples collected at which platforms based professional judgment. Duplicate samples shall be collected sequentially by test (i.e., PAH, PAH duplicate - metal, metal duplicate, sulfide, sulfide-duplicate etc.).

6.3 Sample Containers

Samples for organic chemical analysis (Benzene, PAH's and O&G) and toxicity are collected in glass jars, and samples for inorganic analyses (ammonia, metals, and sulfide) will be collected in polyethylene (plastic) containers. The size and specific bottle for each analysis is given in Table 4. The sample volumes for some tests are less than those typically recommended due to weight considerations when travelling by helicopter, and known historical sample excess from waste disposal at the Region 9 Lab. For whole effluent toxicity tests, red abalone larval development, 40 mL glass VOA vials will be filled with produced water at each of the platforms. For drilling mud toxicity test a 500 mL wide-mouth jar will be filled with minimal headspace. All sample bottles will be provided by the EPA Region 9 Lab and will be pre-cleaned and certified.

6.4 Equipment Decontamination

Since grab samples will be collected at all sites, it is not expected that sampling equipment will be needed. If sampling equipment is used, it will be decontaminated prior to transport to the field. The decontamination procedure to be used is as follows:

1. Wash with non-phosphate detergent.
2. Tap water rinse.
3. Deionized water rinse

6.5 Disposal of Contaminated Materials

Rags, gloves, and other solid materials that are used on-site will be collected in plastic trash bags and disposed of in accordance with all local, state, and Federal regulations. For this event, disposable material will be considered non-hazardous.

7.0 SAMPLE IDENTIFICATION, DOCUMENTATION PACKAGING AND SHIPMENT

7.1 Sample Identification

A sample label will be attached to each sample bottle. All information entered on the label will be in indelible ink. The following information will be recorded on the label:

1) Sample number;
2) Date of collection;
3) Time of collection;
4) Analysis requested;
5) Preservation;
6) Sampler

Multiple containers may be placed in a Ziplock® bag with a single custody seal affixed across the opening. All samples will be placed in a shipping cooler with double-bagged ice for transport to the laboratory. A chain-of-custody form will be prepared and delivered with the samples. The shipping coolers will also have a custody seal across the cooler opening prior to shipping.

7.2 Documentation

All sampling related activities conducted at each platform will be documented in field notebooks, and copies of these notes will be forwarded to the EPA. Field logbooks will document where, when, how, and from whom any vital project information was obtained. Logbook entries will be complete and accurate enough to permit reconstruction of field activities. Logbooks are bound with consecutively numbered pages. Each page will be dated and the time of entry noted in military time. All entries will be legible, written in black ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions or other terminology.

Chain-of-Custody records will be used to trace transport of the sample shipment container from the field to the laboratory. At a minimum, the following information will be recorded in the field notebook during the collection of each sample.

- Sample location and EPA sample number
- Corresponding split sample number
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or grab

- Type of sample (i.e., matrix)
- Type of sampling equipment used
- Field observations and details important to analysis or integrity of samples (e.g., heavy rains, odors, colors, etc.)
- Preliminary sample descriptions (e.g., for produced water: brown water with strong sulphur odor)
- Type(s) of preservation used
- Shipping arrangements (overnight air bill number)
- Recipient laboratory(ies)

In addition to the sampling information, the following specifics will also be recorded in the field logbook for each day of sampling:

- Location and number of any photos
- Time of site arrival/entry on site and time of site departure
- Complications encountered in sampling
- Other personnel on site
- Discussions with operators, or federal, state, or other regulatory agencies
- Deviations from sampling plan
- Changes in personnel and responsibilities as well as reasons for the changes

7.3 Packing and Shipment

OCS compliance samples should be packed prior to shipment using the following procedures:

1. Allow sufficient headspace in all bottles (except VOCs) to compensate for any pressure and temperature changes (`5 percent of the container volume).

2. Be sure the lids on all bottles are tight (will not leak).

3. Place bottles in bubble wrap and in separate and appropriately sized polyethylene bags and seal the bags.

4. Select a sturdy cooler in good repair. Secure and tape the drain plug with fiber or duct tape. Line the cooler with a large heavy duty plastic bag.

5. Place ice ("double bagged") in heavy duty polyethylene bags and properly sealed) on top of and/or between the samples. Fill all remaining space between the bottles with ice or inert packing material when necessary.

6. Securely fasten the top of the large garbage bag with custody tape.

7. Place the COC record into a plastic bag, and tape the bag to the inner side of the cooler lid.

8. Close the cooler and securely tape (with fibre tape) the top of the cooler shut. Chain-of-custody seals should be affixed to the top and sides of the cooler within the securing tape so that the cooler cannot be opened without breaking the seal.

9. A label containing the name and address of the shipper should be placed on the outside of the container. Labels used in the shipment of hazardous materials (e.g., Cargo Only Air Craft, Flammable Solids, etc.) are not required to be on the outside of containers used to transport these produced water samples.

10. **Notify the R9 Laboratory RSCC for each shipment (510-412-2389). Provide the the RSCC with your name, phone number, number of samples shipped and tracking number(s).**

    Produced water samples for toxicity analysis must be shipped for overnight delivery on the same day as collected or testing will not be performed. Produced water samples for chemical analysis and drilling fluids/muds for toxicity testing may be held in the field overnight under chain-of-custody, on-ice (if necessary) and shipped the following day. Ice should be refreshed prior to shipment when samples are held in a cooler overnight.

8.0 QUALITY ASSURANCE

To assure the quality of laboratory analyses the following quality control samples will be taken:

8.1 Field Duplicate: For chemical analyses, double volume will be collected once every ten samples, to assess sampling precision. The duplicate will be collected by filling both bottles for one analysis before filling the bottles for the next analysis. The duplicate will be assigned a unique sample number and sent "blind" to the lab.

8.2 Matrix Spike/Duplicate: For chemical analyses, double volume will be collected from one platform each year samples to assess matrix effects. This additional volume is for the laboratory to perform a matrix spike/matrix spike duplicate or duplicate analysis. It is a quality control check for the laboratory and will be labelled with the same sample number and have twice the number of containers. The chain-of-custody record will specify the sample designated for matrix/duplicate analysis.

8.3 Blanks: A trip blank (2 X 40 mL vial) will be placed in the cooler used to ship samples for volatile organics (i.e., benzene) in the cooler used for shipment to assess potential contamination during transport. Trip blanks will be provided by the Region

9 Laboratory. A temperature blank (vial filled with tap water) will be included in each shipping cooler to ensure that samples are shipped and received at a temperature 4 °C ± 2 °C.

8.4 Reference Toxicity

Each batch of produced water toxicity tests will be accompanied by a concurrent reference toxicity test. A reference toxicity test (positive control test) is a test conducted concurrently with a test on environmental samples to determine possible changes in condition of the test organisms and demonstrate a laboratory's ability to obtain consistent results with the test method. Reference toxicity tests are performed with known chemicals (in this case, zinc sulphate) in diluted seawater. One laboratory blank will be used in each reference and produced water toxicity test. These blanks (called negative control treatments) must consist of at least 5 replicates of dilution seawater (0.2 µm filtered natural seawater).

9.0 FIELD HEALTH AND SAFETY

The BSEE staff has their own site safety plan for Oil Platform sampling event. It is a separate document and can be requested from BSEE.

10.0 REFERENCES

USEPA, 1983. Methods for Chemical Analysis of Water and Wastes. EPA/600/4-79/020.

USEPA, 1993. Guidance on Evaluation, Resolution, and Documentation of Analytical Problems Associated with Compliance Monitoring. EPA 821-B-93-001.

USEPA, 1995. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms. EPA/600/R-95/136.

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Attachment A	NPDES General Permit CAG 2800000
Attachment B	Final Modification to NPDES General Permit CAG 2800000
Attachment C	EPA/BSEE Memorandum of Agreement (MOA), FY16 Workplan.

Figure 1-1 Santa Maria Platforms Map

Figure 1-2 Santa Barbara Platforms Map

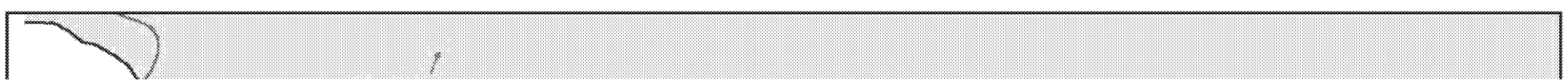

Figure 1-3 Long Beach/San Pedro Platforms Map

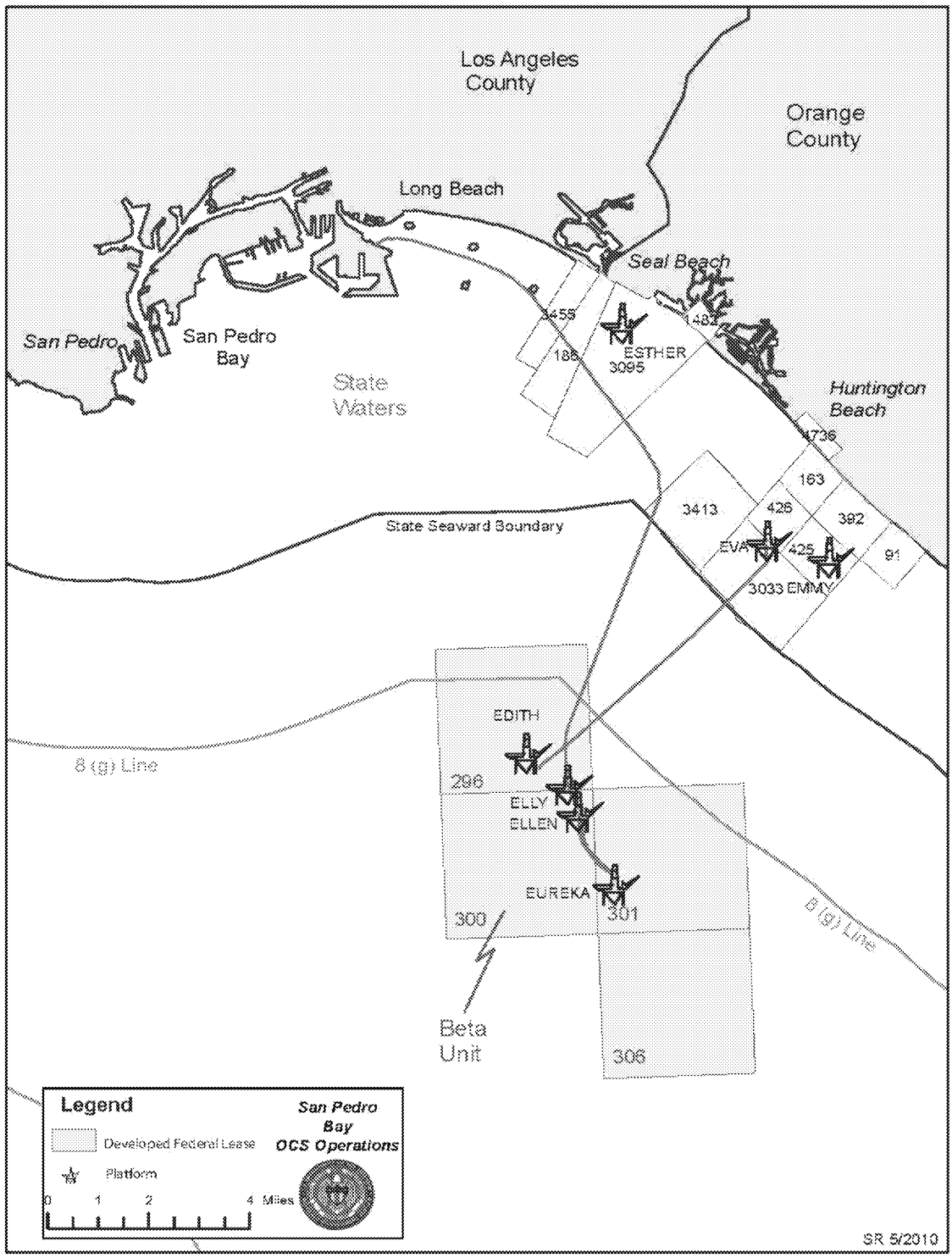

Table 4-1 Request for Analysis

#	Field Sample ID	Cr/Cu/Zn	Sulfide	Ammonia	VOCs	SVOCs	Oil & Grease	Toxicity
	Preservative	HNO_3 pH<2	1 mL ZnAc NaOH pH>9	H_2SO_4 pH<2	none	none	HCl pH>2	none
	Container	.25L poly	.5L poly	.25L poly	40 mL vial	.5L glass	.5L glass	40 mL vial
	#	1	1	1	3	2	2	2
	Holding time	6 months	14 days	28 days	7 days	7 days	28 days	36 hours
1	A	1				2	2	2
2	B					2	2	2
3	C						2	2
4	EDITH	1					2	2
5	ELLEN						2	2
6	ELLY		1		3	2	2	2
7	EUREKA						2	2
8	GAIL		1		3	2	2	2
9	GILDA	1	1			2	2	2
10	GINA	1		1		2	2	2
11	GRACE						2	2
12	HABITAT	1	1		3	2	2	2
13	HARMONY						2	2
14	HARVEST	1	1	1	3	2	2	2
15	HENRY						2	2
16	HERITAGE						2	2
17	HERMOSA	1	1		3	2	2	2
18	HILDAGO		1		3	2	2	2
19	HILLHOUSE					2	2	2
20	HOGAN	1			3	2	2	2
21	HONDO						2	2
22	HOUCHIN						2	2
23	IRENE						2	2
	Subtotal	**8**	**7**	**2**	**21**	**24**	**46**	**46**
	MS/MSD-01		Double volume from one of the 13 platforms above (N/A Toxicity)					
	Duplicate-02		Double volume from one of the 13 platforms above (N/A Toxicity)					
	TB-0X		One trip blank (set) for each day samples for VOCs are shipped					
	Total Containers	**10**	**9**	**8**	**25**	**26**	**50**	**NA**

Table 4-2 Reporting and Permit Limits (Chemistry)

Reporting Limit Permits Limit

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Reporting Limit Permits Limit

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Reporting Limit Permit Limit

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Attachment A NPDES General Permit CAG 2800000

Attachment B – NPDES General Permit CAG 2800000 – Final Modification

Attachment C – EPA/BSEE MOA Workplan