CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

Lahontan Regional Water Quality Control Board

March 8, 2016

John Phillips, Fleet & Facilities Director **CERTIFIED MAIL 7009 0820 0001 6630 3959**
Travel Systems, LLC
Aramark Sports and Entertainment Services, LCC
P.O. Box 12309
Zephry Cove, Nevada 89448
Phillips-john@aramark.com

The Corporation Trust Company of Nevada **CERTIFIED MAIL 7009 0820 0001 6630 3966**
Registered Agent
701 South Carson Street, Suite 200
Carson City, Nevada 89701

WITHDRAWAL OF ADMINISTRATIVE CIVIL LIABILITY COMPLAINT NO. R6T-2016-0006 AND ISSUANCE OF REVISED ADMINISTRATIVE CIVIL LIABILITY COMPLAINT NO. R6T-2016-0008 FOR ARAMARK – EL DORADO COUNTY, WDID NO. 6A091503011

I am withdrawing Administrative Civil Liability Complaint No. R6T-2016-0006, issued to Travel Systems, LLC, and Aramark Sports and Entertainment Services, LCC (collectively referred to as "Aramark" or "Discharger") on February 19, 2016. I am issuing a revised complaint which includes a revised civil liability methodology determination. The revised methodology adjusts the economic benefit, adjusting the recommended civil liability from $4,983.00 to $4,683.00.

Enclosed please find Administrative Civil Liability Complaint No. R6T-2016-0008 (Complaint) issued pursuant to California Water code section 13385, alleging violations by the Discharger of the *Water Quality Control Plan for the Lahontan Region*. The violations are the result of the unauthorized discharge of four gallons of hydraulic oil into Lake Tahoe on March 5, 2015. The Complaint proposes that the Regional Water Quality Control Board, Lahontan Region (Lahontan Water Board) assess an administrative civil liability against the Discharger in the amount of **$4,683.00** pursuant to California Water Code section 13385. Also enclosed is a Waiver of Hearing form for this matter.

Both Aramark and the Prosecution Team have agreed to continue following the Hearing Procedures that the Advisory Team issued on February 19, 2016, for Administrative Civil Liability Complaint No. R6T-2016-0006. Those procedures establish various deadlines for conducting a hearing at the May 11-12, 2016, Board meeting.

Unless waived, a hearing before the Lahontan Water Board or a Lahontan Water Board Hearing Panel (Hearing Panel) will be held on this Complaint pursuant to Water Code section 13323. At the hearing, the Lahontan Water Board will consider whether to impose administrative civil liability (as proposed in the Complaint or for a different amount), decline the administrative civil liability, or refer the matter to the Attorney General for judicial enforcement. Public hearing procedures for this matter are also enclosed. The public hearing procedures identify the type of information that must be submitted in preparation for the public hearing, identify the hearing participants, and explain how the public hearing will proceed.

The Discharger may contest the proposed administrative civil liability at the hearing or, in the alternative, may waive its right to the hearing. Should the Discharger choose to waive its right to a hearing, an authorized agent must sign the enclosed Waiver of Hearing form and return it to the Lahontan Water Board's South Lake Tahoe office by **5:00 p.m. on April 4, 2016**. If the Lahontan Water Board does not receive the waiver and full payment of the liability by this date and time, the matter will be heard before the Lahontan Water Board or a Hearing Panel within 90 days of the Complaint's issuance date. An agenda containing the date, time, and location of the hearing will be mailed to the Dischargers at least 10 days prior to the hearing date

If you have any questions regarding this matter, please contact Eric J. Taxer, Water Resources Control Engineer, at (530) 542-5434 (Eric.Taxer@waterboards.ca.gov) or Cathe Pool, Senior Water Resources Control Engineer, at (530) 542-5460 (Catherine.Pool@waterboards.ca.gov).

Lauri Kemper

Lauri Kemper, P.E.
Assistant Executive Officer

Enclosures:
1. Administrative Civil Liability Complaint No. R6T-2016-0008
2. Waiver of Hearing Form
3. Hearing Procedures
4. Public Participation Information Sheet

cc (with enclosure):

Regional Board Members
Patty Z. Kouyoumdjian, Executive Officer, Lahontan Regional Water Quality Control Board
Kim Niemeyer, Staff Counsel, State Water Resources Control Board, Office of Chief Counsel
John Prager, Staff Counsel, State Water Resources Control Board, Office of Enforcement
Laura Drabandt, State Water Resources Control Board, Office of Enforcement
Catherine Pool, Lahontan Regional Water Quality Control Board
Eric Taxer, Lahontan Regional Water Quality Control Board
Steve Sweet, Tahoe Regional Planning Agency
Ken Kasman, Tahoe Regional Planning Agency
Bob Hosea, California Department of Fish and Wildlife
Karen Bender, El Dorado County Department of Environmental Health
Krista Costantini, El Dorado County Department of Environmental Health
Jason Burke, Stormwater Program Coordinator, City of South Lake Tahoe
Dan Jack, Ski Run Marina
Elie Alyeshmerni

EJT/ma/T: Tahoe Queen, RE-ISSUED ACL Complaint Cover Letter, 2016-03-03 EJT
File Under: 6A091503011

ENCLOSURE 1

STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

In the Matter of:	**COMPLAINT NO. R6T-2016-0008 FOR ADMINISTRATIVE CIVIL LIABILITY**
ARAMARK SPORTS AND ENTERTAINMENT SERVICES, LLC, and TRAVEL SYSTEMS, LLC	
WDID No. 6A091503011	

ARAMARK SPORTS AND ENTERTAINMENT SERVICES, LLC, AND TRAVEL SYSTEMS, LCC ARE HEREBY GIVEN NOTICE THAT:

1. As a result of a hydraulic oil spill into Lake Tahoe from the Tahoe Queen vessel, which occurred on March 5, 2015, Aramark Sports and Entertainment Services, LLC and Travel Systems, LLC (collectively referred to as "Aramark", or Discharger") are herein alleged to have violated provisions of California Water Code section 13385, subdivision (a), for which the California Regional Water Quality Control Board, Lahontan Region (Lahontan Water Board) may impose administrative civil liabilities pursuant to Water Code section 13385, subdivision (c). This Administrative Civil Liability Complaint (Complaint) is issued under authority of Water Code section 13323.

2. Unless waived, a hearing on this Complaint will be held before the Lahontan Water Board on May 11-12, 2016, at 971 Silver Dollar Avenue, South Lake Tahoe, California. At the hearing, the Lahontan Water Board will consider whether to affirm, reject, or modify the proposed civil liability, or refer the matter to the Attorney General's Office for recovery of judicial liability. The Discharger or its representative will have an opportunity to be heard and to contest the allegations in this Complaint and the imposition of civil liability. An agenda for the meeting will be available at http://www.waterboards.ca.gov/lahontan/board_info/agenda.shtml not less than 10 days before the hearing date.

3. The Discharger can waive its right to a hearing to contest the allegations contained in this Complaint by submitting a signed waiver and paying the civil liability in full or by taking other actions as described in the attached waiver form. If this matter proceeds to hearing, the Lahontan Water Board's Prosecution Team reserves the right to seek an increase in the civil liability amount to cover the costs of enforcement incurred subsequent to the issuance of this Complaint through hearing.

FACTUAL BASIS FOR THE ALLEGED VIOLATIONS

4. The Discharger owns and operates the Tahoe Queen vessel, located at Ski Run Marina in South Lake Tahoe, California. A location map is provided in Attachment A to this document.

5. On March 5, 2015, Lahontan Water Board staff received a complaint of an oily substance within the waters of Lake Tahoe along the west side of Ski Run Marina. The complainant's dog was in the water, and upon returning home, the complainant discovered an oily substance was coating the dog. When the complainant returned to the marina to identify a potential source of the oily substance, she observed an oily and greasy-to-the-touch sheen on the water where the dog had been. The complainant reported her observations to the California Department of Emergency Services (Cal OES) at 9:11 p.m. that evening, and Cal OES subsequently forwarded the report to the Lahontan Water Board in addition to other agencies [see Attachment 5 to the Administrative Civil Liability Methodology Document, attached to this Complaint].

6. The following day on March 6, 2015, at 10:30 a.m., City of South Lake Tahoe stormwater program staff inspected the City's outfall pipes within the Ski Run Marina area in response to the report filed with Cal OES. City staff did not observe any signs that an oily substance had been discharged from their storm water collection and conveyance system. They did observe an oily sheen on the water within the Ski Run Marina and outside the marina along the shoreline near the Tahoe Queen vessel. Between 10:30 and 10:40 a.m., City staff observed the Discharger's staff deploying absorbent material on board the Tahoe Queen vessel and in the lake area around the vessel. Photographs provided by City staff indicate that the oil sheen was located on the shoreline to the west of the marina, consistent with the oil sheen reported by the complainant to Cal OES on March 5, 2015 [see Attachment 6 to the Administrative Civil Liability Methodology Document, attached to this Complaint].

7. At 11:49 a.m. on March 6, 2015, Mr. Joao Rodriguez (Discharger's Marina Manager) notified the Cal OES that a hydraulic hose leaked oil onto the Tahoe Queen vessel and into the waters of Lake Tahoe at Ski Run Marina. Mr. Rodriguez stated that the cause of the leak was unknown at the time, but that a boom and absorbent pads were placed around the Tahoe Queen vessel to contain and clean up the discharge.

   At 12:01 p.m., Mr. John Phillips, the Discharger's Fleet and Facilities Director, provided an update to Cal OES stating that the total volume released was approximately 10 gallons, of which approximately 5 gallons had been discharged into Lake Tahoe (these estimates were later revised to 9 gallons released, of which 4 gallons had been discharged into Lake Tahoe). Mr. Phillips stated that cleanup was in progress. Mr. Phillips reported the time of the discharge to have occurred at 9:30 am on March 6, 2015.

8. El Dorado County Department of Environmental Health inspected the site the morning of March 6, 2015. Mr. Curtis Kiesel from the El Dorado County Department of Environmental Health provided an additional update to Cal OES at 12:30 pm, stating that the Discharger was placing a boom around the sheen, and that the California Department of Fish and Wildlife were collecting water samples. Mr. Kiesel added that the extent of the sheen was unknown at the time, but that the sheen appeared to have blown towards the marina.

9. The Discharger submitted a spill report to the Lahontan Water Board on March 16, 2015, and provided supplemental information to the spill report March 24, 2015. The following facts were provided in the spill report.

   a. Maintenance activities on the Tahoe Queen vessel's paddlewheel had been occurring prior to the discharge event. A contractor for the Discharger, Advanced Marine, was conducting the maintenance. The contractor disconnected the hydraulic lines, but the lines were not adequately capped per industry standard (i.e., steel caps). The contractor capped the lines using only plastic and duct tape to prevent dust and water from entering the lines. The contractor did not create a pressurized seal to prevent oil from spilling from the lines because the contractor believed the engine was static and would not be started.

   b. On March 5, 2015, at approximately 4:30 p.m., the Discharger's staff (associated with another vessel, the Paradise) conducted a routine weekly inspection of the Tahoe Queen vessel. The routine inspection typically includes engine startup to prevent carbon buildup. The Discharger's staff involved with the weekly inspection did not know that the hydraulic lines were still undergoing repair at the time of the weekly inspection.

   c. As a result of engine startup during the weekly inspection, approximately nine gallons of hydraulic oil was spilled onto the rear deck of the Tahoe Queen vessel. Over five gallons of the spilled oil were recovered, and four gallons were released into Lake Tahoe.

   d. The hydraulic oil used is a highly refined mineral oil, as noted on the material safety data sheet submitted March 16, 2015.

   e. The spill was not observed by the Discharger's staff until 9:45 a.m. the following morning, March 6, 2015. The spill was discovered by Joao Rodriguez after being notified by Ski Run Marina staff of an oily sheen on the waters in and around the marina. Mr. Rodriguez determined the source of the discharge to be from maintenance activities on the Tahoe Queen.

   f. The Discharger deployed spill containment booms and reported the spill upon observation of the discharge on March 6, 2015. The material was substantially cleaned up by March 7, and the results of water samples collected on March 10, 2015, verified no detectable concentrations of oil remained in the marina area.

   g. The Tahoe Queen repairs were completed on March 12, 2015.

   h. Aramark employees who perform servicing or maintenance on equipment are required by company policy to have lock-out/tag-out training. The Discharger's March 24, 2015 report indicates that this training may not have been provided to its employees working on the Tahoe Queen. The report did not indicate that its contractor had lock-out/tag-out training, nor did it indicate that such protocols were implemented.

10. The California Department of Fish and Wildlife collected two water samples on March 6, 2015. The sample locations were at the west end of Ski Run Marina and within the middle of Ski Run Marina. The analyses were completed on March 30, 2015, and confirmed the presence of petroleum hydrocarbons (sample analysis conducted only for confirmation, not for concentration values).

11. The Lahontan Water Board issued a Notice of Violation and Investigative Order No. R6T-2015-0029 to the Discharger on June 19, 2015. The Order required the Discharger to submit information regarding the cost to properly seal the hydraulic lines, a standard operating procedure specific to boat maintenance activities at Ski Run Marina, the cost for developing the standard operating procedure document, documentation that all of the Discharger's employees and contractors performing operation and maintenance activities on the Tahoe Queen have received lock-out/tag-out training and/or refresher training, and any additional information to assist the evaluation of the nature, circumstances, extent, and gravity of the violations. The Discharger complied with the Order on August 28, 2015. The information provided was used to assess the proposed civil liability (see Attachment B, Administrative Civil Liability Methodology).

APPLICABLE PROHIBITIONS AND REQUIREMENTS

12. Section 301 of the Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. § 1311) and Water Code section 13376 prohibit the discharge of pollutants to waters of the United States except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit.

13. The Lahontan Water Board adopted the *Water Quality Control Plan for the Lahontan Region* (Basin Plan) pursuant to Water Code Section 13243. The Basin Plan contains the following prohibitions:

    "Waters shall not contain oils, greases, waxes or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect the water for beneficial uses." [Basin Plan, Chapter 5.1]

    "The discharge of treated or untreated domestic sewage, garbage or other solid wastes, or any other deleterious material to the surface waters of the Lake Tahoe Basin is prohibited." [Basin Plan, Chapter 5.2]

    "The discharge, attributable to human activities, of solid or liquid waste materials, including soil, silt, clay, sand, and other organic and earthen materials, to the surface waters of the Lake Tahoe Basin, is prohibited." [Basin Plan, Chapter 5.2]

"The discharge of wastes from boats, marinas, or other shoreline appurtenances to surface waters of the Lake Tahoe HU is prohibited." [Basin Plan, Chapter 5.2]

"The discharge of any waste or deleterious material to surface waters of the Lake Tahoe HU is prohibited." [Basin Plan, Chapter 5.2]

"The discharge of waste which causes violation of any narrative water quality objective contained in this Plan, including the Nondegradation Objective, is prohibited." [Basin Plan, Chapters 3 and 5.2]

ALLEGED VIOLATIONS

14. The Discharger violated Water Code section 13376 and Clean Water Act section 301 by discharging approximately four gallons of pollutants (hydraulic oil) to waters of the United States (Lake Tahoe) on March 5, 2015, without filing a report of waste discharge or obtaining an NPDES permit. These violations subject the Discharger to liability pursuant to Water Code section 13385, subdivisions (a)(1) and (a)(5).

15. The Discharger violated prohibitions in the Basin Plan by discharging approximately four gallons of hydraulic oil from the Tahoe Queen vessel into Lake Tahoe on March 5, 2010, adversely affecting beneficial uses of Lake Tahoe. These violations subject the Discharger to liability pursuant to Water Code section 13385, subdivision (a)(4).

16. The Discharger caused oil or any residuary product of petroleum to be deposited in or on a water of the state when it released four gallons of hydraulic oil into Lake Tahoe on March 5, 2015. This subjects the Discharger to liability pursuant to Water Code section 13350, subdivision (a).

WATER CODE SECTIONS UPON WHICH ADMINISTRATIVE CIVIL LIABILITY IS BEING ASSESSED FOR THE ALLEGED VIOLATIONS

17. Pursuant to Water Code section 13385, subdivision (a)(1), a discharger is subject to civil liability for violating Water Code section 13376. Pursuant to Water Code section 13385, subdivision (a)(4), a discharger is subject to civil liability for violating an order or prohibition issued pursuant to Water Code section 13243 (e.g., the Basin Plan), if the activity subject to the order or prohibition is subject to regulation under Chapter 5.5 of Division 7 of the California Water Code (e.g., involves discharge of pollutants to waters of the United States regulated under the Clean Water Act). Pursuant to Water Code section 13385, subdivision (a)(5), a discharger is subject to civil liability for violating Section 301 of the Clean Water Act.

18. Pursuant to Water Code section 13385, subdivision (c), civil liability may be imposed administratively by the Lahontan Water Board in an amount not to exceed the sum of both of the following:

    (1) Ten thousand dollars ($10,000) for each day in which the violation occurs; and

    (2) Where there is a discharge, any portion of which is not susceptible to cleanup or is not cleaned up, and the volume discharged but not cleaned up exceeds 1,000 gallons, an additional liability not to exceed ten dollars ($10) multiplied by the number of gallons by which the volume discharged but not cleaned up exceeds 1,000 gallons.

19. Pursuant to Water Code section 13350, subdivision (a), a discharger is subject to civil liability for violation of a waste discharge requirement or other order or prohibition issued by the State Water Board (e.g., Order No. 2006-0003-DWQ).

20. Pursuant to Water Code section 13350, subdivision (e), civil liability may be imposed administratively by the Lahontan Water Board in an amount not to exceed five thousand dollars ($5,000) for each day in which the violation occurs, or an amount not to exceed ten dollars ($10) per gallon discharged, but not both.

21. For the violations cited above, administrative civil liability may be assessed either under Water Code section 13350 or Water Code section 13385, but not both (see § 13385, subd. (g)). Since the discharge was to waters of the United States, it is appropriate to proceed under Water Code section 13385 here, and to hold the Water Code section 13350 violations in the alternative.

FACTORS CONSIDERED IN DETERMINING ADMINISTRATIVE CIVIL LIABILITY

22. Pursuant to Water Code section 13385, subdivision (e), in determining the amount of any civil liability, the Water Board is required to take into account the nature, circumstances, extent, and gravity of the violations, whether the discharges are susceptible to cleanup or abatement, the degree of toxicity of the discharges, and, with respect to the violator, the ability to pay, the effect on its ability to continue its business, any voluntary cleanup efforts undertaken, any prior history of violations, the degree of culpability, economic benefit or savings, if any, resulting from the violations, and other matters that justice may require.

23. On November 17, 2009, the State Water Board adopted Resolution 2009-0083 amending the Water Quality Enforcement Policy (Enforcement Policy). The Enforcement Policy was approved by the Office of Administrative Law and became effective on May 20, 2010. The Enforcement Policy establishes a methodology for assessing administrative civil liability. The use of this methodology addresses the factors that are required to be considered when imposing a civil liability as outlined in Water Code section 13385, subdivision (e). The entire Enforcement Policy can be found at:

    http://www.waterboards.ca.gov/water_issues/programs/enforcement/docs/enf_policy_final111709.pdf

24. The required factors have been considered for the violations alleged herein using the methodology in the Enforcement Policy, as explained in detail in Attachment B.

MAXIMUM ADMINISTRATIVE CIVIL LIABILITY

25. Pursuant to Water Code section 13385, subdivision (c), the total maximum administrative civil liability that may be imposed for the violations alleged in this Complaint is **$10,000**, as described in Attachments B and C.

PROPOSED ADMINISTRATIVE CIVIL LIABILITY AMOUNT

26. Based on consideration of the above facts, the applicable law, and after applying the administrative civil liability methodology as described in Attachments B and C, the Assistant Executive Officer of the Water Board proposes that civil liability be imposed administratively on the Discharger in the amount of **$4,683.00**.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

27. Issuance of this Complaint is an enforcement action and is, therefore, exempt from the California Environmental Quality Act (Pub. Res. Code § 21000 et seq.), pursuant to title 14, California Code of Regulations, section 15308 and section 15321, subsection (a)(2).

Lauri Kemper

Lauri Kemper
Assistant Executive Officer

March 8, 2016

Date

Attachments:

A. Location Map
B. Administrative Civil Liability Methodology
C. Enforcement Policy Methodology Spreadsheet

ATTACHMENT A

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Tahoe Queen
1940
Imagery Date: 4/16/2015 38°57'02.29" N 119°57'32.25" W elev 6250 ft eye alt 695
Google ea

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ATTACHMENT B

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ATTACHMENT B

ADMINISTRATIVE CIVIL LIABILITY METHODOLOGY

Administrative civil liability may be imposed pursuant to the procedures described in California Water Code section 13323. The Complaint alleges the act or failure to act that constitutes a violation of law, the provision of law authorizing civil liability to be imposed, and the proposed civil liability.

Pursuant to Water Code section 13385, subdivision (c), civil liability may be imposed administratively by the Lahontan Regional Water Quality Control Board (Lahontan Water Board) in an amount not to exceed the sum of both of the following:

(1) Ten thousand dollars ($10,000) for each day in which the violation occurs; and

(2) Where there is a discharge, any portion of which is not susceptible to cleanup or is not cleaned up, and the volume discharged but not cleaned up exceeds 1,000 gallons, an additional liability not to exceed ten dollars ($10) multiplied by the number of gallons by which the volume discharged but not cleaned up exceeds 1,000 gallons.

Water Code section 13385, subdivision (e) requires the Lahontan Water Board to consider several factors when determining the amount of civil liability to impose. These factors include:

> "…the nature, circumstances, extent, and gravity of the violation or violations, whether the discharge is susceptible to cleanup or abatement, the degree of toxicity of the discharge, and, with respect to the violator, the ability to pay, the effect on its ability to continue its business, any voluntary cleanup efforts undertaken, any prior history of violations, the degree of culpability, economic benefit or savings, if any, resulting from the violation, and other matters that justice may require. At a minimum, liability shall be assessed at a level that recovers the economic benefits, if any, derived from the acts that constitute the violation."

On November 17, 2009, the State Water Resources Control Board (State Water Board) adopted Resolution 2009-0083 amending the Water Quality Enforcement Policy (Enforcement Policy). The Enforcement Policy provides a calculation methodology for determining administrative civil liability. The calculation methodology includes an analysis of the factors in Water Code section 13385, subdivision (e), and it enables fair and consistent implementation of the Water Code's liability provisions. Attachment C and the following discussion presents the administrative civil liability derived from the Enforcement Policy's administrative civil liability calculation methodology. Attachment C is attached hereto and incorporated herein by this reference.

The alleged violation by Aramark in the Complaint and this technical analysis is a discharge violation for the purpose of applying the Enforcement Policy's penalty calculation methodology. The violation resulted from an unauthorized discharge of four gallons of hydraulic oil into Lake Tahoe on March 5, 2015. This analysis omits step three of the calculation methodology, which addresses non-discharge violations.

Aramark submitted a spill investigation report, dated March 16, 2015 (Attachment 1), and supplemental information to the spill report dated March 24, 2015 (Attachment 2). Page 1 of the March 16, 2015 report states, "Based on the remaining volume of the oil in the tank, it is estimated that approximately nine gallons of the hydraulic oil was spilled onto the rear deck of the Tahoe Queen's. [sic]. Over five gallons of the spilled oil were recovered before the remaining approximately four gallons were accidentally released into the lake."

Step 1: Potential for Harm for Discharge Violations

Actual or threatened impacts to beneficial uses are determined using a three-factor scoring system. The three factors include: (a) the harm or potential harm to beneficial uses; (b) the physical, chemical, biological, or thermal characteristics of the discharge; and (c) the susceptibility to cleanup or abatement of the discharge(s). A numeric score is determined for each of the three factors. These scores are then added together to determine a final Potential for Harm score. Based on the scores for environmental harm, receptor risk, and cleanup susceptibility, and as further detailed below, a score of **6** (six) is assigned to Step 1 of the calculation methodology.

A. Factor 1: Harm or Potential Harm to Beneficial Uses

This factor evaluates direct or indirect harm or potential for harm to beneficial uses that may result from exposure to the pollutants or contaminants in the illegal discharge. A score between 0 (negligible) and 5 (major) is assigned in accordance with the statutory factors of the nature, circumstances, extent and gravity of the violation.

Hydraulic oil discharges can pollute surface or ground waters, threaten public health, adversely affect aquatic life, and impair the recreational use and aesthetic enjoyment of surface waters.

The Water Quality Control Plan for the Lahontan Region (Basin Plan) was adopted on March 31, 1995, and most recently amended on September 10, 2015. Chapter 5 of the Basin Plan establishes Water Quality Standards and Control Measures for the Lake Tahoe Basin. Chapter 5 of the Basin Plan (Table 5.1-1, Page 5.1-16) lists the designated beneficial uses for Lake Tahoe. The beneficial uses that were or that could be impacted by the unauthorized discharge of hydraulic oil include contact recreation (swimming, water skiing, wading, and fishing), non-contact recreation (picnicking, sunbathing, hiking, boating, kayaking, sightseeing, aesthetic enjoyment), cold freshwater habitat, wildlife habitat, preservation of biological habitats of special significance, migration of aquatic organisms, and spawning (support of high quality aquatic habitat necessary for reproduction and early development of fish and wildlife).

At a minimum, the discharge of hydraulic oil to Lake Tahoe created a more than moderate threat to contact and non-contact recreation beneficial uses. The discharge occurred during a warm and sunny spring day (http://www.accuweather.com/en/us/south-lake-tahoe-ca/96150/march-weather/337257), when it is reasonable to assume that recreational users would be on or in the water. Indeed, the Lahontan Water Board was initially notified of the discharge via electronic mail from the California Office of Emergency Services's Warning Center. The March 5, 2015 electronic mail (time-stamped 9:23 p.m. and addressed to Scott Ferguson of the Lahontan Water Board staff, included in Attachment 5) describes impacts to contact recreation beneficial uses. The electronic mail states, "Caller states she was at the beach and her dog was in the water and when she arrived at home she found that the dog had an oily substance on her. Caller states she went back to the beach to see what the dog had gotten into caller states there was sheen and when she put her hand in the water it came out oily as in touch (Greasy). [sic]"

Lahontan Water Board staff followed up with the complainant on March 6, 2015 (5:34 p.m., March 6, 2015 electronic mail from Lisa Scoralle to Scott Ferguson, included in Attachment 5). The complainant indicated to Lahontan Water Board staff that she and her dog had been to the Ski Run Marina beach the previous evening, and her dog had been swimming in Lake Tahoe at that location. When they got home after dark, she touched the dog and noticed that her hands (and the dog's fur) were oily to the touch. She described the oily substance as having an industrial smell. She washed the dog with a pet shampoo, but the substance did not come off. She then re-washed the dog with a dishwashing liquid, and that was successful in removing the oil and odor. She was later contacted by Bryan Vyverberg with the El Dorado County Environmental Health who told her there had been a hydraulic fuel spill discovered at the Ski Run Marina and that he suspected the two incidents were related.

The hydraulic oil could potentially create a localized affect on aquatic and habitat-related beneficial uses. The hydraulic oil that was discharged is a Chevron Company product called "Clarity Hydraulic Oil AW 46," as noted in the material safety data sheet (MSDS) provided in Attachment G to Aramark's August 28, 2015 technical report (Attachment 3). The MSDS describes potential impacts to human and environmental health, as well as measures to take in the event of exposure.

Regarding human ingestion, inhalation, and skin exposure impacts, page 2 of the MSDS states,

> "If more than several mouthfuls are swallowed, abdominal discomfort, nausea, and diarrhea may occur.
>
> "Breathing the vapour or mist may cause respiratory irritation, discomfort, or other pulmonary effects.
>
> "Expected to cause no more than minor skin irritation.
>
> "Prolonged or frequently repeated contact may cause more severe irritation or may cause the skin to become cracked or dry from the defatting action of this material."

Regarding the long-term toxic effects of the material, page 2 of the MSDS states, "The base oil component(s) are not expected to be carcinogenic based on the IARC criteria. This product has not been tested as a whole for chronic health effects." Pages 4-5 of the MSDS adds,

> "This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, hydrocracking and hydrotreating. These oils have not been listed in the U.S. National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as carcinogenic to humans."

Page 5 of the MSDS addresses environmental effects. It states, "This product is expected to have low aquatic toxicity (LD50 > 1000 mg/l) and is not considered to represent a long-term danger to the aquatic environment."

The Chevron Company product Clarity Hydraulic Oil AW 46 is a type of hydraulic oil. In general, hydraulic oil contains various additives. These additives often include phosphates [See United States Department of Health and Human Services, Agency for Toxic Substances and Disease Registry report providing information regarding the chemical identity of hydraulic fluid products located at: http://www.atsdr.cdc.gov/toxprofiles/tp99-c3.pdf and provided in Attachment 4]. Because the Chevron Company product Clarity Hydraulic Oil AW 46 is proprietary, it's chemical composition is not made public. Therefore, it is unknown whether it contains common hydraulic oil additives such as phosphates.

Lake Tahoe is designated an Outstanding National Resource Water because of its extraordinary clarity, purity, and deep blue color [Basin Plan chapter 4, section 4.9, page 4.9-2; Basin Plan chapter 5, page 5-1]. However, the Lake's clarity has been on a decreasing trend since standardized monitoring was initiated by the University of California at Davis in the late 1960s [Lake Tahoe TMDL Program 2015 Performance Report, page 2]. This decreasing trend, which has only recently begun to slow, is largely due to nitrogen, phosphorus, and fine sediment discharges associated with human activities [Basin Plan, Chapter 5, page 5-1]. As a result, Lake Tahoe is listed on the Federal Clean Water Act Section 303(d) list as impaired due to excessive fine sediment, nitrogen and phosphorus [pages ES-1 and 16-2 of the 2010 Lake Tahoe TMDL Report, http://www.waterboards.ca.gov/lahontan/water_issues/programs/tmdl/lake_tahoe/docs/tmdl_rpt_nov2010.pdf]. Public and private partnerships are in place to invest approximately $1 billion into Lake Tahoe's restoration through the Environmental Improvement Program (EIP), which follows millions of dollars that have already been spent to protect Lake Tahoe preceding EIP. The Lahontan Water Board considers any discharge of nutrients and sediments into Lake Tahoe, regardless of the magnitude of the discharge, to seriously threaten the extensive efforts made toward restoring Lake Tahoe's famed clarity

Hydraulic oil discharges, such as the one subject to this Complaint, contain relatively minor quantities of nutrients (phosphorus) when compared to Lake Tahoe's annual nutrient loading received from all sources. However, the nutrients and organic substances from this discharge can still have a localized effect on Lake Tahoe's water quality and clarity, can locally thwart some of the progress of the above-referenced efforts, and can further increase the already significant challenge of reversing the decades-long decline in Lake Tahoe's famed clarity.

The discharge of four gallons of hydraulic oil on March 5, 2015, resulted in **above moderate harm or potential harm** to the beneficial uses of Lake Tahoe. The Enforcement Policy defines above moderate as:

> *"Above moderate – more than moderate threat to beneficial uses (i.e., impacts are observed or likely substantial, temporary restrictions on beneficial uses (e.g., less than 5 days), and human or ecological health concerns)."*

The discharge resulted in observed impacts to contact and non-contact recreational beneficial uses, as documented by the March 5, 2015 notification from the California Office of Emergency Services. The hydraulic oil could potentially have created localized impacts on human health and minimal impacts to aquatic health, as noted in the MSDS for the hydraulic oil that was discharged. Furthermore, any discharge of substances which can contain substances that can degrade Lake Tahoe's famed clarity is a serious threat to the efforts made toward restoring Lake Tahoe.

Based on the circumstances described above, a score of **4** (four) is assigned to Factor 1 of the calculation methodology.

B. Factor 2: The Physical, Chemical, Biological or Thermal Characteristics of the Discharge

This factor evaluates the degree of toxicity of the discharge by evaluating the physical, chemical, biological, and/or thermal nature of the discharge. Toxicity is the degree to which a substance can damage a living or non-living organism. Toxicity can refer to the effect on a whole organism, such as an animal, bacterium, or plant, as well as the effect on a substructure of the organism, such as a cell or an organ. A score between 0 (negligible risk) and 4 (significant risk) is assigned based on a determination of the risk or threat of the discharged material on potential receptors. Potential receptors are those identified considering human, environmental and ecosystem health exposure pathways.

The MSDS provided by Aramark indicates that the hydraulic oil is not carcinogenic to humans and is not expected to present a long-term danger to aquatic life. However, page 5 of the MSDS states, “This product is expected to have low aquatic toxicity…” indicating that the discharged hydraulic fluid does have some level of aquatic toxicity. Additionally, the MSDS notes that hydraulic oil can be a skin and inhalation irritant, and it can also cause abdominal discomfort, nausea, and diarrhea if ingested.

The characteristics of the discharged material therefore posed a **moderate** risk or threat to potential receptors. The Enforcement Policy defines moderate as:

> *“Discharged material poses a moderate risk or threat to potential receptors (i.e., the chemical and/or physical characteristics of the discharged material have some level of toxicity or pose a moderate level of concern regarding receptor protection).”*

The low aquatic toxicity and the potential for causing abdominal/intestinal impacts at a minimum, poses a moderate level of threat to human and ecological receptors. Accordingly, a score of **2** (two) is assigned to Factor 2.

C. Factor 3: Susceptibility to Cleanup or Abatement

Pursuant to the Enforcement Policy a score of 0 is assigned for this factor if 50 percent or more of the discharge is susceptible to cleanup or abatement. A score of one is assigned if less than 50 percent or more of the discharge is susceptible to cleanup or abatement.

Nine gallons of hydraulic oil were initially released, of which less than half (four gallons) were discharged into Lake Tahoe. Aramark did not deploy oil absorbent materials to contain and collect the discharged hydraulic oil until approximately 18 hours following the discharge event (discharge was estimated to occur at approximately 4:30 p.m. on March 5, 2015 [page 1, March 24, 2015 Aramark Supplemental Spill Report], and deployment of cleanup materials were completed at approximately 10:30 a.m. on March 6, 2015 [page 2, March 16, 2015 Aramark Spill Report]). It is assumed that a portion of the hydraulic oil directly discharged into Lake Tahoe was cleaned up, but an estimated quantity is not provided. Regardless, more than 50 percent of the total nine gallons that was initially released was cleaned up, and the remaining amount is susceptible to abatement. Therefore, a score of **0** is assigned to this factor.

<u>Step 2: Assessments for Discharge Violations</u>

Water Code section 13385, subdivision (c), allows civil liability to be assessed on a daily basis and on a per gallon basis for any amount discharged but not cleaned up in excess of 1,000 gallons. Civil liability may be assessed in an amount up to $10,000 per day of violation, and up to $10 per gallon discharged but not cleaned up in excess of 1,000 gallons.

The Enforcement Policy provides that the initial liability amount shall be determined on a per day and a per gallon basis using the Potential for Harm score from Step 1 in conjunction with the Extent of Deviation from the Requirement of the violation. (See Enforcement Policy, Tables 1 and 2.)

A. <u>Extent of Deviation from the Requirement</u>

Section 301 of the Federal Water Pollution Control Act (33 U.S.C. § 1311) (Clean Water Act) and Water Code section 13376 prohibit the discharge of pollutants to waters of the United States except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit.

The *Water Quality Control Plan for the Lahontan Region* (Basin Plan), adopted pursuant to Water Code section 13243, contains the following prohibitions:

> *"The discharge of treated or untreated domestic sewage, garbage or other solid wastes, or any other deleterious material to the surface waters of the Lake Tahoe Basin is prohibited." [Basin Plan, Chapter 5.2]*
>
> *"The discharge, attributable to human activities, of solid or liquid waste materials, including soil, silt, clay, sand, and other organic and earthen materials, to the surface waters of the Lake Tahoe Basin, is prohibited." [Basin Plan, Chapter 5.2]*

"The discharge of wastes from boats, marinas, or other shoreline appurtenances to surface waters of the Lake Tahoe HU is prohibited." [Basin Plan, Chapter 5.2]

"The discharge of any waste or deleterious material to surface waters of the Lake Tahoe HU is prohibited." [Basin Plan, Chapter 5.2]

"The discharge of waste which causes violation of any narrative water quality objective contained in this Plan, including the Nondegradation Objective, is prohibited." [Basin Plan, Chapters 3 and 5.2]

The Basin Plan also contains the following narrative water quality objective:

"Waters shall not contain oils, greases, waxes or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect the water for beneficial uses." [Basin Plan, Chapter 5.1]

Aramark discharged four gallons of hydraulic oil from the Tahoe Queen vessel directly into Lake Tahoe, which is a water of the United States as defined by the Clean Water Act and Code of Federal Regulations, on March 5, 2015 [Page 1, March 16, 2015 Aramark Spill Report]. The discharge created an oily sheen along the shore zone area near Ski Run Marina [Page 2, March 16, 2015 Aramark Spill Report. Page 2 and attached photos, electronic mail from Lauri Kemper to Scott Ferguson et. al. (Attachment 6)]. Such discharges are expressly prohibited under the Clean Water Act, the California Water Code, and the Basin Plan. Thus, the discharge is a major deviation from prescribed requirements. The calculation methodology defines a major deviation as,

"The requirement has been rendered ineffective (e.g., discharger disregards the requirement, and/or the requirement is rendered ineffective in its essential functions)."

The hydraulic oil discharge rendered the prohibitions on discharges (e.g., oils, deleterious material, organic materials, discharges from boats, and wastes) to waters of the United States ineffective in their essential functions. The Lahontan Water Board was notified of the discharge by a complainant whose dog was coated in an oily substance after being in Lake Tahoe. The complainant observed an oily and greasy-to-the touch sheen on the water where the dog had been. Thus, the discharge resulted in observed adverse impacts to contact recreation beneficial uses. The prohibitions would be effective only if no hydraulic oil discharge had occurred.

Accordingly, based on the Potential for Harm score of 6 and major deviation from the requirements, the per-gallon and per-day factors for the discharge are both **0.22**.

B. Initial Amount of ACL

The initial base liability amount for the discharge is calculated by multiplying and adding:

(per gallon factor) x (gallons discharged but not cleaned up over 1000 gallons) x (maximum per gallon liability) + (per day factor) x (days of violation) x (maximum per day liability)
= Initial Base Liability

(0.22) x (0 gallons) x ($10/gallon) + (0.22) x (1 day) x ($10,000/day) = **$2,200**

Step 3: Per Day Assessments for Non-Discharge Violations

Non-discharge violations are not alleged in the Complaint.

Step 4: Adjustment Factors

The Enforcement Policy describes three factors related to the violator's conduct that should be considered for modification of the amount of initial liability: the violator's culpability, the violator's efforts to cleanup or cooperate with regulatory authorities after the violation, and the violator's compliance history. After each of these factors is considered for the violations involved, the applicable factor should be multiplied by the proposed amount for each violation to determine the revised amount for that violation.

A. Adjustment for Culpability

For culpability, the Enforcement Policy suggests an adjustment resulting in a multiplier between 0.5 to 1.5, with the lower multiplier for accidental incidents, and the higher multiplier for intentional or negligent behavior. In this case, a culpability multiplier of **1.5** has been selected for the reasons described below:

Aramark's March 16, 2015 spill report identifies the cause of the hydraulic discharge to be from maintenance activities occurring at the time on the Tahoe Queen vessel. Page 1 of the report states, "Specifically, when making repairs to the paddle wheel, the hydraulic lines were disconnected and *were not adequately capped* [emphasis added]…an employee may have inadvertently started the engine, causing hydraulic oil to discharge from the hydraulic line." Aramark's March 24, 2015 Supplemental Spill Report adds additional information stating that the engine was, indeed, started. Page 2 of that supplemental report states,

> "…the crew of the Paradise was instructed to conduct a routine weekly inspection of the Tahoe Queen, which typically includes starting the engine to prevent carbon buildup. We believe it may have been starting of the engine that resulted in the release of the mineral oil from the

> hydraulic lines. The crew of the Paradise did not know that the hydraulic lines were still undergoing repair."

Page 2 of Aramark's March 24, 2015 Supplemental Spill Report states that, "The lines were capped by Aramark's contractor, Advanced Marine, using plastic and duct tape wrapped tightly around the plastic to create a seal." Aramark's response to Lahontan Water Board staff's question regarding how Aramark's procedure for capping the lines differed from the industry standard is that its contractor, "…did not anticipate needing to create a pressurized seal to prevent oil from coming of out the lines [sic]…The lines from which we believe there was a release are now capped with steel plates," [Page 2, March 24, 2015 Supplemental Spill Report]., Page 2 of that report notes that the contractor did not use steel plates to cap the lines because he believed the engine was static and would not be started, and that plastic was used to cap the lines only to prevent dust and water from entering the lines.

Page 2 of Aramark's supplemental spill report states that the crew from another Aramark-owned vessel was instructed to conduct a routine weekly inspection of the Tahoe Queen at the time of the discharge. Routine weekly inspections include starting the engine. The employees did not know that the hydraulic lines of the Tahoe Queen vessel were being repaired at the time of the weekly inspection.

Furthermore, page 2 of Aramark's March 24, 2015 Supplemental Spill Report notes that its, "…employees who perform servicing or maintenance on equipment are required by company policy to have lock out/tag out training. Lockout/tag out ensures that locked out machines or equipment are properly shut off and not started up when maintenance or servicing work is being performed... We do not believe that this training has been provided to Aramark employees working on the Tahoe Queen…" Page 2 of Aramark's August 28, 2015 Techincal Report verifies that all employees later received lock-out/tag-out training on July 9, 2015.

Finally, no evidence has been submitted to indicate that Aramark's contractors and employees deployed containment booms or other means of secondary containment around the Tahoe Queen Vessel or work area before starting a maintenance project that involves working on systems that could result in a release of contaminants such as hydraulic oil. Such preventative measures are imperative when performing maintenance activities on sensitive water bodies like Lake Tahoe.

Aramark is ultimately responsible for the proper operations and maintenance of its fleet, which includes the Tahoe Queen. Aramark is also responsible for the actions of its contractors and employees, and is also responsible to ensure its employees are appropriately trained to successfully perform their assigned duties in a manner that is safe both to human health and to the environmental. Aramark's failure to ensure its contractors implement an industry standard of care and to ensure its own employees received training in accordance with Aramark's own policy directly contributed to the discharge of hydraulic oil into Lake Tahoe. Therefore, a culpability multiplier of 1.5 is appropriate here.

B. Adjustment for Cleanup and Cooperation

For cleanup and cooperation, the Enforcement Policy suggests an adjustment should result in a multiplier between 0.75 and 1.5. A lower multiplier is for situations where there is a high degree of cleanup and/or cooperation and a higher multiplier is for situations where cleanup and/or cooperation is minimal or absent. In this case, a Cleanup and Cooperation multiplier of **1.25** has been selected.

Lower values are typically reserved for dischargers who immediately identify a discharge and implement appropriate cleanup measures. Aramark staff did not observe the discharge when it occurred and therefore did not immediately implement cleanup measures. The discharge occurred at approximately 4:30 p.m. on March 5, 2015, and Aramark was not aware of a potential discharge until the following morning after being notified of a spill report by the Ski Run Marina management. Aramark's marina manager did not locate the source of the discharge until 9:45 a.m. on March 6, 2015, and cleanup measures were deployed by 10:30 a.m. – 16 hours after the discharge had occurred [page 1, March 24, 2015 Aramark Supplemental Spill Report and page 2, March 16, 2015 Aramark Spill Report].

A higher factor is not considered here because once Aramark discovered the discharge it promptly reported the spill to appropriate agencies and implemented its own spill prevention/cleanup plan as identified in the Lake Tahoe Geographic Response Plan (September, 2007, prepared by the Lake Tahoe Response Plan Area Committee, of which Aramark is a member). Aramark continued to work with the California Department of Fish and Wildlife and left containment booms in place until confirmatory post-cleanup samples were collected and analyzed to confirm non-detectable concentrations of petroleum product [see pages 1-2 of Aramark's March 16, 2015 Spill Report].

C. Adjustment for History of Violations

The Enforcement Policy suggests that where there is a history of repeat violations, a minimum multiplier of 1.1 should be used for this factor. In this case, a neutral multiplier of **1.0** has been selected based upon absence of prior violations.

Step 5: Determination of Total Base Liability Amount

Total Base Liability Amount of **$4,125** is determined by multiplying the initial liability amount for the violation from Step 2 by the adjustment factors from Step 4:

(Initial Base Liability) x (Culpability) x (Cleanup) x (History) = Total Base Liability
($2,200) x (1.5) x (1.25) x (1.0) = $4,125

Step 6: Ability to Pay and Ability to Continue Business

The Enforcement Policy provides that if the Lahontan Water Board has sufficient financial information to assess the violator's ability to pay the Total Base Liability, or to assess the effect of the Total Base Liability on the violator's ability to continue in business, then the Total Base Liability amount may be adjusted downward. Similarly, if a violator's ability to pay is greater than similarly situated dischargers, it may justify an increase in the amount to provide a sufficient deterrent effect.

The Lahontan Water Board Prosecution Team has enough information to suggest that Aramark has the ability to pay the proposed liability, so that the burden of rebutting this presumption shifts to Aramark. Aramark's net income for 2014 was $149 million, and its net income for 2015 was $235.9 million (see http://www.msn.com/en-us/money/stockdetails/financials/fi-126.1.ARMK.NYS). This indicates Aramark has the ability to pay the liability.

<u>Step 7: Other Factors as Justice May Require</u>

The Enforcement Policy provides that if the Lahontan Water Board believes that the amount determined using the above factors is inappropriate, the liability amount may be adjusted under the provision for "other factors as justice may require," if express, evidence-supported findings are made. Additionally, the staff costs for investigating the violation should be added to the liability amount.

A. <u>Adjustments for Other Factors as Justice May Require</u>

The Lahontan Water Board Prosecution Team has determined that the proposed base liability amount is appropriate. The proposed base liability appropriately considers the potential for harm that was experienced to recreational beneficial uses and appropriately addresses impacts to the extensive efforts made toward restoring Lake Tahoe's famed clarity. Therefore, no adjustment is being made for other factors as justice may require.

B. <u>Adjustment for Staff Costs</u>

The Water Board has suspended the practice of adding staff cost into administrative civil liabilities based upon the California State Auditor's findings stated in its 2012-120 Audit Report. Specifically, one of the findings in the Audit Report is that staffing costs in penalty actions for water quality certification violations are, "generally not supported and are inaccurate because of inflated cost rates." (California State Auditor Report 2012-120 State Water Resources Control Board, *It Should Ensure a More Consistent Administration of Water Quality Certification Program*, June 2013). This enforcement action does not involve violations of a 401 Water Quality Certification, as was the focus in Audit Report 2012-120. However, staff believes the justification in the Audit Report still applies to this enforcement action where the staff cost rate has yet to be revised to reflect actual staff salaries and overhead cost for each program. In an abundance of caution, the Water Board, in consultation with the State Water Resources Control Board, has suspended adding staff cost into administrative civil liabilities until the issues identified by the State Auditor can be addressed.

Step 8: Economic Benefit

The Enforcement Policy directs the Lahontan Water Board to determine any economic benefit of the violations based upon the best available information. The Enforcement Policy suggests that the Lahontan Water Board compare the economic benefit amount to the adjusted Total Base Liability and ensure that the adjusted Total Base Liability is, at a minimum, 10 percent greater than the economic benefit amount. Doing so should create a deterrent effect and will prevent administrative civil liabilities from simply becoming the cost of doing business.

Aramark's August 28, 2015 Technical Report identifies the following cost savings:

A. "The cost estimate including labor, to properly seal the hydraulic lines in accordance with industry standards totaled $450," [page 1 of Technical Report]. Lahontan Water Board staff considers the labor as a recurring expense that would be necessary in some capacity for each maintenance period. The associated economic benefit of non-compliance from March 5, 2015 to the proposed liability payment date of May 11, 2016 at a discount rate of 7.30 percent is $293.

B. "The cost for developing the SOP [standard operating procedure] included $1,500 and $1,800 incurred by Aramark and EEC [consultant retained by Aramark], respectively, for a total cost of $3,300 for SOP development," [page 1 of Technical Report]. Lahontan Water Board staff considers this a delayed economic benefit. The non-compliance date for the SOP development is assumed to be the implementation date of the Enforcement Policy (May 20, 2010). While Aramark should have had a standard operating procedures developed at the time it assumed ownership of the Tahoe Queen [Aramark assumed ownership of the Tahoe Queen in 2002, see https://en.wikipedia.org/wiki/Hornblower_Cruises], historical operation without standard procedures prior to promulgation of the Enforcement Policy has been excluded. Aramark developed and implemented standard operating procedures on July 9, 2015 (Page 2 of Aramark's August 28, 2015 Technical Report). The benefit of non-compliance from May 20, 2010 to July 9, 2015, with a proposed liability payment date of May 11, 2016, at a discount rate of 7.60 percent, is $879.

C. "Cost for implementing the SOP totaled $440.00 and consisted of training for the incorporation of spill prevention, containment, control and communication/reporting with maintenance activities," [page 1 of Technical Report]. Lahontan Water Board staff maintains that this training should have been conducted annually once Aramark assumed ownership of the Tahoe Queen in 2002. However, the Lahontan Water Board is excluding historical operation prior to promulgation of the Enforcement Policy on May 20, 2010. Aramark implemented this training for the first time on July 9, 2015 (Page 2 of Aramark's August 28, 2015 Technical Report).The benefit of non-compliance from May 20, 2010 to July 9, 2015, with a proposed liability payment date of May 11, 2016, at a discount rate of 7.60 percent, is $1,741.

D. "The cost incurred by Aramark for conducting the lock-out/tag-out training totaled $339.66 and included seventeen (17) sessions with an average of one hour per session at an employee hourly rate of $19.98," [page 2 of Technical Report]. Lahontan Water Board staff maintains that this training should have been conducted annually once Aramark assumed ownership of the Tahoe Queen in 2002. However, the Lahontan Water Board is excluding historical operation prior to promulgation of the Enforcement Policy on May 20, 2010. Aramark implemented this training for the first time on July 9, 2015 (Page 2 of Aramark's August 28, 2015 Technical Report).The benefit of non-compliance from May 20, 2010 to July 9, 2015, with a proposed liability payment date of May 11, 2016, at a discount rate of 7.60 percent, is $1,344.

The total savings, less interest, is $4,257. To ensure the adjusted Total Base Liability is, at a minimum, 10 percent greater than the economic benefit amount, the Total Base Liability must be greater than $4,683 (not accounting for accrued interest).

Step 9: Maximum and Minimum Liability Amounts

The maximum liability amount the Lahontan Water Board may assess administratively pursuant to Water Code section 13385, subdivision (c), for Aramark's March 5, 2015 discharge of hydraulic oil is $10,000 for the one day of violation.

Water Code section 13385, subdivision (c) does not establish a minimum liability. However, the Enforcement Policy requires that:

> *The adjusted Total Base Liability shall be at least 10 percent higher than the Economic Benefit Amount so that liabilities are not construed as the cost of doing business and that the assessed liability provides a meaningful deterrent to future violations*.

Therefore, the minimum liability amount the Lahontan Water Board must assess is $4,683.

Step 10: Final Liability Amount

The Total Proposed Liability Amount is **$4,683** based upon the considerations discussed in detail, above.

Attachments:

1. Aramark Spill Report Dated March 16, 2015
2. Aramark Supplemental Spill Report Dated March 24, 2015
3. Aramark Technical Report Dated August 28, 2015
4. United States Department of Health and Human Services, Agency for Toxic Substances and Disease Registry report, Chemical and Physical Information for Hydraulic Fluid
5. Lahontan Water Board Documents related to Spill Reporting and Investigation
6. March 6, 2015 electronic mail from Lauri Kemper to Scott Ferguson, et al
7. Economic Benefit Analysis Spreadsheet

ATTACHMENT 1

Aramark Spill Report Dated March 16, 2015

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Waterboards

	Phillips, John B. <Phillips-John@aramark.com>
	Monday, March 16, 2015 4:20 PM
:	Taxer, Eric@Waterboards
Cc:	Sloma, David P.
Subject:	Tahoe Queen Spill Report 3-16-15
Attachments:	Tahoe Queen Spill Report 3-16-15.pdf; Marina Lab Results.pdf; ClarityHydraulicOilAW46.pdf

Hello Eric

Please accept the attached spill report as our written response to your requested.

John Phillips | Aramark | Fleet & Facilities Director | Zephyr Cove Resort | Spooner Summit Recreation | Lake Tahoe Cruises
760 US Highway 50
PO Box 12309
Zephyr Cove, NV 89448

P 775.589.4933 M: 928.691.0064
EMAIL Phillips-john@aramark.com | **WEB** www.zephyrcove.com | **FACEBOOK** laketahoecruises | **TWITTER** @aramark

aramark

John Phillips
Fleet and Facilities Director

March 16, 2015

Via Email: eric.taxer@waterboards.ca.gov

Eric J. Taxer, P.E.
Water Resource Control Engineer
California Regional Water Quality Control Board—Lahontan Region
2501 Lake Tahoe Boulevard
South Lake Tahoe, CA 96150

Subject: **Tahoe Queen Spill at Ski Run Marina - March 6, 2015**

Dear Mr. Taxer:

This letter is to follow up on our verbal report to your office on March 6, 2015 regarding a discharge of approximately four gallons of Clarity Hydraulic Oil into Lake Tahoe. The release occurred from the Tahoe Queen excursion vessel at Ski Run Marina. Attached is the material safety data sheet (MSDS) for this mineral oil product. A summary of the incident and response actions is below.

Incident Description

The first sign of a problem was when Dan Jack, Manager of Ski Run Marina, received a report of a sheen on the water at 8:30 AM on March 6th. Mr. Jack took various steps to attempt to locate the source of the sheen. At 9:45 AM, Aramark's Marina Manager, Joao Rodriguez, discovered the source of the leak to be from maintenance activities on the Tahoe Queen. Specifically, when making repairs to the paddle wheel, the hydraulic lines were disconnected and were not adequately capped. The exact cause of the release is not known; however, we believe an employee may have inadvertently started the engine, causing hydraulic oil to discharge from the hydraulic line. The hydraulic tank and hose can hold a maximum of 25 and 5 gallons of oil, respectively.

Based on the remaining volume of the oil in the tank, it is estimated that approximately nine gallons of the hydraulic oil was spilled onto the rear deck of the Tahoe Queen's. Over five gallons of the spilled oil were recovered before the remaining approximately four gallons were accidentally released into the lake.

aramark

Response Action

Aramark promptly deployed booms (details below) and reported the spill to the following agencies on March 6th:

- El Dorado County Environmental Management
- Office of Emergency Services, California State Warning Center
- National Response Center (NRC)
- Tahoe Regional Planning Authority (TRPA)
- United States Coast Guard Waterway Spill / Release Sectors
- Department of Fish and Wildlife, Office of Spill Prevention and Response (DFW)

Activities to place vinyl containment booms around the affected area near the Tahoe Queen were completed by 10:30 AM. A containment boom was also placed across the mouth of the harbor at approximately 12:00 PM, as directed by a California Department of Fish and Wildlife Officer who was present. The oil sheen within the boomed area near the Tahoe Queen was removed by 2:30 PM; and the crew then proceeded to clean up the marina area. The marina was substantially cleaned up by dark and the boom was left in place at both locations. The next morning, March 7th, the Aramark crew returned to the marina site and completed the cleanup by removing any remaining oil sheen from the top of the water. The recovered water was contained in seven 55 gallon drums (approximately 300-325 gallons in total) and transported to Aramark's managed waste accumulation area located at the Zephyr Cove Resort by Flyers Energy of San Francisco, CA. This oily wastewater will be disposed of by H2O Environmental of Reno, NV, once wastewater characterization and/or approval is complete. The absorbent pads used in the cleanup efforts were contained in dedicated spill waste bags and will be disposed of properly by Petrosolutions of Reno, NV. The containment booms were left in place until confirmatory post-cleanup samples were collected and analyzed.

On Tuesday, March 10th, Aramark collected water samples from five locations. Two samples were collected from inside the boom that was around the Tahoe Queen, two were from the channel area and one was from inside the Marina. The samples were analyzed for total petroleum hydrocarbons (TPH) by a CA-certified laboratory, Alpha Analytics, located in Sparks, NV. The laboratory report is attached. All of the samples results were confirmed "non-detect".

Unfortunately, we were not provided the results from sampling conducted by the Department of Fish & Wildlife on March 6th; therefore, we are not able to include those results within this spill report.

aramark

Preventative Action

Repairs to the paddlewheel on the Tahoe Queen were completed on March 12th and the hydraulic system is now operational.

Aramark is committed to spill prevention, and we will improve our current maintenance practices in the following ways:

- We will use an industry standard capping system (i.e., steel caps) that will not allow fluid to be discharged, even under pressure.
- All systems will be shut down and locked out to prevent incidental activation during the shutdown period.
- All employees working on energized equipment will receive lock out/tag out training or refresher training as needed.
- Containment booms will be placed around the vessel and/or project area before starting a maintenance project that involves working on systems that could result in a release of oil.
- We will develop a standard operating procedure (SOP) specific to boat maintenance activities at Ski Run Marina focused on spill prevention, containment and control. This SOP will also include agency reporting protocols, in the event of a release to the water.
- We will ensure we have the most current version of Ski Run Marina's SPCC Plan and ensure understanding of Aramark's responsibilities for compliance with the plan. Aramark will submit any recommended revisions to the Manager of the Ski Run Marina with respect to Aramark's activities. (Please note that Aramark does not operate Ski Run Marina.)

If you have any questions regarding this submittal, please contact me at (775)-589-4933.

Sincerely,

John Phillips
Fleet and Facilities Director
Phillips-john@aramark.com

Material Safety Data Sheet

Chevron

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

Clarity Hydraulic Oil AW 32, 46, 68, 100

Product Use: Hydraulic Oil
Product Number(s): 230340, 230341, 230342, 255702, 278022, 278023, 278024
Synonyms: Clarity Hydraulic Oil AW 32, 46, 68, ISOCLEAN Certified
Company Identification
Chevron Products Company
a division of Chevron U.S.A. Inc.
6001 Bollinger Canyon Rd.
San Ramon, CA 94583
United States of America
www.chevronlubricants.com

Transportation Emergency Response
CHEMTREC: (800) 424-9300 or (703) 527-3887
Health Emergency
Chevron Emergency Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623
Product Information
email : lubemsds@chevron.com
Product Information: 1 (800) 582-3835, LUBETEK@chevron.com

SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
Highly refined mineral oil (C15 - C50)	Mixture	70 - 99 %weight

SECTION 3 HAZARDS IDENTIFICATION

IMMEDIATE HEALTH EFFECTS
Eye: Not expected to cause prolonged or significant eye irritation.
Skin: Contact with the skin is not expected to cause prolonged or significant irritation. Contact with the skin is not expected to cause an allergic skin response. Not expected to be harmful to internal organs if absorbed through the skin. High-Pressure Equipment Information: Accidental high-velocity injection under the skin of materials of this type may result in serious injury. Seek medical attention at once should an

accident like this occur. The initial wound at the injection site may not appear to be serious at first; but, if left untreated, could result in disfigurement or amputation of the affected part.

Ingestion: Not expected to be harmful if swallowed.
Inhalation: Not expected to be harmful if inhaled. Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit. Symptoms of respiratory irritation may include coughing and difficulty breathing.

SECTION 4 FIRST AID MEASURES

Eye: No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.
Skin: No specific first aid measures are required. As a precaution, remove clothing and shoes if contaminated. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.
Ingestion: No specific first aid measures are required. Do not induce vomiting. As a precaution, get medical advice.
Inhalation: No specific first aid measures are required. If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.
Note to Physicians: In an accident involving high-pressure equipment, this product may be injected under the skin. Such an accident may result in a small, sometimes bloodless, puncture wound. However, because of its driving force, material injected into a fingertip can be deposited into the palm of the hand. Within 24 hours, there is usually a great deal of swelling, discoloration, and intense throbbing pain. Immediate treatment at a surgical emergency center is recommended.

SECTION 5 FIRE FIGHTING MEASURES

Leaks/ruptures in high pressure system using materials of this type can create a fire hazard when in the vicinity of ignition sources (eg. open flame, pilot lights, sparks, or electric arcs).

FIRE CLASSIFICATION:
OSHA Classification (29 CFR 1910.1200): Not classified by OSHA as flammable or combustible.

NFPA RATINGS: Health: 0 Flammability: 1 Reactivity: 0

FLAMMABLE PROPERTIES:
Flashpoint: (Cleveland Open Cup) 190 °C (374 °F) Minimum
Autoignition: No data available
Flammability (Explosive) Limits (% by volume in air): Lower: Not Applicable Upper: Not Applicable

EXTINGUISHING MEDIA: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

PROTECTION OF FIRE FIGHTERS:
Fire Fighting Instructions: This material will burn although it is not easily ignited. See Section 7 for proper handling and storage. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.
Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne

solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.
Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.
Reporting: Report spills to local authorities and/or the U.S. Coast Guard's National Response Center at (800) 424-8802 as appropriate or required.

SECTION 7 HANDLING AND STORAGE

Precautionary Measures: DO NOT USE IN HIGH PRESSURE SYSTEMS in the vicinity of flames, sparks and hot surfaces. Use only in well ventilated areas. Keep container closed.

General Handling Information: Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.
Static Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.
Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:
Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS:
Use in a well-ventilated area.

PERSONAL PROTECTIVE EQUIPMENT

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.
Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: 4H (PE/EVAL), Nitrile Rubber, Silver Shield, Viton.
Respiratory Protection: No respiratory protection is normally required.
If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit for mineral oil mist. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge. Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

Occupational Exposure Limits:

Component	Agency	TWA	STEL	Ceiling	Notation
Highly refined mineral oil (C15 - C50)	ACGIH	5 mg/m3	10 mg/m3	--	--
Highly refined mineral oil (C15 - C50)	OSHA Z-1	5 mg/m3	--	--	--

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Colorless
Physical State: Liquid
Odor: Petroleum odor
pH: Not Applicable
Vapor Pressure: <0.01 mmHg @ 37.8 °C (100 °F)
Vapor Density (Air = 1): >1
Boiling Point: 315°C (599°F)
Solubility: Soluble in hydrocarbons; insoluble in water
Freezing Point: Not Applicable
Density: 0.86 - 0.87 kg/l @ 15°C (59°F)
Viscosity: 32 mm2/s - 110 mm2/s @ 40°C (104°F)
Evaporation Rate: No data available

SECTION 10 STABILITY AND REACTIVITY

Reactivity: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Incompatibility With Other Materials: Not applicable
Hazardous Decomposition Products: None known (None expected)
Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE HEALTH EFFECTS

Eye Irritation: The eye irritation hazard is based on evaluation of data for similar materials or product components.

Skin Irritation: The skin irritation hazard is based on evaluation of data for similar materials or product components.

Skin Sensitization: The skin sensitization hazard is based on evaluation of data for similar materials or product components.

Acute Dermal Toxicity: The acute dermal toxicity hazard is based on evaluation of data for similar materials or product components.

Acute Oral Toxicity: The acute oral toxicity hazard is based on evaluation of data for similar materials or product components.

Acute Inhalation Toxicity: The acute inhalation toxicity hazard is based on evaluation of data for similar materials or product components.

ADDITIONAL TOXICOLOGY INFORMATION:

This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, severe hydrocracking, or severe hydrotreating. None of the oils requires a cancer warning under the OSHA Hazard Communication Standard (29 CFR 1910.1200). These oils have not been listed in the National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as; carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), or possibly carcinogenic to humans (Group 2B).
These oils have not been classified by the American Conference of Governmental Industrial Hygienists (ACGIH) as: confirmed human carcinogen (A1), suspected human carcinogen (A2), or confirmed animal carcinogen with unknown relevance to humans (A3).

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY

This material is not expected to be harmful to aquatic organisms. The ecotoxicity hazard is based on an evaluation of data for the components or a similar material.

ENVIRONMENTAL FATE

Ready Biodegradability: This material is not expected to be readily biodegradable. The biodegradability of this material is based on an evaluation of data for the components or a similar material.

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT Shipping Description: PETROLEUM LUBRICATING OIL, NOT REGULATED AS A HAZARDOUS MATERIAL FOR TRANSPORTATION UNDER 49 CFR

IMO/IMDG Shipping Description: PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER THE IMDG CODE

ICAO/IATA Shipping Description: PETROLEUM LUBRICATING OIL; NOT REGULATED AS DANGEROUS GOODS FOR TRANSPORT UNDER ICAO TI OR IATA DGR

SECTION 15 REGULATORY INFORMATION

EPCRA 311/312 CATEGORIES:

1.	Immediate (Acute) Health Effects:	NO
2.	Delayed (Chronic) Health Effects:	NO
3.	Fire Hazard:	NO
4.	Sudden Release of Pressure Hazard:	NO
5.	Reactivity Hazard:	NO

REGULATORY LISTS SEARCHED:

01-1=IARC Group 1	03=EPCRA 313
01-2A=IARC Group 2A	04=CA Proposition 65
01-2B=IARC Group 2B	05=MA RTK
02=NTP Carcinogen	06=NJ RTK
	07=PA RTK

No components of this material were found on the regulatory lists above.

CHEMICAL INVENTORIES:
All components comply with the following chemical inventory requirements: AICS (Australia), DSL (Canada), EINECS (European Union), ENCS (Japan), IECSC (China), KECI (Korea), PICCS (Philippines), TSCA (United States).

NEW JERSEY RTK CLASSIFICATION:
Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A. 34:5A-1 et. seq., the product is to be identified as follows: PETROLEUM OIL (Hydraulic oil)

SECTION 16 OTHER INFORMATION

NFPA RATINGS: Health: 0 Flammability: 1 Reactivity: 0

HMIS RATINGS: Health: 1 Flammability: 1 Reactivity: 0
(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published

evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

LABEL RECOMMENDATION:
Label Category : INDUSTRIAL OIL 1 - IND1

REVISION STATEMENT: This revision updates the following sections of this Safety Data Sheet: 1,16
Revision Date: January 16, 2015

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
	CAS - Chemical Abstract Service Number
ACGIH - American Conference of Governmental Industrial Hygienists	IMO/IMDG - International Maritime Dangerous Goods Code
API - American Petroleum Institute	MSDS - Material Safety Data Sheet
CVX - Chevron	NFPA - National Fire Protection Association (USA)
DOT - Department of Transportation (USA)	NTP - National Toxicology Program (USA)
IARC - International Agency for Research on Cancer	OSHA - Occupational Safety and Health Administration
NCEL - New Chemical Exposure Limit	EPA - Environmental Protection Agency
SCBA - Self-Contained Breathing Apparatus	

Prepared according to the 29 CFR 1910.1200 (2012) by Chevron Energy Technology Company, 6001 Bollinger Canyon Road San Ramon, CA 94583.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

Alpha Analytical, Inc
255 Glendale Ave. • Suite 21 • Sparks, Nevada 89431-5778
(775) 355-1044 • (775) 355-0406 FAX • 1-800-283-1183

ANALYTICAL REPORT

EEC Environmental
1 City Boulevard West Suite 1800
Orange, CA 92868

Attn: Mark Zeko
Phone: (714) 667-2300
Fax: (714) 667-2310
Date Received : 03/10/15

Job: Marina

Total Petroleum Hydrocarbons - Extractable (TPH-E) EPA Method SW8015B

		Parameter	Concentration	Reporting Limit	Date Extracted	Date Analyzed
Client ID :	BK-1					
Lab ID :	EEC15031002-01A	TPH-E (DRO)	ND	0.50 mg/L	03/11/15 10:25	03/11/15 11:09
Date Sampled	03/10/15 14:10	TPH-E (ORO)	ND	0.50 mg/L	03/11/15 10:25	03/11/15 11:09
		Surr: Nonane	120	(53-145) %REC	03/11/15 10:25	03/11/15 11:09
Client ID :	BK-2					
Lab ID :	EEC15031002-02A	TPH-E (DRO)	ND	0.50 mg/L	03/11/15 10:25	03/11/15 11:35
Date Sampled	03/10/15 14:05	TPH-E (ORO)	ND	0.50 mg/L	03/11/15 10:25	03/11/15 11:35
		Surr: Nonane	117	(53-145) %REC	03/11/15 10:25	03/11/15 11:35
Client ID :	TQ-1					
Lab ID :	EEC15031002-03A	TPH-E (DRO)	ND	0.50 mg/L	03/11/15 10:25	03/11/15 12:01
Date Sampled	03/10/15 14:00	TPH-E (ORO)	ND	0.50 mg/L	03/11/15 10:25	03/11/15 12:01
		Surr: Nonane	108	(53-145) %REC	03/11/15 10:25	03/11/15 12:01
Client ID :	TQ-2					
Lab ID :	EEC15031002-04A	TPH-E (DRO)	ND	0.50 mg/L	03/11/15 10:25	03/11/15 12:27
Date Sampled	03/10/15 13:55	TPH-E (ORO)	ND	0.50 mg/L	03/11/15 10:25	03/11/15 12:27
		Surr: Nonane	113	(53-145) %REC	03/11/15 10:25	03/11/15 12:27
Client ID :	M-1					
Lab ID :	EEC15031002-05A	TPH-E (DRO)	ND	0.50 mg/L	03/11/15 10:25	03/11/15 12:53
Date Sampled	03/10/15 13:50	TPH-E (ORO)	ND	0.50 mg/L	03/11/15 10:25	03/11/15 12:53
		Surr: Nonane	112	(53-145) %REC	03/11/15 10:25	03/11/15 12:53

Diesel Range Organics (DRO) C13-C22
Oil Range Organics (ORO) C22-C40+
ND = Not Detected

Roger Scholl Randy Gardner Walter Hinchman

ACLASS ACCREDITED DoD ELAP

Roger L. Scholl, Ph.D., Laboratory Director • • Randy Gardner, Laboratory Manager • • Walter Hinchman, Quality Assurance Officer
Sacramento, CA • (916) 366-9089 / Las Vegas, NV • (702) 281-4848 / Carson, CA • (714) 386-2901 / info@alpha-analytical.com
Alpha Analytical, Inc. certifies that the test results meet all requirements of NELAC unless footnoted otherwise.
Statement of Data Authenticity: Alpha Analytical, Inc. attests that the data reported has not been altered in any way.
Alpha Analytical, Inc. currently holds appropriate and available NDEP certifications for the data reported - certification #NV00016.

3/11/15
Report Date

RUSH

Page: 1 of 1

Billing Information :

CHAIN-OF-CUSTODY RECORD

NV

Alpha Analytical, Inc.
255 Glendale Avenue, Suite 21 Sparks, Nevada 89431-5778
TEL: (775) 355-1044 FAX: (775) 355-0406

WorkOrder : EEC15031002
Report Due By : 5:00 PM On : 11-Mar-15

Client:
EEC Environmental
1 City Boulevard West Suite 1800

Orange, CA 92868

Report Attention	Phone Number	EMail Address
Mark Zeko	(714) 667-2300 x	mzeko@eecenironmental.com

EDD Required : No

Sampled by : Ron Baltazor

Cooler Temp	Samples Received	Date Printed
4 °C	10-Mar-15	10-Mar-15

PO :

Client's COC # : none Job : Marina

QC Level : S3 = Final Rpt, MBLK, LCS, MS/MSD With Surrogates

Alpha Sample ID	Client Sample ID	Matrix	Collection Date	No. of Bottles Alpha	No. of Bottles Sub	TAT	Requested Tests: TPH/E_W								Sample Remarks
EEC15031002-01A	BK-1	AQ	03/10/15 14:10	3	0	1	TPH/E_N								
EEC15031002-02A	BK-2	AQ	03/10/15 14:05	3	0	1	TPH/E_N								
EEC15031002-03A	TQ-1	AQ	03/10/15 14:00	3	0	1	TPH/E_N								
EEC15031002-04A	TQ-2	AQ	03/10/15 13:55	3	0	1	TPH/E_N								
EEC15031002-05A	M-1	AQ	03/10/15 13:50	3	0	1	TPH/E_N								

Comments: 24hr TAT. Samples brought in by client. Frozen ice. :

	Signature	Print Name	Company	Date/Time
Logged in by:	Morgan Lowery	Morgan Lowery	Alpha Analytical, Inc.	3/10/15 1551

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense. The report for the analysis of the above samples is applicable only to those samples received by the laboratory with this COC. The liability of the laboratory is limited to the amount paid for the report.

Matrix Type : AQ(Aqueous) AR(Air) SO(Soil) WS(Waste) DW(Drinking Water) OT(Other) Bottle Type: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

Billing Information:

Company: EEC Environmental
Attn.: Mark Zeko
Address: Once City Boulevard West, Suite 1800
City, State, Zip: Orange, CA 92868
Phone Number: 714-667-2300 Fax: 714-667-2310

Alpha Analytical, Inc.

Main Laboratory: 255 Glendale Ave, Suite 21 Sparks, NV 89431 Phone: 775-355-1044 Fax: 775-355-0406

Satellite Service Centers:

Northern CA: 9891 Horn Road, Suite C, Rancho Cordova, CA 95827 Phone: 916-366-9089
Southern NV: 6255 McLeod Ave, Suite 24, Las Vegas, NV 89120 Phone: 702-281-4848
Southern CA: 1007 E. Dominguez St., Suite O, Carson, CA 90746 Phone: 714-386-2901
Northern NV: 1250 Lamoille Hwy, #310 Elko, NV 89801 Phone: 775-388-7043

Page # 1 of 1

Consultant/ Client Info:

Company: EEC
Address: Once City Boulevard West, Suite 1800
City, State, Zip: Orange, CA 92868

Job and Purchase Order Info:

Job #:
Job Name: Marina
P.O. #:

Report Attention/Project Manager:

Name: Mark Zeko
Email Address: mzeko@eecenvironmental.com
Phone #: 714-667-2300
Cell #: 714-614-2174

QC Deliverable Info:

EDD Required? Yes / No EDF Required? Yes / No
Global ID:
Data Validation Packages: III or IV

Samples Collected from which State? (circle one) AR CA KS NV OR WA DOD Site Other

Time Sampled (HHMM)	Date Sampled (MM/DD)	Matrix* (See Key Below)	Lab ID Number (For Lab Use Only)	Sample Description	TAT	Field Filtered?	# Containers** (See Key Below)	TPH Extractable (diesel and oil range)	Remarks
1410	3/10/2015	AQ	[redacted]	BK-1	24 Hr.	No	3	X	24 Hour Rush; Please email results as available.
1405	3/10/2015	AQ		BK-2	24 Hr.	No	3	X	24 Hour Rush; Please email results as available.
1400	3/10/2015	AQ		TQ-1	24 Hr.	No	3	X	24 Hour Rush; Please email results as available.
1355	3/10/2015	AQ		TQ-2	24 Hr.	No	3	X	24 Hour Rush; Please email results as available.
1350	3/10/2015	AQ		M-1	24 Hr.	No	3	X	24 Hour Rush; Please email results as available.

Analysis Requested

ADDITIONAL INSTRUCTIONS:

I (field sampler) attest to the validity and authenticity of this sample(s). I am aware that tampering with or intentionally mislabeling the sample location, date or time of collection is considered fraud and may be grounds for legal action. NAC 445.0636 (c) (2).

Sampled By: [signature]

Relinquished by: (Signature/Affiliation)	Date	Time	Received by: (Signature/Affiliation)	Date	Time
[signature]	3/10/2015	1525	K Murray / AA [initials]	3/10/15	1525

* Key: AQ - Aqueous WA - Waste OT - Other SO - Soil **: L - Liter V - VOA S-Soil Jar O - Orbo T - Tedlar B - Brass P - Plastic OT - Other

NOTE: Samples are discarded 60 days after sample receipt unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense. The report for the analysis of the above samples is applicable only to those samples received by the laboratory with this COC. The liability of the laboratory is limited to the amount paid for the report.

ATTACHMENT 2

Aramark Supplemental Spill Report Dated March 24, 2015

This page is intentionally left blank.

Taxer, Eric@Waterboards

From:	Phillips, John B. <Phillips-John@aramark.com>
Sent:	Tuesday, March 24, 2015 11:25 AM
To:	Taxer, Eric@Waterboards
Subject:	RE: Tahoe Queen Spill Report
Attachments:	2011 EPA Publication on Environmentally Acceptable Lubricants.pdf; 2012 Chevron Oils onboard.pdf; Chevron Description of Clarity Hydraulic Oil.pdf; claritybrochure_v0612_1 (2).pdf; LTC SPCC.PDF

Hello Eric,

Thank you for allowing us the additional time to respond. Please find below our responses to your questions. I also wanted to provide you with some additional information and a correction to the information that was in our prior letter dated March 16, 2015.

First, I wanted to be sure you were aware that the hydraulic oil that was released from the Tahoe Queen, Chevron's Clarity Hydraulic Oil, is a specially formulated synthetic mineral oil determined to be non-toxic to aquatic organisms and inherently biodegradable. The material is considered an "environmentally acceptable lubricant" constituting a "best management practice" (BMP) by operators of vessels covered under U.S. EPA's Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels (VGP). As indicated in the MSDS that we provided with our initial report, the mineral oil is not toxic to aquatic life or the environment. The material passed the 96-hour LL50 test at over fifty times the concentration threshold for fingerling rainbow trout and mysid shrimp with zero mortality. The material also was subjected to the CEC L-33-A93 test protocol and found to be "inherently biodegradable," according to EPA OPPTS 835.3110 and OECD Guidelines. Enclosed is additional literature on the product.

Second, we conducted further investigation of the facts and would like to share additional helpful information. On the day in question, witnesses confirm that the winds were coming out of the Northwest and blowing South Easterly toward the harbor/marina area. This resulted in the wind carrying all of the mineral oil into the marina, which acted to contain the entire contents of the spill. None of the mineral oil impacted the shoreline and Aramark and marina personnel promptly cleaned up the entirety of the spilled mineral oil, as explained in our March 16th report.

Also, in our previous report, we had indicated that a boom was placed across the mouth of the harbor at noon on March 6th. Actually, as reported by Ski Run Marina personnel, the boom was placed there earlier that morning and, at noon, the Fish and Wildlife officer asked that it be left in place until the sheen had been cleaned up.

Given that there was a very small amount of non-toxic mineral oil released, it was contained in the marina area, and was promptly cleaned up, we believe that this release had no impact on the lake environment.

Below please find additional answers to your questions.

****

1. We had a report of an oily discharge on Thursday evening, March 5th. Reports from DFW staff, El Dorado County staff, and marina folks indicate that the hydraulic line may have been leaking as early as March 5th. Could you please provide additional information on this, since the report only discusses the spill being reported to Aramark staff the morning of March 6?

   We gathered additional information and discovered that the Paradise (another vessel operated by Aramark) docked at Ski Run Marina at approximately 4:00 or 4:30 pm on March 5th. After the passengers had .

disembarked, the crew of the Paradise was instructed to conduct a routine weekly inspection of the Tahoe Queen, which typically includes starting the engine to prevent carbon buildup. We believe it may have been the starting of the engine that resulted in the release of the mineral oil from the hydraulic lines. The crew of the Paradise did not know that the hydraulic lines were still undergoing repair.

Aramark was not made aware of the release until the morning of March 6th. As soon as we were made aware of it, we promptly began containment and cleanup actions.

2. You state that the hydraulic lines were not adequately capped. Please provide details, in writing, on how they were capped, and how that differs from the industry standard capping system referenced in your preventative action section of the report. Also, please state why the industry standard was not used.

   The lines were capped by Aramark's contractor, Advanced Marine, using plastic and duct tape wrapped tightly around the plastic to create a secure seal. The contractor indicated that he believed the engine was static and would not be started, so they only capped the lines to prevent influent of dust and water and did not anticipate needing to create a pressurized seal to prevent oil from coming of out the lines. Therefore, when the engine was started by the Paradise crew, it likely caused the cap to be pushed off and a small amount of mineral hydraulic oil released. The lines from which we believe there was a release are now capped with steel plates.

3. When did maintenance staff last receive lock out/tag out training? What is the requirement for such training?

   The repair work on the Tahoe Queen was conducted by a contractor, Advanced Marine. Aramark's employees did not work directly on the equipment to our knowledge. Aramark employees who perform servicing or maintenance on equipment are required by company policy to have lock out/tag out training. Lockout/tag out ensures that locked out machines or equipment are properly shut off and not started up when maintenance or servicing work is being performed. Aramark will take steps to ensure this training is conducted and/or repeated for applicable Aramark employees who are likely to come in contact with or service equipment. We do not believe that this training has been provided to Aramark employees working on the Tahoe Queen, but we are checking our records to verify.

4. What does the Marina's SPCC plan require with respect to deployment of cleanup materials prior to performance of Maintenance Activities?

   We enclose a copy of the SPCC we were provided by Ski Run Marina, dated November 2008. You will note that the SPCC plan does not address maintenance activities related to the Tahoe Queen and is limited to the marina activities only. However, as explained in our March 16th report, Aramark is in the process of developing its own SOP for maintenance activities. We will conduct training on this SOP promptly after it is developed.

John Phillips | Aramark | Fleet & Facilities Director | Zephyr Cove Resort | Spooner Summit Recreation | Lake Tahoe Cruises
760 US Highway 50
PO Box 12309
Zephyr Cove, NV 89448

P 775.589.4933 M: 928.691.0064
EMAIL Phillips-john@aramark.com | **WEB** www.zephyrcove.com | **FACEBOOK** laketahoecruises | **TWITTER** @aramark

Taxer, Eric@Waterboards

From:	Phillips, John B. <Phillips-John@aramark.com>
Sent:	Tuesday, March 24, 2015 11:25 AM
To:	Taxer, Eric@Waterboards
Subject:	RE: Tahoe Queen Spill Report
Attachments:	2011 EPA Publication on Environmentally Acceptable Lubricants.pdf; 2012 Chevron onboard.pdf; Chevron Description of Clarity Hydraulic Oil.pdf; claritybrochure_v061 (2).pdf; LTC SPCC.PDF

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****

1. We had a report of an oily discharge on Thursday evening, March 5th. Reports from DFW staff, El Dorado County staff, and marina folks indicate that the hydraulic line may have been leaking as early as March 5th. Could you please provide additional information on this, since the report only discusses the spill being reported to Aramark staff the morning of March 6?

   We gathered additional information and discovered that the Paradise (another vessel operated by Aramark) docked at Ski Run Marina at approximately 4:00 or 4:30 pm on March 5th. After the passengers had disembarked, the crew of the Paradise was instructed to conduct a routine weekly inspection of the Tahoe Queen, which typically includes starting the engine to prevent carbon buildup. We believe it may have been the starting of the engine that resulted in the release of the mineral oil from the hydraulic lines. The crew of the Paradise did not know that the hydraulic lines were still undergoing repair.

Aramark was not made aware of the release until the morning of March 6th. As soon as we were made aware of it, we promptly began containment and cleanup actions.

2. You state that the hydraulic lines were not adequately capped. Please provide details, in writing, on how they were capped, and how that differs from the industry standard capping system referenced in your preventative action section of the report. Also, please state why the industry standard was not used.

The lines were capped by Aramark's contractor, Advanced Marine, using plastic and duct tape wrapped tightly around the plastic to create a secure seal. The contractor indicated that he believed the engine was static and would not be started, so they only capped the lines to prevent influent of dust and water and did not anticipate needing to create a pressurized seal to prevent oil from coming of out the lines. Therefore, when the engine was started by the Paradise crew, it likely caused the cap to be pushed off and a small amount of mineral hydraulic oil released. The lines from which we believe there was a release are now capped with steel plates.

3. When did maintenance staff last receive lock out/tag out training? What is the requirement for such training?

The repair work on the Tahoe Queen was conducted by a contractor, Advanced Marine. Aramark's employees did not work directly on the equipment to our knowledge. Aramark employees who perform servicing or maintenance on equipment are required by company policy to have lock out/tag out training. Lockout/tag out ensures that locked out machines or equipment are properly shut off and not started up when maintenance or servicing work is being performed. Aramark will take steps to ensure this training is conducted and/or repeated for applicable Aramark employees who are likely to come in contact with or service equipment. We do not believe that this training has been provided to Aramark employees working on the Tahoe Queen, but we are checking our records to verify.

4. What does the Marina's SPCC plan require with respect to deployment of cleanup materials prior to performance of Maintenance Activities?

We enclose a copy of the SPCC we were provided by Ski Run Marina, dated November 2008. You will note that the SPCC plan does not address maintenance activities related to the Tahoe Queen and is limited to the marina activities only. However, as explained in our March 16th report, Aramark is in the process of developing its own SOP for maintenance activities. We will conduct training on this SOP promptly after it is developed.

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PLEASE PRINT RESPONSIBLY

From: Taxer, Eric@Waterboards [mailto:eric.taxer@waterboards.ca.gov]
Sent: Tuesday, March 17, 2015 4:33 PM
To: Phillips, John B.
Cc: Ferguson, Scott@Waterboards; Tyler, Tobi@Waterboards
Subject: Tahoe Queen Spill Report

Hi John, and thank you for the spill report. I have just a couple of questions.

1. We had a report of an oily discharge on Thursday evening, March 5th. Reports from DFW staff, El Dorado County staff, and marina folks indicate that the hydraulic line may have been leaking as early as March 5th. Could you please provide additional information on this, since the report only discusses the spill being reported to Aramark staff the morning of March 6?

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3. When did maintenance staff last receive lock out/tag out training? What is the requirement for such training?

4. What does the Marina's SPCC plan require with respect to deployment of cleanup materials prior to performance of Maintenance Activities?

Can you get us a response, via written email, by tomorrow? If not, then by Tuesday the 24th will be fine (I'll be away for a few days beginning the 19th).

Thanks,
Eric

Eric J. Taxer, P.E.
Water Resource Control Engineer
California Regional Water Quality Control Board – Lahontan Region
2501 Lake Tahoe Boulevard
South Lake Tahoe, CA 96150
530-542-5434

"To plant a garden is to believe in tomorrow"
- Audrey Hepburn

United States Environmental Protection Agency
Office of Wastewater Management
Washington, DC 20460

Environmentally Acceptable Lubricants

EPA 800-R-11-002
November 2011

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The EPA contacts for this document are Ryan Albert (202) 564-0763 and Brian Rappoli (202) 566-1548.

SECTION 1
INTRODUCTION

The purpose of this document is to describe the range of environmentally preferable lubricants that may be used as a best management practice (BMP) by operators of vessels covered under the Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels (VGP)[1]. Within this document, the term environmentally acceptable lubricant (EAL) is used to describe those lubricants that have been demonstrated to meet standards for biodegradability, toxicity and bioaccumulation potential that minimize their likely adverse consequences in the aquatic environment, compared to conventional lubricants. In contrast, lubricants that may be expected to have desirable environmental qualities, but have not been demonstrated to meet these standards, are referred to as environmentally friendly lubricants (EFLs) or biolubricants.

Lubricants lost from a vessel enter the aquatic environment, where serious damage to the aquatic ecosystem can occur. Consequently, there has been an emphasis on encouraging the use of EALs on vessels to protect the environment (Carter, 2009). Although their use is increasing, EALs comprise only a small percentage of the total lubricant market.

The significance of lubricant discharges (not accidental spills) to the aquatic ecosystem is substantial. The majority of ocean going ships operate with oil-lubricated stern tubes and use lubricating oils in a large number of applications in on-deck and underwater (submerged) machinery. Oil leakage from stern tubes, once considered a part of normal "operational consumption" of oil, has become an issue of concern and is now considered as oil pollution. Stern tube leakage is a significant source of lubricant oil inputs to the aquatic environment. A 2001 study commissioned by the European Commission DG Joint Research Centre revealed that routine unauthorized operational discharges of oil from ships in the Mediterranean Sea created more pollution than accidental spills (Pavlakis et al., 2001). Stern tube leakage was identified as a major source of these discharges.

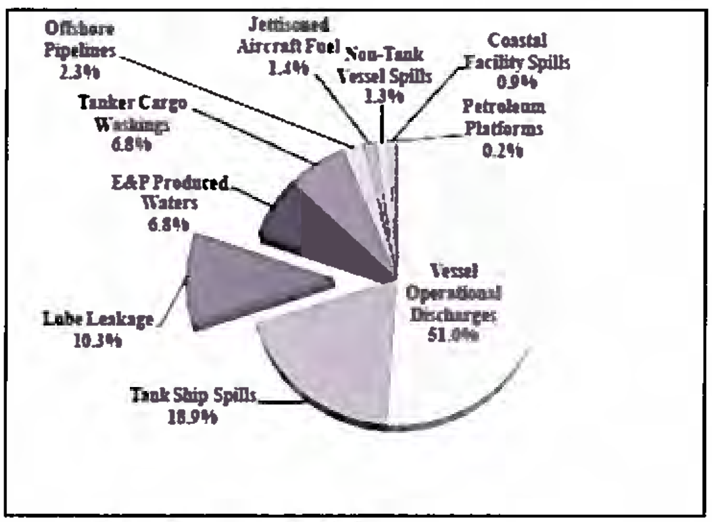
An analysis of data on oil consumption performed by a lubricant supplier indicated a range of average daily stern tube lubricant consumption rates for different vessels (Etkin, 2010). The average rate across vessel types was 2.6 liters per day, but ranged from less than 1 liter per day to 20 liters per day. Because it is common practice to use the lubricant supplied for the vessel's main engines as the stern tube lubricant to minimize the number of lubricants held on board, the amount which is used in stern tubes and released to the sea is not recorded.

Engine oil formulations have the correct characteristics (e.g., viscosity) to fulfill the role of lubricants specifically formulated for stern tubes. However, engine oil additives, which can be up to 30% of the formulation, are strongly alkaline (to neutralize the acids formed during fuel combustion). Consequently, due to the nature of engine oil additives, this practice greatly increases the toxic effects of stern tube discharges.

[1] The 2008 VGP encourages vessel owners and operators to use environmentally preferable lubricants whenever possible.

In addition to spills and stern tube leakage, there are "operational inputs" of lubricant oils that occur due to continuous low-level discharges and leakages that occur during normal vessel operations in port. The sources of operational discharges include deck machinery and in-water (submerged) machinery. There are a number of systems situated below the waterline that must be lubricated. The main systems to consider are the stern tube bearing, thruster gearboxes, and horizontal stabilizers. All of these have pressurized lubricating oil systems that maintain a pressure higher than the surrounding sea. This ensures that no significant amount of seawater can enter the oil system, where it would compromise the unit's reliability. However, any leakage of lubricant oil flows into the sea.

A 2010 study estimated the marine inputs of lubricant oils within the 4,708 ports and harbors of the world through stern tube leakage and operational discharges from marine shipping (Etkin, 2010). The study results indicate that commercial vessels make over 1.7 million port visits each year and leak 4.6 to 28.6 million liters of lubricating oil from stern tubes. In addition, 32.3 million liters of oil is introduced to marine waters from other operational discharges and leaks. In total, operational discharges (including stern tube leakage) input 36.9 to 61 million liters of lubricating oil into marine port waters annually – the equivalent of about one and a half Exxon Valdez-sized spills. Assuming that the higher estimate of stern tube leakage is representative of the inputs that may occur in port as well as in transit, the total estimated input of lubricating oil from leakage and operational discharges represents nearly 61 million liters annually worldwide. Leaks of lubricating oil represent 10 percent of the total oil inputs into marine waters, as estimated in the 2003 NRC Oil in the Sea study (see Figure 1). The total annual estimated response and damage costs for these leaks and operational discharges are estimated to be about $322 million worldwide. Total estimated costs for the U.S. are estimated to be $31 million annually (Etkin, 2010).



Based on Etkin, 2010 and NRC, 2003

Figure 1. Annual Oil Inputs into the Marine Environment

The following sections of this document describe the main types of EALs in current production; considerations for EALs in the aquatic environment; the standards for biodegradability, toxicity and bioaccumulation potential of EALs; the potential advantages and disadvantages of using EALs on board commercial vessels; and labeling programs.

1.1 Marketing and Labeling

Although EALs have been in commercial production for years, they comprise a small portion of the total lubricant market and are still regarded as niche products (Habereder et al., 2008). The market for EALs continues to expand, particularly in Europe, where the use of such lubricants is being encouraged through a combination of tax breaks, purchasing subsidies, and national and international labeling programs based on well-defined criteria. Many lubricants are advertised as being environmentally preferable; however, currently there are no regulatory standards for EALs, and no internationally accepted term by which they are defined. To distinguish lubricants which have been shown to be both biodegradable and non-toxic according to acceptable test methods from those lubricants that are simply marketed as being "environmental" (or similar terminology), in their 1999 Lubricants and Hydraulic Fluids Manual, the US Army Corps of Engineers recommended use of the term "environmentally acceptable" (a term commonly used by American Society for Testing and Materials (ASTM) committees) to address environmental lubricants. Bioaccumulation potential was not addressed within this definition of EALs.

While numerous terms are presently used to advertise lubricants as having desirable environmental properties, there is growing consensus to use the term "environmentally acceptable" to denote a lubricant that is biodegradable, exhibits low toxicity to aquatic organisms and has a low potential for bioaccumulation. Although many tests for these qualities exist, there is also harmonization underway within the lubricant manufacturing community regarding the most appropriate standard testing methods for these and other qualities determined to be important for an EAL, such as the proportion of renewable (recyclable) materials used in manufacturing. An environmentally acceptable lubricant should still perform well in comparison to the conventional lubricant it replaces. This harmonization is being driven by national and international labeling programs, particularly in European nations where the testing procedures and criteria have been codified (Habereder et al., 2008 and IENICA, 2004). These labeling requirements, while not regulated by law, have helped to clarify the difference between EAL and EFL products in the marketplace.

Because the majority of a lubricant is composed of the base oil, the base oil used in an EAL must be biodegradable. The three most common categories of biodegradable base oils are: 1) vegetable oils, 2) synthetic esters, and 3) polyalkylene glycols. Due to the low toxicities of these three types of base oils, aquatic toxicity exhibited by lubricants formulated from them is typically a consequence of the performance enhancing additives or thickening agents (found in greases) used in the formulation, which can vary widely.

SECTION 2
TYPES OF ENVIRONMENTALLY ACCEPTABLE LUBRICANTS

Environmentally acceptable lubricants are commonly classified according to the type of base oil used in their formulation. In general, lubricants consist of approximately 75 to 90 percent base oil. Greases contain approximately 10 percent thickening agent, which is usually a soap (Gow, 2009), in addition to the base oil. The remaining fraction of a lubricant formulation consists of performance enhancing additives. A lubricant formulation can include hundreds of additives, which address performance issues specific to their application and performance shortcomings of the base oil. Additives are commonly used to address oxidative aging, corrosion, high pressure, low or high temperature conditions, phase transition, shear, foaming, and hydrolysis (particularly for vegetable and synthetic ester-based oils) (Habereder et al., 2008).

The number of additives that are compatible with vegetable oils, synthetic esters, or polyalkylene glycols is small relative to the number of additives that are compatible with conventional (mineral) base oils. However, this is changing as a result of increased emphasis on EAL development. Additive manufacturers are working more closely with the lubricant industry to design additives that are suitable for improving the performance of EALs that are more environmentally benign (Aluyor et al. 2009). For some of the more stringent labeling programs (see Section 5), additives used in EAL must be both ashless (i.e., containing no metals other than Ca, Na, K, Mg) and non-toxic (Haberader et al. 2009). Among the soaps, calcium-based soaps are considered less toxic compared to other types (e.g., lithum-based), and soaps in general are considered less toxic than graphite thickeners (Gow, 2009).

2.1 VEGETABLE OILS

The main components of vegetable oils are triglycerides (natural esters), the precise chemical nature of which is dependent on both the plant species and strain from which the oil is obtained (Haberader et al., 2008 and Nelson, 2000). Outside the U.S., rapeseed is the most commonly used crop for creating vegetable oil lubricants (Cuevas, 2005 and Habereder et al., 2008). In the U.S., the most commonly used crops for producing vegetable oil lubricants are canola, soybeans, and sunflowers (Nelson, 2000).

Largely because of performance issues related to low thermo-oxidative stability and poor cold flow behavior, pure vegetable oil-based lubricants comprise a relatively small fraction of the biolubricant market, although recent research developments have shown promise for overcoming these shortcomings (Erhan et al., 2006 and Kabir et al., 2008). Another reason is that vegetable oil-based lubricants are much less available than synthetic esters (Bremmer and Plonsker, 2008). To date, their most common commercial applications include hydraulic fluid and wire rope grease.

2.2 SYNTHETIC ESTERS

Lubricants based on synthetic esters have been in production longer than any other class of biolubricant and were first used for jet engine lubrication in the 1950s. Synthetic esters can be prepared by the esterification of biobased materials (i.e., some combination of modified animal fat and vegetable oil). Because synthetic esters can be specifically tailored for their intended application, they have many performance advantages over pure vegetable oils, and are used as the base oil in lubricants for many vessel applications, including hydraulic oil, stern tube oil, thruster oil, gear lubricant, and grease (ACE, 1999 and Habereder et al., 2008). Synthetic esters-based EALs are developed and marketed by several major oil companies including British Petroleum, Chevron, Exxon/Mobil and Gulf, and are currently the most widely commercially available class of EAL.

2.3 POLYALKYLENE GLYCOLS

Polyalkylene glycols (PAG) are synthetic lubricant base oils, typically made by the polymerization of ethylene or propylene oxide (Brown, 1997). Depending on the precursor, they can be soluble in either oil (propylene oxide) or water (ethylene oxide) (Greaves, 2008 and Habereder et al., 2008). Although they are made from petroleum-based materials, PAGs can be highly biodegradable, particularly the water soluble PAGs (Greaves, 2008; Sada et al., 2008; and Sada et al., 2009).

2.4 WATER

At least one company has developed a completely seawater-lubricated stern tube system that uses non-metallic bearings in place of metal bearings. This system is currently in place in over 500 commercial vessels, including several Carnival Corporation cruise ships (Carter, 2009).

SECTION 3
CONSIDERATIONS FOR EALS IN THE AQUATIC ENVIRONMENT

A number of factors must be considered when selecting lubricants for use in the aquatic environment. Vessels require a variety of lubricants for different applications and on-ship storage can be limited. Consequently, the most useful lubricants are those that can perform well in a variety of applications (Rana, 2001). Additionally, lubricants must be widely available; in the case of some larger ocean going vessels, compatible lubricants must be available at ports around the globe (Blanken, 2006).

Marine environments are characterized by high humidity conditions, and seawater ingress can pose serious lubrication problems in sealed compartments, such as stern tubes and hydraulic systems (Rana, 2001). Stern tube seals are highly susceptible to leakage, both from normal operations, including vibrations and misalignment, and from contact with nets or fishing lines (Sada et al., 2008 and Carter, 2009). The constant presence of seawater increases the potential for corrosion, requiring thicker greases to repel water and corrosion inhibitors to minimize corrosion following seawater ingress. In addition, lubricants subject to frequent contact with water have a greater likelihood of undergoing some degree of biodegradation (ACE, 1999).

3.1 Thickening Agents

Stiffer greases (i.e., National Lubricating Grease Institute grade 3 or higher) are typically used in marine applications as they repel water more effectively. Lithium-based thickeners are the most commonly used thickening agents, as they are considered to have the best all-purpose formulation. Although they comprise a much smaller fraction of the grease market, calcium-based thickeners do perform well under cool, wet conditions, and are used in formulations for some marine applications (e.g., propeller housing and water pumps). Anhydrous calcium-based greases are becoming increasingly common in Europe, where there is a greater emphasis on adoption of EALs, because of their relatively low toxicity and better performance at higher temperatures (Gow, 2009).

3.2 Advantages and Disadvantages of Vegetable-based EALs

In addition to their environmental benefits (i.e., high biodegradability and low aquatic toxicity), vegetable oils possess several advantageous performance qualities compared to mineral oils. They have a higher viscosity index (meaning they do not thin as readily at high temperatures) and they have a higher lubricity, or ability to reduce friction (Nelson, 2000; IENICA, 2004). Vegetable oil-based lubricants also have a high flash point, meaning they combust at higher temperatures than conventional mineral oils. They perform well at extreme pressures, and do not react with paints, seals, and varnishes (ACE, 1999).

Vegetable oils possess several major performance drawbacks, however, which have limited their use in the formulation of EALs. The primary limitations are (1) poor performance at both low and high temperatures and (2) oxidative instability (Erhan et al., 2006 and Habereder et al., 2008). Vegetable oils thicken more than mineral oils at low temperatures and are subject to increased oxidation at high temperatures, resulting in the need for more frequent oil changes. These shortcomings can be addressed with the use of selected additives for a formulation or through the selective breeding and use of high-oleic oils (i.e., oils that contain more oleic acid, a monounsaturated fat, and less polyunsaturated fats) that are less susceptible to oxidative instability. The use of selected additives can increase production costs and may decrease the overall environmental acceptability of the product (Nelson, 2000; Bremmer and Plonsker, 2008). In addition, vegetable oils remove mineral oil deposits, resulting in the need for more frequent oil filter service.

Vegetable oil lubricants are more expensive than comparable mineral oil lubricants, as a function of both higher base oil costs, as well as higher costs for the base oil-compatible additives (ACE, 1999). Although Miller (2008) stated that vegetable oil lubricants cost approximately double that of mineral base oils, more recent information obtained through personal communication with a major lubricant supplier suggests that the current cost premium for these biolubricants may be only 20% more. Changing from a mineral to a vegetable oil lubricant is relatively simple, as vegetable oils and mineral oils are compatible and vegetable oil lubricants will perform properly if some mineral oil residue remains. Because the overall formulations are less toxic, disposal costs are generally lower; however, this may not always be the case, as fewer disposal stations are able to accept spent biobased lubricants (ACE, 1999; Nelson, 2000; and Bremmer and Plonsker, 2008).

3.3 ADVANTAGES AND DISADVANTAGES OF SYNTHETIC ESTER-BASED EALS

Synthetic esters perform well across a wide range of temperatures, have a high viscosity index, possess high lubricity, provide corrosion protection, and have high oxidative stability (ACE, 1999 and Habereder et al., 2008). Because they contain biobased material, many synthetic esters satisfy testing requirements for biodegradability and aquatic toxicity, although they tend to be less readily biodegradable than pure vegetable oil-based lubricants (WISE Solutions, 2006). Synthetic ester-based lubricants can be more or less toxic than vegetable oil-based lubricants, depending on the aquatic toxicity of the additives used in the formulation. The only notable performance issue with synthetic esters is that they are incompatible with some paints, finishes, and seal materials (ACE, 1999).

Synthetic esters are generally the most expensive class of EAL (Miller, 2008). Synthetic ester-based biolubricants cost approximately 2-3 times that for comparable conventional mineral oil-based lubricants. As the availability of synthetic ester-based EALs increases, this cost differential is expected to decline.

The relatively higher cost of synthetic esters is somewhat mitigated by their high oxidative stability, which results in longer lubricant life. This is particularly applicable to areas of the vessel that require more frequent lubricant changes (e.g., engine oil, hydraulic fluid, stern tube-thruster fluid). Synthetic esters are compatible with mineral oil, which reduces changeover costs, but similar to vegetable oils in that their effectiveness at removing mineral oil deposits can cause filters to clog during the period initially following lubricant changeover (ACE, 1999). Disposal costs are similar to those for vegetable oil-based lubricants.

3.4 ADVANTAGES AND DISADVANTAGES OF POLYALKYLENE GLYCOL-BASED EALS

Lubricants consisting of polyalkylene glycols (PAGs) have the best overall low- and high-temperature viscosity performance among all of the classes of biolubricants. For marine applications, water soluble PAG EALs are attractive because, in addition to their high biodegradability, they retain their performance characteristics following water influx better than other EALs; as a result, PAG EALs have received consideration as a stern tube lubricant (Sada et al., 2008; Sada et al., 2009). The water solubility of ethylene oxide-derived PAGs can improve performance relative to other lubricants by maintaining viscosity following some fraction of water influx (up to 20% in some laboratory tests), which can be of great importance for stern tube lubrication (Sada et al., 2008; Carter, 2009). PAGs also perform well in terms of lubricity, viscosity index, and corrosion protection. The relatively high viscosity and lubricity of PAGs has resulted in the recent development of PAG-based thruster lubricants (Sada et al., 2009).

Disadvantages associated with PAGs are that they are incompatible with mineral oils, as well as most paints, varnishes, and seals (ACE, 1999; Sura et al., 2008). Because of this incompatibility, they have the highest changeover costs of any class of EAL (Sada et al., 2008). Additionally, water soluble PAGs may demonstrate increased toxicity to aquatic organisms by directly entering the water column and sediments rather than remaining on the water column surface as a sheen (Habereder et al., 2008).

3.5 AVAILABILITY AND COST OF EALS

At the present, the global availability of EALs for different marine applications is growing. One manufacturer of marine EALs, Castrol Bio Range, provided data demonstrating that stern tube and thruster lubricant, hydraulic fluids, gear lubricants and grease were available in the following global regions and countries (Pearce et al., 2010; Castrol Marine, 2011):

- Americas: USA;
- Northern Europe: Belgium, Denmark, Finland, France, Germany, Netherlands, Norway, Sweden, UK;
- Mediterranean: Italy, Spain, Turkey, UAE; and
- Asia-Pacific: China, Japan, Hong Kong, Singapore, Korea.

Market cost data for EALs are unavailable, because manufacturers consider such data to be proprietary marking information. The purchase prices of EALs are guarded closely by the manufacturers, and EPA has generally been unable to obtain publicly available cost information from EAL manufacturers. Operating costs for ship-owners and charterers using environmentally preferable lubricants are expected to increase modestly relative to conventional products, although there can be efficiency gains from longer life (e.g., reduced corrosive properties, enhance water contamination performance). However, the benefit of using environmentally preferable lubricants can be considerable in terms of reduced environmental impacts.

Some indication of the cost of EALs relative to conventional lubricants was provided by a major lubricant vendor and is tabulated in Table 1. Some specialized lubricants may have higher costs.

Table 1. Cost of EALs

Lubricant Base Oil	Ratio of EAL cost to Conventional Mineral Oil Lubricant Cost
Mineral Oil	1
Vegetable Oils	1.2
Synthetic Esters	2 to 3
Polyalkylene Glycols	2 to 3

An informal survey of websites for the boating supply distributors West Marine, Jamestown Distributors, Aerospace Lubricants, Inc. and Aqua Lube, demonstrates that semi-synthetic ester and full synthetic ester engine oil, gear oil, and greases are the most commonly available biolubricants for recreational vessel owners. The costs of full synthetic ester formulations (primarily two cycle and four stroke engine oils) range from 1.4-1.8 times the costs of comparable conventional (mineral oil) formulations. These distributor websites do not provide information as to whether any of the synthetic ester-based biolubricants meet certification standards that would classify them as EAL. For commercial vessels, relative pricing information for Gulf Oil marine lubricants reveals that costs for biolubricants advertised (synthetic gear oil, compressor oil, and coolant oil, the three synthetic lubricants), ranged from approximately 1.3-2.5 times (coolant oil) to 3.5-4.3 times (gear oil and compressor oil) the cost for comparable mineral oil products (Gulf Marine, 2010). It may be reasonable to assume that the cost premium for EALs is similar to these price ratios.

Many countries, primarily in Europe, encourage the manufacture and consumption of EALs. Examples are through tax exemptions on environmentally acceptable base oils, taxes on mineral oils, subsidies to consumers to cover the price difference between conventional and EALs, or preferential purchasing programs that require a percentage of certain classes of product to be made from renewable resources (Habereder et al., 2008; IENICA, 2004; and WISE Solutions, 2006).

SECTION 4
DEFINING "ENVIRONMENTALLY ACCEPTABLE"

Lubricants may be labeled using a variety of terms to signify that they are environmentally friendly. Although EFLs are most likely to be tested for biodegradability, aquatic toxicity and bioaccumulation potential, there are numerous other methods, which vary in their sensitivity.

4.1 BIODEGRADABILITY

Biodegradability is a measure of the breakdown of a chemical (or a chemical mixture) by micro-organisms. *Primary* biodegradation is the loss of one or more active groups in a chemical compound that renders the compound inactive with regard to a particular function (Betton, 2009). Primary biodegradation may result in the conversion of a toxic compound into a less toxic or non-toxic compound. *Ultimate* biodegradation, also referred to as mineralization, is the process whereby a chemical compound is converted to carbon dioxide, water, and mineral salts (Betton, 2009).

In addition to primary and ultimate biodegradation, biodegradation is also defined by two other operational properties: inherent biodegradability and ready biodegradability. A compound is considered *inherently* biodegradable so long as it shows evidence of biodegradation in any test for biodegradability. *Readily* biodegradable is an operational definition that some fraction of a compound is ultimately biodegradable within a specific timeframe, as specified by a test method.

Common test methods, such as those developed by the Organization for Economic Cooperation and Development (OECD), the Coordinating European Council (CEC), and the American Society for Testing and Materials (ASTM), for determining lubricant biodegradability are OECD 301B (the Modified Strum test), ASTM D-5864, and CEC L-33-A-934. Both OECD 301B and ASTM D-5864 measure ready biodegradability, defined as the conversion of 60% of the material to CO_2 within a ten day window following the onset of biodegradation, which must occur within 28 days of test initiation (Willing, 2001). In contrast, the CEC method tests the overall biodegradability of hydrocarbon compounds and requires 80% or greater biodegradability as measured by the infrared absorbance of extractable lipophilic compounds (CEC, 1997 and WISE Solutions, 2006). Unlike the OECD and ASTM methods, the CEC method does not distinguish between primary and ultimate biodegradability, and is considered to be a less stringent test (Blanken, 2006).

Table 2 lists some of the internationally standardized test methods that measure biodegradability.

Table 2. Internationally Standardized Test Methods for Measuring Biodegradability

Test Type	Test Name	Measured Parameter[a]	Pass Level[b]	Method
Ready Biodegradability (A substance is considered to be inherently biodegradable using any of these tests if it shows ≥20% biodegradability within the test duration)	DDAT	DOC	≥70%	OECD 301A
	Strum test	CO_2	≥60%	OECD 301B
	MITI test	DOC	≥70%	OECD 301C
	Closed bottle test	BOD/COD	≥60%	OECD 301D
	MOST	DOC	≥70%	OECD 301E
	Sapromat	BOD/COD	≥60%	OECD 301F
	Strum test	CO_2	≥60%	ASTM D-5864
	Shake flask test	CO_2	≥60%	EPA 560/6-82-003
	BODIS test	BOD/COD	≥60%	ISO 10708
Hydrocarbon degradability	CEC test	Infrared Spectrum	≥80%	CEC L-33-A-934
Screening tests (semi-official)	CO_2 headspace test	CO_2	≥60%	ISO 14593

Source: modified from Willing, 2001

a. DOC – dissolved organic carbon; CO_2 – carbon dioxide; BOD – biochemical oxygen demand; COD – chemical oxygen demand

b. Ready biodegradability is defined as complete mineralization of a compound into water, carbon dioxide, and mineral salts according to a specific test criterion. Pass levels indicate the percentage of complete mineralization (or ultimate biodegradation) as indicated by the "Measured Parameter" that must occur for a product to be classified as readily biodegradable.

Table 3 summarizes biodegradation rates for different lubricant base oils. Ester-based oils have a much greater inherent biodegradation rate due to the presence of carboxylic acid groups that bacteria can readily utilize (Mudge, 2010). These compounds are also more water soluble than compounds that do not contain polar functional groups, the absence of which can reduce their bioaccumulation potential.

Table 3. Summary of Differential Biodegradation Rates by Lubricant Base Oils

Lubricant base oil	Base oil source	Biodegradation
Mineral oil	Petroleum	Persistent / Inherently
Polyalkylene glycols (PAG)	Petroleum - synthesized hydrocarbon	Readily
Synthetic Ester	Synthesized from biological sources	Readily
Vegetable Oils	Naturally occurring vegetable oils	Readily

Source: Mudge, 2010

4.2 AQUATIC TOXICITY

In addition to possessing a certain percentage of readily biodegradable material, an EAL must also demonstrate low toxicity to aquatic organisms. Test methods to demonstrate toxicity include the OECD tests series 201-4, and 209-212; and corresponding USEPA environmental effect test guidelines from EPA 560/6-82-002. The most common aquatic toxicity tests for assessing EALs are the 72-hour growth test for algae (OECD 201), the 48-hour acute toxicity test for daphnia (OECD 202), and the 96-hour toxicity test for fish (OECD 203). Analogous USEPA tests are sections EG-8, EG-1, and EG-9 of EPA 560/6-82-002 for algae, daphnia, and fish, respectively. A listing of all of the OECD aquatic toxicity tests is included in Table 4.

Table 4. OECD Aquatic Toxicity Tests

Test Title, with Species	Test Number
Growth Inhibition Test, Alga	OECD 201
Acute Immobilization Test, *Daphnia* sp.	OECD 202
Acute Toxicity Test, Fish	OECD 203
Prolonged Toxicity Test: 14-Day Study, Fish	OECD 204
Respiration Inhibition Test, Bacteria	OECD 209
Early-Life Stage Toxicity Test, Fish	OECD 210
Reproduction Test, *Daphnia magna*	OECD 211
Short-term Toxicity Test on Embryo and Sac-fry Stages, Fish	OECD 212

In general, the vegetable oil and synthetic ester base oils have a low toxicity towards marine organisms with the LC_{50} for fish toxicity reported as being ~10,000 ppm for fatty acid esters and glycerol esters (see Table 5) (van Broekhuizen, 2003). Water soluble PAGs may demonstrate increased toxicity to aquatic organisms by directly entering the water column and sediments rather than remaining on the water column surface as a sheen (Habereder et al. 2008).

Table 5. Summary of Comparative Toxicity of Base Oils

Lubricant base oil	Base oil source	Toxicity
Mineral oil	Petroleum	High
Polyalkylene glycols (PAG)	Petroleum - synthesized hydrocarbon	Low[a]
Synthetic Ester	Synthesized from biological sources	Low
Vegetable Oils	Naturally occurring vegetable oils	Low

Source: Mudge, 2010
a. Solubility may increase the toxicity of some PAGs

As with many oily chemicals, the toxicity in some tests is not measureable as the LC_{50} exceeds the water solubility of the compound (Mudge, 2010). In such cases, it is possible to induce physical effects such as smothering but this is not a chemical toxic effect. Some methodologies use the water-accommodated fraction, the part of the oil that disperse or dissolves in water, although this is not a true reflection of the entire oil behavior in the marine environment.

The petroleum-based oils have a greater toxicity to biota in the marine food chain compared to the other base oil sources (Mudge, 2010). This is related to the more rapid breakdown of petroleum-based oils once in the sea, which ultimately affects the potential for bioaccumulation. The toxicity of petroleum-based oils is also dependent upon additives used in formulations and metabolites produced in biodegradation.

The use of additives is dependent on the choice of base oil and the intended function of the lubricant (Mudge, 2010). However, several of the more toxic compounds in formulations are also the ones with poor degradability. The overall product toxicity may be significantly reduced by switching to a biologically-sourced base oil used in conjunction with low toxicity additives.

4.3 BIOACCUMULATION

The propensity of a substance to bioaccumulate is another property of a lubricant that is often considered in the qualification of a product as an EAL (Mudge, 2010). Bioaccumulation is the build-up of chemicals within the tissues of an organism over time. The longer the organism is exposed to a chemical and the longer the organism lives, the greater the accumulation of the chemical in the tissues (Mudge, 2010). If the chemical has a slow degradation rate or low depuration rate within an organism, concentrations of that chemical may build-up in the organism's tissues and may eventually lead to adverse biological effects. It is, therefore, desirable to use compounds in formulations that do not bioaccumulate. It may not be possible to phase out all bioaccumulating compounds, but it is feasible to use chemicals that have a lower bioaccumulation potential, either through not being taken up as readily or by degrading more quickly both in the environment and in the organism.

The bioaccumulation potential of a compound is directly related to its water solubility; chemicals that are not water soluble tend to move into fatty tissues rather than to staying in water. These lipophilic chemicals include most of the compounds used in the manufacture of the base oil in lubricants. The water solubility of a compound is related to the type of atoms in the molecule; compounds comprised solely of carbon and hydrogen tend to have the lowest solubility in water. Compounds of this type includes alkanes, which form almost 90% of the current base oil in conventional lubricant formulations. The inclusion of one or more oxygen atoms in a molecule will, in general, increase the water solubility and reduce bioaccumulation. Compounds with oxygen also tend to degrade more quickly in the environment or be excreted faster from organisms.

Many naturally-derived base oils used in lubricants are formulated around carboxylic acids, which increase water solubility and degradation; therefore, their bioaccumulation potential is reduced in comparison to alkane-based oils.

It has been assumed for some time that larger molecules are not bioaccumulated as they are unable to physically pass through the membranes of cells and be incorporated into the living cells (Arnot et al., 2010). Therefore, when designing lubricant formulations, the molecular size of the components of the base oil are considered as they will directly affect the rate of uptake. There has been several criteria proposed over the past few years to describe the point at which chemicals are no longer taken up in the body and bioaccumulated (Arnot et al., 2010). In an evaluation of data for esters, there was a strong link between the log K_{ow} (the logarithm of the partitioning coefficient of a substance in n-octanol and water) and the log BCF (a measure of the bioconcentration from water into aquatic organisms), while the other factors had less well-defined relationships. The selection criteria chosen by the Canadian Government and United Nations Environment Program (UNEP) (Canada, 2000 and UNEP, 2001) and the U.S. Environmental Protection Agency (USEPA, 1999) led to cut-off log K_{ow} values of ~5. There is no single criterion to adequately describe the BCF; one study proposes a holistic approach integrating several factors, including measured uptake and elimination rates (Arnot et al., 2010).

Certain labeling programs, most notably the European Eco-label (see Section 5), require demonstration that a product is not bioaccumulative. This can be accomplished in a number of ways for organic compounds, such as measuring log K_{ow}, or BCF. The two most common test methods for establishing bioaccumulation potential are OECD 117 and 107. For these tests, the test substance is added to a mixture of octanol and water and its dissolution in each phase is detected using gas chromatography or an infra red detector. The bioaccumulation of the substance is measured by establishing its partition coefficient (expressed as log K_{ow}) in octanol and water. Substances that have a tendency to bioaccumulate will preferentially dissolve in the octanol rather than the water, and octanol mimics the fatty tissue in an organism. Therefore, the greater the log K_{ow}, the greater the likelihood that the substance will bioaccumulate.

Partition coefficients for the marine environment are normally measured on a log scale between 0-6. Substances with log K_{ow} <3 are deemed not to bioaccumulate and those with log K_{ow} >3 are deemed to be bioaccumulating.

Seawater may increase the likelihood of uptake by organisms in comparison to freshwater due to "salting out" of lipophilic substances. Therefore, although freshwater is used in these test methods, as long as conservative acceptance limits are set, they can be used as an indicator of bioaccumulation potential in the marine environment. The use of these test methods as an indicator of a substance's bioaccumulation potential can negate the need to carry out *in vivo* or *in vitro* fish or mussel testing.

In summary, the level to which a component of the product is bioaccumulated in an organism is dependent on the environmental and biological half-lives of the compounds (some will degrade before being incorporated into an organism and some will be metabolized within the organism), as well as the lipophilic nature of the compounds (as measured by water solubility). Any component that has low water solubility may potentially bioaccumulate in an organism. In the case of lubricants, fatty acid-containing components have reduced bioaccumulation potential due to greater water solubility and higher biodegradation rates. This is one distinct advantage in using esters over the other carbon and hydrogen alone base oil types (see Table 6).

Table 6. Summary of Bioaccumulation Potential by Base Oil Types

Lubricant base oil	Base oil source	Potential for Bioaccumulation
Mineral oil	Petroleum	Yes
Polyalkylene glycols (PAG)	Petroleum - synthesized hydrocarbon	No
Synthetic Ester	Synthesized from biological sources	No
Vegetable Oils	Naturally occurring vegetable oils	No

Source: Mudge, 2010

4.4 Summary of Environmentally Acceptable Lubricant Characteristics

A summary of the major factors regarding biodegradation, toxicity and bioaccumulation potential, for each of the base oil types is shown in Table 7. In this table, the three major criteria are presented for each base oil and color-coded to indicate the environmental outcome. The biodegradability of a lubricant reflects that of the lubricant's base oil, while the degree of aquatic toxicity is typically a consequence of the performance enhancing additives (or thickening agents) within the formulation. The base oils that degrade quickly are considered more preferable than those that do not rapidly degrade, although there might be a trade-off with regard to the depletion of oxygen during compound metabolism. The compounds that do not bioaccumulate and are relatively less toxic are considered more preferable than those that bioaccumulate and have higher toxicities.

Table 7. Comparative Environmental Behavior of Lubricants by Base Oil Type

Lubricant base oil	Base oil source	Biodegradation	Potential for Bioaccumulation	Toxicity
Mineral oil	Petroleum	Persistent / Inherently	Yes	High
Polyalkylene glycols (PAG)	Petroleum - synthesized hydrocarbon	Readily	No	Low[a]
Synthetic Ester	Synthesized from biological sources	Readily	No	Low
Vegetable Oils	Naturally occurring vegetable oils	Readily	No	Low

Source: Mudge, 2010

a. Solubility may increase the toxicity of some PAGs

Currently, a majority of lubricant base oils (mineral oils) have the lowest biodegradation rate, a high potential for bioaccumulation, and a measurable toxicity towards marine organisms. In contrast, the base oils derived from oleochemicals (vegetable oils and synthetic esters) degrade faster, have a smaller residual, do not bioaccumulate appreciably and have a lower toxicity to marine organisms. PAG-based lubricants are also generally biodegradable and do not bioaccumulate; however, some PAGs may be more toxic due to their solubility in water. On the basis of this simple comparison, lower environmental impacts will arise if a greater proportion of base oils are manufactured from biologically-sourced materials.

SECTION 5
ENVIRONMENTALLY ACCEPTABLE LUBRICANT LABELING PROGRAM

To minimize confusion in the marketplace and to increase public awareness and create sensitivity for environmentally preferable products, national and international labeling programs have been developed, primarily in Europe (Habereder et al., 2008). These labeling programs have defined and established methods to measure the properties of a lubricant that would qualify it as being environmentally acceptable. The labeling programs can aid the purchasing decisions of a vessel operator by helping to remove uncertainty. The principal national and international labeling certification programs for biolubricants and EALs are presented below.

5.1 National Labeling Programs

5.1.1 Blue Angel

The first national labeling scheme for lubricants was the German Blue Angel label, developed in 1988. Criteria have been developed for several classes of lubricants, including hydraulic fluids, lubricating oils, and greases. In order to qualify for certification, a lubricant must possess the following characteristics: biodegradability; low toxicity to aquatic organisms; non-bioaccumulative; and no dangerous components (such as carcinogens or toxic substances as defined by Germany's Ordinance on Hazardous Substances). A product must also pass technical performance characteristics appropriate for its use. Biodegradability can be demonstrated using OECD tests 301B-301F to measure ultimate biodegradability or CEC L-33-A-934 to measure primary biodegradability. Blue Angel's requirement for ultimate biodegradability is the primary difference between the Blue Angel labeling certification program and other national and international certification programs. Aquatic toxicity is determined according to OECD 201-203.

Products receiving the Blue Angel certification must also pass a series of technical performance requirements that depend on the class of lubricant. Unlike some of the other labeling programs, the Blue Angel certification does not have any requirements for renewability; consequently, lubricants comprised completely of petroleum-sourced components can receive Blue Angel certification. Nevertheless, Blue Angel certification is considered rather stringent, and the proportion of lubricants receiving this certification remains low, with the majority being hydraulic fluids (Habereder et al., 2008). A complete list of all lubricants that carry the Blue Angel certification can be found at http://www.blauer-engel.de/en/products_brands/search_products/search_for_products.php.

5.1.2 Swedish Standard

Another national labeling scheme for lubricants is the Swedish Standard, which includes standards for hydraulic fluids (SS 155434) and greases (SS 155470). Evaluation of a lubricant under the Swedish Standard involves testing for biodegradability and aquatic toxicity, as well as sensitizing properties of a lubricant formulation and its components (Habereder et al., 2008). The Swedish Standard evaluates biodegradability using ISO test methods (e.g., ISO 9439), and has varying requirements, depending upon class, for renewable resources content (SP 2010). The

Swedish Standard is unique because it was conceived and developed as a collaborative project between government and industry. This program has more listed lubricant products, particularly hydraulic fluids, than any other national labeling program (IENICA, 2004).

5.2 INTERNATIONAL LABELING PROGRAMS

5.2.1 Nordic Swan

The first international labeling program for EALs was the Nordic Swan program, encompassing Norway, Sweden, Finland, Iceland, and Denmark. This program was initially introduced for hydraulic oil, two-stroke oil, grease, and transmission and gear oil (IENICA, 2004). The Nordic Swan certification addresses biodegradability, aquatic toxicity (OECD 201 and 202), technical performance, and renewability. The renewability requirements are the highest of all the labeling programs (e.g., at least 65% renewable content for hydraulic fluid, transmission fluid, gear oil, or grease, and at least 50% for two-stroke oil). Consequently, very few lubricants bear the Nordic Swan label (Habereder et al., 2008).

5.2.2 European Eco-label

The European Union has adopted a single European Eco-label. The Eco-label is considered to be the first major advancement towards creating a single international standard, and is becoming the most generally accepted label. The Eco-label for lubricants was established in 2005, and includes hydraulic fluids, greases, and total loss lubricants, such as two-stroke oils. This labeling scheme consists of seven criteria encompassing biodegradability, aquatic toxicity, bioaccumulation, and the presence of certain classes of toxic substances (Habereder et al., 2008). A complete list of all lubricants that carry the European Eco-Label can be found at http://www.eco-label.com/default.htm.

The ecological criteria for Eco-label lubricants aim at promoting products that have a reduced impact on the water and soil during their use and contain a large fraction of biologically-based material. Since this is the most widely accepted labeling program, the requirements for this labeling scheme are described in detail below.

5.2.2.1 Dangerous Materials

Before a lubricant can be considered for the Eco-label, it is determined that neither the formulation nor any of the main components are on the list of R-phrases (risk phrases) pertaining to environmental and human health hazards according to the European Union Dangerous Preparations Directive (IENICA, 2004). These include qualities such as explosiveness, flammability, carcinogenic potential, volatility, potential to cause birth defects, etc.

5.2.2.2 Toxicity

Aquatic toxicity can be evaluated either for the complete formulation and main compounds (those compounds comprising at least 5% of the formulation) or for each constituent substance. Greases must be evaluated for each constituent substance unless it can be shown that the thickening agent is at least inherently biodegradable (see below). All formulations and components must pass both OECD 201 and 202 for acute toxicity testing, and OECD 210 or 211 for chronic toxicity testing. If evaluated for the formulation and main constituents, the LC_{50} (i.e., concentration of a compound or mixture that will kill half of the sample population of a specific test-organism in a specified period) of hydraulic fluids must be at least 100 mg/L and the LC_{50} of greases, two-stroke oils, and all other total loss lubricants must be at least 1000 mg/L (European Commission, 2009). If the evaluation is based on each constituent substance, then constituents that comprise less than 20% of hydraulic fluids can have an LC_{50} of 10-100 mg/L or have a no observed effect concentration (NOEC) of 1-10 mg/L; constituents that comprise less than 5% of hydraulic fluids can have an LC_{50} of 1-10 mg/L or have a NOEC of 0.1-1 mg/L; and constituents that comprise less than 1% of hydraulic fluids can have an LC_{50} of less than 1 mg/L or have a NOEC of 0-0.1 mg/L. For greases, two-stroke oils, and other total loss lubricants, the respective percentages are 25%, 1%, and 0.1% (European Commission, 2009).

5.2.2.3 Biodegradability and Bioaccumulation

Ninety percent or more of the total hydraulic oil formulation (75% for greases or two-stroke oils) must be ultimately biodegradable, as determined according to any of OECD tests 301 A-F, or equivalent. Less than 5% of the hydraulic oil formulation (20% for greases or two-stroke oils) must be inherently biodegradable. Inherent biodegradability can be defined as at least 20%, but less than 60% or 70% biodegradable (depending on the test), for any of OECD 301 A-F, or it can be defined as greater than 70% biodegradation in the OECD 302C test (or equivalent), or greater than 60% biodegradation in the ISO 14593 test (European Commission, 2009).

In addition to being biodegradable, a lubricant must not have the potential to be bioaccumulative. A lubricant is considered not potentially bioaccumulative if one of the following conditions is met: it has a molar mass greater than 800 g/mol or a molecular diameter greater than 1.5 nm; it has a log K_{ow} less than 3 or greater than 7; or it has a measured BCF less than 100 L/Kg (European Commission, 2004). Log K_{ow} , which can be assessed using OECD 107, 117, or 123, or calculated, can be used to demonstrate bioaccumulation potential for organic compounds only. For all other compounds, BCF must be measured using the flow-through fish test given by OECD 305 (European Commission, 2004).

5.2.2.4 Restricted Substances

Lubricant formulations must not include certain specific substances, including halogenated organic compounds, nitrite compounds, metals or metallic compounds (with the possible exception of sodium-, potassium-, magnesium-, lithium-, aluminum-,and calcium-based soaps) (European Commission, 2004).

5.2.2.5 Renewable Content

At least 50% of hydraulic oils and two-stroke oils, and at least 45% of greases, must consist of renewable materials, with renewable defined as vegetable oils or animal fats (European Commission, 2004). Given that 70-90% of a lubricant or lubricant grease is the formulation's base oil, this requirement effectively excludes mineral oil lubricants from Eco-label certification.

5.2.2.6 Other

The final criteria for the Eco-label are for technical performance, which are specific to the lubricant class in question.

5.2.3 OSPAR

The offshore oil and gas industry is highly regulated, particularly in the North Sea, compared to other marine industries (Pearce et al, 2010). Considerable attention is given to the chemicals used on and discharged from offshore oil facilities. Some of these chemicals, such as well chemicals, are deliberately discharged during normal use, similar to the discharge of total loss lubricants by the marine industry.

The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention)[2] is the current legal instrument guiding international cooperation on the protection of the marine environment of the North-East Atlantic. Work under the Convention is managed by the OSPAR Commission, which is made up by representatives of 15 contracting Governments and the European Commission (represents the European Union).

The standards for environmental compliance, which are defined within the OSPAR Harmonized Mandatory Control Scheme (HMCS) regulations, require component level testing of chemicals released to the marine environment for biodegradation, bioaccumulation, and toxicity. These standards, which apply to the North Sea, are being adopted by most other oil and gas regulators around the world (including Australia, Canada, India, Indonesia and New Zealand) as they are considered to be the most appropriate for measuring the overall impact of a substance – not just its persistence (Pearce et al., 2010). Although these regulations do not cover the shipping industry, they may be considered the most appropriate standards for measuring the impact of released chemicals in the marine environment.

The OSPAR standards measure environmental performance of chemicals in terms of persistence (biodegradation in seawater over a 28-day period, by OECD 306), bioaccumulation (evaluation by measuring K_{ow} using OECD 117 or 107) and marine toxicity to four North Sea species (algae, copepods, sediment reworkers and bottom-dwelling fish). Testing is carried out on each component, and must be conducted by an approved third-party laboratory. The OSPAR protocols for methods for the testing of chemicals used in the offshore oil industry are available online (OSPAR, 2006). The mechanisms set out in the HMCS to ensure and actively promote the continued shift towards the use of less hazardous substances (or preferably non-hazardous substances) are described in the OSPAR Decision 2000/2 on a Harmonised Mandatory Control System for the Use and Reduction of the Discharge of Offshore Chemicals (OSPAR, 2000).

5.3 SUMMARY OF ENVIRONMENTALLY ACCEPTABLE LUBRICANT LABELING PROGRAMS

A summary of the major EAL labeling programs discussed in this section (including biodegradation, toxicity, bioaccumulation potential and other criteria) is provided in Table 8.

[2] www.ospar.org

Table 8. Comparison of EAL Labeling Programs

EAL Labeling Program	Biodegradability	Aquatic Toxicity	Bioaccumulation	Other Criteria
Blue Angel (Germany)	OECD 301B-F (ultimate biodeg.) or CEC L-33-A-934 (primary biodeg.)	OECD 201-203	OECD 305 A-E or K_{ow}	Dangerous materials; Technical performance
Swedish Standard	ISO 9439	NA	None	Renewable content; Sensitizing properties
Nordic Swan	NA	OECD 201-202	None	Renewable content; Technical performance
European Eco-label	OECD 301 A-F (ultimate biodeg.), OECD 302C or ISO 14593	OECD 201 and 202 (acute) & OECD 210 or 211 (chronic)	OECD 107, 117 or 123 (K_{ow} for organic compounds) or OECD 305	Dangerous materials; Restricted substances; Renewable content; Technical performance
OSPAR	OECD 306 (degradation under marine conditions)	Marine toxicity to 4 species	OECD 117or 107 (K_{ow})	

NA - Not available

SECTION 6
CONCLUSION

Because much of the lubricant lost from a vessel directly enters the aquatic environment, there is a greater focus on encouraging the implementation of EALs on vessels (see 2008 VGP, page 24) (Carter, 2009). For all applications where lubricants are likely to enter the water, EAL formulations using vegetable oils, biodegradable synthetic esters or biodegradable polyalkylene glycols as oil bases instead of mineral oils can offer significantly reduced environmental impacts across all applications. Although their use is increasing, EALs continue to comprise only a small percentage of the total lubricant market.

Among types of EALs used in vessels, hydraulic fluids are the most prevalent. Along with chain saw oil, more hydraulic fluids carry the Blue Angel and European Eco-label than any other class of lubricant. A major reason for the success of environmentally acceptable hydraulic fluid is that some of the performance issues associated with EALs in open systems (particularly those formulated with vegetable oil derived base oils), such as oxidation, temperature sensitivity, and biodegradation following exposure to water, are less problematic in this closed system (ACE, 1999).

Stern tube leakage is a significant source of lubricant oil inputs to the aquatic environment; therefore, the benefit of replacing mineral-oil-based stern tube lubricants with EALs is expected to be considerable. Because of the inevitability of leaks, stern tube lubricants are also subject to water influx and increased biodegradability associated with water contact. While still a niche market, environmentally acceptable stern tube lubricants formulated from PAGs have shown to perform as well as a conventional stern tube lubricant, with the additional benefit of maintained viscosity following water influx (Sada et al., 2009).

SECTION 7
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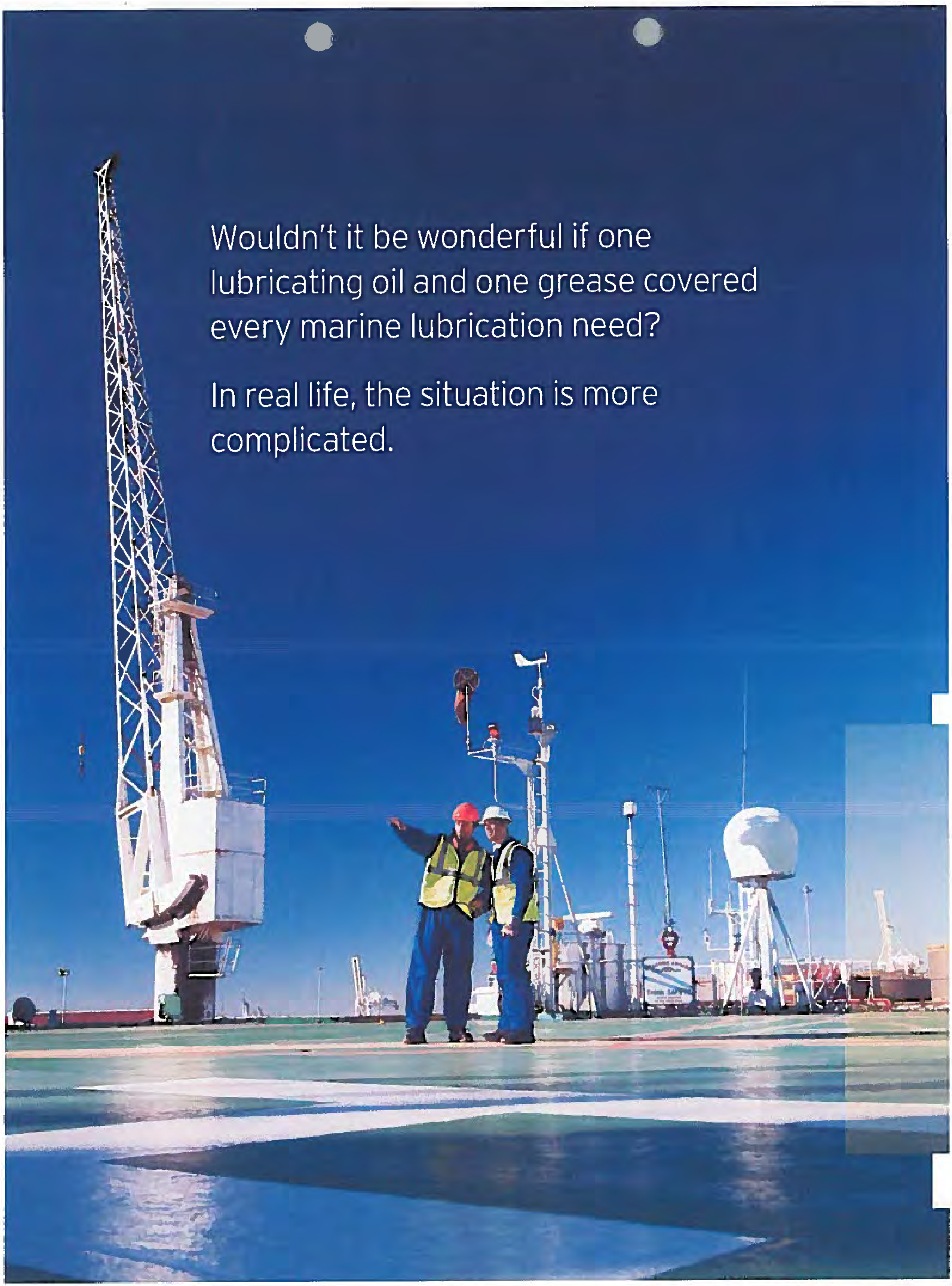
Marine Lubrication Stem to Stern

The complete marine lubricant product line

Chevron

Marine Lubrication Stem to Stern

Contents


Wouldn't it be wonderful if one lubricating oil and one grease covered every marine lubrication need?
In real life, the situation is more complicated.

1 The Complete Marine Lubricant Product Line

It would be great to need only one lubricating oil and one grease to cover all marine lubrication requirements.

Unfortunately, not only does every piece of machinery or system require its own specific type of lubricant, similar machinery and systems of different manufacturers need different lubricants, depending on the requirements set by the original equipment manufacturer (OEM), and related to application and operating conditions.

For an effective operation of a marine vessel, the following types of products are required:

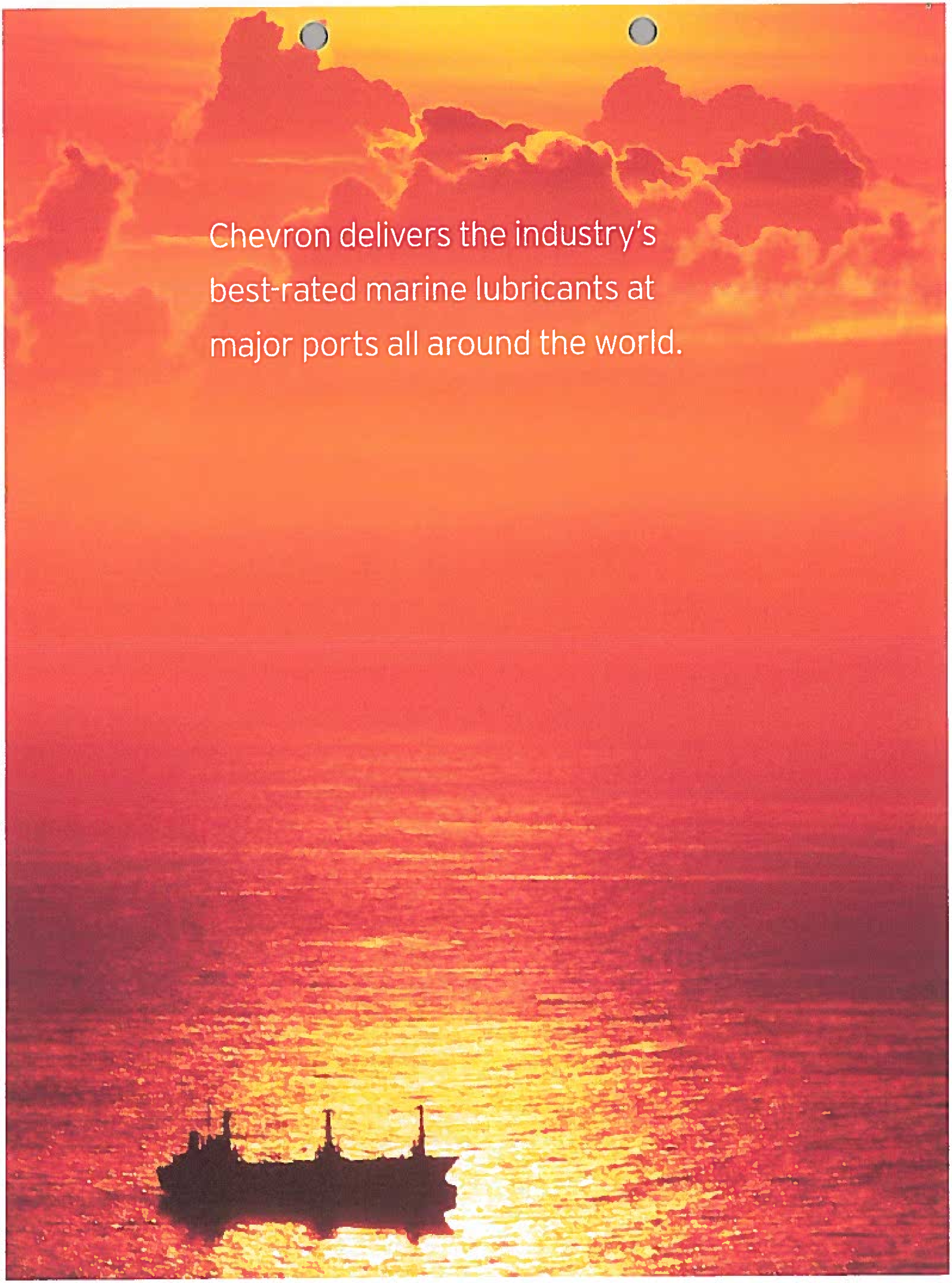
- Slow-speed engine cylinder oils
- Slow-speed engine system oils
- Medium-speed engine oils
- High-speed diesel engine oils
- Turbine oils
- Hydraulic oils
- Gear oils
- Air compressor oils
- Refrigerating compressor oils
- Gas compressor oils
- Open gear lubricant
- Greases
- Rust preventative
- Cooling water treatment

Most lubricants come in a variety of different SAE or ISO viscosity grades and a range of base numbers (BN):

- Engine oils are available with base numbers ranging from 5 to 70, and in SAE viscosity grades 30, 40, 50, and 15W-40.
- Hydraulic, turbine, gear, and compressor oils are available in different ISO viscosity grades ranging from ISO 15 up to 680.
- Greases are available with different properties and consistencies.

In addition, a number of lubricants are available in both mineral and synthetic versions.

The Chevron laboratory provides state-of-the-art testing, research and development, and technical support.


Chevron delivers the industry's best-rated marine lubricants at major ports all around the world.

2 Engine Oils

There are three different marine diesel applications:

- Slow-speed, two-stroke crosshead engines (60 - 250 rpm)
- Medium-speed, four-stroke trunk piston engines (400 - 1000 rpm)
- High-speed, four-stroke engines (> 1000 rpm)

2.1 Slow-speed diesel engines

Slow-speed, two-stroke crosshead engines are the predominant marine propulsion engines, also in use for land-based power generation applications. Lubrication of crosshead engines is separated into cylinder and crankcase lubrication.

2.1.1 Cylinder lubrication

Cylinder lubrication of slow-speed engines is a "once-through" or "total-loss" system. The cylinder oil is injected into the cylinder and distributed on the liner surface by the reciprocating movement of the piston. The cylinder oil burns and is partly scraped down to the scavenging air space where it is drained. The lube oil consumption (oil feed rate) is either mechanically or electronically controlled by the engine, based on engine speed, power output and sulphur level of the fuel.

With the ever-increasing maximum firing pressures (from around 90 bar in the mid-70s, to around 150 bar in the late 90s) the thermal load on combustion chamber parts increased simultaneously. Cylinder oils with improved thermal and oxidation stability were developed to meet the requirements of the latest design engines with cylinder liner temperatures up to 270°C. The cylinder oil viscosity will determine oil film thickness and spreadability of the oil on the liner surface. The general requirement for cylinder oil viscosity is SAE 50.

A certain alkalinity level of cylinder oil, expressed in base number (BN), is required to neutralize acidic combustion products. The base number is therefore related to the sulphur content of the fuel. The BN also reflects the detergency level of the oil, for example, the ability of the oil to keep the piston rings, lands, and grooves free from deposits. On the other hand, excess alkalinity, when using low sulphur fuel for prolonged periods of time, may promote ash deposits on piston crowns and exhaust valves. In general, 70 BN cylinder oils cover the vast majority of uses. A correct balance must be established between base number and applied oil feed rate and the sulphur level of the fuel.

For vessels sailing continuously in ECAs (Emission Controlled Areas) — for example, the North Sea or the Baltic — where ships have to use fuel with a maximum of 1.0%wt sulphur, a low BN cylinder oil with sufficient detergency such as Taro Special HT LS 40 is recommended. For vessels sailing in multi-sulphur conditions, a mid-BN cylinder oil such as Taro Special HT 55 — designed to optimize Sulphur-Base balance for a wide range of fuels — may be an appropriate choice.

TABLE 1: SLOW-SPEED ENGINE CYLINDER OILS

Chevron Product	SAE Viscosity Grade	Base Number	Application
Taro® Special HT 70	50	70	High sulphur fuel, all engine designs
Taro Special HT 55	50	55	High or low sulphur fuel, all engine designs
Taro Special HT LS 40	50	40	Low sulphur fuel, all engine designs

2.1.2 Crankcase lubrication

Modern slow-speed engine crankcase lubrication requires a 5–10 BN system oil with excellent separating characteristics and high detergency performance level in order to keep the piston-cooling gallery and crankcase clean and free from deposits.

The introduction of PTO/PTI gears on slow-speed engines necessitated increased load-carrying capacity of system oils. The load-carrying capacity is assessed by the FZG gear test. A specified set of gears (indicated by the letter "A") runs at constant speed in a sump containing the test oil with a constant temperature. The load on the gears is increased in steps. After each load step, the weight loss of the gears is measured until lubrication completely fails. This failure load step indicates the maximum load-carrying capacity of the test oil. The test conditions for engine oils are 8.3 m/s pitch line speed of the gears with an oil bath temperature of 90°C. An FZG FLS (Failure Load Stage) of 11 is generally required for today's system oils. On Chevron's product data sheets, the FZG value is shown as FZG 11 (A/8.3/90).

An SAE 30 viscosity grade is generally applicable for marine slow-speed engine system oils. The viscosity of the oil in service, however, slowly increases over time. This is partly due to ageing (oxidation) of the oil, but mainly due to the ingress of waste cylinder oil entering the system through leaking piston rod stuffing boxes and recycling of stuffing box drain oil. Along with the viscosity, the base number of the system oil will increase as well. Contamination with high alkaline cylinder oil additives has a negative influence on the water-separating characteristics of the system oil, and increases the risk of bearing lacquering and cavitation. For this reason, Chevron introduced the SAE 20 version of the standard system oil in order to dilute the high viscosity and high BN system oil in place. This SAE 20 system oil – Veritas 800 Marine 20 – has the exact same chemical properties, but with lower viscosity.

Besides the main engine application, the system oil is commonly used for the intermediate shafting and stern tube as well.

TABLE 2: SLOW-SPEED ENGINE SYSTEM OILS

Chevron Product	SAE Viscosity Grade	Base Number	Application
Veritas® 800 Marine 20	20	5	System top-up or partial replacement
Veritas 800 Marine 30	30	5	General use

Left: An FZG test rig used to assess the load-carrying capacity of slow-speed engine system oils.

Right: A view of the piston ring area through a scavenging port of a slow-speed engine.

2.2 Medium-speed diesel engines

Medium-speed, four-stroke, trunk piston engines are used for both propulsion and diesel generator applications. Unlike slow-speed engines, there is no separation between cylinder and crankcase lubrication, and the system oil needs to fulfill the requirements for both. Being directly exposed to blow-by gases and fuel leakage, the oil requires much higher dispersancy to cope with contamination.

Except for the slow-speed engine, where the amount of cylinder oil is exactly adjusted to the operating conditions, medium-speed engines have splash lubrication, which means excess cylinder lubrication. The base number of medium-speed engine oils can, therefore, be lower than slow-speed engine cylinder oils, while maintaining the required quantity of alkaline additive.

As with slow-speed engine cylinder oils, the medium-speed engine oils require sufficient detergent and dispersant properties to allow marine diesel and heavy fuel operation. It is essential for reliable engine operation and extended time between overhauls to keep the piston ring area and cooling gallery clean and the crankcase free from sludge, even under the most severe running conditions.

During operation, the alkalinity (base number) of the oil in service depletes due to acid neutralization. Base depletion is compensated by fresh oil additions necessary to make up for oil consumption. The ideal situation is to establish a balance between lube oil consumption and base depletion, maintaining a base number equilibrium above the condemning limit set by the OEM.

Lube oil consumption is mainly related to engine hardware. Piston ring and liner condition is critical in this respect. With the introduction of the anti-bore polishing-ring and consequent lube consumption figures as low as 0.3 g/kWh, high base number oils are not only required for high fuel sulphur levels, but to compensate for the low oil refreshment rate as well. In addition to the regular 30 and 40 base number oils, most oil companies have also introduced 50, 55 or 60 base number products.

Engine oils generally contain zinc compounds to enhance anti-wear properties. For EMD manufactured engines with silver-lined bearings, zinc-free oil must be present to counter incompatibility of zinc and silver. Delo® 6170 CFO is a 17 BN engine oil for diesel engines used in railroad, power generation, oil well drilling and marine applications requiring zinc-free oils.

Above: Cleanliness of piston ring area.

Below: Cleanliness of piston cooling gallery.

CHART 1: BASE NUMBER DEPLETION OF CRANKCASE OIL IN SERVICE

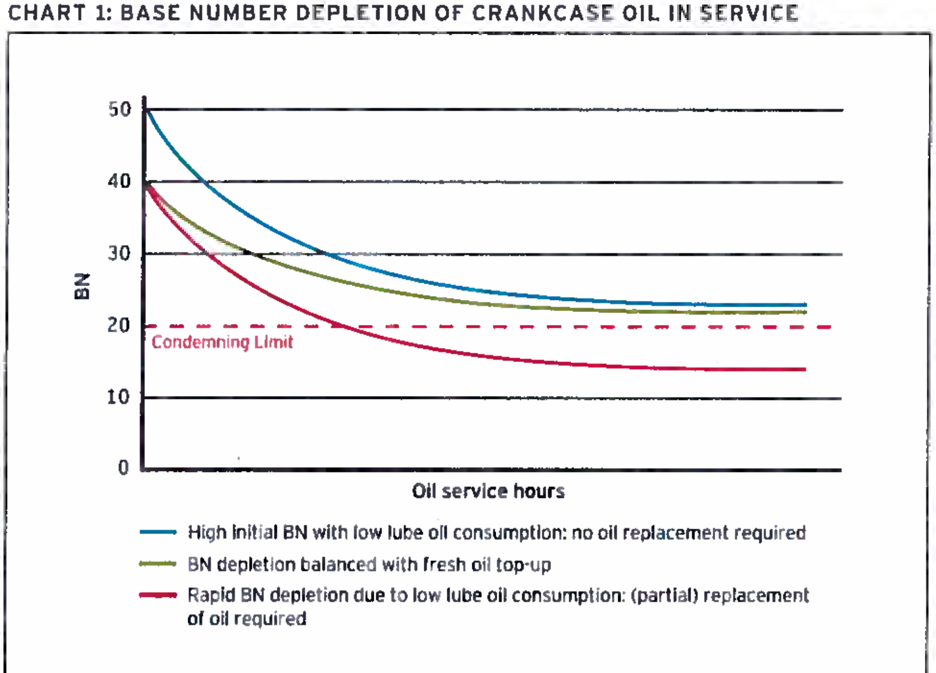


TABLE 3: MEDIUM-SPEED DIESEL ENGINE OILS

Chevron Product	SAE Viscosity Grade	Base Number	Application
Delo® 1000 Marine 30, 40	30, 40	12	MDO and gasoil operation
Taro® 20 DP 30, 40	30, 40	20	High sulphur MDO/MGO operation, HFO auxiliary operation
Taro 30 DP 30, 40	30, 40	30	HFO operation
Taro 40 XL 40	40	40	HFO operation
Taro 50 XL 40	40	50	HFO operation/low oil consumption

2.3 High-speed diesel engines

Onboard deep-sea marine vessels, high-speed diesel engines are mainly used in emergency equipment such as generators, fire pumps, air compressors, and life boats. Inland marine and fishing vessels use high-speed diesels for propulsion and generators.

As most of these engines are derived from automotive-type diesels, the lubricant oil must comply with automotive specifications and OEM requirements. API CG-4 or CH-4 and ACEA E2 are generally required for marine high-speed diesels using multigrade oils.

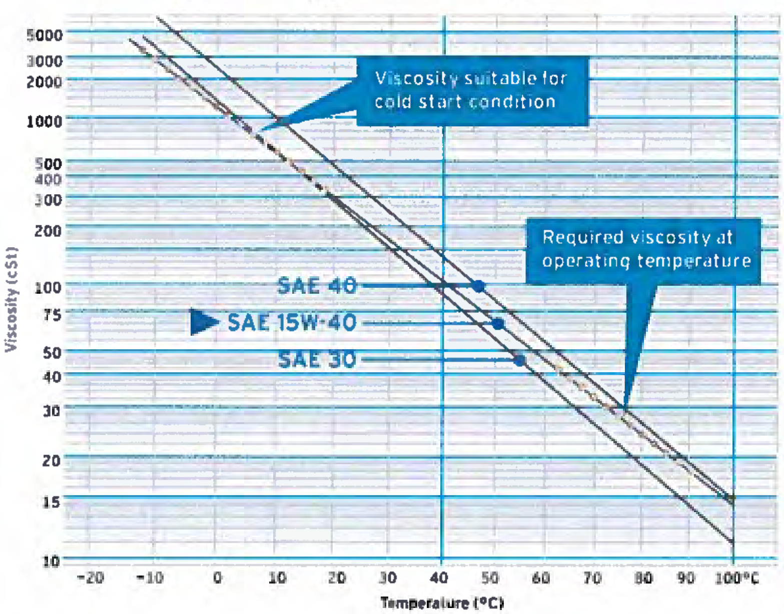
Since emergency equipment is located outside engine room spaces and is exposed to variable ambient temperatures, lubricant oil for such applications needs to have a viscosity suitable for cold start conditions, while maintaining the required viscosity at operating temperature. A multigrade SAE 15W-40 is generally recommended. SAE 30 and 40 grades are available for propulsion engines.

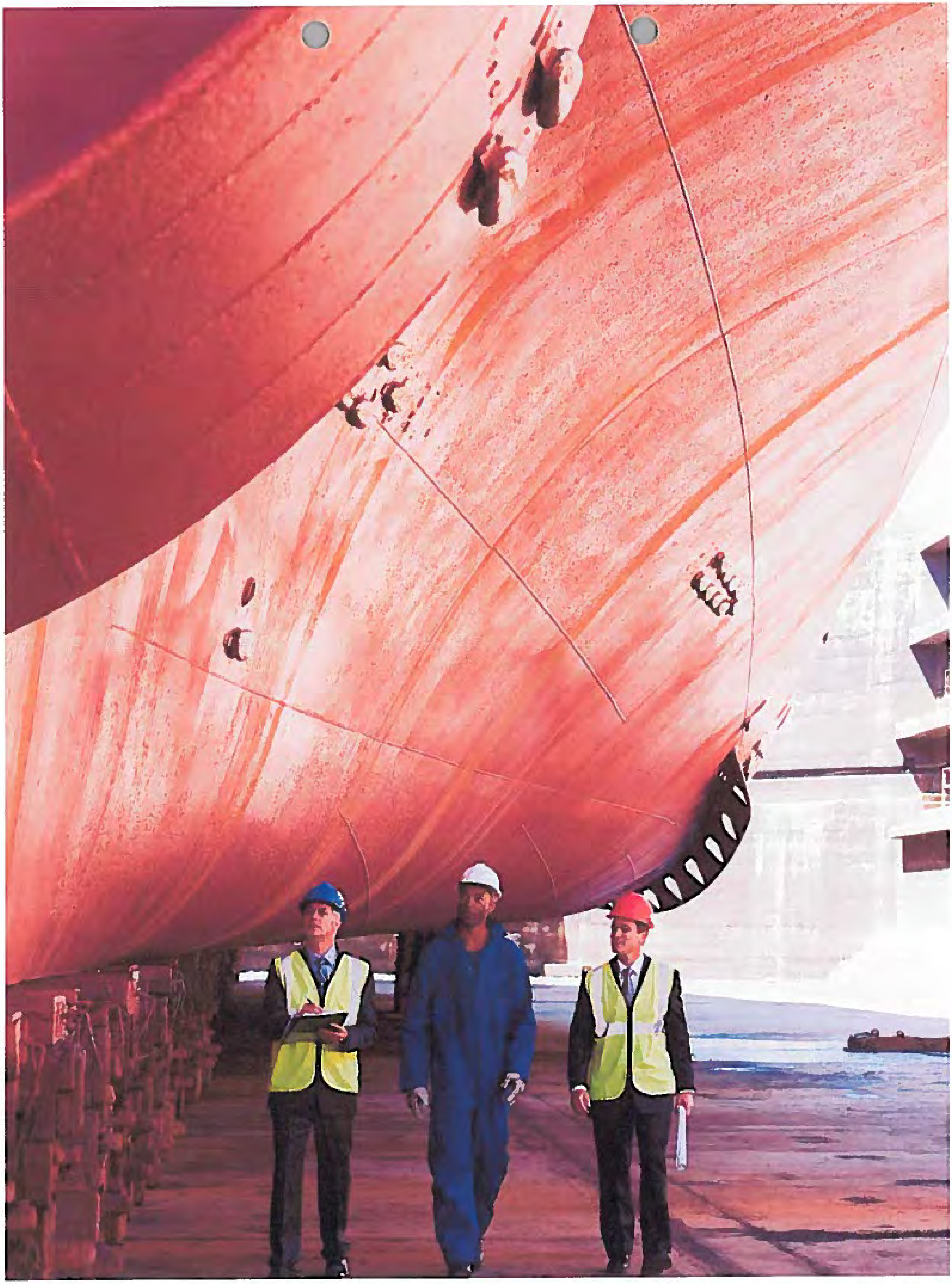
The high-speed ferry market is relatively new. High-speed ferries are either powered by gas turbines or large high-power, high-speed diesel engines such as the MTU engines, requiring SHPD (Super High-Performance Diesel) oils.

TABLE 4: HIGH-SPEED DIESEL ENGINE OILS

Chevron Product	Performance requirements	Applications	OEMs
Ursa® Marine	*High-performance* API CG-4 ACEA E2 MAN 270/271 MB 228.0/228.1 MTU Type I	Emergency diesels SAE 15W-40 Other SAE 30/40	Caterpillar, Dorman Cummins, Hatz Yanmar, Mercedes MAN, Scania Daihatsu, SKL Deutz, Ruston Petter, Bukh Scania, MTU Volvo, Mitsubishi Valmet, Lister
Delo® SHP	*Super high-performance* API SF ACEA E2 MB 228.2 MTU Type II CCMC D5 SHPD	Propulsion SAE 40 (High-speed ferries, etc.)	
Delo 6170 CFO 40	*Zinc-free requirement*	EMD engines	Caterpillar
Ursa Extra Duty	*Special requirement*	Two-stroke, low ash, SAE 40	Detroit Diesel

CHART 2: VISCOSITY-TEMPERATURE CHART OF URSA MARINE SERIES HIGH-SPEED ENGINE





3 Turbine Oils

Turbine oils are primarily developed for lubrication of bearings and gears of steam and gas turbines. Turbine oils are actually highly refined paraffinic base oils with rust, oxidation, and foam inhibitors.

Turbine oils can be used in a variety of machinery not requiring sophisticated additive packages. Turbine oils are suitable for all kinds of equipment where an economical, yet high-quality, stable lubricant with good water-separating characteristics is sufficient. Besides steam and gas turbines, turbine oil is used for turbo chargers, speed governors, hydraulic systems, and screw and piston air compressors.

TABLE 5: TURBINE OILS

Chevron Product	SAE Viscosity Grade	Application
Regal® R&O	32, 46	Turbines, screw air compressors
	68	Steam and gas turbines, turbo chargers, hydraulic systems, etc.
Regal EP	100	Extreme pressure version: steam turbines

4 Hydraulic Oils

Compared with turbine oils, hydraulic oils are more advanced, particularly with respect to anti-wear performance, air release properties, and viscosity index. Also, hydraulic oils must meet cleanliness codes (particle size and quantity) set by equipment manufacturers.

The high anti-wear performance of hydraulic oils is required for lubrication of the vane, gear, and piston pumps and motors incorporated in hydraulic systems. A typical FZG failure load stage of 11 to 12 is comparable with gear oils. Hydraulic oils are also suitable for reduction gears where oil-immersed disc clutches prohibit the use of EP gear oils.

High viscosity index of around 150 and low pour point is required to allow operation of marine applications in both tropical and arctic conditions.

- ***Viscosity Index (VI):*** The effect of temperature change on viscosity. Paraffinic mineral oils generally have a VI of 90–100. High VI hydraulic oils are treated with VI improvers and have a VI of around 150.
- ***Pour Point:*** The lowest temperature at which oil will flow under test conditions specified by ASTM method D 97 or D 5950.

Hydraulic oils are available in a variety of viscosity grades ranging from ISO 15 for servo systems to ISO 100 for vane pumps and gears.

TABLE 6: HIGH VI HYDRAULIC OILS:

Chevron Product	SAE Viscosity Grade	Application
Rando® HDZ	15, 22	Servo, control systems, turbo couplings
	32, 46	Hatch covers, screw air compressors
	68, 100	Cranes, winches, thrusters, CPP systems, gears

5 Gear Oils

One of the most significant characteristics of gear oils is the load-carrying capacity. The nature of loads encountered in gears is typically different from loads in hydraulic systems and engines. Lubrication in hydraulic systems and engines is predominantly hydrodynamic; with gears, elasto-hydrodynamic lubrication plays an important role.

Gear oils are treated with EP (extreme pressure) additives, which provide protection against metal-to-metal contact, even under severe boundary lubrication conditions.

- ***EP Additives:*** An EP additive chemically reacts with the metal surface under conditions of extreme pressure to form a surface film that prevents the welding of opposing asperities.
- ***Hydrodynamic lubrication:*** When the shape and relative speed of the sliding surfaces cause the formation of an oil film having sufficient pressure to separate the surfaces.
- ***Elasto-hydrodynamic lubrication:*** Where the lubricant oil film separating the surfaces is concentrated to a very small area of contact (point or line contact). At that point, high local pressure causes compression of the oil and consequent viscosity increase.
- ***Boundary lubrication:*** Moving parts not completely separated by oil film. Metal contact occurs resulting in high friction and wear.

The FZG gear test is also applicable to gear oils. The test conditions, however, are more severe. Whereas hydraulic and engine oils are tested with a gear set running at 8.3 m/s pitch line speed and 90°C oil temperature, gear oils are tested at 16.6 m/s and 140°C. Gear oils typically meet FZG failure load stage better than 12 under such conditions [FZG 12 (A/16.6/140)].

Synthetic PAO-based gear oil with higher thermal stability is recommended to meet continuous high-temperature operation conditions such as lubricant or fuel separator gears.

As with hydraulic oils, gear oils are available in a range of viscosity grades, from ISO 68 up to ISO 680.

Gear oils require increased load-carrying capacity.

TABLE 7: GEAR OILS

Chevron Product	SAE Viscosity Grade	Application
Mineral: Meropa®	68, 100	Thrusters
	150, 220, 320	Spur and bevel reduction gears
	460, 680	Worm gears, gear couplings
Synthetic: Pinnacle® Marine Gear	220	High-temperature applications (centrifuge gears)

6 Compressor Oils

For marine applications, there are three compressor systems:

- Air compressors
- Refrigerating compressors
- LPG/LNG compressors

6.1 Air compressors

Onboard ships, compressed air is an essential power transmission medium. The necessity for reliable starting compressors is often overlooked. Marine engines won't start without compressed air. For safety reasons, a specified number of starting procedures is legally required to maneuver with slow-speed engines, while essential control systems are often pneumatically operated.

Air compressor oils are available in both mineral and synthetic versions.

Compression temperatures of reciprocating two-stage starting air compressors can rise to over 250°C — temperatures where rapid oil degradation starts and carbonization of valves and cooler tubes might become a problem. Synthetic oils are beneficial for their higher thermal and oxidation stability, whereas mineral oils may offer a more economical solution in three-stage compressors working at lower compression temperatures.

Synthetic lubricants for reciprocating (starting) air compressors are generally manufactured from diester base stocks.

Synthetic lubricants for screw and rotary air compressors are generally manufactured from polyalphaolefine (PAO) base oils.

Diester-based air compressor oils have proven to prevent carbon formation on valves and cooler tubes of piston air compressors, providing for reduced maintenance and part costs, and extended drain intervals. Therefore, synthetic compressor oils can be very cost-effective when problems arise.

PAO-based rotary air compressor oils are often required for their low pour point and excellent thermal, oxidation and hydrolytic stability.

- ***Thermal stability:*** Ability of oil to resist cracking and decomposition on prolonged exposure to elevated temperature
- ***Oxidation stability:*** Resistance of oil to oxidation
- ***Hydrolytic stability:*** Ability of additives and certain synthetic lubricants to resist chemical decomposition in the presence of water

ISO VG 68 synthetic PAO-based compressor oils are recommended for turbo charger bearings; providing for reduced bearing friction, hence, improved turbo charger efficiency; reduced maintenance and extended drain intervals. Chevron Cetus® PAO 68 is approved by ABB as "special low friction oil", required for their VTR.4 series turbo chargers.

Heavily carbonized valves and cooler tubes of a starting air compressor

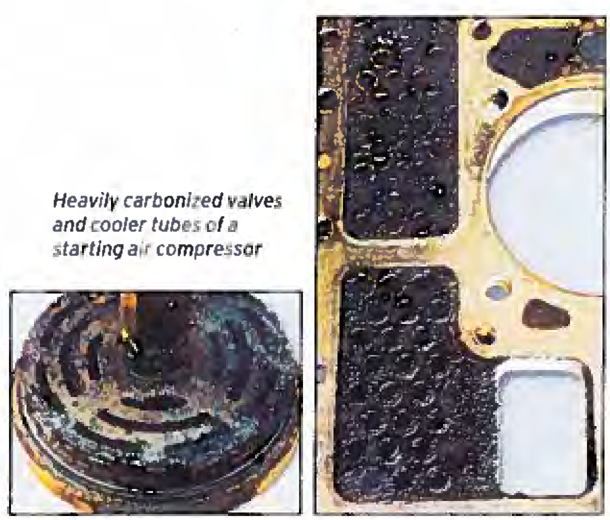


TABLE 7: AIR COMPRESSOR OILS

Chevron Product	SAE Viscosity Grade	Application
PAO-based synthetic: Cetus® PAO	46, 68	Screw and rotary air compressors Turbo chargers (68 grade)
Mineral: Compressor Oil EP VDL	100	Reciprocating air compressors requiring DIN 51506 VDL specification
Diester-based synthetic: Cetus DE	100	Reciprocating air compressors

6.2 Refrigerating compressors

Oils for domestic- and cargo-refrigerating compressors and air conditioning compressors are available in mineral and synthetic versions. The choice for mineral or synthetic products is dictated by the requirements for solubility and compatibility with different types of refrigerating gases.

Conventional R12 and R22 systems require mineral oil. Mineral refrigerating oils are de-waxed to prevent wax crystallization at low temperatures (low pour point).

Environmental legislation demanded for chlorine-free refrigerant gases such as R134a and R404a. These refrigerant gases specifically require polyolester synthetic lubricants.

For extreme low-temperature operation with conventional gases, an alkylbenzene lubricant is recommended.

TABLE 8: REFRIGERATING OILS

Chevron Product	SAE Viscosity Grade	Application
Mineral: Capella® WF	68	Conventional gases (R12, R22, ammonia)
Synthetic polyolester: Capella HFC	32, 55, 100	Chlorine-free gases (R134a, R404a)
Synthetic alkylbenzene: Refrigeration Oil Low Temp	68	Low-temperature operation (R22, R502)

6.3 LPG/LNG compressors

Mineral hydrocarbon oils are not always suitable for crankcase lubrication of enclosed natural gas compressors. Condensated natural gas would dilute the mineral oil when entering the crankcase, resulting in reduced oil viscosity. Natural gas compressor oils are therefore manufactured with polyalkyleneglycol (PAG) lubricants, having very low solubility for natural gas.

TABLE 9: LPG/LNG COMPRESSOR OILS

Chevron Product	Viscosity	Application
LPG Compressor Oil	185 cSt at 40°C	LPG/LNG compressors

7 Heat Transfer Fluids

Ships running on heavy fuel require heating for HFO bunkers, HFO transfer and booster systems, HFO and lubricant oil centrifuges, as well as engine preheating and domestic heating.

Both steam and thermal oil can be used as heat transfer mediums. On most modern motor vessels, oil-filled heat transfer systems have replaced steam boilers for heating purposes.

Oil-filled heat transfer systems usually operate at around 200°C bulk oil temperature. The skin (oil film adjacent to the heat exchanger tubes) or film temperature, however, may exceed 300°C. Mineral heat transfer oils are manufactured with highly refined paraffinic base oils with inherently good thermal and oxidation stability.

TABLE 10: HEAT TRANSFER FLUIDS

Chevron Product	ISO Viscosity Grade	Max. Bulk Temperature	Max. Film Temperature	Application
Texatherm®	32, 46	315°C	335°C	Heat transfer systems

8 Open Gear Lubricants, Greases, and Rust Preventatives

8.1 Open gear lubricants

Open gears such as windlass drives, crane slewing gears, and traversing gears of gantry cranes are traditionally lubricated with asphaltic lubricants. Although extremely tacky and water-resistant, asphaltic lubricants tend to soften and drip when exposed to the sun, which might be an environmental concern in certain port areas. Modern open gear lubricants are water-resistant greases, manufactured with calcium soap, high- viscosity base oils, and solid lubricants like graphite and molybdenumdisulphide for shock-loading conditions. Besides open gears, this type of lubricant can be used for a variety of deck applications such as wire ropes, slow-rotating plain- and roller bearings, hinges, etc., thus replacing a number of bituminous, petrolatum, and special grease products.

8.2 Greases

Over the years, a wide variety of greases have been developed for different areas of industry and applications. For logistic and economical reasons, ships preferably use one or two multipurpose greases covering all shipboard applications.

For grease-lubricated plain, ball, and roller bearings and general grease points, a lithium soap grease with mineral oil, EP properties and an NLGI consistency number of 2 is generally applicable. An NLGI 0 grade is available for central lubrication systems where free gravitational flow from the grease reservoir to the grease pump suction requires thinner grease.

For added protection under shock-load conditions, the same grease is available with additional molybdenumdisulphide as solid lubricant.

For high- and low-temperature applications, a synthetic grease is available that consists of polyalphaolefine lubricant and lithium-complex soap.

8.3 Rust preventatives

For protection of spare parts such as cylinder liners and pistons, a rust preventative product is available. Rust preventatives usually are a solvent cutback petrolatum, which can be brushed or sprayed, leaving a durable protective layer. Rust preventatives are suitable for wire rope protection as well.

TABLE 11: OPEN GEAR LUBRICANTS, GREASES, AND RUST PREVENTATIVES

Chevron Product	Type	NLGI	Application
Multifak® EP	Lithium soap Mineral oil EP	0 2	Central lubrication systems (e.g. steering gears) General lubrication; plain, ball, and roller bearings
Molytex® EP	Lithium soap Mineral oil EP, MoS_2	2	Plain, ball, roller, and thrust bearings under shock-load conditions
Ulti-Plex® Synthetic Grease EP	Lithium complex soap Synthetic oil EP	1.5	High-temperature applications
Texclad® 2	Calcium soap High-viscosity mineral oil Graphite and MoS_2	2	Open gears, wire ropes and general deck applications
Rustproof Compound L	Solvent cutback petrolatum	–	Spare parts, wire ropes

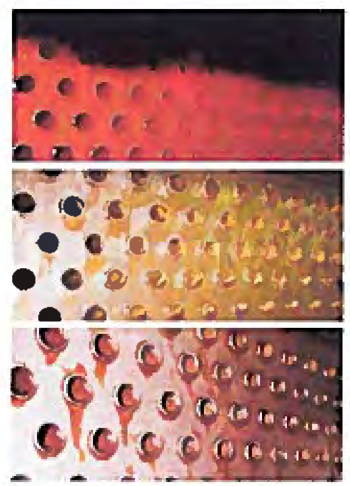
9 Cooling Water Treatment and Corrosion Inhibitors

Water-cooled machinery requires protection against general and localized corrosion and cavitation corrosion of metal surfaces. Most corrosion inhibitors are concentrates that have to be diluted with fresh water.

Onboard, the cooling water treatment should provide protection against corrosion of cast iron, steel, aluminum and copper alloys, and should be compatible with elastomers and plastics. Traditional corrosion inhibitors such as amines, nitrites, nitrates, phosphates, silicates and benzoates usually have adverse properties like poor stability, rapid depletion, incompatibility and toxicity.

Havoline® Extended Life cooling water treatment, developed with patented carboxylate technology, are environmentally acceptable, low toxic, and have extremely low depletion. They protect effectively against all types of corrosion while efficiently cooling the system.

Air Cooler, Sulzer 12RTA84C-UG Main Engine – Pipe Bundle



Before change-over (traditional coolant)

After 4,000 hours with Havoline XLI

After 13,000 hours with Havoline XLI

TABLE 12: COOLING WATER TREATMENT

Chevron Product	Type	Application
Havoline XLI	Water-based	Fresh cooling water systems
Havoline XLC	Ethylene glycol-based	Fresh cooling water systems where anti-freeze protection is required

10 Promoting Environmental Sensitivity

Public opinion and government regulation have driven a new global focus on environmental responsibility. Many maritime companies intend to improve their environmental footprint, but have been unwilling to accept the traditional compromises — in additional operating costs or reduced performance — necessary to achieve 'green' operation.

Finding the correct 'green' lubricants is vital for true environmental responsibility, but it is not an easy choice. Marketers use non-specific descriptors such as 'Bio Friendly', 'Green', 'Eco Safe' and 'Biodegradable' to classify products as either biodegradable and/or non-toxic to marine organisms. In addition, government regulations may vary by country so there is no single standard for defining these products. What selection criteria should be used? Some considerations are:

- **Personal safety:** Is the product as safe (or safer) to handle than conventional products?
- **Aquatic toxicity rating:** Is it harmful to marine organisms if a spill does occur? And at what levels? Does it just pass the minimum point?
- **Biodegradability:** If a spill does occur, how long will the product remain in the marine environment? How quickly will it biodegrade?
- **Product performance:** Does the product provide lubrication performance as good as conventional lubricants, including service life, seal compatibility, lubrication properties and OEM specifications?
- **Product availability and compatibility** with other products
- **Product cost**

Aquatic toxicity testing determines how harmful products are for various marine organisms. Chevron's Clarity product line was tested with a 96-hour LL50 test, in which toxicity is expressed as concentration in parts per million of the test material that results in a 50% mortality rate after 96 hours, generally considered acceptable if LL50 result is >1,000 ppm. Clarity products passed the test at over fifty times this amount with zero mortality results for fingerling rainbow trout and mysid shrimp.

For biodegradability, Clarity products were tested with the CEC L-33-A93 test protocol, which determines the time it takes before a product degrades to a certain percentage. According to definitions from the EPA OPPTS 835.3110 and OECD Guidelines, Clarity products can be called ***inherently biodegradable***, which means that in less than 84 days the virgin product has biodegraded by more than 60%. In actual testing, Clarity products biodegraded by 60% in only 60 days.

Selection of 'green' lubricants is always a balance between the cost of operation and environmental benefits. Clarity products are created with Chevron's proprietary highly refined base oils and advanced ashless additive technology. The Clarity line provides exceptional oxidation stability, water separability, foam suppression and protection against wear, rust and corrosion.

TABLE 13: CLARITY MARINE LUBRICANTS

Chevron Product	ISO Viscosity Grade	Application
Clarity® Machine Oils	100, 150, 220, 320	Deck equipment, gearboxes, separators
Clarity Hydraulic Oil AW	22, 100	Stern tubes (ISO 100), deck equipment, hydraulic systems
Clarity Synthetic Hydraulic Oil AW	32, 46, 68	Deck equipment, gearboxes, separators

11 Conclusion

Marine lubricant suppliers must keep a comprehensive range of products available in a wide range of ports around the world in order to meet customers' needs. The amount of stock held in any one location is a careful balance between maintaining product availability and the high cost of holding inventory for extended periods.

To assist the planning of deliveries, Chevron maintains an up-to-date online International Port Directory showing the product line available at each port, the delivery methods available (barge, truck, drum, etc.), the number of days' notice required for orders and details of any local restrictions. The online directory is found at www.chevronmarineproducts.com/ports.

To achieve an efficient delivery, the lubricant supplier must schedule production at a blending plant, arrange delivery trucks or barges and liaise with the local agent, as well as handle customs clearance and cope with different time zones.

There are a few areas where the political situation prevents lubricant supplies. There are also some locations where the only products available are from the national or other local oil company.

Tremendous savings can be made by planning ahead. Lifting in some ports can require a minimum of ten days' notice and availability is "subject to inquiry", whereas taking delivery at the next port can often mean a delivery requiring only two days' notice and significantly lower costs.

The ship manager and ship staff should be familiar with limitations and port restrictions to ensure continuity of supply and consistency of lubricant quality. Careful selection of the correct lubricants and planning of deliveries will result in the trouble-free lubrication of your vessels.

For more detailed information regarding Chevron products and services, please visit our website at www.chevronmarineproducts.com.

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Chevron

CLARITY® HYDRAULIC OIL AW

22, 32, 46, 68, 100

PRODUCT DESCRIPTION

Clarity® Hydraulic Oils AW are designed to give excellent protection in mobile and stationary hydraulic vane-, piston-, and gear-type pumps and in high-performance industrial applications as well as in environmentally sensitive areas.

CUSTOMER BENEFITS

Clarity Hydraulic Oils AW deliver value through:

- **Premium performance** — Ashless formulation meets or exceeds major vane, piston and gear pump manufacturer's requirements for viscosity, rust and corrosion protection, hydrolytic stability, water separability, foam inhibition, and filterability.
- **Exceptional oxidation stability** — Longer service life than conventional zinc-based antiwear hydraulic oils or vegetable hydraulic oils.
- **Excellent antiwear properties** — Provides excellent wear protection.
- **Low toxicity** — Very low acute aquatic toxicity to both fish and invertebrates based on tests of water accommodated fractions. Ashless formulation facilitates conventional recycling programs.
- **Excellent low temperature pumpability** — ISO 22 grade specifically developed to ensure good low temperature fluidity for low temperature operations as low as -40°C (-40°F).
- **Zinc-free/Ashless** — Suited for applications involving yellow metals found in piston pumps.

FEATURES

Clarity Hydraulic Oils AW are formulated with premium base oil technology and an ashless ("zinc-free") additive system that provides exceptional oxidation stability, water separability, foam suppression, and protection against wear, rust and corrosion. They are designed to meet or exceed the performance requirements of conventional antiwear hydraulic oils, especially in severe, high-output applications such as axial piston pumps. The antiwear performance of these oils makes them especially suited for high performance industrial applications utilizing axial piston pumps where pressures may exceed 5000 psi.

The zinc-free formula makes it well suited for applications involving yellow metals found in hydraulic systems.

Clarity Hydraulic Oils AW are long-life lubricants (are not vegetable oil based), with dramatically longer TOST (ASTM D943 oxidation stability test) lives than conventional zinc-based hydraulic fluids. A longer TOST life equates to longer service life, which can improve the customer's bottom line. This level of oxidation stability is especially applicable in high efficiency (high speed, high temperature, high output) applications where severe stress is placed on the hydraulic fluid.

Clarity Hydraulic Oil AW 22 and 100 are shear-stable high VI hydraulic oils designed to improve equipment efficiency and increase operating temperature range of the applicable grade.

Many hydraulic systems are required to operate in environmentally sensitive areas where leaks or spills of hydraulic fluid may result in contamination of the soil or nearby waterways. Conventional antiwear hydraulic oils are formulated with metal-containing performance additives which can persist in the environment in the event of leaks. Vegetable-based hydraulic oils generally

Product(s) manufactured in the USA.
Always confirm that the product selected is consistent with the original equipment manufacturer's recommendation for the equipment operating conditions and customer's maintenance practices.

A **Chevron** company product

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meet the environmental requirements, but can fall short of the performance requirements.

Applications

Clarity® Hydraulic Oils AW are designed for use in mobile and stationary hydraulic vane-, piston-, and gear-type pumps.

Clarity Hydraulic Oils AW have shown excellent performance in applications involving servo-valves using multimetal components.

Clarity Hydraulic Oils AW meet the requirements of:

- **ASTM D6158 HM** (ISO 32, 46, 68), **HV** (ISO 22, 100)
- **Denison** HF-0, HF-2 testing requirements of T5D (ISO 32, 46, 68)
- **DIN** 51524-2 (ISO 32, 46, 68)
- **DIN** 51524-3 (ISO 22, 100)
- **Eaton-Vickers** for use in M-2950-S (mobile) and I-286-S (stationary) hydraulic systems. Passes Eaton-Vickers 35VQ25 pump test. (ISO 32, 46, 68)
- **ISO 11158 L-HV** (ISO 22, 100)
- **MAG Cincinnati, Cincinnati Machine** P-68 (ISO 32), P-70 (ISO 46), P-69 (ISO 68)

Clarity Hydraulic Oil AW 100 is approved for Stern tube applications by:

- **Blohm+Voss**
- **Wärtsilä-Japan**

Clarity Hydraulic Oils AW (ISO 32, 46, 68) are registered by **NSF** and are acceptable as a lubricant where there is no possibility of food contact (H2) in and around food processing areas. The NSF Nonfood Compounds Registration Program is a continuation of the USDA product approval and listing program, which is based on meeting regulatory requirements of appropriate use, ingredient review and labeling verification.

Clarity Hydraulic Oils AW are not compatible with zinc/calcium containing fluids, and OEM recommended lubricant change-out procedures including drain and flush requirements need to be adhered to.

Do not use in high pressure systems in the vicinity of flames, sparks and hot surfaces. Use only in well ventilated areas. Keep container closed.

Always confirm that the product selected is consistent with the original equipment manufacturer's recommendation for the equipment operating conditions and customer's maintenance practices.

TYPICAL TEST DATA

ISO Grade	22	32	46	68	100
Product Number	*255694*	*230342*	*230341*	*230340*	*255702*
MSDS Number	*32409*	*6691*	*6691*	*6691*	*6691*
API Gravity	37.1	32.8	31.9	31.8	31.8
Viscosity, Kinematic cSt at 40°C cSt at 100°C	22.6 5.3	33.6 5.6	46.0 6.8	64.6 8.5	95.0 13.8
Viscosity, Saybolt SUS at 100°F SUS at 210°F	117 44.0	173 45.0	237 49.0	334 54.8	486 74.6
Viscosity Index	180	104	101	102	145
Flash Point, °C(°F)	200(392)	222(432)	224(435)	224(435)	266(511)
Pour Point, °C(°F)	-52 (-62)	-33(-27)	-30(-22)	-30(-22)	-40(-40)
Brookfield Viscosity, ASTM D2983, cP at -20°C	630	—	—	—	—
Brookfield Viscosity, ASTM D2983, cP at -30°C	1680	—	—	—	—
Brookfield Viscosity, ASTM D2983, cP at -40°C	6280	—	—	—	—
Oxidation Stability Hours to 2.0 mg KOH/g acid number, ASTM D943	>10,000	>18,000[a]	>18,000[a]	>18,000[a]	>5,000
FZG Gear Test, DIN 51354, Fail Stage	—	12	≥12	≥12	—
Acute Aquatic Toxicity (LC-50, OECD 203)	Pass	Pass	Pass	Pass	Pass

a Modified ASTM D943, allowed to run beyond 10,000 h.

The test results expressed above were obtained during the development of the product line and are considered representative of any/all commercial samples.

Always confirm that the product selected is consistent with the original equipment manufacturer's recommendation for the equipment operating conditions and customer's maintenance practices.

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Clarity® Marine Lubricants

High performance meets environmental sensitivity

The maritime environment is challenging to equipment. Long hours, heavy loads, extreme weather and the constant risk of contamination all contribute to difficult operating conditions. Downtime is inevitable. And when your equipment is down, so is your bottom line.

With one of the largest distribution networks in the industry, Chevron has the infrastructure to deliver the lubrication products and services you need. From our global operational reach to the depth of our experienced personnel, we stand for one thing above all else: **reliability**.

Chevron's Clarity® Marine Lubricants deliver the benefits of environmental sensitivity and dependable high performance.

Clarity® Marine Lubricants

Take Advantage of the Latest Technology

Clarity Marine Lubricants strike the perfect balance between high performance and environmental sensitivity.

These inherently biodegradable lubricants are created with Chevron's proprietary highly refined base oils and advanced ashless additive technology. The Clarity Marine Lubricants line provides exceptional oxidation stability, water separability, foam suppression and protection against wear, rust and corrosion.

Premium performance

Clarity Marine Lubricants exceed most major pump manufacturers' requirements. They are suited for most hydraulic pumps including vane and axial piston pumps containing yellow metals.

Environmental sensitivity

Clarity Marine Lubricants pass the stringent Acute Aquatic Toxicity testing (EL/LL50 OECD 210, 202, 203)*.

Clarity Marine Lubricants are ashless, premium hydraulic oils that help keep your stern tube seals and deck hydraulic systems operating longer.

Test data shows that Chevron's Clarity Marine Lubricants product line allows you to take advantage of premium performance and environmental sensitivity:

Clarity Synthetic Hydraulic Oil AW — available in ISO 32, 46 and 68 viscosity grades — is specifically designed for deck equipment and central hydraulic systems. A synthetic formulation provides these high-performance attributes:

- High viscosity index (VI) for increased temperature operating window (TOW)
- Potential for extended drain intervals
- Decreased fuel consumption by improving overall pump efficiency by up to 8 percent when compared to lower VI products

Clarity Synthetic Hydraulic Oil AW is approved by Frank Mohn-Framo hydraulic cargo pumping (ISO 46), and meets the manufacturer's requirements for McGregor hatch cover systems (ISO 32).

Clarity Hydraulic Oil AW — available in ISO 22 and 100 viscosity grades — is a versatile long-life lubricant for use in both high-output hydraulic systems, as well as in marine stern tube applications (ISO 100). Clarity Hydraulic Oil AW 22 and 100 are shear-stable high VI oils designed to improve equipment efficiency and increase operating range of the applicable grade. When used in marine stern tubes, Clarity Hydraulic Oil AW 100 provides the necessary seal protection and lubrication for this critical application.

Clarity Hydraulic Oil AW 100 is approved for stern tube application by the following manufacturers: Blohm+Voss, Kemel (Kobelco), and Wartsila-Japan.

The Clarity Marine lubricants featured above also provide the following high-performance attributes:

- Formulated with no heavy metal additives; facilitates conventional recycling
- Stability in the presence of water; facilitates filtration
- Very low acute aquatic toxicity*
- Inherently biodegradable
- Provides cost-effective alternative to readily biodegradable hydraulic fluids such as those that are ester-based and vegetable oil-based

Environmental Impact Criteria

Comparison: Clarity Synthetic vs. Ester-based Synthetics

	Clarity Synthetic Lubricants	Typical Ester-based Synthetics
Feed stock	Synthetic Petroleum-based feed stock	Ester feed stock
Relative energy required to create	Low	Moderate to high
Aquatic toxicity (EL/LL50 OECD 201, 202, 203)*	Pass*	Pass
Biodegradability	Inherently (Less biodegradable)	Readily (More biodegradable)
Oxidation stability – Expected lubricant service life	Extended interval	Extended interval
Lubricity	High	High
Seal compatibility	Pass	Pass
Compatibility with mineral-based lubricants	Excellent	Good
Ease of recycling used product	Easy	Moderate to difficult
Relative ease of on-board inventory management and product availability	Easily procured	Potential availability issues
Cost	Relatively lower cost	Relatively higher cost

* *Tested with fingerling rainbow trout, daphnia, freshwater algae, and Mysid shrimp using a water accommodated fraction up to 5000 mg/liter (fifty times the*

Typical Test Data, Selected Clarity Marine Lubricants

	Clarity Synthetic Hydraulic Oils AW			Clarity Hydraulic Oils AW
Viscosity Grade	**ISO 32**	**ISO 46**	**ISO 68**	**ISO 100**
Viscosity, Kinematic cSt at 40°C	32.5	46.5	68	95.0
Viscosity, Kinematic cSt at 100°C	7.0	9.3	11.4	13.8
Viscosity Index	186	186	162	145
Flash Point,°C	228	230	218	266
Pour Point, °C	-48	-42	-45	-40
FZG Failure Load Stage, DIN 51354	11	≥12	≥12	≥12
Rust Prevention, ASTM D 665 Procedure B	Pass	Pass	Pass	Pass
Oxidation Stability Hours to 2.0 mg KOH/g acid number, ASTM D 943	> 10,000	> 10,000	> 10,000	> 5,000
Foam Sequence I, II, III ASTM D892	0/0, 30/0, 10/0	0/0, 30/0, 10/0	0/0, 30/0, 10/0	0/0, 30/0, 10/0

Typical test data are average values only. Minor variations which do not affect product performance are to be expected in normal manufacturing.

Oil Analysis Programs

When used together with our Clarity Marine Lubricants, our **FAST**™ and **DOT.FAST**® oil analysis programs help you achieve longer equipment life and extended drain intervals. By understanding the changing environment within a piece of equipment, you can precisely schedule preventive maintenance that can reduce or even eliminate unplanned downtime. Chevron offers the marine industry a complete range of high-performance products — including greases, cooling water treatments, hydraulic oils, rust proofing compounds, gear and compressor oils — specifically formulated for the challenges of the marine environment.

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Chevron

Always confirm that the product selected is consistent with the original equipment

AMENDMENTS TO THE JULY 19, 2000
SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

FOR

Ski Run Marina
900 Ski Run Boulevard, Suite 1
South Lake Tahoe, California 96150

November 2008

REGISTERED PROFESSIONAL ENGINEER
R. MARK HOEFER
No. C 44756
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

NOV 0 5 2008

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INTRODUCTION

In accordance with Code of Federal Requirements (CFR), Title 40 (Protection of the Environment), Part 112 (40 CFR 112), a Spill Prevention Control and Countermeasure (SPCC) Plan was first prepared for the Ski Run Marina, formerly known as the "Ski Run Marina Village, in July 2000. As amended in 2002, 40 CFR 112.5(b) requires the owner or operator of a facility for which an SPCC Plan is required, to review the SPCC Plan at least every 5 years from the date the last review was required under 40 CFR 112. As evidenced by his signature on the *SPCC Compliance Inspection Plan Review Page* (Attachment 1, Page 2), the "Authorized Facility Representative" for Ski Run Marina has twice documented his review of the SPCC Plan – once in January 2003 and once in January 2006. In April 2007, the facility representative determined that the SPCC Plan required both non-technical and technical revisions. Those revisions were document in the *May 2007 Amendments to the July 19, 2000 Spill Prevention Control and Countermeasure Plan.*

Since preparation of the May 2007 Amendments, numerous site improvements have occurred at the Ski Run Marina. Said improvements include modifying the marina walkways and boardwalks, dredging the harbor, and improving the marina's fuel containment/distribution system. These improvements prompted the Authorized Facility Representative to once again amend the July 2000 SPCC Plan. For clarity, the amendments set forth in May 2007, and the amendments associated with more recent improvements at the facility are incorporated into this document – the November 2008 Amendments.

Pursuant to 40 CFR 112.5 (c), certification by a Professional Engineer is required for any technical amendments to an SPCC Plan. As evidenced by his signed stamp on the cover of this Amendment, this revision has been reviewed and certified by a Professional Engineer as being in accordance with good engineering practice. This determination is based on evidence that recent improvements to the facility, including modifications to the marina walkways and boardwalks, and improvements to the marina's fuel containment/distribution system have been designed in accordance with requirements set forth by the City of South Lake Tahoe Building Department and the El Dorado County, Department Environmental Management.

The July 2000 SPCC Plan (Attachment 1) will be implemented with the following revisions noted:

- <u>Non-technical Revisions</u>:

  1. The Compliance Inspection Plan Review Page has been updated to reflect the 2002 amendments to 40 CFR 112 (see attached Revised Compliance Inspection Plan Review Page). The Revised Compliance Inspection Plan Review Page shall be used to document all future SPCC Plan reviews.

  2. Other non-technical revisions are presented in Table 1.1.

Table 1.1 Non-technical Revisions to the July 2000 SPCC Plan (Attachment 1) Ski Run Marina	
Description of required revision:	**SPCC Plan page reference:**
1. Change *Facility Name* from "Ski Run Marina Village" to "Ski Run Marina."	Title Page, Pages 1 – 17, in the page header. Page 1, under 3.A. Page 4, under 6.A. and 6.C. Page 5, under 6.D.
2. Change *Facility Owner* from: Ski Run Marina Village 900 Ski Run Blvd. South Lake Tahoe, California 96150 (530) 540-9500 to: **Mansoor Alyeshmerni** **9454 Wilshire Blvd., Penthouse** **Beverly Hills, CA 90212** **(310) 275-6132**	Page 1, under 1.A.
3. Change *Facility Operator* from: Ski Run Marina Village 900 Ski Run Blvd. South Lake Tahoe, California 96150 (530) 540-9500 to: **Ski Run Marina** **900 Ski Run Blvd.** **South Lake Tahoe, California 96150** **(530) 544-9500**	Page 1, under 1.B.
4. Change *Facility Contacts* from: Michael R. Phillips, Owner, (916) 652-5155 Dan Jack, Manager, (530) 540-9500 to: **Mansoor Alyeshmerni, Owner, (310) 275-6132** **Dan Jack, Manager, (530) 544-9500**	Page 1, under 2.

Table 1.1 Non-technical Revisions to the July 2000 SPCC Plan (Attachment 1), continued. Ski Run Marina	
Description of required revision:	**SPCC Plan (Attachment 1) page reference:**
5. Change *Hornblower Cruises* to **Lake Tahoe Cruises**	Table of Contents, Appendices, APPENDIX B Pages 1 and 2, under 3.A. Page 3, under 5.C. Page 4, under 6.C. Page 5, under 6.D. Page 6, under 7.B. Page 10, in the title for Appendix B
6. Change *Emergency Contacts* from: Michael R. Phillips, Owner, (916) 652-5155 Dan Jack, Manager, (530) 544-9500 to: **Mansoor Alyeshmerni, Owner, (310) 275-6132** **Dan Jack, Manager, (530) 544-9500**	Page 7, under 9.A.

- Technical Revisions:

1. Technical revisions consist of updating Figure 1 of the July 2000 SPCC Plan to reflect changes in the site plan for the facility, including improvements to marina walkways and boardwalks, and the fuel containment/distribution system (see attached Figure No. 1, Revised Facility Layout and Surface Drainage System).

For the following technical revisions, text shown with strikeout is to be deleted, and bold text is to be inserted.

2. Page 1 of the SPCC Plan, Section 3 – Facility Description, subsection A - Facility Operations, second and third paragraphs, revise as follows:

As shown in Figure No. 1, the unleaded gasoline and diesel fuel is stored in an aboveground ~~Convault~~ tank that was installed in ~~1992~~**2008**. ~~Please refer to Appendix D for a drawing of the tank.~~ The ~~size~~ **make of the tank is Spartan Inc. Fireguard, model number** ~~used by the marina~~ is ~~D1000~~**VT-4000 SPLIT**. This tank is fabricated from ~~concrete and~~ steel; it is equipped with ~~both a~~ double wall **containment structure** and a spill-containment basin beneath the tank. **The new tank includes an array of fuel sensing devices (Automatic Tank Gages) for monitoring the fuel system and detection of gross fuel leaks.** The total capacity of the tank is ~~2,000~~**4,000** gallons but is subdivided into two ~~1,000~~ **2,000**gallon tanks by a partition running down the center. This design allows for storing up to ~~1,000~~**2,000** gallons of gasoline and ~~1,000~~**2,000** gallons of diesel fuel. Dedicated ~~galvanized steel~~

~~pipelines~~ **double walled flexible fuel lines** convey fuel from the ~~two tanks~~ **tank** to two fuel dispensers~~, one~~. **One fuel dispenser is located on the east side of the marina area and dispenses** ~~for~~ unleaded gasoline **only.** ~~purchased by William Sports Rentals and~~ **The other fuel dispenser is located on the west side of the marina and dispenses** ~~one for~~ diesel fuel **only.** ~~Purchased by Hornblower Cruises.~~ Importantly, no fuel is sold to the general public. **Manual emergency fuel shut-off valves are located at both the aboveground tank and at the dispensers.**

~~Hornblower~~ **Lake Tahoe** Cruises operates year-round, generally from 6:00 a.m. to 8:00 p.m. In contrast, ~~Williams Sports Rentals~~ **Ski Run Boat Company** only operates from May to October, from 7:00 a.m. to 7:00 p.m. When necessary, additional gasoline and diesel fuel is added to the tank by a local fuel dealer using a relatively small fuel-delivery truck. During the summer, the fuel dealer refills the tank every ~~other~~ **three** days. During the winter, fuel deliveries decrease to once ~~a week~~ **every two weeks.**

3. Page 2 of the SPCC Plan, Section 3 – Facility Description, subsection B - Facility Storage Tank, revise as follows:

Tank ID	Volume	Contents
~~Convault~~ **Spartan Inc.**	~~1,000~~**2,000** gallon partition	No. 2 Diesel Fuel
Fireguard VT-4000 Split	~~1,000~~**2,000** gallon partition	Unleaded Gasoline
Aboveground Tank	~~2,000~~**4,000** gallons total	

4. Page 2 of the SPCC Plan, Section 3 – Facility Description, subsection C – Drainage Pathway and Distance to Navigable Waters, revise as follows:

As shown in **Figure 1 (Revised Facility Layout and Drainage System)**, the ~~Convault~~**aboveground** tank is located less than ten feet from the edge of the inner harbor of the marina. The landscaped area adjacent to the tank would probably absorb a spill that was not contained either by the ~~catch~~ **spill containment** basin located underneath the tank or by absorbent pads. Run off from the landscaped area could spill into the inner harbor, which is less than ten feet from the tank.

5. Page 3 of the SPCC Plan, Section 5 – Potential Spill Predictions, Volumes, Rates and Control Measures, subsection A – Transferring Fuel from Delivery Truck to Convault, revise as follows:

A. Transferring Fuel from Delivery Truck to ~~Convault~~**Aboveground Tank**

6. Page 3 of the SPCC Plan, Section 5 – Potential Spill Predictions, Volumes, Rates and Control Measures, subsection A, first and second paragraphs, revise as follows:

Berry-Hinkley Industries in South Lake Tahoe delivers fuel using a relatively small fuel-delivery truck. The truck drives is trained on a regular basis on how to respond to fuel spills that could occur while filling the ~~Convault~~ **aboveground** tank. Please refer to Appendix A to review this procedure. Fuel is pumped at the rate of 16 gallons per minute. Although it is very unlikely, a complete break in the line would produce a leak flowing at roughly this rate. To make sure a break or leak does not occur, the hoses, valves and piping used during fueling are inspected on a regular basis.

The most common problem encountered when filling a tank is an accidental overfilling. Both partitions inside the ~~Convault~~ **aboveground** tank are equipped with liquid-level indicators. When filling the tank, the driver of the fuel-delivery truck uses these indicators to monitor the rising level inside each partition. As an added precaution, each fill nozzle is surrounded with a spill container that can hold up to 5 gallons of fuel. Should an overfilling occur, the fuel in the container can be readily drained down into the tank using a hand valve that is normally closed. Finally, a ~~catch~~ **spill containment** basin with a capacity of ~~496~~**488.4** gallons is located underneath the tank. ~~Assuming the catch basin is empty and given a pumping rate of 16 gallons per minute, it would take 34 minutes to completely fill the catch basin. As a practical matter, it is very unlikely that a tank overfilling could continue for this long without being detected by the truck driver because it only takes 60 minutes to fill the tank. Please refer to Appendix E to review the engineering calculations. According to Berry-Hinkley, there has been only one overfilling of the tank since it was installed in 1992. Only a few gallons of fuel spilled into the catch basin, and it was readily removed using absorbent pads.~~

7. Page 3 of the SPCC Plan, Section 5 – Potential Spill Predictions, Volumes, Rates and Control Measures, subsection B – Pipeline Leaks, revise as follows:

As shown in Figure 1, two ~~2~~**1 1/2**-inch ~~steel~~ pipelines convey unleaded gasoline and no. 2 diesel fuel from the ~~Convault~~ **aboveground** tank to the two fuel dispensers at the ~~edge of the lake~~**east and west sides of the Marina, respectively. From the aboveground tank to the Marina piers, the fuel lines are buried. The underground portions of the fuel lines are APG plastic, set inside a crush resistant conduit. At the piers, the fuel lines transition to steel pipe attached to the underside of the piers.** Marina personnel inspect ~~this~~**the visible portions of the** piping **system** every day to make sure it is not leaking. To further minimize the amount of fuel that can leak from the two pipelines, electrically operated solenoid valves are installed in each pipeline where they connect to the tank. Whenever the dispenser is off, these valves close automatically. In the unlikely event a pipeline breaks completely open, the only fuel that can leak out is the amount inside the pipeline. On this basis, the maximum amount of gasoline that could be spilled in the event there is a break in the gasoline pipeline is ~~60~~**approximately 26.2** gallons. In the event there is a break in the diesel pipeline, the maximum amount of fuel that could leak out is ~~75~~**approximately 47.1** gallons. Please refer to **REVISED** Appendix E for the calculations. ~~As a practical matter, it is unlikely that this much fuel would leak out. For example, the pipeline carrying the diesel fuel follows an elevated bridge that crosses the inner harbor. As a result, the maximum height of the pipeline is above the top of the Convault. Should there be a rupture in the diesel pipeline, approximately one-half of the maximum, or 37 gallons would leak out.~~

8. Page 4 of the SPCC Plan, Section 6 – Prevention Measures Provided, subsection A – Convault Tank, revise as follows:

A. ~~Convault~~ **Aboveground** Tank

The ~~Convault~~ **aboveground** tank design provides the best assurance that major fuel spills from the tank will not occur. The tank is manufactured in accordance with UL standards 142 and 2085. As a result, the tank has a 2-hour fire rating and will withstand impacts from vehicles and bullets. In addition, with its low center of gravity, it is resistant to tipping over in an earthquake. As mentioned above, each filling nozzle is surrounded by a spill container that will catch up to 5 gallons of fuel. Should an overfilling occur, fuel in the spill container can be readily drained down into the tank using a hand valve that is normally closed. Finally, the tank is equipped with a double containment system. ~~Using a special test port, the tank owner can check for~~ **Automated detection/reporting equipment will detect and report** fuel between the two containment walls~~ at any time~~.

In addition to its very robust design, the ~~Convault~~ **aboveground** tank is equipped with a ~~catch~~ **spill containment** basin that is located directly below the tank. This ~~catch~~ **spill containment** basin has a capacity of ~~496~~**488.4** gallons. As the tank is partitioned into two ~~1,000~~**2,000**-gallon tanks, the ~~catch~~ **spill containment** basin is equivalent to almost ~~50 percent~~ **¼** of the full capacity of each sub tank. For all these reasons, the ~~Convault~~ **Spartan Inc. Fireguard** tank is an excellent choice for an aboveground tank at the marina. ~~Drawings of the tank located at Ski Run Marina Village are provided in Appendix D.~~ The **tank model** ~~size used by the marina~~ is size ~~D1000~~**VT-4000 SPLIT**.

9. Page 4 of the SPCC Plan, Section 6 – Prevention Measures Provided, subsection C – On-site Spill Kits, first sentence, revise as follows:

   The marina maintains a spill kit in a closed container right next to the ~~Convault~~ **aboveground** tank.

10. Page 5 of the SPCC Plan, Section 6 – Prevention Measures Provided, subsection D – Personnel Training and Spill Prevention Procedures, first paragraph, revise as follows:

    As part of their initial orientation, the marina manager trains new **Ski Run Marina** employees in how to conduct and log the ~~daily~~ **weekly,** ~~and~~ quarterly, **and annual** inspections listed in Section ~~10 above~~ **11, below**. Classes in responding to fuel spills are conducted once a year **for Ski Run Marina employees** by the marina manager or consultant. Attendance records **for Ski Run Marina employees** are kept in the employee personnel file. Fuel spills associated with the ~~Convault~~ **aboveground** tank **would be the responsibility of Ski Run Marina. Fuel spills associated with that portion of the fuel distribution system from the aboveground tank to the dispensers (including the dispensers) would be the responsibility of Lake Tahoe Cruises and Ski Run Boat Company. Lake Tahoe Cruises and Ski Run Boat Company would be the primary responders in the event of a fuel spill in that portion of the fuel distribution system from the aboveground tank to the fuel dispensers (including the dispensers).** ~~, pipelines and fuel dispenser are handled by the marina. Any spills that may occur during fueling are best handled by the personnel engaged in the fueling operation, with follow-up and waste disposal conducted by the marina.~~ **Lake Tahoe Cruises and Ski Run Boat Company also provide regular training for their employees who are engaged in fueling operations.**

11. Page 5 of the SPCC Plan, Section 6 – Prevention Measures Provided, subsection E – Inspection Logs, revise as follows:

The following inspections are documented in a logbook kept in the marina manager's office.

1. ~~Daily~~ **Weekly** inspection of the ~~Convault~~ **aboveground** tank, pipelines and fuel dispensers
~~2. Quarterly check for fuel in the space between the two tank walls~~
~~3.~~**2.** Quarterly check on the operation of the liquid-level gauges and solenoid valves
~~4.~~**3.** Annual check on the readiness of spill kit stored adjacent to ~~Convault~~ **aboveground** tank

If any problems are observed during ~~a daily~~ **an** inspection, the manager is notified and corrective actions are taken as soon as possible. Please refer to Appendix F for a copy of the Inspection Log Form used to document the above inspections.

12. Page 6 of the SPCC Plan, Section 6 – Prevention Measures Provided, subsection G – Site Security, revise as follows:

The area around the ~~Convault~~ **aboveground** tank is illuminated at night. In addition, a ~~wooden~~ fence protects the tank on all four sides. ~~Finally, steel posts anchored in concrete protect the tank from motor vehicles in the area.~~ The area around the fuel dispenser is also illuminated at night, and the dispenser has a key-operated lock so that unauthorized personnel cannot operate it.

13. Page 6 of the SPCC Plan, Section 7 – Drainage Control, subsection A, revise as follows:

~~Convault~~ **Aboveground** Tank:

~~The catch basin located beneath the Convault tank is equipped with a valve that is normally closed.~~ After ~~inspection, storm water is drained from the catch basin by opening this valve. Should the catch basin contain fuel or a mixture of fuel and water, the catch basin would be drained to buckets that would be emptied into a 55-gallon storage drum. This drum would be removed from the property by a licensed hazardous waste hauler.~~ **The spill containment basin below the aboveground tank is regularly inspected for the presence of accumulated storm water. When storm water is present within the spill containment basin, it is pumped out of the basin and disposed of in accordance with applicable local, state, and federal requirements.**

14. Page 6 of the SPCC Plan, Section 7 – Drainage Control, subsection C – Storm Water, revise as follows:

The only place that storm water collects is in the ~~catch~~ **spill containment** basin underneath the ~~Convault~~ **aboveground** tank. As discussed above, ~~this~~ **accumulated** storm water is ~~allowed to drain only after it has been visually inspected~~ **pumped out of the basin and disposed of in accordance with applicable local, state, and federal requirements.**

15. Page 6 of the SPCC Plan, Section 8 – Storage Tank Inspections, subsection A – Periodic Tank-Integrity Testing, revise as follows:

The ~~Convault~~ **aboveground** tank was designed to store hydrocarbon fuels and was manufactured in accordance with UL standards for this type of tank. The tank is equipped with a double wall. Any fuel leaking through the inner wall **would be detected and reported via automated sensing/reporting devices.** ~~collects between the two walls. A special inspection tube mounted on top of the tank is used to gain access to the space between the two walls. This tube is used to inspect the space between the two tank walls and confirm that no fuel is present. Inspections are documented in the inspection log.~~

16. Page 7 of the SPCC Plan, Section 8 – Storage Tank Inspections, subsection B – Liquid Level Indicators, revise as follows:

    As noted, both partitions inside the ~~Convault~~ **aboveground** tank are equipped with liquid-level indicators that are used monitor liquid level during filling. These level indicators are inspected and maintained by marina personnel.

17. Page 12 of the SPCC Plan, Appendix D – Drawings of Convault Tank, revise as follows:

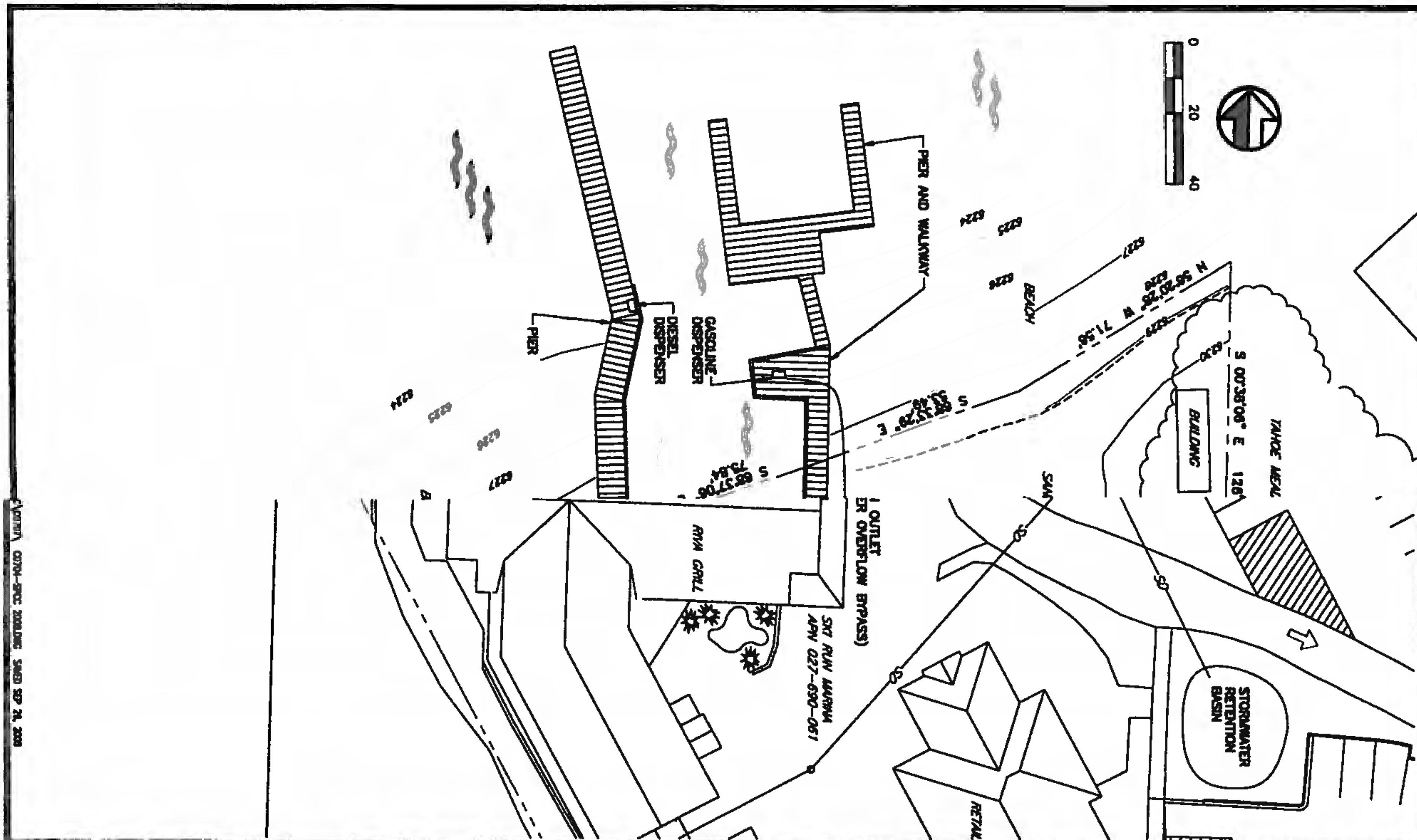
    Delete Appendix D.

18. Page 13 of the SPCC Plan, Appendix E, Engineering Calculations, revise as follows:

    Replace existing calculations (Appendix E) with new calculations for new aboveground tank spill containment basin and pipelines (REVISED Appendix E).

19. Pages 14, 15, 16, 17 of the SPCC Plan, Appendix F, Inspection Log Forms, revise as follows:

    Replace existing Log Forms (Appendix F) with new Log Forms provided in REVISED Appendix F.



SKI RUN MARINA
SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

REVISED FACILITY LAYOUT AND SURFACE DRAINAGE SYSTEM

JWA CONSULTING ENGINEERS, INC.
Zephyr Cove, Nevada
Pleasant Hill, California

SCALE: AS SHOWN

REV.	DATE	DESCRIPTION

REGISTERED PROFESSIONAL ENGINEER — R. MARK HOEFER — No. C 44785 — Exp. 3/31/10 — CIVIL — STATE OF CALIFORNIA

SHEET NUMBER
Figure 1
1 OF 1 SHEETS

PROJECT NO.
C0704

C:\C0707\ C0704-SPCC 2008.DWG SAVED SEP 26, 2008

Revised Appendix E
Engineering Calculations

Volume of Spartan Inc. Fireguard Aboveground Tank Spill CONTAINMENT BASIN

Volume = Depth x Width x Length of Spill Containment Basin

Volume = 8" x 18" x 65' = 0.67' x 1.5' x 65'

Volume = 65.3 cubic feet

One cubic foot = 7.48 gallons

Volume = 65.3 cubic feet = 488.4 gallons

Maximum Amount of Fuel Spilled Following a Pipeline Rupture

The maximum amount of fuel that can be spilled is based on the internal volume of the pipeline.

Gasoline Pipeline:

Pipeline has 1 ½-inch internal diameter.

Total length of pipeline is 288 feet (approx.).

Internal area of pipe = 1.77 square inches = 0.012 square feet.

Volume of pipe = length x internal area = 288 feet x 0.012 square feet = 3.5 cubic feet (approx.).

1 cubic foot = 7.48 gallons.

Volume = 3.5 cubic feet = 26.2 gallons (approx.).

Diesel Pipeline:

Pipeline is 1 ½-inch internal diameter.

Total length of pipeline is 523 feet (approx.).

Internal area of pipe = 1.77 square inches = 0.012 square feet.

Volume of pipe = length x internal area = 523 feet x 0.012 square feet = 6.3 cubic feet (approx.).

1 cubic foot = 7.48 gallons

Volume = 6.3 cubic feet = 47.1 gallons (approx.).

REVISED APPENDIX F
INSPECTION LOG FORMS

Weekly Inspection of Aboveground Tank, Pipelines and Fuel Dispensers

Date Inspected	Inspector	Problems Noted	Date Fixed

Quarterly Inspection of Liquid –Level Gauges and Solenoid Valves on Aboveground Tank

Date Inspected	Inspector	Problems Noted	Date Fixed

Annual Inspection of Sill-Kit Readiness

Date Inspected	Inspector	Problems Noted	Date Fixed

REVISED SPILL PREVENTION CONTROL AND COUNTERMEASURE

COMPLIANCE INSPECTION PLAN

REVIEW PAGE

In accordance with 40 CFR 112.5(b), as amended in 2002, the owner or operator of a facility required to prepare a Spill Prevention Control and Countermeasure (SPCC) Plan, is required to review his SPCC Plan at least every 5 years from the date the last review was required under 40 CFR 112. The owner or operator must amend the SPCC Plan within 6 months of the review to include more effective prevention and control technology if: (1) Such technology will significantly reduce the likelihood of a discharge as described in 40 CFR 112.1(b) from the facility; and (2) if such technology has been field-proven at the time of the review. Implementation of amendments is required within 6 months following amendment. The following checklist shall serve as documentation that the owner or operator has completed the required SPCC Plan review and his determination as to whether he will amend the Plan. In accordance with 40 CFR 112.5(c), technical amendments to an SPCC must be certified by a Professional Engineer (PE). PE certification is not required for non-technical amendments, like changes to phone numbers, names, etc.

REVIEW DATES:	SIGNATURE:	WILL YOU AMEND THE SPCC PLAN?	
1. May 1, 2013	M Alyeshmerni (SIGN) Manzoor Alyeshmerni (PRINTED NAME)	☐ Yes.	☑ No.
2. May 1, 2018	(SIGN) (PRINTED NAME)	☐ Yes.	☐ No.
3. May 1, 2023	(SIGN) (PRINTED NAME)	☐ Yes.	☐ No.

ATTACHMENT 1

JULY 2000 SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN
FOR
SKI RUN MARINA VILLAGE

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

for

Ski Run Marina Village
900 Ski Run Blvd., Suite 1
South Lake Tahoe, California 96150

Original Date of Plan: July 19, 2000
Date of Last Plan Amendment/P.E. Certification: July 19, 2000
Date of Last Plan Review: July 19, 2000

Designated person accountable for spill prevention:
Dan Jack
Facility Manager

I hereby certify that I have examined the facility, and being familiar with the provisions of 40 CFR part 112, attest that this SPCC Plan has been prepared in accordance with good engineering practices.

Engineer: Dominic Meo III, P.E., DEE

Signature: ______________________

Registration Number: CH 4253

State: California

REGISTERED PROFESSIONAL ENGINEER
DOMINIC MEO, III
No. CH 4253
9-30-00
STATE OF CALIFORNIA

SPILL PREVENTION CONTROL AND COUNTERMEASURE COMPLIANCE INSPECTION PLAN REVIEW PAGE

In accordance with 40 CFR 112.5(b), a review and evaluation of this SPCC Plan is conducted at least once every three years. As a result of this review and evaluation, Ski Run Marina Village will amend the SPCC Plan within six months of the review to include more effective prevention and control technology if: (1) such technology will significantly reduce the likelihood of a spill event from the facility, and (2) if such technology has been field-proven at the time of the review. Any amendment to the SPCC Plan shall be certified by a Professional Engineer within six months after a change in the facility design, construction, operation, or maintenance occurs which materially effects the facility's potential for the discharge of petroleum hydrocarbons into or upon navigable waters of the United States or adjoining shorelines.

Review Dates	Signature
1. January 1, 2003	[signature]
2. January 1, 2006	[signature]
3. January 1, 2009	
4. January 1, 2012	
5. January 1, 2015	

MANAGEMENT APPROVAL

Ski Run Marina Village is committed to the prevention of discharges of petroleum hydrocarbons to navigable waters and the environment and maintains the highest standards for spill prevention control and countermeasures through regular review, updating and implementation of this Spill Prevention Control and Countermeasures Plan.

Authorized Facility Representative: Dan Jack

Signature: [signature] Title: Facility Manager

Table of Contents

Figures

Appendices

1. Facility Owner and Operator:

A. Facility Owner, Address and Telephone

Ski Run Marina Village
900 Ski Run Blvd., Suite 1
South Lake Tahoe, California 96150
(530)540-9500

B. Facility Operator, Address and Telephone

Ski Run Marina Village
900 Ski Run Blvd., Suite 1
South Lake Tahoe, California 96150
(530)540-9500

2. Facility Contacts:

Name	Title	Telephone
Michael R. Phillips	Owner	(916)652-5155
Dan Jack	Manager	(530)544-9500

3. Facility Description:

A. Facility Operations:

Ski Run Marina Village is an established, year-round resort in South Lake Tahoe, California, located on the southern shore of Lake Tahoe. Two independently operated businesses, Hornblower Cruises, Inc. and Williams Sports Rentals, Inc. lease dock space from the marina. In addition, these businesses also purchase fuel from the marina. Hornblower Cruises purchases no. 2 diesel fuel, while Williams Sports Rentals purchases unleaded gasoline.

As shown in Figure 1, the unleaded gasoline and diesel fuel is stored in an aboveground Convault tank that was installed in 1992. Please refer to Appendix D for a drawing of the tank. The size used by the marina is D1000. This tank is fabricated from concrete and steel; it is equipped with both a double wall and a spill-containment basin beneath the tank. The total capacity of the tank is 2,000 gallons but is subdivided into two 1,000-gallon tanks by a partition running down the center. This design allows for storing up to 1,000 gallons of gasoline and 1,000 gallons of no. 2 diesel fuel. Dedicated galvanized steel pipelines convey fuel from the two tanks to two fuel dispensers, one for unleaded gasoline purchased by Williams Sports Rentals and one for diesel fuel purchased by Hornblower Cruises. Importantly, no fuel is sold to the general public.

Hornblower Cruises operates year-round, generally from 6:00 a.m. to 8:00 p.m. In contrast, Williams Sports Rentals only operates from May to October, from 7:00 a.m. to 7:00 p.m. When necessary, additional gasoline and diesel fuel is added to the tank by a local fuel dealer using a relatively small fuel-delivery truck. During the summer, the fuel dealer refills the tank every other day. During the winter, fuel deliveries decrease to once a week.

B. Facility Storage Tank:

Tank ID	Volume	Contents
Convault Aboveground Tank	1,000 gallon partition 1,000 gallon partition 2,000 gallons total	No. 2 Diesel Fuel Unleaded Gasoline

C. Drainage Pathway and Distance to Navigable Waters:

As shown in 1, the Convault tank is located less than ten feet from the edge of the inner harbor of the marina. The landscaped area adjacent to the tank would probably absorb a spill that was not contained either by the catch basin located underneath the tank or by absorbent pads. Run off from the landscaped area could spill into the inner harbor, which is less than ten feet from the tank.

4. Spill History:

Although the following spills are quite small, both were reported to the Lahontan Regional Water Quality Control Board.

Location and Date of Spill	Type and Amount of Spill	Cause	Affected Water Course	Damages and Cost of Damages	Cleanup Cost	Corrective Action
1994	No. 2 diesel, approx. two gallons	Tank overfilling	None	Fuel captured by catch basin	none	Modified filling procedure
1998	No. 2 diesel, approx. one pint	Leak from dispenser	None	Fuel leaked onto soil	$700.00	Modified dispensing procedure
1999	Gasoline, drips	Leaking dispenser	None	Fuel leaked onto soil	$5,000.00	Replaced dispenser

5. Potential Spill Predictions, Volumes, Rates and Control Measures:

A. Transferring Fuel from Delivery Truck to Convault Tank:

Berry-Hinckley Industries in South Lake Tahoe delivers fuel using a relatively small fuel-delivery truck. The truck driver is trained on a regular basis on how to respond to fuel spills that could occur while filling the Convault tank. Please refer to Appendix A to review this procedure. Fuel is pumped at the rate of 16 gallons per minute. Although it is very unlikely, a complete break in the line would produce a leak flowing at roughly this rate. To make sure a break or leak does not occur, the hoses, valves and piping used during fueling are inspected on a regular basis.

The most common problem encountered when filling a tank is an accidental overfilling. Both partitions inside the Convault tank are equipped with liquid-level indicators. When filling the tank, the driver of the fuel-delivery truck uses these indicators to monitor the rising level inside each partition. As an added precaution, each fill nozzle is surrounded with a spill container that can hold up to 5 gallons of fuel. Should an overfilling occur, the fuel in the container can be readily drained down into the tank using a hand valve that is normally closed. Finally, a catch basin with a capacity of 496 gallons is located underneath the tank. Assuming the catch basin is empty and given a pumping rate of 16 gallons per minute, it would take 31 minutes to completely fill the catch basin. As a practical matter, it is very unlikely that a tank overfilling could continue for this long without being detected by the truck driver because it only takes 60 minutes to fill the tank. Please refer to Appendix E to review the engineering calculations. According Berry-Hinckley, there has been only one overfilling of the tank since it was installed in 1992. Only a few gallons of fuel spilled into the catch basin, and it was readily removed using absorbent pads.

B. Pipeline Leaks:

As shown in Figure 1, two 2-inch steel pipelines convey unleaded gasoline and no. 2 diesel fuel from the Convault tank to the two fuel dispensers at the edge of the lake. Marina personnel inspect this piping every day to make sure it is not leaking. To further minimize the amount of fuel that can leak from the two pipelines, electrically operated solenoid valves are installed in each pipeline where they connect to the tank. Whenever the dispenser is off, these valves close automatically. In the unlikely event a pipeline breaks completely open, the only fuel that can leak out is the amount inside the pipeline. On this basis, the maximum amount of gasoline that could be spilled in the event there is a break in the gasoline pipeline is 60 gallons. In the event there is a break in the diesel pipeline, the maximum amount of fuel that could leak out is 75 gallons. Please refer to Appendix E for the calculations. As a practical matter, it is unlikely that this much fuel would leak out. For example, the pipeline carrying the diesel fuel follows an elevated bridge that crosses the inner harbor. As a result, the maximum height of the pipeline is above the top of the Convault tank. Should there be a rupture in the diesel pipeline, approximately one-half of the maximum, or 37 gallons would leak out.

C. Spills when Dispensing Fuel:

Hornblower Cruises operates the diesel dispenser and Williams Sports Rentals operates the gasoline dispenser. The fueling procedure used by Hornblower Cruises is provided in Appendix B, while the procedure used by Williams Sports Rentals is provided in Appendix C. These procedures are designed to prevent any spills from occurring. If a spill does occur, however, the Marina will be notified as soon as possible. Because fueling is a manual operation, a spill would be detected very quickly, and the total amount spilled should be relatively small.

6. Prevention Measures Provided:

A. Convault Tank:

The Convault tank design provides the best assurance that major fuel spills from the tank will not occur. The tank is manufactured in accordance with UL standards 142 and 2085. As a result, the tank has a 2-hour fire rating and will withstand impacts from vehicles and bullets. In addition, with its low center of gravity, it is resistant to tipping over in an earthquake. As mentioned above, each filling nozzle is surrounded by a spill container that will catch up to 5 gallons of fuel. Should an overfilling occur, fuel in the spill container can be readily drained down into the tank using a hand valve that is normally closed. Finally, the tank is equipped with a double-containment system. Using a special test port, the tank owner can check for fuel between the two containment walls at any time.

In addition to its very robust design, the Convault tank is equipped with a catch basin that is located directly below the tank. This catch basin has a capacity of 496 gallons. Please refer to Appendix E to review the engineering calculations. As the tank is partitioned into two 1,000-gallon tanks, the catch basin is equivalent to almost 50 percent of the full capacity of each sub tank. For all of these reasons, the Convault tank is an excellent choice for an aboveground tank at the marina. Drawings of the tank located at Ski Run Marina Village are provided in Appendix D. The size used by the marina is size D1000.

B. Pipelines and Fuel Dispensers:

If either pipeline requires maintenance, the pipeline is drained through valves strategically located at low points in the piping. This minimizes the leakage of fuel when maintenance personnel loosen a piping connection. As mentioned above, solenoid valves in the pipelines limit the amount of fuel that can leak from a ruptured pipeline to the amount actually inside the pipeline. Marina personnel also inspect the two fuel dispensers, one for unleaded gasoline and one for diesel fuel, on a daily basis. In addition, a metal catch basin is located directly below the unleaded gasoline dispenser to catch any small drips from the bottom of the dispenser.

C. On-Site Spill Kits:

Ski Run Marina Village:
The marina maintains a spill kit in a closed container right next to the Convault tank. In the event a spill occurs during loading of the tank or during maintenance work, workers have ready access to a complete spill kit. This kit includes safety equipment such as eye protection and gloves and special pads that absorb spills. The kit also contains a floating boom that could be deployed to contain the spread of leaking fuel on the inner harbor adjacent to the tank.

Hornblower Cruises:
Hornblower Cruises maintains a spill kit that is to be used to control any spills that may occur during fueling. The kit contains a face shield, goggles, rubber gloves, absorbent pads and a 400-foot boom for controlling the spread of leaking fuel on the lake.

Williams Sports Rentals:
Williams Sports Rentals also maintains a spill kit that is to be used to control any spills that may occur during fueling. The kit contains a face shield, goggles, rubber gloves and absorbent pads. It also contains a floating boom for controlling the spread of leaking fuel on the lake.

D. Personnel Training and Spill Prevention Procedures:

Ski Run Marina Village:
As part of their initial orientation, the marina manager trains new employees in how to conduct and log the daily and quarterly inspections listed in Section 10 above. Classes in responding to fuel spills are conducted once a year by the marina manager or a consultant. Attendance records are kept in the employee personnel file. Fuel spills associated with the Convault tank, pipelines and fuel dispenser are handled by the marina. Any spills that may occur during fueling are best handled by the personnel engaged in the fueling operation, with follow up and waste disposal conducted by the marina.

Hornblower Cruises:
Hornblower Cruises conducts their own fueling operations. No. 2 diesel is loaded into the fuel tanks on board their vessels. Once a year, the company's Port Engineer conducts classes in proper fueling and spill-response procedures. The procedure used by the company is provided in Appendix B.

Williams Sports Rentals:
Williams Sports Rentals conducts their own fueling operations. Unleaded gasoline is loaded into the fuel tanks on board their rental boats. Once a year, the Harbor Master conducts classes in proper fueling and spill-response procedures. The procedure used by the company is provided in Appendix C.

E. Inspection Logs:

The following inspections are documented in a logbook kept in the marina manager's office.

1. Daily inspection of the Convault tank, pipelines and fuel dispenser
2. Quarterly check for fuel in the space between the two tank walls
3. Quarterly check on the operation of the liquid-level gauges and solenoid valves
4. Annual check on readiness of spill kit stored adjacent to Convault tank

If any problems are observed during a daily inspection, the manager is notified and corrective actions are taken as soon as possible. Please refer to Appendix F for a copy of the Inspection Log Form used to document the above inspections.

F. Emergency Notifications:

As shown in Section 9.B. below, when a spill occurs, marina management will call 911 to alert the local emergency agencies. If necessary, they will call a contractor that has the equipment and personnel to handle the spill. As quickly as possible after the spill occurs, marina management will call all the phone numbers listed in Section 9.B.

G. Site Security:

The area around the Convault tank is illuminated at night. In addition, a wooden fence protects the tank on all four sides. Finally, steel posts anchored in concrete protect the tank from motor vehicles in the area. The area around the fuel dispenser is also illuminated at night, and the dispenser has a key-operated lock so that unauthorized personnel cannot operate it.

7. Drainage Control:

A. Convault Tank:

The catch basin located beneath the Convault tank is equipped with a valve that is normally closed. After inspection, storm water is drained from the catch basin by opening this valve. Should the catch basin contain fuel or a mixture of fuel and water, the catch basin would be drained to buckets that would be emptied into a 55-gallon storage drum. This drum would be removed from the property by a licensed hazardous waste hauler.

B. Fuel-Dispensing Hoses:

Williams Sports Rentals uses the hose attached to the fuel dispenser to fill the fuel tanks on their rental boats. This hose is allowed to drain into the fuel tank on the boat after the dispenser pump shuts off. However, Hornblower Cruises needs a longer hose to carry fuel from the dispenser to their larger boats. When not in use, this hose is kept wound up on a hose reel that is used exclusively by the Hornblower Cruises vessels. Before fueling, the hose is unreeled and attached to the fill cap on the vessel. At the end of fueling, the hose is allowed to drain into the vessel's fuel tank. After draining, the empty hose is reeled back up.

C. Storm Water:

The only place that storm water collects is in the catch basin underneath the Convault tank. As discussed above, this water is allowed to drain only after it has been visually inspected.

8. Storage Tank Inspections:

A. Periodic Tank-Integrity Testing:

The Convault tank was designed to store hydrocarbon fuels and was manufactured in accordance with UL standards for this type of tank. The tank is equipped with a double wall. Any fuel leaking through the inner wall collects between the two walls. A special inspection tube mounted on top of the tank is used to gain access to the space between the two walls. This tube is used to inspect the space between the two tank walls and confirm that no fuel is present. Inspections are documented in the inspection log.

B. Liquid-Level Indicators:

As noted, both partitions inside the Convault tank are equipped with liquid-level indicators that are used to monitor liquid level during filling. These level indicators are inspected and maintained by marina personnel.

9. Emergency Contacts and Phone Numbers:

A. Emergency Contacts:

Name	Title	Telephone
Michael R. Phillips	Owner	(916)652-5155
Dan Jack	Manager	(530)544-9500

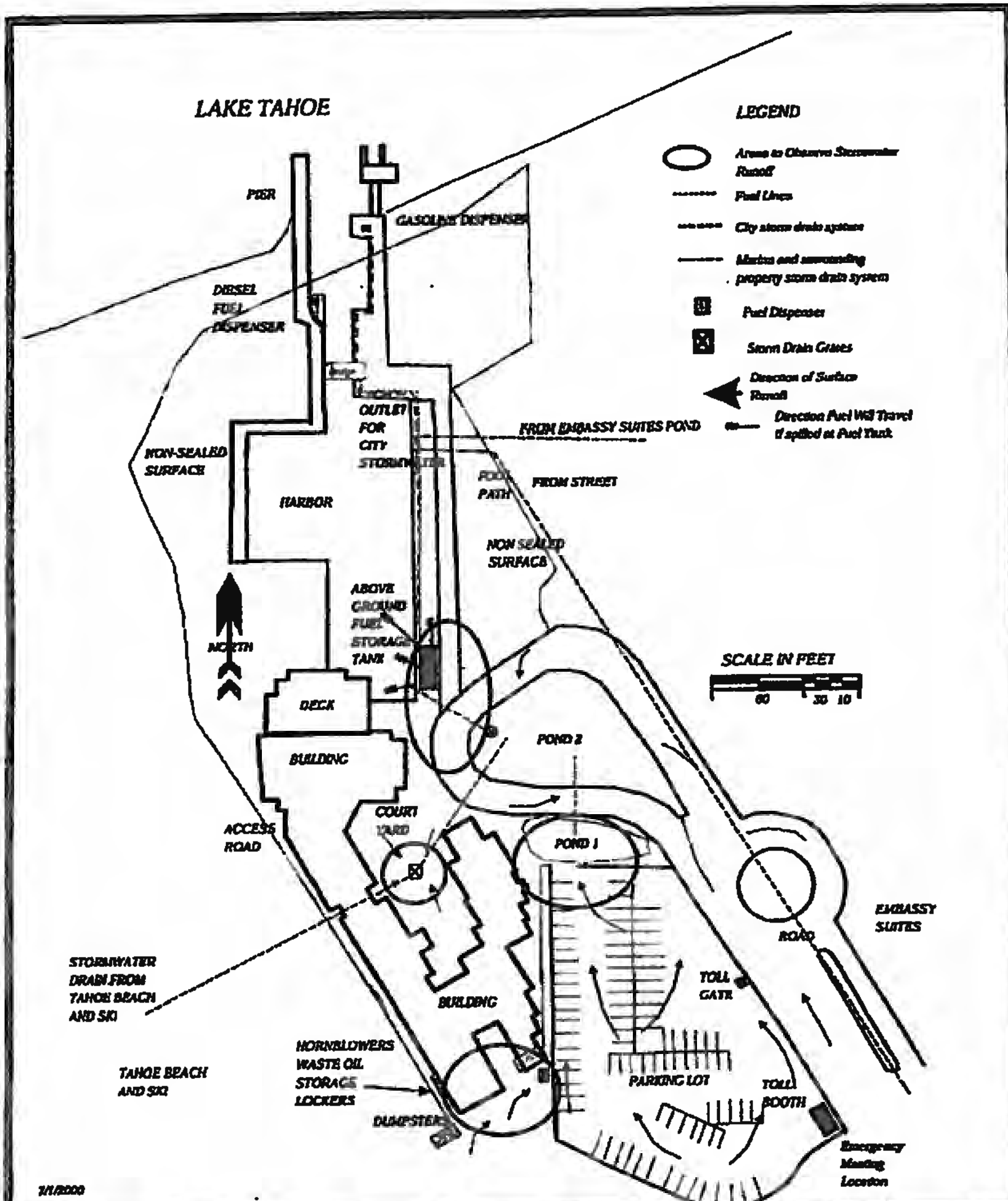
B. Emergency Phone Numbers:

When a spill occurs, Marina management must be notified immediately. They will assess the situation and supervise the clean-up efforts. As soon as possible, management must make the following calls. To facilitate making these calls, a copy of this page of the SPCC plan must be posted in the manager's office.

Local Emergency Services	911
California State Office of Emergency Service	(800)852-7550
El Dorado County Office of Emergency Services	(530)626-4911
El Dorado County Department of Environmental Management	(530)621-5300
Lahontan Regional Water Quality Control Board	(800)852-7550
Lake Tahoe Management Unit	(530)573-2600
EPA Region IX Spill Phone	(415)744-2000
National Response Center	(800)424-8802

If fuel enters the lake, contact the U.S. Coast Guard in Sacramento.

United States Coast Guard	(916)583-4433



Geotechnical Support Services	Ski Run Marina Village Facility Layout and Surface Drainage Diagram	Figure #1

APPENDIX A
BERRY-HINCKLEY INDUSTRIES PROCEDURE FOR RESPONDING TO FUEL SPILLS

1. Stop the source of release; turn off pumps, close valves, etc.

2. As soon as possible, advise marina management that a spill has occurred. They will make the emergency phone calls listed in Section 9.B.

3. Put on safety glasses or face shield and rubber gloves approved for handling gasoline and diesel fuel.

4. If the spill is captured by the catch basin underneath the tank, transfer the waste fuel to a DOT approved drum. Use absorbent mats or solid absorbent to remove any fuel remaining in the catch basin. Place the waste absorbent in a DOT approved drum.

5. If the spill is not captured by the catch basin underneath the tank, use absorbent material to form a dam and stop the spread of the spilled fuel. Add additional absorbent to the spilled fuel until the entire spill has been absorbed. Place the waste absorbent in a DOT approved drum.

6. Place a hazardous waste label on the drum and fill in all of the requested information.

APPENDIX B
HORNBLOWER CRUISES FUELING PROCEDURE

1. Prior to commencement of fueling operations, the Captain will inspect the dock area and vessel to ensure that the following precautions will be observed.
   - There is no repair work in progress.
   - There is no open flame on deck or in dock area.
   - All connections are tight and set accordingly.
   - Vent pipes are free of obstructions.
   - Ensure that a qualified crewmember is present to monitor deck fill area and make sure no leaks occur.
   - Install a drip pan at the tank fill/vent area along with absorbent rags.
   - Tank capacity chart and emergency numbers are posted in fueling area.

2. Using a proper size, approved and working hose and connection, remove starboard cover cap and connect fueling hose.

3. An oil diaper and spill over bucket will be put under each connection on the vessel for possible problems.

4. Secure metal drip pans under filler neck as well as fuel oil vents.

5. Insure hose is seated and secured before pumping.

6. Notify engineer on board in Hold Area that connections have been completed.

7. Upon approval from engineer begin taking on fuel.

8. Fill fuel oil at steady pace and ensure nozzle manned at all times.

9. Sound fuel oil tanks or check sight glass periodically to avoid over fueling.

10. When gauge reading shows 900 gallons, stop fueling. Allow pumps to completely stop and drain hose before disconnection to avoid spills of any type.

11. When fueling is complete, wipe any excess residue off any part of vessel or dock.

12. Make sure all fuel oil caps or cam-lock fittings are secured when finished.

13. When completed, log it and inform the captain of such, log that all lines are secure, log amount of fuel on board and return crossover valve to the on position.

15. In the event of any spills, personally notify both the captain on board and Marina management. Marina management will make the emergency phone calls listed in Section 9.B.

APPENDIX B
HORNBLOWER CRUISES FUELING PROCEDURE

1. Prior to commencement of fueling operations, the Captain will inspect the dock area and vessel to ensure that the following precautions will be observed.
   - There is no repair work in progress.
   - There is no open flame on deck or in dock area.
   - All connections are tight and set accordingly.
   - Vent pipes are free of obstructions.
   - Ensure that a qualified crewmember is present to monitor deck fill area and make sure no leaks occur.
   - Install a drip pan at the tank fill/vent area along with absorbent rags.
   - Tank capacity chart and emergency numbers are posted in fueling area.

2. Using a proper size, approved and working hose and connection, remove starboard cover cap and connect fueling hose.

3. An oil diaper and spill over bucket will be put under each connection on the vessel for possible problems.

4. Secure metal drip pans under filler neck as well as fuel oil vents.

5. Insure hose is seated and secured before pumping.

6. Notify engineer on board in Hold Area that connections have been completed.

7. Upon approval from engineer begin taking on fuel.

8. Fill fuel oil at steady pace and ensure nozzle manned at all times.

9. Sound fuel oil tanks or check sight glass periodically to avoid over fueling.

10. When gauge reading shows 900 gallons, stop fueling. Allow pumps to completely stop and drain hose before disconnection to avoid spills of any type.

11. When fueling is complete, wipe any excess residue off any part of vessel or dock.

12. Make sure all fuel oil caps or cam-lock fittings are secured when finished.

13. When completed, log it and inform the captain of such, log that all lines are secure, log amount of fuel on board and return crossover valve to the on position.

15. In the event of any spills, personally notify both the captain on board and Marina management. Marina management will make the emergency phone calls listed in Section 9.B.

APPENDIX C
WILLIAMS SPORTS RENTALS FUELING PROCEDURE

1. Prior to commencement of fueling operations the dispenser's operator will inspect the dock area and vessel to ensure that the following precautions will be observed.

   - There is no repair work in progress.
   - There is no open flame on deck or dock *(i.e. lit cigarettes, welding torches, propane lanterns or heaters)*.
   - All connections are tight and set accordingly.
   - Vent pipes are free of obstructions.
   - Ensure that a qualified attendant is present to monitor the fill area and make sure no leaks occur.
   - Install a drip pan at the tank fill/vent area along with absorbent rags.
   - Emergency numbers are posted in fueling area.

2. Using a proper size, approved and working hose and connection, remove fuel cover cap and connect fueling hose.

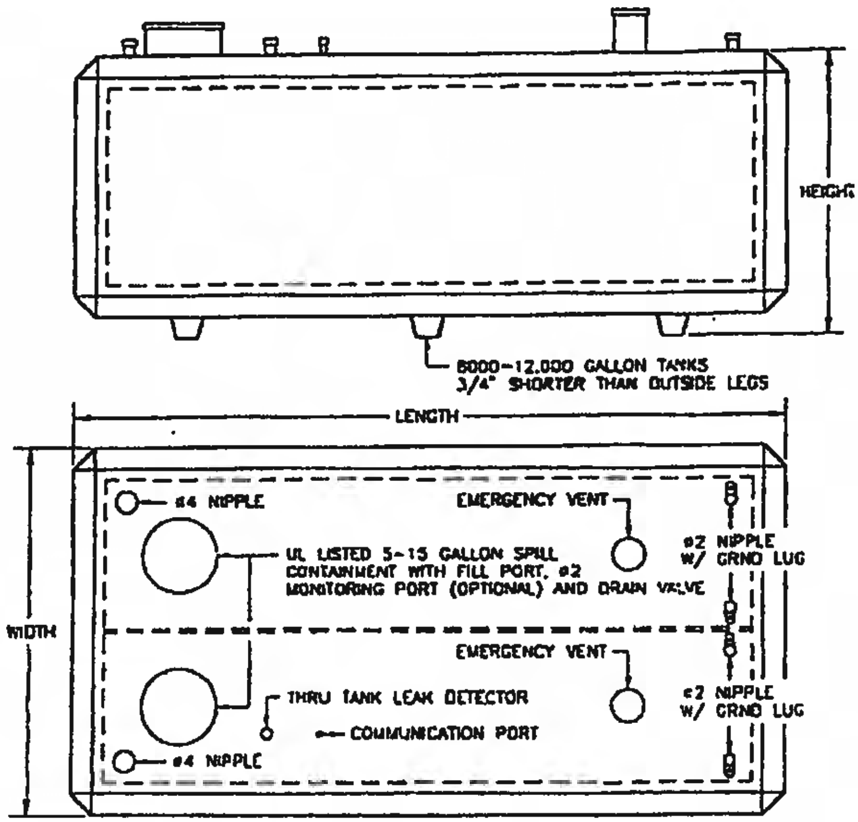
3. An oil diaper and spill over bucket will be stored next to the fueling boat to be used if any leak in the fueling system is identified.

4. Insure hose is seated and secured before pumping.

5. Pump fuel at a steady rate and ensure the nozzle is manned at all times.

6. In the event a spill occurs, notify Marina management immediately. They will make the emergency phone calls listed in Section 9.B.

APPENDIX D
DRAWINGS OF CONVAULT TANK



SIZE	LENGTH	WIDTH	HEIGHT	WEIGHT
D250	11'-0"	4'-9"	3'-4"	12,000
D500	11'-0"	5'-8"	4'-4"	15,500
D1000	11'-3"	8'-0"	5'-6"	30,000
D1500 LP	11'-3"	8'-0"	7'-3"	30,000
D1500 HP	9'-9"	8'-0"	8'-9"	37,500
D2000 LP	17'-7"	8'-0"	6'-5"	45,500
D2000 HP	12'-6"	8'-0"	8'-9"	40,000
D2,600 G	15'-6"	8'-0"	8'-9"	47,000
D2600 W	13'-2"	11'-11"	6'-11"	53,000
D3000	17'-7"	8'-0"	8'-9"	59,000
D4000	23'-1"	8'-0"	8'-9"	72,000
D5000	28'-7"	8'-0"	8'-9"	87,500
D6000	34'-1"	8'-0"	8'-9"	101,000

Note: Size used by Ski Run Marina is D1000

APPENDIX E
ENGINEERING CALCULATIONS

VOLUME OF CONVAULT CATCH BASIN

Volume = Depth x Width x Length of Catch Basin

Volume = 0.5 ft. x 10.0 ft. x 13.25 ft.

Volume = 66.25 cubic feet

One cubic foot = 7.48 gallons

Volume = 66.25 cubic feel x 7.48 gallons per cubic feet

Volume = 496 gallons

TIME NEEDED TO FILL CATCH BASIN DURING TANK OVERFLOW

Fuel is pumped into tank at rate of 16 gallons per minute. In the event an accidental overfilling occurs, the time needed to fill the catch basin is calculated:

Time to fill catch basin = 496 gallons/16 gallons per minute

Time to fill catch basin = 31 minutes

MAXIMUM AMOUNT OF FUEL SPILLED FOLLOWING A PIPELINE RUPTURE

The maximum amount of fuel that can spill is based on the internal volume of the pipeline.

Gasoline Pipeline

Pipeline is 2" schedule 40 pipe.
The total length of the pipeline from tank to dispenser = 344 feet = 4,128 inches.
Internal flow area = 3.356 square inches.
Volume = 4,128 inches long x 3.356 square inches flow area = 13,854 cubic inches
Volume = 8.02 cubic feet
1 cubic foot = 7.48 gallons
Volume = 60.0 gallons of gasoline

Diesel Pipeline

Pipeline is 2" schedule 40 pipe.
The total length of the pipeline from tank to dispenser = 432 feet = 5,184 inches.
Internal flow area = 3.356 square inches.
Volume = 5,184 inches long x 3.356 square inches flow area = 17,398 cubic inches
Volume = 10.07 cubic feet
1 cubic foot = 7.48 gallons
Volume = 75.3 gallons of gasoline

APPENDIX F
INSPECTION LOG FORMS

Daily Inspection of Convault Tank, Pipelines and Fuel Dispenser

Date Inspected	Inspector	Problems Noted	Date Fixed

Quarterly Inspection of Integrity of Double Containment Inside Convault Tank

Date Inspected	Inspector	Problems Noted	Date Fixed

Quarterly Inspection of Liquid-Level Gauges and Solenoid Valves on Convault Tank

Date Inspected	Inspector	Problems Noted	Date Fixed

Ski Run Marina Village
Spill Prevention Control and Countermeasure Plan

Annual Inspection of Ski Run Marina Spill-Kit Readiness

Date Inspected	Inspector	Problems Noted	Date Fixed

ATTACHMENT 3

Aramark Technical Report Dated August 28, 2015

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Taxer, Eric@Waterboards

From:	Resmondo, Dan <Resmondo-Dan@aramark.com>
Sent:	Friday, August 28, 2015 2:25 PM
To:	Taxer, Eric@Waterboards
Cc:	Walter, Stephanie; Peter J. Fontaine (pfontaine@cozen.com); Malatesta, Lara; Hawkins, Jermaine
Subject:	Aramark Tahoe Queen Investigative Order R6T-2015-0029-A1
Attachments:	Tahoe Queen Technical Report 8-28-15.pdf; Attachment_A Standard Operating Procedure.pdf; Attachment B_Aramark LOTO Training Documentation.pdf; Attachment C_Contractor LOTO Training Documentation.pdf; Attachment D_Request for Discovery R6T-2015-0029 pdf.pdf; Attachment E_Response from El Dorado DA.pdf; Attachment F_MSDSDetailPage.pdf; Attachment G_Chevron Description of Clarity Hydraulic Oil.pdf

Per your request, Aramark has prepared the attached technical report in response to your letter dated June 19, 2015. If you have any questions regarding this technical report or any of the attachments, please feel free to contact me at (775) 589-4934.

We would appreciate it, if you would please confirm receipt of this correspondence for our records. Thank you.

Best regards,

Dan Resmondo | Aramark | General Manager | Lake Tahoe Operations
760 US Highway 50, PO Box 12309
Zephyr Cove, NV 89448
M 702.343.2573 F 775.589.4915

EMAIL resmondo-dan@aramark.com | WEB www.zephyrcove.com | FACEBOOK aramark | TWITTER @aramark

Dan Resmondo
General Manager

August 28, 2015

Via Email: eric.taxer@waterboards.ca.gov

Eric 1. Taxer, P.E. Water Resource Control Engineer California Regional Water Quality Control Board-Lahontan Region 2501 Lake Tahoe Boulevard South Lake Tahoe, CA 96150

Subject: Technical Report

Dear Mr. Taxer:

Per your request, Aramark has prepared the Technical Report, herein, addressing all areas identified in your letter dated June 19, 2015. For assistance in preparing the Technical Report, Aramark retained EEC Environmental whose staff provided regulatory and technical advice as well as support in the preparation of various documents.

For each of the requested items, we provided you with the information and, where applicable, we attached the supporting documentation.

1. The cost estimate including labor, to properly seal the hydraulic lines in accordance with industry standards totaled $450.

2. Aramark has developed the attached (Attachment A) Standard Operating Procedure (SOP), titled "Program Document", specifically for the fueling and maintenance activities at Ski Run Marina. The SOP provides Aramark's employees, vendors and contractors with the information needed to conduct fueling and maintenance activities on vessels maintained by Aramark in a manner that complies with applicable regulations, the Lake Tahoe Geographic Response Plan (LTGRP) and protects the health and safety of employees, contractors, vendors, clients, visitors, surrounding neighbors and the environment.

3. The cost for developing the SOP included $1,500 and $1,800 incurred by Aramark and EEC, respectively, for a total cost of $3,300 for SOP development. Cost for implementing the SOP totaled $440.00 and consisted of training for the incorporation of spill prevention, containment, control and communication/reporting with maintenance activities. The total cost for developing and implementing the SOP amounted to $3,740.

4. All employees performing operation and maintenance activities on the Tahoe Queen received lock-out/tag-out training on July 9, 2015 (Attachment B). The training was provided to ensure that the purpose and function of Aramark's energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees. For the Affected Associates, the training included the following topics:

    - Purpose and use of the energy control procedures
    - Awareness of what various locks and tags look like and their purpose
    - Awareness that any attempts to reenergize equipment or remove LOTO devices is strictly forbidden

    For the Authorized Associates, the training included the following topics:

    - Lock-out/tag-out standard
    - Types of lock-out/tag-out devices
    - Lock-out/tag-out responsibilities
    - Energy Control Program
    - Lock-out/tag-out inspections and training requirements

    The cost incurred by Aramark for conducting the lock-out/tag-out training totaled $339.66 and included seventeen (17) sessions with an average of one hour per session at an employee hourly rate of $19.98.

5. Email dated July 27, 2015, from the contractor (Advanced Marine) working on the Tahoe Queen in March 2015 as a documentation of the received lock-out/tag-out training (Attachment C).

6. In order to provide you with the results of the water quality sampling collected on March 6, 2015, EEC, on behalf of Aramark, contacted the California Department of Fish and Wildlife who declined to provide the results and directed us to the El Dorado County District Attorney's (DA's) Office in South Lake Tahoe. The DA's Office demanded a formal request for discovery which Aramark's Counsel (Cozen O'Connor) submitted on July 20, 2015 (Attachment D). In a letter dated July 30, 2015, (Attachment E) the DA's Office informed us that Aramark's request was denied. Consequently, in spite of the attempts made, we are not able to include those results within this technical report. We would expect that the DA's Office might be more responsive to a request for this data by the Regional Board.

7. Aramark is committed to preventing the accidental release of chemicals into the environment and to using environmentally sensitive products. As previously stated, the Clarity hydraulic oil (AW 46), that was released from the Tahoe Queen is a specially formulated synthetic mineral oil determined to be non-toxic to aquatic organisms and inherently biodegradable. The material is considered an "environmentally acceptable lubricant" constituting a "best management practice" (BMP) by operators of vessels covered under U.S. EPA's Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels (VGP). As indicated in the attached MSDS (Attachment F), that was also provided with our initial report, the mineral oil is not toxic to aquatic life or the

environment. The material passed the 96-hour LL50 test at over fifty times the concentration threshold for fingerling rainbow trout and mysid shrimp with zero mortality. The material also was subjected to the CEC L-33-A93 test protocol and found to be "inherently biodegradable," according to EPA OPPTS 835.3110 and OECD Guidelines. Enclosed (Attachment G) is additional literature on the product. As we explained in our spill response documentation, given that there was a very small amount of non-toxic mineral oil released, it was contained in the marina area, and was promptly cleaned up, we believe that this release had no impact on the lake environment.

If you have any questions regarding this technical report, please contact me at (775)-589-4934.

Sincerely,

Dan Resmondo, General Manager
Resmondo-Dan@aramark.com

Attachments:

- Attachment A: Standard Operating Procedure
- Attachment B: Aramark's LOTO Training Documentation
- Attachment C: Contractor's LOTO Training Documentation
- Attachment D: Request to the El Dorado County District Attorney's Office
- Attachment E: Response from the El Dorado County District Attorney's Office
- Attachment F: Clarity Hydraulic Oil MSDS
- Attachment G: Clarity Hydraulic Oil Product Information

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Attachment A
Standard Operating Procedure

On-Water Maintenance & Fueling Activities

LAKE TAHOE CRUISES

Program Document and Tools

For Aramark Vessels on Lake Tahoe

aramark

Table of Contents

Revision History

Revision #	Revision Summary	Revision Date	Approval	
			Section Owner	M.S. Leader
0	Initial Release	07/2015		

1. PURPOSE

Aramark's Fueling and Maintenance Activities at Lake Tahoe (referred to in this document as "the program") provides Aramark employees and vendors/contractors with basic information needed to conduct fueling and maintenance activities on vessels maintained by Aramark in a manner that complies with applicable regulations, the Lake Tahoe Geographic Response Plan (LTGRP) and protects the health and safety of employees, contractors, vendors, clients, visitors, surrounding neighbors and the environment.

This program was developed for the following purposes:

- Define procedures and tactics for preventing and responding to any accidental discharges or spills into Lake Tahoe resulting from fueling and maintenance activities performed by Aramark and its contractors at Lake Tahoe.
- Protect the public, Aramark personnel, contractors' personnel and other responders during accidental discharges or spills.
- Minimize damage to the environment, natural resources, and facility installations from an accidental discharge.
- Describe the distribution of responsibilities and basic procedures for responding to an accidental discharge or spills and performing cleanup operations.

This guidance will help you properly perform fueling and maintenance activities by:

- ✓ Specifying training requirements for all Aramark employees and vendors/contractors.
- ✓ Assigning responsibilities for Aramark personnel and vendors/contractors.
- ✓ Providing guidelines for notifying local, county, state and federal agencies in the event of an accidental chemical release.
- ✓ Addressing spill prevention, containment and control during on-water fueling and maintenance activities.

2. SCOPE

This program applies to all company personnel and any Vendor/Contractor personnel working aboard an Aramark owned/operated vessel moored on Lake Tahoe who perform or may be called upon to perform duties with respect to vessel fueling and maintenance.

The guidance contained in this program document is in accordance with the federal requirements established by the United States Environmental Protection Agency (EPA), USCG and the LTGRP.

The LTGRP establishes the policies, responsibilities, and procedures required to protect life, environment, and property from the effects of hazardous materials incidents. In addition, the LTGRP establishes the emergency response organization for hazardous materials incidents occurring within the Lake Tahoe watershed and is generally intended to be used for oil spills or chemical releases that impact or could potentially impact drainages entering Lake Tahoe, Lake Tahoe itself, and its outflow at the Truckee River.

3. RESPONSIBILITIES

All personnel must work as a team to successfully manage fueling and maintenance operations at Lake Tahoe. To achieve this goal, key staff members must understand their own roles and responsibilities, as well as those of others.

The following sections provide general guidance to Aramark managers in defining and assigning clear roles and responsibilities for the proper fueling and maintenance of vessels. This guidance is meant to capture primary roles and responsibilities for a typical Aramark operation and is not intended to be comprehensive. Therefore, it is the responsibility of the Aramark Location Managers to further define roles and responsibilities based on their own organizational structure, staff capabilities, services provided, client contractual agreements, role of vendors and contractors, etc.

3.1 LOCATION MANAGER

The role of the Location Manager is to ensure that fueling and maintenance activities are performed in accordance with applicable environmental laws and regulations as well as the LTGRP to protect the health and safety of employees, vendors, contractors, clients, visitors, surrounding neighbors, and the environment. At Aramark, the Location Manager is the individual that has direct responsibility for overall location operations and is typically designated as a Resident District Manager (RDM), General Manager (GM) or Front-Line Manager (FLM).

The Aramark Location Manager must fully understand the scope of Aramark's commitments under pertinent Client contractual agreements and clearly outline roles and responsibilities between Aramark and the Aramark Client for the fueling and maintenance of vessels. The Location Manager also has the overall responsibility for effective program implementation that includes the duty to:

- Provide Resources and Personnel to effectively implement program.
- Conduct Annual Evaluation of Program.
- Know and understand Program Requirements and Procedures.
- Coordinate Spill Notification and Response Efforts.

3.2 OPERATIONS MANAGER/CAPTAIN

- Train All Employees as required.
- Conduct Pre-Maintenance Planning and Fueling Procedures.
- Implement Procedures of this program.
- Perform Inspections and Verify Compliance.
- Insure Vendors/Contractors have reviewed Program and Procedures and signed off on acceptance of Program Compliance.
- Notify GM, Aramark S&RC of any observed or perceived concerns.
- Implement Spill Response and Notification Procedures if necessary.

3.3 PROGRAM SUPPORT PERSONNEL

- Comply with Procedures.
- Report Spill immediately in accordance with established reporting procedures.
- Report Concerns to Management.

3.4 VENDORS/CONTRACTORS

- Comply with Procedures.
- Report Spills immediately in accordance with established reporting procedures.
- Insure all employees are trained as required.

3.5 ALL PERSONNEL

All personnel are responsible to:

- Observe all posted signs and instructions on labels.
- Stay out of restricted areas.
- Notify the Operations Manager/Captain if a spill or release occurs.
- Communicate all concerns to the Operations Manager/Captain.

4. PROGRAM

This procedure has been developed to provide guidance for properly performing fueling and maintenance operations at Lake Tahoe aboard Aramark vessels in a manner that is safe to the employees and protective of the environment.

IMPORTANT NOTE: *It is Aramark's policy that, during fueling activities, a trained individual is holding the nozzle and manually keeping it open during the entire fueling operation. It is against Aramark's policy to have the fueling operation unattended or to have an individual block the valve open in any way.*

4.1 ON-WATER FUELING PROCEDURE

Prior to commencement of fueling operations, the Captain will inspect the dock area and vessel to ensure the following precautions are observed:

- There is no repair work in progress.
- There is no open flame on deck or in dock area.
- All connections are tight and set accordingly.
- Vent pipes are free of obstructions.
- A qualified crewmember is present to monitor deck fill area and make sure that no leaks occur.
- A drip pan is installed at the tank fill/vent area along with absorbent pads.
- Tank capacity chart and emergency numbers are posted in fueling areas.
- Fuel level onboard is observed and the amount of fuel to be delivered is clearly communicated.

After verification and confirmation of the abovementioned requirements, the Captain will allow the fueling to proceed and will verify that the operator is following all procedures listed below:

- Using a proper size, approved and working hose and connection, the fuel cover cap is removed and fueling hose is connected.
- An oil diaper and spill over bucket are placed under each connection on the vessel for any possible leaks or drips.
- Metal drip pans are secured under filler neck as well as fuel oil vents.
- Hose is staffed and secured before pumping.
- Engineer on board in Hold Area is notified that connections have been completed.
- Upon approval from captain begin taking on fuel.
- Fill fuel oil at a steady pace and ensure nozzle is staffed at all times.
- Sound fuel oil tanks or check sight glass periodically to avoid overfilling.
- Fueling is stopped when gauge reading shows 900 gallons. Pumps are allowed to completely stop and hose is drained before disconnection to avoid spills of any type.
- When fueling is complete, any excess residue on any part of the vessel or dock is wiped off.
- All fuel caps and cam-lock fittings are properly secured when finished.
- When fueling operation is terminated, operator informs the captain of such and completes the log including logging that all lines are secure, the amount of fuel on board and that return crossover valve are turned to the "ON" position.
- In the event of any spill, immediately implement spill response procedures and notifications.

4.2 ON-WATER MAINTENANCE PROCEDURE

A review of this program will take place prior to beginning on-water repair and maintenance or when tasks or procedures change. This review will be the responsibility of the Captain, or Manager in charge. All Vendors and Contractors working on Aramark Vessels will be required to read and agree to abide by all procedures related to this document by incorporating these procedures into their contract. (see Form No. OM 01-01 Contractor/Vendor Agreement Form) *Captains must document on ships log all work being completed aboard boat and that procedures have been reviewed and records completed.*

- All work will be completed in accordance with the procedures described in the document.
- All work will be completed in compliance with applicable U.S. Coast Guard regulations and in conformance with LTGRP requirements for establishing the policies, responsibilities, and procedures required to protect life, environment, and property from the effects of hazardous materials incidents.
- All work will be completed in compliance with applicable Local, County, State and Federal water quality regulations and waste management regulations.
- Monitoring of all in-water maintenance and repair activities described in this program is delegated to the Captain or Manager in charge. Not less than daily visits to the work area are required. The area will be re-inspected immediately upon completion of the work by the Captain or Manager in charge.
- Where work processes differ from those described below, environmental protection must be of equal or greater effectiveness. Where a potential risk of environmental contamination is predictable, precautions must be taken prior to commencement of work. If effective precautions cannot be assured, then the work is not authorized by Aramark.
- Lock out Tag out (LOTO) procedures will be utilized when appropriate. All Vendors will need to provide proof of employee training, sign the Vendor LOTO form, and provide a copy of their Energy Control Procedures (ECP's). (see training requirements)
- When working directly over water, some form of "secondary containment" will be placed directly under the area where work is being performed (a skiff, dinghy, Styrofoam or wood float; plastic sheeting affixed securely to the hull beneath the work area extended outward from the hull; or other means of preventing contaminants from reaching the water).
- Spill containment booms will also be deployed while work is being performed and will not be removed until all maintenance activities are completed and the Captain or Manager in charge has approved their removal.
- All materials will be cleaned up and promptly and properly disposed of at the end of the work shift or at the end of the task, whichever occurs first.
- Absorbent materials will be made readily available prior to commencing use of any material that could feasibly spill and poses a risk to the environment.
- In the event of any spill, immediately notify both the captain on board and Marina Management and implement spill response procedures. (see Emergency Notifications OM 01-04)

4.3 SPILL PREVENTION, CONTROL AND COUNTERMEASURES

In the event of the occurrence of a spill or release into the water, the following procedure will be followed:

- Immediately isolate or contain the released material with the use of containment boom if a sheen or product is floating. Absorbents will be used to physically remove any spilled chemical product that is floating.
- Staff/Vendors/Contractors shall immediately notify Aramark management, and follow notifications procedures identified in the LTGRP (see Form No. OM 01-04 - Emergency Contact Information). A copy of the LTGRP shall be maintained on-site and all personnel shall be familiar with it and, in particular, with its reporting requirements.
- Any environmental incident or spill will be documented and clean-up accomplished prior to work continuing. A review of the incident or spill will follow in order to help prevent a re-occurrence.
- All work will be accomplished as expeditiously as possible so as not to prolong the task and thus increase the exposure to a spill.
- Open containers of liquids will be limited to the minimum amount required for the task- normally five gallons or less.
- Secondary containment practices will be followed when open containers are on deck or on the dock.
- Containers will be closed or sealed when stored or not in use. Chemical storage will be in approved storage locations with secondary containment.

In addition, Aramark's Oil Management/SPCC Program (Rule Number: ES-OM-1) will be reviewed in conjunction with the abovementioned procedures.

5. TRAINING

All Aramark and vendors/contactors employees that are involved in fueling and maintenance and spill response at Lake Tahoe are provided initial training covering all related operations and emergency response procedures. Training is provided on the operation and maintenance of equipment to prevent discharges; discharge procedure protocols; applicable pollution control laws, rules, and regulations; general facility operations; and, the contents of this Program.

The Location Manager and Operations Manager/Captain are responsible for ensuring that all personnel complete the appropriate training before beginning their work assignments. Table 1 below provides detailed description of required training frequency for various activities. All employees performing maintenance aboard Aramark Vessels will receive the listed training prior to beginning work Refer to Aramark's SAFE portal at https://safe.Aramark.net for a current listing of all available on-line training and resources.

Table 1. Required Training Frequency for Various Activities

SPCC-Ski Run Marina/Zephyr Cove	Annual
Lock out Tag out	Annual
Used Oil Management	Annual
On Water Maintenance Procedures	Annual
Fueling Procedures	Annual
Hazardous Materials Handling	Annual

Any major changes in fueling or maintenance standard operating procedures are brought to the attention of the affected personnel. Aramark employs an active emergency response program including regular exercises of the Hazardous Waste/Materials Contingency Plan. Discharge prevention briefings for maintenance and fueling personnel and vendors/contractors are conducted at least once a year to assure adequate understanding of the Spill Prevention, Control and Countermeasures (SPCC). Such briefings highlight and describe known discharges or failures, malfunctioning components, and any recently developed precautionary measures. At least one Aramark employee on duty must receive or will receive at least an initial 24 hours of Hazmat emergency response training. Additionally, 8 hours of annual refresher training is provided.

In addition to facility personnel, temporary personnel and contractors are informed of preventive measures and spill response procedures prior to being allowed to start work.

6. RECORDKEEPING

The Fueling and Maintenance Program files must be maintained for a minimum of three (3) years, or as required by other agencies with regulatory authority over your Client location or the Client and includes the following:

- Completed Implementation /Self-Assessment Checklists
- Training records, including Training Agenda and Roster Forms (for training not recorded in Aramark's LMS or GMM)
- Monthly inventory
- Integrity, leak detection and control equipment calibration records
- Inspection records, including Corrective Action records
- Incident records and reports (spills, releases, accident records, etc.)
- SPCC Plan (if required)
- Emergency Contacts and Procedures list, including location of spill and emergency response materials, equipment and systems (this may be included in site SPCC Plan or ERP or the LTGRP)
- File storage and retention requirements may vary by state or location requirements. In addition, an off-site repository and/or electronic backup may be used, as necessary, in accordance with the facility requirements.

7. REGULATORY AND OTHER REFERENCES

- Additional information about environmental management programs is available through the SAFE portal at https://safe.Aramark.net
- Aramark SAFE Management system – Oil Management/SPCC Rule (ES-OM-1)
- Electronic Federal Code of Regulations website - http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=%2Findex.tpl (Title 40 Volume 26 [Subchapter I, Parts 280, 281, 282] and Volume 27 [Subchapter J, Part 302 – Reportable Quantities)
- EPA SPCC Rule Webpage - http://www.epa.gov/osweroe1/content/spcc/
- 40 CFR 112.7(d) (Oil Pollution Prevention) http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr112_main_02.tpl

8. DEFINITIONS

Learning Management System (LMS): An electronic database containing Aramark training resources and records completion of training by employee.

Location Manager: At Aramark, the Location Manager is the individual that has direct responsibility for overall site operations and is typically designated as a Resident District Manager (RDM), General Manager (GM) or Front-Line Manager (FLM).

Occupational Safety and Health Administration (OSHA): A federal regulatory agency that enforces occupational safety and health rules and regulations.

Personal Protective Equipment (PPE): Tools and materials, including protective clothing and gear (i.e., gloves, goggles, aprons, boots, respirators, etc.), used to prevent or minimize exposure of an individual to a hazard.

Program Coordinator: Aramark's designated, on-site individual with day-to-day responsibility for program implementation.

Program Support Personnel: Aramark employees and/or managed employees who have responsibilities in supporting defined aspects of overall program implementation. Aramark Supervisors or Managers of specific lines of service (i.e., facilities management, janitorial, grounds maintenance, dining, etc.) would likely be designated as Program Support Personnel.

Safety Assurance in Food & Environments (SAFE): Aramark's comprehensive occupational, food and environmental safety management program accessible through the SAFE portal at https://safe.Aramark.net.

Secondary Containment: An additional containment system that provides protection against releases to the environment in the event that the primary container fails. The capacity of oil secondary containment systems must be the greater of: (1) 10% of the volume of all containers with free liquids; or (2) 100% of the volume of the largest container with free liquids.

Spill: An accidental or intentional discharge of oil which reaches bodies of water.

Vessel: Every description of watercraft or other artificial contrivance used, or capable of being used, as a means for the commercial transport of passengers.

Work Area: A room or defined space in a workplace where universal chemicals or wastes area used or generated or stored, and where employees are present.

Workplace: An establishment, project or job site, at one geographical location containing one or more work areas.

Attachments & Guides

Form No.	Name	Description
OM 01-01	**Contractor/Vendor Agreement Form**	Form to be signed by vendors and contractors acknowledging that they have read Aramark's fueling and maintenance procedures.
OM 01-02	**Required Training Modules**	A list of all required training in association with fueling and maintenance activities.
OM 01-03	**Training Agenda & Roster**	Form to record the list of persons who attended a particular training.
OM 01-04	**Emergency Contact Information**	Notification involving a release or threatened release of hazardous materials, petroleum products, or other contaminants impacting public health and/or the environment
OM 01-05	**Immediate Action Guide**	LTGRP recommended steps to follow for an immediate response to a spill.
OM 01-06	**Inventory of Spill Response Equipment**	Listing of all Spill response equipment and location.
OM 01-07	**Implementation/Self-Assessment Checklist**	Checklist listing items to be reviewed at implementation and annual self-assessment.

OM 01-01

Contractor/Vendor Agreement Form and Acknowledgement of Policies

Date: ______________________________

Job Location: ____

Description of Work to be Performed:

____
____
____

Contractor/Subcontractor* ____

I have been informed by: ____ **of the On Water Maintenance Policies & Procedures used by Aramark at this location. I have received a copy of their Program and have informed my employees. I agree to comply with all SOP's outlined in the Program.**

If Lockout/Tagout requirements are to be implemented, complete and follow LOTO protocol.

Signature: ____

Print Name/Title: ____

Name of Company ____

OM 01-02

Required Training Modules

Training	Link to Training
Oil Management & SPCC Program	Oil Management and the SPCC Rule (Online - LMS)
Storm Water	Passenger Vessel Association VGP Manual
Used Oil Management	Used Oil Management (Online-LMS)
On Water Maintenance Procedures	See program Document
Fueling Procedures	See Program Document
Hazardous Materials Handling	Hazardous Waste Management (Online-LMS)
Lock out Tag out	Lockout Tagout/English Lockout Tagout/Spanish (Online-LMS)
Universal Waste Management	Universal Waste Management (Online-LMS)

OM 01-03
Training Agenda & Roster
(Page 1 of 2)

Check the box of the training delivered (i.e., General or Fueling/Maintenance Program).

General Employee Training

- Information about the Fueling and Maintenance Program (written program, list of emergency numbers, who to contact, where information is kept, etc.)
- Where to find SPCC-related information
- General release prevention, detection and response practices

Specific Steps in Fueling and Maintenance of Vessels at Lake Tahoe

- Information about the operations in the work area where fueling and maintenance are performed
- The methods and observations used to detect the presence or release
- The physical and environmental hazards in the work area
- The measures employees can take to protect themselves and the environment from these hazards, including specific procedures the employer has implemented to protect the employees and environment from releases of oil (fuel or lubricant), such as appropriate work practices, inspections, emergency procedures, and PPE to be used
- The details of the Aramark Fueling and Maintenance Program

Fueling and Maintenance
Training Agenda & Roster

Date of Training:		Time:	
Profit Center:			
Name of Instructor:			
Title of Instructor:			
Print Name of Each Attendee:			
Training Agenda:			
Instructor (Print Name):			
Signature of Instructor:			

Attach additional Training Attendance Rosters as needed. Maintain the original in the Fueling and Maintenance Program File.

It is Aramark's policy that, during fueling activities, a trained individual is holding the nozzle and manually keeping it open during the entire fueling operation. It is against Aramark's policy to have the fueling operation unattended or to have an individual block the valve open in any way.

OM 01-04

In the event of an accidental spill, Marina management shall be notified immediately. The Marina management staff will assess the situation and supervise the clean-up efforts. As soon as possible, management must make the required notifications to the agencies listed below.

List of Emergency Contacts

Name	Title	Telephone
Joao Rodrigues	Aramark Water Operations	775 589 4941
Dan Jack	Ski Run Marina Manager	530 544 9500
Aramark Safety & Risk		800 645 RISK (7475)
TBD	Aramark General Manager	775 589 4934

Agency		Telephone
Local Emergency Services		911
California State Office of Emergency Services		800 852 7550
El Dorado County Office of Emergency Services		530 626 4911
El Dorado Department of Environmental Management		530 621 5300
Lahontan Regional Water Quality Board		800 852 7550
Lake Tahoe Management Unit		530 573 2600
EPA Region IX Spill Phone		415 744 2000
National Response Center		800 424 8802
USCG Sacramento		916 583 4433

OM 01-05

If this is an Emergency...

...Involving a release or threatened release of hazardous materials, petroleum products, or other contaminants impacting public health and/or the environment

Most Important – Protect yourself and others!

Then:

1) Turn to the **Immediate Action Guide (Yellow Tab)** for initial steps taken in a hazardous material, petroleum product, or other contaminant emergency

First On-Scene (Fire, Law, EMS, Public, etc.) *will notify local **Dispatch** (via 911 or radio)* *A complete list of Dispatch Centers can be found beginning on page R-2 of this plan*

Dispatch will make the following Mandatory Notifications

California State Warning Center (OES)	(800) 852-7550 or (916) 845-8911
Nevada Division of Emergency Management	(775) 687-0300 or (775) 687-0400
National Response Center	(800) 424-8802

Dispatch will also consider notifying the following Affected or Adjacent Agencies:

- ☐ County Environmental Health
- ☐ Local OES - County Emergency Management
- ☐ Truckee River Water Master (775) 742-9289
- ☐ Local Drinking Water Agencies

2) After the ***Mandatory Notifications*** are made, use **Notification (Red Tab)** to implement the notification procedures described in the **Immediate Action Guide**

3) Use the Lake Tahoe Basin Maps (Green Tab) to pinpoint the location and surrounding geography of the incident site

4) Use the Lake and River Response Strategies (Blue Tab) to develop a mitigation plan

5) Review the **Supporting Documentation (White Tabs)** for additional information needed during the response

LTGRP Immediate Action Guide

Lake Tahoe Geographic Response Plan
September 2007
Immediate Action Guide (Yellow Tab)

How to Use the Immediate Action Guide

IF YOU ARE NOT QUALIFED TO ACTIVATE THIS PLAN:
DIAL 911 AND ASK FOR ASSISTANCE

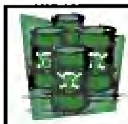
Complete the following steps to activate the Lake Tahoe Geographic Response Plan.

Make Initial Mandatory Notifications

Review General Information Regarding HazMat Response

Identify Lake, Roadway, and Fixed Facility Incidents

- and/or -



Abandoned/Unknown Containers and WMD

Public Information/Press Release

This is only a guide:
Nothing in this section shall supersede the experience, initiative, and ingenuity of the responders in overcoming the complexities of actual emergency conditions.

Y-1

OM 01-06

Inventory of Spill Equipment

Equipment	Location	Quantity
Boom	Tahoe Queen/ Helm	150 feet
Oil Sock Boom	Tahoe Queen Engine Room	60 Feet
Haz-Mat Pillow	Tahoe Queen Engine Room	6
Goggle	Tahoe Queen Engine Room	1
Disposal Bag	Tahoe Queen Engine Room	10
Absorbent Boom	Tahoe Queen Engine Room	6
Gloves	Tahoe Queen Engine Room	2
Absorbent Pads	Tahoe Queen Engine Room	50
	TQ Spill Kit	
Haz-mat Socks	Tahoe Queen Engine Room	48 Feet
Pillows	Tahoe Queen Engine Room	7
Disposal Bag	Tahoe Queen Engine Room	3
Gloves	Tahoe Queen Engine Room	1
Absorbent Pads	Tahoe Queen Engine Room	20
20 Gallon Over pack	Tahoe Queen Engine Room	1
	Paradise Spill Kit	
Haz-mat Socks	Paradise Engine Room	48 Feet
Pillows	Paradise Engine Room	7
Disposal Bag	Paradise Engine Room	3
Gloves	Paradise Engine Room	1
Absorbent Pads	Paradise Engine Room	20
20 Gallon Over pack	Paradise Engine Room	1

OM 01-07

This Form shall be completed as part of the implementation process and on an annual basis as part of a self-assessment effort.

	Implementation Checklist/Self-Assessment	Answer (or location of information)
	Who is the Program Coordinator? *(Name)*	Joao Rodrigues
	Where are the Program files kept? *(List location)*	Aboard each boat at helm
	What procedure is followed to ensure all employees are trained? (Indicate responsible person(s))	Joao Rodrigues will complete annual self-assessment, verify training records current.
	What procedure is followed to ensure all Contractors/Vendors are informed of program? (Indicate responsible person(s))	Joao Rodrigues will complete annual self-assessment, verify vendor forms are being completed.
	What procedure is followed to ensure all work is reviewed and approved prior to start? (Indicate responsible person(s))	When PO is completed Joao will notify Captain of required reviews/vendor forms. Review Captains log for verification.
	What procedure is followed to ensure all spill prevention measures are being followed? (Indicate responsible person(s))	Pre-work meetings will be conducted, by captain or Joao.
	What procedure is followed to ensure all work is conducted as required by Program? (Indicate responsible person(s))	Inspection of work will be completed by Joao or Port Captain. Document in Captains log.
	Where are Emergency Procedures and Contact List or SPCC Plan? (list locations) Are they Current?	Helm of each boat.
	Is Inventory of Spill Equipment Current? (update quarterly)	Yes-updated August 2015
	When was the last self-assessment completed? (Indicate responsible person(s))	August 2015

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Attachment B
Aramark's LOTO Training Documentation

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OS 05-09

Training Agenda & Roster

Course Name: Control of Hazardous Energy (Lockout/Tagout) - Affected Associates

Component/Market Center: 10008666200 / 20008660300

Course Description: Lockout/Tagout for Affected Associates is mandatory for all Aramark associates whose job requires him/her to work in an area in which service or maintenance on equipment is being performed. The topics discussed during this training include but not limited to the following;

- Purpose and use of the energy control procedures
- Awareness of what various locks and tags look like and their purpose
- Awareness that any attempts to reenergize equipment or remove LOTO devices is strictly forbidden

Trainee Signature Statement: I have participated in Lockout/Tagout training for Affected Associates. I understand the information that was presented during the training program and my responsibilities for adhering to the procedures and controls in the program to protect myself. The following individuals attended this training session.

Print Name / Sign	Date of Training	Manager's Initials
Zac Rogers [signature]	07/09/15	JR
Dominic Grasseschi [signature]	07.09.15	JR
Andrew Warner [signature]	07-09-15	JR
Joseph Moore [signature]	07-09-15	JR
Osvaldo Cox [signature]	7-9-15	JR
Joao Rodrigues [signature]	7-9-15	JR

Page ____ of ____

Title: Lockout/Tagout	Number: OS-5
Form: Training Agenda & Roster	Form No: OS 05-09

Training Agenda & Roster

Course Name: Control of Hazardous Energy (Lockout/Tagout) - Authorized Associates

Component/Market Center: 650866200 | 86603

Course Description: Lockout/Tagout for Authorized Associates is mandatory for all Aramark associates or "Authorized Associates" who will use lockout procedures to control hazardous energies when performing work activities on equipment or systems. The topics discussed during this training include but not limited to the following;

- Lockout/tagout standard
- Types of lockout/tagout devices
- Lockout/tagout responsibilities
- Energy Control Program
- Lockout/tagout inspections and training requirements

Trainee Signature Statement: I have participated in Lockout/Tagout training for Authorized Associates. I understand the information that was presented during the training program and my responsibilities for adhering to the procedures and controls in the program to protect myself. The following individuals attended this training session.

Print Name / Sign	Date of Training	Manager's Initials
JOAO RODRIGUES [signature]	7/8/15	JR
Sam Miller [signature]	7/9/15	JR
James Griffith [signature]	7-9-15	JR
Perez Terry [signature]	7-9-15	JR
MANUEL CANSINO	7-9-15	JR
Christina Garrett	7-9-15	JR
Osvaldo Gonzalez	7-9-15	JR
Zac Rogers [signature]	07/09/15	JR
Andrew Warner [signature]	7/9/15	JR
Dominic Grasseschi [signature]	7/9/15	JR
Joseph Moore [signature]	7/9/15	JR

Page ____ of ____

aramark | ARAMARK SAFE

Safety Assurance in Food & Environments

Attachment C

Contractor's LOTO Training Documents

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From: John Shaw <jshaw@amsdiving.com>
Date: July 27, 2015 at 11:14:05 AM PDT
To: "Rodrigues, Joao" <Rodrigues-Joao@aramark.com>
Subject: Re: Information Request by the Board

Jay,

Our guys receive documented lockout/tagout training during their respective commercial diver training courses. Advanced Marine follows standard lockout/tagout procedures where potential hazards to our personnel exist. I am currently developing a formal lockout/tagout training program for our people.

With respect to cost to seal hydraulic lines, the estimate is negligible. One guy and several hours to fashion a jumper to bypass the hydraulic drive motor on the starboard stern. Price in the neighborhood of $400-$500.

Let me know if you need more info.

John

Sent from my iPhone

On Jul 23, 2015, at 9:59 AM, Rodrigues, Joao <Rodrigues-Joao@aramark.com> wrote:

John,

Attachment D

Request to the El Dorado County District Attorney's Office

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COZEN O'CONNOR

July 20, 2015

Peter J. Fontaine
Direct Phone 215-665-2723
Direct Fax 866-850-7491
pfontaine@cozen.com

VIA UPS NEXT DAY AIR

District Attorney - SLT
County of El Dorado District Attorney
South Lake Tahoe Office
1360 Johnson Blvd.
Suite 105
South Lake Tahoe, CA 96150

Re: Request for Discovery of Information in Connection with Investigative Order No. R6T-2015-0029

To Whom It May Concern:

Our firm represents Travel Systems, LLC and its affiliates ("Aramark") in the above-captioned matter before the Lahontan Regional Water Quality Control Board (the "Board"), which concerns an accidental discharge from an Aramark-owned vessel that occurred on March 5, 2015.

The Board has asked Aramark to provide it with certain information under Order and has imposed a strict schedule for Aramark to respond to the Board's Order. The requested information includes sampling results collected by the California Department of Fish and Wildlife.

The Board has imposed a strict schedule for Aramark to respond to the Board's Order. In an effort to provide the Board with the requested information in a timely manner, we respectfully ask that the District Attorney's office disclose the sampling results for the water samples collected on March 6, 2015 by Officer Darrell Stevenson from the California Department of Fish and Wildlife as soon as possible.

We would appreciate receiving the sampling results within five days of the date of delivery of this request. Given these time constraints, we kindly request that the District Attorney's office, if possible, provide us with both electronic and hard copies, which would allow for more expedient delivery to the Board. You may email the sampling results to me at pfontaine@cozen.com and send the hard copy to me in the enclosed self-addressed envelope.

If you have any questions, please do not hesitate to contact me at 215-665-2723.

Sincerely,

COZEN O'CONNOR

BY: PETER J. FONTAINE

cc: Najib Saadeh, Senior Regulatory Specialist, EEC Environmental
Stephanie Walter, Associate Vice President & Assistant General Counsel, Aramark

Attachment E

Response from El Dorado County's District Attorney

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OFFICE OF THE
DISTRICT ATTORNEY
EL DORADO COUNTY, CALIFORNIA

VERN PIERSON. DISTRICT ATTORNEY

July 30, 2015

Peter J. Fontaine
Cozen & O'Connor
One Liberty Place
1650 Market Street
Philadelphia, PA 19103

RE: Public Records Act Request, Aramark
Investigative Order No. R6T-2015-0029

Dear Mr. Fontaine:

We are in receipt of your request for discovery of information dated July 20, 2015, and received by this office on July 21, 2015, seeking "sample results collected by the California Department of Fish and Wildlife".

We will not be able to provide you with the requested samples at this time. Any such information in the possession of the El Dorado County District Attorney's Office would be exempt from disclosure pursuant to Government Code Section 6254(f), and would also be protected by the attorney client privilege and be protected attorney work product, since any records in our office have been gathered as part of an ongoing criminal investigation. Releasing the information we may have obtained from the California Department of Fish and Wildlife and law enforcement agencies could endanger the successful completion of our investigation.

We would be happy to revisit the issue of disclosure of documents at the conclusion of our investigation.

Very truly yours,

DISTRICT ATTORNEY
EL DORADO COUNTY

JAMES A. CLINCHARD
Assistant District Attorney

JAC:nva

PLEASE REPLY TO:

•• 515 Main Street
Placerville, CA 95667
(530) 621-6472
Fax (530) 621-1280

1360 Johnson Blvd. Ste 105
South Lake Tahoe, CA 96151
(530) 573-3100
Fax (530) 544-6413

WEB SITE
www.co.el-dorado.ca.us/eldoda

Attachment F
Clarity Hydraulic Oil MSDS

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CALTEX

MSDS

trade name:	Clarity Hydraulic Oil AW 46
product code:	520267
supplier:	Chevron Lubricants Vietnam Limited Hanoi Branch 5th Floor - Horison Offices 40 - Cat Linh Hanoi Vietnam
routine inquiries:	+84-4-37332545
fax:	+84-4-37332555

chemical description: Hydraulic Oil

components	cas no.	range in %
Hydrotreated heavy paraffinic distillate	64742547	> 99
Additives	Not Available	< 1

warning statements: NO SIGNIFICANT HAZARD.

eyes: Expected to cause no more than minor eye irritation characterized by tearing or a burning sensation.

oral:	If more than several mouthfuls are swallowed, abdominal discomfort, nausea, and diarrhea may occur.
inhalation:	Breathing the vapour or mist may cause respiratory irritation, discomfort, or other pulmonary effects.
skin:	Expected to cause no more than minor skin irritation. Prolonged or frequently repeated contact may cause more severe irritation or may cause the skin to become cracked or dry from the defatting action of this material.
long term toxic effects:	The base oil component(s) are not expected to be carcinogenic based on IARC criteria. This product has not been tested as a whole for chronic health effects. See Section 11 for additional information.

eyes:	Flush eyes immediately with fresh water for at least 15 minutes while holding the eyelids open. If irritation persists, see a doctor.
skin:	Wash skin thoroughly with soap and water. Launder contaminated clothing. If skin irritation persists or a rash develops as a result of excessive contact, see a doctor.
ingestion:	If swallowed and person is conscious, give water or milk. DO NOT make person vomit except on advice of medical personnel. If advice cannot be obtained, take person with container and label to nearest emergency treatment center. Never give anything by mouth to an unconscious person.
inhalation:	If respiratory irritation or any signs or symptoms as described in this MSDS occur, move the person to fresh air. If any of these effects continue, see a doctor.
advice to doctor:	None Applicable.

ignition temp. (degrees c):	Not Determined
flammable limits (% by volume):	Not Determined
flash point (degrees c):	> 190 (COC)
fire extinguishing agents:	According to the U.S. National Fire Protection Association Guide, use water fog, dry chemical, foam,

or carbon dioxide. Water or foam may cause frothing. Use water to cool fire-exposed containers. If a leak or spill has not ignited, use water spray to disperse the vapours and to provide protection for persons attempting to stop the leak.

explosion hazards:

For fires involving this material, do not enter any enclosed or confined space without self-contained breathing apparatus to protect against the hazardous effects of combustion products or oxygen deficiency.

in case of spill:

Stop the source of the leak or release and contain spill if possible. Ventilate area. Use respirator and protective clothing as discussed in this MSDS. Cover spill with a generous amount of inert absorbent. Use a stiff broom to mix thoroughly. Sweep up and place in a disposable container. Scrub contaminated area with detergent and water using a stiff broom. Pick up liquid with additional absorbent and place in a disposable container. Prevent contamination of groundwater or surface water.

Minimum feasible handling temperatures should be maintained. Periods of exposure to high temperatures should be minimised. Water contamination should be avoided.

Misuse of empty containers can be hazardous. DO NOT cut, weld, heat or drill container. Residue may ignite with explosive violence if heated sufficiently. Do not pressurize or expose to open flame or heat. Keep container closed and drum bungs in place.

eyes:

No special eye protection is usually necessary.

Safety glasses, chemical type goggles, or face shield appropriate where splashing or misting is expected during routine operations or spill clean-up.

skin:

Exposed employees should exercise reasonable personal cleanliness; this includes cleansing exposed skin several times daily with soap and water, and laundering or dry cleaning soiled work clothing at least weekly.

inhalation:

Respiratory protection is normally not required. However, if operating conditions create airborne concentrations that are excessive and may exceed the recommended exposure standard(s), the use of an approved

	respirator is recommended.
	Wear approved respiratory protection such as a toxic dust, mist and fume respirator.
ventilation:	Use adequate ventilation to keep the airborne concentrations of this material below the ACGIH TLV for mineral oil mists. Local exhaust ventilation and/or enclosure of the process is preferred in these cases.
exposure limits:	The ACGIH TLV for mineral oil mists is 5 mg/m3 for a daily 8-hour exposure. A short term exposure limit (STEL) of 10 mg/m3 is recommended.

note: The following data may represent a range of approximate or typical values for products in the same family. Precise technical information is provided in Product Bulletins and can be obtained from your Marketing Representative.

appearance & odor:	Pale, yellow liquid.
boiling point (deg. c):	Not Determined
vapor pr. (mmhg @ 25 deg. c):	Not Determined
vapor density (air = 1):	Not Determined
ph of undiluted product:	Not Applicable
solubility (water):	Negligible
percent volatile by volume:	Not Determined
evaporation:	Not Determined
viscosity (all product grades):	32 - 68 mm2/s @ 40 deg. C

hazardous polymerizations:	DO NOT OCCUR
products of combustion:	Carbon monoxide, carbon dioxide, and aldehydes and ketones may be formed.
conditions to avoid:	Strong oxidizers such as chlorates, nitrates, peroxides, etc.

general:	This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, hydrocracking and hydrotreating. These oils have not been listed in the U.S. National

Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as carcinogenic or probably carcinogenic to humans.

environmental effects: This product is expected to have low aquatic toxicity (LD50 > 1000 mg/l) and is not considered to represent a long-term danger to the aquatic environment.

waste disposal: Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations. Contact local environmental or health authorities for approved disposal of this material.

remarks: This material may present environmental risks common to oil spills. Contact your local oil spill response group and applicable government agencies if a spill occurs.

transport of dangerous goods:

UN Number:	Not Applicable
Dangerous Goods Class:	Not Applicable
Proper Shipping Name:	Not Applicable
Hazchem Code (Australia/NZ):	Not Applicable
Additional Information:	None Determined.

respirator information: Where local approval authority is absent, respirator users can refer to U.S. NIOSH, European Standard EU-149, or joint Australia-New Zealand AS/NZS 1715/1716 for guidance.

Respirator users in Australia and New Zealand should comply with AS/NZS 1715/1716.

No specific notes on this product.

Approved HES Services
Revision Date: Feb-27-2002

Attachment G

Clarity Hydraulic Oil Product Information

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CLARITY® HYDRAULIC OIL AW

22, 32, 46, 68, 100

PRODUCT DESCRIPTION

Clarity® Hydraulic Oils AW are designed to give excellent protection in mobile and stationary hydraulic vane-, piston-, and gear-type pumps and in high-performance industrial applications as well as in environmentally sensitive areas.

CUSTOMER BENEFITS

Clarity Hydraulic Oils AW deliver value through:

- **Premium performance** — Ashless formulation meets or exceeds major vane, piston and gear pump manufacturer's requirements for viscosity, rust and corrosion protection, hydrolytic stability, water separability, foam inhibition, and filterability.
- **Exceptional oxidation stability** — Longer service life than conventional zinc-based antiwear hydraulic oils or vegetable hydraulic oils.
- **Excellent antiwear properties** — Provides excellent wear protection.
- **Low toxicity** — Very low acute aquatic toxicity to both fish and invertebrates based on tests of water accommodated fractions. Ashless formulation facilitates conventional recycling programs.
- **Excellent low temperature pumpability** — ISO 22 grade specifically developed to ensure good low temperature fluidity for low temperature operations as low as -40°C (-40°F).
- **Zinc-free/Ashless** — Suited for applications involving yellow metals found in piston pumps.

FEATURES

Clarity Hydraulic Oils AW are formulated with premium base oil technology and an ashless ("zinc-free") additive system that provides exceptional oxidation stability, water separability, foam suppression, and protection against wear, rust and corrosion. They are designed to meet or exceed the performance requirements of conventional antiwear hydraulic oils, especially in severe, high-output applications such as axial piston pumps. The antiwear performance of these oils makes them especially suited for high performance industrial applications utilizing axial piston pumps where pressures may exceed 5000 psi.

The zinc-free formula makes it well suited for applications involving yellow metals found in hydraulic systems.

Clarity Hydraulic Oils AW are long-life lubricants (are not vegetable oil based), with dramatically longer TOST (ASTM D943 oxidation stability test) lives than conventional zinc-based hydraulic fluids. A longer TOST life equates to longer service life, which can improve the customer's bottom line. This level of oxidation stability is especially applicable in high efficiency (high speed, high temperature, high output) applications where severe stress is placed on the hydraulic fluid.

Clarity Hydraulic Oil AW 22 and 100 are shear-stable high VI hydraulic oils designed to improve equipment efficiency and increase operating temperature range of the applicable grade.

Many hydraulic systems are required to operate in environmentally sensitive areas where leaks or spills of hydraulic fluid may result in contamination of the soil or nearby waterways. Conventional antiwear hydraulic oils are formulated with metal-containing performance additives which can persist in the environment in the event of leaks. Vegetable-based hydraulic oils generally

Product(s) manufactured in the USA.
Always confirm that the product selected is consistent with the original equipment manufacturer's recommendation for the equipment operating conditions and customer's maintenance practices.

A **Chevron** company product

11 June 2014
IO-25

meet the environmental requirements, but can fall short of the performance requirements.

Applications

Clarity® Hydraulic Oils AW are designed for use in mobile and stationary hydraulic vane-, piston-, and gear-type pumps.

Clarity Hydraulic Oils AW have shown excellent performance in applications involving servo-valves using multimetal components.

Clarity Hydraulic Oils AW meet the requirements of:

- **ASTM D6158 HM** (ISO 32, 46, 68), **HV** (ISO 22, 100)
- **Denison** HF-0, HF-2 testing requirements of T5D (ISO 32, 46, 68)
- **DIN** 51524-2 (ISO 32, 46, 68)
- **DIN** 51524-3 (ISO 22, 100)
- **Eaton-Vickers** for use in M-2950-S (mobile) and I-286-S (stationary) hydraulic systems. Passes Eaton-Vickers 35VQ25 pump test. (ISO 32, 46, 68)
- **ISO 11158 L-HV** (ISO 22, 100)
- **MAG Cincinnati, Cincinnati Machine** P-68 (ISO 32), P-70 (ISO 46), P-69 (ISO 68)

Clarity Hydraulic Oil AW 100 is approved for Stern tube applications by:

- **Blohm+Voss**
- **Wärtsilä-Japan**

Clarity Hydraulic Oils AW (ISO 32, 46, 68) are registered by **NSF** and are acceptable as a lubricant where there is no possibility of food contact (H2) in and around food processing areas. The NSF Nonfood Compounds Registration Program is a continuation of the USDA product approval and listing program, which is based on meeting regulatory requirements of appropriate use, ingredient review and labeling verification.

Clarity Hydraulic Oils AW are not compatible with zinc/calcium containing fluids, and OEM recommended lubricant change-out procedures including drain and flush requirements need to be adhered to.

Do not use in high pressure systems in the vicinity of flames, sparks and hot surfaces. Use only in well ventilated areas. Keep container closed.

Always confirm that the product selected is consistent with the original equipment manufacturer's recommendation for the equipment operating conditions and customer's maintenance practices.

ATTACHMENT 4

USDHHS - Agency for Toxic Substances and Disease Registry Report, Chemical and Physical Information for Hydraulic Fluid

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3. CHEMICAL AND PHYSICAL INFORMATION

3.1 Chemical Identity

Information regarding the chemical identity of hydraulic fluid products is located in Table 3-l. This table contains information representative of three types of hydraulic fluids: mineral oil, organophosphate ester, and polyalphaolefin.

Early fluid power systems used water as the hydraulic medium. Because of its corrosive effect on the metallic parts and lack of lubricity, water was replaced by petroleum-based oil. The petroleum-based fluids discussed in this profile are mineral oil and water-in-oil emulsion fluids. Water-in-oil emulsions consist of 35-40% water, $\leq$60% mineral oil, and emulsifiers and additives. The water is dispersed in fine droplets in the oil phase. However, these fluids containing oil are readily ignited (NFPA 1991). Some water-in-oil emulsion hydraulic fluids contain ethylene glycol; however, ethylene glycol represents $\leq$10% of the total volume of water-in-oil emulsion hydraulic fluids. The carbon number range in mineral oil hydraulic fluids will vary depending on the application, but probably is in the range of C_{15} to C_{50}(IARC 1984). The hydrocarbon components of mineral oil (and ethylene glycol) are used in numerous other applications, so the presence of these components in the environment cannot be uniquely associated with mineral oil-based hydraulic fluid use.

Most mineral oil hydraulic fluids are made from dewaxed paraffin-based crude oils that are blended with additives to impart appropriate properties for the specific use (Newton 1989; Papay 1989, 1991; Wills 1980). The types of additives, which are summarized below, are quite numerous and in some cases (Mattie et al. 1993) may contain organophosphate esters. These additives include extreme pressure additives, which help prevent surface damage under severe loading (organic sulfur-, phosphorus-, and chlorine-containing compounds); anti-wear additives, which prevent wearing under light loads (fatty acids and derivatives, organophosphate esters); corrosion inhibitors, which prevent corrosion by oxygen and water (fatty acids, sulfonates, and salts of fatty acids); oxidation inhibitors, which inhibit oxidation of the hydraulic fluid (phenols, amines, and sulfides); defoamers, which prevent foam formation (silicone oils); viscosity index improvers, which reduce the dependence of viscosity on temperature (polyalphaolefins, polymethacrylates, and polyalkylstyrenes); pour point depressants, which lower the pour point temperature (polymethacrylates and condensation products); demulsifiers, which allow separation of oil and water (ionogenic and nonionogenic polar compounds); and dispersants, which prevent unwanted deposits (sulfonates and amides) (Moller 1989).

Table 3-1. Chemical Identity of Hydraulic Fluid Products

Characteristic	Houghto-Safe 5047F[a]	Pyroguard A-433[b]	Quintolubric 95830W[b]
Class	Water-in-oil	Water-in-oil	Water-in-oil
Product description	No data	No data	No data
Registered trade name(s)	Houghto-Safe 5047F	Pyroguard A-433	Quintolubric 95830W
Components	Mineral oil (30–60%); ethylene glycol (1–10%); remainder water	Mineral oil (60%); water (40%)	Mineral oil (60%); water (40%)
Identification numbers:			
CAS registry	No data	No data	No data
NIOSH RTECS	No data	No data	No data
EPA hazardous waste	No data	No data	No data
OHM/TADS	No data	No data	No data
DOT/UN/NA/IMCO shipping	No data	No data	No data
HSDB	No data	No data	No data
NCI	No data	No data	No data

Characteristic	Sunsafe F[a]	Cellulube 220[c]	Durad 110[d]
Class	Water-in-oil	Phosphate ester	Phosphate ester
Product description	No data	Triaryl phosphate	Isopropylated triphenyl phosphate mixture
Registered trade name(s)	Sunsafe F	Cellulube 220*	Durad 110
Components	Mineral oil (60%); water (40%); <2% ethylene glycol	Triphenyl phosphate; tricresyl phosphates, trixylenyl phosphates; trialkyl phenyl phosphates	Isopropylated triphenyl phosphate; triphenyl phosphate
Identification numbers:			
CAS registry	No data	No data	No data
NIOSH RTECS	No data	No data	No data
EPA hazardous waste	No data	No data	No data
OHM/TADS	No data	No data	No data
DOT/UN/NA/IMCO shipping	No data	No data	Not applicable
HSDB	No data	No data	No data
NCI	No data	No data	No data

Table 3-1. Chemical Identity of Hydraulic Fluid Products (continued)

Characteristic	Durad 125[e] (additive)	Durad 220[f] (additive)	Durad 220B[g]
Class	Phosphate ester	Phosphate ester	Phosphate ester
Product description	Tricresyl phosphate	Isopropylphenyl phosphate	t-Butylphenyl diphenyl phosphate mixture
Registered trade name(s)	Durad 125	Durad 220	Durad 220B; MIL-H-19457C[x]
Components	Tricresyl phosphates; currently less than 1% total *ortho* isomer, no detectable tri-*ortho*-cresyl phosphate	Isopropylphenyl phosphate blend	t-Butylphenyl phenyl phosphate; triphenyl phosphate
Identification numbers:			
CAS registry	No data	No data	28777-70-0[w]
NIOSH RTECS	No data	No data	TC8625000[x]
EPA hazardous waste	No data	No data	No data
OHM/TADS	No data	No data	No data
DOT/UN/NA/IMCO shipping	No data	No data	Not applicable
HSDB	No data	No data	No data
NCI	No data	No data	No data

Characteristic	Durad 300[h]	Durad 550B[i]	Durad MP280B[j] (hydraulic fluid) (now known as Reolube$_R$)
Class	Phosphate ester	Phosphate ester	Phosphate ester
Product description	Isopropylated triphenyl phosphate mixture	t-Butylated triphenyl phosphate mixture	Mixed triaryl phosphate
Registered trade name(s)	Durad 300	Durad 550B	Durad MP280B (Reolube$_R$)
Components	Isopropylated triphenyl phosphate; triphenyl phosphate (15%)	Not specified	t-butylphenyl phenyl phosphate, triphenyl phosphate; additives
Identification numbers:			
CAS registry	No data	No data	68937-40-6
NIOSH RTECS	No data	No data	No data
EPA hazardous waste	No data	No data	No data
OHM/TADS	No data	No data	No data
DOT/UN/NA/IMCO shipping	Not applicable	Not applicable	No data
HSDB	No data	No data	No data
NCI	No data	No data	No data

Table 3-1. Chemical Identity of Hydraulic Fluid Products (continued)

Characteristic	Fyrquel 150[k]	Fyrquel 220[l]	Fyrquel EHC[m]
Class	Phosphate ester mixture	Phosphate ester mixture	Phosphate ester mixture
Product description	Butylated triphenyl phosphate	Mixed triaryl phosphate	Mixed triaryl phosphate
Registered trade name(s)	Fyrquel 150	Fyrquel 220	Fyrquel EHC
Components	Butylated triphenyl phosphate ≈100%; triphenyl phosphate 15–20%	t-Butylphenyl diphenyl phosphate 35–40%; di(t-butylphenyl) phenyl phosphate 25–30%; triphenyl phosphate 15–20%; tri (p-t-butylphenyl) phosphate 6–10%; butylated triphenyl phosphate 6–10%	Mixed triaryl phosphate ≈50%; mixed xylenyl phosphate ≈ 50%; triphenyl phosphate ≈7–10%
Identification numbers:			
CAS registry	No data	55957-10-3[w]	No data
NIOSH RTECS	No data	No data	No data
EPA hazardous waste	No data	No data	No data
OHM/TADS	No data	No data	No data
DOT/UN/NA/IMCO shipping	No data	No data	No data
HSDB	No data	No data	No data
NCI	No data	No data	No data

Characteristic	Hyjet IV[n]	Pydraul 29ELT[o]	Pydraul 50E[o]
Class	Organophosphate	Phosphate ester	Phosphate ester
Product description	Trialkyl phosphate	Mixed triaryl phosphate	Phosphate ester mixture
Registered trade name(s)	Hyjet IV	Pydraul 29ELT	Pydraul 50E
Components	Tributyl phosphate (79%); cycloaliphatic epoxide (2.0%) additives, including a triaryl phophate (21.0%)	Mixture of 2-ethylhexyl diphenyl blend; p-t-butyl phenyl blend; triphenyl phosphate; $di_{(7\text{-}9\text{-}11)}$phthalate blend; di-2-ethylhexyl phenyl phosphate	Nonylphenyl diphenyl phosphate (≈41%); cumylphenyl diphenyl phosphate (≈23%); triphenyl phosphate (≈36%)[w]
Identification numbers:			
CAS registry	No data	No data	66594-31-8[w]
NIOSH RTECS	No data	No data	No data
EPA hazardous waste	No data	No data	No data
OHM/TADS	No data	No data	No data
DOT/UN/NA/IMCO shipping	UN3082	No data	Not applicable
HSDB	No data	No data	No data
NCI	No data	No data	No data

Table 3-1. Chemical Identity of Hydraulic Fluid Products (continued)

Characteristic	Pydraul 90E[o]	Reofos 50[p]	Reofos 65[q]	Reolube HYD46[r]
Class	Phosphate ester	Phosphate ester	Phosphate ester	Phosphate ester blend
Product description	Mixed triaryl phosphate	Isopropylated triphenyl phosphate mixture	Isopropylated triphenyl phosphate mixture	Isopropylated triphenyl phosphate blend
Registered trade name(s)	Pydraul 90E	Reofos 50	Reofos 65	Reolube HYD46
Components	Mixture of nonylphenyl diphenyl phosphate; cumylphenyl phosphate; cumylphenyl diphenyl phosphate; triphenyl phosphate; performance additives—phosphate ester blends including CAS# 6630-28-3	Not specified	Mixture of triphenyl phosphate; o-isopropylphenyl diphenyl phosphate; bis(o-isopropylphenyl)phenyl phosphate; tris(o-isopropylphenyl)phosphate	Not specified
Identification numbers:				
CAS registry	No data	63848-94-2[w]	No data	107028-44-4[w]
NIOSH RTECS	No data	No data	No data	No data
EPA hazardous waste	No data	No data	No data	No data
OHM/TADS	No data	No data	No data	No data
DOT/UN/NA/IMCO shipping	No data	No data	No data	No data
HSDB	No data	No data	No data	No data
NCI	No data	No data	No data	No data

Table 3-1. Chemical Identity of Hydraulic Fluid Products (continued)

Characteristic	Skydrol 500B-4[s]	Skydrol LD-4[t]	Cyclotriphosphazene[u]	Polyalphaolefin
Class	Phosphate ester mixture	Phosphate ester mixture	Phosphazene ester	Polyalphaolefin
Product description			Cyclotriphosphazene	Hydrogenated oligomers of alphaolefins
Registered trade name(s)	Skydrol 500B, Skydrol 500B-4	Skydrol LD-4		See Table 3-2
Components	Skydrol 500B: tri-n-butyl-phosphate (65–75%); di-n-butyl phenyl phosphate (10–15%); n-butyl diphenyl phosphate (10–15%); Skydrol 500B-4[y]: tributyl phosphate; dibutyl phenyl phosphate; butyl diphenyl phosphate	Skydrol LD: tri-n-butyl-phosphate[y] Skydrol LD-4: tributyl phosphate; dibutyl phenyl phosphate; 2,5-di-tert-butyl-p-cresol (minor component); butyl diphenyl phosphate	Dimers, trimers and tetramers of cyclotriphosphazene ester and 0.1% tolyltriazole $(P_3N_3)_n$	Mixture of oligomers of linear alphaolefins having 6 or more carbon atoms[v] $(C{=}C-C-C-C-C-)_n$
Identification numbers:				
CAS registry	50815-84-4[w]	55962-27-1[w]	291-37-2	See Table 3-2
NIOSH RTECS	VX5500000[x]	No data	No data	
EPA hazardous waste	No data	No data	No data	
OHM/TADS	No data	No data	No data	
DOT/UN/NA/IMCO shipping	Not applicable	Not applicable	No data	
HSDB	No data	No data	No data	
NCI	No data	No data	No data	

[a] Houghton 1992
[b] Kinkead et al. 1987a
[c] Carpenter et al. 1956, 1959*
[d] FMC 1991d
[e] FMC 1992f
[f] FMC 1994
[g] FMC 1992e
[h] FMC 1991c
[i] FMC 1992c
[j] FMC 1992d
[k] Akzo 1989
[l] Akzo 1992
[m] Akzo 1991
[n] Chevron1994
[o] Monsanto 1986b
[p] FMC 1995
[q] Mortensen and Ladefoged 1992
[r] FMC 1990, 1995
[s] Monsanto 1992a
[t] Monsanto 1992b
[u] Kinkead et al. 1992a
[v] Shubkin 1993
[w] CAS 1995a
[x] RTECS 1996
[y] Monsanto 1990

*A fluid designated "TAP-1" described by Siegel et al. (1965) appears to be very similar if not identical to Cellulube 220.

CAS = Chemical Abstracts Service; DOT/UN/NA/IMO = Dept. of Transportation/United Nations/North America/International Maritime Dangerous Goods Code; EPA = Environmental Protection Agency; HSDB = Hazardous Substances Data Bank; NCI = National Cancer Institute; NIOSH = National Institute for Occupational Safety and Health; OHM/TADS = Oil and Hazardous Materials/Technical Assistance Data System; RTECS = Registry of Toxic Effects of Chemical Substances

The exact nature of each of these additives appears to be trade secret information since none of the Material Safety Data Sheets describing the hydraulic fluids presented in this profile identify these materials. In addition, no information concerning the exact production methods used in manufacturing these hydraulic fluids was located in the available literature. Nonetheless, they are probably manufactured in batch processes and then tested to insure that they conform to the specifications for which they are sold. The number, nature, and amount of each additive used in a batch may depend on availability, cost, or performance.

The carbon number range (hence, viscosity) in mineral oil hydraulic fluids will vary depending on the application of the fluid (IARC 1984; Papay 1989, 1991, 1993; Wills 1980), but probably are in the range of C_{15} to C_{50}. The higher the carbon number, the higher the viscosity; viscosity is a major factor in determining the base stock of a hydraulic fluid (Moller 1989; Papay 1989, 1991, 1993; Shubkin 1993; Wills 1980). A more highly refined mineral oil will have better viscosity properties (i.e., high viscosity index or low dependence of viscosity on temperature) (Moller 1989; Shubkin 1993).

In the past, hydraulic fluids using mineral oils sometimes included such additives as PCBs to improve the thermal resistance or other properties of the resulting fluids. While such uses of PCBs have been discontinued, PCBs at NPL sites may be encountered as a component where hydraulic fluids are a site contaminant (ATSDR 1993b).

Synthetic fire-resistant fluids have been developed to replace petroleum-based fluids for many applications. Although there are several types of these less hazardous fluids, the only synthetic fluids discussed in this profile are phosphate esters and polyalphaolefins. The phosphate esters are tertiary esters of *ortho*phosphoric acid, $O{=}P(OH)_3$, and may be triaryl, trialkyl, and alkyl/aryl. The polyalphaolefins are usually based on 2-decene and contain a mixture of oligomers (dimers, trimers, etc.).

The first commercial trialkyl phosphate esters (TAP) were tricresyl phosphate (TCP) and trixylenyl phosphate (TXP), referred to as "natural" phosphate esters because the cresols and xylenols used as raw materials are derived from petroleum oil or coal tar (Marino and Placek 1994). These products are not commercially significant at present; however, at waste disposal sites, contaminants from older product formulations may be encountered, particularly those containing the neurotoxic tri-*ortho*-cresyl phosphate isomer. "Synthetic" phosphate esters are derived from synthetic feedstocks. Specific synthetic reactions have been developed to produce triaryl, trialkyl, and alkyl\aryl esters. The triaryl phosphates are currently the most significant commercial products (Marino 1992). All three organic groups can be the same, such as tricresyl

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or trixylenyl phosphate, or they may be different, as iso-propylphenyl diphenyl phosphate or cresyl diphenyl phosphate. Of the trialkyl phosphate esters, tributyl phosphate is the most important of the synthetic base stocks. Most are used in aircraft hydraulic fluids (Marino 1992). Dibutyl phenyl phosphate, also used as an aircraft hydraulic fluid, is the most important of the alkyl/aryl phosphate esters (Marino 1992).

Products may be either mixtures of phosphate ester compounds resulting directly from the manufacturing process or mixtures resulting from post-blending or compounding with additives.

One of the main human health concerns about organophosphate esters is the potential for neurotoxicity reactions, in particular a condition known as organophosphate-induced delayed neurotoxicity (OPIDN). Tri-*ortho*- cresyl phosphate (TOCP) has been identified as one of the more potent OPIDN neurotoxins in humans, and was formerly a constituent in some organophosphate ester hydraulic fluid products (Marino 1992; Marino and Placek 1994). Production processes now routinely remove virtually all the TOCP. For instance, tricresyl phosphate (TCP) products now typically are manufactured to contain over 98% meta and para isomers and virtually no TOCP (Marino and Placek 1994). Products containing these compounds associated with OPIDN have now entirely disappeared from commercial use, and the vast majority of the industrial organophosphate esters are based on triaryl phosphates with no halogenated components (Marino 1992). At waste disposal sites, however, site contaminants from older product formulations containing the *ortho* form may be encountered.

In addition, organophosphate esters also are used as antiwear additives in hydraulic fluids and other lubricants; of the organophosphate esters discussed in this profile, Durad 110, 125, 220B, and 300 are categorized by their manufacturers as antiwear additives and not as hydraulic fluids (FMC 1991c, 1991d, 1992a, 1992b; Marino and Placek 1994).

Before the 1960s products were introduced based on alkyl aryl phosphates that could contain chlorinated aromatic hydrocarbons. Such products have now entirely disappeared from commercial use, and the vast majority of the industrial organophosphate esters are based on triaryl phosphates with no halogenated components (Marino 1992). However, at older waste disposal sites, hydraulic fluid site contaminants could contain chlorinated hydrocarbons. As with the PCBs formerly included as additives in other forms of hydraulic fluids, these additives may present more toxicity risks than the primary ingredients of the hydraulic fluids.

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A typical polyalphaolefin oil prepared from 1-decene and $BF_3 \cdot n\text{-}C_4H_9OH$ catalyst at 30 °C contains predominantly trimer (C_{30}hydrocarbons) with much smaller amounts of dimer, tetramer, pentamer, and hexamer. While 1 -decene is the most common starting material, other alphaolefins can be used, depending on the needs of the product oil.

The final oil contains a large number of isomers (e.g., the trimer of 1 -decene contains many C_{30} isomers, the tetramer contains many C_{40} isomers) which result from skeletal branching during the oligomerization (Shubkin 1993). Polyalphaolefin oils are many times classified by their kinematic viscosity at 100 °C; the higher the viscosity, the longer the average chain length of the polyalphaolefin. The isomer distribution of a polyalphaolefin oil used in a particular hydraulic fluid will depend on the application. A polyalphaolefin oil contains a narrower range of molecular weights than a comparable mineral oil (Chrisope and Landry 1993;Shubkin 1993).

Most hydraulic fluids contain additives that impart needed properties (Papay 1989, 1991; Wills 1980). The exact composition and proportion of these additives in a certain type of fluid depends on the intended use. Hydraulic fluids are compounded to conform to performance-based standards such as Military or ASTM (American Society for Testing and Materials) specifications. Some examples of Military specifications are shown in Table 3-2. Many different formulations can be compounded to conform to one performance standard. It should be noted that the variability among these products or even within products with the same trade names may confuse efforts to determine environmental and health effects of hydraulic fluids at hazardous waste landfills since hydraulic fluids that are currently used may or may not contain the same components present in old products of the same name.

Table 3-3 contains information regarding the chemical identity of principal components of hydraulic fluids. Trade names are included when the component constitutes 100% (or nearly 100%) of the product. Information has also been included for several representative types of mineral oil. It should be noted, however, that the term “mineral oil” encompasses a wide variety of petroleum-based products. Several phosphate esters used as hydraulic fluid additives are also included in Table 3-3.

Some of the products listed in the tables in Chapter 3 are not currently on the market. Information has been included for these products since components may be present at older waste disposal sites. For example, Cellulube 200 has not been a commercial product for over 20 years, Pydraul products are no longer sold commercially, and MIL-H- 19457B has been obsolete since 1981 (FMC 1995). In addition, some product

Table 3-2. Examples of Military Standards for Hydraulic Fluids

Property	MIL-H-5606[a]	MIL-H-5606F[b]	MIL-H-19457B[c]	MIL-H-19457C[c]	MIL-H-83282[b,d]	MIL-H-83306[e]
Class	Petroleum base	Petroleum base	Phosphate ester	Phosphate ester	Hydrogenated polyalphaolefin	Phosphate ester
Product description	No data	No data	No data	Butylated triphenyl phosphate mixture	No data	No data
Synonyms	MLO 82-585	No data	No data	MIL-H-19457D	MIL-H-83282C	No data
Major components[f]	Napthenic type petroleum oil	Petroleum products with additives	Trixylyl phosphate	Triphenyl phosphate; t-butyl phenyl diphenyl phosphate; di-t-butylphenyl phenyl phosphate; little to no tri-(t-butylphenyl) phosphate	Trimers of polyalphaolefin[e]	Tributyl-phosphate and dibutyl phenyl phosphate base stock
Operational temperature range	No data	-54–135 °C	No data	No data	-40–205 °C	No data
NATO Code	No data	H515	No data	No data	H-537	No data
Other	No data	No data	Obsolete since 1981	No data	No data	No data

[a] Kinkead et al. 1985
[b] Department of Defense 1993
[c] FMC 1995
[d] MIL-H-83282 LT is a candidate low-temperature hydraulic fluid
[e] Mattie et al. 1993
[f] Numerous chemicals may be added to the hydraulic fluid base stocks to improve fluid characteristics. Tricresyl or triphenyl phosphate may be added as antiwear additives (Department of Defense 1993). The amount of the ortho isomer of tricresyl phosphate may not exceed 1% of total tricresyl phosphate (Mattie[1] et al. 1993).

Ta[illegible] [illegible]hemical Identity of Hydraulic Fluid Components[a]

Characteristic	Tri[illegible]ate	Trixylyl phosphate	Cresyl diphenyl phosphate	Triphenyl phosphate
Type	Organophosphate ester	Organophosphate ester	Organophosphate ester	Organophosphate ester
Synonym(s)	TCP; tritolyl phosphate	Xylyl phosphate; TXP; trixylenyl phosphate	Diphenyl tolyl phosphate	TPP
Registered trade name(s)	Durad 125[b]	Durad 220X[c] Kronitex TXP[d] Reofos 95 Fyrquel 220[d]	Phosflex 112; Santicizer 140	Celluflex TPP; Disflamoll TP; Phosflex TPP
Major components	Mixture of isomers, predominantly m, p, little o	Mixture of isomers	Mixture of isomers	Triphenyl phosphate
Chemical formula	$C_{21}H_{21}O_4P$	$C_{24}H_{27}O_4P$	$C_{19}H_{17}O_4P$	$C_{18}H_{15}O_4P$
Chemical structure	(RO)(RO)(RO)P=O	(RO)(RO)(RO)P=O	(RO)(R'O)(R'O)P=O	(RO)(RO)(RO)P=O
Identification numbers:				
CAS registry	1330-78-5	25155-23-1	26444-49-5	115-86-6
NIOSH RTECS	68952-35-2[b]	No data	TC5520000	TC8400000
EPA hazardous waste	No data	No data	No data	No data
OHM/TADS	No data	No data	No data	No data
DOT/UN/NA/IMCO shipping	No data	No data	No data	No data
HSDB	6774	6094	6096	2536
NCI	No data	No data	No data	No data

Table 3-3. Chemical Identity of Hydraulic Fluid Components[a] (continued)

Characteristic	Isopropyl phenyl diphenyl ester	t-Butylphenyl diphenyl phosphate	Dibutyl phenyl phosphate	Nonylphenyl diphenyl phosphate
Type	Organophosphate ester	Organophosphate ester	Organophosphate ester	Organophosphate ester
Synonym(s)	No data		DBPP	No data
Registered trade name(s)	Phosflex 41P; Kronitex 100	Fyrquel GT; Saniticizer 100B; Santicizer 154	No data	No data
Major components	Mixture of isomers		Dibutyl phenyl phosphate	Nonylphenyl diphenyl phosphate
Chemical formula	$C_{21}H_{21}O_4P$	$C_{22}H_{23}O_4P$	$C_{14}H_{23}O_4P$	$C_{27}H_{33}O_4P$
Chemical structure	(RO)(RO')(RO')P=O	(RO)(R'O)(R'O)P=O	(RO)(RO)(R'O)P=O	(RO)(R'O)(R'O)P=O
Identification numbers:				
CAS registry	28108-99-8	56803-37-3	2528-36-1	38638-05-0
NIOSH RTECS	No data	No data	TB9626600	No data
EPA hazardous waste	No data	No data	No data	No data
OHM/TADS	No data	No data	No data	No data
DOT/UN/NA/IMCO shipping	No data	No data	No data	No data
HSDB	6795	6102	2604	No data
NCI	No data	No data	No data	No data

Table 3-3. Chemical Identity of Hydraulic Fluid Components[a] (continued)

Characteristic	2-Ethylhexyl diphenyl phosphate	Isodecyl diphenyl phosphate	Tri-n-butyl phosphate	Tris-isopropyl phenyl phosphate
Type	Organophosphate ester	Organophosphate ester	Organophosphate ester	Organophosphate ester
Synonym(s)	Diphenyl-2-ethylhexyl phosphate	Isodecyldiphenylphosphate	Tributyl phosphate; TBP; butyl phosphate;TNBP	No data
Registered trade name(s)	Saniticizer 141; Octicizer	Saniticizer 148[b]	Skydrol LD[d] Celluphos 4	Durad 110, Durad 300
Major components	2-Ethylhexyl diphenyl phosphate	Isodecyl diphenyl phosphate	Tri-n-butyl phosphate	Isopropylphenyl phosphate
Chemical formula	$C_{20}H_{27}O_4P$	$C_{22}H_{31}O_4P$	$C_{12}H_{27}O_4P$	$C_{27}H_{33}O_4P$
Chemical structure	(RO)(R'O)(R'O)P=O	(RO)(R'O)(R'O)P=O	(RO)(RO)(RO)P = O	(RO)(RO)(RO)P = O
Identification numbers:				
CAS registry	1241-94-7	29761-21-5	126-73-8	26967-76-0
NIOSH RTECS	TC6125000	No data	(55962-27-1 Skydrol LD)[b]	No data
EPA hazardous waste	No data	No data	TC7700000	No data
OHM/TADS	No data	No data	No data	No data
DOT/UN/NA/IMCO shipping	No data	No data	No data	No data
HSDB	370	6797	1678	6797
NCI	No data	No data	No data	No data

Table 3-3. Chemical Identity of Hydraulic Fluid Components[a] (continued)

Characteristic	Tri-o-cresyl phosphate	Mineral Oil[e]	Mineral Oil[e]
Type	Organophosphate ester	Mineral oil	Mineral oil
Synonym(s)	o-Tolyl phosphate; TOCP; TOTP	Petroleum distillates; solvent-refined light paraffinic	Petroleum distillates, straight-run middle
Registered trade name(s)	Past contaminant of tricresyl phosphate	No data	No data
Major components	Tri-o-cresyl phosphate	Predominantly saturated hydrocarbons predominantly in the range C15 through C30	Hydrocarbons predominantly in the range C11 through C20
Chemical formula	$C_{21}H_{21}O_4P$		
Chemical structure	(RO)(RO)(RO)P=O		
Identification numbers:			
CAS registry	78-30-8	64741-89-5	64741-44-2
NIOSH RTECS	TD0350000	PY8041500	LX329600
EPA hazardous waste	No data	No data	No data
OHM/TADS	No data	No data	No data
DOT/UN/NA/IMCO shipping	UN 2574; IMO 6.1	No data	No data
HSDB	4084	No data	No data
NCI	No data	No data	No data

[a] All information from HSDB 1995 unless otherwise noted.
[b] FMC 1994
[c] Muir 1984
[d] Nobile et al. 1980
[e] RTECS 1996

CAS = Chemical Abstracts Service; DOT/UN/NA/IMO = Dept. of Transportation/United Nations/North America/International Maritime Dangerous Goods Code; EPA = Environmental Protection Agency; HSDB = Hazardous Substances Data Bank; NCI = National Cancer Institute; NIOSH = National Institute for Occupational Safety and Health; OHM/TADS = Oil and Hazardous Materials/Technical Assistance Data System; RTECS = Registry of Toxic Effects of Chemical Substances names and designations have changed. For example, Durad MP 280B is now known as a Reolube (effective January 1995) (FMC 1995).

3.2 Physical and Chemical Properties

Information regarding the physical and chemical properties of selected hydraulic fluid products is shown in Table 3-4. Physical and chemical properties of selected hydraulic fluid components are shown in Table 3-5.

The physical properties important for the projected use of hydraulic fluids are viscosity, density, foaming behavior, and fire resistance. There is no generally recognized test method for measuring flammability of hydraulic fluids, although various test methods may be utilized (Moller 1989).

Physical data important for describing environmental behavior (K_{OC}, K_{OW}, vapor pressure, water solubility, and Henry's law constant) are incomplete. In general, hydraulic fluids have relatively low water solubilities.

A summary of the hydraulic fluids discussed in this profile is found in Table 3-6. Data on some of the components of hydraulic fluids are shown in Tables 3-7 through 3-9.

Table 3-4. Physical and Chemical Properties of Hydraulic Fluid Products

Property	Houghto-Safe 5047F[a]	Pyroguard A-433[b]	Quintolubric 95830W[b]	Sunsafe F[b]
Molecular weight	Not applicable	Not applicable	Not applicable	Not applicable
Color	Opaque white	Milky white	Milky white	Milky white
Physical state	Liquid	Liquid	Liquid	Liquid
Melting point	No data	No data	No data	No data
Boiling point	102 °C	100 °C	100 °C	100 °C
Density	0.927 g/mL	0.92 g/mL	0.96 g/mL	0.92 g/mL
Odor	Bland	No data	No data	No data
Odor threshold: Water Air	No data	No data	No data	No data
Solubility:				
Water	Emulsion	No data	No data	No data
Organic solvents	No data	No data	No data	No data
Partition coefficients: Log K_{ow} Log K_{oc}	No data	No data	No data	No data
Vapor pressure	No data	No data	No data	No data
Henry's law constant	No data	No data	No data	No data
Autoignition temperature	No data	No data	No data	No data
Flashpoint	No data	No data	No data	No data
Flammability limits	No data	No data	No data	No data
Conversion factors	No data	No data	No data	No data
Explosive limits	No data	No data	No data	No data

Table 3-4. Physical and Chemical Properties of Hydraulic Fluid Products (continued)

Property	Cellulube 220	Durad 110[c]	Durad 125[d]	Durad 220
Molecular weight	No data	No data	368.36[e]	No data
Color	No data	Clear	Practically colorless	No data
Physical state	No data	Liquid	Liquid	No data
Melting point	No data	No data	No data	No data
Boiling point	No data	220–270 °C at 4 mm Hg	420 °C	No data
Density	No data	1.1–1.17 g/mL at 20 °C	1.162 at 25 °C	No data
Odor	No data	Odorless	Odorless	No data
Odor threshold: Water Air	No data	No data	No data	No data
Solubility:				
Water	No data	No data	0.36 mg/L at 25 °C; insoluble (<0.002% at 85 °C)[e]	No data
Organic solvents	No data	No data	Miscible with common solvents and thinners, vegetable oils[e]	No data
Partition coefficients:				
Log K_{ow}	No data	No data	5.11; 6.34 (est.)[f]	No data
Log K_{oc}	No data	No data	No data	No data
Vapor pressure	No data	0.026 mm Hg at 150 °C	1×10^{-7} at 10 °C	No data
Henry's law constant	No data	No data	5.35×10^{-8} atm-m^3/mol (est.)	No data
Autoignition temperature	No data	551 °C	420 °C	No data
Flashpoint	No data	199 °C (closed cup)	427 °C (760 mm Hg)[g]	No data
Flammability limits	No data	No data	225–235 °C (Pensky-Martin closed cup)[g]	No data
Conversion factors	No data	No data	No data	No data
Explosive limits	No data	No explosion hazard	No data	No data

Table 3-4. Physical and Chemical Properties of Hydraulic Fluid Products (continued)

Property	Durad 220B[h]	Durad 300[i]	Durad 550B[j]	Durad MP280B[j]
Molecular weight	No data	No data	No data	No data
Color	Clear blue	Clear	Clear	Clear blue
Physical state	Liquid	Liquid	Liquid	Liquid
Melting point	-20 °C	No data	No data	No data
Boiling point	416 °C	220–270 °C at 4 mm Hg	No data	No data
Density	1.145–1.165 g/mL at 20 °C	1.15–1.17 g/mL at 20 °C	1.124 g/mL at 20 °C	1.145–1.165 g/mL at 20 °C
Odor	Odorless	Odorless	Odorless	No data
Odor threshold:	No data	No data	No data	No data
Water				
Air				
Solubility:				
Water	Insoluble	Insoluble	Insoluble	Insoluble
Organic solvents	No data	No data	No data	No data
Partition coefficients:	No data	No data	No data	No data
Log K_{ow}	No data	No data	No data	
Log K_{oc}		No data	No data	
Vapor pressure	0.033 mm Hg at 22 °C	0.026 mm Hg at 150 °C	<0.033 mm Hg at 150 °C	0.033 mm Hg at 150 °C
Henry's law constant	No data	No data	No data	No data
Autoignition temperature	535 °C	551 °C	480 °C	No data
Flashpoint	243 °C (closed cup)	199 °C (closed cup)	254 °C (open cup)	243 °C (closed cup)
Flammability limits	No data	No data	No data	No data
Conversion factors	No data	No data	No data	No data
Explosive limits	No data	No data	No data	No data

Table 3-4. Physical and Chemical Properties of Hydraulic Fluid Products (continued)

Property	Fyrquel 150[k]	Fyrquel 220[l]	Fyrquel EHC[m]	Hyjet IV[n]
Molecular weight	~400 formula weight	No data	No data	265 (average)
Color	Clear	Clear	Clear	Clear purple
Physical state	Liquid	Liquid	Liquid	Liquid
Melting point	No data	No data	No data	No data
Boiling point	decomp. >352 °C	decomp. >352 °C	No data	288 °C
Density	No data	No data	No data	0.997 g/mL
Odor	Essentially none	Essentially none	Essentially none	Sweet
Odor threshold: Water Air	No data	No data	No data	No data
Solubility:				
Water	Miscibility <0.1 mL	<1000 ppm	<1000 ppm	Insoluble
Organic solvents	No data	No data	No data	Soluble in hydrocarbon solvents
Partition coefficients: Log K_{ow} Log K_{oc}	No data	No data	No data	No data
Vapor pressure	<0.1 mm Hg at 37.8 °C	<0.1 mm Hg at 37.8 °C	<0.1 mm Hg at 37.8 °C	0.5 mm Hg at 93 °C
Henry's law constant	No data	No data	No data	No data
Autoignition temperature	No data	No data	No data	518 °C
Flashpoint	246 °C (closed cup)	246 °C (closed cup)	>235 °C (open cup)	182 °C (open cup)
Flammability limits	No data	No data	No data	No data
Conversion factors	No data	No data	No data	No data
Explosive limits	No data	No data	No data	No data

Table 3-4. Physical and Chemical Properties of Hydraulic Fluid Products (continued)

Property	Pydraul 29ELT[n]	Pydraul 50E[n]	Pydraul 90E[o]	Reofos 50[p]
Molecular weight	No data	No data	No data	No data
Color	Clear to slightly hazy blue	Blue to blue-green	Green to blue	No data
Physical state	Liquid	Liquid	Liquid	No data
Melting point	No data	No data	No data	No data
Boiling point	No data	399 °C	No data	No data
Density	1.09–1.10 at 25 °C	1.145–1.165 g/mL at 25 °C	1.147–1.167 g/mL at 25 °C	No data
Odor	No data	No data	No data	No data
Odor threshold: Water Air	No data	No data	No data	No data
Solubility:				
Water	Practically insoluble	160 mg/L	Practically insoluble	No data
Organic solvents	No data	No data	No data	No data
Partition coefficients: Log K_{ow} Log K_{oc}	No data	No data	No data	No data
Vapor pressure	0.002 mm Hg at 93 °C	0.002 mm Hg at 93 °C	0.001 mm Hg at 93 °C	No data
Henry's law constant	No data	No data	No data	No data
Autoignition temperature	No data	465 °C	No data	No data
Flashpoint	No data	241 °C (open cup)	No data	No data
Flammability limits	No data	No data	No data	No data
Conversion factors	No data	No data	No data	No data
Explosive limits	No data	No data	No data	No data

Table 3-4. Physical and Chemical Properties of Hydraulic Fluid Products (continued)

Property	Reofos 65	Reolube HYD46[q]	Skydrol 500B-4[r]
Molecular weight	No data	No data	No data
Color	No data	Slightly hazy	Clear purple
Physical state	No data	Liquid	Liquid
Melting point	No data	No data	No data
Boiling point	No data	>400 °C (est.)	125 °C at 267 mm Hg (est.)
Density	No data	1.121 g/mL at 20 °C	1.052–1.060 g/mL at 25°C
Odor	No data	No data	No data
Odor threshold: Water Air	No data	No data	No data
Solubility: Water Organic solvents	No data	No data	No data
Partition coefficients: Log K_{ow} Log K_{oc}	No data	No data	No data
Vapor pressure	No data	No data	No data
Henry's law constant	No data	No data	No data
Autoignition temperature	No data	545 °C	399 °C
Flashpoint	No data	245 °C (open cup)	160 °C (open cup)
Flammability limits in air	No data	No data	No data
Conversion factors	No data	No data	No data
Explosive limits	No data	No data	No data

Table 3-4. Physical and Chemical Properties of Hydraulic Fluid Products (continued)

Property	Skydrol LD-4[s]	Cyclotriphosphazene[t]	Polyalphaolefin
Molecular weight	No data	No data	No data
Color	Clear purple	No data	No data
Physical state	Liquid	Liquid	No data
Melting point	No data	No data	No data
Boiling point	125 °C at 380 mm Hg (est.)	No data	No data
Density	1.004–1.014 g/mL at 25 °C	1.445 g/mL	No data
Odor	No data	No data	No data
Odor threshold: Water Air	No data	No data	No data
Solubility: Water at 25 °C Organic solvents	No data	No data	No data
Partition coefficients: Log K_{ow} Log K_{oc}	No data	No data	No data
Vapor pressure	No data	0.48 mm Hg at 65 °C	No data
Henry's law constant	No data	No data	No data
Autoignition temperature	399 °C	No data	No data
Flashpoint	160 °C (open cup)	No data	No data
Flammability limits in air	No data	No data	No data
Conversion factors	No data	No data	No data
Explosive limits	No data	No data	No data

[a] Houghton 1992
[b] Kinkead et al. 1987a, 1988
[c] FMC 1992e
[d] All information from HSDB 1995, except where noted
[e] Mayer et al. 1981
[f] SRC 1995
[g] FMC, Marino and Placek 1994
[h] Chevron 1994
[i] FMC 1991c
[j] FMC 1992c
[k] Akzo 1992
[l] Akzo 1991
[m] Akzo 1989
[n] Monsanto 1986b
[o] Monsanto 1986c
[p] FMC 1991d
[q] FMC 1995
[r] Monsanto 1992a
[s] Monsanto 1992b
[t] Kinkead et al. 1990

Table 3-5. Physical and Chemical Properties of Selected Hydraulic Fluid Components[a]

Property	Tricresyl phosphate	Trixylyl phosphate	Cresyl diphenyl phosphate	Triphenyl phosphate
Molecular weight	368.36[m]	410.45	340.33	326.29[g]
Color	Practically colorless	No data	Clear	Colorless; white
Physical state	Liquid	Liquid	Liquid	Crystals[g]
Melting point, °C	No data		-38	50-51[g]
Boiling point, °C	420 °C	243–265 °C	390	245 (11 mm Hg)[g]
Density, g/cm^3	1.162 at 25 °C	1.155	1.208	1.2055 g/mL at 30 °C[g]
Odor	Odorless		Very slight odor	Characteristic, resembling phenol
Odor threshold: Water Air	No data	No data	No data	No data
Solubility:				
Water	0.36 mg/L at 25 °C; insoluble (<0.002% 85 °C)[b]	0.002% at 85 °C; 0.89 mg/mL	Insoluble	Insoluble[b]; 0.002% at 54 °C
Organic solvent(s)	Miscible with common solvents and thinners, vegetable oils[b]	No data	Soluble in most organic solvents except glycerol	Soluble in benzene, $CHCl_3$, ether, acetone[b]
Partition coefficients:				
Log K_{ow}	5.11; 6.34 (est.)[c]	5.63[i]; 7.98 (est.)[c]	No data	4.7 (est.)[c]
Log K_{oc}	No data	3.67–4.44 (est.)	No data	4.26 (est.)
Vapor pressure, mm Hg	1.1 x 10^{-7} at 10 °C	5.15x10^{-8} (30 °C)	No data	1 mm Hg at 193.5 °C
Henry's law constant	5.35x10^{-8} atm-m^3/mol (est.)[d]	7.19x10^{-8} atm-m^3/mol (est.)[d]	No data	<9.87x10^{-8} atm-m^3/mol[i]; 3.98x10^{-8} atm-m^3/mol (est.)[d]
Autoignition temperature	410 °C 427 °C (760 mm Hg)[e]	535–545 °C[e]	No data	No data
Flashpoint, °C	225-235 °C (Pensky-Martin closed cup)[e]	245–255 °C (Pensky-Martin closed cup)[e]	232 °C (closed cup)[f]	220 °C (closed cup)
Flammability limits	No data	No data	No data	Noncombustible
Conversion factors	No data	No data	1 ppm = 13.89 mg/m^3	1 ppm=13.32 mg/m^3
Explosive limits	No data	No data	No data	No data

Table 3-5. Physical and Chemical Properties of Selected Hydraulic Fluid Components[a] (continued)

Property	Isopropyl phenyl diphenyl ester	t-Butylphenyl diphenyl phosphate	Dibutyl phenyl phosphate
Molecular weight	368	382.40	286.34
Color	No data	No data	Clear, slightly yellow
Physical state	No data	No data	Liquid
Melting point, °C	No data	No data	No data
Boiling point, °C	No data	No data	131–132 °C
Density, g/cm^3	No data	No data	1.0691 at 25 °C
Odor	No data	No data	Butanolic
Odor threshold:	No data	No data	No data
Water			
Air			
Solubility:			
Water	2.2 mg/mL	No data	Very low; 96 ppm
Organic solvent(s)	No data	No data	No data
Partition coefficients:			
Log K_{ow}	6.16 (est.)[c]; 5.31 (est.)	6.61(est.)[c]	4.27
Log K_{oc}	No data	No data	3.23
Vapor pressure, mm Hg	3.515×10^{-7} (25 °C, est.)	No data	2.3×10^{-4} mm Hg 25 °C (est.)
Henry's law constant	7.74×10^{-8} atm-m^3/mol (est.)[d]	2.15×10^{-5} atm-m^3/mol at 25 °C[f]; 1.03×10^{-7} atm-m^3/mol[d]	5.04×10^{-7} atm-m^3/mol
Autoignition temperature	No data	No data	129 °C (closed cup)
Flashpoint	No data	No data	No data
Flammability limits	No data	No data	No data
Conversion factors	No data	No data	No data
Explosive limits	No data	No data	No data

Table 3-5. Physical and Chemical Properties of Selected Hydraulic Fluid Components[a] (continued)

Property	Nonylphenyl diphenyl phosphate	2-Ethylhexyl diphenyl phosphate	Isodecyl diphenyl phosphate
Molecular weight	452	362.41	390
Color	No data	No data	No data
Physical state	Liquid	Liquid	No data
Melting point, °C	No data	-30 °C	No data
Boiling point, °C	471	375 °C	249 at 1.33 kPa
Density, g/cm^3	No data	No data	1.070 g/mL
Odor	No data	No data	No data
Odor threshold: Water Air	No data	No data	No data
Solubility:			
Water	0.77 ng/L[b]	1.9 mg/L at 25 °C	0.75 mg/L at 25 °C
Organic solvent(s)	No data	No data	No data
Partition coefficients:			
Log K_{ow}	5.93[m] ; 9.2[c]	5.73	5.44
Log K_{oc}	3.69[h]	No data	4.34 (est.)
Vapor pressure, mm Hg	$1.9x10^{-8}$ [h]	6.29×10^{-5} at 30 °C (est.)	$1.6x10^{-5}$ at 25 °C (est.)
Henry's law constant	$4.24x10^{-7}$ atm-m^3/mol (est.)[d]; $1.4x10^{-8}$ atm-m^3/mol[h]	$5.42x10^{-5}$ atm-m^3/mol at 25 °C[i]	$4.36x10^{-7}$ atm-m^3/mol (est.)[d]
Autoignition temperature	No data	No data	No data
Flashpoint	No data	No data	No data
Flammability limits	No data	No data	No data
Conversion factors	No data	No data	No data
Explosive limits	No data	No data	No data

Table 3-5. Physical and Chemical Properties of Selected Hydraulic Fluid Components[a] (continued)

Property	Tri-n-butyl phosphate	Tris(isopropyl phenyl)phosphate	Tri-o-cresyl phosphate
Molecular weight	266.32	452	368.37[g]
Color	Colorless	No data	Colorless or pale yellow[b]
Physical state	Liquid	Liquid	Liquid[b]
Melting point, °C	<-80 °C[g]	-25	11 °C[g]
Boiling point, °C	289 °C[g]	220–270 (0.53 kPa)	~410 °C[g]
Density	0.976 g/mL at 25 °C[g]	1.159 g/mL at 25 °C	1.1955 g/mL at 25 °C[g]
Odor	Odorless[h]	No data	Practically odorless
Odor threshold: Water Air	No data	No data	No data
Solubility:			
Water	1 mL dissolves in about 165 mL water[g]	No data	Sparingly soluble[b]
Organic solvent(s)	Soluble in ether, benzene carbon disulfide, alcohol[b]	No data	Soluble in alcohol, benzene, ether[b]; soluble in acetic acid[g]
Partition coefficients:			
Log K_{ow}	No data	No data	No data
Log K_{oc}	No data	No data	No data
Vapor pressure, mm Hg	127 mm Hg at 177 °C	No data	10 mm Hg at 265 °C
Henry's law constant	No data	No data	No data
Autoignition temperature	No data	No data	385 °C[f]
Flashpoint	146 °C[g]	No data	225 °C (closed cup)[f]
Flammability limits	No data	No data	No data
Conversion factors	No data	No data	No data
Explosive limits	No data	No data	No data

[a] All information from HSDB, except where noted
[b] Mayer et al. 1981
[c] SRC 1995b KOWWIN
[d] SRC 1994a HENRYWIN
[e] FMC, Marino and Placek 1994
[f] NFPA 1991
[g] Merck 1989
[h] Boethling and Cooper 1985
[i] Muir et al. 1985

EPA = Environmental Protection Agency; HSDB = Hazardous Substances Data Bank; $CHCl_3$ = chloroform; est. = estimated; kPa = kilopascal

Table 3-6. Summary of Chemical Information for Selected Hydraulic Fluids

Name	Source	Identity/Composition	Physical and Chemical Properties
Mineral oil based fluids			
MIL-H-5606	Various[a]	Table 3-2	Meets specifications[b]
Houghto-Safe 5047F	Houghton	Table 3-1	Table 3-4
Sunsafe F	Sun	Table 3-1	Table 3-4
Pyroguard A-443	Mobil	Table 3-1	Table 3-4
Quintolubric 958 30W	Quaker	Table 3-1	Table 3-4
Organophosphate esters			
Fyrquel 150	Akzo	Table 3-1	Table 3-4
Fyrquel 220	Akzo	Table 3-1	Table 3-4
Fyrquel EHC	Akzo	Table 3-1	Table 3-4
Durad 110	FMC	Table 3-1	Table 3-4
Durad 125	FMC	Table 3-1	Table 3-5 (tricresyl phosphate)
Durad 220B	FMC	Table 3-1	Table 3-4
Durad 300	FMC	Table 3-1	Table 3-4
Durad 550B	FMC	Table 3-1	Table 3-4
Durad MP 280B[d]	FMC	Table 3-1	Table 3-4
Skydrol 500B	Monsanto	Table 3-1	Table 3-4
Skydrol 500B-4	Monsanto	Table 3-1	Table 3-4
Skydrol LD	Monsanto	Table 3-1	Table 3-4
Skydrol LD-4	Monsanto	Table 3-1	Table 3-4
Pydraul 29E LT[c,h]	Monsanto	Table 3-1	Table 3-4
Pydraul 50E[c,f]	Monsanto	Table 3-1	Table 3-4
Pydraul 90E[c,g]	Monsanto	Table 3-1	Table 3-4
Reofos 50[c]	FMC	Table 3-1	Table 3-4
Reofos 65[c]	FMC	Table 3-1	No data
Reolube HYD46	FMC	Table 3-1	Table 3-4
Cellulube 220[c]	FMC	Table 3-1	No data
Santicizer 141	Monsanto	2-Ethylhexyl diphenyl phosphate	Table 3-5 (2-Ethylhexyl diphenyl phosphate)
Santicizer 148	Monsanto	Isodecyl diphenyl phosphate[i]	Table 3-5 (isodecyl diphenyl phosphate)
MIL-H-19457B	Various[a]	Table 3-2	Meets specifications[b]
MIL-H-19457C	Various[a]	Table 3-2	Meets specifications[b]
MIL-H-83306	Various[a]	Table 3-2	Meets specifications[b]
Hyjet IV	Chevron	Table 3-1	Table 3-4

Table 3-6. Summary of Chemical Information for Selected Hydraulic Fluids (continued)

Name	Source	Identity/Composition	Physical and Chemical Properties
Polyalphaolefins			
MIL-H-83282	Various[a]	Table 3-2	Meets specifications[b]
MIL-H-83282LT	Various[a]	Low temperature version of MIL-H-83282. Dimer (49%)/-trimer (16.5%) blend ofpolyalphaolefin[e]	Meets specifications[b]
Other			
Cyclotriphosphazine	Not reported	Dimers, trimers and tetramers of cyclotriphosphazene[i]	Table 3-4

[a] Products from various producers may meet the specifications.
[b] Specifications have been established for properties such as viscosity, flammability, and shear stability. The range of physical properties of the available hydraulic fluids is not available.
[c] Discontinued product
[d] Reolube MP 280B effective January 1995
[e] Mattie et al. 1993
[f] Pydraul 50E is Fyrquel 220 (Akzo 1993)
[g] Pydraul 90E is Fyrquel 450 (Akzo 1993)
[h] Pydraul 20E LT is Fyrquel LT (Akzo 1993)
[i] Kinkead et al. 1990
[j] FMC 1994

Table 3-7. Water Solubility of Hydrocarbon Components of Mineral Oil Hydraulic Fluids

Hydrocarbon	Distilled water solubility (ppm)	Salt water solubility (ppm)
Tetradecane (C_{14})	2.2	1.7
Hexadecane (C_{16})	0.9	0.4
Octadecane (C_{18})	2.1	0.8
Eicosane (C_{20})	1.9	0.8
Hexaeicosane (C_{26})	1.7	0.1
Hexatricontane (C_{36})	1.7[a]	

[a]Shaw 1989

Source: Sutton and Calder 1974, except where noted

Table 3-8. Log K_{ow} Values for Organophosphate Ester Hydraulic Fluid Components

Chemical name	Log K_{ow}
Triphenyl phosphate	4.63
Tricresyl phosphate, mixed isomers	5.11
Trixylenyl phosphate, mixed isomers	5.63
Isopropylphenyl diphenyl phosphate, mixed isomers	5.31
2-Isopropylphenyl diphenyl phosphate	5.65
2,4-Diisopropylphenyl diphenyl phosphate	6.52
2,4,6-Triisopropylphenyl diphenyl phosphate	≈6.70
Nonylphenyl diphenyl phosphate, mixed isomers	5.93
Cumylylphenyl diphenyl phosphate, mixed isomers	6.08
t-Butylphenyl diphenyl phosphate, mixed isomers	5.12
2-Ethylhexyl diphenyl phosphate	5.73
Tributyl phosphate	4.00
Dibutyl phenyl phosphate	4.27

Sources: Ciba-Geigy 1986; Mayer et al. 1981; Saeger et al. 1979

Table 3-9. Water Solubilities for Organophosphate Ester Hydraulic Fluid Components

Chemical name	Water solubility (mg/L)
Triphenyl phosphate	1.9
Tricresyl phosphate, mixed isomers	0.36
Trixylenyl phosphate, mixed isomers	0.89[a]
Isopropylphenyl diphenyl phosphate, mixed isomers	2.2
Nonylphenyl diphenyl phosphate, mixed isomers	0.77
Cumylphenyl diphenyl phosphate, mixed isomers	0.063
t-Butylphenyl diphenyl phosphate, mixed isomers	3.2
2-Ethylhexyl diphenyl phosphate	1.9
Tributyl phosphate	280.0
Dibutyl phenyl phosphate	280.0

[a]Ofstad and Sletten (1985) reported a water solubility of 0.11 mg/L for trixylenyl phosphate, which is significantly lower than the one reported by Saeger et al. (1979).

Source: Mayer et al. 1981; Saeger et al. 1979

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ATTACHMENT 5

Lahontan Water Board Documents Related to Spill Reporting and Investigation

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Scoralle, Lisa@Waterboards

From: Scoralle, Lisa@Waterboards
Sent: Friday, March 06, 2015 5:34 PM
To: Ferguson, Scott@Waterboards; Taxer, Eric@Waterboards
Subject: Re: OES Spill Report #15-1279 (Vollmer)

Scott and Eric

I spoke with Beth Vollmer [redacted], complainant re: incident OES # 15-1279. She said she reported the incident following a visit with her dog to the beach at the Ski Run Marina last night. She said her dog had been swimming in the lake. When they got home after dark, she touched the dog and noticed that her hands (and the dog's fur) were oily to the touch. She described the oily substance as having an "industrial smell" that was "pretty fragrant". She washed the dog with a pet shampoo, but the substance did not come off. She then rewashed the dog with a dishwashing liquid, and that was successful in removing the oil and odor. She said the dog appears to be ok.

She has since been contacted by Fish and Wildlife (F&W), "EPA" and Brian with El Dorado County Environmental Health (ph 530-621-5924, no last name provided). Brian told her there had been a hydraulic fuel spill discovered at the marina this morning, leaking from the Tahoe Queen, and that he suspected the two incidents were related. She said he told her that Aramark (owner of the Tahoe Queen) was responsible for the spill, and that they set out booms to start cleaning it up. If the two incidents are related, it would appear the release from the Tahoe Queen (OES #15-1291) started as early as last night. I left a message with Brian this afternoon, at the number given.

Curtis Kiesel with EDCEH called me back (ph 530-621-6656). He said Brian Vyverberg with EDCEH had been involved last night when Ms. Vollmer reported her incident. Curtis said he was returning my call regarding "the spill at the Tahoe Queen". He said at the time he was there with F&W this afternoon, there was approx. 10 gal of hydraulic oil that had been released. The spill was no longer going on and they were in the process of containing it and cleaning it up. He said Daryl Stevenson from F&W collected samples for analysis. I ask him if he knew whether the Vollmer incident and the Queen release were related. Curtis said that, based on the location where the dog had been swimming (just west of where the Queen was berthed), they determined that the two incidents are "definitely" related.

Eric requested I give him this information and the Vollmer incident report (OES #15-1279), and he will take it from here.

Lisa Scoralle, PG
Engineering Geologist
Lahontan Regional Water Quality Control Board
lscoralle@waterboards.ca.gov
530-542-5452

Taxer, Eric@Waterboards

From: Ferguson, Scott@Waterboards
Sent: Monday, March 09, 2015 6:47 AM
To: Scoralle, Lisa@Waterboards
Cc: Taxer, Eric@Waterboards
Subject: RE: Re: OES Spill Report #15-1279 (Vollmer)

Lisa,

Thank you for the follow-up. Do you know when Ms. Vollmer was at the beach with her dog? This could be very useful information in determining the full time period in which the discharge occurred. If you do not know, please contact Ms. Vollmer to get this information and pass it onto Eric.

Thank you to both of you for coordinating on this effort.

Scott C. Ferguson
Supervising Water Resource Control Engineer
Regulatory and Enforcement Division
Email: Scott.Ferguson@waterboards.ca.gov
Phone: (530) 542-5432

From: Scoralle, Lisa@Waterboards
Sent: Friday, March 06, 2015 5:34 PM
To: Ferguson, Scott@Waterboards; Taxer, Eric@Waterboards
Subject: Re: OES Spill Report #15-1279 (Vollmer)

Scott and Eric

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Eric requested I give him this information and the Vollmer incident report (OES #15-1279), and he will take it from here.

Lisa Scoralle, PG
Engineering Geologist
Lahontan Regional Water Quality Control Board
lscoralle@waterboards.ca.gov
530-542-5452

Taxer, Eric@Waterboards

From: Scoralle, Lisa@Waterboards
Sent: Wednesday, March 11, 2015 2:44 PM
To: Ferguson, Scott@Waterboards; Taxer, Eric@Waterboards
Subject: RE: Re: OES Spill Report #15-1279 (Vollmer)

Scott and Eric

I just spoke with Ms. Vollmer again. She said she and her dog were at the beach at sunset on the night in question, so she estimates it was likely around 6pm.

lisa

From: Ferguson, Scott@Waterboards
Sent: Monday, March 09, 2015 6:47 AM
To: Scoralle, Lisa@Waterboards
Cc: Taxer, Eric@Waterboards
Subject: RE: Re: OES Spill Report #15-1279 (Vollmer)

Lisa,

Thank you for the follow-up. Do you know when Ms. Vollmer was at the beach with her dog? This could be very useful information in determining the full time period in which the discharge occurred. If you do not know, please contact Ms. Vollmer to get this information and pass it onto Eric.

Thank you to both of you for coordinating on this effort.

Scott C. Ferguson
Supervising Water Resource Control Engineer
Regulatory and Enforcement Division
Email: Scott.Ferguson@waterboards.ca.gov
Phone: (530) 542-5432

From: Scoralle, Lisa@Waterboards
Sent: Friday, March 06, 2015 5:34 PM
To: Ferguson, Scott@Waterboards; Taxer, Eric@Waterboards
Subject: Re: OES Spill Report #15-1279 (Vollmer)

Scott and Eric

I spoke with Beth Vollmer [redacted], complainant re: incident OES # 15-1279. She said she reported the incident following a visit with her dog to the beach at the Ski Run Marina last night. She said her dog had been swimming in the lake. When they got home after dark, she touched the dog and noticed that her hands (and the dog's fur) were oily to the touch. She described the oily substance as having an "industrial smell" that was "pretty fragrant". She washed the dog with a pet shampoo, but the substance did not come off. She then rewashed the dog with a dishwashing liquid, and that was successful in removing the oil and odor. She said the dog appears to be ok.

She has since been contacted by Fish and Wildlife (F&W), "EPA" and Brian with El Dorado County Environmental Health (ph 530-621-5924, no last name provided). Brian told her there had been a hydraulic fuel spill discovered at the marina this morning, leaking from the Tahoe Queen, and that he suspected the two incidents were related. She said he told her that Aramark (owner of the Tahoe Queen) was responsible for the spill, and that they set out booms to start cleaning it up. If the two incidents are related, it would appear the release from the Tahoe Queen (OES #15-1291) started as early as last night. I left a message with Brian this afternoon, at the number given.

Curtis Kiesel with EDCEH called me back (ph 530-621-6656). He said Brian Vyverberg with EDCEH had been involved last night when Ms. Vollmer reported her incident. Curtis said he was returning my call regarding "the spill at the Tahoe Queen". He said at the time he was there with F&W this afternoon, there was approx. 10 gal of hydraulic oil that had been released. The spill was no longer going on and they were in the process of containing it and cleaning it up. He said Daryl Stevenson from F&W collected samples for analysis. I ask him if he knew whether the Vollmer incident and the Queen release were related. Curtis said that, based on the location where the dog had been swimming (just west of where the Queen was berthed), they determined that the two incidents are "definitely" related.

Eric requested I give him this information and the Vollmer incident report (OES #15-1279), and he will take it from here.

Lisa Scoralle, PG
Engineering Geologist
Lahontan Regional Water Quality Control Board
lscoralle@waterboards.ca.gov
530-542-5452

Scoralle, Lisa@Waterboards

From:	Miller, Alan@Waterboards
Sent:	Friday, March 06, 2015 1:45 PM
To:	Scoralle, Lisa@Waterboards
Cc:	Ferguson, Scott@Waterboards
Subject:	FW: Hazardous Materials Spill Update: Cal OES Control #:15-1291

-----Original Message-----
From: Warning Center [mailto:Warning.Center@oes.ca.gov]
Sent: Friday, March 06, 2015 1:25 PM
To: Miller, Alan@Waterboards
Subject: Hazardous Materials Spill Update: Cal OES Control #:15-1291

Governor's Office of Emergency Services
Hazardous Materials Spill Update
CONTROL #: 15-1291 NRC#: 1109821

NOTIFY DATE/TIME: 03/06/2015 / 1149
RECEIVED BY: Tim Tribble | OCCURENCE DATE/TIME:3/6/2015 / 0930
CITY/OP. AREA: South Lake Tahoe/El Dorado County

1.a. PERSON NOTIFYING Cal OES
PERSON CALLING Cal OES: XXX | AGENCY: NRC
PHONE #: 800-424-8802 | EXT: | PAGER #(CELLPHONE):

1.b. PERSON REPORTING SPILL (If different from above):
PERSON CALLING Cal OES: JAY RODRIGUES | AGENCY: ARAMARK
PHONE #: 530-545-2591 | EXT: | PAGER #(CELLPHONE):

SUBSTANCE TYPE:
a. SUBSTANCE: / b.QTY: Amount / Measure / c. TYPE / d. OTHER / e. Pipeline / f. Vessel Over => 300 tons
1. Hydraulic Oil / 5 / Gal(s) / PETROLEUM / / No /

2.

3.

4.

Original Description: Per the NRC Report: CALLER STATED THAT A HYDRAULIC HOSE LEAKED OIL ONTO THE VESSEL AND INTO THE WATER DUE TO UNKNOWN CAUSES. A BOOM WAS PLACED AROUND THE VESSEL, ABSORBENT PADS WERE USED FOR CLEAN UP.

Update(s): 03/06/2015 12:01:05 PM - Per the caller they measure the tank and the total volume release is 10 gallons, about 5 gallons made it into the water. Clean up is in progress by Aramark,

---

PERSON NOTIFYING Cal OES OF SPILL UPDATE:
NAME: Curtis Kiesel | AGENCY: El Dorado County Environmental Management
PHONE #: 530-621-6656 | EXT: | PAGER #(CELLPHONE):

UPDATE QUANTITY:

1. Amount: Gal(s)
2. Amount:
3. Amount:
4. Amount:

UPDATE RECEIVED BY: Tim Tribble
UPDATE KNOWN IMPACT:
UPDATE CAUSE:
SITUATION UPDATE: Per the caller approximately 10 gallons of hydraulic fluid was released. Caller arrived on scene at 1230, the owner of the vessel was putting out a boom to contain the sheen, California Fish and Game was on scene collecting samples, the extent of the sheen is unknown at this time. it appears to have blown towards the marina. The staff of the vessel are cleaning it up at this time

---

CONFIDENTIAL:

FAX NOTIFICATION LIST: AA/CUPA, DFG-OSPR, DTSC, RWQCB, US EPA, USFWS, COASTAL COM, DWP-DO, LANDS, PARKS & REC, USCG, Co/WP, Co/Hlth, Co/E-Hlth, OTHER, DFG/OSPR/MSU
ADMINISTERING AGENCY:
SECONDARY AGENCY:
OTHER NOTIFIED: NRC

Created by Warning Center on 3/6/2015 1:21:49 PM Last Modified by Warning Center on 3/6/2015 1:21:37 PM

California State Warning Center
Governor's Office of Emergency Services
Phone: (916) 845-8911
Warning.Center@oes.ca.gov

Scoralle, Lisa@Waterboards

From:	Miller, Alan@Waterboards
Sent:	Friday, March 06, 2015 1:44 PM
To:	Scoralle, Lisa@Waterboards
Cc:	Ferguson, Scott@Waterboards
Subject:	FW: Hazardous Materials Spill Update: Cal OES Control #:15-1291

-----Original Message-----
From: Warning Center [mailto:Warning.Center@oes.ca.gov]
Sent: Friday, March 06, 2015 12:03 PM
To: Miller, Alan@Waterboards
Subject: Hazardous Materials Spill Update: Cal OES Control #:15-1291

Governor's Office of Emergency Services
Hazardous Materials Spill Update
CONTROL #: 15-1291 NRC#: 1109B21

NOTIFY DATE/TIME: 03/06/2015 / 1149
RECEIVED BY: Tim Tribble | OCCURENCE DATE/TIME:3/6/2015 / 0930
CITY/OP. AREA: South Lake Tahoe/El Dorado County

1.a. PERSON NOTIFYING Cal OES
PERSON CALLING Cal OES: XXX | AGENCY: NRC
PHONE #: 800-424-8802 | EXT: | PAGER #(CELLPHONE):

1.b. PERSON REPORTING SPILL (If different from above):
PERSON CALLING Cal OES: JAY RODRIGUES | AGENCY: ARAMARK
PHONE #: 530-545-2591 | EXT: | PAGER #(CELLPHONE):

SUBSTANCE TYPE:
a. SUBSTANCE: / b.QTY: Amount / Measure / c. TYPE / d. OTHER / e. Pipeline / f. Vessel Over => 300 tons
1. Hydraulic Oil / 5 / Gal(s) / PETROLEUM / / No /

2.

3.

4.

Original Description: Per the NRC Report: CALLER STATED THAT A HYDRAULIC HOSE LEAKED OIL ONTO THE VESSEL AND INTO THE WATER DUE TO UNKNOWN CAUSES. A BOOM WAS PLACED AROUND THE VESSEL, ABSORBENT PADS WERE USED FOR CLEAN UP.

Update(s):

PERSON NOTIFYING Cal OES OF SPILL UPDATE:
NAME: John Phillips | AGENCY: Tahoe Queen
PHONE #: 775-589-4933 | EXT: | PAGER #(CELLPHONE):

UPDATE QUANTITY:
1. Amount: 10 Gal(s)
2. Amount:
3. Amount:
4. Amount:

UPDATE RECEIVED BY: Tim Tribble
UPDATE KNOWN IMPACT:
UPDATE CAUSE: Mechanical
SITUATION UPDATE: Per the caller they measure the tank and the total volume release is 10 gallons, about 5 gallons made it into the water. Clean up is in progress by Aramark,

---

CONFIDENTIAL:

FAX NOTIFICATION LIST: AA/CUPA, DFG-OSPR, DTSC, RWQCB, US EPA, USFWS, COASTAL COM, DWP-DO, LANDS, PARKS & REC, USCG, Co/WP, Co/Hlth, Co/E-Hlth, OTHER, DFG/OSPR/MSU
ADMINISTERING AGENCY:
SECONDARY AGENCY:
OTHER NOTIFIED: NRC

Created by Warning Center on 3/6/2015 12:01:05 PM Last Modified by Warning Center on 3/6/2015 12:00:53 PM

California State Warning Center
Governor's Office of Emergency Services
Phone: (916) 845-8911
Warning.Center@oes.ca.gov

Taxer, Eric@Waterboards

From:	Warning Center@OES
Sent:	Friday, March 06, 2015 11:59 AM
To:	Ferguson, Scott@Waterboards
Subject:	Hazardous Materials Spill Report: Cal OES Control #:15-1291

Governor's Office of Emergency Services
Hazardous Materials Spill Report

DATE: 03/06/2015 | RECEIVED BY Cal OES: Tim Tribble | Cal OES CNTRL #:15-1291
TIME: 1149 | RECEIVED BY OSPR: | NRC#:1109821

1.a. PERSON NOTIFYING Cal OES
1. NAME: XXX | 2. AGENCY: NRC
3. PHONE #: 800-424-8802 | 4. EXT: | 5. PAGER #:

1.b. PERSON REPORTING SPILL (If different from above):
1. NAME: JAY RODRIGUES | 2. AGENCY: ARAMARK
3. PHONE #: 530-545-2591 | 4. EXT: | 5. PAGER #:

---

2. SUBSTANCE TYPE:
a. SUBSTANCE: / b.QTY: / Amount / Measure / c. TYPE / d. OTHER / e. PIPELINE / f. Vessel Over => 300 tons
1. Hydraulic Oil / = / 5 / Gal(s) / PETROLEUM / / No / Unknown

----

2.

3.

----

g. DESCRIPTION: Per the NRC Report: CALLER STATED THAT A HYDRAULIC HOSE LEAKED OIL ONTO THE VESSEL AND INTO THE WATER DUE TO UNKNOWN CAUSES. A BOOM WAS PLACED AROUND THE VESSEL, ABSORBENT PADS WERE USED FOR CLEAN UP.
h. CONTAINED: Yes | i. WATER INVOLVED: Yes
j. WATERWAY: Lake Tahoe | k. DRINKING WATER IMPACTED: Unknown
l. KNOWN IMPACT: Unknown

3.a. INCIDENT LOCATION: 100 SKIRUN BLVD
b. CITY: South Lake Tahoe | c. COUNTY: El Dorado County | d. ZIP:

---

4. INCIDENT DESCRIPTION:
a. DATE: 3/6/2015 | b. TIME(Military): 0930 | c. SITE: Waterways
| d. CAUSE: Unknown

e. INJURIES: No | f. FATALITY: No | g. EVACUATIONS: No | h. CLEANUP BY: Unknown
e. INJURIES #: | f. FATALS #: | g. EVACS #:

---

5. SUSPECTED RESPONSIBLE PARTY:
a. NAME: JAY RODRIGUES | b. AGENCY: ARAMARK
c. PHONE#: 530-545-2591 | d. EXT:
e. MAIL ADDRESS: 760 HWY 50
f. CITY: ZEPHYR COVE | g. STATE: NV | h. ZIP: 89448

---

6. NOTIFICATION INFORMATION:
a. ON SCENE: | b. OTHER ON SCENE:
c. OTHER NOTIFIED: NRC
d. ADMIN. AGENCY:
e. SEC. AGENCY:
f. ADDITIONAL COUNTY: Nevada County , Placer County g. ADMIN. AGENCY: Nevada County Environmental Health Department , Placer County Health Department
h. NOTIFICATION LIST: DOG Unit: | RWQCB Unit: 6A

AA/CUPA, DFG-OSPR, DTSC, RWQCB, US EPA, USFWS, COASTAL COM, DWP-DO, LANDS, PARKS & REC, USCG, Co/WP, Co/Hlth, Co/E-Hlth, OTHER, DFG/OSPR/MSU

CONFIDENTIAL REMARKS:

Created by Warning Center on 3/6/2015 11:49:35 AM Last Modified by Warning Center on 3/6/2015 11:58:52 AM

California State Warning Center
Governor's Office Emergency Services
Phone: (916) 845-8911
Warning.Center@oes.ca.gov

Link to Spill Report:
http://w3.calema.ca.gov/operational/malhaz.nsf/SpillAllDocs/23738FC007CAA83988257E00006CE8FA?OpenDocument

Ferguson, Scott@Waterboards

From: Waming Center <Warning.Center@oes.ca.gov>
Sent: Friday, March 06, 2015 8:45 AM
To: Ferguson, Scott@Waterboards
Subject: Hazardous Materials Spill Update: Cal OES Control #:15-1279

Governor's Office of Emergency Services
Hazardous Materials Spill Update
CONTROL #: 15-1279 NRC#:

NOTIFY DATE/TIME: 03/05/2015 / 2111
RECEIVED BY: Kavin Godwin | OCCURENCE DATE/TIME:3/5/2015 / 1800
CITY/OP. AREA: South Lake Tahoe/El Dorado County

1.a. PERSON NOTIFYING Cal OES
PERSON CALLING Cal OES: Beth Vollmer | AGENCY: Citizen
PHONE #: [redacted] | EXT: | PAGER #(CELLPHONE):

1.b. PERSON REPORTING SPILL (If different from above):
PERSON CALLING Cal OES: | AGENCY:
PHONE #: | EXT: | PAGER #(CELLPHONE):

SUBSTANCE TYPE:
a. SUBSTANCE: / b.QTY: Amount / Measure / c. TYPE / d. OTHER / e. Pipeline / f. Vessel Over => 300 tons
1. Unknown Oil / Unknown / Unknown / PETROLEUM / / No / No

2.

3.

4.

Original Description: Caller states she was at the beach and her dog was in the water and when she arrived at home she found that the dog had an oily substance on her. Caller states she went back to the beach to see what the dog had gotten into caller states there was sheen and when she put her hand in the water it came out oily as in touch (Greasy) .

Update(s): 03/05/2015 09:52:51 PM - NRC Report #1109767 issued with no additional information ; 03/06/2015 08:40:38 AM - RP stats that at appox. 0001-0100 hrs, there was no evidence of an oily sheen. RP states that El Dorado Co. Env Health will conduct a daytime follow-up inspection.

PERSON NOTIFYING Cal OES OF SPILL UPDATE:
NAME: Bryan Vyverberg | AGENCY: El Dorado Co. Env Health
PHONE #: 530-621-5924 | EXT: | PAGER #(CELLPHONE):

UPDATE QUANTITY:

1. Amount: Unknown
2. Amount:
3. Amount:
4. Amount:

UPDATE RECEIVED BY: Tracy Stocks
UPDATE KNOWN IMPACT:
UPDATE CAUSE:
SITUATION UPDATE: RP stats that at appox. 0001-0100 hrs, there was no evidence of an oily sheen. RP states that El Dorado Co. Env Health will conduct a daytime follow-up inspection.

CONFIDENTIAL:

FAX NOTIFICATION LIST: AA/CUPA, DFG-OSPR, DTSC, RWQCB, US EPA, USFWS, COASTAL COM, DWP-DO, LANDS, PARKS & REC, USCG, Co/E-Hlth
ADMINISTERING AGENCY: El Dorado County Environmental Management SECONDARY AGENCY:
OTHER NOTIFIED:

Created by Warning Center on 3/6/2015 8:40:38 AM Last Modified by Warning Center on 3/6/2015 8:45:29 AM

California State Warning Center
Governor's Office of Emergency Services
Phone: (916) 845-8911
Warning.Center@oes.ca.gov

Ferguson, Scott@Waterboards

From:	Warning Center <Warning.Center@oes.ca.gov>
Sent:	Thursday, March 05, 2015 9:54 PM
To:	Ferguson, Scott@Waterboards
Subject:	Hazardous Materials Spill Update: Cal OES Control #:15-1279

Governor's Office of Emergency Services
Hazardous Materials Spill Update
CONTROL #: 15-1279 NRC#: 1109767

NOTIFY DATE/TIME: 03/05/2015 / 2111
RECEIVED BY: Kavin Godwin | OCCURENCE DATE/TIME:3/5/2015 / 1800
CITY/OP. AREA: South Lake Tahoe/El Dorado County

1.a. PERSON NOTIFYING Cal OES
PERSON CALLING Cal OES: Beth Vollmer | AGENCY: Citizen
PHONE #: [redacted] | EXT: | PAGER #(CELLPHONE):

1.b. PERSON REPORTING SPILL (If different from above):
PERSON CALLING Cal OES: | AGENCY:
PHONE #: | EXT: | PAGER #(CELLPHONE):

SUBSTANCE TYPE:
a. SUBSTANCE: / b.QTY: Amount / Measure / c. TYPE / d. OTHER / e. Pipeline / f. Vessel Over => 300 tons
1. Unknown Oil / Unknown / Unknown / PETROLEUM / / No / No

2.

3.

4.

Original Description: Caller states she was at the beach and her dog was in the water and when she arrived at home she found that the dog had an oily substance on her. Caller states she went back to the beach to see what the dog had gotten into caller states there was sheen and when she put her hand in the water it came out oily as in touch (Greasy) .

Update(s): 03/05/2015 09:52:51 PM - NRC Report #1109767 issued with no additional information

---

PERSON NOTIFYING Cal OES OF SPILL UPDATE:
NAME: XXXX | AGENCY: NRC
PHONE #: 800-424-8802 | EXT: | PAGER #(CELLPHONE):

UPDATE QUANTITY:

1. Amount: Unknown
2. Amount:
3. Amount:
4. Amount:

UPDATE RECEIVED BY: Charles Bickinella
UPDATE KNOWN IMPACT:
UPDATE CAUSE:
SITUATION UPDATE: NRC Report #1109767 issued with no additional information

---

CONFIDENTIAL:

FAX NOTIFICATION LIST: AA/CUPA, DFG-OSPR, DTSC, RWQCB, US EPA, USFWS, COASTAL COM, DWP-DO, LANDS, PARKS & REC, USCG, Co/E-Hlth
ADMINISTERING AGENCY: El Dorado County Environmental Management SECONDARY AGENCY:
OTHER NOTIFIED:

Created by Warning Center on 3/5/2015 9:52:51 PM Last Modified by Warning Center on 3/5/2015 9:53:53 PM

California State Warning Center
Governor's Office of Emergency Services
Phone: (916) 845-8911
Warning.Center@oes.ca.gov

Ferguson, Scott@Waterboards

From: Warning Center <Warning.Center@oes.ca.gov>
Sent: Thursday, March 05, 2015 9:23 PM
To: Ferguson, Scott@Waterboards
Subject: Hazardous Materials Spill Report: Cal OES Control #:15-1279

RWQCB 6A, DWP D/O, US EPA, OSPR, State Lands, El Dorado Co Env Health, Please confirm receipt via E-Mail or at 916-845-8911

Governor's Office of Emergency Services
Hazardous Materials Spill Report

DATE: 03/05/2015 | RECEIVED BY Cal OES: Kavin Godwin | Cal OES CNTRL #:15-1279
TIME: 2111 | RECEIVED BY OSPR: | NRC#:

1.a. PERSON NOTIFYING Cal OES
1. NAME: Beth Vollmer | 2. AGENCY: Citizen
3. PHONE #: [redacted] | 4. EXT: | 5. PAGER #:

1.b. PERSON REPORTING SPILL (If different from above):
1. NAME: | 2. AGENCY:
3. PHONE #: | 4. EXT: | 5. PAGER #:

---

2. SUBSTANCE TYPE:
a. SUBSTANCE: / b.QTY: / Amount / Measure / c. TYPE / d. OTHER / e. PIPELINE / f. Vessel Over => 300 tons
1. Unknown Oil / = / Unknown / Unknown / PETROLEUM / / No / No

----

2.

3.

----

g. DESCRIPTION: Caller states she was at the beach and her dog was in the water and when she arrived at home she found that the dog had an oily substance on her. Caller states she went back to the beach to see what the dog had gotten into caller states there was sheen and when she put her hand in the water it came out oily as in touch (Greasy) .
h. CONTAINED: No | i. WATER INVOLVED: Yes
j. WATERWAY: Lake Tahoe | k. DRINKING WATER IMPACTED: Unknown
l. KNOWN IMPACT: Unknown

3.a. INCIDENT LOCATION: South Lake Tahoe at the end of Ski Run Blvd, Western Side of marina
b. CITY: South Lake Tahoe | c. COUNTY: El Dorado County | d. ZIP: 96150

4. INCIDENT DESCRIPTION:
a. DATE: 3/5/2015 | b. TIME(Military): 1800 | c. SITE: Waterways
| d. CAUSE: Unknown
e. INJURIES: No | f. FATALITY: No | g. EVACUATIONS: No | h.
CLEANUP BY: Unknown
e. INJURIES #: | f. FATALS #: | g. EVACS #:

---

5. SUSPECTED RESPONSIBLE PARTY:
a. NAME: Unknown | b. AGENCY:
c. PHONE#: | d. EXT:
e. MAIL ADDRESS:
f. CITY: | g. STATE: CA | h. ZIP:

---

6. NOTIFICATION INFORMATION:
a. ON SCENE: | b. OTHER ON SCENE:
c. OTHER NOTIFIED:
d. ADMIN. AGENCY: El Dorado County Environmental Management e. SEC. AGENCY:
f. ADDITIONAL COUNTY: g. ADMIN. AGENCY:
h. NOTIFICATION LIST: DOG Unit: | RWQCB Unit: 6A

AA/CUPA, DFG-OSPR, DTSC, RWQCB, US EPA, USFWS, COASTAL COM, DWP-DO, LANDS, PARKS & REC, USCG, Co/E-Hlth

CONFIDENTIAL REMARKS:

Created by Warning Center on 3/5/2015 9:11:08 PM Last
Modified by Warning Center on 3/5/2015 9:23:26 PM

California State Warning Center
Governor's Office Emergency Services
Phone: (916) 845-8911
Warning.Center@oes.ca.gov

Link to Spill Report:
http://w3.calema.ca.gov/operational/malhaz.nsf/SpillAllDocs/3A22DD2C09E03AA488257E00001C7C64?OpenDocument

ATTACHMENT 6

March 6, 2015, Electronic Email from Lauri Kemper to Scott Ferguson, et al

This page is intentionally left blank.

Taxer, Eric@Waterboards

From:	Kemper, Lauri@Waterboards
Sent:	Friday, March 06, 2015 5:13 PM
To:	Ferguson, Scott@Waterboards; Tyler, Tobi@Waterboards; Miller, Alan@Waterboards
Cc:	Larsen, Robert@Waterboards
Subject:	FW: USEPA Call - Oil Sheen at Ski Run Marina
Attachments:	photo summary.pdf; Hazardous Materials Spill Report: Cal OES Control #:15-1279

FYI

Thank you , Bob for sharing the info from Jason Burke at the City.

We also received an OES email last nite from beth vollmer who noticed her greasy dog after a walk near ski run marina....

Scott – this incident may need some further follow up with Aramark....seems their boat has had a number of maintenance issues....

Lauri Kemper, P.E.
Assistant Executive Officer
Lahontan Water Board
2501 Lake Tahoe Boulevard
South Lake Tahoe, CA 96150

Lauri.kemper@waterboards.ca.gov
(530) 542-5436

Save our Water – see what more you can do to conserve water at http://saveourwater.com/
For more information on Water Board programs and projects, please see our website at http://www.waterboards.ca.gov/lahontan/

From: Larsen, Robert@Waterboards
Sent: Friday, March 06, 2015 12:26 PM
To: Kemper, Lauri@Waterboards
Subject: FW: USEPA Call - Oil Sheen at Ski Run Marina

FYI – an apparent hydraulic leak on the Tahoe Queen has been identified and staff are taking measures to control the discharge. City stormwater staff have confirmed this isn't an urban runoff issue.

Robert Larsen
Senior Environmental Scientist
Lahontan Water Board
530-542-5439
RLarsen@waterboards.ca.gov

From: Jason Burke [mailto:jburke@cityofslt.us]
Sent: Friday, March 06, 2015 12:20 PM

To: Krista Costantini; Maria Rodriguez; Karen Bender; Houghton, Barbara@El Dorado County Environmental Management Departme
Cc: Ray Jarvis; Larsen, Robert@Waterboards
Subject: RE: USEPA Call - Oil Sheen at Ski Run Marina

Hi Krista:
I went out to the Ski Run Marina to verify if the oily sheen was coming from the City storm drains, as reported in the email below and via a phone call from the Ski Run Marina. The source of the sheen is most likely a hydraulic fluid leak from the Tahoe Queen, and Aramark staff were onsite working to absorb the leak from within and around the boat. Marina personally were also on hand, and had deployed a boom at the mouth of the Marina (see attached photos).

Eric Friedlander, Mark Frisina and myself checked our three storm drain outfalls at around 10:30 this morning with absorbent pads to verify if any of the sheen was coming from our storm drains – there was no oily material present on the absorbent pads placed in the outfalls. We also confirmed this by checking the pipes upstream of the outfalls, and drain inlets leading to the outfalls. There was no sign of any oily material in the city storm drains or coming out of the outfalls.

While we were checking the storm drains, Aramark staff were busy using absorbent materials onboard the Tahoe Queen and in the lake area around the boat. Oil sheen was visible within the Marina and outside the Marina along the shoreline near the Tahoe Queen. The sheen appears to have been blown into the Marina, and a boom is now in place at the mouth of the Marina.

I spoke with Jason Musante by phone, and noted there are no agency staff onsite as of 10:40 AM, only Aramark and Marina staff working to clean up the sheen in the lake apparently from the Tahoe Queen.

Please let me know if you would like any additional information.

Jason Burke
Stormwater Program Coordinator
City of South Lake Tahoe
1052 Tata Lane
South Lake Tahoe, CA 96150
(530) 542-6038
jburke@cityofslt.us

From: Krista Costantini [mailto:krista.costantini@edcgov.us]
Sent: Friday, March 06, 2015 10:59 AM
To: Jason Burke; Maria Rodriguez; Karen Bender; Barbara Houghton
Subject: USEPA Call - Oil Sheen at Ski Run Marina

Hello,
We just received a call from Jason Musante with USEPA, (213) 479-2120. They received a citizen complaint about an oily substance that was on his dog after it came out of the water. Mr. Musante contacted Dan Jack at the Marina who said it appears the substance is eminating from the storm drain. Mr. Musante requested follow up. OES #15-1279

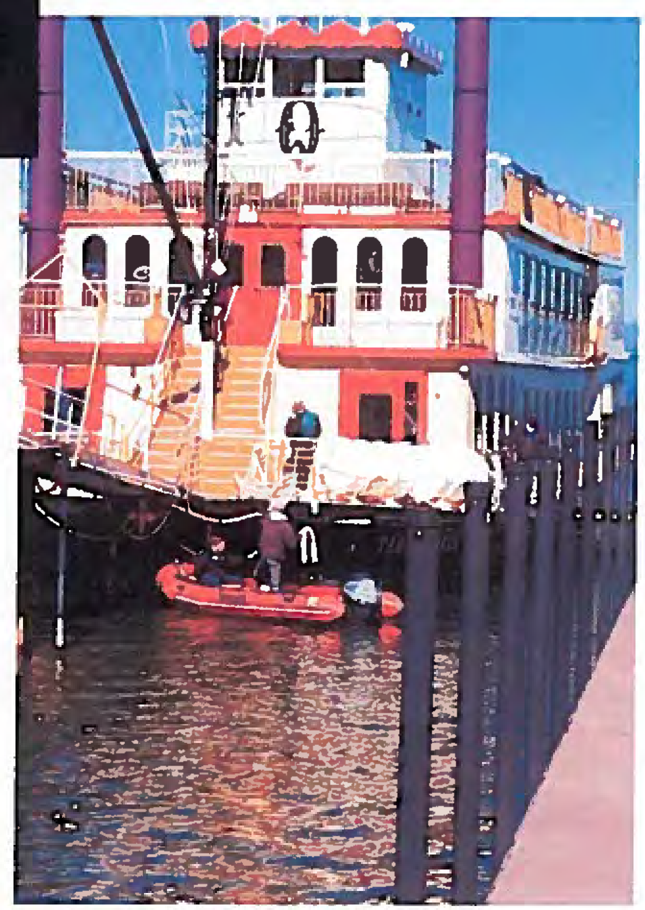
I gave Mr. Musante contact numbers for City stormwater personnel as well.

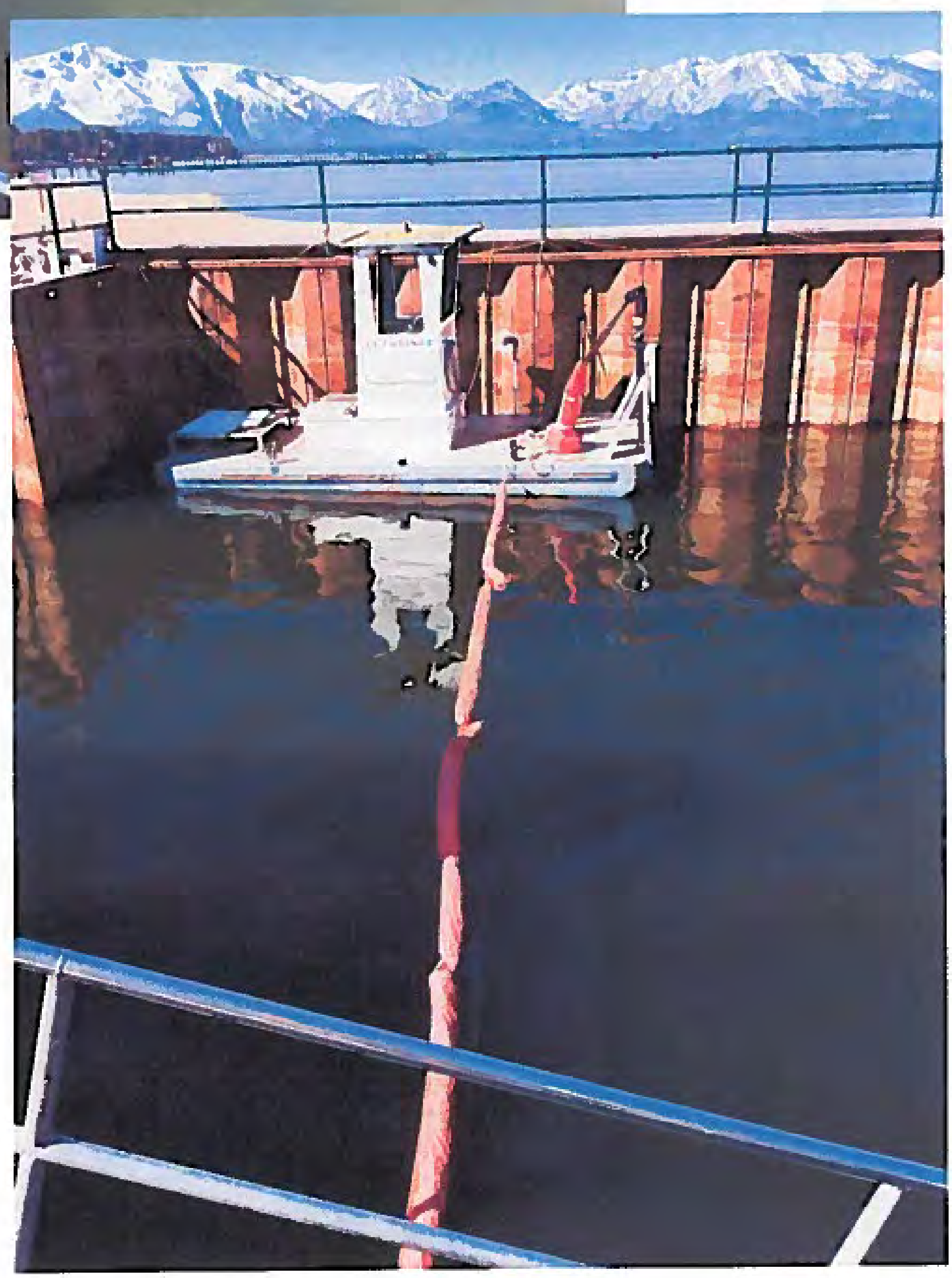
Krista Costantini
Development Aide

County of El Dorado
Community Development Agency
Environmental Management Division
3368 Lake Tahoe Blvd., Suite 303
So. Lake Tahoe, CA 96150
(530) 573-3450 / FAX (530) 542-3364
krista.costantini@edcgov.us

Oil sheen on lakeshore near Tahoe Queen

Tahoe Queen staff working to absorb hydraulic fluid leak on ship

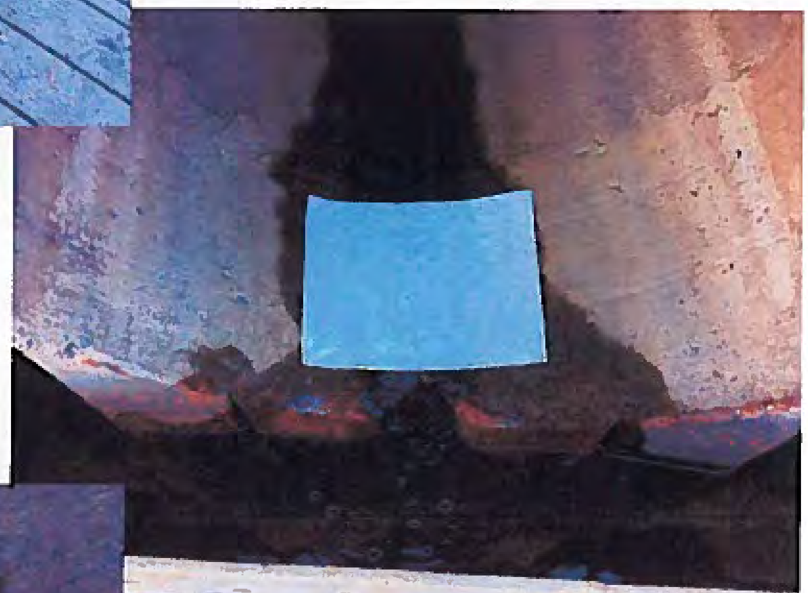


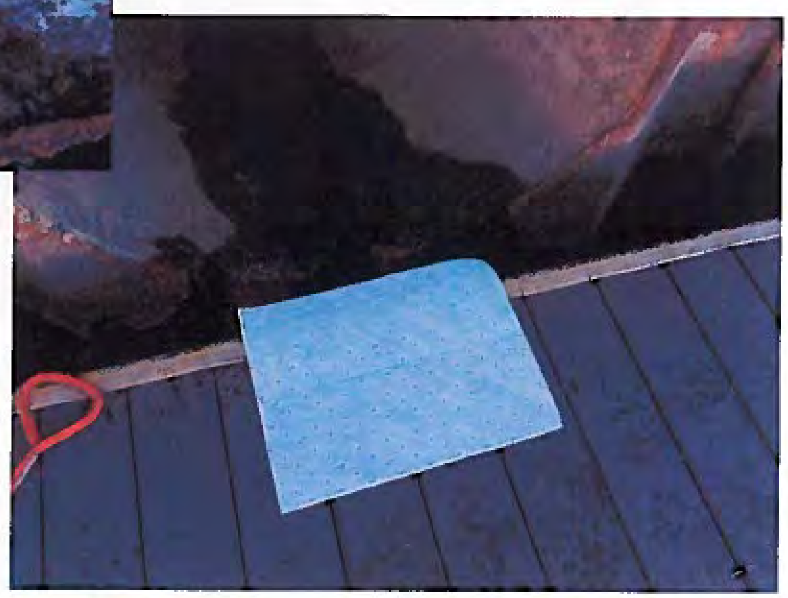


Boom deployed by Ski Run Boat Company staff to contain or prevent oily sheen from entering or leaving the marina

Absorbent pads palced in City storm drain outfalls into marina to verify if oil sheen is coming from storm drain:

No oil or hydraulic fluid was observed on the absorbent pads, and an upstream field survey of the drainage system indacted no oil or fluid spills were reaching storm drains



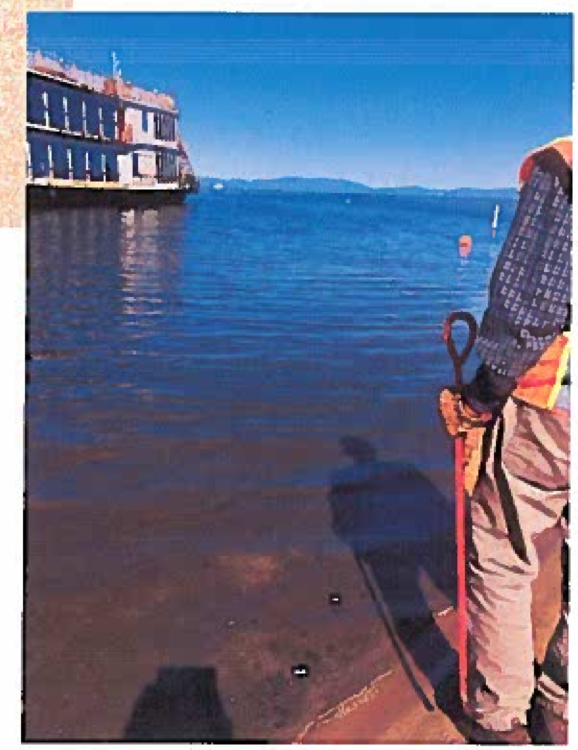


Absorbent boom before

Absorbent boom in upstream storm drain

Absorbent boon after placement in storm drain pipe upstream from Ski Run Marina, no oily material present

Oil sheen on lake (outside of Ski Run Marina, next to Tahoe Queen), visible only in shadows due to lighting.



Taxer, Eric@Waterboards

From: Warning Center@OES
Sent: Thursday, March 05, 2015 9:23 PM
To: Kemper, Lauri@Waterboards
Subject: Hazardous Materials Spill Report: Cal OES Control #:15-1279

RWQCB 6A, DWP D/O, US EPA, OSPR, State Lands, El Dorado Co Env Health, Please confirm receipt via E-Mail or at 916-845-8911

Governor's Office of Emergency Services
Hazardous Materials Spill Report

DATE: 03/05/2015 | RECEIVED BY Cal OES: Kavin Godwin | Cal OES CNTRL #:15-1279
TIME: 2111 | RECEIVED BY OSPR: | NRC#:

1.a. PERSON NOTIFYING Cal OES
1. NAME: Beth Vollmer | 2. AGENCY: Citizen
3. PHONE #: [redacted] | 4. EXT: | 5. PAGER #:

1.b. PERSON REPORTING SPILL (If different from above):
1. NAME: | 2. AGENCY:
3. PHONE #: | 4. EXT: | 5. PAGER #:

---

2. SUBSTANCE TYPE:
a. SUBSTANCE: / b.QTY: / Amount / Measure / c. TYPE / d. OTHER / e. PIPELINE / f. Vessel Over => 300 tons
1. Unknown Oil / = / Unknown / Unknown / PETROLEUM / / No / No

----

2.

3.

----

g. DESCRIPTION: Caller states she was at the beach and her dog was in the water and when she arrived at home she found that the dog had an oily substance on her. Caller states she went back to the beach to see what the dog had gotten into caller states there was sheen and when she put her hand in the water it came out oily as in touch (Greasy) .
h. CONTAINED: No | i. WATER INVOLVED: Yes
j. WATERWAY: Lake Tahoe | k. DRINKING WATER IMPACTED: Unknown
l. KNOWN IMPACT: Unknown

3.a. INCIDENT LOCATION: South Lake Tahoe at the end of Ski Run Blvd, Western Side of marina
b. CITY: South Lake Tahoe | c. COUNTY: El Dorado County | d. ZIP: 96150

4. INCIDENT DESCRIPTION:
a. DATE: 3/5/2015 | b. TIME(Military): 1800 | c. SITE: Waterways
| d. CAUSE: Unknown
e. INJURIES: No | f. FATALITY: No | g. EVACUATIONS: No | h.
CLEANUP BY: Unknown
e. INJURIES #: | f. FATALS #: | g. EVACS #:

5. SUSPECTED RESPONSIBLE PARTY:
a. NAME: Unknown | b. AGENCY:
c. PHONE#: | d. EXT:
e. MAIL ADDRESS:
f. CITY: | g. STATE: CA | h. ZIP:

6. NOTIFICATION INFORMATION:
a. ON SCENE: | b. OTHER ON SCENE:
c. OTHER NOTIFIED:
d. ADMIN. AGENCY: El Dorado County Environmental Management e. SEC. AGENCY:
f. ADDITIONAL COUNTY: g. ADMIN. AGENCY:
h. NOTIFICATION LIST: DOG Unit: | RWQCB Unit: 6A

AA/CUPA, DFG-OSPR, DTSC, RWQCB, US EPA, USFWS, COASTAL COM, DWP-DO, LANDS, PARKS & REC, USCG, Co/E-Hlth

CONFIDENTIAL REMARKS:

Created by Warning Center on 3/5/2015 9:11:08 PM Last
Modified by Warning Center on 3/5/2015 9:23:26 PM

California State Warning Center
Governor's Office Emergency Services
Phone: (916) 845-8911
Warning.Center@oes.ca.gov

Link to Spill Report:
http://w3.calema.ca.gov/operational/malhaz.nsf/SpillAllDocs/3A22DD2C09E03AA488257E00001C7C64?OpenDocument

ATTACHMENT 7

Economic Benefit Analysis Spreadsheet

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Economic Benefit Analysis

Aramark Sports and Entertainment Services, LCC

Compliance Action	Capital Investment Amount	Capital Investment Basis	Capital Investment Date	Capital Investment Delayed?	One-Time Non-Depreciable Expenditure Amount	One-Time Non-Depreciable Expenditure Basis	One-Time Non-Depreciable Expenditure Date	One-Time Non-Depreciable Expenditure Delayed?	Annual Cost Amount	Annual Cost Basis	Annual Cost Date	Non-Compliance Date	Compliance Date	Penalty Payment Date	Discount Rate	Benefit of Non-Compliance
Proper Hydraulic Line Seal		ECI	1/1/2015	Y	$ 450.00	ECI	8/28/2015	N		ECI	1/1/2015	3/5/2015	5/11/2016	5/11/2016	7.30%	$ 293
SOP Development		ECI	1/1/2015	Y	$ 3,300.00	ECI	8/28/2015	Y		ECI	1/1/2015	5/20/2010	7/9/2015	5/11/2016	7.60%	$ 879
SOP Training		ECI	1/1/2015	Y		ECI	1/1/2015	N	$ 440	ECI	8/28/2015	5/20/2010	7/9/2015	5/11/2016	7.60%	$ 1,741
LOTO Training		ECI	1/1/2015	Y		ECI	1/1/2015	N	$ 340	ECI	8/28/2015	5/20/2010	7/9/2015	5/11/2016	7.60%	$ 1,344

Income Tax Schedule: For-Profit (Other than C-Corporation) **Analyst:** Bryan Elder **Total Benefit: $ 4,257**

USEPA BEN Model Version: Version 5.5.0 (July 2015) **Date/Time of Analysis:** 3/1/2016 8:32

Assunptions:

1 Costs for proper hydraulic line seal were provided by Discharger and assumed to include mostly labor expenses.
2 SOP development costs provided by Discharger.
3 SOP and LOTO training are assumed to be annually conducted based on SOP training schedule. Costs provided by Discharger.
4 Non-compliance date for hydraulic line seal assumed to be date of ilicit discharge.
5 Non-compliance date for SOP development and training assumed to be implementation date of SWRCB Enforcement Policy. Historical operation without proper training and standard procedures has been excluded.
6 Compliance date assumed to be the penalty payment date for avoided costs. Compliance date for SOP and training assumed to be July 9, 2015.
7 Penalty payment date assumed to be the proposed Regional Board hearing date of May 11, 2016.
8 The economic benefit analysis assumes the Discharger operates as a for-profit entity.

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ATTACHMENT **C**

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Penalty Calculation Methodology Worksheet - Version Date: 2/4/2014

Instructions
1. Select Potential Harm for Discharge Violations
2. Select Characteristics of the Discharge
3. Select Susceptibility to Cleanup or Abatement
4. Select Deviation from Standard
5. Click "Determine Harm & per Gallon/Day..."
6. Enter Values into the Yellow highlighted fields

Select Item	4 = Above Moderate
Select Item	2 = Discharged material poses moderate risk
Select Item	> 50% of Discharge Susceptible to Cleanup or A
Select Item	Major

Discharger Name/ID: Aramark: Tahoe Queen

				Violation 1	
Discharge Violations	**Step 1**	Potential Harm Factor (Generated from Button)	6		
	Step 2	Per Gallon Factor (Generated from Button)	0.22		
		Gallons	0		
		Statutory Maximum	10000.00		
		High Volume			
		Total		**$**	**-**
		Per Day Factor (Generated from Button)	0.22		
		Days	1		
		Statutory Max per Day	$ 10,000		
		Total		**$**	**2,200**
Non-Discharge Violations	**Step 3**	Per Day Factor			
		Total Days			
		Multiple Day Violation Reduction			
		Statutory Max per Day			
		Total		$	-
		Initial Amount of the ACL		**$**	**2,200.00**
Add'l Factors	**Step 4**	Culpability	1.5	$	3,300.00
		Cleanup and Cooperation	1.25	$	4,125.00
		History of Violations	1	$	4,125.00
		Maximum for this Violation	$ 10,000.00		
		Amount for this Violation		$	4,125.00

Step 5	**Total Base Liability Amount**			**$**	**4,125.00**
Step 6		Ability to Pay & to Continue in Business	1	$	4,125.00
Step 7		Other Factors as Justice May Require	1	$	4,125.00
		Staff Costs	$ -	$	4,125.00
Step 8		Economic Benefit	$ 4,257		
Step 9		Minimum Liability Amount	$ 4,683.00		
		Maximum Liability Amount	$ 10,000.00		
Step 10	**Final Liability Amount**			**$**	**4,683.00**

Penalty Day Range Generator

Start Date of Violation=		
End Date of Violation=		
Maximum Days Fined (Steps 2 & 3) =		Days
Minimum Days Fined (Steps 2 & 3) =		Days

ENCLOSURE 2

FOR ADMINISTRATIVE CIVIL LIABILITY COMPLAINT

By signing this waiver, I affirm and acknowledge the following:

I am duly authorized to represent Travel Systems, LLC, and Aramark Sports and Entertainment Services, LCC (hereinafter "Discharger") in connection with Administrative Civil Liability Complaint No. R6T-2016-0006 (hereinafter the "Complaint"). I am informed that California Water Code section 13323, subdivision (b), states that, "a hearing before the regional board shall be conducted within 90 days after the party has been served [with the complaint]. The person who has been issued a complaint may waive the right to a hearing."

☐ ***(Check here if the Discharger waives the hearing requirement and will pay the liability.)***

a. I hereby waive any right the Discharger may have to a hearing before the Regional Water Board.

b. I certify that the Discharger will remit payment for the civil liability imposed in the total amount of **four thousand six hundred eighty three dollars ($4,683)** by check that references "ACL Complaint No. R6T-2016-0006" made payable in the amount of **$4,683** to the "*State Water Pollution Cleanup and Abatement.*" Payment must be received by the Regional Water Board by **5:00 p.m. on April 4, 2016,** or the Regional Water Board may adopt an Administrative Civil Liability Order requiring payment.

c. I understand the payment of the above amount constitutes a proposed settlement of the Complaint, and that any settlement will not become final until after the 30-day public notice and comment period mandated by the State Water Resources Control Board's Water Quality Enforcement Policy expires. Should the Regional Water Board receive significant new information or comments from any source (excluding the Water Board's Prosecution Team) during this comment period, the Regional Water Board's Assistant Executive Officer may withdraw the complaint, return payment, and issue a new complaint. I understand that this proposed settlement is subject to approval by the Regional Water Board, and that the Regional Water Board may consider this proposed settlement in a public meeting or hearing. I also understand that approval of the settlement will result in the Discharger having waived the right to contest the allegations in the Complaint and the imposition of civil liability.

d. I understand that payment of the above amount is not a substitute for compliance with applicable laws and that continuing violations of the type alleged in the Complaint may subject the Dischargers to further enforcement, including additional civil liability.

____
(Print Name and Title)

____
(Signature)

____
(Date)

ENCLOSURE 3

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

HEARING PROCEDURES

CONSIDERATION OF ADOPTION OF AN ADMINISTRATIVE CIVIL LIABILITY ORDER FOR ARAMARK, EL DORADO COUNTY

WATER BOARD PUBLIC HEARING SCHEDULED FOR MAY 11-12, 2016

Please read these hearing procedures carefully. Failure to comply with the deadlines and other requirements contained herein may result in the exclusion of your documents and/or testimony.

Background

On February 19, 2016, the Lahontan Water Board Prosecution Team mailed an Administrative Civil Liability Complaint (Complaint) to John Phillips, Fleet and Facilities Director with Aramark Sports and Entertainment Services, LCC and Travel Systems LLC, and to The Corporation Trust Company of Nevada, Registered Agent, regarding the Tahoe Queen sightseeing boat in South Lake Tahoe, El Dorado County. The Complaint alleges that Aramark Sports and Entertainment Services, LCC and Travel Systems LLC (collectively referred to as "Aramark" or "Discharger") violated the Clean Water Act, California Water Code, and waste discharge prohibitions specified by the *Water Quality Control Plan for the Lahontan Region*. The Complaint recommends imposing a $4,983 liability against Aramark. For more information, see:

http://www.waterboards.ca.gov/rwqcb6/water_issues/programs/enforcement/

Purpose and Timing of Public Hearing

The purpose of the public hearing is to consider relevant evidence and testimony regarding the Complaint. Following the hearing, the Lahontan Water Board will consider adopting the liability (as proposed in the Complaint or for a different amount, either higher or lower than proposed, but not to exceed the maximum liability provided for by law), rejecting it, or referring the matter to the California Attorney General.

The public hearing will be held during the regular meeting of the Lahontan Water Board on May 11-12, 2016. The public hearing will begin at a time and location as announced in the Lahontan Water Board meeting agenda. An agenda for the meeting will be available on the Lahontan Water Board's web page at www.waterboards.ca.gov/lahontan no later than **10 days before the meeting.**

Public Hearing Deadlines

Deadline	Who Submits?	Written Item
March 4, 2016, 14 days from Complaint Release Date 4pm	Designated Parties and The Public	Objections to the Hearing Procedures
March 4, 2016, 14 days from Complaint Release Date, 4pm	The Public	Requests for Designated Party status
March 4, 2016, 14 days from Complaint Release Date, 4pm	Prosecution Team	Witness list, summaries of witness testimony, and referenced documents,
March 11, 2016, 21 days after Complaint Release Date, 4pm	Designated Parties	Objections to requests for Designated Party status
April 4, 2016, 45 days from Complaint Release Date, 4pm	Designated Parties, except the Prosecution Team	Technical and legal arguments/briefs, supporting evidence and documents, and witness lists, and summaries of witness testimony
April 11, 2016, 52 days from Complaint Release Date, 4pm	Designated Parties and The Public	Requests for additional time at the hearing
April 11, 2016, 52 days from Complaint Release Date, 4pm	The Public	Statements pertaining to the allegations
April 18, 2016, 59 days from Complaint Release Date, 4pm	Prosecution Team	Rebuttal evidence or testimony
April 25, 2016, 66 days from Complaint Release Date, 4pm	Designated Parties, except the Prosecution Team	Objections to Prosecution Team rebuttal evidence or testimony

The above-listed deadlines apply to those who want to participate in the Lahontan Water Board's May 11-12, 2016 public hearing. The Lahontan Water Board's Prosecution Team and Aramark (**Designated Parties**) will have an opportunity to submit evidence, written testimony, technical briefs, and/or legal briefs prior to the public hearing. **The Public**, which includes, but is not limited to, any interested agency, organization, public official, or private citizen, will also have an opportunity to submit written comments or statements prior to the public hearing. The table, above, identifies when the Designated Parties and the Public are required to submit their written materials in preparation for the public hearing.

Instructions for All Submittals

To facilitate the public hearing process, the following types of information/documentation must be submitted prior to the public hearing for Lahontan Water Board review:

- Technical and legal arguments/briefs
- Supporting evidence and documents, including witness lists and summaries of witness testimony
- Statements pertaining to the allegations

All submittals must be on 8½" x 11" size paper (including attachments and figures), must be in a legible font no smaller than 11-point size, and should be submitted electronically in a searchable pdf format. In an effort to save paper and electronic file space, you may reference documents that have been previously submitted or are part of the public record for this case, and there is no need or requirement to include full copies of those documents. For each document included by reference, identify the name of that document, the location of where the document resides, a copy of the relevant pages from the document, and a statement explaining why those excerpts of the document are relevant to your case. Examples of such documents that need not be submitted in full include, but are not limited to, previously submitted monitoring reports, documents that have been shared between the Prosecution Team and Aramark, and documents that can be downloaded from the Lahontan Water Board's website regarding this case:

http://www.waterboards.ca.gov/lahontan/water_issues/programs/enforcement/index

Party-Specific Instructions

For the Public – Please submit your information to the Lahontan Water Board's Executive Assistant, Sue Genera. Ms. Genera works at the Lahontan Water Board's South Lake Tahoe office and she can be reached at Sue.Genera@waterboards.ca.gov or (530) 542-5414. Please contact Ms. Genera directly if you have any questions. Each email or hard copy submittal sent to Ms. Genera must have in the subject line, "Aramark ACL Hearing." Ms. Genera will distribute your information to the Lahontan Water Board members, the Lahontan Water Board's Advisory Team, and to the Designated Parties.

For the Prosecution Team – In addition to a hard copy original, the Prosecution Team shall submit an electronic copy of each submittal, in addition to 15 hard copies (double-sided, three-hole punched) to Ms. Genera. The originals, electronic copies, and 15 hard copies of each submittal must be received by Ms. Genera by the deadlines specified above. An additional copy (electronic or hard copy) of each submittal must also be sent to the Advisory Team's Staff Counsel and to the other Designated Parties and received by the deadlines specified above. Each email or hard copy submittal must have in the subject line, "Aramark ACL Hearing." Ms. Genera will distribute Prosecution Team submittals to the Lahontan Water Board members and the Lahontan Water Board's Advisory Team.

For Designated Parties Other than the Prosecution Team – If the submittals include more than 20 pages, follow the directions for the Prosecution Team specified above. Otherwise, an original and one electronic copy must be received by Ms. Genera by the deadlines specified above. An additional copy (electronic or hard copy) of each submittal must also be submitted to the Advisory Team's Staff Counsel and the Prosecution Team Primary Representatives identified, below, and received by the deadlines specified above. Each e-mail or hard copy submittal must have in the subject line, "Aramark ACL Hearing." Ms. Genera will distribute your submittals to the Lahontan Water Board members and the Lahontan Water Board's Advisory Team.

Objections to Hearing Procedures

The public hearing will be conducted in accordance with this set of hearing procedures or as it may be amended. A copy of the general procedures governing adjudicatory hearings before the Lahontan Water Board may be found at California Code of Regulations, title 23, sections 648 et seq., and is available at www.waterboards.ca.gov or upon request. In accordance with section 648, subdivision (d), any procedure not provided by this set of hearing procedures is deemed waived.

Ms. Genera must receive any objections to this set of hearing procedures **no later than 4:00 p.m. on March 4, 2016** or they will be considered waived.

Public Hearing Participants

Participants in these public hearings are identified as either "Designated Parties" or "Public" or "Advisory Team." Designated Parties may present evidence and cross-examine witnesses and are subject to cross-examination. The Public includes all parties (e.g., the private citizens, public officials, agencies, organizations, interest groups), other than those identified as Designated Parties or Advisory Team. The Public may present non-evidentiary policy statements (statements or comments), but may not cross-examine witnesses and are not subject to cross-examination. The Advisory Team provides impartial technical and legal advice to the Lahontan Water Board members following the public hearing. Designated Parties and the Public may be asked to respond to questions from Lahontan Water Board members and the Advisory Team.

The following participants are hereby identified as Designated Parties in this proceeding:

1. Lahontan Water Board Prosecution Team
2. Aramark

Requesting Designated Party Status

Persons who wish to participate in the public hearing as a Designated Party must submit their request for Designated Party status in writing (with copies of the request sent to the other Designated Parties). Such requests must be received by Ms. Genera **no later than 4:00 p.m. on March 4, 2016**. The request shall: (1) include an explanation of the basis for the request (e.g., how the issues to be addressed in the hearing and the potential actions by the Lahontan Water Board affect the person requesting the status change); and, (2) include a statement explaining why the currently identified Designated Parties do not adequately represent the interests of the person requesting the status change. Objections to such request must be received by Ms. Genera **no later than 4:00 p.m. on March 11, 2016.**

Primary Representatives

For the Lahontan Water Board's Advisory Team

Patty Z. Kouyoumdjian, Executive Officer Lahontan Regional Water Quality Control Board 2501 Lake Tahoe Blvd. South Lake Tahoe, CA 96150 Patty.Kouyoumdjian@waterboards.ca.gov Phone: (530) 542-5412 Fax: (530) 544-2271	Kim Niemeyer, Staff Counsel State Water Resources Control Board, Office of Chief Counsel 1001 I Street Sacramento, CA 95814 Kim.Niemeyer@waterboards.ca.gov Phone: (530) 341-5549 Fax: (916) 341-5199

For the Water Board's Prosecution Team

Scott Ferguson, Supervising WRC Engineer Lahontan Regional Water Quality Control Board 2501 Lake Tahoe Blvd. South Lake Tahoe, CA 96150 Scott.Ferguson@waterboards.ca.gov Phone: (530) 542-5432 Fax: (530) 542-5470	John Prager, Staff Counsel State Water Resources Control Board, Office of Enforcement 1001 I Street Sacramento, CA 95814 Prager.John@waterboards.ca.gov Phone: (916) 341-5542

For Aramark

John Phillips, Fleet and Facilities Director Aramark Sports and Entertainment Services, LCC Travel Systems LLC PO Box 12309 Zephyr Cove, NV 89448 Phillips-john@aramark.com	The Corporation Trust Company of Nevada, Registered Agent 701 South Carson Street, Suite 200 Carson City, Nevada 89701

Separation of Functions

As indicated above, Lahontan Water Board staff participating in this proceeding has been separated into two teams to help ensure the fairness and impartiality of this proceeding. The Lahontan Water Board's Prosecution Team includes staff who will act in a prosecutorial role by presenting evidence for consideration by the Lahontan Water Board. The Lahontan Water Board's Advisory Team includes staff who will provide the Water Board with technical and legal advice.

Advisory Team members are: Patty Z. Kouyoumdjian, Executive Officer; Doug Smith, Supervising Engineering Geologist; and Kim Niemeyer, Staff Counsel.

Prosecution Team members are: Lauri Kemper, Assistant Executive Officer; John Prager, Staff Counsel; Scott Ferguson, Supervising WRC Engineer; Catherine Pool, Senior WRC Engineer; and Eric Taxer, WRC Engineer.

Any members of the Advisory Team who normally supervise any members of the Prosecution Team are not acting as their supervisors in this proceeding, and vice versa. Members of the Prosecution Team may have acted as advisors to the Lahontan Water Board in other, unrelated matters, but they are not advising the Lahontan Water Board in this proceeding. Members of the Prosecution Team have not had any ex parte communications with Lahontan Water Board members or Advisory Team members regarding this proceeding.

Ex Parte Communication

The Designated Parties and Public are forbidden from engaging in ex parte communications regarding this matter with Lahontan Water Board members or Advisory Team members. An ex parte contact is any written or verbal communication pertaining to the investigation, preparation or prosecution of the proposed Order between a Designated Party or the Public on one hand, and a Lahontan Water Board member or Advisory Team member on the other hand, unless the communication is copied to all other Designated Parties (if written) or made in a manner open to all other Designated Parties (if verbal). Communications regarding non-controversial procedural matters are not ex parte contacts and are not restricted. Communications among one or more Designated Parties and the Public themselves are not ex parte contacts.

Hearing Time Limits

Please note that the scheduled public hearing is designed for the Designated Parties to simply summarize the previously submitted evidence/technical and legal arguments. This means that all evidence and/or arguments must be submitted by the deadlines specified in these Hearing Procedures, so the Designated Parties do not need to reintroduce any evidence. At the hearing, the Designated Parties should focus their limited time to highlight important points from the previously submitted evidence or testimony.

To ensure that all participants have an opportunity to participate in the hearing, the following time limits shall apply: each Designated Party shall have a combined 45 minutes to present an overview of its evidence, to present and cross-examine witnesses, and to provide a closing statement; and each Public participant shall have 10 minutes to present non-evidentiary statements. Participants with similar interests or comments are requested to make joint presentations, and participants are requested to avoid redundant comments. Participants (Designated Parties and the Public) who would like additional time must submit their request in writing to Ms. Genera with copies to the Designated Parties. Such requests must be received by Ms. Genera **no later than 4:00 p.m. on April 11, 2016.** Additional time may be provided at the discretion of the Advisory Team (prior to the hearing) or the Water Board Chair (at the hearing) upon a showing that additional time is necessary.

Evidence, Exhibits and Policy Statements

The following information must be submitted in advance of the public hearing:

1. All written evidence and exhibits that a Designated Party would like the Lahontan Water Board to consider. Evidence and exhibits already in the Lahontan Water Board's public files may be submitted by reference as long as the exhibits and their location are clearly identified in accordance with California Code of Regulations, title 23, section 648.3.

2. All legal briefs and technical arguments or analysis.

3. The name of each witness, if any, whom a Designated Party intends to call at the hearing, and a summary of each witness' proposed testimony.

4. The qualifications of each expert witness, if any.

The Prosecution Team has indicated that it has submitted its evidence as part of the Complaint. The Prosecution Team has yet to submit its Witness List, Summaries of Witness Testimony, and List of Documents to be incorporated by Reference. The Prosecution Team shall submit this information according to the Instructions for All

Submittals, above. This information must be received by Ms. Genera **no later than 4:00 p.m.** on **March 4, 2016.**

Aramark shall submit their information (described in Nos. 1 - 4, above) according to the Instructions for All Submittals, above. This information must be received by Ms. Genera **no later than 4:00 p.m. on April 4, 2016.**

The Prosecution Team has the opportunity to submit rebuttal evidence or testimony in conformance with the Instructions for All Submittals. This material must be received by Ms. Genera **no later than 4:00 p.m. on April 18, 2016.**

The Public who would like to submit written non-evidentiary statements pertaining to the allegations are encouraged to submit them to Ms. Genera as early as possible, but **no later than 4:00 p.m. on April 11, 2016.** Public members do not need to submit written comments in order to speak at the public hearing.

In accordance with California Code of Regulations, title 23, section 648.4, the Lahontan Water Board endeavors to avoid surprise testimony or evidence. Absent a showing of good cause and lack of prejudice to the parties, the Lahontan Water Board may exclude evidence and testimony that is not submitted in accordance with these hearing procedures. Excluded evidence and testimony will not be considered by the Lahontan Water Board and will not be included in the administrative record for this proceeding. Power Point and other visual presentations may be used at the hearing, but their content may not exceed the scope of other timely submitted written material. A written and electronic copy of such material that Designated Parties or the Public intend to present at the hearing must be submitted to Ms. Genera at or before the hearing for inclusion in the administrative record. Additionally, any witness who has submitted written testimony for the hearing shall appear at the hearing and affirm that the written testimony is true and correct, and shall be available for cross-examination.

Evidentiary Objections

The Designated Parties other than the Prosecution Team shall submit all written objections to the Prosecution Team's evidence and testimony as part of the Designated Parties' information due **April 4, 2016**. The Prosecution Team shall submit all written objections to the other Designated Parties' evidence and testimony as part of the Prosecution Team's rebuttal due **April 18, 2016**. The Designated Parties other than the Prosecution Team shall submit their written objections to the Prosecution Team's rebuttal evidence and testimony according to the Instructions for All Submittals, above. This information must be received by Ms. Genera **no later than 4:00 p.m. on April 25, 2016.** The Advisory Team will notify the parties about further action to be taken on such objections (if any) and when that action will be taken.

Request for Pre-hearing Conference

A Designated Party may request that a pre-hearing conference be held before the public hearing in accordance with Water Code section 13228.15. A pre-hearing conference may address any of the matters described in subdivision (b) of Government Code section 11511.5:

1. Exploration of settlement possibilities.
2. Preparation of stipulations.
3. Clarification of issues.
4. Rulings on identity and limitation of the number of witnesses.
5. Objections to proffers of evidence.
6. Order of presentation of evidence and cross-examination.
7. Rulings regarding issuance of subpoenas and protective orders.
8. Schedules for the submission of written briefs and schedules for the commencement and conduct of the hearing.
9. Exchange of witness lists and of exhibits or documents to be offered in evidence at the hearing.
10. Motions for intervention.
11. Exploration of the possibility of using alternative dispute resolution provided in Article 5 (commencing with Section 11420.10) of, or the informal hearing procedure provided in Article 10 (commencing with Section 11445.10) of, Chapter 4.5, and objections to use of the informal hearing procedure. Use of alternative dispute resolution or of the informal hearing procedure is subject to subdivision (d).
12. Any other matters as shall promote the orderly and prompt conduct of the hearing.

Requests must contain a description of the issues proposed to be discussed during that conference, and must be submitted to Ms. Genera, with a copy to all other Designated Parties, as early as practicable.

Evidentiary Documents and File

The Complaint and related evidentiary documents are on file and may be inspected or copied at the Lahontan Water Board's office at 2501 Lake Tahoe Blvd, South Lake Tahoe, CA. These files shall be considered part of the official administrative record for this public hearing. Other submittals received for this proceeding will be added to these files and will become part of the administrative record absent a contrary ruling by the Lahontan Water Board Chair.

Questions

Please send any questions regarding this public hearing to Ms. Genera at (530) 542-5414 (Sue.Genera@waterboards.ca.gov).

Patty Z. Kouyoumdjian

Patty Z. Kouyoumdjian
Executive Officer

DATE: February 19, 2016

ENCLOSURE 4

California Regional Water Quality Control Board
Lahontan Region

PUBLIC PARTICIPATION IN THE ENFORCEMENT HEARING PROCESS

Many steps take place before the Lahontan Water Board makes its decision regarding proposed formal enforcement actions (e.g., Cease and Desist Orders, Administrative Civil Liability Orders (fines) at a public hearing. One important element in the Lahontan Water Board's decision-making process is **public participation**. This document helps to identify how the public can participate in the Lahontan Water Board's decision-making process regarding formal enforcement actions brought before the Lahontan Water Board.

There are four major sequential steps involved with Lahontan Water Board decision-making process that include: 1) The Proposed Enforcement Action, 2) Hearing Procedures, 3) Evidence Submittal, Rebuttal, and Objections, and 4) Lahontan Water Board Public Hearing. **The Public**, which includes but is not limited to, any private citizen, public official, interested agency, or organization that is not identified as a "Designated Party" by the Hearing Procedures, has multiple opportunities to participate in the Lahontan Water Board's public hearing process, as described below.

Step 1: The Proposed Enforcement Action

The Lahontan Water Board's Prosecution Team (Prosecution Team) gathers evidence and presents its case by releasing a proposed enforcement action, either a complaint or proposed enforcement order. The proposed enforcement actions contain allegations regarding responsible parties and violations of laws, regulations, and/or permit requirements, in addition to requirements for taking corrective actions or paying fines.

Hearing Procedures are released by the Lahontan Water Board's Advisory Team (Advisory Team) at the same time or shortly after the proposed enforcement action is released. The Hearing Procedures, in part, identify how and when the Public participates in the Lahontan Water Board's decision-making process regarding the proposed enforcement actions. The Hearing Procedures and proposed enforcement actions can be found through this Lahontan Water Board webpage:

http://www.waterboards.ca.gov/lahontan/water_issues/programs/enforcement/index.shtml

Step 2: Hearing Procedures

The Hearing Procedures identify numerous opportunities for submitting evidence, testimony, and public comments In preparation for the public hearing. The Hearing Procedures also explain how the public hearing itself will proceed.

Opportunity #1 for Public Participation-Objections to Hearing Procedures
The Hearing Procedures establish a deadline for all parties, including the Public, to review and submit objections/requests regarding the Hearing Procedures.

Opportunity #2 for Public Participation-Request for Designated Party Status
The Hearing Procedures establish an opportunity for Public participants to request Designated Party status. Designated Party status allows the participant to submit evidence relevant to the allegations, to cross-examine witnesses, and to be cross-examined.

Opportunity #3 for Public Participation-Request for Additional Presentation Time
The Hearing Procedures establish time limits for presentations at the public hearing. All parties, including the Public, may request additional time to present information at the public hearing. Such requests must be accompanied with an explanation of why the additional time is necessary.

Step 3: Evidence Submittal, Rebuttal, and Objections

The Hearing Procedures require the Designated Parties (Prosecution Team, Responsible Parties, Parties granted Designated Party status) to submit their evidence and supporting documentation by specific deadlines. This information is posted on the Lahontan Water Board's web site as it is received.

Opportunity #4 for Public Participation-Comments Regarding the Allegations
Public participants have an opportunity to review the Designated Parties' information and the proposed enforcement action and submit written comments regarding the Designated Parties' information and the proposed enforcement action.

Step 4: Water Board Hearing

The Lahontan Water Board's meeting agenda is typically posted approximately three weeks before the scheduled Lahontan Water Board public hearing. The meeting agenda identifies the specific date, meeting location, and approximate starting time for the public hearing. The meeting agenda can be found at this Lahontan Water Board webpage:

http://www.waterboards.ca.gov/lahontan/board_info/

Opportunity #5 for Public Participation-Oral Presentation
The Public may present oral comments at the Lahontan Water Board's public hearing regarding the proposed enforcement action.

The Hearing Procedures establish deadlines for submitting the information the Lahontan Water Board will largely rely upon in making its decision regarding proposed formal enforcement actions. The section titled, "Instructions for All Submittals" describes how to submit information in preparation for the public hearing. Be sure to read and follow these instructions. Doing so will help ensure that your valuable input, as a public participant, will be included in the Lahontan Water Board's Enforcement Public Hearing Process.

If you have questions, please contact Sue Genera, Executive Assistant to Patty Z. Kouyoumdjian, Executive Officer, at (530) 542-5414, or Sue.Genera@waterboards.ca.gov. She will either answer your questions, or make sure that the appropriate Lahontan Water Board staff member responds to your questions.