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NEW WHATCOM REDEVELOPMENT PROJECT WATER QUALITY TECHNICAL REPORT

Draft EIS

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1.0 INTRODUCTION

1.1 Site Area Description

The New Whatcom Redevelopment (site) area subject to redevelopment is approximately 216 acres of contiguous waterfront property in central Bellingham (Figures 1-1 and 1-2). The site is within the City of Bellingham's Central Business District Neighborhood Redevelopment Area, bounded by Bellingham Bay to the west, Roeder Avenue, and State Street. The site has been divided into ten redevelopment areas for planning purposes, however these redevelopment areas do not necessarily correspond to existing or future planned stormwater collection systems or catchments (Figure 1-3). Excluding the Aerated Stabilization Basin (ASB) there are eleven existing identified outfalls from various portions of the site, and from off-site areas that are passed through the site, to Bellingham Bay and the Whatcom Waterway. The eleven outfalls are identified below (David Evans and Associates [DEA], 2007)

1. A box culvert formerly serving the City's wastewater treatment plant discharges to the west side of the Whatcom Waterway between the ASB and Redevelopment Area 1. The full contributing area to this storm outfall is not known, but it mainly serves off-site areas in the city to the north of the outfall. Three C Street stormwater conveyance pipes tie into this culvert.

2 & 3. The Bay Street Overpass discharges to the northeastern corner of the Whatcom Waterway via two outfalls. The full contributing area to these storm outfalls is not known, but they appear to serve on- and off-site areas along the eastern and northern boundary to Redevelopment Area 2.

4. The Laurel Street outfall is a 24 inch diameter pipe which mainly discharges stormwater originating off-site to the east, but also drains a small portion of Redevelopment Areas 5 and 7.
5. An outfall on the northwestern side of the Bellingham Shipping Terminal discharges a large portion of Redevelopment Area 9 to Bellingham Bay.
6. An outfall from Redevelopment Area 9 near Planning Area 8 discharges to Bellingham bay from the northeastern portion of Redevelopment Area 9.
7. An outfall on the southwestern side of the Bellingham Shipping Terminal may discharge stormwater from a small portion of Redevelopment Area 9 to Bellingham Bay.
8. The Cornwall Avenue outfall collects stormwater from most of Redevelopment Area 6 and from Cornwall Avenue between Redevelopment Areas 6 and 7.
9. The Cedar Street outfall serves a contributing off-site area southwest of Redevelopment Area 10.
10. The Bornstein Seafood outfall identified through an Industrial General NPDES permit, discharging into the I & J Waterway; and
11. The Bellingham Marine Industries outfall identified through an Industrial General NPDES permit discharging into the Whatcom Waterway.

The ASB is an existing 35.9-acre wastewater treatment facility discharging to Bellingham Bay (Figure 1-2), The ASB treats stormwater and industrial wastewater from certain Georgia Pacific operations onsite in Areas 1, 2, 3, 4, 5, and 8. Processed wastewater from Puget Sound Energy's Encogen facility (in Area 6) also discharges to the ASB. Stormwater runoff is collected though a series of ditches, culverts, and underground pipes, and combined with GP's and Encogen's wastewater. The combined effluent discharges to a pump station located at the north end of the vacated West Laurel Street right-of-way. The pump station discharges the

effluent through an approximately 700-foot long force main that extends under the Whatcom Waterway, and then discharges into the ASB. The effluent is treated in the ASB and then pumped through a 60-inch diameter pipe which extends 8,000 feet into Bellingham Bay.

Off-site stormwater passing through the site to discharge to Bellingham Bay or the Whatcom Waterway would be unaffected by the New Whatcom Redevelopment Project (i.e., would

Source: Blumen Consulting Group

Figure 1- 1
New Whatcom Redevelopment Vicinity Map

Source: Blumen Consulting Group

Figure 1- 2
New Whatcom Redevelopment Site

Source: Blumen Consulting Group

Figure 1- 3
New Whatcom Redevelopment Areas

continue to discharge subsequent to redevelopment as under existing conditions), and is not evaluated further in this assessment.

1.2 Alternatives Description

There are three Redevelopment Alternatives, one sub-Alternative, and a No Action Alternative under study which encompass a full range of land use intensities and densities that the site could potentially accommodate over the long term. These are described in detail in Chapter 2 of the DEIS.

The Port of Bellingham owns or manages about 162.7 acres of the approximately 216-acre site, including the 35.9-acre Aerated Stabilization Basin (ASB). Discharge to the ASB will be terminated for planned remediation and redevelopment as a marina, in coordination with planned upland redevelopment of the New Whatcom site (refer to **Chapter 2** of the Draft EIS for more information on the cleanup and redevelopment of the ASB). The removal of the ASB would require two steps. First, industrial wastewater and industrial stormwater runoff from those portions of the site that discharge to the ASB would need to be terminated, and Ecology would need to concur that the industrial discharge and the need for industrial discharge coverage under the NPDES program were both terminated. Second, an alternative routing of stormwater runoff from the site to an existing or new onsite stormwater treatment system would need to be provided.

The City of Bellingham owns approximately 10.5 acres of the site. Approximately 43 acres of the site contain various marine industrial and industrial uses owned by other parties, including a 6.9-acre railroad corridor owned and operated by Burlington Northern Santa Fe (BNSF). Stormwater from the BNSF corridor would be unaffected by the alternatives, although the corridor would be relocated under some of them, and is not analyzed in detail in this report (i.e., stormwater runoff from the railroad corridor is handled the same as off-site areas that pass stormwater though the site but would otherwise be unaffected by the alternatives). Railroad corridor relocation would be subject to specific permitting and environmental review separate from the New Whatcom Redevelopment Project undertaken by the Washington Department of Transportation (WSDOT) and BNSF in the future.

There are a number of separate actions planned or proposed on the site or in the site's vicinity that have independent utility, and would occur independently of the New Whatcom redevelopment alternatives. Water quality impacts from these separate actions are evaluated as cumulative impacts in combination with the EIS Alternatives in this report. These could include for example major improvements to the Bellingham Shipping Terminal to accommodate additional large vessels.

All redevelopment alternatives assume some level of early action infrastructure redevelopment would occur, which could include at grade roadway improvements, conversion of the ASB to a marina, certain onsite parks, trails, utility and open space elements. Under the No Action Alternative some aspects of the marina would vary as described below.

All analysis in this report for buildout by 2026 assumes the ASB area would no longer be serving as a wastewater treatment facility, the PSE Encogen facility would no longer be operating at this site, and that remediation activities under the Final Cleanup Action Plan for the

Whatcom Waterway Cleanup Site, as well as other Cleanup Action Plans for other portions of the site, are completed and effective prior to or as part of redevelopment.

Alternative 1 is the highest density alternative with the largest array of park, trail, and open space amenities, and includes multifamily, retail, goods and services along with institutional, light industrial and marine-related uses. Most parking would be in structured garages. Alternative 1 would have an alternative marina configuration with a different number of moorage slips than under the No Action Alternative and would add public access and habitat features. Transient moorage located parallel to the north and south shorelines of the Whatcom Waterway are assumed under Alternatives 1 through 3 to allow temporary docking to access uses at the redeveloped site. The temporary moorages are described in Chapter 2 of the Draft EIS.

Alternative 2 is the medium density alternative with lower building heights than under Alternative 1, but is otherwise similar to Alternative 1 in terms of land uses and the marina. Under this alternative the BNSF railroad corridor would be relocated to the eastern property boundary.

Alternative 2A is the medium density alternative with a delayed railroad corridor relocation and differences in timing and nature of some roadway improvements.

Alternative 3 is the lower density alternative, with the less infrastructure improvements than Alternatives 1 and 2 and lower building heights. The majority of parking would be accommodated by surface lots and street parking. A marina as under Alternatives 1 and 2 is assumed. The railroad corridor is assumed to remain in its present location.

Alternative 4 is the no action alternative, which reflects what would occur if a Master Development Plan, Development Agreement, and Planned Action Ordinance for the New Whatcom Redevelopment Area are not completed. Under this alternative, redevelopment of vacant or underutilized land consistent with the existing industrial zoning is assumed. A marina would be constructed at the site of the ASB. Other limited roadway and pier improvements would occur. There would be no parks or amenities.

The DEIS evaluates most elements for the alternatives at two time periods: 2016 which represents interim development, and 2026, which is assumed to represent build out of the project. Planning analysis demonstrated that at 2016 the area of pollution generating surfaces[1] for stormwater would be less than at 2026 under all alternatives, even though some interim areas may be used for parking lots until they are built with structures. Because the greatest stormwater quality impacts would occur at the time of greatest pollution generating surfaces, this water quality analysis only evaluates the 2026 built-out time period.

To encompass the range of water quality impacts under all alternatives, Alternative 1 (highest density), Alternative 3 (lowest density) and Alternative 4 (no action) are assessed quantitatively. Alternatives 2 and 2a (medium density) are evaluated qualitatively relative to the results for Alternatives 1 and 3.

Under Alternatives 1 through 3, stormwater management on the site could consist of the following:

[1] For example, parking lots and roadways are considered pollution generating surfaces, as opposed to rooftops composed of inert materials.

1. Existing outfalls to Bellingham Bay serving off-site stormwater collection systems that pass through the site would continue to be used and would not be altered by the redevelopment project.
2. New outfalls to Bellingham Bay would be constructed for redevelopment above the mean higher high water elevation to replace existing outfalls serving the site which would be removed. The outfalls are as follows (refer to Table 1-1; and to David Evans and Associates, Inc. 2007 for outfall locations shown in Figures 3 and 4 of that report and other specifics):
    a. The following outfall locations and structures would be new:
        i. Outfall A located in Redevelopment Area 2 discharging to Bellingham Bay off W. Chestnut Street (if extended to the bay);
        ii. Outfall C located in the western corner of Redevelopment Area 4 discharging to Bellingham Bay at the dock inlet;
        iii. Outfall G located in Redevelopment Area 1 discharging into the marina at F Street (if extended); and
        iv. Outfall H located in Redevelopment Area 1 discharging into Bellingham Bay at Hilton Street (if extended);
    b. The following outfall structures B, E, and F would be new but constructed next to existing outfalls:
        i. Outfall B located on the boundary between Redevelopment Areas 3 and 4;
        ii. Outfall E located at the boundary between Redevelopment Areas 9 and 10; and
        iii. Outfall F located in Redevelopment Area 1 discharging to Bellingham Bay near the eastern corner of the Marina;
    c. Outfall D discharging to Bellingham Bay from the northwestern side of Redevelopment Area 9 would be reconstructed;
    d. Redevelopment Area 10 would be served by multiple linear dissipaters; potentially each building could have its own dispersion trench constructed above the mean higher high water elevation.
3. Stormwater originating on roofs constructed with inert materials would be conveyed directly to outfalls without treatment, because roofs of this type are not considered pollution generating surfaces.
4. Stormwater originating on all pollution generating surfaces would be treated for water quality before discharge. Water quality treatment would be provided to Basic Treatment standards designed in accordance with the 2005 Washington Department of Ecology *Stormwater Management Manual for Western Washington* required by the City of Bellingham (see Section 2.2.6 of this report). Basic treatment could be provided by any type of facility meeting Basic criteria under the manual, but the most probable facility types are likely to be wet vaults, bioretention facilities (which also qualify as an Enhanced Treatment), biofiltration swales, and filter strips.

In addition, the Port anticipates participating in the LEED for Neighborhood Development (LEED-ND) Pilot Program. This jointly funded initiative by the Port and City would seek to achieve, among other things the LEED Neighborhood Development Program guidelines which include Innovation & Design Process points for a Clean Ocean Marina and stormwater design to minimize impervious surfaces and provide innovative water quality treatment techniques.

Table 1- 1

Outfalls Serving Redevelopment Areas 1 Through 10

Outfall	Redevelopment Area									
	1	2	3	4	5	6	7	8	9	10
A		●			●[2]					
B		●	●	●	●[2]		●[2]	●[2]		
C				●		●[2]		●		
D									●	
E					●[3]	●	●	●	●	
F	●									
G	●									
H	●									
Area 10										●

[2] Not under Alternative 3 or 4
[3] Not under Alternative 1

2.0 AFFECTED ENVIRONMENT

2.1 Hydrologic Setting

The New Whatcom Redevelopment Project site drains directly to Bellingham Bay or the Whatcom Waterway within Bellingham Bay located in Puget Sound. The site is located within the Puget Sound Central Watershed and is part of the greater Nooksack drainage basin as Water Resource Inventory Area (WRIA) 1 (Washington Department of Fisheries [WDF] 1975). Depths of both the inner and outer Whatcom Waterways are a result of historic dredging. Whatcom Creek (WRIA 01-3110) originates in Whatcom Lake and drains to the Whatcom Waterway. Tidal influence from Bellingham Bay into Whatcom Creek extends to the Maritime Heritage Center park but not upstream of the park because of a steep rise in slope at a falls (Anchor Environmental, pers. comm. August 1, 2007). The Maritime Heritage Fish Hatchery draws water from Whatcom Creek at river mile (RM) 0.2 which is upstream of the falls and the zone of tidal influence (Ecology 1990).

Bellingham Bay has shellfish beds susceptible to bacteria contamination on the west side of Bellingham Bay, on the opposite side of the Bay from the New Whatcom Redevelopment site. The Washington Department of Ecology (Ecology 2007) determined the bacteria source to the Bay most heavily impacting the shellfish beds is the Nooksack River and not Whatcom Creek because of Whatcom Creek's distance from the shellfish beds.

Bellingham Bay is about 28 square miles in size and about 6 miles across from the Whatcom Waterway on the east side to Lummi Shore Drive on the west side. Most of the estuarine influence into Bellingham Bay occurs at its north end where the Nooksack River enters the bay. Water at depth in Bellingham Bay is higher in salinity and cooler, and consequently denser, than the warmer and lower salinity water flowing into the bay from the river and other upland sources, which collects at the surface. Currents in Bellingham Bay are influenced by semi-diurnal tidal exchange, freshwater input from the Nooksack River, Whatcom Creek, other streams, and wind.

A majority of the site lies on relatively flat areas of upland and fill on the eastern side of Bellingham Bay that is divided by the Whatcom Waterway. The site is cleared and mainly paved or graveled with a combination of industrial and maritime uses. Impervious areas (including gravel, structures, and paving) comprise approximately 94 percent of the site (CollinsWoerman, 2007). Stormwater from industrial areas on the site drains to Bellingham Bay or the Whatcom Waterway for the most part without water quality treatment, although some oil water separators or catch basin settling facilities exist, and runoff from certain Georgia Pacific operations are treated in the ASB as described above. The Port of Bellingham typically manages stormwater quality on its properties and facilities through the use of source control measures that are both structural and operational. Source control measures typically include 1) restriction of uses to cargo marshalling and equipment storage; 2) site house-keeping, including sweeping; and 3) catch basin cleaning, using catch basins as traps for petroleum hydrocarbons and particulates/sediments.

2.2 Water Quality-Related Regulations

2.2.1 State Water Quality Standards

Surface waters in the State of Washington are regulated for quality by Chapter 173-201A WAC, administered through the Washington State Department of Ecology (Ecology). State water quality standards are intended to protect all beneficial uses of surface waters, including the protection of aquatic biota. State Water Quality Standards were last amended on November 20, 2006.

Bellingham Bay has Designated Uses for Excellent Aquatic Life; Shellfish Harvest; Primary Contact Recreation; and other uses including Wildlife Habitat, Harvesting, Commerce/Navigation; Boating; and Aesthetics (Chapter 173-201A-210(1) through (4)) as established by Table 612 (Chapter 173-201A-612). These use designations provide for excellent quality salmonid and other fish migration, rearing and spawning; clam, oyster, and mussel rearing and spawning; crustacean and other shellfish rearing and spawning; and other uses through water quality standards (Table 2-1).

Table 2- 1
Marine Water Quality Standards for Bellingham Bay
(Chapter 173-201A-210 WAC)

Excellent Use Designation for Marine Waters *(see the WAC for details beyond those summarized here)*	
Dissolved oxygen	The lowest 1-day minimum is **6.0** mg/L as the lowest 1-day minimum, measured to represent the dominant aquatic habitat of the monitoring site. When a water body's dissolved oxygen is lower than 6.0 mg/L or within 0.2 mg/L of the criterion, and that condition is due to natural conditions, then human actions considered cumulatively may not cause the dissolved oxygen of that water body to decrease more than 0.2 mg/L. Concentrations of dissolved oxygen are not to fall below the criterion at a probability frequency of more than once every ten years on average.
Temperature	Shall not exceed **16**°C (60.8°F) measured as a 1-day maximum temperature (1-DMax). When a water body's temperature is warmer than 16°C or within 0.3°C of the criterion, and that condition is due to natural conditions, then human actions considered cumulatively may not cause the 7-DADMax temperature of that water body to increase more than 0.3°C.
pH	Shall be within the range of **7.0 to 8.5** with a human-caused variation within a range of less than 0.5 units.
Turbidity	Shall not exceed **5** nephelometric turbidity units (NTU) over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Toxic substances	Shall not be introduced above natural background levels in waters of the state that have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity of the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department. (Toxic substances include dissolved metals and ammonia-nitrogen).
Shellfish Harvest and Primary Contact Recreation	
Fecal coliforms	Fecal coliform organism levels must not exceed a geometric mean value of **14** colonies/100 mL, with not more than 10 percent of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.

Source: Ecology (2006)

Because tidal influences extend less than 0.2 RM into Whatcom Creek, minor water quality influence from the site at the mouth of Whatcom Creek is possible. However, for the purposes of this report it is assumed that if marine water quality standards are maintained, there would be no impairment to the very small zone of tidal influence in Whatcom Creek. Typically, freshwater inflow from Whatcom Creek would "lens" over the top of the more saline and therefore denser tidal inflow from the Whatcom Waterway. For that reason and because of the slight area of tidal influence up into Whatcom Creek, freshwater quality standards for Whatcom Creek are not evaluated here as a criterion applicable to the site.

2.2.2 Section 303(d) Threatened and Impaired Water Bodies

Section 303(d) of the 1972 Federal Clean Water Act (CWA) requires states to identify and list threatened and impaired water bodies. The CWA requires the list to be updated and submitted for review and approval by the U.S. Environmental Protection Agency (EPA) every 2 years. The purpose of the listing is to identify water body segments where, with technology-based pollution control measures, applicable standard(s) are not expected to be met for the listed water quality parameter(s). The EPA allowed states to skip the year 2000 303(d) list due to the ongoing development of new federal rules affecting the listing process and the Total Maximum Daily Load (TMDL) program. TMDLs are prepared to restore state waters to all beneficial uses, or to prevent anticipated degradation of beneficial uses (see below). The 2004 Integrated Water Quality Assessment is the current 303(d) listing. Inner Bellingham Bay and the Whatcom Waterway where the site is located are not listed as impaired for any parameters under the current 303(d) listing. Four parameters were specifically assessed in 2004: dissolved oxygen, fecal coliform, pH and temperature. Dissolved oxygen was categorized as having data insufficient to list the waterbody as impaired but there still may be concern, because of circulation patterns that may increase the bay's susceptibility to human-induced causes of lowered oxygen. Ecology determined that fecal coliforms and pH met water quality standards, and that there are insufficient human influences to produce significant temperature increases above naturally caused patterns.

2.2.3 Total Maximum Daily Load (TMDL)

A TMDL has been prepared for Inner Bellingham Bay because of contaminated sediments (Ecology 2001). Ecology regulates sediment cleanup levels as water quality standards; however this TMDL has no direct consequence to the stormwater quality assessment in this report. As indicated in Section 2.1, remediation of contaminated sediments at the site is assumed to be completed prior to redevelopment as an independent action separate from the New Whatcom Redevelopment Project.

2.2.4 National Pollutant Discharge Elimination System (NPDES) Permit for Construction Discharge

For all new construction activity disturbing at least one acre, a Notice of Intent (NOI) must be filed to obtain a National Pollutant Discharge Elimination System (NPDES) Permit (General or Individual) from Ecology for discharge of stormwater. The NPDES permit requires preparation and implementation of a stormwater pollution prevention plan (SWPPP). The current General NPDES permit was issued November 16, 2005 and became effective December 16, 2005. The

current General NPDES permit differs from the prior permit in a number of ways which are as follows (Ecology 2005):

- Sites with 1 to 5 acres of disturbed soils were added to the permit coverage. This is a requirement of EPA's Phase II Stormwater Rule. Previously only sites with greater than 5 acres of disturbed soils were required to be permitted.
- Monitoring (both visual inspections and sampling of pH, turbidity, and total petroleum hydrocarbons (TPH) are required to verify proper implementation of the Stormwater Pollution Prevention Plan (SWPPP) as required in RCW 90.48.555. The pH and TPH analyses are dependent on significant concrete work (pH) or whether a visual sheen or petroleum odor is observed. Turbidity monitoring is required from all stormwater ponds at least weekly when stormwater discharge occurs.
- The permit establishes a benchmark for turbidity of 25 Nephelometric Turbidity Units (NTUs), which presumes that construction BMPs are effectively controlling sediment if site discharge is less than the benchmark value.
- The permit allows turbidity monitoring for smaller sites (less than 20 acres) to be measured using a less expensive transparency tube. Sites that disturb greater than 20 acres are required to measure turbidity with a turbidimeter.
- A Stormwater Pollution Prevention Plan (SWPPP) must be completed by the time of application for permit coverage and must be made available for public review upon request during the application period.
- Additional monitoring requirements may apply for sites discharging to 303(d) listed waterbodies and waterbodies with applicable TMDLs for construction-related parameters (turbidity/fine sediment, high pH, and phosphorus); and sites may be required to perform additional monitoring by Ecology administrative order. There are no TMDLs for construction-related parameters that would trigger 303(d)-related monitoring for a New Whatcom Redevelopment NPDES Permit.

2.2.5 National Pollutant Discharge Elimination System (NPDES) permit for Stormwater Discharge

The City of Bellingham maintains a stormwater collection and conveyance system that includes storm drains discharging to Bellingham Bay, including some which discharge from and through the site. These discharges are regulated under Phase II of the Federal NPDES Storm Water Program administered by Ecology. The Port of Bellingham has a General NPDES permit for stormwater discharges for the maintenance shop near the shipping terminal on the Whatcom Waterway (Redevelopment Area 9). Bornstein's Seafood carries General NPDES permit coverage for Industrial Stormwater discharge from a portion of Redevelopment Area 1 on the site to the I and J Street Waterway. NPDES permit coverage for stormwater discharges after redevelopment would be obtained as required for the various industrial, boatyard, shipyard, and/or urban (municipal) land uses.

2.2.6 City of Bellingham Municipal Code (BMC) 15.42 Stormwater Management

The City of Bellingham has adopted a Stormwater Management Code which includes a Watershed Master Plan adopted by the City, sets minimum drainage requirements for new and redevelopment, and requires Best Management Practices (BMPs) from the latest (2005) Washington Department of Ecology (Ecology) Stormwater Management Manual for Western Washington. BMC 15.42 also provides for approval of Low Impact Development (LID) features

from the *LID Technical Guidance Manual for Puget Sound* (Puget Sound Action Team, 2005). It is assumed that redevelopment on the site would conform to all applicable City of Bellingham requirements.

2.2.7 Stormwater Management Manual for Western Washington (2005)

The Proposed Project would utilize Best Management Practices from the Ecology (2005) *Stormwater Management Manual for Western Washington* (Ecology 2005 Manual) for stormwater management as required by BMC 15.42. The Ecology 2005 Manual contains water quality treatment and quantity control measures that are a mixture of source control, performance, and design standard requirements. There is no requirement for water quantity (detention) control at the New Whatcom site because it discharges directly to Puget Sound and discharges to marine waters require "Basic" water quality treatment under the Ecology 2005 Manual (per Appendix I-C of that Manual).

2.3 Surface Water Quality

2.3.1 Existing Surface Water Data

Recent baseline water quality data for Inner Bellingham Bay / Whatcom Waterway in the vicinity of the site, and for runoff from the existing site, are relatively sparse. Ecology collected data at a long-term "core" water quality station (BLL009, *"Bellingham Bay – Pt. Frances"*) from 1990 through the present, but this station is too distant from the site to reasonably characterize water quality near the Whatcom Waterway. Ecology also collected data at a rotational marine monitoring station from the central/west side of Bellingham Bay intermittently from 1973 through 2003 (Station BLL011, *"Bellingham Bay off Nooksack"*). This station is nearer to the site but still is approximately 5 miles distant and is influenced by the Nooksack River and Puget Sound to a greater extent than waters near the site. These data included discrete samples for fecal coliforms, chlorophyll and phaeopigment, nitrate-nitrogen, ammonium, ortho-phosphate, silicate, and secchi (water clarity); and profile data (samples at regular depth intervals from the surface) for temperature, salinity, density, chlorophyll, dissolved oxygen, and pH. Dissolved metals and other parameters more typical of urban stormwater constituents were not collected at these stations and therefore these data are not very useful for the purposes of establishing background for urban storm runoff. However, the marine monitoring data by Ecology do indicate good water quality consistent with marine water quality standards for the parameters that were analyzed. The most recent 2003 data (collected monthly in February and April through September) for Station BLL011 nearest the site indicate the following for four parameters that were analyzed and most germane to urban stormwater runoff:

- Dissolved Oxygen: Beginning in May dissolved oxygen becomes slightly depleted at the greatest depths (greater than about 22 meters), in terms of falling below the 6.0 mg/L state standard; and by July a thermocline established (a rapid temperature drop over a short depth that establishes a physical barrier between shallower and deeper water layers) at about a 5 to 6 meter depth, leading to dissolved oxygen less than 6 mg/L below about 9.5 meters. By August of 2003, dissolved oxygen was 6 mg/L or above down to a depth of 19.5 meters, indicating the thermocline is not stable or long-lasting at that location. However, in all months sampled, dissolved oxygen was never lower than 4.5 mg/L in the deepest water, so anoxic (oxygen depleted) conditions were not occurring in the bottom waters. Dissolved oxygen in the upper water column was in the

general range of 10 mg/L to 15 mg/L; well above the 1-day minimum state standard of 6 mg/L. Ecology determined in its 2004 303(d) determination that 11 "excursions beyond the criterion" out of 21 samples collected between 1993-2000 at Station BLL011 may reflect human influences, but did not warrant a listing as impaired for dissolved oxygen.

- Temperature: During the summer temperature generally falls with depth, and at the hottest time of the year in 2003 surface temperatures (samples at 1.5 and 2.0 meters) were above the 1-day maximum standard of 16 ^{o}C (July 15; 17.62 ^{o}C and 16.41 ^{o}C, respectively). All other samples at all depths and all other months were within the standard. Ecology concluded in 2004 that these and all other exceedances observed since 1993 at this station are a natural condition and that there are insufficient human influences to produce significant temperature increases.

- pH: All samples at all depths in 2003 were within state standards. Ecology has not observed any exceedances for pH since sampling began at this station in 1993.

- Fecal coliforms: Discrete samples collected at the surface in 2003 at Station BLL011 reported a fecal coliform density of 1 colony forming unit per 100 mL, which is well within the marine standard. Ecology determined in 2004 that while data from 1985 and 1987 each showed one excursion near this station, more recent data since 1996 show no excursions over standards and its conclusion is that water standards are being met for fecal coliforms.

Water quality data for Bellingham Bay and runoff from various portions of the site were also reported in the Remedial Investigation report for the Whatcom Waterway site (Anchor Environmental, LLC and Hart Crowser, Inc., 2000). These included salinity, total suspended solids, and heavy metals measured in 1996. The data in Table 2-2 are for station HC-SW-12 from inner Bellingham Bay (about 3,000 feet southwest of the ASB) collected during the wet and dry seasons for selected metals reported in the Anchor *et al.* (2000) Remedial Investigation.

Table 2- 2
Inner Bellingham Bay Seawater Quality

Parameter	Units	Wet Season Value	Dry Season Value	Water Quality Standard
Salinity	ppt	23.0	15.0	--
Total Suspended Solids	mg/L	27	19	--
Dissolved Copper	µg/L	<1	1.8 *(estimated value)*	3.1 maximum (1)
Dissolved Lead	µg/L	<3	<15	8.1 maximum (1)
Dissolved Zinc	µg/L	<10	<10	81 maximum (1)

Source: Anchor et al. 2000

(1) Background dissolved metals standard based Marine Toxic Substance Criteria Table 240(3) WAC 173-201A-240 and is a 4-Day average concentration not to be exceeded more than once every 3 years on average.

Most values for dissolved copper, lead, and zinc were reported below the detection limits shown in Table 2-2. Based on these data copper, lead, and zinc were reported well within state standards during the wet season and copper and zinc were within standards during the dry season. The detection limit for dissolved lead in the dry season was higher than the state standard, so compliance with state standards cannot be definitively demonstrated when this

sample was taken. However, because dissolved lead was confirmed to be less than 3 µg/L during the wet season when most stormwater discharge occurs, it is unlikely the dry season value when little stormwater discharge occurs would have been measured above the standard had the detection limit been lower.

The quality of existing storm runoff from two portions of the site can be estimated (as of 1996) using data reported in Anchor *et al.* (2000) for the Bornstein Seafoods outfall into the I and J Street and the BMI outfall into the Whatcom Waterway (both part of Redevelopment Area 1 in the northern portion of the site) (Table 2-3). Added best management practices and source control measures at these locations and other properties that are part of the New Whatcom Redevelopment site area likely have improved storm runoff quality since these data were collected, but they are indicative of historic conditions for some portions of the site.

Table 2- 3
Bornstein Seafoods and BMI 1996 Outfall Stormwater Quality

Location	Parameter	Units	Wet Season Value	Dry Season Value
Bornstein Seafoods Outfall	Salinity	ppt	1.5	2.5
	Total Suspended Solids	mg/L	110	240
	Dissolved Copper	µg/L	1600 *(estimated)*	110
	Dissolved Lead	µg/L	<3	<3
	Dissolved Zinc	µg/L	830 *(estimated)*	320
BMI Outfall	Salinity	ppt	0	--
	Total Suspended Solids	mg/L	290	--
	Dissolved Copper	µg/L	6.7	--
	Dissolved Lead	µg/L	<3	--
	Dissolved Zinc	µg/L	<10	--

Source: Anchor et al. 2000

A Combined Sewer Overflow (CSO) at C Street discharges to Bellingham Bay. This CSO is regulated under the Bellingham Post Point NPDES Permit. Post Point is the City's wastewater treatment plant location. There have been three CSO overflow events since 1995, but Retec Group, Inc. (2006) reports the City of Bellingham has made substantial system improvements to minimize overflow since that time. It is assumed that CSO overflow would not occur by buildout at 2026.

3.0 IMPACT EVALUATION

3.1 Construction

Redevelopment construction would occur in response to market demand but be complete by 2026 under Alternatives 1 through 3. Under Alternative 4, redevelopment under industrial zoning is expected to be complete by 2026.

3.1.1 Construction Impacts Under Redevelopment Alternatives 1, 2, 2A, 3, and 4

Under Alternatives 1 , 2, and 2A the assumed amount of site work, the potential for construction impacts related to water quality, and the best management practices to manage stormwater to avoid and minimize construction related impacts, would be very similar. The potential for construction-related impacts from Alternatives 3 and 4 would be somewhat less than under Alternatives 1 through 2A because the BNSF railroad corridor would not be relocated. Although Alternatives 3 and 4 would have the least redeveloped structure, clearing and grading for redevelopment could cover the same area by 2026 as under Alternatives 1 through 2A with the exception of the railroad corridor. However, the scale of construction in any given year through 2026 under Alternatives 1 through 4 cannot be predicted and could be equal. Consequently, this section discusses the nature and likely intensity of construction impacts in any given year under the assumption the impact potential risk from the Alternatives is similar on a year by year basis, and mitigating measures to avoid or minimize such impacts would be similar.

The nature of the construction that could lead to erosion includes the following: removal of some structures and foundations, placing and compacting structural fill, and preloading stockpiles. This work could all occur to various degrees over time, leaving exposed soil and soil stockpiles near the Whatcom Waterway and Bellingham Bay. Discharge of stormwater during construction would require site coverage under an NPDES permit issued by Ecology under Federal Clean Water Act authorization. It is likely but not certain that an Individual NPDES permit would be issued for construction discharge under Alternatives 1 through 3 because of the size and duration of earthwork that would occur, but work on various portions of the site under different proposals and over an extended period of time may be judged by Ecology to qualify for General NPDES Permit coverage. No matter what type of NPDES permit would apply, Temporary Erosion and Sediment Control (TESC) best management practices (BMPs) would be implemented and maintained in accordance with a Stormwater Pollution Prevention Plan (SWPPP) that would be prepared as required by the NPDES permit under all Alternatives.

TESC BMPs would be required by the NPDES permit to prevent the potential for uncontrolled sediment release to Bellingham Bay. Sediment discharge could adversely affect water quality. Impact risk would rise during construction in the wet season because of the increased difficulty in preventing erosion when soils are saturated and exposed during wet weather. However, relatively rare summer storms could also have the same result. Minor turbidity and minor sediment-related impacts would not have long-lasting adverse impacts. However, short-term water quality impairment and related habitat degradation could occur if inputs were sustained or if sustained and significant turbidity reached the Whatcom Waterway or Bellingham Bay. Short-term water quality impacts could include increases in turbidity and suspended and settleable solids.

The Ecology 2005 Manual construction BMPs include establishment of marked clearing limits before construction, construction entrance stabilization, stormwater sediment and flow control,

soil stabilization, slope protection, inlet and outlet protection, channel protection, pollutant protection, dewatering control, site maintenance, and site management. The City of Bellingham requires use of the Ecology 2005 Manual, which defines the wet season as October 1 to April 30. During this wet season, clearing, grading, and other soil-disturbing activities would only occur if silt-laden runoff can be prevented from leaving the site. The seasonal limitations may be modified under the NPDES permit by Ecology based on site conditions at the time of construction (including consideration of cover, the low slopes, soil type, and proximity to Bellingham Bay), construction activities and extent of disturbed areas, and proposed TESC BMPs. During the wet season exposed soil may be uncovered for up to 2 days if it is actively worked. During the dry season from May 1 to September 30, exposed soil may be left uncovered for up to 7 days if it is actively worked. BMPs from the Ecology 2005 Manual that could be employed in various combinations for the SWPPP are shown in Tables 3-1 and 3-2. Construction would also conform to the soil management plan related to site remediation, which is not part of this assessment.

Table 3- 1
Summary of Temporary Erosion and Sediment Control (TESC) Best Management Practices (BMPs) from the Ecology 2005 Manual

Measure	Manual Description and Site Applicability	New Whatcom Redevelopment Utilization	Ecology 2005 Manual BMP Reference
Temporary Cover	Temporary vegetation cover over unworked disturbed areas.	Early fall hydroseeding or other cover measures could be applied to over-winter exposed areas that would not otherwise be covered or worked.	Element 5 BMP C120 Temporary and Permanent Seeding Volume II, Page 4-13
Temporary Cover	Mulching and matting (gravel, slag or crushed stone; hay or straw; wood fiber).	See above. Mulching and matting could be employed in exposed over-wintered areas not otherwise covered, especially where worked too late in the season to hydroseed.	Element 5 BMP C 121 Mulching Volume II, Page 4-20
Temporary Cover	Clear plastic cover.	Plastic cover could be employed to protect stockpiles from erosion, protect exposed and unworked areas of the site during the winter, protect vulnerable exposed areas during summer storms, or protect storm runoff from recently poured concrete in the event of rain.	Element 5 BMP C 123 Plastic Covering Volume II, Page 4-26

Measure	Manual Description and Site Applicability	New Whatcom Redevelopment Utilization	Ecology 2005 Manual BMP Reference
Permanent Cover	Preservation of native vegetation; Clearing only where construction will occur.	This has little applicability to the redevelopment site because of prior remediation and current industrial use. Clearing limits would be marked or fenced where warranted and applicable.	Element 1 Mark Clearing Limits BMP C101 Preserving Natural Vegetation Volume II, Page 4-2
Buffer Zones	Undisturbed natural vegetation to serve as "living filter."	See above.	Element 1 BMP C102 Buffer Zones Volume II, Page 4-5
Permanent Seeding and Planting	Permanent vegetation planting on final graded and cleared areas, or areas left for one year or more.	Landscaping vegetation would be planted as soon as practical as the site is redeveloped, and temporary site stabilization measures are replaced.	Element 5 BMP C120 Temporary and Permanent Seeding Volume II, Page 4-13
Permanent Seeding and Planting	Sodding.	Sod may be used in turf landscape, or if immediate landscaping is desired as redevelopment on the site proceeds.	Element 5 BMP C124 Sodding Volume II, Page 4-28
Topsoil	Providing appropriate growth medium for landscaped areas.	Contracts would ensure that contractors plant permanent landscaping on soils suitable for growth and survival of landscaping.	Element 5 BMP C125 Topsoil Page 4-29
Stabilized Construction Entrance	Stable pad with quarry spalls to dislodge sediment at construction ingress and egress.	The main entrances/exits for heavy construction equipment would include stabilized quarry spall pads as warranted to dislodge sediment from vehicles before leaving the site.	Element 2 BMP C105 Stabilized Construction Entrance Volume II, Page 4-8

Measure	Manual Description and Site Applicability	New Whatcom Redevelopment Utilization	Ecology 2005 Manual BMP Reference
Construction Road Stabilization	Temporary stabilization of on-site access roads during wet weather.	Where soils are exposed, access routes would be stabilized with rock during wet weather if necessary. Haul roads would be placed where permanent roads are located and be covered with asphalt treated base (ATB) as soon as practical following structural fill and utility installation.	Element 2 BMP C107 Construction Road Stabilization Volume II, Page 4-12
Dust Control	Reduce dust during land clearing, grading, and construction.	On-site control of dust emissions from grading and construction activity would be implemented. Re-used water from temporary storm treatment traps or ponds could preferentially be used for dust control.	Element 5 BMP C140 Dust Control Volume II, Page 4-40
Level Spreader	Temporary outlet across a slope.	Not applicable to this site.	Element 6 BMP C206 Level Spreader Page 4-73
Outlet Protection	Lined aprons or energy dissipaters at outlet to prevent scour.	Dewatering and construction stormwater discharge would include outlet protection as warranted.	Element 8 BMP C209 Outlet Protection Volume II, Page 4-80
Filter Fence	Temporary sediment barrier.	Filter fence would be used as a perimeter sediment interception measure as warranted.	Element 4 BMP C233 Silt Fence Page 4-94
Straw Bale Barrier	Temporary sediment barrier.	Straw bale barriers could be used to create small temporary sediment traps from time to time as isolated situations may warrant, but are not expected to be required or useful to prevent turbid discharge at this site.	Element 4 BMP C230 Straw Bale Barrier Page 4-89
Brush Barrier	Temporary sediment barrier.	Not applicable to this site.	Element 4 BMP C231 Brush Barrier Page 4-92
Gravel Filter Berm	Temporary measure to retain sediment from traffic areas.	Not applicable to this site.	Element 4 BMP C232 Gravel Filter Berm Page 4-93

Measure	Manual Description and Site Applicability	New Whatcom Redevelopment Utilization	Ecology 2005 Manual BMP Reference
Storm Drain Inlet Protection	Sediment filter, elevated rim, or excavated impounding area around storm drains.	This BMP is employed where storm drain inlets are made operational before permanent stabilization of the drainage. These or equivalent measures to prevent sediment transport may be employed as the site is built out.	Element 7 BMP C220 Storm Drain Inlet Protection Volume II, Page 4-82
Sediment Trap	Small temporary ponds for sediment traps.	Temporary traps would be used as needed during construction.	Element 4 BMP C240 Sediment Trap Volume II, Page 4-102
Temporary Sediment Pond and Water Quality Basin	Controlled stormwater release.	Temporary ponds or permanent vaults would be used as needed during construction to treat runoff to remove sediment.	Element 4 BMP C241 Temporary Sediment Pond Volume II, Page 4-105

Table 3- 2
Summary of Construction Contaminant (non-sediment) Control Best Management Practices (BMPs) under the Ecology 2005 Manual

Measure	Manual Description and Site Applicability	Ecology 2005 Manual BMP Reference
Pesticide Control	Proper management, storage and handling of pesticides.	Element 9 Volume II, Page 3-12
Handling of Petroleum Products	Proper transport, storage and handling of petroleum products.	Element 9 Volume II, Page 3-12
Nutrient Application and Control	Proper transport, storage and handling of fertilizer products.	Element 9 Volume II, Page 3-12
Solid Waste Handling and Disposal	Building debris.	Element 9 Volume II, Page 3-12
Use of Construction Chemicals	Paints, acids, cleaning solvents, asphalt products.	Element 9 Volume II, Page 3-12

Measure	Manual Description and Site Applicability	Ecology 2005 Manual BMP Reference
Handling Hazardous Products	General guidelines for managing or minimizing the above hazardous wastes.	Element 9 Volume II, Page 3-12
Equipment Washing	Cleaners and solvents associated with vehicle washing.	Element 9 Volume II, Page 3-12
Spill Control Planning and Cleanup	Spill Control Plan with contact list.	Volume IV, Page 2-53
Treatment and Disposal of Soils Contaminated by Construction	Contaminated soils caused by spill or leak during construction.	Element 9 Volume II, Page 3-12

A construction monitoring plan(s) would be prepared as required by the NPDES permit(s) that describes weekly TESC inspection, monitoring locations, sampling frequency, sampling trigger, corrective actions, follow up monitoring, reporting to Ecology, and a record of site TESC inspections. The elements of the construction monitoring plan would follow any NPDES permit requirements issued specifically for the New Whatcom Redevelopment Project(s).

Conveyance of existing stormwater entering from offsite areas that discharge to Bellingham Bay or the Whatcom Waterway would continue through the New Whatcom site during and after construction.

3.1.2 On Site Stormwater BMPs

On-site stormwater would be collected and directed to temporary sediment trap(s) or ponds or to vaults constructed for permanent stormwater treatment in accordance with the 2005 Ecology Manual (BMP C240, C241). Storm drainage details are included in a Stormwater Report (David Evans and Associates 2007).

Prior to or during the first stages of redevelopment, construction best management practices would be installed in accordance with the 2005 Ecology Manual and local ordinances. Temporary bypass for the existing offsite storm discharge lines would be provided as warranted if their present locations interfere with redevelopment prior to completing the new stormwater discharge routing. Subsequent to redevelopment connections would be made to the new on-site stormwater system to pass offsite flows through the site. Eight new outfalls would be constructed to replace existing outfalls now serving the site (outfalls A-H) and drainage from Redevelopment Area 10 would be managed by construction of several linear dissipaters to discharge to Bellingham Bay (the specific number to be determined as part of specific redevelopment application review). It is assumed that construction of these outfalls would occur above or at mean higher high water so that in-water work would be avoided.

Construction entrance sediment control methods may vary according to the number of truck trips and cubic yards of material to be added to the site under future specific grading plans. Construction entrance BMPs could also vary dependent on the amount of material planned for import or demolition export in any given construction season. If final grading plans for any given season dictate heavy demand on entrances, then a wheel wash that prevents sediment trackout (BMP C106) would be developed accordingly, which could be a closed loop wheel wash system

with an asphalt-treated base, pressurized spraying, daily maintenance, and polymers to remove sediment. If soil import or demolition export is estimated to be smaller or easily managed, more conventional dry or wet wheel washes may be suitable, so long as state water quality standards can be maintained and track-out of sediment is avoided.

3.1.3 Alternative Methods for Sediment Control

Stormwater discharge is required by NPDES permit to comply with the WAC 173-201A standard of a 5 nephelometric turbidity unit (NTU) change over background. This standard would be achieved by any combination of BMP source control measures (Table 3 -1), and by treatment of stormwater by any combination of the following Ecology 2005 Manual measures, which may vary as warranted by stormwater quality, season, and extent of construction activity:

- Multiple Stormwater Ponds (BMP C241),
- Stormwater Filtration (BMP C251),
- Polyacrylamide for Soil Erosion Protection (BMP C126),
- Chemical Treatment (BMP C250). The Project may employ the use of a chemical treatment system (Chitosan or Electrocoagulation) approved by Ecology if warranted to meet permit discharge requirements.

In addition to standard TESC measures, and if warranted to meet NPDES permit requirements, the Port of Bellingham may propose the use of treatments that reduce sediment mobilization in storm runoff or to remove sediment from TESC ponds. Anionic polyacrylamide (PAM) could be used for soil stabilization purposes to prevent sediment mobilization. This product is applied to exposed soils and forms a temporary nontoxic barrier to the impact energy of rainfall, which greatly reduces soil mobilization during storms. PAM is listed as an approved BMP for soil stabilization for TESC purposes in Ecology's 2005 Manual. Use of PAM would require site specific NPDES Permit approvals and its inclusion in the SWPPP.

The Port of Bellingham may propose to Ecology that Chitosan© or similar product be used to remove sediment from water in TESC ponds. Although no specific product is proposed at this time, several local field tests of Chitosan© have been performed locally with favorable results and are reported here. Use of Chitosan© would require site specific NPDES Permit approvals.

The U.S. Department of Transportation (Western Federal Lands Highway Division [FLHD]) treated construction runoff from the I-90 Sunset Interchange Project in Issaquah, Washington with Chitosan© in February 2002. Water from that project's steep graded hill slopes typically had turbidity in the range of 150 NTU before Chitosan (Liqui-Floc©) treatment, and around 1 NTU after treatment. Water was pumped from collection ponds and routed by pipe to a Baker Tank sand filtration system, which had Chitosan© additive. Liquid Chitosan© was also added to the water as it passed through the pipe (0.5 mg/L, or 1 gallon per 20,000 gallons of stormwater), which caused the fine sediments to bind together for removal in the sand filter. A similar system was used for the Lakeside Construction Project in Redmond, Washington in early 2001, which obtained similar results. Phosphorus, heavy metals, and oils that are associated with the fine particles are removed with the sediment. Chitosan© is non-toxic and biodegradable (U.S. Department of Transportation, March 19, 2002). The water must be within the pH range of 6 to 8, which is met by all area waters. Chitosan© has no effect on pH level after treatment. Chitosan© is not yet approved for general use by Ecology as a TESC BMP. Chitosan© is currently permitted by Ecology with an approved site-specific treatment plan, including monitoring and reporting. This product or a similar flocculant with a proven record of field performance may be proposed if Ecology agrees to its use pursuant to the NPDES permit for

construction. Chitosan© or a similar product is not likely to be needed to prevent adverse impacts from construction, but could provide another valuable BMP management tool and could lessen the potential for periodic unintended turbid discharges that are reasonably expected for any large-scale and long-term construction project.

3.1.4 In-Water Work

In-water construction work would consist of the following:

- Under Marina Concept A (to take place under the Redevelopment Alternatives 1 through 3), up to 300 steel or concrete piles could be placed to support up to 120,000 square feet of float area and approximately 1,200 square feet of ramp. Under Marina Concept B (under No Action Alternative 4) up to 360 piles, up to 138,000 square feet of float, and approximately 1,200 square feet of ramp would be constructed.

- Under Alternatives 1 through 3, approximately 98,700 square feet of overwater wharf and about 560 creosote piles, approximately 1,490 linear feet of bulkhead and associated rip rap covering approximately 1,890 square feet of the south Whatcom Waterway would be removed for restoration of a natural shoreline.

- Under Redevelopment Alternatives 1 through 3 approximately 1,500 linear feet of shoreline would be restored on the south side of the Whatcom Waterway to create 2.4 acres of new natural shoreline and beach, some of which would occur below the mean higher high water line.

- Transient moorage within the Whatcom Waterway would be constructed under Redevelopment Alternatives 1 through 3 with ramps to the shoreline. On the south side of the Waterway, two floats each 1,500 feet long by 20-feet wide with 120-foot by 10-foot ramps are proposed for construction, supported by 64 steel piles. On the south side of the Waterway, a 900-foot by 20-foot float and a 600-foot by 20-foot float would be constructed, each with a 120-foot by 10-foot ramp supported by 64 steel piles.

All of this work would proceed in compliance with conditions to be established in federal, state, and local permits and using mitigation described by Grette Associates LLC (2007) to prevent adverse impacts to water quality.

3.1.5 Petroleum-Based Products and Spill Response and Prevention

The use of heavy equipment during construction may require on-site fueling and often limited storage of products such as lubricating oil and hydraulic fluid, which may create a risk for accidental spills. Unintended release of fuels, oil, or hydraulic fluid could contaminate soils and, if untended or uncontrolled, migrate to groundwater or into the Whatcom Waterway or Bellingham Bay. The SWPPP would identify plans for control measures and spill response to prevent or control construction equipment leakage of fuel, oil or hydraulic fluid. Water quality impacts from construction spills can typically be prevented or limited to very local areas by BMPs and accidental spill provisions as required by the NPDES permit. Spill response plans would provide for emergency, local and state agency notification, provision for on-site storage of spill response and cleanup materials, training, and response and cleanup procedures.

3.1.6 Concrete Work

Construction of foundations, structures, curbing, driveways, sidewalks and other infrastructure includes concrete work which can raise pH in stormwater if contact of stormwater occurs during curing. Curing times vary with weather conditions and concrete types. Marine waters are much less susceptible to pH impacts than fresh waters because they are very highly buffered (meaning it is difficult to alter the pH of seawater), which neutralizes higher pH water when it is introduced.

Management of the higher pH runoff where concrete is used, along with pH monitoring, is a best management practice to avoid introducing high pH water into the natural environment and could be handled through a variety of options at the site. Concrete affected runoff could be isolated from other non pH-affected construction runoff depending on the scale of work. Options available to the construction on the site include the following:

- Sequestering pH affected water in ponds and treatment by carbon dioxide sparging with dry ice or compressed CO_2 to return it to neutral pH;
- Discharge to sanitary sewers (if feasible) with appropriate permits from the City;
- Use of pH affected water for dust control; and
- Re-use of pH affected water by the off-site batch plants providing concrete for the project.

Rinsing of concrete-related equipment also raises pH, and would be stringently controlled by provisions in the SWPPP. These could include the following:

- Concrete truck rinsate could be returned with the trucks to the off-site batch plants for re-use as process water.
- Minor rinsate from other concrete equipment could be controlled by confining it to plastic-lined pits or temporary holding tanks that are separately managed from the storm drainage control system (with contents legally disposed off-site or as described immediately above).

3.1.7 Features Incorporated into the New Whatcom Redevelopment Proposal

With the proper employment of construction best management measures it is concluded that the site could adequately prevent long term or severe turbidity impacts to surface waters during construction that could adversely affect aquatic habitat. Monitoring, site cleanup, and on-site inspections as required by the NPDES permit would be expected to locate and rectify problems shortly after their occurrence, or prevent them altogether.

The following features would be incorporated into the New Whatcom Redevelopment construction plan (under redevelopment Alternatives 1 through 3) to reduce or off-set the potential construction-related water quality impacts:

- An NPDES Permit for Stormwater Discharges Associated with Construction Activities would be obtained from Ecology, which would contain monitoring and erosion control requirements deemed necessary by Ecology.

- A Stormwater Pollution Prevention Plan (SWPPP) would be prepared and implemented as required by the NPDES permit and would be updated as warranted, which would contain specific best management practices for each construction season.

- Monitoring requirements determined by Ecology for the NPDES permit(s) would be implemented and reported.

- Best management practices would be implemented from the menu of measures listed in Tables 3-1 and 3-2. The major TESC measures detailed in the SWPPP would include (but are not limited to) the following:
    - Marking the construction limits (i.e., marking limits on plans and in the field using plastic, metal, or fence);
    - Installation of temporary construction access (stabilized entrances) and staging areas (i.e., limiting construction vehicles to points stabilized with quarry spall or rock with wheel wash pad);
    - Road cleaning (i.e., shoveling or sweeping sediment, followed by street sweeping);
    - Perimeter protection such as silt fencing when necessary to intercept fine sediments and fencing or flagging of clearing limits;
    - Soil stabilization: temporary or permanent cover such as seeding, mulching, sodding, plastic covering, erosion control fabrics and matting, application of polyacrylamide (PAM) to the soil, or gravel base, over disturbed areas or stockpiles to prevent erosion (after 7 days unused/unworked from May 1 through September 30; after 2 days unused/unworked from October 1 through April 30 or as needed to respond to weather forecasts);
    - Utilize a certified on-site TESC inspector and conduct inspections weekly and following each rainfall in excess of 0.25 inches/ 24 hours;
    - Convey offsite existing drainage through construction areas via pipelines to prevent mixing with construction stormwater;
    - Treat runoff to remove sediment;
    - Cover measures (for example, hydroseed, straw cover, polyacrylamide [PAM], and/or plastic);
    - Stabilize channels and outlets (i.e. armoring as necessary to prevent erosion or scour);
    - Control of all pollutants on-site, including removal and legal disposal of construction waste or soils contaminated by construction activity or accidental spills;
    - Maintenance and inspection of BMPs and TESC measures;
    - Compliance with all federal, state, and City of Bellingham code and permit requirements; and
    - Accidental spill response plans, on-site clean-up materials storage, and worker training;

- Construction entrances would include truck wheel washes in addition to quarry spalls to dislodge sediment if warranted by truck traffic and soil export volumes; and routine street cleaning;

- Use of specialized products such as Chitosan or Electrocoagulation and other water treatment systems if warranted and approved by Ecology under the NPDES permit;

- BMPs proposed for concrete work are the following:
    - Cement trucks wash water would not be disposed on-site, but would be returned to the off-site batch plant for recycling as process water;
    - New concrete work would be covered and protected from rainfall until cured; and
    - Monitoring of pH would occur in areas with active concrete work; and

- In-water construction would employ conditions to be established in federal, state, and local permits and use mitigation described by Grette Associates LLC (2007) to prevent adverse impacts to water quality.

3.1.8 Probable Scale of Construction Impacts under Alternatives 1 through 4

With proper control of storm drainage, in-water work BMPs (see Grette and Associates, Inc. 2007), and good accidental spill response planning, adverse impacts from fine sediment, alkaline (high) pH, and construction-related accidental hazardous material spills would be reasonably expected to be avoided or limited to small short-term occurrences with no lasting adverse effects. Some minor introductions of fine sediments to Bellingham Bay or the Whatcom Waterway from heavy rainstorm runoff during shoreline restoration work, piling removal, and/or new piling installation would be likely to occur from time to time, but stringent implementation of SWPPP measures and countermeasures required by federal, state, and City of Bellingham permits should identify and rapidly correct such occurrences so they would not adversely affect habitat through water quality impacts. Alternative 4 would have the lowest risk in any given construction year, because less construction activity would occur on an overall basis as compared to the other Redevelopment Alternatives 1 through 3.

Alternatives 1 through 3 include the removal and upland disposal of about 560 creosote treated piles. Creosote is a complex mixture of many chemicals and has been found to be potentially toxic to fish, other marine organisms and humans. Approximately 300 chemicals have been identified in coal-tar creosote, and there may be 10,000 other chemicals present in the mixture. The major chemicals that can cause harmful health effects are polycyclic aromatic hydrocarbons (PAHs), phenols and cresols. While creosote leaches from treated wood at a very slow rate (Kang *et al* 2005), these compounds may be bioconcentrated by aquatic animals and plants, and can induce liver damage and other pathologies in fish exposed to creosote contamination. Therefore, removal of existing creosote treated timber piles would remove a significant source of chronic creosote contamination from the marine environment in the site area. In the long term such removal would more than compensate for short-term sediment water quality impacts from pile removal and other in-water construction work proposed under the redevelopment alternatives.

3.1.9 Significant Unavoidable Adverse Impacts from Construction

None are anticipated with mitigation developed as part of the proposal as described above.

3.2 Stormwater Quality Impact Evaluation

Stormwater management under the various alternatives is summarized in Section 1.2 of this report and by David Evans and Associates (2007). Section 3.2 describes typical stormwater contaminants expected from the types of land use that are proposed, quantitatively analyzes performance of the stormwater facilities that are proposed or could be employed under the various alternatives, and discusses results. State water quality standards are concentration-based, and concentrations of typical stormwater constituents under the various alternatives are quantitatively evaluated and compared to these standards for Redevelopment Alternatives 1 (higher density), 3 (lower density) and the No Action Alternative 4. Redevelopment Alternatives 2 and 2A (medium density) are qualitatively evaluated relative to Alternatives 1 and 3. Water quality under the alternatives is forecast by using data from the literature to estimate untreated water quality for major categories of land use (for example, office, industrial, commercial/retail, and housing), mixed in proportion to the volume of runoff each is expected to contribute from pollution-generating surfaces. These untreated concentrations are then reduced by the expected performance of the stormwater facilities to predict discharge water quality.

The analysis assumes approximately half of the runoff from the redevelopment would be treated using wet vaults and the other half using a combination of bioretention, biofiltration, and filter strips. However any facility type (and any combination of facilities) meeting Basic Treatment criteria under the Ecology 2005 Manual ultimately could be used. The resultant discharge is assessed in relation to the existing water quality condition and water quality standards to describe impacts for "conservative" water quality constituents at each of the nine outfall collection points (runoff to multiple dispersion points in Redevelopment Area 10 is treated as a single outfall for the purposes of this analysis), and from all nine outfalls proportionately combined (the total combined site discharge to Bellingham Bay). "Non-conservative" constituents are evaluated qualitatively, or by analysis using other separate studies from the literature. The terms "conservative" and "non-conservative" in this context are scientific terms used to classify different types of water quality constituents or characteristics. Conservative parameters are, for example, metals, nitrogen and phosphorus compounds, solids, and petroleum hydrocarbons that may degrade or convert to other compounds, but can be sensibly described in mass quantity terms. Non-conservative parameters, for example temperature, pH, and dissolved oxygen, do not have meaningful mass quantity characteristics.

Planning analysis demonstrated that at 2016 the area of pollution generating surfaces[4] for stormwater would be less than at 2026 under all alternatives, even though some interim areas may be used for parking lots until they are built with structures. Because the greatest stormwater quality impacts would occur at the time of greatest pollution generating surfaces, this water quality analysis only evaluates the 2026 built-out time period.

3.2.1 Description of Stormwater Contaminants

Vehicular traffic is the greatest local cause of stormwater pollution. Data for urban storm runoff quality have shown a dramatic decline in all automotive pollutants from roadways and parking lots since the 1980s, due to improvements in automobile design, fuels, automotive emission

[4] For example, parking lots and roadways are considered pollution generating surfaces, as opposed to rooftops composed of inert materials.

controls and catalytic converters (CH2M Hill 1992; Associated Earth Sciences, Inc. 2000; Brown and Schueler 1997; Comings, Booth, and Horner 1999; King County 1995; Martin 1989; Schueler *et al.* 1991; Urbonas 1994). This has led to significant improvements in urban runoff quality over the past 25 years.

Vehicles deposit an array of organic and inorganic pollutants to roadways and parking areas, which accumulate and then wash off with storm runoff. These include heavy metals, petroleum products, and solids. Oils and greases contain lead and zinc, tire wear contributes zinc, moving parts of automobiles wear and deposit lead and copper, and brake linings and protective coatings to undercarriages contain copper. Streets themselves degrade to some extent, also contributing suspended sediments to storm runoff (Harper 2000). Roadways also collect runoff from driveways and landscaping around residential lots and structures when rainfall is heavy enough to saturate soils. Concentrations of pollutants in stormwater are highly variable by site, and are affected by numerous factors such as traffic and parking characteristics, storm intensity, rainfall pattern within a given storm, amount of time since the last storm, road maintenance (such as street sweeping), and airborne contributions from adjacent land use (Maestri *et al.* 1988; Harper 2000). The following section is a brief overview of stormwater contaminants typical of the land use categories used in the analysis.

Metals

Three of the heavy metals are typically used to assess stormwater quality and its impacts. These are lead, zinc and copper. Lead (Pb) in stormwater runoff on streets is mainly associated with particulates and mainly originates from wear of moving vehicle parts. The primary source of roadway copper (Cu) is wear from vehicle parts, such as brakes, alternators, and radiators. Low concentrations of the cupric ion of copper are extremely toxic to phytoplankton (Metro 1982). Zinc (Zn) is an abundant trace mineral that occurs naturally in water bodies. A substantial source of zinc on roadways is tire wear. Lesser amounts of zinc originate from brake linings and exhaust emissions. Galvanized metal in structures are also a source of zinc in stormwater. Studies show roadways adjacent to lakes contribute to zinc accumulations in lake sediments, where zinc is effectively immobilized (Gjessing *et al*. 1984; Yousef *et al.* 1984). Zinc is not considered a carcinogenic metal and federal agencies have no specified health limits for zinc. However, Washington State water quality standards for zinc do exist and are used in this analysis. Once in sediments (for example, trapped in the bottom of stormwater ponds or vaults, or entrained in bioswales), heavy metals tend to be immobile unless the sediments are disturbed (Yousef *et al*. 1984). The dissolved, bivalent (double positive charge) ion of heavy metals is generally the toxic form; dissolved metals are the basis for state water quality standards.

Oil, Grease, and Total Petroleum Hydrocarbons (TPH)

Oil and grease have natural vegetative and manmade components. Total petroleum hydrocarbons (TPH) are a subset of oil and grease derived solely from petroleum products that are more volatile than oil and grease. Natural oils from vegetation generally comprise the remainder. TPH results from automotive spills, leaks, antifreeze, hydraulic fluids, and asphalt leachate (Washington State Department of Transportation [WSDOT] 1997). Oil and grease and TPH have poor solubility in water and are hydrophobic, which means they readily separate from the aqueous (water) phase and adhere to solid surfaces when the opportunity is afforded (for example, to grasses in bioswales). Appreciable amounts of oil and grease can remain dispersed in water in emulsified form where there is sufficient mixing energy in the water to

cause and maintain emulsification. Oil and grease and TPH that adhere to emergent surfaces are degraded by microbial digestion, sunlight (photochemical degradation), and volatilization.

Total Suspended Solids (TSS)

Suspended solids are comprised of inorganic and organic material and can be transported by, suspended in, or deposited from stormwater. Suspended solids are generally considered one of the most substantial nonpoint source contaminants (nonpoint meaning no single discrete source), because other contaminants bind to fine particulates (Waters 1995, Crawford and Mansue 1996). Metal ions, organic chemicals, and phosphorus bind to and are transported by mobile fines or immobilized with settled fines (Waters 1995, Simmons 1993).

Nutrients

Nutrients tend to build-up on impervious surfaces. Nitrogen (N) and phosphorus (P) occur in stormwater runoff from roadways, from fertilizers used in landscaping, from exterior use of detergents, and from sediment erosion. Nitrogen occurs in numerous forms, including dissolved molecular nitrogen, ammonia-nitrogen (NH_3-N), and nitrate- and nitrite-nitrogen (NO_2-N and NO_3-N, respectively). Nitrogen is also reduced to nitrogen gas and volatilized (lost to the atmosphere) through microbial activity (denitrifying bacteria), usually under anaerobic (no or low oxygen) conditions. Nitrogen is the most limiting nutrient to algal growth in marine waters. Gaseous nitrogen can be fixed (converted to organic form) by microbes symbiotic with some plants, such as red alders. Phosphorus, unlike nitrogen, readily binds to aluminum and iron in sediments where it is immobilized, though still available to plant root uptake. Phosphorus can be converted from mineral form in sediments to dissolved form in water under anaerobic conditions.

Pesticides: Insecticides and Herbicides

Some landscaping insecticides and herbicides can be transported in stormwater runoff. The mobility and persistence of pesticides varies greatly. Where measured, the appearance of landscape chemicals in urban settings tends to be sporadic and has not been associated with toxic effect to surface waters. Metro (1982) first reported tentative identification of seven pesticides in five of twenty-one samples collected during its survey of residential and urban areas in the early 1980s. Of the seven pesticides found, all had concentrations in untreated surface runoff above chronic standards at least once; however, no violations of standards in receiving waters were noted and the report concluded *"due to dilution, flushing, adsorption, and sediment deposition, no acute toxicity problems were discovered in the sites studied"* (Metro 1982). Subsequently, USGS and Ecology conducted a survey of pesticides in 13 small streams in the Puget Sound Basin, using data collected between 1987 and 1995 (Bortleson and Davis 1997). None of the pesticides detected exceeded existing state or federal freshwater aquatic life criteria. Although no violations of state toxicity standards were found, four pesticides (diazinon, mevinphos, malathion [all insecticides], and diuron [an herbicide]) were found in surface waters at levels exceeding maximum concentrations recommended for the protection of aquatic life (National Academy of Sciences and National Academy of Engineering 1973). As a result, these products came under increasing scrutiny. Although there was no definite conclusion of impact in the Bortleson and Davis (1997) study, it did highlight the importance of minimizing pesticide use as a source control measure.

In a more recent study concluded in 1998, USGS, Ecology, and King County tested 10 streams in King County for pesticides. The streams studied were subject to influence from single family yard maintenance practices that would not be directly applicable to high density multifamily housing proposed for the site, but were indicative of conditions that may exist wherever homeowner discretion in landscape maintenance predominates. Diazinon was the only pesticide shown to be a problem, but this product was found at levels considered toxic to aquatic life in 9 of the 10 streams. In addition to direct toxicity, diazinon inhibits olfactory-mediated alarm responses and homing behavior in salmonids (Scholz 2000). Diazinon was used by homeowners to control European cranefly (*Tipula paludosa*) larvae in their lawns. On May 19, 2000, EPA's Office of Pesticide Programs published a Federal Register notice announcing a preliminary human health risk assessment for diazinon, which reclassified this insecticide to "restricted use," and all indoor household use retail sales ended in December 2002. Manufacturing of diazinon for all lawn and garden uses ceased in June 2003, and all sales and distribution stopped in August 2003.

Other pesticides have come under scrutiny and are now restricted. On December 31, 2000 Dursban became prohibited for food and crop uses; on December 31, 2001 retail sale of Dursban was prohibited; and Dursban was eliminated from use as a pre- and post-construction control for termites and carpenter ants on December 31, 2005.

Fecal Coliforms

Fecal coliforms in stormwater are an inevitable result of development because natural filtering pathways for storm runoff that used to remove them, such as interflow through shallow soils and sheetflow through forest duff and vegetation, are replaced by impervious surfaces and stormwater treatment facilities. Even absent residential pet influences which can be considerable, wildlife including birds are sources of fecal coliforms that collect on roadways and impervious surfaces until storms wash them to and through stormwater facilities. Fecal bacteria densities have been shown to be related to housing density, percent impervious surface, and domestic animal density (Young and Thackston 1999). Fecal coliforms tend to be extremely variable and peak values are immediately responsive to storms, making average stormwater discharge concentrations difficult to predict.

Biochemical Oxygen Demand (BOD)

BOD is a measure of the amount of oxygen required for aerobic micro-organisms to oxidize the organic content of water or sediments under the water over a fixed period of time, usually five days (Chapman 1996). This type of metabolism consumes oxygen, and thereby lowers the oxygen content in water. Generally, stormwater runoff from mixed use development carries a very low biochemical oxygen demand, unlike for example runoff from agricultural areas with significant livestock use, or discharge from wastewater treatment plants. Because the alternatives would all comprise urban mixed use or industrial use, BOD and dissolved oxygen is not included in the quantitative water quality model.

Temperature

Urban runoff from summer storms is often thought to be warm because of the influence of impervious surfaces and wet ponds which warm from sunlight and warm air temperatures. However, measurement of air and wet pond temperatures during the summer demonstrates that storm runoff in western Washington rarely coincides with warmer weather. In the Puget

Lowlands, most storms and the vast majority of runoff volume occurs during the cooler weather seasons (late fall through early spring). A temperature monitoring study was conducted by A.C. Kindig & Co. at Trossachs, a residential development in the City of Sammamish, Washington in the Puget Lowlands. Continuous gages measured stormwater and air temperatures from May 2000 through September 2000. Temperature gages were installed at inflow to the combined wet detention pond, in the wet pond, at the wet pond outflow (which was inflow to a sand filter), and at the sand filter outflow (A.C. Kindig 2000). An ambient air temperature gage was installed out of direct sunlight at the site. From July through September runoff from summer storms never overcame evaporative losses in the wet pond to cause discharge to occur. From May through September storm runoff entered the wet pond at temperatures consistently below 62 ºF (16.7^{o}C) due to evaporative cooling, and because of the cooler air temperatures measured during all storms (A.C. Kindig 2000). Water within the wet pond cooled rapidly during all storms, both because of cooler air temperatures and because of mixing with the cooler inflow water. Pond discharge occurred for the first time after several days of rain between September 5th and September 11th. The series of storms that resulted in pond outflow followed periodic storms and cooler weather starting in late August. When pond outflow began, the pond temperature had dropped to about 60 to 61ºF (15.6 to 16.1^{o}C), and continued to drop as the storm and discharge continued.

These discharge temperatures are within the range of background temperature in Bellingham Bay during the summer. On July 15 and August 19, 2003 surface temperatures at Bellingham Bay station BLL011 were measured at 17.62 ^{o}C and 15.94 ^{o}C, respectively. The New Whatcom Redevelopment Project is unlikely to employ open wet ponds. The types of facilities the project is most likely to employ all would generate cooler stormwater than wet ponds, because they have no open water component exposed to sunlight (i.e., wet vaults, biofiltration swales, bioretention, and filter strips). Therefore, stormwater discharge temperature is expected to be well within water quality standards and natural background conditions in Bellingham Bay, and is not analyzed further.

3.2.2 Water Quality Analysis Methods Summary

Within each of the nine outfall catchments (A through H and Area 10; see Table 1-1) stormwater quality was determined for each of the five major land use categories that are assumed under the redevelopment alternatives: industrial, office, goods and services, housing, and park / landscaping. All assessments are for built-out conditions assumed by 2026. The stormwater contributions from each category were proportionately mixed based on assumed square footage of land cover for each land use category (contaminant source area exposed to runoff) using data calculated by CollinsWoerman. Rooftop runoff is assumed to bypass the stormwater treatment facilities and discharge directly to Bellingham Bay because it does not require stormwater treatment under City of Bellingham code, so the stormwater assessment includes storm runoff from parking, sidewalks, landscaping, and access roadways associated with each land use category. Since most of the land use categories are impervious, they would generate the same volumes and rates of stormwater runoff on a square foot coverage basis except the park / landscaping, which generates about 19% of the runoff of all other land use category types according to calculations by David Evans and Associates. The amount of runoff was adjusted for the amount of park or landscaping contained within each category accordingly. Stormwater runoff from BNSF Railroad right of way is an existing background condition assumed to be unaffected by any alternative (except for location), and like other pass-through stormwater from off-site areas is not included in this analysis.

Stormwater quality was forecast by the following method:

1. Untreated stormwater runoff quality for each proposed land use category was estimated using data from previous studies at sites with similar land uses to each proposed category. None of the existing industrial use discharges at the site were considered representative of redeveloped industrial use by 2026 due to changes in source control and other pollution prevention measures that have taken place since those measurements were taken.
2. Storm runoff from different land use categories was proportionately mixed on the basis of contributing area as described above, except for landscaping within each category, and the park category which were proportionately reduced (weighted downward to 19% of contributing runoff area) on the basis of runoff calculations by David Evans and Associates, Inc.
3. The quality of the combined inflow to the stormwater facility was modified by the expected performance of (1) wet vaults and (2) bioretention/biofiltration/filter strip treatment and (3) the average of the two to represent the most likely 50:50 combined use of the two categories of facilities. Since specific plans for facility types and locations do not exist at this stage, this method was used to estimate a reasonably expected range and probable average storm discharge quality.
4. The forecast quality of the treated discharge (without dilution by rooftop runoff) was directly compared (prior to dilution or mixing in Bellingham Bay) to marine water quality standards and to background water quality in Bellingham Bay.

3.2.3 Stormwater Quality Treatment Facilities

Bioretention / Biofiltration Swale / Filter Strip

Stormwater runoff could be treated by bioretention, biofiltration swale, or filter strip. Bioretention (sometimes referred to as a “rain garden”) is a Low Impact Development (LID) type of facility that infiltrates at least 91 percent of the average annual runoff volume through a planted basin containing a specific blend of soils that remove contaminants through sorption, filtration, degradation, and volatilization. Bioretention minimizes storm runoff through evaporation and plant transpiration. Bioretention does use a fairly large amount of space (about 5% of the contributing catchment) but fits well into landscaping or parks and therefore is the most likely of these three facility types to be employed on the site under Alternatives 1 through 3 (Alternative 4 has no parks). A biofiltration swale is an open, gently sloped, vegetated channel with design features that make it more difficult to employ in dense urban settings. Biofiltration swales treat the same volume of storm runoff by physical filtration, settling of suspended particles and absorbed contaminants, and to a very minor degree, uptake and sorption of nutrients and metals by the vegetation itself during the growing season. Filter strips are generally employed to treat runoff generated as sheetflow from any linear feature (such as a roadway) but require a very broad roadway shoulder for adequate treatment, and may not be suitable in dense urban settings for that reason. Treatment occurs by sheetflow filtration through a vegetated slope and works by the same principles as biofiltration swales. The length of the biofiltration channel and the width of the filter strip or strips are established by the Ecology 2005 Manual to provide enough distance/time for contaminant removal. Grass-lined swales can be very effective at removing sediments, particle-bound toxicants like metals, and oil and grease from surface runoff. Data in the literature indicate that these types of facilities have similar contaminant removal capabilities except for fecal coliforms, as shown in Table 3-3. Biofiltration swales and filter trips are ineffective at removing fecal coliforms, but bioretention is very effective.

Table 3- 3
Bioretention / Biofiltration Swale / Filter Strip Contaminant Removal Efficiency (%)

Reference	TSS	Tur-bidity	TP	Ammonia-Nitrogen	NOx	Diss. Lead	Diss. Zinc	Diss. Copper	Fecal Coli-forms	Oil and Grease
AESI 2000 (Swale filtration)	88		63		91		66		0	
Barrett 1995 (Swale filtration)	74		31		59	50-90	50-90	50-90		88
USEPA 1999 (Swale filtration)	81		9	50	38	67	71	51		62
Goldberg 1993 (Swale filtration)	68		5	16	31	62		42	0	
Metro 1992 (Swale filtration)	83		29		0	67	63	46	0	75
Schueler *et al.* 1991 (Swale filtration)	70		30			50-90	50-90	50-90		
Schueler 1997 (Swale filtration)	81		29		38	14-55	14-55	14-55	0	62
Davis et al. 1998 (Bioretention)	81		29		38	51-71				58
PDGER 1993 (Bioretention)	90								90	
Coffman1998 (Bioretention)			81	79	23	99	99	93		
USEPA 2000 (Bioretention)					15	79	78	48		
Hsieh and Davis 2005 (Bioretention)	91		63	13	0	>98				>97
Winer 2000 (Bioretention)			65			95-97				
(Average) Removal Efficiency Used in this Analysis	80	80[(1)]	39	40	33	73	64	61	80[(2)]	74

TSS= total suspended solids; TP=total phosphorus; NOx = nitrate plus nitrite-nitrogen
(1) Turbidity estimated as the same as TSS removal.
(2) Bioretention facilities are assumed the most likely application over filter strips and biofiltration swales for the New Whatcom Project, because they fit more easily into landscaping features. Consequently, the bioretention rate of fecal coliform removal was used in the analysis. The 90% literature value for fecal coliform removal by bioretention was reduced to 80% using professional judgment, because only one datum was available.

Wet Vaults

Wet vault(s) are assumed in all areas of the site not served by bioretention / biofiltration swale / filter strips under Alternatives 1 through 4, although many other options could be employed under City code that meet the Basic Treatment requirements of the Ecology 2005 Manual. Wet vaults are not as effective in removing nitrogen as open wet ponds, because they lack algal and uptake which is dependant on sunlight, but otherwise mechanisms of contaminant removal in vaults are similar to those in ponds. The processes that function as well in wet vaults as wet

ponds include microbial degradation, volatilization, degradation (except that dependent on sunlight), and most importantly removal through settling of particulates (Nussbaum 1990). The vault volume also dilutes the first portion of stormwater inflow from each storm with higher quality water treated since the previous storm. Quiescent, or between-storm, settling of particulates and attached contaminants is very effective if the time between storms is a period of days. However, most runoff volume is treated under dynamic conditions during storms while pond inflow and outflow is occurring simultaneously. Overall performance in removing particulates and the dissolved constituents that they attract and bind is a function of hydraulic residence time and dissipation of hydraulic energy, which relates to the amount of time slowly settling small particles have to settle to the pond bottom. The size, shape, and dead water depth in wet vaults are designed to dissipate hydraulic energy of water passing through the vault or pond to promote settling of particulates, as well as prevent re-suspension of settled material. Efficiency for fine particle removal measured as the percentage of outflow over inflow concentrations is extremely variable from start to finish of a given storm and from storm to storm. Contaminant removal varies with storm intensity, time between storms, and inflow concentrations of contaminants. Recently measured stormwater inflow concentrations in the Puget Lowlands for new master plan developments have been lower than predictions based on studies in the literature would suggest (A.C. Kindig & Co. 2002 and 2003; AESI 2000). It is recognized that very dilute or low stormwater constituent inflow concentrations are more difficult to reduce in stormwater facilities than high concentration inflows. Stormwater facility functions are presented in the literature as averaged percent removal efficiencies for individual contaminants based on an assumed average inflow concentration. However, the best measure of performance is treated discharge concentrations of contaminants, since most water quality standards and water quality influence on habitat are concentration-based. Vaults typically discharge more nitrogen and may discharge slightly more phosphorus than wet ponds, and therefore are not recommended for nutrient-sensitive waters. Bellingham Bay is not designated as nutrient-sensitive so wet vault treatment is consistent with stormwater objectives for the site. Although more expensive than wet ponds to construct, wet vaults like wet ponds are cost-effective to maintain, are more adaptable to dense urban projects, and have a long expected service lifetime.

Wet vault and wet pond (where applicable to vaults) contaminant removal efficiencies were derived from the literature as shown in Table 3-4.

Table 3- 4
Wet Vault and Wet Pond Contaminant Removal Efficiencies (%)

Reference	TSS	TP	Ammonia-Nitrogen	Nitrate +Nitrite-Nitrogen	Dissolved Lead	Dissolved Zinc	Dissolved Copper	Fecal Coliforms	Oil and Grease
AESI 2000	73	95				11			
A.C. Kindig & Co. 2003 (wet pond)	25	25-50 (30)		75-95 (83)		20-76 (49)			
Brown and Schueler 1997 (wet pond)	77	47		24	73	51	57	65	83

Reference	TSS	TP	Ammonia-Nitrogen	Nitrate +Nitrite-Nitrogen	Dissolved Lead	Dissolved Zinc	Dissolved Copper	Fecal Coliforms	Oil and Grease
Comings, Booth, and Horner 1999 (wet pond)	71	33			75	59	42		
King County 1998 (wet pond)	80								
King County 1995 (wet pond)	53-86 (70)	43-61 (50)	72	67	25-80 (53)	28-53 (40)			
Herrera 2004 (wet pond)	96	80				81			
Shapiro 1999 (wet vault) (1)	21-51 (36)	<1-23 (7)	<1-36 (12)(1)	5-28 (17)(1)	2-58 (30)	17-36 (26)	13-13 (13)		
Basic Wet Vault Efficiencies Used in this Analysis	**80(2)**	**50**	**12**	**17**	**57**	**45**	**37**	**55(3)**	**70(4)**

TSS= total suspended solids; TP=total phosphorus

(1) Wet vault performance for Lakemont facilities in Bellevue, Washington; water passing through the vault only. A wet vault lacks sunlight, which lowers biological uptake performance, particularly for nitrogen compounds. These data were used to predict the wet vault efficiency for nitrate+nitrite-nitrogen and ammonia-nitrogen removal, but were not used to predict the wet pond nitrate+nitrite-nitrogen and ammonia-nitrogen removal efficiency.

(2) Treatment assumed by Ecology based on its research for a basic wet pond or wet vault design in the 2005 Stormwater Management Manual for Western Washington.

(3) Fecal coliforms are not well removed by saturated flow paths, meaning that when inflow and outflow from a vault occur simultaneously, the method of fecal coliform removal is mainly dilution from the stored water volume, wherein fecal coliforms die and diminish between storms. Because the literature datum of 65 percent removal is based on one source and fecal coliform occurrence is highly variable, the value was conservatively lowered to 55 percent based on professional judgment.

(4) Because the 83 percent removal figure for oil and grease is based on one literature reference the predicted removal was conservatively lowered by about 10 percent to a 75 percent removal efficiency, on the basis of professional judgment. Since vaults lack photochemical degradation capability, oil and grease removal for vaults was lowered an additional 5 percent.

Stormwater Facility Maintenance

To be effective, water quality facilities must be maintained. Bioretention / biofiltration swale /filter strip maintenance measures include mowing to the design height (for the bioswale and filter strip), vegetation maintenance, sediment and debris removal, repair of eroded or scoured sections by re-grading, and replanting or reseeding as warranted. Accumulations of noxious or nuisance vegetation (morning glory, English Ivy, reed canary grass, Japanese knotweed, purple loosestrife, blackberry, Scotch broom, tansy, poison oak, stinging nettles, devils club) or visible oil, gas, or other contaminants should be removed. Obstructions should be removed to maintain proper water flow through the swale.

Wet vault maintenance measures include the following:

1. The vault should be inspected annually and floating debris and accumulated petroleum products should be removed as needed and at least annually;
2. Sediment should be removed when sediments accumulate to 18 inches (one foot of intentional sediment storage allowance plus an additional 6 inches). Sediment should

be tested for toxicants in compliance with local disposal requirements if land uses in the catchment include commercial or industrial zones; otherwise disposal to any approved offsite location for the purpose is allowed;

3. Water drained or pumped from vaults prior to sediment removal usually can be discharged to storm drains if it is not excessively turbid and if floatable debris and visual petroleum sheens are removed; and
4. Drain lines, oil absorbent pads, baffles, inlet grates, outlet control structures, air vents, and access ladders should be checked for proper operation and repaired as needed.

3.2.4 Water Quality Analysis Model

Untreated stormwater quality was forecast for each of the nine stormwater catchments or basins described in Section 1 of this report for Alternatives 1, 3, and 4 (draining to outfalls A through H and Area 10).

The types of land uses proposed under the various alternatives were placed into 5 categories, each of which would generate a different quality of stormwater (Table 3-5). The stormwater quality predicted for each land use category was based on site-measured and/or data from the literature as described below. It is important to note that a conservative approach to parking exposed to rainfall was taken in the analysis. The data used to derive runoff quality all come from sites with exposed parking, which together with roadways are the greatest source of stormwater contaminants. Under Alternatives 1, 3, and 4 exposed parking would vary, with more inside structured parking under buildings for Alternative 1, a lesser amount under Alternative 3, and none or very little under Alternative 4. This means that the analysis for Alternative 1 and (to a lesser extent) Alternative 3 overstates contaminant concentrations and thus is conservative (tending to overstate impacts).

Table 3- 5
Land Use Categories and Sources of Untreated Stormwater Data for the Water Quality Assessment

Land Use Category	Included in Alternatives	Land Use Description and Source of Untreated Water Quality Data
Industrial	Alternatives 1-4	**Industrial** use includes light/marine industrial operations including adjacent service yards for storage and construction use, including light manufacturing, marine services, fish processing, accessory office uses, and surface parking. Untreated water quality for these areas was based on on-site measurements of stormwater from the Trident/City Ice industrial North Bay site adjacent to Elliott Bay in Seattle (A.C. Kindig & Co. 2005a).

Land Use Category	Included in Alternatives	Land Use Description and Source of Untreated Water Quality Data
Office	Alternatives 1-3	**Office** could include offices, research facilities, professional services, related shipping and receiving, and associated landscaping, pedestrian, parking (including structured parking), and access roadway surfaces. Untreated runoff quality was forecast using stormwater data from the literature for the Eastgate business park in Bellevue, Washington for most parameters (Comings, Booth, and Horner 1999), and a Tampa, Florida business park for nitrogen compounds and oil and grease, which were not measured at Eastgate (Southwest Florida management District 1995). Fecal coliforms were based on the geometric mean measured at the Segale Business Park, a light industrial office park in Tukwila, Washington (A.C. Kindig & Co. 2005b). TPH was conservatively based on industrial use measures from the North Bay site (A.C. Kindig & Co. 2005).
Goods and Services	Alternatives 1-3	**Goods and Services** includes small and midsize neighborhood retail services, restaurants, and associated access roadway surfaces, parking, and landscaping. Untreated runoff quality data were used from the Pine Lake Shopping Center in Sammamish, Washington (TP and turbidity) (King County 1993); the Kirkland Office Park in Kirkland, Washington (dissolved metals and total suspended solids) (AESI 1998). These data are considered conservative because they do not include roof contributions as the other literature sources do. Parameters not measured in these studies were estimated from other sources: retail stores and restaurants in Marquette, Michigan ((dissolved lead, ammonia, and nitrate-nitrogen) (Steuer *et al.* 1997); fecal coliforms using the geometric mean from impervious surfaces and TPH conservatively from industrial use measured from the Segale Business Park (A.C. Kindig & Co. 2005b), on-site; and oil and grease from a Tampa, Florida office park (Southwest Florida management District 1995).
Housing	Alternatives 1-3	**Housing** includes multifamily structures 1 to 6 stories or greater, including associated access roads, parking, and landscaping. Untreated runoff quality was estimated using data for townhomes with a density of 13 to 14 DU/acre at the Snoqualmie Ridge project in Snoqualmie, Washington (A.C. Kindig & Co. 2002); TPH conservatively from industrial use areas on site (no other data available). Residential density is likely to be greater than this, making the analysis conservative because parking for high rise usually occurs below the structure, eliminating some or all exposed parking and the associated contaminants. Fecal coliforms were taken from the geometric mean from the Segale Business Park (A.C. Kindig & Co. 2005b), to account for the fact that housing would be included in multistory (often combined use) structures without individual gardens or exposed trash receptacles, and under the assumption that measures would be taken to properly dispose of pet waste.
Parks	Alternatives 1-3	**Parks** Untreated runoff quality for these areas was estimated using data from greenbelts and parks including trails (Meister & Kefer 1981) and from undeveloped park areas at Snoqualmie Ridge, Snoqualmie Washington (Beak 1994).

Untreated water quality for each of the land use categories is summarized in Table 3-6.

Table 3- 6
Untreated Water Quality for Each Land Use Category

Parameter	Units	Indust.	Office	Goods & Services	Housing	Parks
Dissolved Copper	µg/L	3.14	1.4	1.6	0.5	2.0
Dissolved Zinc	µg/L	123.0	33.0	16.0	32.0	26.0
Dissolved Lead	µg/L	0.8	1.2	2.1	0.03	2.4
Total Ammonia-N	mg/L	0.15	0.12	0.19	0.003	0.94
Nitrate + Nitrite-N	mg/L	0.07	0.45	0.30	0.12	0.37
Total Phosphorus	mg/L	0.09	0.17	0.16	0.04	0.459
Turbidity *(NTU=nephalometric turbidity units)*	NTU	1.7	20.0	24.0	10.0	0.14
Total Suspended Solids	mg/L	46.0	16.0	27.0	1.0	18.0
Fecal Coliforms *(CFU = colony forming units)*	CFU/100 mL	23	250	250	250	2
Total Petroleum Hydrocarbons	mg/L	0.57	0.57	0.57	0.57	1.2
Oil and Grease	mg/L	1.13	3.20	3.20	0.8	8.8

The types and amounts of land use under the various alternatives within each of the 9 outfall catchments were defined by CollinsWoerman within the 10 Redevelopment Areas on the site at buildout in 2026. The relationship between the drainage basins and the site Redevelopment Areas is shown in Table 1-1, and the proportionate contribution of each land use category to storm runoff in each basin is shown in Table 3-7.

Table 3- 7
Proportionate Contribution of Land Use Categories to Storm Runoff in Each Catchment
(rounded to nearest whole %, including sidewalks, roadway access, and landscaping allocations to each land use category)

Alternative	Outfall	Industrial	Office	Goods & Services	Housing	Parks
1	A	0	79	1	16	5
	B	0	66	16	11	7
	C	0	35	7	53	6
	D	20	68	4	6	2
	E	9	62	16	11	2
	F	68	17	2	11	3
	G	68	17	2	11	3
	H	68	17	2	11	3
	Area 10	0	0	0	78	22
3	A	0	44	18	35	2
	B	0	79	5	11	4
	C	0	30	32	37	2
	D	24	48	3	23	2
	E	6	48	25	21	1
	F	56	3	8	30	2
	G	56	3	8	30	2
	H	56	3	8	30	2
	Area 10	0	0	2	95	2

Alternative	Outfall	Industrial	Office	Goods & Services	Housing	Parks
4 (No Action)	A	100				
	B	100				
	C	100				
	D	100				
	E	100				
	F	100				
	G	100				
	H	100				
	Area 10	100				

3.2.5 Water Quality Forecast Under Alternatives 1 through 4

Using the methods described above, water quality in runoff from the site (to outfalls A through H and Area 10) was quantitatively estimated at buildout in 2026 for each of the Alternatives 1, 3 and 4 (Tables 3-8 through 3-10) and compared to state standards (WAC 173A-201A) and existing condition data for Bellingham Bay at Station HC-SW-12 for dissolved metals and suspended solids (Table 2-2). All other existing condition data are from Ecology's long-term marine discrete sample data for outer Bellingham Bay at Station BLL011 in 2003. All outfalls combined (to show discharge as though it was one outfall from the entire site to the Whatcom Waterway and Bellingham Bay) are shown in Table 3-11 for Alternatives 1, 3, and 4 at buildout in 2026. The nine outfalls were proportionately combined for Table 3-11 using the weighted contributing area of contaminant sources within each catchment that would be treated in the three water quality facility categories (wet vaults; bioretention / biofiltration swale / filter strip; and a 50:50 combination of each).

Table 3- 8
Alternative 1 Treated Discharge Water Quality Estimate *(Vault (V), Bioretention (B), and 50% of Each (V&B))*

Water Quality Parameter	Units	Existing Condition	Treat-ment	Outfall A	Outfall B	Outfall C	Outfall D	Outfall E	Outfall F	Outfall G	Outfall H	Area 10	State Marine Water Quality Standards
Dissolved Copper	*µg/L*	<1 – 1.8	V	0.8	0.9	0.6	1.1	0.9	1.6	1.6	1.6	0.5	3.1[(A)]
			B	0.5	0.5	0.4	0.7	0.6	1.0	1.0	1.0	0.3	
			V&B	0.7	0.7	0.5	0.9	0.8	1.3	1.3	1.3	0.4	
Dissolved Zinc	*µg/L*	<10	V	17.8	16.3	17.0	27.4	21.2	51.3	51.3	51.3	16.9	81.0[(A)]
			B	11.7	10.7	11.1	17.9	13.9	33.6	33.6	33.6	11.0	
			V&B	14.7	13.5	14.1	22.6	17.6	42.4	42.4	42.4	14.0	
Dissolved Lead	*µg/L*	<3	V	0.5	0.6	0.3	0.5	0.5	0.4	0.4	0.4	0.2	8.1[(A)]
			B	0.3	0.3	0.2	0.3	0.3	0.2	0.2	0.2	0.1	
			V&B	0.4	0.5	0.2	0.4	0.4	0.3	0.3	0.3	0.2	
Total Ammonia-N	*mg/L*	0 – 5.18	V	0.12	0.15	0.10	0.12	0.12	0.13	0.13	0.13	0.19	1.6
			B	0.08	0.10	0.07	0.08	0.08	0.09	0.09	0.09	0.13	
			V&B	0.10	0.13	0.08	0.10	0.10	0.11	0.11	0.11	0.16	
Nitrate+Nitrite-N	*mg/L*	0 – 28.95	V	0.33	0.32	0.22	0.29	0.29	0.13	0.13	0.13	0.15	none
			B	0.26	0.26	0.18	0.23	0.24	0.10	0.10	0.10	0.12	
			V&B	0.29	0.29	0.20	0.26	0.26	0.11	0.11	0.11	0.13	
Total Phosphorus	*mg/L*	0.06 – 2.39 *(ortho-p)*	V	0.08	0.09	0.06	0.08	0.08	0.05	0.05	0.05	0.07	none
			B	0.10	0.11	0.07	0.09	0.09	0.07	0.07	0.07	0.08	
			V&B	0.09	0.10	0.07	0.09	0.08	0.06	0.06	0.06	0.07	
Turbidity	*NTU*		V	3.5	3.6	2.8	3.1	3.5	1.2	1.2	1.2	1.6	5 NTU over back-ground
			B	3.5	3.6	2.8	3.1	3.5	1.2	1.2	1.2	1.6	
			V&B	3.5	3.6	2.8	3.1	3.5	1.2	1.2	1.2	1.6	
Total Suspended Solids	*mg/L*	19-27	V	2.8	3.2	1.8	4.3	3.8	7.0	7.0	7.0	1.0	none
			B	2.8	3.2	1.8	4.3	3.8	7.0	7.0	7.0	1.0	
			V&B	2.8	3.2	1.8	4.3	3.8	7.0	7.0	7.0	1.0	
Fecal Coliforms	*CFU/ 100mL*	1 - 2	V	107	105	106	90	101	40	40	40	88	Geometric mean less than 14
			B	48	47	47	40	45	18	18	18	39	
			V&B	78	76	77	65	73	29	29	29	63	
Total Petroleum Hydrocarbons	*mg/L*		V	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	No visible sheen (~5.0 mg/L)
			B	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
			V&B	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Oil & Grease	*mg/L*		V	0.9	1.0	0.7	0.8	0.9	0.5	0.5	0.5	0.8	No visible sheen (~5.0 mg/L)
			B	0.8	0.9	0.6	0.7	0.7	0.4	0.4	0.4	0.7	
			V&B	0.9	0.9	0.6	0.8	0.8	0.5	0.5	0.5	0.7	

[A] *A four-day average not to be exceeded more than once every three years on the average (WAC 173-201A).*

Table 3- 9
Alternative 3 Treated Discharge Water Quality Estimate *(Vault (V), Bioretention (B), and 50% of Each (V&B))*

Water Quality Parameter	Units	Existing Condition	Treat-ment	Outfall A	Outfall B	Outfall C	Outfall D	Outfall E	Outfall F	Outfall G	Outfall H	Area 10	State Marine Water Quality Standards
Dissolved Copper	*µg/L*	<1 – 1.8	V	0.7	0.8	0.7	1.0	0.9	1.3	1.3	1.3	0.4	3.1[(A)]
			B	0.4	0.5	0.4	0.6	0.5	0.8	0.8	0.8	0.2	
			V&B	0.6	0.7	0.6	0.8	0.7	1.1	1.1	1.1	0.3	
Dissolved Zinc	*µg/L*	<10	V	16.2	17.5	14.9	29.7	18.5	45.1	45.1	45.1	17.3	81.0[(A)]
			B	10.6	11.4	9.8	19.4	12.1	29.5	29.5	29.5	11.3	
			V&B	13.4	14.4	12.3	24.6	15.3	37.3	37.3	37.3	14.3	
Dissolved Lead	*µg/L*	<3	V	0.4	0.5	0.5	0.4	0.5	0.3	0.3	0.3	0.1	8.1[(A)]
			B	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.0	
			V&B	0.3	0.4	0.4	0.3	0.4	0.2	0.2	0.2	0.0	
Total Ammonia-N	*mg/L*	0 – 5.18	V	0.09	0.13	0.10	0.10	0.10	0.11	0.11	0.11	0.02	1.6
			B	0.06	0.09	0.07	0.07	0.07	0.07	0.07	0.07	0.02	
			V&B	0.08	0.11	0.08	0.09	0.09	0.09	0.09	0.09	0.02	
Nitrate+Nitrite-N	*mg/L*	0 – 28.95	V	0.25	0.33	0.23	0.23	0.27	0.10	0.10	0.10	0.11	none
			B	0.20	0.27	0.19	0.18	0.21	0.08	0.08	0.08	0.09	
			V&B	0.23	0.30	0.21	0.21	0.24	0.09	0.09	0.09	0.10	
Total Phosphorus	*mg/L*	0.06 – 2.39 *(ortho-p)*	V	0.06	0.08	0.06	0.06	0.07	0.04	0.04	0.04	0.03	none
			B	0.08	0.10	0.08	0.08	0.08	0.05	0.05	0.05	0.03	
			V&B	0.07	0.09	0.07	0.07	0.08	0.05	0.05	0.05	0.03	
Turbidity	*NTU*		V	3.4	3.6	3.4	2.6	3.5	1.3	1.3	1.3	2.0	5 NTU over back-ground
			B	3.4	3.6	3.4	2.6	3.5	1.3	1.3	1.3	2.0	
			V&B	3.4	3.6	3.4	2.6	3.5	1.3	1.3	1.3	2.0	
Total Suspended Solids	*mg/L*	19-27	V	2.5	3.0	2.8	4.0	3.5	5.9	5.9	5.9	0.4	none
			B	2.5	3.0	2.8	4.0	3.5	5.9	5.9	5.9	0.4	
			V&B	2.5	3.0	2.8	4.0	3.5	5.9	5.9	5.9	0.4	
Fecal Coliforms	*CFU/ 100mL*	1 - 2	V	110	108	111	86	106	53	53	53	110	Geometric mean less than 14
			B	49	48	49	38	47	24	24	24	49	
			V&B	80	78	80	62	77	38	38	38	79	
Total Petroleum Hydrocarbons	*mg/L*		V	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	No visible sheen (~5.0 mg/L)
			B	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	
			V&B	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Oil & Grease	*mg/L*		V	0.7	0.9	0.7	0.7	0.8	0.4	0.4	0.4	0.3	No visible sheen (~5.0 mg/L)
			B	0.6	0.8	0.6	0.6	0.7	0.4	0.4	0.4	0.3	
			V&B	0.7	0.9	0.7	0.6	0.7	0.4	0.4	0.4	0.3	

[A] *A four-day average not to be exceeded more than once every three years on the average (WAC 173-201A).*

Table 3- 10
Alternative 4 Treated Discharge Water Quality Estimate *(Vault (V), Bioretention (B), and 50% of Each (V&B))*

Water Quality Parameter	Units	Existing Condition	Treat-ment	Outfall A	Outfall B	Outfall C	Outfall D	Outfall E	Outfall F	Outfall G	Outfall H	Area 10	State Marine Water Quality Standards
Dissolved Copper	*µg/L*	<1 – 1.8	V	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.1[(A)]
			B	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
			V&B	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	
Dissolved Zinc	*µg/L*	<10	V	67.7	67.7	67.7	67.7	67.7	67.7	67.7	67.7	67.7	81.0[(A)]
			B	44.3	44.3	44.3	44.3	44.3	44.3	44.3	44.3	44.3	
			V&B	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	
Dissolved Lead	*µg/L*	<3	V	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	8.1[(A)]
			B	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
			V&B	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
Total Ammonia-N	*mg/L*	0 – 5.18	V	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1.6
			B	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	
			V&B	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	
Nitrate+Nitrite-N	*mg/L*	0 – 28.95	V	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	none
			B	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
			V&B	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Total Phosphorus	*mg/L*	0.06 – 2.39 *(ortho-p)*	V	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	none
			B	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
			V&B	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
Turbidity	*NTU*		V	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	5 NTU over back-ground
			B	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
			V&B	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
Total Suspended Solids	*mg/L*	19-27	V	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	none
			B	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	
			V&B	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	
Fecal Coliforms	*CFU/ 100mL*	1 - 2	V	10	10	10	10	10	10	10	10	10	Geometric mean less than 14
			B	5	5	5	5	5	5	5	5	5	
			V&B	7	7	7	7	7	7	7	7	7	
Total Petroleum Hydrocarbons	*mg/L*		V	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	No visible sheen (~5.0 mg/L)
			B	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
			V&B	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Oil & Grease	*mg/L*		V	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	No visible sheen (~5.0 mg/L)
			B	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
			V&B	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	

[A] *A four-day average not to be exceeded more than once every three years on the average (WAC 173-201A).*

Table 3- 11
Combined Outfall Treated Discharge Water Quality Estimate for all Alternatives

Water Quality Parameter	Units	Existing Condition	Alt 1			Alt 3			Alt 4 (No Action)			State Marine Water Quality Standards
			Vault	Bio-retention	Both	Vault	Bio-retention	Both	Vault	Bio-retention	Both	
Dissolved Copper	*µg/L*	<1 – 1.8	1.0	0.6	0.8	0.9	0.6	0.7	2.0	1.2	1.6	3.1[(A)]
Dissolved Zinc	*µg/L*	<10	27.9	18.3	23.1	25.8	16.9	21.3	67.7	44.3	56.0	81.0[(A)]
Dissolved Lead	*µg/L*	<3	0.4	0.3	0.3	0.4	0.2	0.3	0.3	0.2	0.3	8.1[(A)]
Total Ammonia-N	*mg/L*	0 – 5.18	0.13	0.09	0.11	0.10	0.07	0.08	0.13	0.09	0.11	1.6
Nitrate+Nitrite-N	*mg/L*	0 - 28.95	0.23	0.19	0.21	0.20	0.16	0.18	0.06	0.05	0.05	none
Total Phosphorus	*mg/L*	0.06 – 2.39 *(ortho-p)*	0.07	0.08	0.08	0.06	0.07	0.06	0.05	0.05	0.05	none
Turbidity	*NTU*		2.6	2.6	2.6	2.7	2.7	2.7	0.3	0.3	0.3	5 NTU over back-ground
Total Suspended Solids	*mg/L*	19 - 27	4.0	4.0	4.0	3.6	3.6	3.6	9.2	9.2	9.2	none
Fecal Coliforms	*CFU/ 100mL*	1 - 2	84	38	61	92	41	66	10	5	8	Geometric mean less than 14
Total Petroleum Hydrocarbons	*mg/L*		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	No visible sheen (~5.0 mg/L)
Oil & Grease	*mg/L*		0.8	0.7	0.7	0.6	0.5	0.6	0.3	0.3	0.3	No visible sheen (~5.0 mg/L)

[A] *A four-day average not to be exceeded more than once every three years on the average (WAC 173-201A).*

Redevelopment Alternatives 1 and 3

Alternatives 1 and 3 represent the highest and lowest intensity of land use under the redevelopment alternatives. Under these alternatives, the overall quality of water discharged to the Whatcom Waterway and Bellingham Bay would be improved over existing conditions (Table 2-3). This is true whether considered from any of the nine individual outfalls (Tables 3-8 through 3-9), as well as for the site-wide combined outfalls (Table 3-13). It is important to consider that the contaminant concentrations shown in Tables 3-8 and 3-9 are conservative because they are calculated solely on the treated stormwater discharge from pollution-generating surfaces. Stormwater contributions to the outfalls from inert rooftops would lower storm contaminant concentrations in discharge to values below these levels.

At buildout in 2026 all stormwater parameters would be well within marine water quality standards and well within background conditions in Bellingham Bay with the exception of fecal coliforms, which are discussed in more detail below. Dissolved zinc would likely be above background at the outfalls (prior to any mixing), but would be well within state standards under both Alternatives before discharge (or mixing) to Bellingham Bay or the Whatcom Waterway.

In terms of degree of impact, stormwater constituents would have only slightly higher concentrations under the higher intensity Alternative 1 than under the lowest intensity Alternative 3, with the exception of fecal coliforms. Fecal coliform concentrations would be somewhat higher under Alternative 3 than under Alternative 1, because there is more park area assumed at buildout in 2026 under Alternative 1 and parks have few fecal coliforms in storm runoff. For all other parameters, the difference in water quality between the two alternatives is very slight.

Fecal coliforms could be above state marine water quality standards at all outfalls under Alternatives 1 and 3. Fecal coliform concentrations would be lowest under bioretention treatment as discussed in more detail below. Fecal coliforms originate from wildlife, including bird droppings, and thus occur wherever storm runoff is generated from impervious surfaces. Pet waste exacerbates fecal coliform concentrations when it is left to run off with stormwater. From a water quality perspective, fecal coliforms are difficult to remove with any water quality facilities because they readily pass through all saturated flow systems and are small enough for some to pass through filtration-based systems including bioretention. On a site-wide basis, fecal coliforms after treatment are projected to range from about 38 up to 92 CFU (colony forming units)/100mL under Alternatives 1 and 3 (Table 3-11). On an outfall by outfall basis, the model predicts a range of 18 to 111 CFU/100 mL (Tables 3-8 and 3-9). Discrete sampling by Ecology in 2003 indicated outer Bellingham Bay had fecal coliform concentrations between 1 to 2 CFU/100 mL, and the standard is for a geometric mean under 14 CFU/100mL. Fecal coliforms were not reported for existing site runoff, but given that there is no stormwater quality treatment for runoff at present that would remove fecal coliforms, both Alternatives 1 and 3 are likely to represent a near-comparable source of fecal coliforms to the existing industrial condition (i.e., the residential component and pets may add fecal coliforms, but runoff from all pollution-generating surfaces would be treated and thus remove more fecal coliforms than at present).

As noted in Section 2, the concentration of fecal coliforms in Bellingham Bay is low and Ecology considers that fecal coliform standards in Bellingham Bay are being met. Given (1) steps taken by the City of Bellingham to remove CSO influence to Bellingham Bay at C Street near the site, (2) the Whatcom Creek TMDL to reduce fecal coliform sources in the Whatcom Creek

watershed that drains to Bellingham Bay at the Whatcom Waterway, and (3) fecal coliforms in storm runoff are discharged without treatment under existing conditions, it is reasonably probable that fecal coliform concentrations in Bellingham Bay near the site would be improved or at worst unchanged by buildout in 2026. Since fecal coliforms are within standards in Bellingham Bay at present, it is reasonably probable they would remain so under Alternatives 1 and 3. To the extent bioretention is employed more than vault or other stormwater treatment facilities with redevelopment, fecal coliform concentrations would occur at the lower ends of the ranges shown in Tables 3-8 through 3-10.

Some non-conservative water quality parameters, including pH, dissolved oxygen, and temperature, are too responsive to buffering, air temperature, and/or receiving water characteristics to be meaningfully modeled on an average annual basis. These are qualitatively appraised below:

- The marine standard for pH is within the range of 7.0 to 8.5, with a human caused variation in the receiving water within a range of less than 0.5 units. Marine waters are very well buffered (which means seawater chemistry tends to remain pH neutral). In addition, rainfall in contact with cured concrete tends to buffer pH towards neutral range, so any of the redevelopment alternatives would likely maintain relatively neutral in pH at discharge. For both of those reasons, pH in Bellingham Bay or the Whatcom Waterway is unlikely to be affected by any of the alternatives.
- Dissolved oxygen is difficult to forecast because it constantly seeks atmospheric equilibrium, which is a function of temperature. Biochemical oxygen demand (BOD) is a measure of the oxygen-consuming potential in a water sample, and tends to be very low in urbanized stormwater. Facilities such as bioretention, bioswales, and filter strips facilitate atmospheric equilibrium, and BOD in urban storm runoff tends to be very low. It is reasonably expected that the project would cause no change in dissolved oxygen in Bellingham Bay or the Whatcom Waterway.
- The marine standard for temperature is a 1-day maximum below 16 degrees C. As described in Section 3.2.1, stormwater runoff in summer in the Puget Sound lowlands rarely coincides with warmer weather and when it does data show storm discharges would be within background in Bellingham Bay and the Whatcom Waterway. To the extent that underground vault water quality treatment systems are utilized on the site under Alternatives 1 and 3, discharge temperatures would be somewhat lower since solar warming of standing water would not occur.

Some land uses could include shipping, storing, and processing hazardous materials. To the extent that these are industrial processes, they would be handled under an industrial NPDES permit which requires preparation of a SWPPP to show how all hazardous materials and process waters will be handled and kept out of the stormwater system. To the extent that they are related to non-industrial processes, their use and handling are regulated by the City of Bellingham and the State of Washington. No specific lists of hazardous materials can be identified at this point, however all uses would be required to follow applicable local, state, and federal laws to protect public safety and the environment.

Redevelopment Alternatives 2 and 2A

Alternatives 2 and 2A are medium density redevelopment Alternatives, and thus represent a mid-point between Alternatives 1 and 3. The water quality results under Alternatives 1 and 3

were very similar. Since no adverse impacts are forecast under Alternatives 1 and 3, the intermediate Alternatives 2 and 2A are unlikely to have adverse impacts.

No Action Alternative 4

Alternative 4 is the no action alternative but would result in a change from the existing condition on a site-wide basis as allowed under the existing industrial use zoning. Water quality forecast results for the no action industrial alternative indicates it would have poorer water quality for dissolved metals (i.e., higher concentrations of dissolved metals) than under the redevelopment alternatives, though still within state standards, and except for zinc within or near background (Tables 3-10 and 3-11). Fecal coliforms would be lowest under this alternative because industrial use has fewer human-induced sources of fecal coliforms than all other land use categories except parks. Unlike under the redevelopment alternatives, fecal coliforms would likely be within state water quality standards no matter what type of Basic stormwater treatment facility was employed for this alternative. Under the no action Alternative 4, fecal coliform concentrations would be reduced relative to existing conditions, because future treatment of stormwater by basic water quality treatment facilities is assumed and industrial land use would continue to buildout at 2026.

Stormwater Facility Differences

Under all Alternatives 1 through 4 any stormwater quality facilities meeting Basic Treatment criteria from the Ecology 2005 Manual could be used. This analysis looked at all stormwater treated by (1) wet vaults, (2) all stormwater treated by bioretention or biofiltration swales or filter strips, and (3) a 50:50 mix of the two to reflect the most probable combination of facilities that would be constructed. Results for each of these three facility treatments for Alternatives 1, 3 and 4 are shown in Tables 3-8 through 3-11. For dissolved metals, ammonia, nitrate-nitrogen, and fecal coliforms, bioretention provides better treatment than vaults, with the 50:50 mix of facilities giving an intermediate result. However as described above all results with all treatment combinations would meet state standards for water quality in the discharge with no mixing zone, except for fecal coliforms. For fecal coliforms bioretention provided the best treatment. The results indicate fecal coliforms would be much higher if biofiltration swales or filter strips are employed to any degree.

3.2.6 Assessment of the Benefit of Low Impact Development Measures on the Site

In recent years alternative means to maintain natural system hydrology, protect streams from increases in storm water runoff, and protect wetlands have been developed under the collective term of “low impact development” or LID. Many of these methods seek to infiltrate stormwater in localized areas where it is generated, for example through bioretention and pervious/porous hard surface treatments, in order to reduce hydraulic impacts. Other methods seek to reduce stormwater runoff volumes, for example use of vegetation to hold and evapotranspire rainfall between storms, reducing runoff volumes.

The existing site is largely impervious, and is planned with redevelopment to cap contaminated sediments. On the urbanized or industrial scale assumed under Alternatives 1 through 4, meaningful infiltration is not feasible on this site because of the combined high impervious surface coverage and remediation capping. Since stormwater from the site enters Bellingham Bay or the Whatcom Waterway directly after treatment, there are no streams or wetlands

downstream needing hydrologic or flow control protection (because there is no potential to affect sea water elevations or currents by the project storm discharge). While LID measures could be employed to various extents with some of the proposed land uses, depending on cost and engineering feasibility, there would be no expected benefit from a hydrologic (flow control) or water quality perspective to downstream aquatic habitat relative to the stormwater system analyzed above beyond those already identified for bioretention, which is an LID form of stormwater treatment. Other LID treatments such as porous pavement treatments or other semi-permeable treatments are not required to further mitigate water quality, and would not be able to do so on this site in a meaningful way. Nonetheless, to the extent that porous pavements or other semi-permeable treatments are feasible and employed, they would reduce stormwater generation from smaller storms or from the earlier stages of storms, even if the change would be minor and would not be necessary to avoid adverse impacts from stormwater. This would allow more runoff to be held on the site and more runoff to be treated in the stormwater facilities, which is beneficial even though unlikely to have significant effect on this site for the reasons described above.

3.2.7 Marina Operation

Under all alternatives a marina would be constructed on the site of the ASB. The marina would have the least moorage spaces (460 slips) and include more shoreline restoration features under redevelopment Alternatives 1 through 3. Under the no action Alternative 4, the marina would have 600 slips. About 2 percent of the slips are anticipated to have live-aboards under all alternatives.

The Port of Bellingham is considering a marina concept that includes "Clean Ocean Marina" features such as:

- Designing depths and geometry to enable natural flushing circulation;
- Monitoring water quality;
- Limiting live-aboards;
- Providing restrooms, showers, and waste pump-out facilities;
- Providing education materials on clean boating practices and proper waste disposal;
- Providing recycling facilities and disposal sites for waste oil
- Providing indoor facilities, paint booths, and hull maintenance areas for boat repair and maintenance with systems to capture paint dust and runoff;
- Locate and design fueling facilities to minimize and contain spills;
- Maintain a fuel spill recovery plan; and
- Establish no-wake areas to prevent erosion.

The Port would operate the marina under a general Boatyard NPDES permit if such permit is deemed necessary by Ecology, which would require measures to maintain water quality standards in Bellingham Bay. The Port would use BMPs outlined in Ecology's Resource Manual for Pollution Prevention in Marinas (Appendix A) (Ecology 1998). These BMPs include bilge water discharge management, fuel dock operation and maintenance, hazardous and solid wastes management, waste oils management and spills prevention and accidental spill cleanup, sewage management, and exotic species introduction preventive measures. These BMPs are predominantly focused on preventing contaminant entry to Bellingham Bay, and secondarily on effective cleanup of accidental spills. By preventing the introduction of contaminants (and under the assumption that live-aboards would comprise a relatively small fraction of total moorage at about 2 percent), the marina stormwater runoff would be the same as runoff from other non-

pollution generating surfaces such as rooftops, which require no stormwater quality treatment before discharge. Effective measures to maintain the source control measures through moorage user education and marina upkeep would help prevent any portion of the marina from becoming a pollution-generating surface, other than the associated parking and roadways which would be treated by stormwater facilities before discharge of runoff.

3.3 Cumulative Impacts

Separate actions and background projects that could occur independently of the New Whatcom Redevelopment Project include major changes to the Bellingham Shipping Terminal, such as two new piers to accommodate large vessels, and improvements to replace bulkheads and piers in-kind on the north side of the Whatcom Waterway and I and J Waterway, and an overwater trail (pedestrian bridge). These actions would involve in-water work to remove/replace/repair in-water and overwater structures, and addition of two new piers for large vessels at the Bellingham Shipping Terminal that would change operations at that facility somewhat. These actions could influence water quality in the short term (for replacement and construction) and long-term (operational changes at the Bellingham Shipping Terminal. These possible influences are considered for cumulative impacts with the New Whatcom Redevelopment Project in this section.

Construction to remove and replace bulkheads and piers in-kind are categories of in-water work that could have short term impacts similar to those discussed above for the Port's proposal to construct the marina under all Alternatives, transient moorage under the Redevelopment Alternatives, and improve the south side of the Whatcom Waterway to restore habitat under the Redevelopment Alternatives. Similar mitigating measures and permit requirements and conditions would apply to these separate actions as would apply to the New Whatcom Redevelopment to minimize and avoid impacts, and would be expected to have similar effectiveness. To the extent that separate actions involving in-water construction occur at the same time as New Whatcom Redevelopment in-water construction, then separated but more numerous areas of Bellingham Bay or the Whatcom Waterway could have concurrent short term sediment influences on water quality than would occur with New Whatcom Redevelopment alone. The mitigating measures are reasonably expected to keep all short term construction influences within the immediate area of each construction activity, so no overlap of construction impacts between the separate actions and New Whatcom redevelopment is expected. If the separate action in-water construction occurs at different times from the New Whatcom in-water construction, then there would be no cumulative impact on water quality.

In the longer term, addition of new piers to the Bellingham Shipping Terminal may change operations at that Terminal. The Washington Department of Ecology would determine any changes warranted by improvements to the Terminal as part of the NPDES permitting for the facility, which could include an individual Shipyard NPDES permit and associated requirements to prevent adverse impacts to water quality and maintain water quality standards. These requirements would extend to ship maintenance practices, sewage and bilge operations of moored vessels, and dockside and upland storage and management of materials used for ship vessel and shipyard maintenance and operations, including fuels, hydraulic fluids, paints, solvents, oils and all hazardous materials. There is no reasonable expectation that changes to operations at Bellingham Shipping Terminal would have adverse cumulative impacts with New Whatcom Redevelopment under any alternative. Water quality in storm runoff from the New Whatcom Redevelopment site would improve from existing conditions under all alternatives, and

NPDES permit requirements for the Bellingham Shipping Terminal would require maintenance of state water quality standards in stormwater runoff from that facility.

3.4 Mitigating Measures

Potential mitigation measures for water quality include the following:

- Construction mitigation measures in Section 3.1;
- Minimizing generation of dissolved zinc and copper through prohibitions on unsealed external ornamental copper and galvanized metal, except where required through code and/or necessary for public safety and/or where no feasible alternatives exist;
- Ensuring the zinc and copper source controls extend to rooftops, which should be constructed of inert materials to enable roof runoff to bypass water quality treatment facilities;
- Minimizing fecal coliforms by
    - Emphasizing pet waste removal by visitors and residents to the parks;
    - Discouraging feeding and roosting of gulls and waterfowl on the site;
- Maximizing fecal coliform removal by encouraging use of bioretention and discouraging use of biofiltration swales and filter strips; and
- Marina source control and operational BMPs identified in Section 3.2.7 and Appendix A.

3.5 Unavoidable Adverse Impacts

During construction of in-water structures (under Alternatives 1 through 4) and restoration of shoreline and removal of creosote piles and wharf on the south side of the Whatcom Waterway (under Alternatives 1 through 3), some sediment release to Whatcom Waterway or Bellingham Bay waters in the immediate vicinity of the construction activity should be expected. The turbidity from these short-term releases would be controlled and minimized by best management practices described in Grette and Associates, Inc. (2007) but would not be eliminated.

It is probable that during some storms fecal coliforms from storm runoff in the immediate vicinity of the outfalls would exceed state water quality standards, although there may be little or no change from the existing stormwater discharges for fecal coliforms. Mitigating measures to remove and control wildlife and pet sources of fecal coliforms are expected to offset this potential to a large degree, but may not remove it altogether. Discharges of fecal coliforms in stormwater under all alternatives are not expected to cause exceedances of state water quality standards for fecal coliforms in Bellingham Bay under any circumstance.

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APPENDIX A

RESOURCE MANUAL FOR POLLUTION PREVENTION IN MARINAS (Ecology 1998)

RESOURCE MANUAL
FOR
POLLUTION PREVENTION
IN
MARINAS

WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

Resource Manual for Pollution Prevention in Marinas

Washington State Department of Ecology
Water Quality Program
Permit Management Section
P.O. Box 47600
Olympia, Washington 98504-6432

Telephone: (360) 407-6000

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Resource Manual for Pollution Prevention in Marinas

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DISCLAIMER

This manual is intended as an educational tool for marina operators and boaters. It does not constitute a complete reference to state, federal or local laws. Relying on the information in this book will not protect you legally. This book may not be relied upon to create a right or benefit substantive or procedural, enforceable at law or in equity by any person.

Contributing agencies, organizations and individuals cannot assume any liability for the accuracy or completeness of the information in this publication. Inclusion in this book is not an endorsement of the companies listed. Final determination of the proper handling and disposal of waste is the sole responsibility of the generator.

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This resource manual for pollution prevention in marinas was developed and written by Ms. Pat Buller-Pearson, Business/Environmental Partnership Program Manager for the Puget Soundkeeper Alliance in January 1995. Ms. Molly Cadranell, of Cadranell Yacht Landing, is responsible for the design and layout of the original manual as well as this newly revised second edition. The Washington State Department of Ecology, in conjunction with their external advisory workgroup, updated the original manual in May 1998.

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Ms. Sue Hamilton, King County Health Department
Ms. Cynthia Hickey, King County Industrial Waste
Ms. Cynthia Balogh, King County Local Hazardous Waste Management Program
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Mr. Miles Kuntz, Hazardous Waste and Toxics Reduction Program
Mr. Scott Lamb, Hazardous Waste and Toxics Reduction Program
Ms. Patricia Jatczak, Hazardous Waste and Toxics Reduction Program
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Paul Stasch
Project Lead
Water Quality Program
Washington State Department of Ecology

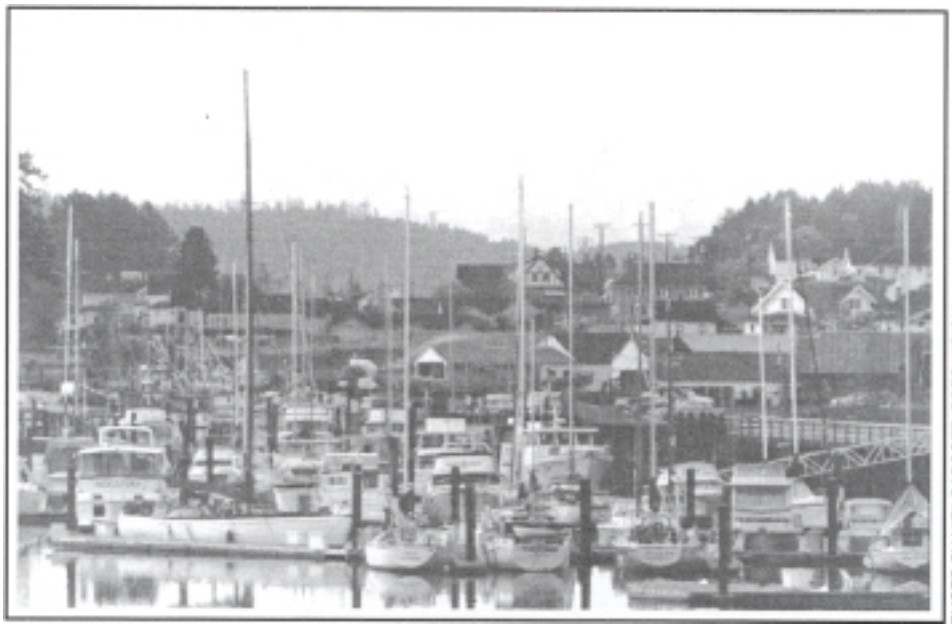

PHOTO BY NITA BARCOTT (FOTO VISION)

Daybreak at Gig Harbor announces another opportunity for boating on beautiful Puget Sound

A Resource Manual For Pollution Prevention in Marinas

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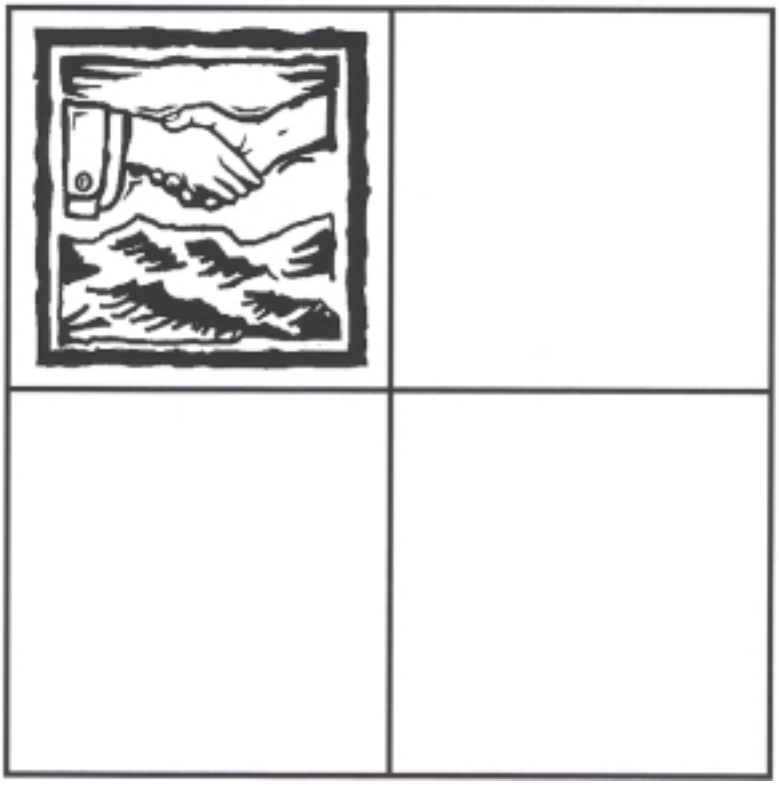
Section 1

Introduction



Introduction

This manual is intended to assist Washington State marina managers, harbormasters and yacht clubs to develop best management practices (BMPs) and sound environmental alternatives for their tenants and the marine contractors working within their facilities. Best management practices are common sense initiatives and low cost management solutions. Once adopted, these measures will prevent or minimize pollution at its source, before it reaches the waters of the state and contaminates sediments, thus reducing a marina's environmental liabilities.

Best management practices make good economic sense. It is always cheaper and easier to clean up pollution at the source. After it has dispersed throughout the environment, the costs of cleanup and remediation are many magnitudes higher. Pollution prevention practiced in marinas is important to promote an abundance of aquatic life and a healthy boating environment. Remember, the bays, rivers and lakes of Washington State are one of our most important assets.

Our rivers were once viewed as open sewers that would carry our wastes away while oceans were thought to have an unlimited capacity to assimilate them. It was not long ago that Lake Washington posed a significant human health threat to those that fished and swam in it. We have come a long way with our environmental ethic since then. We now know that all surface waters are fragile resources that require careful stewardship. Despite the obvious improvement, we must all work together to make additional improvements in the quality of our waters.

The United States congress enacted the Federal Clean Water Act (CWA) as a means to bring about many of the initial improvements we have seen in our lakes, rivers and bays. It was the primary regulatory vehicle used to limit the discharge of pollutants to navigable waters of the United States. The U.S. Environmental Protection Agency (EPA) was authorized to implement the CWA. In order to control pollutants, the EPA developed water quality criteria, effluent standards and a permitting process to control these discharges. The State Legislature enacted the Water Pollution Control Act, Chapter 90.48 RCW, to control these same pollutants in the State of Washington. This law reads in part:

> *"It shall be unlawful for any person to throw, drain, run, or otherwise discharge into any of the waters of this state, or to cause, permit or suffer to be thrown, run, drain, allowed to seep or other wise discharge into such waters any organic or inorganic matter that shall cause or tend to cause pollution..."*

The legislature enabled the Washington State Department of Ecology (Ecology) to adopt water quality criteria and effluent standards and implement the federal permitting program. This program is responsible for issuing National Pollutant Discharge Elimination System (NPDES) permits to point source discharges.

Since there are few, if any, marinas that qualify as point source discharges, they do not need to apply for and receive an NPDES permit. This does not mean however, that marinas do not pollute. They do. However, their sources of pollutants (antifouling paints, gray water, sewage and detergents) are diffuse and/or intermittent. Because of this marinas are by their very nature considered non-point sources, not subject to the permitting requirements. This is why BMPs are the control mechanism of choice.

Implementation of BMPs is typically voluntary and can be completed over time. However, if voluntary implementation is slow and incomplete, or if violations of the water quality standards exist, regulatory implementation may be a necessity. Obviously, this would be a less than desirable situation.

One thing we know for sure, BMPs cannot work if nobody knows about them. You and your staff should become completely familiar with the BMPs you have developed for your marina. Train your staff about your marina BMPs and how to recognize those practices of tenants and marine contractors that cause water-borne pollution. Post them so everybody knows what to follow. Everyone should understand that plumes of discolored water, piles of treated wood sawdust on the floats and oil sheens from bilges have no place in your marina. Explain the water quality impacts of the in-water hull cleaning of vessels painted with antifouling paints. Do not permit any tenants to use a tidal grid for anything other than changing propellers, zincs or for conducting emergency repairs. Incorporate your BMPs into your moorage agreement.

"…BMPs cannot work if nobody knows about them"

Marine contractors working in your marina can present a unique challenge. You should consider having them read your BMPs and then sign a clean worker contract. Require proof of insurance and make them produce their business license. Consider the use of environmental deposits to ensure they will not leave your floats and surrounding waters a disaster.

Should a problem develop with a particular tenant or contractor, bring it to their attention and remind them of your BMPs. Often that is not enough so be prepared to explain why their actions are not protective of the environment. If a problem persists, do not be afraid to terminate a tenant's lease or bar a contractor from working in your marina.

We hope this manual will be a living document that you can use for years to come. We selected the durable three-ring binder design so it would fit nicely on a shelf. You can add pertinent information of your choosing, (such as your spill plan and marina specific BMPs) or replace that which becomes out dated. We have included a reference section of relevant materials you might find worthy of ordering. Also enclosed is a resource guide of governmental contacts and a service directory of private vendors.

Let's all work together to keep our marinas ship shape!

Common Questions

These questions are frequently asked by marina owners, tenants, and boaters as we work together to understand our impact on the environment. Short answers are provided, including some section references for more information.

What about divers conducting in-water hull cleaning?

Ecology has determined that in-water hull cleaning is a commercial operation whose discharge requires an NPDES permit. However, Ecology cannot permit an activity that has a reasonable potential to violate the water quality standards necessary to protect aquatic life. Cleaning a vessel's hull painted with an anti fouling paint can violate the water quality standard for copper. As a result, Ecology has issued a draft environmental advisory withdrawing support for the practice. This draft advisory will not become effective until issued in final form. A copy of the draft advisory is available through the Department of Ecology. For additional information call Paul Stasch at (360) 407-6446.

What about tidal flushing action in Puget Sound? Don't our strong, twice-a-day tides flush and get rid of most of the pollutants from boating and marinas?

Contrary to popular belief, the circulation of water in Puget Sound is relatively poor. In fact, in the South Sound, pollutants may take many years to be fully flushed from the waters. Many marinas are sited in protected low-flushing bays.

In addition, pollutants such as heavy metals found in some bottom paints fall to the bottom and contaminate the sediments. These toxic pollutants remain in the bottom sediments indefinitely, unless they are removed.

How big a problem is boating/marina pollution? How does it compare with <u>other</u> sources?

Individual boaters are only a very small part of the problem, but multiplied by tens of thousands the combined effects of individual actions do have a significant impact on the health of the ecosystem. It has been estimated that boating activities represent 5% of the pollution entering our waters, but that small amount is often obvious and visible in the water.

Runoff from streets and parking lots, industrial discharges, failing residential septic systems, poor farming or livestock practices, commercial fishing boats, recreational boaters, and household toxics all contribute to the pollution of the waters of our state. Each of us must take responsibility for our part of the problem. We can change many habits and practices to lessen our impact on water quality.

Why are they "Picking on" boaters?

"They" can mean federal, state, local government agencies or environmental groups depending upon who is talking. Many boaters feel they have been unfairly taxed and regulated in recent years. They feel they are more visible and easily identified than other larger sources of pollution, and that many people assume boaters have "deep pockets." Boaters and marinas **<u>are</u>** very visible; they are located on shorelines and directly in the waters of the state. These are the areas where direct impacts can have serious effects.

Sewage discharges have forced restrictions or closure of about 40% of commercial shellfish beds. This is an alert to all who care about this resource and the health of our environment. Many sources contribute to water pollution. Large industry has been regulated for years; more recently other sources are receiving attention. As responsible users of the resource, we have an opportunity to lead the way in initiating and supporting clean boating and marina practices to preserve and protect the natural beauty of our waters.

Can anything be dumped overboard?

Trash-NO. Oil, fuel, or other petroleum products-NO. Oily bilge water- NO. Toxic paint and cleaners-NO. Sewage-in Puget Sound it is illegal to discharge any sewage (including treated sewage) at the moorage. Use the holding tank when you are cruising and use a pump-out when you return. Never discharge any sewage near sensitive areas such as shellfish beds.

Which materials and products degrade water quality?

Many boat cleaning and maintenance products and paints are toxic. Oil and petroleum products are toxic. It is illegal to use liquid detergents to disperse oil either in the bilge or in the water. Liquid soaps may get rid of the sheen but not the oil. Soap breaks oil into smaller droplets that are harder to see, harder to contain and more damaging to sensitive marine life. There is no dispersant (liquid soap) that is acceptable for getting rid of oil and petroleum products in the water. IT IS IMPORTANT TO KNOW THAT "BIODEGRADABLE" DOES NOT MEAN "NON TOXIC" OR NONPOLLUTING. Many products listed as "biodegradable" are toxic to the environment. Additionally, soaps degrade water quality by contributing to algae bloom. Check labels carefully! See Section 7.

What can I use instead?

Section 7 includes some alternative products and companies that make environmentally friendly products.

What are the current laws? Who is responsible for enforcement?

Current federal and state laws (and corresponding penalties) that pertain to marina and boating activities are listed in Section 3.

What are my liabilities as a marina owner/operator?

As a business owner, you are personally responsible for any spills or discharges of pollution from your property. You are ultimately liable for the actions of your employees and customers engaged in work that relates to your business. You can be held personally and financially responsible for any damage caused to property, health or to the environment and can be susceptible to administrative and criminal fines and penalties for breaking the law. The bottom line is that you are liable for the impacts of any hazardous, toxic, or dangerous releases from your operation.

Where can I get help?

Section 8 lists resource agencies and organizations that you may contact for advice and assistance. Several will provide free on-site visits and consultations.

Is there any money available to help with costs of pollution prevention, pumpouts, etc?

The Clean Vessel Act (enacted by Congress in 1992) makes funds available to construct, renovate, and operate pumpout stations and to conduct boater environmental education programs. Contact Washington State Parks and Recreation, (360) 902-8511 for information and applications.

Contact the local Hazardous Waste Program Library (206) 689-3051 for information in the Incentives Data Base on grant money available to King County small businesses.

Why do I have to get involved with all this?

To preserve and protect our waters, it is the right thing to do. To protect yourself from future liability issues, it is the right thing to do. Legally, it is the right thing to do. Contamination of your property, or property that you lease, can result in expensive fines and remediation costs as well as impairing future use, sale or transfer of your property. Economically, it is substantially less costly to prevent than it is to clean up.

What are Best Management Practices (BMPS)?

Best Management Practices are pollution control activities designed to prevent or reduce the discharge of pollutants into surface or ground water. BMPs are required by Ecology under both individual and general NPDES discharge permits for boatyards and shipyards. BMPs are not legally required for marinas at this time. But marinas and boaters are still required not to pollute. This manual contains BMPs recommended for marinas and boaters in order to control pollution associated with their activities.

What kind of maintenance can still be done at the slip?

Slip-side maintenance should be limited to projects involving less than 25% of the above- water surface area. If the work is more extensive than that, the repair is a boatyard-type repair needing a permit, or a haul-out at the local permitted boatyard. Before boaters begin a maintenance project, they should check with the marina operator or harbor master. Many marinas have adopted strict maintenance policies which limit or prohibit some types of slip-side maintenance. Most other maintenance procedures can be done by adopting Best Management Practices (BMPs) and using common sense.

What about commercial fishing boats? Do they follow any best management practices?

Much pollution prevention outreach has been done to commercial fishermen in the last few years. Fishing organizations are involved in education and publishing information in newsletters. FISH EXPO and similar tradeshows provide opportunities to demonstrate new environmentally friendly products and equipment. Pacific States Marine Fisheries Commission F.I.S.H. Habitat Education Program distributes BMP information and pollution prevention products and materials, including a pledge form of personal commitment to reducing pollution. Washington Sea Grant also works with commercial fishermen on small oil spill prevention and response. Most ports now provide facilities for collecting and recycling waste oil from commercial fishing vessels. These are widely used.

How do I get people to be responsible for their own clean boating practices?

Education is the key. We are rapidly becoming aware of the impact of many human activities upon the health of our natural resources. Boaters need to know how they can still enjoy boating activities with the least "boat print" left behind. Marina operators can implement BMPs and post them at their marinas. Yacht clubs can lead by example and through education/information programs at their clubs. Yacht brokers can provide educational materials. Recreational boating classes can include environmental information. Boaters need to "pass the word" along to others moored at their docks.

What can I do about "orphan wastes" at my marina?

"Orphan wastes" are those mysterious deposits of stuff (usually liquid) left near marina dumpsters and on docks. These are often unidentified and unlabeled, abandoned for the marina operator to deal with. Talk with the guilty dumper if you can identify who did it. Most important, clearly post a sign indicating WHERE and HOW to dispose of common boat waste products. Encourage boaters to buy the right quantity in the first place, giveaway or trade what they don't need, and make sure boaters understand that <u>they</u> are responsible for disposing of hazardous waste at a household hazardous waste collection place. Treat any orphaned waste as hazardous waste, unless you know differently. <u>Do not mix it with your other waste oil and thereby risk contamination of the entire batch.</u> Talk with your local moderate risk waste program about the possibility of their sponsoring hazardous waste collection events during the year.

What kind of boat work can I do on the "tidal grid?"

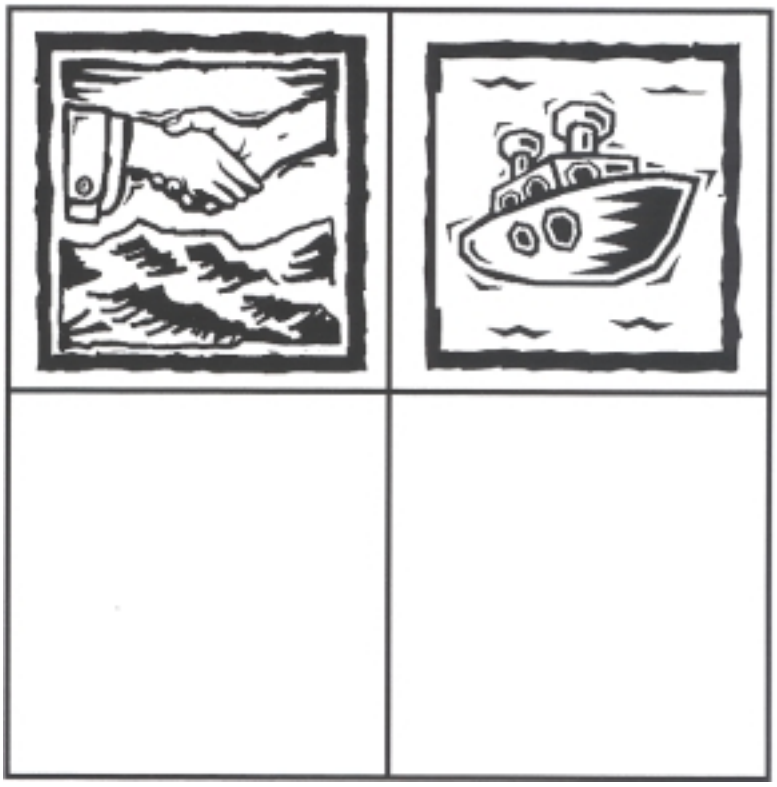
Grids may be used for marine surveys, changing zincs, and doing minor prop and shaft work that does not disturb bottom paint. No hull scraping, washing, cleaning and painting are allowed. These are all boatyard activities that require a NPDES permit.

What about liveaboards?

Key issues with liveaboards in marinas are sewage disposal and heavy use of marina facilities. Some marinas with large numbers of liveaboards are considering sewage management plans, perhaps with scheduled pumpouts and/or submitted pumpout records.

Section 2

A Partnership to Prevent Pollution



A Partnership to Prevent Pollution

The policies and practices of a marina influence the habits of boaters. A marina which provides adequate facilities for waste oil, garbage, sewage pump-out, and properly manages fuel docks and hazardous materials encourages boaters not to pollute. Marinas can also influence boaters by establishing policies that prohibit operation and maintenance of vessels in ways that add pollutants to the water or hazardous wastes to the dumpster.

No matter how well a marina is designed, constructed, or maintained, pollution prevention will not occur without the cooperation of boaters**. Marinas and boaters must work as partners in pollution prevention.** The marina operator provides a policy of best management practices, as well as support services such as used oil receptacles, recycling, and well equipped fuel docks. The boater uses the facilities responsibly, pays for his/her share of these services, and undertakes to reduce use of toxic products.

The purpose of this manual is to provide harbormasters and marina operators with ways to forge such a partnership. For each source of boater pollution identified in this document a Best Management Practice (BMP) is described and methods to influence or educate tenants and other boaters in order to achieve the BMP are suggested. Tips for boaters are also included so that you, the marina operator, can both educate and influence your customers. Finally, a section listing agency/business resources, recyclers, hazardous waste management companies, and alternative products is provided to help you in implementing the measures described.

This manual focuses on sources of pollution such as:

- discharge of oil or oil-based products into the marine waters during engine maintenance and repair, fueling, discharging oily bilge wastes, and improper disposal of oil products
- pollutants discharged from boats during operation (sewage, detergents, graywater)
- hazardous materials (paints, lacquers, thinners, strippers, solvents and preservatives) which find their way into our surface waters directly or in storm water
- trash and plastics tossed (intentionally or inadvertently) overboard
- spill prevention and spill response
- introduction of exotic species.

These sources of pollution can degrade the health of the region's marine environment and threaten public health. They may also effect the viability of businesses which rely on a healthy ecosystem. Certainly the health of our waters and all the life that they support is worth an ounce of prevention.

Incentives for Pollution Prevention at Marinas

Pollution costs money.

By preventing pollution instead of creating it, you reduce costs for waste disposal, cut material costs, and improve safety both for employees and visitors. If you provide waste recycling and collection facilities and educate boaters about best management practices when using and disposing of hazardous materials at the marina, your facility will be cleaner and you will spend less time and money cleaning up spills and wastes left by boaters. It is substantially less costly to prevent a spill than it is to clean it up.

Compliance with the law.

This is another reason to operate a marina in a manner consistent with best environmental management practices. Owners and operators of marinas must comply with numerous hazardous waste control and oil spill response laws. If hazardous waste contamination occurs, a marina may be liable for significant remediation costs.

If a property is being sold and contamination is a possibility, lenders may require sellers to perform extensive hazardous waste assessments. A business which has hazardous waste contamination will have a hard time selling the property without taking significant and expensive steps to remediate the problem. It's easier and less expensive to employ pollution prevention measures before contamination becomes a problem.

In addition, the recreational boating industry is receiving increased attention as a source of coastal "non-point source" pollution. All states are required by recent amendments to the Coastal Zone Management Act (CZARA) to adopt programs which control a number of industries identified as sources of coastal non-point source pollution. Marinas are identified as one of these sources of non-point source pollution. Washington is at the formative stage of structuring a program in response to the CZARA requirements (for further information look in the Environmental Regulations Section.)

Clean marinas also attract customers.

A clean marina increases the pleasure of boating experiences, and reinforces the public image that boating is clean and fun. Establishing environmental policies promotes good management practices by staff and customers.

Public opinion is important.

The best way to promote and establish the perception of marinas and boaters as responsible, careful stewards of water quality is to become proactive. Take steps to protect water quality. Let your community know you care about the environment and that you are actively doing something about it.

The Bigger Picture: Environment, Economy, Responsibility, Beauty

Boating and water related recreational activities are an integral part of life in Washington State and an important part of our economy. Residents of the Northwest value our waters for commercial fishing and shellfish production, recreational activities, and for the beauty this natural resource brings to our lives. It is estimated that 50,000 boats are permanently moored in Puget Sound, and thousands more are trailered in for occasional use. Marinas and boaters are certainly a very small part of the problem, but multiplied by 50,000 the combined effects of our individual actions do have a direct impact on the health of the ecosystem. Increasingly, we are learning to value and protect the richness and diversity of our aquatic ecosystems as a whole.

"…marine pollution can have devastating effects on the entire food chain…"

Environment, economy, responsibility, and beauty are simple answers to the "Why?" of pollution prevention.

Environment

Our aquatic ecosystems are an intricately connected web of life. This vast web, which links the survival of the smallest plants and animals on the surface and in the sediments to that of the largest, exits in a delicate state of balance. The health of organisms at each level of the food chain depends on the health of those on which they feed and which feed on them. Destruction of wetlands, losses in spawning grounds and declining food sources from other forms of marine pollution can have devastating effects on the entire food chain, including people.

Although nature often surprises us with its resiliency, small changes can have lasting effects throughout the region. Contaminants that are released into our waters enter the food chain at many different levels and affect the health of all organisms within the ecosystem. Concentrated over time, the effect of these contaminants is magnified greatly.

The physical properties of our waters also affect whether these wastes can be diluted or flushed from the waters. For example, the circulation of water in Puget Sound is relatively poor. In fact, in the South Sound pollutants may take many years to be fully flushed from the waters. Pollutants discharged into rivers are moved downstream, and those discharged into lakes often remain for years.

Fish and Shellfish

In Puget Sound, sediment contamination has been scientifically linked to cancerous liver tumors and reproductive failure in several species of bottom fish.

Most shellfish (such as clams and oysters) feed by filtering huge quantities of water through their systems. When the waters or sediments are contaminated, shellfish pick up and accumulate disease-causing bacteria and viruses called pathogens. While these pathogens may not directly harm the shellfish, they can be passed on to marine mammals or humans, sometimes with deadly consequences.

Sewage discharges have forced restriction or closure of about 40% of the Sound's commercial shellfish beds.

Economy

Washington's commercial shellfish harvest contributes an estimated $26 million to the state's economy every year. Many of our prime shellfish beds have been closed to harvesting as a result of fecal coliform bacteria an indicator of elevated levels of raw sewage. Because of convincing circumstantial evidence, many state regulators and citizen groups are creating strict no-anchorage zones near sensitive shellfish beds.

Healthy marina and boating industries rely on people buying and using their boats enjoying fishing, sailing, and recreation. Recreational boat sales account for $700 million per year in Washington State, and recreational fishing contributes $26 million. Clean water is essential for successful marina and boating business.

Responsibility

Marina and boating activities are one of many sources of pollution that impact our waters. All activities that deal with engines and fuels do cause pollution. In order to minimize their environmental impact, boaters need to be more aware of the effects of certain practices such as pumping out an oily bilge, "topping off" the fuel tank, in-water sanding and varnishing and using toxic cleaning and maintenance products. However, boater education will do little without adequate waste management facilities and policies that encourage pollution prevention at marinas.

Why should marinas become environmentally compatible and proactive? Most simply, it makes common sense. Profitable boating businesses need clean environments. The public expects and demands environmental protection today. It helps business move boating services into the 21st Century. It is the right thing to do. It is the law. The good news it is not that difficult. For most questions, answers exist; for others, they can be found. And there are people and agencies willing to help.*

Beauty

"It is written on the arched sky,
It looks out from every star...
It is spread out like a legible language
upon the broad face of an unsleeping ocean.
It is the poetry of Nature,
It is that which uplifts the spirit within us ..."

John Ruskin

*This paragraph adapted from reprints by Neil Ross Consultants Inc.

What are Best Management Practices (BMPs)?

Best Management Practices (BMPs) are low technology ways to protect the environment.

In general, BMPs are pollution control activities designed to prevent or reduce the discharge of pollutants into surface or ground water. Achieving pollution reduction through BMPs may require business operators to alter practices of operation and housekeeping. The amount of change required varies depending on the type of activities conducted at each marina. To be successful, BMPs must fit the needs of the business using them and be incorporated into routine activities.

BMPs fall into two categories: source control and treatment.

Source control BMPs are measures which *prevent* pollutants from coming into contact with ground water or surface waters. Typical source control measures for marinas include the use of tarpaulins when boaters are doing maintenance and painting, berms for hazardous wastes and storage areas, covers, sweeping or vacuuming, drip pans, and waste segregation. Source control BMPs rely heavily on the diligence and cooperation of operators and boaters in following management practices. **Source-control BMPs need to be especially monitored when allowing independent contractors and boat owners to work on their own boats.** Most BMPs at marinas are source control.

Treatment BMPs at marinas are measures that reduce toxicity or volume of a waste *after* it has been generated. Examples include oil/water separators for storm water in parking lots or boat haul-out facilities, or remediating contaminated sediments. In general, most treatment BMPs are more expensive and labor intensive than source control measures.

What is Your Liability?

As a business owner, you are personally responsible for any spills or discharges of pollution from your property. You are ultimately liable for the actions of your employees and customers engaged in work that relates to your business. You can be held personally and financially responsible for any damage caused to property, health or to the environment and susceptible to administrative and criminal fines and penalties for breaking the law. The bottom line is that you are liable for the impacts of any hazardous, toxic or oily release from your operations.

Financial liabilities can include, but are not limited to, the cost of specialized spill prevention equipment, medical bills and financial compensation for injured workers or customers, any cleanup expenses and fines of up to $10,000 per day per event for discharges of pollutants to surface waters, ($20,000 per day per event for oil).

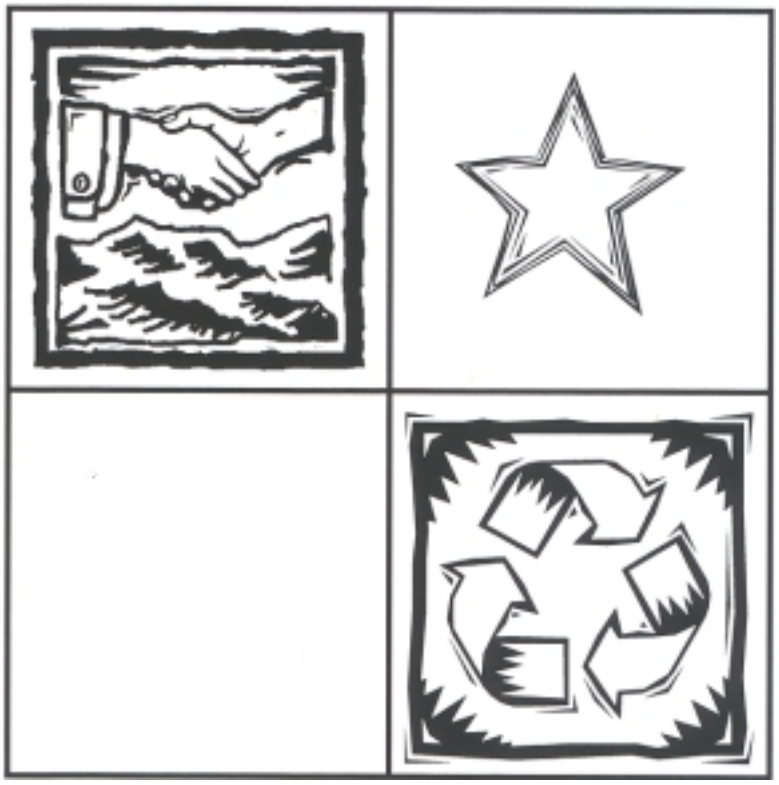
How Can You Reduce Your Liability?

Reducing your environmental liabilities by implementing BMPs sends a strong message to your customers that you care about the health of your community and the environment. For many businesses this message has resulted in increased business and marketing opportunities. The last few years have brought a marked change in philosophy for most people who value nature and outdoor experience; the public now understands that human activities are having a negative impact on our natural resources and they want to do their part to help protect those resources. The key is to identify low cost, practical, relatively simple ways to protect the water and then to help make it as easy as possible for people to follow through.

Implementing BMPs and helping to educate your tenants and transient boaters also sends a strong message to local, state, and federal agencies that you care about water quality and environmental concerns, that you are proactive, cooperative, and willing to be a leader in establishing clean marinas and clean boating practices. Government agencies would much rather work with you than come in as enforcers. They can help you in your efforts at waste minimization and pollution reduction so that enforcement measures will not be necessary. You, as marina owners and operators, also have an opportunity to give clear feedback and input so that agencies gain from your business experience and ideas. It is the preferred working relationship for all concerned!

Section 3

Environmental Regulations



Environmental Regulations CWA, OPA, MTCA, EPA, DOE And You

Environmental laws and regulations have changed dramatically during the last decade, reflecting the growing concern over environmental health and safety. Not surprisingly, many marine businesses have fallen under increased scrutiny as the public has become more conscious of water pollution. Issues of environmental health and safety are addressed under a variety of regulations, agencies and programs which often overlap or seem contradictory. The following list of regulations and regulators is by no means exhaustive and is meant to be used only as an introduction for marina owners and boaters.

INTERNATIONAL LAW

MARPOL
Marine Pollution Act

In 1973, the International Convention for the Prevention of Pollution from Ships was drafted into law to protect the ocean environment. This document was modified in 1978 to include five annexes on ocean dumping. With these amendments the treaty is known as the Marine Pollution Act (MARPOL). To date 39 countries, including the United States, have signed the international treaty.

Annex V of MARPOL specifically prohibits the dumping of any plastics from any vessel anywhere in the ocean, or in our navigable waters, and restricts the dumping of all other types of refuse from boats. All vessels over 26 feet must display a durable placard explaining MARPOL Annex V disposal regulations.

> Placards may be obtained from a marine supply store or from The National Oceanic and Atmospheric Administration (NOAA), Marine Debris Information Office, 725 De Sales Street, N.W., Washington, D.C. 20036.

Vessels of 40 feet and over must write a waste management plan outlining the name of the person in charge of the vessel and describing the proper handling of refuse. The management plan should also include how new passengers and/or crew are educated on MARPOL Annex V requirements, since the regulations state that the vessel shall not be operated unless each person handling garbage follows the waste management plan.

FEDERAL LAW

CWA
Clean Water Act

Originally passed as the Federal Water Pollution Control Act, when amended in 1977 the Act became popularly known as the Clean Water Act. This act, in conjunction with our state laws, serves as the basis and framework for Washington state's present water quality regulatory program. The Act sets a national goal to eliminate all discharges of pollutants to surface water with the immediate goal of making waters "fishable and swimmable." The CWA provides the authority for the **National Pollutant Discharge Elimination System (NPDES) permit program** to prevent pollution of waterways. Permits are required for discharges of waste water, and in some cases storm water, from boatyards, shipyards, and other industries. The U.S. Environmental Protection Agency delegated to Washington State Department of Ecology the authority to administer NPDES permits.

Important Note For Marina Owners/Operators:

TIDAL GRIDS - If marinas do not severely restrict activities on their tidal grids, they are considered to be an operating boatyard. If their Standard Industrial Classification (SIC) code is for a marina, and they are allowing boatyard activities they must obtain coverage under the NPDES general boatyard permit and comply with all its provisions for collecting/treating wastewater. The general boatyard permit prohibits the use of tidal grids for routine maintenance of the hull, such as scraping, sanding and painting.

The exceptions: grids may be used for changing zincs, doing minor prop and shaft work that does not disturb bottom paint, and marine surveys.

REPAIR OF BOATS IN THE WATER - Marinas that allow tenants to conduct extensive repairs on vessels in the water may also be categorized as a boatyard needing a NPDES permit. The cutoff is 25% of the surface area of a vessel above the waterline. If the work is more extensive than that, the repair is a boatyard-type repair needing a permit, or a haulout at the local boatyard (permitted, of course). If the marina wishes to allow significant amounts of boat repair in the water, the marina needs to apply for the boatyard permit. If a mobile repair operator from a permitted boatyard comes to a marina to work on a boat, the mobile operator is bound to comply with the boatyard permit BMP requirements and will be the party held liable for permit violations if water quality violations occur.

SEDIMENTS - Sediment investigation and cleanup can be required by administrative order under either/both water quality and MTCA statute.

OPA
Oil Pollution Act of 1990

The U.S. Minerals Management Service recently proposed to include all marina fuel docks on navigable waters in the same risk category as offshore oil production facilities, refineries, and oil tankers, thus requiring $150 million cleanup liability insurance. The marina industry has widely protested and fuel dock inclusion is being reconsidered; but lesser liability risks will remain. The Marina Operators Association of America has recommended exempting all facilities with less than 100,000 gallon fuel storage capacity - almost all marinas.

CZARA, 6217, Chapter 5 Nonpoint Pollution Coastal Zone Guidance
Coastal Zone Act Reauthorization Amendments of 1990

All coastal and Great Lakes states are incorporating management measures into coastal management programs for all marinas and boatyards, yacht clubs, public docks, and launch ramps. Eventually, similar controls could likely apply to all inland boating waters when the Clean Water Act Reauthorization is passed by Congress.

Facility managers are expected to have a Best Management Plan (BMP) to reduce the amount of pollution coming from boats and related activities. No pollution permit, or water testing is required (except for new facilities), although states will probably ask to see your BMP whenever any coastal permit is requested.

There are three CZARA guidelines regarding petroleum-related problems:

1. Petroleum Control (CZARA p 5-55)

Reduce the amount of fuel and oil from boat bilges and fuel tank air vents entering marina and surface waters.

Examples of acceptable practices:

a. Use automatic shut-off nozzles and promote the use of fuel/air separators on air vents or tank stems of inboard fuel tanks to reduce the amount of fuel spilled into surface waters during fueling.

b. Promote the use of oil-absorbing materials in the bilge areas of all boats with inboard engines. Examine these materials at least once a year and replace as necessary. Recycle them if possible, or dispose of them in accordance with petroleum disposal regulations.

2. Fuel Station Design (CZARA p 5-41, F)

Design fueling stations to allow for ease in cleanup of spills.

Examples of acceptable practices:

a. Locate and design fueling stations so that spills can be contained in a limited area.

b. Draft a spill contingency plan.

c. Design fueling stations with spill containment equipment.

3. Liquid Material (CZARA, p 5-53)

Provide and maintain appropriate storage, transfer, containment, and disposal facilities for liquid materials, such as oil, harmful solvents, antifreeze and paints, and encourage recycling of these material.

Examples of acceptable practices:

a. Build curbs, berms or other barriers around areas used for the storage of liquid material to contain spills. Store materials in areas impervious to the type of material stored.

b. Separate containers for the disposal of waste oil, waste gasoline, used antifreeze; and waste diesel, kerosene, and mineral spirits should be available and clearly labeled.

c. Direct marina patrons as to the proper disposal of all liquid materials through the use of signs, mailings, and other means.

Clean Vessel Act

Enacted by Congress in 1992, this Act makes funds available to states to construct, renovate, and operate pumpout stations for boater waste reception facilities and to conduct boater environmental education programs. A survey of MSDs must be conducted by the state and a comprehensive plan for pumpout placement must be prepared. Washington state is complying with this requirement and is currently accepting private and public marina applications for pumpout funding. A 25% matching contribution must be provided by the marina. The Clean Vessel Act funds are administered by U.S. Fish and Wildlife Service. Washington's Governor has designated Washington State Parks Service to administer the money in our state. Contact Washington State Parks and Recreation, (360) 902-8511 for information and applications.

RCRA
Resource Conservation and Recovery Act

These federal hazardous waste regulations set the standards for generators and transporters of hazardous wastes, owners and operators of treatment, storage and disposal facilities (TSDF) and owners and operators of underground storage tanks.

In the state of Washington, the level of regulation you face depends not on the size of your business, but on the quantity of hazardous wastes and/or extremely hazardous wastes generated or stored at your facility.

Unlike boatyards and shipyards, most marinas in Washington do not generate or store large amounts of hazardous waste.

Toxic Substance Control Act (TSCA)

This is the regulatory program that establishes management standards for the generation, transport, incineration and disposal of polychlorinated biphenyls (PCBs) and PCB contaminated oils.

PCBs were widely used before 1979 as insulating fluids in electrical equipment such as transformers and capacitors. PCBs were also used in the ballasts of fluorescent light fixtures. PCBs have been shown to cause cancers as well as causing reproductive and developmental effects in mammals and birds.

CERCLA
Comprehensive Environmental Response, Compensation, and Liability, Act

CERCLA, commonly known as the "Superfund" Act, authorizes use of federal funds to clean up contaminated sites. The act authorizes EPA cleanup involvement in the event of an actual or threatened release of a hazardous substance or pollutant that may present an imminent or substantial danger to public health and welfare.

Past and present operating practices which allow hazardous materials to contaminate soils, sediments, surface or receiving waters at marine businesses could create substantial liability for owner/operators. Liability includes all cleanup costs, damages to natural resources, costs of health effect studies, environmental impact assessment studies and up to three times actual federal cleanup expenses. Potentially Responsible Parties (PRPs) include all current and former owners, operators, generators, transporters, lien holders and financial institutions.

Rarely will any small business be affected by CERCLA. Most marinas, unless they are on Harbor Island or Commencement Bay, will encounter Washington State's MTCA before they encounter CERCLA, (see page 19).

SARA
Superfund Amendments and Reauthorization Act

This legislation requires operators to report the storage, use and releases of toxic and hazardous chemicals, above certain quantity thresholds, and to make this information available to the public. SARA also requires operators to provide material safety and data sheets (MSDS) to all employees. For more information, call the Emergency Planning and Community Right-to-Know Hotline, 1-(800)535-0202.

WASHINGTON STATE LAW

Water Pollution Control Act
Chapter 90.48 RCW

The Washington State Department of Ecology is the State Water Pollution Control Agency for implementing the federal Clean Water Act. Ecology is responsible for setting effluent limits and monitoring requirements for both storm water and process waste waters from industry, sewage treatment plants and combined sewer overflows (CSOs). The Water Pollution Control Law also establishes Ecology's right to inspect permitted facilities, enforce water quality standards, enforce permit limitations, issue violations and impose penalties for violations of state water quality standards.

Note:
Under Chapter 90.48.080 RCW "it is illegal to discharge or allow to be discharged any pollutant." In other words, you, as the facility owner, are liable for the activities of all persons performing work that could lead to the discharge of any pollutant. Pollutant is defined as anything that changes the chemical, physical or biological nature of the water it enters.

Procedure Affecting Marina/Boating Community:

The state Department of Ecology is testing a new way to make sure that small oil spills on state waters are reported and cleaned up just as vigorously as the big ones. Ecology, under state oil spill laws, has given a group of specially trained "field responders" authority to write "field citations" - similar to traffic tickets - for spills of less than 500 gallons when there is a clear-cut violation of state law. Field citation ticket books have been carried by the inspectors since September 1, 1994. The "goal here is not to write a lot of tickets, but to make people aware that even a small spill can hurt, and that you need to report it to the proper authorities and clean it up. If you've made an honest mistake and you're making a good attempt to correct it, you'll probably receive a warning and some help to avoid making the same mistake again."

In 1993, approximately 1,500 oil/petroleum spills were reported in central Puget Sound to the Department of Ecology.

An oil spill field citation can be used as a warning or monetary penalty for:

- Unlawful discharge of a petroleum product to state waters from a ship, boat or oil handling facility -maximum penalty is $1,000.
- Failure to immediately notify the proper authorities of petroleum products spilled to state water - maximum penalty is $500. (To report a spill, call 1-800-258-5990. Marine spills must also be reported to the U.S. Coast Guard, 1- 800-424-8802.)
- Failure to immediately collect, remove or contain petroleum products spilled from a ship, boat or oil handling facility - maximum penalty $500.

Remember - disbursement of oil using detergents is against the law.

Hazardous Waste Management Act
Chapter 70.105 RCW

The management of hazardous waste (referred to as dangerous waste in Washington State) is regulated by the Hazardous Waste Management Act of 1976. If you generate more than 220 pounds of hazardous waste per month or accumulate over 2,200 pounds at any one time, then you are fully regulated generator of hazardous waste. You are required to obtain an I.D. number, comply with all reporting and recordkeeping requirements; and track your hazardous waste from "cradle to grave."

MTCA
Model Toxics Control Act Chapter 70.105D RCW

Approved by popular vote in 1988 as Initiative 97, MTCA is the Washington State "Superfund" Act. Modeled after the federal act, MTCA authorizes the use of state funds to locate, assess and cleanup contaminated sites. The Department of Ecology's Toxic Cleanup Program and Sediment Management Unit is identifying areas of sediment contamination in Washington State and prioritizing cleanups. Marinas can not claim ignorance for tenant activities that may adversely affect sediment quality. Long after problem tenants are gone, the property owner will still be left liable for the contaminated sediments.

Oil and Hazardous Substance Spill Prevention and Response
Chapter 90.56 RCW

Intended to be interpreted and implemented in a manner consistent with federal law, this act addresses contingency planning, spill prevention plans and response. It also requires notification of spills.

Hazardous Waste Reduction Act
Chapter 70.95C RCW

The state legislature passed this act in 1990 and mandated Ecology to set rules and develop regulations to implement it. If you generate more than 2,640 lbs of dangerous waste per year, you must develop a pollution prevention plan which outlines your waste reduction and hazardous substance use reduction activities, goals and implementation schedule. The State of WA has an overall goal of reducing hazardous waste generation by 50%.

Solid Waste Management Act
Chapter 70.95 RCW

The state legislature delegated solid waste management to local county government, including the management of moderate risk waste and household hazardous waste.

Used Oil Recycling Act
Chapter 70.951 RCW

The state legislature passed the Used Oil Recycling Act in 1991. It mandated Ecology to establish standards for used oil recycling facilities and banned the disposal of used oil in landfills and its use for dust suppression.

Waste Reduction, Recycling, and Model Litter Control Act
Chapter 95.70C RCW

This act includes the requirement that marinas with over 30 slips are to provide recycling receptacles.

SMA
Shoreline Management Act
Chapter 90.58 RCW

SMA manages appropriate uses of the shorelines of the state. It provides for local governments to prepare shoreline master plans. This is the act that regulates construction and development near waterways. SMA permits are administered by the county or city where the project will take place. Washington State Department of Ecology reviews these permits for compliance with the intent of the SMA.

Pumpout Installation Regulations

The Washington State Department of Health, Office of Shellfish Programs, has published a "Guide for Recreational Vessel Sewage Collection" which includes sections on roles of Federal/State/Local Agencies, equipment options, boater educational materials, and more. One particularly helpful section deals with a summary of the permits required for the installation of recreational vessel pumpout or dump (PO/D) facilities. It describes the background of the permits, who administers them, and addresses and phone numbers to obtain an application for a permit.

Additional Local Regulations

In addition to the specific state and federal regulations discussed here, marina operators must comply with local and regional codes and regulations, which may be more stringent than state or federal regulations. Examples include: solid and hazardous waste disposal restrictions, shoreline, fire and building codes, and Seattle's "No Discharge while Moored" Ordinance.

For More Information

Contact your sewer utilities, fire departments, public health departments, solid waste and storm water utilities, and regulatory agencies.

Laws and Penalties

Law	*Penalties and Enforcement*
Trash Boats over 26' must visibly display the MARPOL trash placard. Additionally, boats over 40' must have a written Waste Management Plan onboard. No trash may be thrown overboard within the boundaries of Puget Sound.	Up to $25,000 in civil penalties, $50,000 in fines and up to five years in jail. International Law: MARPOL Enforcement Agency: U.S. Coast Guard
Pumpout It is illegal to discharge untreated sewage within the 3-mil territorial limit which includes all of Puget Sound and its fresh water tributaries. It is illegal to discharge treated sewage when a boat is moored within the limits of certain metropolitan areas (i.e. Seattle). This applies to both fresh water and salt water.	Fines of up to $10,000 per day for the illegal discharge of sewage. U.S. Coast Guard regulates operation of MSDs under federal law, CWA. Department of Ecology enforces violation of state water quality standards (i.e. discharges).
Oil Boats over 26' must display an "Oil Discharge is Prohibited" placard. U.S. Coast Guard regulations state: "No person may intentionally drain oil or oil waste from any source into the bilge of any vessel."	Fines of up to $20,000 and responsibility for the costs of environmental cleanup or forthcoming damage claims. Law: Oil Pollution Control Act (OPA) and Washington State Water Pollution Control Enforcement Agencies: U.S. Coast Guard (OPA) and Dept. of Ecology (state law).
Reporting Hazardous Materials Spills The person in charge must report any hazardous waste spill from his/her vessel. Call: **1-800-OILS-911** and the U.S. Coast Guard National Response Center **1-800-424-8802**. They will notify the local Coast Guard and EPA. If you are not near a phone, call the local Coast Guard on VHF CH 16.	Fines up to $25,000 and responsibility for the costs of environmental cleanup or forthcoming damage claims. Law: Oil and Hazardous Substance Spill Prevention and Response (Chapter 90.56) Enforcement Agency: U.S. Coast Guard and Department of Ecology
Lead-Acid Batteries Lead-acid batteries must be disposed of properly, either by exchanging when purchasing a new one, or by recycling. To throw batteries in the water or trash is illegal.	Fines up to $10,000 per day for the improper disposal of a lead-acid battery. Law: Dangerous Waste Enforcement Agency: Department of Ecology
Sanding, Painting and Varnishing State law prohibits the discharge of any oil or oil-based paints into the water. This includes most marine paints.	Boaters may be fined up to $10,000 per day per occurrence. Law: WA State Pollution Control Law Enforcement Agency: Department of Ecology

Notes:

Section 4

Recommended Best Management Practices (BMPs)

What are Best Management Practices (BMPs)?

Best Management Practices (BMPs) are low technology ways to protect the environment

In general, BMPs are pollution control activities designed to prevent or reduce the discharge of pollutants into surface or ground water. Achieving pollution reduction through BMPs may require business operators to alter practices of operation and housekeeping. The amount of change required varies depending on the type of activities conducted at each marina. To be successful, BMPs must fit the needs of the business using them and be incorporated into routine activities.

BMPs fall into two categories: source control and treatment

Source control BMPs are measures which prevent pollutants from coming into contact with ground water or surface waters. Typical source control measures for marinas include the use of tarpaulins when boaters are doing maintenance and painting, berms for hazardous wastes and storage areas, covers, sweeping or vacuuming, drip pans, and waste segregation. Source control BMPs rely heavily on the diligence and cooperation of operators and boaters in following management practices. Source-control BMPs need to be especially monitored when allowing independent contractors and boat owners to work on their own boats. Most BMPs at marinas are source control.

Treatment BMPs at marinas are measures that reduce toxicity or volume of a waste after it has been generated. Examples include oil/water separators for storm water in parking lots or boat haul-out facilities, or remediating contaminated sediments. In general, most treatment BMPs are more expensive and labor intensive than source control measures.

The following pages provide Best Management Practices for marina operators concerning:

- Bilgewater Management and Fueling Practices
- Hazardous Waste
- Used Oil
- Solid Waste
- Spill Prevention and Response
- Exotic Species

Summary of Best Management Practices for Marinas

Bilge Water Discharge Management

1. Provide notice that the discharge of contaminated bilge is illegal.
2. Make information available on bilge pumpout services.
3. Make supplies and equipment accessible for removing oil and fuel from bilge water. Oil absorbent pads, diapers, and pillows are made of a special material that repels water but absorbs oil.
4. Do NOT discharge oil contaminated bilge or drain onto the boat launch. If a bilge is severely contaminated with oil, use a pumpout service.
5. Dispose of oil soaked absorbents as a household hazardous waste if possible. Otherwise, wrap in newspaper, place in a plastic bag, and place into the garbage.
6. Do not use detergents or bilge cleaners.
7. Keep bilge area as dry as possible.
8. Do not drain oil into bilge.
9. Fit a tray underneath the engine to collect drips and drops.
10. Fix all fuel and oil leaks in a timely fashion.
11. Provide suction oil changers or pumps that attach to a drill head for your tenants' use.
12. Advise tenants to turn off automatic bilge pumps and use them only when there is water in the bilge.
13. Recommend the installation of a manual override switch for bilge pumps.
14. Recommend the purchase of a hydrocarbon sensitive bilge pump.

Fuel Dock Operation and Maintenance

1. Locate and design fuel stations so spills can be contained.
2. Make absorbent pads and instructions for use readily available.
3. Don't soap your spills, use absorbents. Detergents disperse spills, but do not eliminate them.
4. Install automatic back-pressure shutoffs on all fuel nozzles.
5. Never leave fuel nozzles unattended.
6. Do not allow fuel nozzles to be blocked in an open position.
7. Ask boaters to not "top off" fuel tanks.
8. Use vent cups to capture fuel "burps" from air vents.
9. Provide information about vent whistles and fuel/air separators.
10. Request that boaters install fuel/air separators on their fuel tank vents or consider requiring it in your tenant lease agreement.
11. Clear the fuel nozzle of residual fuel prior to transferring back to the pump.
12. Do not allow self-service on a gravity feed fueling system. Automatic shutoff nozzles may not work on these types of systems.
13. Take extra care in fueling personal watercraft (jet skis). These craft are not stable in water and are very prone to spills while fueling. Consider installing a personal watercraft fueling dock if a lot of jet skis use your marina.

continued…

Summary of Best Management Practices for Marinas, continued…

Hazardous Waste

1. Make it a marina policy that throwing hazardous waste such as used oil, antifreeze, paints, solvents, varnishes and automotive batteries into the garbage is prohibited.
2. Post information on how and where to manage these wastes including Ecology's toll free number 1-800-RECYCLE, the location and hours of county run household hazardous waste collection facilities, and dates and locations of county sponsored hazardous waste collection events.
3. Actively help your tenants to manage these wastes properly. Consider operating a collection facility for hazardous wastes.
4. If operating a collection facility is feasible, it must be coordinated with the county or city Moderate Risk Waste contact (see Appendix B).

Waste Oil and Oil Spills

1. Specify how waste oil is to be managed /recycled in your moorage agreement.
2. Provide receptacles for waste oil recycling or information on waste oil collection sites near your marina by calling 1-800-RECYCLE.
3. Post information identifying oils acceptable for recycling and wastes that will contaminate used oil and prevent it from being recycled.
4. Monitor the use of your oil collection facility, keep it locked after business hours, and maintain a contributor list.
5. Test your waste oil collection tank(s) for chloride contamination on a regular basis with a commercially available screening test.
6. Collect oil in smaller volumes and test it prior to transferring into a larger collection tank. If tests show contamination, isolate that volume and do not add any more oil.
7. Once your collection tank is full and tests “clean” lock it up until your waste oil contractor arrives.
8. Advise tenants to puncture and drain oil filters. Provide receptacles for recycling.
9. Provide containment booms and oil absorbent materials in case of a spill.
10. Post the proper information for reporting spills.

Solid Waste

1. Make it a marina policy that throwing garbage into the water or on the land is prohibited.
2. Provide adequate trash containers for tenants to use.
3. Marinas of at least 30 moorage slips should provide recycling opportunities for aluminum, glass, newspaper, tin, and plastic or as many of these as possible.

continued…

Summary of Best Management Practices for Marinas, continued…

Sewage Management

1. Provide notice that the discharge of sewage is illegal and prohibit the discharge of sewage in your moorage agreement.
2. Provide sewage pumpout as a free-of-charge service or make it part of the standard moorage fee. Especially effective for liveaboards is rebating part of the moorage fee for demonstrated, consistent use of the pumpout.
3. Post the location and operational hours for nearby pumpout facilities and list mobile pumpout services.
4. Provide clear instructions in pumpout use. Include a prohibition against disposal of hazardous materials.
5. Talk to liveaboards who have obviously not moved their vessels to the pumpout facility in a very long time.
6. Provide clean, adequate shore-side facilities and encourage tenants to use them for showering and laundry.
7. Encourage tenants to use biodegradable, phosphate-free detergents on vessels.
8. Minimize food wastes thrown overboard by providing adequate garbage service.
9. Encourage tenants to conserve water and use water saving devices.
10. Prohibit the dumping or abandoning of pet wastes in your tenant lease agreement.
11. Remind boaters and visitors not to harvest shellfish in marinas.

Spill Prevention and Response

1. Identify areas and materials with the highest probability for spills and provide education and training to staff and tenants for prevention.
2. Develop a clearly understood spill response plan.
3. Provide containment booms and oil absorbent materials in case of a spill.
4. Post the proper information for reporting spills.
5. When a spill occurs, stop the spill or leakage at the source.
6. Report the spill immediately to the U.S. Coast Guard National Response Center at 1-800-424-8802 and the Department of Ecology at 1-800-OILS-911 or 1-800-258-5990.
7. Contain the material. Recover what you can, then wait for the Coast Guard or the Department of Ecology to respond.

Exotic Species

1. Remove any visible vegetation from items that were in the water including, boat, motor, and trailer.
2. Flush engine cooling system, live wells, bait tanks, and bilges with hot water.
3. Rinse any other areas that get wet such as water collected in trailer frames, safety light compartments, boat decking and lower portions of the motor cooling system.
4. Water hotter than 110^{o} F will kill veligers, and 110^{o} F will kill adults.
5. Air dry boat and equipment for five days before using in uninfested waters. If gear or surface feels gritty, young mussels may have attached. They should be scraped off into bags and thrown into the garbage.

BILGEWATER AND FUELING

Bilgewater and Fueling

Bilgewater-- The Problem

Discharge of contaminated bilgewater is a major problem facing most marinas. This is because the bilge, being the lowest point on a vessel, tends to accumulate all fluids leaked or spilled onboard. Bilges are a major source of pollutants because they collect lubricating oils, gasoline, antifreeze and transmission fluids leaked from fuel and oil fittings, fuel and hydraulic lines, and engine seals and gaskets. Once in the bilge, these pollutants mix with the water that is present to form a toxic oily soup. Eventually, the bilge becomes too full or begins to emit foul odors and requires pumping.

Petroleum products, such as oil and grease, are toxic to aquatic organisms and persistent in the environment. They are capable of fouling the fur and feathers of marine mammals and birds, destroying their insulating properties. Oils floating on the water are aesthetically unpleasing. The discharge of oily bilgewater from a vessel is also illegal and subject to fines as high as $20,000 per day per violation. Chapter 90.56 RCW reads in part:

It shall be unlawful, except under the circumstances hereafter described in this section, for oil to enter the waters of the state from any ship or any fixed or mobile facility or installation located offshore or onshore whether publicly or privately operated, regardless of the cause of the entry or fault of the person having control over the oil, or regardless of whether it be the result of intentional or negligent conduct, accident or other cause...

The Solution

Bilgewater should be pumped to a sanitary sewer. However, few marinas are currently equipped with bilgewater pumpouts. Therefore, maintaining a clean bilge may be the only viable alternative. Inform your moorage tenants that discharging oily bilgewater is illegal and post signs prohibiting the discharge of oil and dirty bilgewater. Consider having them do the following practices:

- Keep bilge area as dry as possible.
- Regularly check fittings, fluid lines, engine seals and gaskets.
- Fix all fuel and oil leaks detected in a timely fashion.
- Do not drain oil into the bilge.
- Use suction oil changers or oil pumps that attach to a drill head. Tenants may pay a small fee if the marina makes them available.
- Fit a drip pan underneath the engine to collect drips and leaks.
- Be careful when fueling, some vessel's fuel tanks vent onboard.
- Turn off automatic bilge pumps and use them only when there is water in the bilge. When you leave your vessel, turn the pumps back on.

- Recommend the installation of a manual override switch for bilge pumps.
- Recommend the purchase of a hydrocarbon sensitive bilge pump. These pumps shut off automatically when they sense oil.
- Use oil-absorbent pads, pillows or diapers, even in small boats launch by trailer. Make them available to your tenants. Tenants will purchase absorbent products if made available. These absorbents are made of a special type of material that repels water but absorbs oil. They do not absorb antifreeze or other toxic chemicals. Replace them as needed before they become fully saturated with oil.
- If a bilge contains oil, absorb as much free oil as possible with a pad. Then pump the bilge dry and wipe down the bilge and equipment. If bilge is severely contaminated, use a pumpout service. Do not pull the drain plug on a boat with a bilge full of oil, especially if it is on the launch ramp.
- Dispose of oil-soaked absorbents as a used oil or household hazardous waste. If these facilities are not available, then wrap in newspaper and place in a plastic bag. Throw in the garbage as soon as possible.
- Do not use detergents or bilge cleaners unless the bilge is pumped into a sanitary sewer.

Bilge Cleaners

Contrary to many boater's beliefs, most bilge cleaners, even "biodegradable" ones, contain emulsifiers or detergents that tend to mix, not remove, the oily wastes and water from the bilgewater, and disperse it into tiny invisible droplets. This spreads these harmful chemicals further and mixes them throughout the water column when discharged overboard. Detergents are very toxic to aquatic life at extremely low concentrations. Detergent-based cleaners may render absorbent pads ineffective at removing oil and can make the bilgewater unsuitable for sanitary sewer discharge.

Despite advertisements, biological or enzymatic cleaners do not work well enough or consistently enough to destroy the oil within a bilge. Enzymes are protein catalysts produced by living cells and microbes. To work properly, live active bacteria must be present while producing the proper enzymes in the proper amount in the right sequence. The water temperatures in the cold dark bilges of the Northwest are generally too low to allow bilge cleaners to work effectively. The bacteria must also have the right salinity and dissolved oxygen content to consume the oily waste. The slightest deviation from the proper conditions can greatly reduce the bacteria's ability to perform. For example, if not enough oxygen is present, the sulfur in the oil is converted to hydrogen sulfide rather than sulfur dioxide producing a characteristic rotten egg smell.

While bilge cleaners may not perform to the level advertised, they can destroy some of the oils present in the bilge. However once added to the bilge, the bilgewater cannot be discharged overboard.

Fueling -- The Problem

Sloppy fueling is another chronic problem facing marinas. A single pint of fuel or oil can cover an acre of water, killing the aquatic life living in the surface layer. Fuel docks can be both a business asset and an environmental liability. While many marinas may have fuel docks, others do not. At these marinas, boaters often fill their tanks with portable cans of fuel. In either case, the potential for the release of petroleum products into the environment is great. The discharge of oil is also illegal and subject to fines as high as $20,000 per day per violation.

The Solution

Perhaps the best way to reduce the potential for fuel spills is to develop standard operating procedures for fueling in your marina. These procedures can be incorporated into a spill prevention and spill response plan. Guidance on how to develop a spill plan for your marina is discussed in a separate chapter in this manual. One thing we know for sure, if your staff and tenants are not aware of the BMPs, they won't follow them. Train your staff and post the BMPs in a conspicuous location. Openly discuss them with your tenants, to avoid misunderstandings.

The fuel dock is not always operated by the marina proper. Sometimes it is owned and operated by a separate business entity. If this is the case at your marina, consider incorporating the fueling BMPs into the lease agreement. In order to reduce your liability, we strongly recommend that you dispense the fuel from your fuel dock with the direct assistance of the vessel's owner. If you choose not to, we recommend that you directly supervise the fueling operation. Below are included a series of suggested BMPs for fueling operations at your marina. Remember, whether you operate the fuel dock or not, the pollution from it remains your responsibility. Please have your tenants fuel with care, and follow these practices:

- If fuel gets into the surface water, use absorbent pads to recover the spilled materials. Do not soap your spills. Detergents disperse but do not clean up the spills.
- Avoid overfilling tanks. This can lead to fuel “burps” up the fuel stem and out the air vents.
- Request boaters not to “top off” fuel tanks.
- Never leave nozzles unattended.
- Install automatic back pressure shut-offs on all fuel nozzles.
- Do not remove the holding clips from the nozzle.
- Do not allow fuel nozzles to be blocked in an open position.
- Provide information about vent whistles.
- Request boaters to install fuel/air separators on their fuel tank vents or consider requiring it in their moorage agreement.

- Use vent cups to capture fuel "burps" out the air vents.
- Use absorbent pads to mop up small drips, spills and splashes around fuel stems and air vents.
- Clear the fuel nozzle of residual fuel prior to extracting it from the tank stem. Ensure fuel nozzle is done dribbling before transferring back to the pump.
- If you have a gravity-fed fueling system, do not allow self-service. Automatic shut off nozzles may not work on these types of systems.
- Take extra care in fueling personal watercraft (jet skis). These craft are not stable in water and are very prone to spills. If you have a lot of jet skis using your marina, consider installing a personal watercraft fueling dock.

Fuel Line Integrity

Most fuel docks are placed at the end of a dock or pier. The fuel tanks are situated on land and the piping to the fueling station is usually located under the dock or pier. Most pumps are equipped with mechanical leak detection devices. These devices check the pressure on the line prior to the pump fully engaging for operation. Lack of proper pressure is an indication of a leak in the line. If the pressure does not develop, the device will not allow the pump to engage.

Leak detection devices were designed for use on short underground delivery systems where the tank is in close proximity to the fuel dispenser. In the intended design configuration, the mechanical leak detection device takes about three seconds to complete its operation. In a typical marina fueling operation, the piping from the pump to the fueling station is so long, it takes more than three seconds for the fuel to reach the end of the pipe. The length of the pipe and pumping friction can cause the pressure to be great enough that the mechanical leak detection device can shut off prior to a leak being detected.

The most secure fueling system for a marina that has above ground piping would be to replace it with double-walled piping. In addition, a solenoid valve should be installed at the point where the above ground and below ground pipes meet. This valve would insure the mechanical leak detection device would function properly and not be deceived by the piping system. Putting leak-detecting sensors in the inner-space of the double-walled piping would greatly improve your ability to detect a leak in that portion of the delivery system. However, no mechanical system is fail-safe; routine visual inspections should be performed.

HAZARDOUS WASTE MANAGEMENT

Hazardous Waste Management

What Marina Operators Need to Know

In 1980, the US Congress passed the Resource Conservation and Recovery Act (RCRA). This Act established a framework of management standards for hazardous wastes. Nationally, the EPA is authorized to implement the regulations. States can apply for and receive federal delegation to implement the federal program in lieu of EPA. The State of Washington has been delegated for many years.

In Washington State, the Dangerous Waste Regulations, Chapter 173-303 WAC, provide Ecology with the regulatory authority to manage hazardous wastes. These regulations are very complex. In simplest terms, a business becomes subject to the regulation if they generate or manage a waste that designates as hazardous. To designate, the waste must exhibit certain chemical or physical characteristic or qualities such as ignitability (burns), corrosivity (corrodes), reactivity (explodes) or toxicity (poisons).

There are a few categories of wastes that are excluded from regulation even if they would designate as hazardous. Perhaps the most important of these excluded categories to a marina is the household hazardous waste exclusion. This exclusion reads as follows:

> *Household wastes, including household waste that has been collected, transported, stored, or disposed. Wastes which are residues from or are generated by the management of household wastes (i.e. leachate, ash from burning of refuse-derived fuel) are not excluded in this provision. Household wastes mean any waste material (including garbage, trash, and sanitary wastes in septic tanks) derived from households (including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreational areas).*

We have long determined that wastes generated by recreational vessels qualify for this exclusion. We have also determined that if a marina collects, stores and transports these excluded wastes for legitimate recycling and appropriate disposal, the marina does not become subject to regulation under the state Dangerous Waste Regulation.

There are other types of waste that can also avoid full regulation. These wastes are termed conditional exempt. To be conditionally exempt, a business generates a hazardous waste in a quantity that falls below the regulatory threshold and manages the waste within a set of prescribed options, such as sends it to a facility permitted to manage that waste. The threshold used to determine if a waste is conditionally exempt is less than 220 pounds generated per month or 2,200 pounds accumulated onsite at any one time. However, it should be noted that quantity threshold is the aggregate weight of all the wastes generated onsite. Under these amounts, the business is considered a small quantity generator and the waste generated can be managed as a moderate risk waste (MRW).

Moderate risk wastes are not regulated by Ecology but by local government, usually through the adoption of a county ordinance regulations, or local moderate risk waste plan that determines management options for the waste. The jurisdictional health department and the public works department typically implement different aspects of the management of MRW. Public works may oversee the collection and disposal of the MRW, while the health department may establish the permitting requirements. It should be noted, however, that local government program can be more restrictive than either the federal or delegated state program.

Some of the products commonly used by boaters in your marina that may contain hazardous ingredients include the following:

- Paints
- Varnishes
- Paint thinners and solvents
- Antifreeze
- Gasoline
- Batteries
- Engine cleaners
- Wood preservatives and other pesticides
- Sealants, adhesives and epoxies
- Cleaning products

Few marinas will be fully regulated generators of hazardous waste unless they are associated with a boatyard or marine maintenance facility that contributes additional waste. Waste collected from recreational vessels do not count towards a marina's own quantity threshold, and as such cannot change a marina's regulatory status. If you are unclear about your generator status, feel free to contact your local program or the nearest regional office of Ecology and speak with a hazardous waste specialist for additional details concerning waste management requirements. A listing of the different agencies is provided in the back of this manual (See Appendices A and B).

Wastes generated from vessels operated as commercial businesses, such as fishing boats, charter boats, water taxis, and sailing schools, do not qualify for the household hazardous waste exclusion, despite the fact that their wastes are often identical to those generated by recreational boats. However, the wastes from these businesses may be conditionally exempt if they generate less than 220 pounds per month and do not accumulate greater than 2,200 pounds onsite at any one time. The improper management and disposal of hazardous waste is subject to fines as high as $10,000 per day per violation.

The Problem

Since marinas are situated over the water and vessels float on it, the potential for hazardous wastes to end up in the water from improper handling is high. If they do, these wastes can threaten aquatic organisms and negatively impact the water quality within the marina. In addition to the surface water quality impacts, hazardous wastes can impact air quality; and contaminate sediments, soils and drinking water supplies.

Besides these obvious environmental hazards, hazardous wastes can pose serious human health risks as well, through the threat of fires, explosions and chemical burns. These dangers and the hassles to properly dispose of them may drive your tenants to "orphan" their wastes at the marina office or adjacent to the dumpster. Because identifying unknown wastes is often difficult, orphan wastes cost many marinas across the state both time and money.

The Solution

Marinas should consider providing for the safe management of the hazardous waste generated by their tenants. Managing the wastes yourself is the most responsible way to do it. If you make proper disposal easy, you reduce the chances of wastes being dropped into the water or tossed into the garbage. You also reduce your liability at the same time. If waste is illegally disposed on your property, you are liable and it becomes your responsibility to manage it properly. Remember, excluded household waste collected by your marina does not count towards your quantity threshold and does not effect your generator status. While you are allowed to manage wastes derived from households, you cannot manage any wastes generated by a business. Contact your local moderate risk coordinator and the jurisdictional health department for more information (Appendix B).

If you choose to site a moderate risk waste fixed facility at your marina, you should be aware that the jurisdictional health department may require a solid waste handling permit prior to construction and operation. The health department can waive permitting requirements if your proposal qualifies as a "limited MRW fixed facility." For more information on how to site, design, construct and operate a MRW fixed facility, contact the Washington State Department of Ecology and request a copy of the publication *Moderate Risk Waste Fixed Facility Guidelines, March 1992*. You can get a copy by writing:

Washington State Department of Ecology
P.O. Box 47696
Olympia, WA 98504-7696
Telephone: (360) 407-6000

A less desirable option for managing the hazardous wastes generated by your tenants is to place the responsibility for disposing of the waste exclusively on them. Work with your local MRW program to provide information on disposal options, location of collection facilities and dates and locations of collection events. Provide a list of waste management companies and their telephone numbers and make the information available to tenants either through your office, by posting it, or by distributing it in your newsletter or monthly billing statements. We have included a service directory in the back of this manual to assist you. However, if you leave waste management to your tenants you increase the possibility that it will be illegally disposed of or orphaned at your facility. Remember, you remain liable.

Management BMPs

Consider these best management practices when dealing with hazardous waste issues:

- Make it marina policy to manage hazardous wastes and hazardous materials.
- Post a prohibition on the disposal of used oil, antifreeze, paint solvents, varnishes and batteries into the dumpster.
- Operate a hazardous waste collection facility for your tenants.
- Manage the wastes in structurally sound, non-leaking containers with securable lids and made of materials that will not react with the waste material contained within.
- Waste materials should be stored on a bermed concrete slab to provide secondary containment, or managed within a building or inside a modified trailer van.
- Waste containers should be raised up off the floor with pallets to prevent the corrosion of the containers by the moisture of the concrete.

- Pallets should be spaced sufficiently to allow for the periodic inspection of the containers' integrity.
- Incompatible wastes should be segregated from one another and the contents of the containers should be clearly labeled.
- If operating a collection facility is not feasible, provide information to your tenants on how and where to manage their wastes. Provide the Department of Ecology's toll free number, 1-800-RECYCLE for the location and hours of household hazardous waste facilities, and dates and location of county sponsored collection events. Pass the word either through office mailings, by posting it, in your marina newsletter or statement stuffers.
- Encourage the use of alternative product. There are many non-toxic or less-toxic products available that can be used as alternatives to hazardous household chemicals.
- Encourage your tenants to reduce use, to buy only the amount of product needed, share any leftovers, and use the least amount needed to get the job done.
- Solvents such as turpentine and brush cleaners can be reused. Filtering out the solids can extend the life of the product.
- Request tenants to store toxic products separately, in their original containers, and out of reach of children and pets. Store flammables in fireproof containers.

Waste Specific BMPs

The following wastes should be managed in accordance with the following guidelines. These materials should not be disposed of in your dumpster. This prohibition should be clearly posted. Consider incorporating these guidelines into your tenant lease agreements to prevent the inadvertent disposal into the local municipal landfill. Contact your local MRW coordinator and the jurisdictional Health Department for more information on disposal options and permitting requirements (See Appendix B).

• Old gasoline

Old gas is generated by two-cycle outboards and gas powered marine engines. The preferred management alternative for old gasoline is to not generate it. Winterizing a vessel's fuel system can result in far less going bad. During the winter, volatile components of gasoline evaporate out of the fuel rendering it less combustible. Water tends to condense in the tanks or dribble in around poorly sealed fuel caps. Gas can also "break down" over time creating a semifluid gum. This gum causes deposits of hard resin like compounds to clog carburetors and injector systems.

By filling fuel tanks when a vessel is not in use for prolonged periods of time, the potential for water condensation is reduced. Have your tenant consider adding a fuel additive designed to remove water from the fuel. It really doesn't remove the water but rather emulsifies it so it can pass through the system more easily. Fuel additives promote quick starting, reduce gum and varnish build-up and keep carburetors and fuel systems clean.

Waste gasoline should be stored in secured containers marked with the words "FLAMMABLE - Waste Gasoline." Flammable materials need to be managed in accordance with the local fire code. If relatively pure, the gasoline can be filtered and mixed with fresh gasoline or an octane booster, then reused. Waste gas should not be poured on the ground or mixed with your waste oil. It can usually be removed from the site by your waste oil hauler.

• ***Used Oil***

Used oil can be recycled if it has not been mixed with hazardous waste. See the next BMP section on the proper management of used oil.

• ***Antifreeze***

Antifreeze is very toxic and should not be allowed to drain into a bilge, storm sewer or septic tank; or be poured onto the ground. Antifreeze is very recyclable. There are many companies that provide this service. If your marina generated large volumes of antifreeze, you should consider recycling it yourself. For more information on antifreeze recycling, contact the nearest Ecology regional office and speak with a hazardous waste specialist (See Appendix A). Antifreeze should never be mixed with other chemicals and fluid wastes. Once mixed, recycling may become difficult or impossible.

Store used antifreeze out of reach of children and pets until it can be properly recycled. Antifreeze has a slightly sweet taste that is attractive to dogs. There have been a number of documented cases of dogs being poisoned from drinking antifreeze. Keep it in a secured container and label it "TOXIC - Used Antifreeze." When the container is full, have it recycled. Contact your local moderate risk waste coordinator recycling locations (See Appendix B).

• ***Used batteries***

Rechargeable batteries contain heavy metals such as nickel and cadmium. They are hazardous wastes and cannot be disposed of in the garbage. Rechargeable batteries, went spent, can now be recycled in many locations that sell them, such as Radio Shack and Target stores. The web page, http:\\www.rbrc.com, lists recycling locations by zip code.

State solid waste law requires lead-acid batteries to be recycled. Recycling is promoted through the institution of a five-dollar core charge. To extend the life of a battery and reduce corrosion, clean battery terminals frequently with baking soda rinse and distilled water and coat terminals and cable ends with petroleum jelly. Make sure all batteries are full of fluid and kept fully charged. Whether onboard or stored on shore, batteries should always be protected from freezing. If the battery case ruptures, the acid inside (which contains lead) may leak into the bilge or escape into the environment. If a battery is dropped overboard, it should be retrieved with the assistance of a local scuba diver. Caps on spent batteries should be securely fastened.

• ***Solvent***

Paint thinners, turpentine, acetone, methylene chloride and other solvents should be used more than once. Between uses, solvents will clarify. Solvents should not be mixed. All containers accumulating solvents should be marked as to their contents to promote waste segregation. Most solvents are flammable and the containers should clearly identify this risk. Containers should be secured to prevent the evaporations of these volatile materials and mark with the words "FLAMMABLE - waste solvent." Flammable materials need to be managed in accordance with the local fire code.

Many solvents are recyclable so if you have a sufficient volume, consider the purchase of a distillation unit. For more information, contact the nearest Ecology regional office and speak with hazardous waste specialist (See Appendix A). Flammable materials will need to be managed in accordance with the local fire code.

Hazardous Waste Collection Event

If your marina does not have an MRW fixed facility or sufficient space to construct one, consider sponsoring a household hazardous waste collection event. There are many benefits in doing one. Perhaps the biggest benefit is unwanted hazardous wastes and hazardous products are removed from over the water. They are taken off vessels and cleaned out of boathouses and dock lockers where they pose the greatest environmental threat and liability. Collection events can also greatly reduce or eliminate the occurrence of orphaned wastes by allowing for convenient and safe disposal of these materials close to the source. By doing so you may be relieved of some of the day to day hassles and unwanted costs related to unknown wastes being dropped off at your marina.

As discussed previously, local jurisdictions determine the disposal opportunities for household hazardous waste in their local moderate risk waste plan. In most counties, there is a permanent location where waste from households can be dropped off. This is usually at the landfill or at one of the transfer stations. A few counties still do not have a permanent collection facility sited and instead periodically hold household hazardous waste collection events or do mobile collections.

The idea behind the collection of household hazardous waste is to keep these harmful chemicals out of the landfill and redirect them into more responsible and environmentally protective management options. Therefore, the local moderate risk waste program has a very strong interest in working with you to divert these wastes. There are a number of different options for doing this, but you will need to work closely with your local moderate risk waste coordinator. Consider the following:

- Sponsor a collection event exclusively for your marina tenants and deliver the collected wastes to the approved county facility. Alternatively, arrange well in advance to have them picked up by the MRW program, or a legitimate hazardous waste contractor.
- Sponsor a collection event and open it up to the general public. Arrange well in advance to have the collected wastes pick up by the MRW program or a legitimate hazardous waste contractor.
- Cosponsor a mobile collection event with the county at your marina or conduct a satellite collection event and transport the waste to the waste mobile located elsewhere in the county on that day.

Remember, whatever approach you select, there may be significant costs associated with the proper disposal of the collected wastes.

Since collection events are typically only one day long, you will need to advertise it well in advance to get the best tenant participation. Once again, whichever approach you select, contact the MRW coordinator and the jurisdictional health department to work out all the details, and any permitting requirements (See Appendix B).

For more information on how to conduct a household hazardous waste collection event, contact the Washington State Department of Ecology for a copy of the publication: Household Hazardous Waste Guideline for Conducting Collection Events, February, 1989. You can get a copy by writing:

Washington State Department of Ecology
P.O. Box 47696
Olympia, WA 98504-7696
Telephone: (360) 407-6000

• ***Oil-based paint***

Oil-based paints contain hazardous and flammable solvents as carriers. Anti-fouling paints are themselves toxic. Try to eliminate waste by encouraging your tenants to buy only the amount they need to complete a job. Having paint left over is a waste of money and resources. Paints should be stored in containers with secured lids to prevent the evaporation of volatile components. Flammable materials will need to be managed in accordance with the local fire code.

• ***Latex paint***

Water-based paints are generally not hazardous. If the residual paint in the can is dry, it can be thrown in the garbage. Contact your local moderate risk waste coordinator for disposal options (See Appendix B).

• ***Cleaning products***

Cleaners should be used widely, used up, and not washed overboard. Most are toxic and some may be considered hazardous waste when no longer useful. They should be disposed according to the local plan.

• ***Empty containers***

If containers have been emptied by removing all "free product" to the extent practical, they can be placed in the garbage. Do not rinse them out on to the ground. Remove all labels and mark the container "EMPTY." Keep your empty containers in an area protected from the weather and the public to avoid rainfall or your tenants from creating an "unknown" waste. Drums should be recycled for metals content.

Notes:

USED OIL MANAGEMENT

Used Oil Management

What Marina Operators Need to Know

What is used oil? The use oil recycling law, Chapter 70.951 RCW defines used oil as follows:

Used oils means "(a) lubricating fluids that have been removed from an engine crankcase, transmission, gearbox, hydraulic device, or differential of an automobile, bus truck vessel, plane heavy equipment, or machinery powered by an internal combustion engine; (b) any oil that has been refined from crude oil, used, and as a result of use, has been contaminated with physical or chemical impurities; and (c) any oil that has been refined from crude and, as a consequence of extended storage, spillage, or contamination, is no longer useful to the original purchaser."

It should be noted that if an oil was not used, by definition, it cannot be a used oil. But for all intents and purposes, off spec virgin oils may be handled as a used oil without significant impact to a marina. Used oils that designate as hazardous wastes or are mixed with hazardous wastes are outside the scope of this chapter. If the used oil you generate at your marina designates as a hazardous waste, refer to the preceding chapter on hazardous waste management.

Very little of the used oil generated in the state is re-refined, almost all of it is being burned for energy recovery. Most of the waste oil companies managing your used oil are fuel blenders, blending it into bunker fuel. If a fuel blender markets used oil directly to a person that burns the fuel for energy recovery, then the blender is known as a marketer. Marketers must know enough about the physical and chemical properties of the fuel they are selling to ensure it is sold to a burner with different with the appropriate energy recovery equipment (i.e. industrial furnace, boiler or ocean going vessel). Fuels with different constituent concentrations and characteristics have different regulatory requirements.

"Fuels with different constituent concentrations and characteristics have different regulatory requirements."

If the used oil you collect does not designate as hazardous waste and has not been mixed with hazardous waste, it is of no consequence to you what other type of oil it gets co-mingled with after it has been picked up from you. But it is very important that you know some of its characteristics before you send it off site. If your used oil has greater than 1,000 parts per million halogenated hydrocarbons, then it is presumed to be a hazardous waste and must be managed in accordance with the dangerous waste regulations. If your used oil has greater than 50 parts per million polychlorinated biphenyls (PCBs), it is presumed to be a waste regulated by the Toxic Substances Control Act (TSCA). This is a separate federal regulatory program that is distinct from federal hazardous waste. Wastes that are regulated under TSCA are exempted from the state dangerous waste regulation. The TSCA program cannot be delegated to a state.

The Problem

Used engine oil is a very common waste that is also one of the most damaging substances boaters can introduce to the aquatic environment. It may be the single nastiest problem for marinas from both an environmental and aesthetic viewpoint.

The risk of an oil spill and its environmental contamination is a constant concern for all marinas. Used oil is a problem waste that is toxic to many forms of aquatic life. It is also illegal to dump used oil in the water or on the land. Nonetheless, more than 4.5 million gallons of used oil are discarded without being recycled each year in Washington State. Much of this ends up in our surface waters. Oil and water just does not mix.

Since used oil is prohibited from being disposed of in the water, onto the land or into a landfill, marinas have only two options for dealing with it. They are:

➡ Provide a marina-operated used oil collection facility

or

➡ Leave the responsibility of managing used oil to the individual boaters.

The Solution

Providing a well maintained, convenient used oil collection facility for boaters is the best option for any marina. Leaving the responsibility for managing used oil entirely with the individual boater does little to minimize a marina's risk. The advantages of a marina providing a used oil collection facility are:

- Oil is kept out of the water and garbage containers.
- Provides a recycling alternative that your customers will appreciate.
- Prevents used oil from becoming an "orphaned waste" that is left in unmarked containers and abandoned on marina property

Be proactive in managing used oil at your marina – Don't ignore it. Installing and operating a used oil collection facility is the right thing to do. It makes good environmental sense and good business sense too. It could be a part of your hazardous waste management facility discussed in the previous chapter. Used oil recycling is a practical service that a marina can provide for its customers no matter how big or small the marina may be. A collection facility does not need to be a large or expensive capital project. However, there are some minimum standards that need to be incorporated into the design of your facility. For information and assistance on how to design and install a collection facility at your marina, contact your local MRW coordinator.

Secondary containment of the collection tank or waste containers is necessary to minimize the risk of environmental contamination due to accidental spills and sloppy oil handling practices. Secondary containment can be as simple as a drum in an overpack container or as complex as a bermed concrete pad. Whatever you choose, if a drain valve or sump is left open, then you do not have secondary containment. Remember, if your collection facility is protected from the rain, there should be no liquids discharged from the containment area. Other design features to consider include the following:

- Keep the storage capacity of your main collection tank to less than 660 gallons. This will relieve you of some regulatory requirements. However, make sure the design capacity meets your tenants' needs.

- Provide a large securable funnel with a removable particulate screen. This will make it easy to add oil without making a mess and keep nuts, bolts and drain plugs out of your tank. It also provides a place to puncture and drain oil filters overnight.
- If possible, cover the secondary containment area to eliminate the accumulation of rainwater. At a minimum, keep all tanks and container securely closed. Remember, rainwater will add to the volume of material you will have to pay to have hauled offsite and eliminates the possibility of rainwater "floating" the oil out the top of the tank.
- Fence and secure the area to control access to the facility.

Recycling used oil is not a risk free proposition. There is always the possibility that someone will contaminate your used oil with hazardous waste or PCBs by placing tainted oil or chemical wastes in your collection facility. By managing the used oil at your marina, you may subject yourself to the risks of increased disposal costs associated with contaminated oil and the possibility of enforcement actions or fines. The Port of Anacortes was recently penalized by the EPA for the improper management of PCB contaminated used oil. Understand your risks and reduce them through knowledge. Minimize these risks through a series of well-reasoned operational practices.

Used oil collection facilities can be operated to allow direct around-the-clock access to the collection facility by boaters or tightly controlled by marina personnel. There are advantages and disadvantages to each of these approaches. In either case, it is important to provide signage and education so boaters are aware that only used oil can be placed into the collection vessel. Used oil that is contaminated with solvents, paints, thinners or other prohibited substances is not recyclable. Once added, they may contaminate all the oil in a used oil collection facility preventing the entire volume from being recycled. By maintaining a log of contributors to a collection facility and requiring marina personnel to be present to gain access to a facility, incidents of both intentional and unintentional contamination are greatly reduced. We recommend that marinas control the access to their facility and restrict it to normal operating hours. After all, most midnight dumping occurs at midnight.

Used Oil BMPs

Included below are some operational practices that can be incorporated into your BMPs:

- Provide receptacles for used oil recycling, or information on used oil collection sites near you marina by calling 1-800-RECYCLE.
- Specify the used oil recycling requirements in you moorage agreements.
- Post signs that clearly identify oils acceptable for recycling.
- Have tenants puncture and drain used oil filters overnight. Recycle them for their metals content.
- Maintain a contributor list as a means to track down the sources of contamination if it occurs.

- Monitor the use of your facility and keep it locked after business hours.
- Test for chloride contamination on a regular basis with commercially available screening test. Your used oil recycler can provide these test kits.
- Collect oil in smaller volumes and test it prior to transferring into a larger collection tank. If your tank tests "hot," isolate that volume and do not add any more oil. Once your tank is full and tests "clean," lock it up until your oil contractor arrives.

There are several companies that are qualified to collect and transport used oil for recycling. Prior to pick up, these companies test the oil at a collection facility to determine if contamination has occurred. They will likely use the same screening test as you. If your load tests "hot" when the contractor samples it, split a sample with him for chemical specific analysis. It should be noted that the screening tests often give false-positives in the presence of seawater. Make sure the contractor does not mix the contaminated oil into larger and larger volumes. Remember, if the screening test indicates a chloride concentration of greater than 50 parts per million, then it is assumed to be a PCB-contaminated TSCA waste. Quarantine this oil until chemical specific test results are received from the lab. For additional information contact the nearest Ecology regional office and speak with a hazardous waste specialist (See Appendix A).

Used Oil Contingency Fund

Used oil contamination at collection facilities is a very rare occurrence. The legislature authorized an Ecology-funded program to assist in the proper disposal of contaminated used oil that is collected as a part of a county-approved used oil collection program. These monies are known as the Used Oil Contingency Fund and are designed to relieve collection site operators from the elevated costs associated with the disposal of contaminated oil detected at public used oil collection sites identified in the local moderate risk waste plan. In essence, the Used Oil Contingency Fund is an insurance plan for used oil management. For more information on how to become designated as a public used oil collection site, contact your local MRW program. It should be noted that a public used oil collection site is limited to accepting used oil from non-commercial sources to be eligible for Contingency Fund relief in the event of contamination. Included below is the process for coverage under the fund.

Once a tank of used oils has been documented as contaminated, the manager of the public collection site where the used oil is collected contacts the local MRW coordinator to report the incident.

The local coordinator contacts Ecology's regional MRW coordinator with the information necessary to determine if the fund can be used to pay for the "hot" load. A report is started on the incident.

The Ecology regional MRW coordinator calls the state-contracted hauler to authorize the pickup.

A few days after authorization, the Ecology regional MRW coordinator contacts the manager of the public collection site to confirm that the contaminated oils have been removed and the facility is again collecting from the public. The report is completed and forwarded to Ecology's Lacey Office to be matched with the billing.

If your marina does not provide used oil recycling opportunities, at the very least, call 1-800-RECYCLE or your local MRW program to find the used oil collection sites nearest your marina

SOLID WASTE MANAGEMENT

Solid Waste Management

The Problem

Each year an estimated 14 billion pounds of boat wastes, gear, and cargo dumped either intentionally or accidentally into waters of the United States. Many of these wastes end up in the waters of our state. Litter at and around marinas is not only an eyesore but can also harm fish and wildlife, and get caught up in propellers and block water intakes. There are many laws and regulations that pertain to solid waste management. For example, it is against federal law to throw solid wastes into waters of the United States. Marinas are required to provide solid waste disposal facilities for tenants and customers patronizing their facilities.

Marine Pollution Act (MARPOL) is an international law for a cleaner, safer marine environment. Annex V of MARPOL prohibits the dumping of garbage, food wastes, plastics, trash, glass, metal, dunnage, paper, packaging, line, nets and fish cleaning wastes within 3 nautical miles of the United States coastline. Boater and seamen should ensure these solids wastes are returned shore-side and managed in an approved manner on land. Violations of MARPOL should be reported to the United States Coast Guard. Civil penalties of up to $25,000, a fine of up to $50,000 and/or five years imprisonment may be levied against violators.

Vessels operating within 25 miles of the coastline are also subject to stringent restrictions on the type of materials that can be thrown overboard. Recreational and commercial vessels greater than 26 feet in length are required to post a MARPOL placard showing the offshore solid waste disposal restrictions in a visible location. Vessels greater than 40 feet in length are also required to have a written waste management plan on board. Inform your tenants about the MARPOL requirements. These placards can be obtained for $1.00 each plus shipping and handling by contacting:

Center for Marine Conservation
Atlantic Regional Office
1432 North Great Neck Road, Suite 103
Virginia Beach, Virginia 23454
Telephone: (757) 496-0920
Fax: (757) 496-2307
E-mail address: www.cmc-ocean.org

The Solution

Littering on either the land or into our surface waters is prohibited. Marinas are required by state law to provide litter receptacles for use by tenants of the marina. Additionally, marinas with at least thirty moorage slips are required to provide recycling opportunities as long as the county or city where the marina is located has an approved waste reduction plan. Opportunities for at least two of the following materials must be provided, although Ecology encourage the recycling of as many as possible:

- aluminum
- glass
- newspaper
- plastic
- tin

Stick-on logos are available for both litter receptacles and recycling receptacles by calling 1-800-RECYCLE. Contact your local recycling coordinator for more information on recycling opportunities in your community. A listing of the different agencies is provided in the back of this manual.

Lead-acid batteries are required to be recycled. Marinas that sell lead-acid batteries, including marine batteries, must post a sign furnished by the Department of Ecology. The sign explains the $5.00 core charge and that it is illegal to place batteries in the garbage. These signs are available by calling 1-800-RECYCLE.

Marinas that sell more than 1,000 gallons of motor oil or more than 500 oil filters per year are required to post a sign furnished by Ecology notifying purchasers of the importance of used oil recycling and how and where used oil can be recycled. These signs can also be obtained by calling 1-800-RECYCLE.

Inform your tenants that it is illegal to throw trash overboard. Trash floating on our public waterways and washing up on the beach is unsightly and undesirable. State law requires boaters to keep a litterbag or other receptacle in their vessel or boat. Remind them to take reusable containers and recycle their bottles, cans and paper. Make it a marina policy that nothing goes overboard.

Stow it! Don't Throw it!

SEWAGE MANAGEMENT

Sewage Management

The Problem

Washington State has long had a great tradition of clam, oyster, and mussel harvesting. However, shellfish harvesting is much more than a tradition, it is a huge commercial and recreational business worth millions of dollars. Our shellfish industry requires clean water to survive. The closure of our shellfish beds not only effects our public image in a negative way but costs our economy vast sums of money.

Shellfish feed by filtering huge quantities of water through their systems, including contaminants. If the contaminants build-up in significant concentrations, the consumption of raw or undercooked shellfish may be pose a risk to human health.

The two major causes of shellfish contamination are red tides and untreated or improperly treated sewage.

Red tides are caused by a natural occurring algae "blooms" in our waters. Shellfish filter the algae and accumulate a very powerful toxin in their flesh. Since these algae are a naturally occurring part of our environment, there is little we can do except monitor the build-up of toxin and close shellfish beds when necessary.

Feces, whether from human, mammalian, or avian sources, contain fecal coliform bacteria. The level of fecal coliform contamination in shellfish is also an indirect indication of the presence of other pathogens such as viruses. Shellfish, through filter feeding, can concentrate bacterial and viral contamination. Eating contaminated shellfish can make humans sick, causing gastrointestinal disorders, nausea, diarrhea, infectious hepatitis, typhoid fever, gastroenteritis and other diseases.

Almost 40% of Washington's shellfish beds have been closed as a result of environmental contamination, much of which is directly attributed to the discharge of sewage. A part of this sewage comes from illegal discharges by boaters. It is estimated that boat wastes represent about 12% of the shellfish restrictions across the state. A few examples include Twanoh State Park, Sequim Bay State Park, Blake Island State Park, Kingston Marina, John Wayne Marina and Semiahmoo Marina.

Sewage discharged from boats ranks sixth behind failing septic systems, animal wastes, stormwater runoff, sewage treatment outfalls, and marine mammals as a cause of shellfish bed restrictions. However, eating contaminated shellfish is not the only way people can get sick from fecal coliform contamination. Direct contact with the water can also cause sickness.

It is illegal to dump any untreated sewage within the 3-mile territorial limit of the United States coast. This includes all of the Puget Sound and its fresh water tributaries. In some municipal areas (e.g., Seattle) even the dumping of sewage treated in marine sanitation devices is prohibited while the vessel is at moorage. The discharge of sewage is also an aesthetic insult. Toilet paper and fecal matter floating around a boat is repulsive. It decreases the pleasure of boating and certainly makes swimming, snorkeling, and water skiing less attractive. A marina that fails to provide convenient, accessible alternatives to dumping raw sewage will eventually get a bad reputation within the industry.

The discharge from onboard heads and holding tanks is referred to as "black water." The discharge from sinks, laundry and showers is called "graywater." Of the two, black water is certainly the more dangerous and objectionable. This does not mean it is acceptable to dump graywater directly from the boat. Dumping black water can make people sick. Dumping graywater may be harmful to aquatic life within the marina, and contains bacteria and viruses in sufficient quantities to still be a public health concern.

Graywater typically contains food wastes, soaps, and detergents. These waste materials may impose a biochemical oxygen demand and contribute to an excessive build up of nutrients in the receiving waters. This can lower the oxygen levels available to aquatic life and encourages rapid spread of algae. The discharge of both types of wastewater is particularly damaging when the vessel is moored, within the marina. The same breakwater that protects the vessels from currents and winds, limits the flow of water through the marina. Water within the marina cannot refresh itself, resulting in the concentration of these pollutants in the discharges. This is why the waters within some marinas have a characteristic "soupy" coloration when compared to the adjacent waters outside the marina.

The Solution

There are a number of things a marina can do to minimize the impact from the discharge of sewage. While this manual is not intended to provide detailed guidance on all the available options for sewage management at your marina, it is intended to provide a broad overview.

Perhaps the single best thing a marina can do is to develop a sewage management program and provide adequate, well-maintained pumpout stations. The number needed and the exact locations will vary between marinas. It depends largely on the number of boats moored at the marina, but there are a number of other factors to be considered:

- The size distribution of the vessels.
- Distribution of types of marine sanitation devices and portable toilets.
- Availability of shore-side toilet, laundry, and shower facilities.
- Availability and degree of use of commercial pumpout services.
- Physical configuration of the marina.

The following guidelines may help you determine the size and number of pumpout stations for your marina.

Marina Pumpout Storage Capacity

Boats with Holding Tanks or Portable Toilets	Marina Holding Tank Volume (gallons)
1-20 boats	300
21-40 boats	600
41-60 boats	900
61-80 boats	1,200
81-100 boats	1,500
More than 100 boats	2,000

A rule of thumb is to install one pumpout station and one dump station for every 300 boats over 16 feet in length. The location of the pumpout will be dependent on a number of site-specific factors, such as traffic flow through the marina and ability to accommodate vessel draft at low tide. As part of a comprehensive sewage management program for you marina, consider providing the following:

- Self-service pumpout stations on a barge anchored at the entrance to the harbor.
- Portable toilet dump stations for incidental use by boating clients.
- Portable toilet dump stations located at your boat ramps.
- Include a wash down hose at dump stations labeled "Non-Potable Water."

For details on how to properly design and implement a sewage management program contact the Washington State Department of Health, Office of Shellfish Programs for a copy of the publication*: Options for the Collection and Disposal of Recreational Boat Sewage at Marinas*, October 1995. You can get a copy by writing to:

Washington State Department of Health
Office of Shellfish Programs
Airdustrial Center Building 4
P.O. Box 47824
Olympia, WA 98504-7824
Telephone: (360) 753-5992

Operational BMPs

Your sewage management program will not be effective unless you develop and implement good maintenance procedures. When developing your program, consider the following:

- Develop regular inspection schedules of pumpout and dumping facilities.
- Maintain a dedicated fund for the repair and maintenance of pumpout stations and receptacles.
- Have personnel on-hand to monitor and ensure proper use of the equipment.
- Arrange maintenance contracts with contractors competent in the repair and servicing of pumpout and waste dump receptacle equipment.
- Keep sewer lines clean to avoid plugging.

Note: Boat sewage is generally higher strength than typical household septage due to the addition of chemical deodorizers and formaldehyde to the holding tanks.

BMPs for Moorage Tenants

Educate your tenants about the importance of proper sewage management and make it as easy as you can for them to practice conscientious sewage handling:

- Post signs regarding the prohibition on the discharge of sewer.
- Provide the pumpout service free-of-charge or make it part of the standard moorage fee. Especially effective for liveaboards is rebating part of their moorage fee for demonstrated, consistent use of the pumpouts. Clipboard sign-ins or two part sign-in slips may be used for verification. It may be necessary to raise slip fees to cover this incentive program.
- Post the location and operational hours of each pumpout facility.
- Provide educational material on how to use a pumpout facility.
- Post the telephone number of who to call if there is an equipment malfunction.
- Provide clear instructions at each pumpout and dump location. Include a prohibition against disposal of hazardous materials.
- If feasible, add language to tenant lease agreement promoting use of pumpout facilities. For example:

  Require all liveaboards to connect the vessel to the sewage laterals and inlet interface valves of the marina. Connection should include backflow prevention devices.

- Prohibit the discharge of sewage in your tenant lease agreement.
- Talk to liveaboards that have obviously not moved their vessels to the pumpout facility in a very long time.
- If your marina does not have a pumpout facility or you have tenants who have an aversion to pumping their systems out on their own, provide a list of vendors and pumpout locations.
- Provide clean, adequate shore-side facilities and encourage tenants to use them for showering and laundry.

- Encourage tenants to use biodegradable, phosphate-free detergents on vessels.
- Minimize throwing food wastes overboard by providing adequate garbage service.
- Encourage tenants to conserve water and use water saving devices.
- Prohibit the dumping of pet wastes in the water in the tenant lease agreement. Pet feces in a marina pose the same risks to human health and shellfish beds as human sewage. Aesthetically, they are just as unpleasant. Cats should use litter boxes on the vessel and spent litter should be put in the garbage. Dogs should not be allowed to defecate within 100 feet of the water. Use of a "pooper-scooper" is recommended.
- Remind boaters and visitors not to harvest shellfish in marinas.

Sewage Management Assistance

Funding assistance is available from the Washington State Parks and Recreation Commission for up to 75% of the cost of construction or renovation of boater sewage reception facilities. All of the following are eligible for funding:

- Construction/renovation of stationary pumpout and/or dump stations.
- Barge units having some combination of pumpout, dump stations and/or restroom facilities.
- Floating restroom facilities with trailers.
- Pumpout skiffs for use at marinas in conjunction with a stationary pumpout station.

For more details or a complete application, contact the Washington State Parks and Recreation Commission for your application for financial assistance under the Clean Vessel Funding Program. You can get a copy by writing to:

Washington State Parks and Recreation Commission
Boating Programs Office, Clean Vessel
P.O. Box 42654
Olympia, WA 98504-2654
Telephone: (360) 902-8511

Notes:

SPILL PREVENTION AND RESPONSE

Spill Prevention and Response

The Problem

Perhaps you remember the 1985 *Arco Anchorage* tanker spill that released 239,000 gallons of crude into the marine waters around Port Angeles. Or the *Nestucca* barge spill that released 231,000 gallons of fuel oil into the waters off Grays Harbor in 1988. Luckily, few spills are this large. The majority of uncontrolled releases come from small spills with more localized impacts. Even though it is doubtful if you will ever experience a spill approaching this magnitude in your marina, it is still important to be prepared.

After all, no spills are insignificant. Experiments have shown that one gallon of used oil spilled into a million gallons of water will kill half of the Dungeness crab larvae exposed. The routine release of pollutants will degrade surface water quality and erode the aesthetics of your marina.

Human error causes an estimated 80% of the spills in Washington State. This means most spills are preventable. Your marina should be able to prevent as many spills as possible through effective spill prevention planning and respond effectively to those spills that can not be averted. While we do not expect you to be able to respond the next *Exxon Valdez* type incident, we do think you should be prepared to respond to the type of events that are likely to occur in your marina.

The Solution

The best way to prevent spills is to identify the materials and areas with the highest probability for spills. Diesel fuel is the most commonly spilled material across the State of Washington. If your marina has a fuel dock, it is very likely that the fueling operation represents your greatest liability for unplanned releases. If you do not have a fuel dock, your liability may come from marine contractors or tenants conducting maintenance on their boats or the abandoned commercial vessel at the end of the floats. You need to focus your prevention energies wherever your environmental Achilles Heel lies.

This manual provides you with the basic tools necessary to identify and correct those areas with a high potential for environmental releases. Each chapter has given you practical information how to reduce your chances for an unplanned release. We have encouraged you to develop BMPs and policies specific to your marina and to train your tenants and staff to use them to improve the quality of the surface waters in our state. Training, education and planning are the most effective ways to prevent spills. Now its up to you to do just that.

Spill Response

While spill prevention planning will greatly reduce the likelihood of spills, it is still crucial to be prepared for accidental spills. The next phase of your planning efforts must be to determine the prudent steps necessary to reduce the overall environmental impact from the unplanned release that is inevitably going to occur.

The first thing your marina needs to do is develop a spill response plan. The plan should be short, with clear directions that can be understood by each of your staff. The plan should be a living document, with one person responsible for its updating. Emergency notification numbers and equipment inventories should be reviewed on a periodic basis. Copies should be made available to everyone involved in spill response. Components of a spill recovery plan should address the following:

WHO - Identify who is responsible for spill notification, response and follow-up.

WHAT - Determine what types and quantities of spill response equipment necessary for a spill event and the actions needed to mitigate the impacts and recover spilled materials. The type of actions necessary for different type and sizes of spills should be clearly outlined.

WHEN - Define when the different types of response actions need to be implemented and when additional assistance is to be called in.

WHERE - Specify where the spill response equipment and notification telephone numbers are located within the marina.

HOW - Explain how the equipment is to be used and disposed of. Instruct staff how to implement the spill response plan. Practice and conduct drills to familiarize them with their roles and responsibilities.

Your marina should purchase enough spill response equipment to respond adequately to the largest credible spill reasonably anticipated. The types and amounts of the equipment you will need will depend on the nature of the spill threat present at your marina. The spill response equipment should be stored in the area where the greatest risk of a spill exists. Typically the fuel dock. It should be placed where it is easily accessible, clearly marked and can be deployed quickly. When there is a spill, time is essential in getting it contained. Winds and currents will disperse a spill rapidly and the amount of effort necessary to recover that material grows exponentially over time.

If you have more than one high-risk area, you should have a spill kit for each of them or you can make a kit that can easily and rapidly be move to the site of a spill incident. Whether or not your marina keeps the spill supplies under lock and key is your prerogative, but if you lock them up make sure somebody onsite has access to the key.

As stated above, determining the proper kinds of spill response equipment depends on the type of services your marina provides and the type of vessels that moor there. For example, commercial fishing vessels tend to be larger and carry more fuel than does the typical recreational boat and may be less highly maintained. At a minimum, oil booms and absorbent pads, fire extinguishers, portable pumps and communication devices should be made available.

Booms - As a standard rule of thumb, expect to use three feet of boom for every foot of boat. Provide enough boom to handle the largest boats you reasonably expect to moor at your marina.

Fire Extinguishers - Make sure your marina has an adequate number of fire extinguishers. A fire on an unattended vessel can often result in an unplanned release of fuel or other hazardous materials.

Pumps - The use of pumps can also avert a spill. Once a vessel sinks, fuel will begin to escape out of the fuel vents or around the fuel caps.

Communication Devices - Make provisions to communicate with the other members of your spill response team. Cell phones and VHF radios work well for this purpose.

Spill Requirements

When responding to a spill in your marina, always take the following three steps:

Secure the situation - Stop the leak or spillage at the source. Once this has been done, ensure that additional material is not leaked into the environment. For example, if fuel has been spilled into both a vessel's bilge and the water, make sure the bilge pump doesn't turn on, releasing more material.

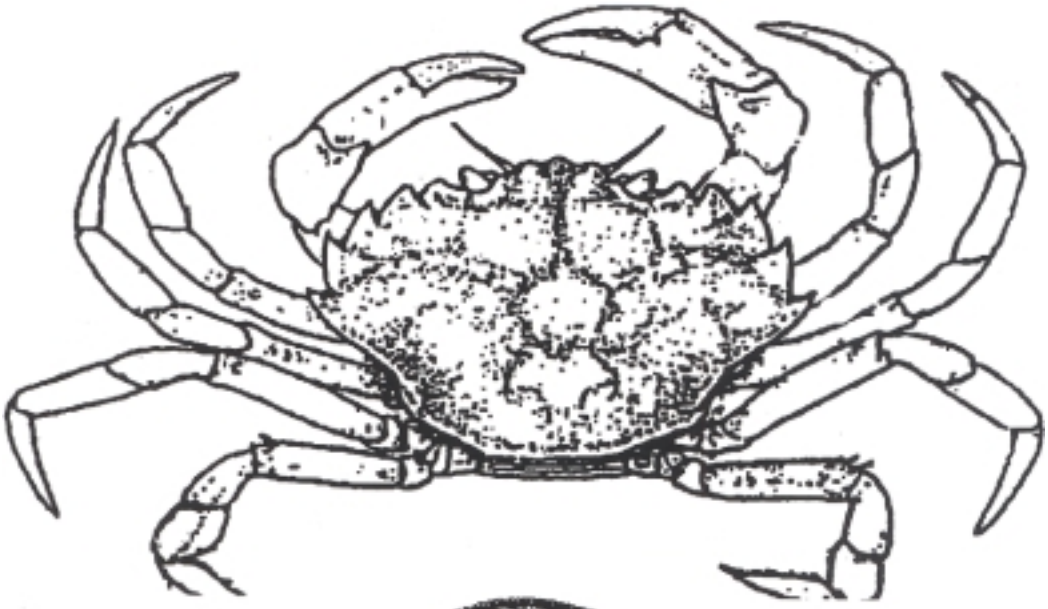
Report the incident - After the situation has stabilized, report it immediately. If someone else is available during the initial response phase, have them report it for you. State and federal law requires both the U.S. Coast Guard and Ecology to be notified of all spills. The Coast Guard can be reached through the National Response Center at 1 (800) 424-8802. Ecology can be reached at either 1 (800) 258-5990 or 1 (800) OILS-911. You will need to provide all pertinent information such as, the type, quantity and location of the spilled material and the responsible party. Post all notification number in a prominent location.

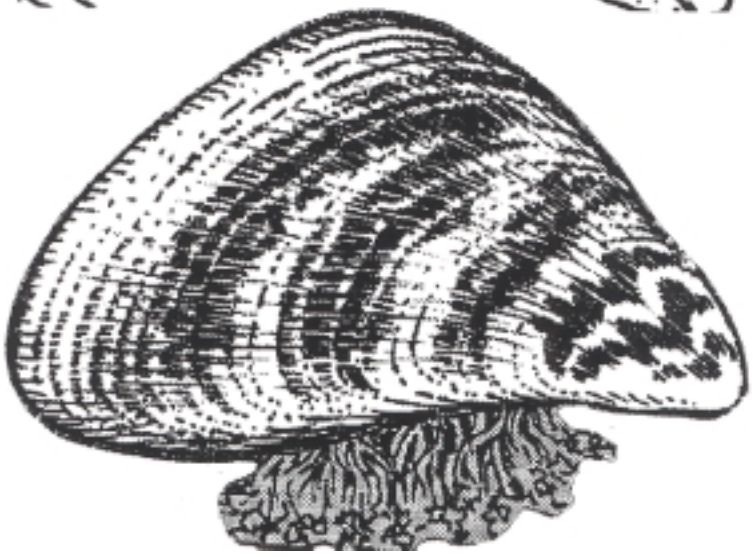
Recover the material - Keep the material contained while you recover what you can or wait for the Coast guard, Ecology or response contractor to arrive. Do not wash the spilled material down with a hose or use detergents to disperse it. This will only make a bad situation worse. Dispose of the collected material in a responsible manner.

Remember, Ecology has the right to seek compensation for any natural resources damaged as a result of a spill. It is in your best interest to respond quickly and effectively to all spills that occur in your marina.

Notes:

EXOTIC SPECIES





Exotic Species

Zebra Muscles

Zebra mussels (*Dreissena polymorpha*) are native to eastern Europe and western Asia. It is believed the mussels were inadvertently introduced into North America in about 1986 from ballast dumped into the Great Lakes by commercial transoceanic freighters. Zebra mussels have rapidly spread to 19 states and two Canadian provinces since they were accidentally released into Lake Erie and Lake St. Clair. To date there have not been any mussels documented west of the Rocky Mountains. Zebra mussels will continue to expand their range as naturally flowing water carries the larvae or veligers downstream. Commercial and recreational vessels and equipment can also speed the spread of mussels when they move from infested waters to uninfested waters. Adult mussels may attach to any hard surface and their veligers may be transported in water

Zebra mussels are small, generally less than 2 inches in length, bivalve molluscs with elongated shell typically marked by alternating light and dark bands, ranging from nearly all light to nearly all dark, but most often with a striped pattern. The mussels can live up to ten years and reach sexual maturity by the end of their first year at a shell length of about 1/2 inch. Each female mussel can produce as many as a million eggs per year. Spawning takes place outside of the shell and produces microscopic plantonic veligers. Within two to five weeks the veligers settle out of the water column and attach to hard surfaces. The mussels form dense mats of up to 65,000 mussels per square foot, in layers of up to five feet thick.

Zebra mussels are tremendous filter feeders and each mussel can siphon up to eight quarts of water per day. This removes a huge amount of phytoplankton and zooplankton. This can have a devastating effect on the aquatic food chain, resulting in fewer fish of all kinds along with the birds and other animals that depend on them as food. It is estimated that the entire volume of Lake Erie is filtered every five days by the zebra mussels there.

The veligers can attach to any hard surface within four hours or remain alive for days in the small amounts of water. A list of potential carriers includes:

- boats and trailers.
- scientific equipment.
- snorkeling and scuba gear.
- fishing equipment.
- plants and animals.

Placing these items into uninfested waters without the following precautions may lead to an accidental introduction. Water intakes and screens can become so plugged that chemical and mechanical means are required to remove the infestation. These mussels can impart a foul taste to the water.

Experts indicate if zebra mussels become established in Washington State it will cost hundreds of millions and perhaps as high as billions of dollars per year for control activities. Extreme precautions should be taken to avoid the introduction of this pest into this state.

Any boat or vessel trailered in from outside of Washington State should be carefully examined prior to launching. All vessels brought in from east of the Rocky Mountains should be considered infected. Likely attachment sites are engine cooling systems, bilges or in through-hull fittings. A list of things you and/or your marina tenants can do to prevent the introduction of this exotic species is provided below.

Preventative Measures

- Remove any visible vegetation from items that were in the water, including boat, motor and trailer.
- Flush engine cooling system, live wells, bait tanks and bilges with hot water. Water hotter than 110 degrees F will kill veligers, and 140 degrees F will kill adults.
- Rinse any other areas that get wet such as water collected in trailer frames, safety light compartments, boat's decking and lower portions of the motor cooling system.
- Air dry boat and equipment for five days before using in uninfested waters. If gear or surface feels gritty, then young mussels may have attached. They should be scraped off into bags and thrown into the garbage.

Remember it only takes a few viable adult mussels or some bilgewater containing microscopic veligers to start Washington's first colony.

Section 5

Tips for Boaters

BEST MANAGEMENT PRACTICES (BMPs) FOR BOATERS

Any activity that utilizes engines causes some pollution. Here are simple things you can do as a responsible boater to leave less of a "boatprint" and protect the water quality of Washington State. Please remember to work in partnership with marina operators to help preserve our marine resources

Waste Oil & Oil Spills

Oil kills marine life. A single gallon of used oil can contaminate over one million gallons of water. It is especially damaging in fertile shallow waters.

1. Practice preventative maintenance. Keep engines tuned and operating at peak efficiency

2. Keep oil absorbent pads and containment pans or trays under the engine when not in water.

3. When changing engine oil, wipe up any spills so oil isn't pumped overboard with bilge water.

4. Recycle used oil. Some marinas have used oil collection centers. Otherwise take it to a local collection place (Schucks, Al's Auto and many gas stations) or to a household hazardous waste event. You can call 1-800-RECYCLE for more info.

5. Oil absorbent pads can be reused many times before they require disposal. Wring out, allowing the oil to drip into a container. Dispose as a hazardous waste. If this is not possible, thoroughly wring out the pads, wrap in newspaper and double wrap in plastic bags to dispose as solid waste.

6. Recycle oil filters by draining oil into a container (for about 24 hours) and taking the oil to a used oil collection facility. The facility may recycle oil filters as well. For more information, call your collection center or 1-800-RECYCLE.

7. Antifreeze and transmission fluid can be recycled at some marinas or at a local hazardous waste collection event. Do not discard these materials in the dumpster, sewer or storm drain.

8. Do not throw hazardous wastes in the dumpster! Oil, paints, solvents, antifreeze and transmission fluid should be collected in separate, well marked containers and taken to hazardous waste collection centers (latex paint can be evaporated outdoors and the empty can thrown in the trash).

9. Do not mix any other fluid in with oil when you pour it into waste oil recycling tanks! Waste oil contaminated with other materials cannot be readily recycled and disposal costs increase dramatically.

Fueling

1. Know fuel capacity prior to filling your tanks. Don't "top-off." Keep absorbent materials on hand to wipe up any spills.

2. Topping off your tanks can cause spills when refueling and when fuel heats, expands in the tanks, and escapes out the vents. Devices to prevent overfilling can be installed into the vent line of the tank and serve as fuel/air separators. This will save money, reduce pollution, prevent fuel stains on your hull and reduce fire hazard during refueling.

3. Handle spills responsibly. Both oil and fuel spills should be reported. Call the National Response Center 1-800-424-8802 and 1-800-OILS-911. Let your marina operator know immediately if the spill occurs within the marina.

Bilge Water

1. Never pump oily bilge water overboard.

2. Never add detergent to bilge water before pumping it overboard. The Coast Guard may fine up to $10,000 for this illegal act.

3. Prevent bilge contamination by fixing small leaks that allow oil or fuel to drip into the bilge. Clean up all spills and fluids when changing oil. Keep an aluminum pan, plastic tray or an absorbant pad in the bilge to contain spills. Inspect lines and hoses for deterioration; secure and prevent from chafing.

4. If oil seeps into the bilge, insert oil absorbent pads to capture it before pumping out the bilge. Squeeze out pads into an oil receptacle and reuse**. Immediately turn off the bilge pump** to prevent contaminants from getting into water.

over...

Sewage

1. Never discharge untreated sewage anywhere within 3 miles of the coast. This means it is illegal to discharge anywhere in Puget Sound. It is also illegal to discharge into lakes and rivers.

2. Use shoreside restrooms when possible.

3. If your boat has no toilet, consider using a "port-o-potty" and disposing of sewage at a pumpout or shoreside facility. **If you have an installed toilet,** you must have a Marine Sanitation Device (MSD). If your boat is 65' or over, you must have a Type II or III MSD. Type III MSDs are merely holding tanks and should never be discharged overboard. They must be emptied through appropriate shoreside methods.

4. If you have an MSD I or II, learn which are the proper treatment chemicals. When possible, use chemical additives that don't contain formaldehyde, formalin, phenol derivatives, ammonia compounds, alcohol bases or chlorine bleach. These can be harmful to your toilet systems and to the environment. Seek safe substitutes.

5. Never discharge your MSD overboard at a marina slip. The adverse impact of chlorine can be lessened if you discharge treated waste while underway in waters over 20' where tidal movement disperses the chlorinated waste.

6. If your boat is equipped with a Y-valve, it must be directed to send sewage only to an MSD (within the 3 mile limit) and must be locked or secured in that position. According to the Coast Guard, the long plastic wire-ties used by electricians are acceptable for securing the Y-Valve.

TIPS ON PUMPING OUT

- Pumpout only your holding tank (not your bilge or solid objects)
- Follow pumpout instructions. If none are posted, encourage the marina to do so.
- When finished using the facility, rinse water through the system.
- Turn off the pump when done.

Boat Cleaning & Maintenance

1. Use shoreside facilities when possible. This reduces gray water generation.

2. Scrub and rinse your boat often. A quick rinse after each outing reduces the need to scrub top-side with harsh cleaners. Use a nontoxic cleaner when you have to use a cleaner.

3. Use only phosphate-free and biodegradable soaps such as citrus-based cleaners. Otherwise, use alternatives such as baking soda and vinegar as all- purpose cleaners.

4. When preparing to paint or varnish, minimize airborne particulates from sanding and scraping. In the slip, drape tarps from the boat to the dock to prevent particulates from entering the water. Turn the boat around in the slip to work on the opposite side. Consider renting vacuum attachments for sanders. Topside, vacuum or sweep up scraped or sanded materials. Particles should be brought to a house- hold hazardous waste collection event.

Solid & Hazardous Waste

1. BE CAREFUL! Don't let trash or plastic get blown overboard. Check for 6-pack rings before emptying the cooler overboard. Cut the loops of 6-pack rings before throwing them in the trash.

2. Leave as much plastic, trash, etc. ashore as possible. Transfer food and other items to reusable containers before your trip. Buy in bulk to reduce packaging.

3. With all trash and hazardous waste. . . "If it goes aboard, it comes ashore."

4. Dispose of your solid and hazardous wastes correctly. Do not mix them or leave them abandoned for someone else to identify and deal with.

Pollution Prevention Policies for Boaters in Our Marina

Toxic materials thrown away at our marina or overboard become hazardous wastes. You can become part of the solution by following these basic practices.

Use Alternatives:

There are many non-toxic or less-toxic products available that can be used as alternatives to hazardous household chemicals. Some are commercial preparations, others are common items found at home such as baking soda, vinegar, or soap and hot water for cleaning. While a little more "elbow grease" may have to be used with some of these products, the benefits include, improved indoor air quality; less risk of accidental poisoning and a smaller amount of hazardous material being released into our environment.

Reduce the Use:

Purchase only what is needed, and use the least amount required to get the job done and share any surplus materials with others.

Reuse:

Solvents such as turpentine and brush cleansers can be reused. Filtering the solids out of suspension can extend the products useful life.

Recycle:

Many hazardous materials can be recycled, such as used oil, antifreeze, solvents and batteries.

Proper Storage:

Store toxic products separately in their original containers, out of the reach of children and pets. Make sure products are used before their self-life expires.

Dispose of Properly:

Never pour toxics into storm drains, sewers, septic systems, on the ground, or put in the garbage. Contact your local MRW program for proper disposal information, a schedule of disposal events, or available collection facilities. Read product labels for disposal information.

We would like to caution you on the use of top-side cleaning products in our marina. Exercise care and caution when using any cleaning product, many detergents are toxic. Products we use every day in our homes maybe perfectly safe in that environment. On our boats, however, where cleaners sometimes are discharged directly into the water without any treatment, the same products can be lethal to marine life.

While grease cutting detergents, scouring powders and bleaches do clean well, all of these products are extremely toxic to marine organisms and have a negative impact on our water quality. Fortunately, there are many alternative products designed specifically for boaters that are less toxic. Carefully read the label, but beware, labels are often designed to mislead. For example, "biodegradable" sounds good, but it doesn't necessarily mean that the product is non-toxic. Does the label say "do not get in your eyes" or "wear gloves"? This is an indication that the product may be hazardous.

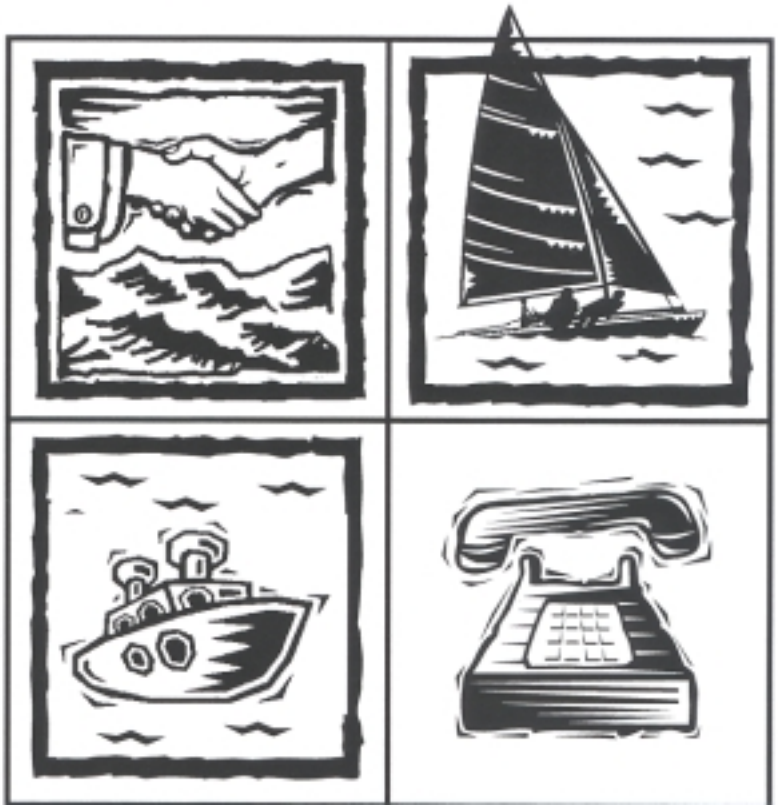
Washington Toxics Coalition – Buy Smart, Buy Safe. This booklet rates household cleaners for their toxicity and environmental impacts. A copy can be obtained by telephoning (206) 643-1545. Cost: $5.00.

Neil Smith and Phil Troy, National Coalition for Marine Conservation – Shopping for Safer Boat Care, 97 Health and Environmental Ratings. A copy can be obtained by telephoning 1-(800)-262-4729. Cost: $13.95.

Feel free to copy the preceding pages of the manual and distribute with your monthly moorage statements to tenants, post on the marina bulletin board, or include them in your marina newsletter.

Section 6

Ways to Pass the Word



Ways to "Pass the Word" Marina, Boater, and Community Education

What is "the word?"

"The word" is "pollution prevention" and it has several parts. One of the most important is that you, as a marina owner/operator, care about water quality. When you take a close look at whether you care, and the reasons that water quality is important to you and your business, you can be more effective in communicating the value of pollution prevention. Liability issues are a big concern for marina owners, and alone are reason enough to implement Best Management Practices (BMPs). To be even more effective in enlisting the cooperation of boaters and tenants, let them know that you are committed to protecting water quality and are taking responsibility for minimizing pollution associated with boating and marina activities. Make sure boaters understand that they are responsible for following BMPs and for proper disposal of wastes.

How to "Pass the word?"

Be proactive. Establish and implement Best Management Practices (BMPs) at your facility. Let people know what you are doing and why. Provide what support services are feasible at your facility (oil receptacles, absorbents, recycling). Be helpful and post names and locations of where boaters can take their waste oil, leftover hazardous wastes such as paints, antifreeze, recycling, etc. if you do not provide these services. This is the time and place for:

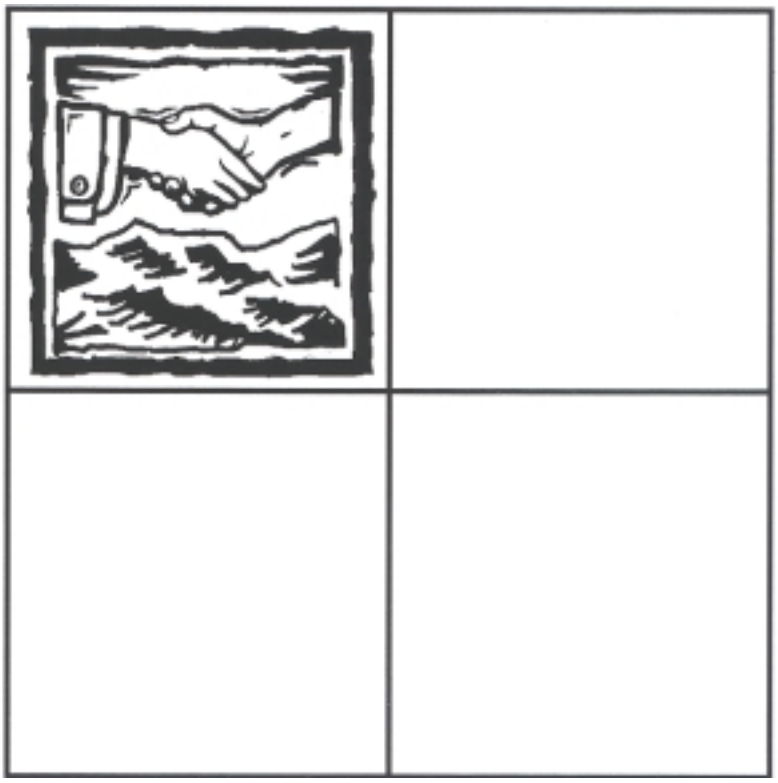
- **Posters** - Laminate and post outside by the docks and dumpsters. List BMPs, important phone numbers, and locations for disposing of wastes.
- **Brochures** - Condense versions of posters, give some background information about water quality and your commitments.
- **Tenant Agreements and Contracts** - Write BMPs for the marina into Tenant Moorage Agreements.
- **Speakers and Programs** - Work with local yacht clubs, environmental groups, boating associations, boat safety classes, and other marinas in order to provide environmental education opportunities for your tenants. Check with local and county agencies about existing programs that you can utilize.
- **Contact local newspapers about publicizing your efforts** - Let the public know that you are working toward protecting water quality.

Be clear, inform your tenants, answer questions, form a partnership. As stated earlier in the manual, and worth repeating: No matter how well a marina is designed, constructed or maintained, pollution prevention will not occur without the cooperation of boaters. **Marinas and boaters must work as partners in pollution prevention.**

Notes:

Section 7

For Your Information



Permitted Boatyards: Northwest Region

Town	*Facility*	*Contact Person*	*Phone*
Anacortes	Anacortes Marine Mall	Dave Zucchi	293-6513
Anacortes	Cap Sante Marine	Shawn Dickson	293-3145
Anacortes	Fidalgo Boatyard	Ernie Armstrong	293-3732
Anacortes	HCH Marine Servicenter	Jeff Granville	293-8200
Anacortes	Lovric's Sea Craft	Florence Lovric	293-2042
Anacortes	North Island Boat Co.	Paul Schweiss	293-2565
Anacortes	Skyline Marina	Dick Britton	293-5134
Anacortes	Wyman's Marina	Don Wyman	293-4606
Bainbridge Isl.	Eagle Harbor Boatyard	Mark Julian	842-9930
Bellevue	Mercer Marine	Doug Burbridge	641-2090
Bellingham	B & J Fiberglass	Bill Henderson	398-9342
Bellingham	Bellingham Marine Ind.	Bob Sternhagen	676-2800
Bellingham	Hawleys Hilton Harbor	Jim Rick	734-9660
Bellingham	Marine Services NW	Jeff Lindhout	671-3820
Bellingham	Padden Creek Marine	Duff McDaniel	733-6248
Bellingham	Weldcraft Steel & Marine	O. Wilson	734-2280
Blaine	Blaine Marine Service	Rick Thompson	332-4964
Blaine	Semiahmoo Marina	Dale Jensen	371-5700
Blaine	Westman Marine	Doug Ward	734-8130
Bremerton	Bremerton Yacht Club	Gene Offenbacher	792-9551
Decatur Island	Reed Bro. Shipyard	Morris Jones	375-6007
Deception Pass	E.Q. Harbor	Kathleen Kranig	679-4783
Deception Pass	Marine Services & Assist	John Aydelotte	675-7900
Des Moines	Block & Tackle Boatyard	Vern Day	878-4414
Edmonds	Port of Edmonds	Bill Stevens	774-0549
Everett	DLH Marine Services	Dale Howmann	334-7292
Everett	Everett Bayside Marine	Jeff Lalone	252-3088
Everett	Harbor Marine Mainten.	Lauren Bivins	259-3285
Everett	Nugget Boat Works	Curtis Reed	339-9088
Everett	Owens Marine	Harvey Owens	252-1514
Everett	Port of Everett	Bob McChesney	259-3164
Everett	Sanger Marine	Ed Sanger	252-6974
Friday Harbor	Albert Jensen & Sons	Nourdine Jensen	378-4343
Keyport	Keyport Undersea Chart.	Warren Posten	779-4360
Kirkland	Yarrow Bay Yacht Sales	Bud Paxman	822-6066
LaConner	LaConner Maritime Serv.	Ed Oczkewica	466-3629
LaConner	Port of Skagit County	Eric Edlund	466-3118
Lopez Island	Islands Marine Center	Ron Meng	468-3377
Marysville	Dagmar's Marina	Victor Loehrer	454-4494
Orcas Island	Deer Harbor Boat Works	Michael Durland	376-4056
Orcas Island	West Sound Marina	Michael Wareham	376-2314
Port Orchard	Dockside Sales & Serv.	Donald Morrison	876-9016
Port Orchard	Kitsap Marine Industries	Orrin Nelson	895-2193

Port Orchard	Pt. Orchard Marine Rail.	Al Lieseke	876-2522
Port Orchard	Suldan's Boat Works	Greg Suldan	876-4435
Poulsbo	Liberty Bay Marine Way	Earl Miller	779-7762
Pt. Roberts	Pt. Roberts Marine Serv.	Paul Skeffington	945-5523
Pt. Rob/Blaine	Dockside Mobile Mar. Ser.	Dave Marks	332-7024
Seattle:	2520 Westlake Bldg.	Sam LeClercq	283-8555
	American Marine Contr.	Gene Lawing	323-3834
	Anderson Marine Repair	Jeff Anderson	282-3746
	Arne Larsson Marine Ptg	Brooke Larsson	283-1373
	Bentzen Yacht Service	Leif Bentzen	547-1124
	Boat Bottom Shop	Richard Wright	283-3324
	CSR Marine	Scott Anderson	632-2001
	Canal Boatyard	Tim Curry	784-8408
	City Boat Annex	Ed Ehler	634-3080
	Commercial Mar. Constr.	Dave LeClercq	284-5791
	Davidson's Marina	Clifford Davidson	486-7141
	Delta Marine	Jack Jones	763-2383
	Dunbar Marine Service	Roy Dunbar	283-6200
	Fairview Marine	David Carlson	323-7634
	Flying "A" Yacht Serv.	Arnold Nordwald	633-3741
	Gallery Marine	Don Gonsorowski	547-2477
	HCH Marine Servicenter	Mark Lindeman	323-2405
	Jensen Motor Boat Co.	Anchor Jensen	632-7888
	LeClercq Marine	Sam LeClercq	283-8555
	Lieb Marine Industries	David Liebrich	284-2820
	Maritime Commerce Cent.	Bob Merrell	284-9926
	Miller & Miller Btyd	Paul Miller	285-5958
	Northern Marine Indust.	Ben Harry	782-1183
	Northlake Maritime Cent.	John Dunato	547-7852
	Northwest Yacht Repair	Greg Allen	285-3460
	Ocean Alexander Marine	Kenneth Morris	547-1395
	Salmon Bay Boatyard	Victor Humeniuk	283-0593
	Seaview Boatyard East	Phil Riise	789-3030
	Seaview Boatyard West	Phil Riise	789-3030
	South Park Marina	Guy Crow	762-3880
	Timeless	Jim Brown	547-9915
	Vic Frank's Boat Co.	Daniel Franck	632-7000
	Watercraft Internat.	Richard Woeck	548-1578
	Wesbrook Marine	Steve Helms	789-3985
	Wilson Marine	Daniel Albanese	284-3630
	Yachtfish Marine	Steve Yadvish	623-3233

Permitted Boatyards: Southwest Region

Town	*Facility*	*Contact*	*Phone*
Aberdeen	Pakonen & Son	Wayne Pakonen	533-3980
Cathlamet	C.A. Neilson	C.A. Neilson	849-4268
Gig Harbor	Gig Harbor Boatyard Inc	Walt Williamson	851-2126
Gig Harbor	NW Yachts & Boatyard	Harold Palmer	858-7700
Grapeview	Marine Project Center	Ronald Gray	275-5256
Hood Canal	Hood Canal Marina/Chemco	Jimmy Chen	878-2252
Hoquiam	Howard Moe Enterprise	Howard Moe	538-1622
Hoquiam	The Shipyard	Don Root	532-7860
Ilwaco	Port of Ilwaco Boatyard	Bob Robertson	642-3144
Olympia	West Bay Marine Center	Neil Falkenburg	943-2022
Olympia	Zittel's Marina	Mike Zittel	459-1950
Pt. Angeles	Port of Pt. Angeles	Ken Sweeney	417-3452
Port Townsend	Baird Boat Co.	Ernie Baird	385-5727
Port Townsend	Fleet Marine	Gary Jonientz	385-4000
Port Townsend	Port of Pt. Townsend	Ken Radon	385-2355
Port Townsend	Integrated Marine Systems	Mark Burn	385-1523
Port Townsend	Pt. Towns. Foundry	Pete Langley	385-6425
Port Townsend	Pt. Towns. Shipwrights	Ben Tyler III	385-6138
Shelton	Shelton Yacht Club	R.W. Johnston	426-7482
South Bend	South Bend Boat Shop	Cris Fosse	875-5712
Tacoma	Day Island Yacht Harbor	Darron Hartman	565-2103
Tacoma	Hylebos Marina	Ron Oline	272-6623
Tacoma	Modutech Marine, Inc	Carl Swindahl	272-9319
Tacoma	Nordlund	Paul Nordlund	627-0605
Tacoma	Picks Cove	Chris Conti	572-3625
Tacoma	Sunnfjord Boats, Ind	Todd Miller	627-1742
Tacoma	Totem Marine	Red Westgard	572-2666

PRODUCTS

Absorbent Materials

Most marine stores have fuel / oil absorbents – bilge pads, pillows or diapers. Many of these resources carry spill kits, and / or products to make you own kit.

Puget Sound region:

Eager Beaver Environmental	(206) 866-8512
Foss Environmental	(206) 767-0441
3 M Corporation	(800) 364-3577
All Maritime Environmental	(206) 282-3191

Out of state:

Absorb-It Absorbent W Products 125 B Western Drive Richmond, CA 94801	(510) 234-5152
Cleveland Cotton Products P.O. Box 6500 Cleveland, OH 44101	(800) 321-2840
NEW PIG Corporation, Catalog and advice	(800) HOT HOGS
RFG Marine Environmental Technologies 3875 Fiscal Cout West Palm Beach, Florida 33404	(800) 842-7771
X-Sorb Super Absorbent Impact Environmental Products P.O. Box 1131 Atascadero, CA 93423	(805) 466-4709

Holding Tank Additives

Bio-Logic Bacterial Holding Tank Treatment	(206) 633-1110
Greenway Enzyme Holding Tank Treatment	(206) 385-1464

Other Products

Bio-Concepts "Bio Bilge" Bilge Cleaner/Oil Digester	(800) 828-5124
The Cricket, Electronic antifouling	(800) 864-8641
Racor “Lifeguard,” Fuel/Air Separator	(800) 344-3286

Alternative Cleaners

Greenway, Natural Enzyme Cleaners	(206) 385-1464
West Marine “Boat Soap”	(206) 292-8663
Washington Toxics Coalition, (for more information on nontoxic cleaning products)	(206) 632-1545

Bottom Paints

Many boaters have questions about bottom paints and how to keep a hull clean without using soft, ablative antifouling paints. Boatyards will best be able to inform them of some choices. A partial list of water based bottom paints (with the least impact to the environment) is provided here for your reference and to help your marina tenants.

Water Based Paints

Neptune II (antifouling) (206) 285-0201
Rogers and Associates - Woolsey paints
1818 Westlake N, #124
Seattle, WA 98109

Varnish and Top side
Rogers and Associates - Z-Spar paints (206) 285-0201
1818 Westlake N, #124
Seattle, WA 98109

Interlux "Aquarius" (800) 223-0154
International Paints
2270 Morris Ave
P.O. Box 386
Union, NJ 07083

Slickthane (with Tephlon) Waterborn Polyurethane (206) 609-4375
WBE Waterborn Epoxy (with Tephlon)
Pier Pressure
P.O. Box 13610
Burton, WA

Alternative Degreasers

Bio-T (206) 762-7502
MCM Northwest
5700 1st Ave. S
Seattle, WA 98108

Tasc Master (800) 877-2436
Environmental Services Corp.
P.O. Box 1302
Englewood Cliffs, NJ 07632

Alternative Paint Strippers

"Paint Buster" (Non-Chlorinated) (800) 523-4114
Nu-Tec, Inc.
701 Putnam Street
Wakefield, MI 49968

Peel Away Marine Safety Strip (212) 869-6350
Dumond Chemicals, Inc.
1501 Broadway
New York, NY 10036

Magi-Sol (TH) (207) 942-5228
Chute Chemical Co.
233 Bomarc Road
Bangor, ME 04401

No-Swett (906) 224-8961
Nu-Tec Chemical Mfg., Inc.
701 Putnam St.
Wakefield, MI 49968

Armex Accustrip (617) 923-0900
A.L. McDonald
Box 315
Watertown, MA 02272

HOW DO I KNOW A PRODUCT IS HAZARDOUS?

A hazardous product is one which can harm the user or the environment. A substance is considered hazardous if it is toxic (poisonous), flammable, caustic (causes burns) or chemically reactive. The best way to tell if a product is hazardous is to **read the label**. DANGER means the product is highly toxic. WARNING signals moderate toxicity. CAUTION less so. Choose CAUTION labels or better still, look for one with no warnings. **Remember, that labels don't address environmental hazards. Avoid phosphates, chlorinated compounds, petroleum distillates, phenols, and formaldehyde. Biodegradable does not mean non-toxic!**

ALTERNATIVES TO TOXIC PRODUCTS

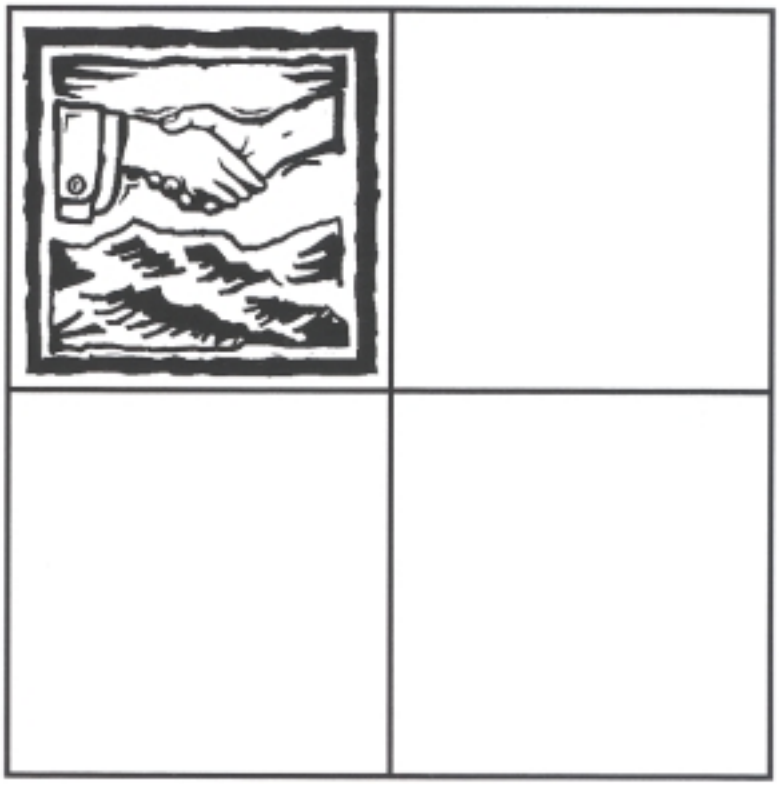
While baking soda, vinegar, lemon juice and vegetable oils are far less harmful than bleaches, scouring powders or detergents, they are still toxic to marine life. Use cleaning products sparingly and minimize the amount discharged into the water. Never dispose of any cleaning products down the thru-hull drain - dispose of them on shore.

Product	**Alternative**
Bleach	Borax, hydrogen peroxide
Detergent & Soap	Elbow Grease
Scouring Powders	Baking soda
General Cleaner	Bicarbonate of soda and vinegar, or lemon juice combined with borax paste
Floor Cleaner	One cup white vinegar in 2 gal. water
Window Cleaner	One cup vinegar + 1 qt. warm water Rinse and squeegee.
Aluminum Cleaner	2 Tblsp. cream of tartar + 1 qt. of hot water
Brass Cleaner	Worcestershire sauce or paste made of equal amounts of salt, vinegar and water
Copper Cleaner	Lemon juice and water
Chrome Cleaner/Polish	Apple cider vinegar to clean; baby oil polish
Fiberglass Stain Remover	Baking soda paste
Mildew Remover	Paste with equal amounts of lemon juice and salt, or vinegar and salt
Drain Opener	Dissemble or use plumber's snake; toxic substances should not be used in a thru-hull drain
Wood Polish	Olive or almond oil (interior wood only)
Hand Cleaner	Baby oil or margarine

Notes:

Section 8

Appendices



Appendix A

Washington State Department of Ecology Resources and Contacts

Toll Free Hotlines

1-800-RECYCLE	For questions about how or where to recycle wastes
1-800-OILS-911	24-hour oil spill reporting
1-800-258-5990	24-hour oil and hazardous materials spill reporting
1-800-633-7585	Hazardous substances information

Website
http://www.wa.gov/ecology

Program Areas

Water Quality Program	(360) 407-6400
Hazardous Waste and Toxics Reduction	(360) 407-6700
Solid Waste & Financial Assistance	(360) 407-7100

Ecology's Regional Offices

Northwest Regional Office
3190 - 160th Ave. SE
Bellevue, WA 98008-5452
(425) 649-7000
(425) 649-7098 Fax

Eastern Regional Office
N. 4601 Monroe, Suite 100
Spokane, WA 99205-1295
(509) 456-2926
(509) 456-6175 Fax

Southwest Regional Office
PO Box 47775
Olympia, WA 98504-7775
(360) 407-6300
(360) 407-6305 Fax

Central Regional Office
15 West Yakima Ave., Suite 200
Yakima, WA 98902-3401
(509) 575-2490
(509) 575-2809 Fax

Accredited Laboratory List
All water quality tests need to be conducted by a laboratory that has been accredited by Washington State. For information on a lab close to you, call the Quality Assurance Section of the Department of Ecology at (360) 895-4649.

Appendix B

Local Government Hazardous Waste Management

Solid Waste, Public Works, and Health Department Resources

Adams County
Health Department (509) 659-3315
Public Works (509) 659-4236

Asotin County
Health Department (509) 758-3344
Public Works (509) 758-1965

Bellingham, City of
Solid Waste (360) 676-6850

Benton County
Health Department (509) 943-2614
Solid Waste (509) 786-5611

Chelan County
Health Department (509) 664-5306
Solid Waste (509) 664-5310
Public Works (509) 664-2631

Clallam County
Health Department (360) 417-2274

Clark County
Health Department (360) 695-9215
Public Works (360) 737-6118 ext. 4939

Columbia County
Health Department (509) 382-2181
Public Works (509) 382-2534

Cowlitz County
Health Department (360) 425-7400
Public Works (360) 577-3125

Douglas County
Health Department (509) 664-5306
Solid Waste (509) 886-0899

Ferry County
Public Works (509) 775-5222

Franklin County
Health Department (509) 943-2614
Public Works (509) 545-3551

Garfield County
Health Department (509) 843-3412
Public Works (509) 843-1262

Grant County
Health Department (509) 754-6060
Public Works (509) 754-2011

Grays Harbor County
Health Department (360) 532-8631
Public Utilities (360) 249-4222

Island County
Health Department (360) 679-7350
Solid Waste (360) 679-7386

Jefferson County
Health Department (360) 385-9400
Public Works (360) 379-6911

Kennewick, City of
Public Works (509) 585-4317

King County
Health Department (206) 296-3976 (Business Waste Line) (206) 296-4692 (Household Hazardous Waste)
Natural Resources (206) 689-3075
Solid Waste (206) 296-4363

Kitsap County
Health Dist. (360) 692-3611
Public Works (360) 895-3931

continued…

Local Government Hazardous Waste Management, continued...

Kittitas County
Health Department (509) 962-7515
Solid Waste (509) 962-7577

Klickitat County
Health Department (509) 773-4565
Solid Waste (509) 773-4295

Lewis County
Health Department (360) 740-1223
Public Services (360) 740-1481

Lincoln County
Health Department (509) 725-2501

Mason County
Health Department (360) 427-9670
Dept. of Comm. Dev (360) 427-9670 ext. 771

Okanogan County
Health Department (509) 422-7154
Public Works (509) 422-7300

Pacific County
Health Department (360) 875-9304

Pend Oreille County
Public Works (509) 447-4515

Pierce County
Health Department (253) 798-6528

Richland, City of
Waste Utility (509) 942-7467

San Juan County
Health Dist. (360) 378-4474
Public Works (360) 378-3421

Skagit County
Health Department (360) 336-9380
Public Works (360) 424-9532

Skamania County
Health Department (509) 695-9215
Public Works (509) 427-9448

Snohomish County
Health Dist. (425) 339-5250
Solid Waste (425) 388-3425

Spokane County
Health Department (509) 324-1500
Solid Waste (509) 625-7898

Stevens County
Solid Waste (509) 738-6106

Tacoma, City of
Refuse Utility (253) 593-7713

Thurston County
Health Department (360) 754-5455

Wahkiakum County
Health Department (360) 795-6207
Public Works (360) 577-3125

Walla Walla County
Health Department (509) 527-3290
Solid Waste (509) 527-3282

Whatcom County
Health Department (360) 783-2504
Public Works (360) 676-6692

Whitman County
Health Department (509) 397-6280
Public Works (509) 397-6206

Yakima County
Health Department (509) 575-4040
Public Works (509) 574-2472

Appendix C

State, Federal, and Other Resources

Washington State Parks and Recreation
1-800-233-0321
Boating Program (360) 902-8551
http://www.parks.wa.gov

U.S. Coast Guard
(206) 217-6232

National Response Center
1-800-424-8802 (report spills)

U.S. Environmental Protection Agency
Seattle Regional Office
1-800-424-4372

Shellfish Advisory
Department of Health
(360) 753-5992
Red Tide Hotline
1-800-562-5632

NOAA National Oceanic and
Atmospheric Administration
Marine Entanglement Research Program
(206) 526-4127

National Marine Fisheries
Marine Mammal Strandings
(206) 526-6733

Washington Department of Fisheries
24-Hour Hotline
(360) 902-2500

Marine Related Organizations

Assoc. of Independent Moorages
(206) 284-9991

International Marine Institute
(941) 480-1212
Website: http://www.imimarina.com

Northwest Marine Trade Assoc.
(206) 634-0911

Pacific NW Pollution Prevention
Resource Center
(206) 223-1151

Puget Soundkeeper Alliance
(206) 286-1309
Spill Violations/ Monitoring
1-800-42-PUGET

Puget Sound Marina Operators Association
(253) 858-2250

Recreational Boating Assoc of Washington
(253) 874-8873

Washington Sea Grant Program
(206) 685-2452

Appendix D

Bilge and Sewage Pumping

Bilge Pumping Services

Airo Tank Cleaning Services
Tacoma, WA
Phone: (253) 383-4916

Amalgamated Services
Kent, WA
Phone: (253) 826-1127

Coastal Tank Cleaning, Inc.
Seattle, WA
Phone: (206) 624-9843

Foss Environmental Services
Seattle, WA
Phone: (206) 767-0441

Frontwater Services
Seattle, WA
Phone: (206) 767-0301

Marine Vacuum Service
Seattle, WA
Phone: (206) 762-0240

Northwest Bilge Service
Seattle, WA
Phone: (206) 527-3233

Protective Environmental Services, Inc.
Seattle, WA
Phone: (206) 624-5503

West Pac Environmental, Inc.
Phone: 1-800-938-1190

Mobile Sewage Disposal Services

Airo Tank Cleaning Services
Tacoma, WA
Phone: (253) 383-4916

Marine Vacuum Service
Seattle, WA
Phone: (206) 762-0240

SaniTug
Seattle, WA
Phone: (206) 632-7323

S.S. Head
Seattle, WA
Phone: (206) 363-5921
Cellular: (206) 910-7102

Public Sewage Pumpout Stations

Key:
DS = Dump Station
PT = Portable Pumpout
ST = Stationary Pumpout
BG = Barge Pumpout

Northern Puget Sound
Anacortes Marina (ST)
Anacortes, WA
Port of Anacortes (ST)
Anacortes, WA
Port of Bellingham – Blaine (PT, DS)
Bellingham, WA
Port of Bellingham – Squalicum (ST, DS)
Bellingham, WA
Cap Sante Boat Haven (ST, DS, PT, BG)
Anacortes, WA
Captain Coupe Park (DS, ST)
Coupeville, WA
Deception Pass State Park (ST)
Oak Harbor, WA
Port of Everett (DS, ST)
Everett, WA
Fort Flagler State Park (DS)
Nordland, WA
Port of Friday Harbor (DS, ST, PT)
Friday Harbor, WA

continued…

Public Sewage Pumpout Stations, continued…

Island Marine Center (ST, DT)
Lopez Island, WA
John Wayne Marina (DS, DT)
Sequim, WA
La Conner Marina (DS, DT)
La Conner, WA
Makah Tribal Moorage (DS, DT)
Neah Bay, WA
Marine Service Center
Anacortes, WA
Mystery Bay State Park (DS, ST)
Nordland, WA
Oak Harbor Marina (DS, ST, BG)
Oak Harbor, WA
Old Alcohol Plant Marina (DS, ST)
Port Hadlock, WA
Olsen's Resort (DS, ST)
Sekiu, WA
Point Roberts Marina (DS, ST)
Point Roberts, WA
Port Angeles Marina (DS, ST)
Port Angeles, WA
Port Ludlow Marina (DS, ST)
Port Ludlow, WA
Port Ludlow Bay Marina (DS, ST)
Port Ludlow, WA
Port Townsend Boat Haven (DS, ST)
Port Townsend, WA
Roche Harbor Resort (DS, ST)
Roche Harbor, WA
Semiahmoo Marina (DS, ST, PT)
Blaine, WA
Sequim Bay State Park (DS)
Sequim, WA
Skyline Marina (ST)
Anacortes, WA
Stuart Island State Park (DS, ST)
Friday Harbor, WA
West Sound Marina (DS)
Orcas, WA

Central Puget Sound

Bainbridge Island City Dock (PT, ST)
Bainbridge Island, WA
Ballard Mill Marina (ST, PT)
Seattle, WA
Bergis Marina (PT)
Seattle, WA
Blake Island State Park (DS, ST)
Manchester, WA
Breakwater Marina (DS, ST)
Tacoma, WA
Bremerton Marina (DS, ST)
Bremerton, WA
Carillon Point Marina (ST, DS)
Kirkland, WA
Chandleris Cove (ST)
Seattle, WA
Chinook Landing Marina (ST)
Tacoma, WA
City of Des Moines Marina (ST, DS)
Des Moines, WA
Crow's Nest Marina (DS, ST)
Tacoma, WA
Dockton Park (ST)
Vashon, WA
Eagle Harbor Marina (ST, PT)
Bainbridge Island, WA
Elliott Bay Marina (ST, PT)
Seattle, WA
H.C. Henry Pier (ST)
Seattle, WA
Harbour Village Marina (ST)
Seattle, WA
Marina Mart Moorings (ST)
Seattle, WA
Parkshore Marina (ST)
Seattle, WA
Pickis Cove Marina (ST)
Tacoma, WA
Pleasant Harbor Marina (ST, PT, DS)
Brinnon, WA
Port Orchard Marina (ST, DS)
Port Orchard, WA
Port Washington Marina (ST, DS)
Bremerton, WA
Port of Brownsville (ST, DS, PT)
Bremerton, WA
Port of Edmonds (ST)
Edmonds, WA
Port of Kingston (DS, ST)
Kingston, WA
Port of Poulsbo (ST, DS, PT)
Poulsbo, WA
Port of Silverdale (DS, ST)
Silverdale, WA
Shilshole Bay Marina (ST, DS)
Seattle, WA
Totem Marina Moorage (ST, DS)
Tacoma, WA
Tyee Marina (ST, DS)
Tacoma, WA

Southern Puget Sound

Alderbrook Inn & Resort (ST)
Union, WA

continued…

Public Sewage Pumpout Stations, continued…

East Bay Marina (ST, DS)
Olympia, WA
Jarrell Cove Marina (ST)
Shelton, WA
Jarrell Cove State Park (ST)
Shelton, WA
Jeresich City Dock (ST, DS)
Gig Harbor, WA
Oro Bay Marina (PT, DS)
Anderson Island, WA
Penrose Point State Park (ST, DS)
Lakebay, WA
Percival Landing (DS, ST)
Olympia, WA
Shelton Marina (DS, ST)
Shelton, WA
Maritime Chanderly (DS, ST)
Gig Harbor, WA
Twanoh State Park (DS, ST)
Union, WA
West Bay Marina (PT)
Olympia, WA

Southwestern Washington

Elochoman Slough Marina (ST)
Cathlamet, WA
Port of Camas-Washougal (ST)
Camas / Washougal, WA
Port of Ilwaco (ST)
Ilwaco, WA
Port of Kalama Marina (ST)
Kalama, WA
Port of Peninsula (ST)
Ocean Park, WA
Steamboat Landing Marina (ST)
Vancouver, WA
Westport Marina (ST)
Westport, WA

Central Washington

Crescent Bar Resort (DS)
Quincy, WA

Daroga State Park (DS)
Orondo, WA

Port of Douglas County (ST, DS)
East Wenatchee, WA

Entiat Marina (DS)
Entiat, WA

Fort Spokane (BG, DS)
Coulee Dam

Keller Ferry Marina (ST)
Wilber, WA

Lakeshore Marina (ST)
Chelan, WA

Old Mill Park (ST)
Mason, WA

Seven Bays Resort (ST)
Davenport, WA

Spring Canyon Park (BG)
Coulee Dam

Stehekin Landing (ST)
Stehekin, WA

Ten Mile Park (BG)
Coulee Dam

Eastern Washington

Boyer Park & Marina (ST)
Colfax, WA

Central Ferry State Park (ST)
Pomeroy, WA

Charbonneau Park (ST)
Pasco, WA

Chief Looking Glass Park (DS)
Asotin, WA

Chief Timothy State Park (ST)
Clarkston, WA

Columbia Point Marina (ST)
Richland, WA

Hell's Canyon Resort (ST, DS)
Clarkston, WA

Kettle Falls Marina (BG)
Kettle Falls, WA

Metz Marina (ST)
Kennewick, WA

Appendix E

Maritime Spill Assistance Services

Advance Disposal Tech.
Portland, OR
Phone: (503) 657-9750

Airo Services
Tacoma, WA
Phone: (253) 383-4916

Apex Environmental
Aberdeen, WA
Phone: (360) 532-3590

CET Environmental Service
Portland, OR
Phone: (503) 227-5892

Clean Care
Tacoma, WA
Phone: (253) 627-3925

Coastal Tank
Seattle, WA
Phone: (206) 624-9843

Coeur d'Alene Dredging, Inc.
Valleyford, WA
Phone: (509) 927-8292

Cowlitz Clean Sweep
Longview, WA
Phone: (360) 423-6316

Environmental Transport, Inc.
Seattle, WA
Phone: (206) 762-8824
Fax: (206) 764-1234

Evergreen Environmental, Inc.
Aberdeen, WA
Phone: (360) 533-6141

First Strike Environmental
Eugene, OR
Phone: 1-800-447-3558

Foss Environmental
Seattle, WA
Phone: (206) 767-0441
Other: 1-800-FE-SPILL

Globe Environmental
Seattle, WA
Phone: (206) 623-0621

Marine Vacuum Service, Inc.
Seattle, WA
Phone: (206) 762-0240
Other: 1-800-540-7491
Fax: (206) 763-8084
or
Portland, OR
Phone: (503) 286-3317
Fax: (503) 286-6063

Phillip Environmental
Seattle, WA
Phone: 1-800-228-7872

Protective Environmental Services
Seattle, WA
Phone: (206) 624-5503

Reidel Environmental Services, Inc.
Seattle, WA
Phone: (206) 382-1655
Fax: (206) 623-6833

Roar Tech, Inc.
Spokane, WA
Phone: (509) 535-6757
Fax: (509) 534-6759

Smith Environmental
Portland, OR
Phone: 1-800-334-0004

Unitech Environmental
Portland, OR
Phone: (360) 763-3381
Other: (503) 254-1274
Fax: (503) 254-1560

West Pac Environmental
Seattle, WA
Phone: (206) 762-1190

Note: This is intended as a partial list of assistance providers and does not include companies that only provide supplies. This list does not constitute an endorsement.

Appendix F

Used Oil Management Companies

Basin Oil Co., Inc.
8661 Dallas Ave. S.
Seattle, WA 98108
Phone: (206) 763-2948

Cleancare Corporation
PO Box 940
Tacoma, WA 98401
Phone: (253) 627-3925
Other: 1-800-282-8128

Harbor Oil Company
11535 N. Force Ave.
Portland, OR 97217
Phone: (503) 285-4648

Inman Oil
1300 W. 12th St.
Vancouver, WA 98660
Phone: (360) 695-7600

International Resource Mgmt., Inc.
PO Box 31100
Portland, OR 97231
Phone: (503) 285-7145

Northwest ENTEK, Inc.
PO Box 6267
Spokane, WA 99207
Phone: (509) 489-9176

Northwest Enviroservice, Inc.
1700 Airport Way S.
Seattle, WA 98124
Phone: 1-800-441-1090
Sales: (206) 622-1085
Fax: (206) 622-6344

Pegasus Professional Services
30250 SW Parkway Ave., Suite 1
Wilsonville, OR 97070
Phone: (503) 682-5802
Fax: (503) 682-1967

Petroleum Reclaiming Service, Inc.
3003 Taylor Way
Tacoma, WA 98421
Phone: (206) 383-4175

Protective Environmental Services
PO Box 94291
Seattle, WA 98124-9766
Phone: (206) 624-5503

Roar Tech, Inc.
N. 522 Fiske St., Suite A
Spokane, WA 99202
Phone: (509) 535-6757
Fax: (509) 534-6759

Safety Kleen Corp.
3210 C St. NE Unit G
Auburn, WA 98002
Phone: (253) 939-2022
or
6303 212th St. SW, Suite C
Lynnwood, WA 98036
Phone: (425) 775-7030
or
9561 E. Montgomery Ave., Unit 16
Spokane, WA 99206
Phone: (509) 928-8353
or
814 E. Ainsworth
Pasco, WA 99301
Phone: (509) 547-8771

Spencer Environmental Services, Inc.
PO Box 1321
Sumner, WA 98390
Phone: 1-800-286-0896
Fax: (253) 863-3490

Van Waters and Rogers, Inc.
PO Box 3541
Terminal Annex
Seattle, WA 98124
Phone: (253) 872-5000
Fax: (253) 872-5041
or
E. 4515 Wisconsin
Spokane, WA 99220
Phone: (509) 534-0405

Vintage Oil, Inc.
744 S. March Pt. Road
Anacortes, WA 98221
Phone: (360) 293-2044

Note: This is intended as a partial list of assistance providers and does not include companies that only provide supplies. This list does not constitute an endorsement.

Appendix G

Hazardous Waste Management Companies

Big Sky Industrial
9711 W. Euclid Road
Spokane, WA 99204
Phone: (509) 624-4949
Fax: (509) 624-0099

Burlington Environmental, Inc.
955 Powell Ave. SW
Renton, WA 98055
Phone: (425) 227-0311
Other: 1-800-228-7872
Fax: (425) 227-6187
or
PO Box 229
Washougal, WA 98671
Phone: (360) 835-8743
Other: 1-800-547-2436
Fax: (360) 835-8872

Chem-Safe Services, Inc.
PO Box 616
Kittitas, WA 98934
Phone: (509) 968-3973
Fax: (509) 968-4680

Cleancare Corporation
PO Box 940
Tacoma, WA 98401
Phone: (253) 627-3925
Other: 1-800-282-8128

EnviroChem Services, LC
PO Box 30687
14333 NE Sandy Blvd.
Portland, OR 97230
Phone: (503) 256-3820
Fax: (503) 256-3824

Enviros, Inc.
200 Marina Park Bldg.
25 Central Way
Kirkland, WA 98033
Phone: (425) 827-5525
Fax: (425) 827-3299

Envirotech Systems, Inc.
18820 Aurora Ave. N., Suite 201
Seattle, WA 98133
Phone: (206) 363-9000
Other: 1-800-922-9395
Fax: (206) 546-1920

International Resource Management, Inc.
PO Box 31100
Portland, OR 97231
Phone: (503) 285-7145

Northwest ENTEK, Inc.
PO Box 6267
Spokane, WA 99207
Phone: (509) 489-9176

Northwest Enviroservice, Inc.
1700 Airport Way S.
Seattle, WA 98124
Phone: 1-800-441-1090
Sales: (206) 622-1085
Fax: (206) 622-6344

Olympus Environmental, Inc.
2002 W. Valley Highway, Suite 600
Auburn, WA 98001
Phone: (253) 735-6625
Fax: (253) 735-6620

Pegasus Professional Services
30250 SW Parkway Ave., Suite 1
Wilsonville, OR 97070
Phone: (503) 682-5802
Fax: (503) 682-1967

Prezant Associates, Inc.
711 – 6th Ave. N., Suite 200
Seattle, WA 98109
Phone: (206) 281-8858
Fax: (206) 281-8922

Protective Environmental Services
PO Box 94291
Seattle, WA 98124-9766
Phone: (206) 624-5503

continued…

Note: This is intended as a partial list of assistance providers and does not include companies that only provide supplies. This list does not constitute an endorsement.

Hazardous Waste Management Companies, continued…

Roar Tech, Inc.
N. 522 Fiske St., Suite A
Spokane, WA 99202
Phone: (509) 535-6757
Fax: (509) 534-6759

Safety Kleen Corp.
3210 C St. NE Unit G
Auburn, WA 98002
Phone: (253) 939-2022
or
6303 212th St. SW, Suite C
Lynnwood, WA 98036
Phone: (425) 775-7030
or
9561 E. Montgomery Ave., Unit 16
Spokane, WA 99206
Phone: (509) 928-8353
or
814 E. Ainsworth
Pasco, WA 99301
Phone: (509) 547-8771

Sol-Pro, Inc.
3401 Lincoln Ave.
Tacoma, WA 98421
Phone: (253) 627-4822
Fax: (253) 627-4997

Spencer Environmental Services, Inc.
PO Box 1321
Sumner, WA 98390
Phone: 1-800-286-0896
Fax: (253) 863-3490

Van Waters and Rogers, Inc.
PO Box 3541
Terminal Annex
Seattle, WA 98124
Phone: (253) 872-5000
Fax: (253) 872-5041
or
E. 4515 Wisconsin
Spokane, WA 99220
Phone: (509) 534-0405

Materials Exchange Services

British Columbia Waste Exchange
225 Smithe St., Suite 201
Vancouver, British Columbia
CANADA V6B2X7
Phone: (604) 683-6009
Fax: (604) 734-7223

Industrial Materials Exchange (IMEX)
506 2nd Ave., Room 201
Seattle, WA 98104
Phone: (206) 296-4899

Pacific Materials Exchange
8621 N. Division, Suite C
Spokane, WA 99208
Phone: (509) 466-1532
Fax: (509) 466-1041

Note: This is intended as a partial list of assistance providers and does not include companies that only provide supplies. This list does not constitute an endorsement.

Appendix H

Battery Recyclers

These companies recycle lead-acid (automotive) batteries:

Allied Battery Co., Inc.
Seattle, WA
Phone: (206) 624-4141

Atomic Batteries
Renton, WA
Phone: (425) 255-6342

Budget Batteries
Bremerton, WA
Phone: (360) 373-1778
or
Kent, WA
Phone: (253) 839-5880
Or
Parkland, WA
Phone: (253) 539-0299
or
Seattle, WA
Phone: (206) 322-2075
or
Tacoma, WA
Phone: (253) 922-3737

Duds Auto Parts & Salvage
Ellensburg, WA
Phone: (509) 962-3837

Dyno Battery
Seattle, WA
Phone: (206) 283-7450

GNB Technologies
Seattle, WA
Phone: (800) 325-3903

Harbor Battery
Aberdeen, WA
Phone: (360) 533-2704

Interstate Batteries
Everett, WA
Phone: 1-800-562-3212
or
Olympia, WA
Phone: 1-800-325-2902
or
Yakima, WA
Phone: (509) 457-3640

Jim's Battery
Vancouver, WA
Phone: (360) 574-3075

PND Corp.
Bellevue, WA
Phone: (425) 562-7252

Standard Battery
Seattle, WA
Phone: (206) 763-1244

Note: This is intended as a partial list of assistance providers and does not include companies that only provide supplies. This list does not constitute an endorsement.

Appendix I

Antifreeze Recyclers

Anti Freeze Recyclers NW
Lynnwood, WA
Phone: (425) 778-4750

Ben's Cleaner Sales, Inc.
22241 4th Ave. S.
Seattle, WA 98134
Phone: (206) 622-4262
Other: 1-800-446-8778
Fax: (206) 622-4560

Big Sky Industrial
9711 W. Euclid Road
Spokane, WA 99204
Phone: (509) 624-4949
Fax: (509) 624-0099

Burlington Environmental, Inc.
955 Powell Ave. SW
Renton, WA 98055
Phone: (425) 227-0311
Other: 1-800-228-7872
Fax: (425) 227-6187
or
PO Box 229
Washougal, WA 98671
Phone: (360) 835-8743
Other: 1-800-547-2436
Fax: (360) 835-8872

Cleancare Corporation
PO Box 940
Tacoma, WA 98401
Phone: (253) 627-3925
Other: 1-800-282-8128

Envirotech Systems, Inc.
18820 Aurora Ave. N., Suite 201
Seattle, WA 98133
Phone: (206) 363-9000
Other: 1-800-922-9395
Fax: (206) 546-1920

First Recovery
PO Box 875
Enumclaw, WA 98022
Phone: 1-800-545-3520
Fax: (360) 813-5663

Mobile Recycling Services, Inc.
Bellevue, WA
Phone: (425) 869-6234

Northwest ENTEK, Inc.
PO Box 6267
Spokane, WA 99207
Phone: (509) 489-9176

Petroleum Reclaiming Service, Inc.
3003 Taylor Way
Tacoma, WA 98421
Phone: (206) 383-4175

Protective Environmental Services
PO Box 94291
Seattle, WA 98124-9766
Phone: (206) 624-5503

Safety Kleen Corp.
3210 C St. NE Unit G
Auburn, WA 98002
Phone: (253) 939-2022
or
6303 212th St. SW, Suite C
Lynnwood, WA 98036
Phone: (425) 775-7030
or
9561 E. Montgomery Ave., Unit 16
Spokane, WA 99206
Phone: (509) 928-8353
or
814 E. Ainsworth
Pasco, WA 99301
Phone: (509) 547-8771

Spencer Environmental Services, Inc.
PO Box 1321
Sumner, WA 98390
Phone: 1-800-286-0896
Fax: (253) 863-3490

Van Waters and Rogers, Inc.
PO Box 3541
Terminal Annex
Seattle, WA 98124
Phone: (253) 872-5000
Fax: (253) 872-5041
or
E. 4515 Wisconsin
Spokane, WA 99220
Phone: (509) 534-0405

Note: This is intended as a partial list of assistance providers and does not include companies that only provide supplies. This list does not constitute an endorsement.

Notes:

Summary of Best Management Practices for Marinas

Waste Oil and Oil Spills

1. Specify how waste oil is to be managed / recycled in your tenant least agreement.
2. Provide receptacles for waste oil recycling or information on waste oil collection sites near your marina by calling 1-800-RECYCLE.
3. Post information identifying oils acceptable for recycling and wastes that will contaminate used oil and prevent it from being recycled.
4. Monitor the use of your oil collection facility, keep it locked after business hours, and maintain a contributor list.
5. Test your waste oil collection tank(s) for chloride contamination on a regular basis with a commercially available screening test.
6. Collect oil in smaller volumes and test it prior to transferring into a larger collection tank. If tests show contamination, isolate that volume and do not add any more oil.
7. Once your collection tank is full and tests "clean" lock it up until your waste oil contractor arrives.
8. Advise tenants to puncture and drain oil filters. Provide receptacles to collect and recycle filters.
9. Provide containment booms and oil absorbent materials in case of a spill.
10. Post the proper information for reporting spills.

Fuel Dock Operation and Maintenance

1. Locate and design fuel stations so spills can be contained.
2. Make absorbent pads and instructions for use readily available.
3. Don't soap your spills, use absorbents. Detergents disperse spills, but do not eliminate them.
4. Install automatic back-pressure shutoffs on all fuel nozzles.
5. Never leave fuel nozzles unattended.
6. Do not allow fuel nozzles to be blocked in an open position.
7. Ask boaters to not "top off" fuel tanks.
8. Use vent cups to capture fuel "burps" from air vents.
9. Provide information about vent whistles and fuel / air separators.
10. Request that boaters install fuel / air separators on their fuel tank vents or consider requiring it in your tenant lease agreement.
11. Clear the fuel nozzle of residual fuel prior to transferring back to the pump.
12. Do not allow self service on a gravity feed fueling system. Automatic shutoff nozzles may not work on these types of systems.
13. Take extra care in fueling personal watercraft (jet skis). These craft are not stable in water and are very prone to spills while fueling. Consider installing a personal watercraft fueling dock if a lot of jet skis use your marina.

continued…

Summary of Best Management Practices for Marinas, continued…

Bilge Water Discharge/Management

1. Provide notice that the discharge of contaminated bilge is illegal.
2. Make information available on bilge pumpout services.
3. Make supplies and equipment accessible for removing oil and fuel from bilge water. Oil absorbent pads, diapers, and pillows are made of a special material that repels water but absorbs oil.
4. Do NOT discharge oil contaminated bilge or drain onto the boat launch. If a bilge is severely contaminated with oil, use a pumpout service.
5. Dispose of oil soaked absorbents as a household hazardous waste if possible. Otherwise, wrap in newspaper, place in a plastic bag, and place into the garbage.
6. Do not use detergents or bilge cleaners.
7. Keep bilge area as dry as possible.
8. Do not drain oil into bilge.
9. Fit a tray underneath the engine to collect drips and drops.
10. Fix all fuel and oil leaks in a timely fashion.
11. Provide suction oil changers or pumps that attach to a drill head for your tenants use.
12. Advise tenants to turn off automatic bilge pumps and use them only when there is water in the bilge.
13. Recommend the installation of a manual override switch for bilge pumps.
14. Recommend the purchase of a hydrocarbon sensitive bilge pump.

Sewage Management

1. Provide notice that the discharge of sewage is illegal and prohibit the discharge of sewage in your tenant lease agreement.
2. Provide sewage pumpout as a free-of-charge service or make it part of the standard moorage fee. Especially effective for liveaboards is rebating part of the moorage fee for demonstrated, consistent use of the pumpout.
3. Post the location and operational hours for nearby pumpout facilities and list mobile pumpout services.
4. Provide clear instructions in pumpout use. Include a prohibition against disposal of hazardous materials.
5. Talk to liveaboards who have obviously not moved their vessels to the pumpout facility in a very long time.
6. Provide clean, adequate shore-side facilities and encourage tenants to use them for showering and laundry.
7. Encourage tenants to use biodegradable, phosphate-free detergents on vessels.
8. Minimize food wastes thrown overboard by providing adequate garbage service.
9. Encourage tenants to conserve water and use water saving devices.
10. Prohibit the dumping or abandoning of pet wastes in your tenant lease agreement.
11. Remind boaters and visitors not to harvest shellfish in marinas.

continued…

Summary of Best Management Practices for Marinas, continued…

Solid Waste

1. Make it a marina policy that throwing garbage into the water or on the land is prohibited.
2. Provide adequate trash containers for tenants to use.
3. Marinas of at least 30 moorage slips should provide recycling opportunities for aluminum, glass, newspaper, tin, and plastic or as many of these as possible.

Hazardous Waste

1. Make it a marina policy that throwing hazardous waste such as used oil, antifreeze, paints, solvents, varnishes and automotive batteries into the garbage is prohibited.
2. Post information on how and where to manage these wastes including Ecology's toll free number 1-800-RECYCLE, the location and hours of county run household hazardous waste collection facilities, and dates and locations of county sponsored hazardous waste collection events.
3. Actively help your tenants to manage these wastes properly. Consider operating a collection facility for hazardous wastes.
4. If operating a collection facility is feasible, it must be coordinated with the county or city Moderate Risk Waste contact (see Appendix B).

Exotic Species

1. Remove any visible vegetation from items that were in the water including, boat, motor, and trailer.
2. Flush engine cooling system, live wells, bait tanks, and bilges with hot water.
3. Rinse any other areas that get wet such as water collected in trailer frames, safety light compartments, boat decking and lower portions of the motor cooling system.
4. Water hotter than 110^{o} F will kill veligers, and 110^{o} F will kill adults.
5. Air dry boat and equipment for five days before using in uninfested waters. If gear or surface feels gritty, young mussels may have attached. They should be scraped off into bags and thrown into the garbage.

Spill Prevention and Response

1. Identify areas and materials with the highest probability for spills and provide education and training to staff and tenants for prevention.
2. Develop a clearly understood spill response plan.
3. When a spill occurs, stop the spill or leakage at the source.
4. Report the spill immediately to the U.S. Coast Guard National Response Center at 1-800-424-8802 and the Department of Ecology at 1-800-OILS-911 or 1-800-258-5990.
5. Contain the material. Recover what you can or wait for the Coast Guard or the Department of Ecology to respond.

Dustless Sanding
Saves Money and Keeps Water Clean

In 1998, the Washington Department of Ecology, with the assistance of the Puget Soundkeeper Alliance, conducted a pilot project to assess all costs and environmental performance of two different bottom paint removal technologies. This demonstration project was co-sponsored by Mr. Neil Falkenburg of West Bay Marina, in Olympia, Washington. One side of the bottom of the project vessel was prepared with a vacuum sander while the other side was prepared with a traditional air rotary grinder. Then costs were compared.

The purpose of the demonstration was to determine if there were economic incentives to adopting dustless sanding technology in addition to the obvious environmental benefits. The NPDES Boatyard General permit is designed to control the release of pollutants into surface waters. The permit states:

> *When stripping, sanding, scraping, grinding, sandblasting, painting, coating and/or varnishing any portion of a vessel, all particles, oils, grits, dusts, flakes, chips, drips, sediments, debris and other solids shall be collected and managed to prevent their release into the environment and entry into waters of the state.*
>
> *Drop cloths, tarpaulins, structures, drapes, shrouding or other protective devices shall be secured around the vessel to collect all such material. The cleanup of all collected materials shall be routinely undertaken to prevent their release into the environment and entry into waters of the state. The use of vacuum sanders is recommended as a means to greatly reduce the amount of particulate released into the environment.*

The cost assessment conducted found boaters using vacuum sanders to prepare the bottom of a 32 foot sailboat for repainting could save $235 in material costs over the air rotary tool.

The economics are different for the boatyard than for an owner working on his boat. The boatyard must purchase the equipment. The Fein vacuum extractor 9-55-13 costs $250 and the Fein MSf 636-1 power head costs $535, for a total system cost of $785. The material cost savings on this project were $170. The system could be paid off in as little as five jobs. If the boatyard rented out the equipment at a rate of $50 per day, the system could be paid for in 16 rental days. If the purchase of the system coincided with the peak work season, the cost of the entire system could be recovered in just over two weeks.

Note: Special thanks are extended to Jeremiah Mitchel for his technical support to this project.
Partial funding for this project provided by a Public Participation Grant from the Washington State Department of Ecology.

Vacuum Sander

- ✓ Need only dust mask and eye protection.
- ✓ Sander safer and comfortable to use.
- ✓ Need only drop cloth
- ✓ Clean with dust completely contained in filter bag
- ✓ 98% dust-free, certified for lead abatement work.
- ✓ Sanding Pads last longer and plug less.
- ✓ Labor - $900.
- ✓ Material - $188 ($54 for boatyard).
- ✓ Total Costs - $1088

Traditional Air Rotary Tool

- ✓ Need respirator and protective coveralls.
- ✓ Safety equipment difficult to work in.
- ✓ Need drop cloth and plastic shrouding.
- ✓ Messy with large volume of solid wastes generated.
- ✓ More paint dust escapes due to positive pressure.
- ✓ Sanding pads gum up rapidly.
- ✓ Labor - $800.
- ✓ Materials - $424 ($224 for boatyard.)
- ✓ Total Costs - $1224

Discussion

All work was performed by qualified boatyard personnel and assigned a flat rate of $50 per hour. Boatyard permit requirements for tarping and shrouding were strictly adhered to. Material costs included duct tape, visqueen, sanding pads, filter bags, safety equipment and rental costs. Standard rental rates were used for equipment and respirator. Time to locate and rent equipment was not included.

Labor costs were similar, but vacuum sanding took slightly longer at 18 hours verses 16 hours. This was attributed to the size difference between the 6" vacuum sander pad and the 8" disc of the air rotary tool. There were significant material savings with the vacuum sander. This was a result of 168 fewer sanding pads gumming up with melted paint from frictional heat and less plastic and tape needed to shroud the vessel, in accordance with permit requirements.

Copper found in bottom paints is a major pollutant in stormwater runoff from boatyards; and a contaminant of marinas. The safe copper levels for our waters are in the low parts per billion while the copper in stormwater is measured in parts per million. The biggest problem is the do-it-yourselfer that walks away from a sanding job and leaves the mess to be blown by the wind or washed away by the rain. It makes no sense to spread the paint dust on the ground only to have to pick it up again. The volume of solid waste generated to contain the mess costs money to collect and dispose of. Vacuum sanders put 98% of the dust immediately into a filter bag, out of the elements and off others boats. Their use will keep your boatyard and marina a cleaner place. Consider the following:

- ❑ Prevent the transport of toxic paint dust into our lakes, streams and marine waters now, purchase a vacuum sander for your boatyard or marina.