IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF HAWAIʻI

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| UNITED STATES OF AMERICA, *et al.*,<br><br>Plaintiffs,<br><br>v.<br><br>HAWAIʻI DEPARTMENT OF TRANSPORTATION,<br><br>Defendant. | Civil Action No. ____________ |

**CONSENT DECREE**

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The United States of America, on behalf of the United States Environmental Protection Agency (EPA), and the Hawaii Department of Health (HDOH) have filed a Complaint in this matter alleging that the Hawaiʻi Department of Transportation (HDOT) has violated the Clean Water Act by failing to comply with the terms of the Hawaiʻi National Pollutant Discharge Elimination System (NPDES) General Permit Authorizing Discharges of Storm Water and Certain Non-Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (Hawaiʻi Small MS4 General Permit) for municipal stormwater discharges at Honolulu and Kalaeloa Barbers Point Harbors. Hawaiʻi Administrative Rules 11-55, Appendix K. The United States further alleges that HDOT violated an administrative order issued by EPA in 2009 requiring the correction of violations and deficiencies in HDOT's stormwater management plans for the two harbors. Hawaiʻi Small MS4 General Permit and Sections 301(a) and 308 of the Clean Water Act, 33 U.S.C. §§ 1311(a) and 1308.

The Parties recognize, and the Court by entering this Consent Decree finds, that this Consent Decree has been negotiated by the Parties in good faith and will avoid litigation between the Parties and that this Consent Decree is fair, reasonable, and in the public interest.

NOW, THEREFORE, before the taking of any testimony, upon the pleadings, without adjudication or admission of any issue of fact or law, and upon consent and agreement of the Parties, it is hereby ADJUDGED, ORDERED, AND DECREED as follows:

## I. GENERAL PROVISIONS

1. Jurisdiction and Venue. This Court has jurisdiction over the subject matter of this action and over the parties pursuant to 33 U.S.C. §§1319 & 1365 and pursuant to 28 U.S.C. §§ 1331, 1345, 1355 & 1367. The Complaint states claims upon which relief may be granted under 33 U.S.C. § 1319 and under applicable provisions of State law. Venue is proper in this District under 33 U.S.C. § 1319(b) and under 28 U.S.C. §§ 1391(b) and (c) & 1395(a), because the defendant may be found here and because the transactions and occurrences giving rise to the Complaint occurred here. For purposes of the Decree, HDOT consents to and will not contest the Court's exercise of personal jurisdiction over HDOT or venue in this District.

2. Parties Bound. The obligations of this Consent Decree apply to and are binding upon the United States and HDOH and upon HDOT and any successor agencies or other entities or persons otherwise bound by law. Within 10 days of entry of this Decree, HDOT shall provide a copy of this Decree to each Manager and each person or firm retained by HDOT to implement this Decree. If, more than 10 days after entry of this Decree, a Manager or other person or firm becomes an employee of HDOT or is retained by HDOT to implement provisions of this Decree, HDOT shall provide such person or firm a copy of the Decree within 10 days of such employment or retention.

## II. DEFINITIONS

3. Except as specifically provided in this Decree, definitions for the terms used in this Decree shall be incorporated from the Clean Water Act and the regulations

promulgated pursuant to the Act. Whenever terms listed below are used in this Decree, the following definitions apply:

"Annual Compliance Report" or "ACR" shall mean the Annual Reporting Requirements set forth in Hawai'i Administrative Rules 11-55, Appendix K § 9 and Paragraph 13 of this Consent Decree.

"BMPs" or "Best Management Practices" shall refer to those methods that are the most effective, practical means of preventing or reducing pollution from stormwater runoff. These include schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States.

"Clean Water Act" or "Act" shall mean the Federal Water Pollution Control Act, as amended, 33 U.S.C. §§ 1251-1387.

"Contractor" shall mean the contractor or contractors procured by HDOT in order to provide various services in support of the requirements of this Consent Decree.

"Construction Project" or "Construction Site" shall mean any location owned, leased or operated by HDOT-Harbors, and at which there is or will be construction resulting in ground-disturbing activities greater than or equal to one acre or that is otherwise subject to the NPDES stormwater construction regulations set forth at 40 C.F.R. § 122.26(b)(14)(x) and (b)(15).

"Cut Sheets" shall mean BMP specifications that contain information needed to install or use the BMP.

"Day" shall mean a calendar day.

"EPA" shall mean the United States Environmental Protection Agency and any of its successor departments, agencies, or instrumentalities.

"Geographic Information System" or "GIS" shall mean: any information system that integrates, stores, edits, analyzes, shares, and displays geographic information for informing decision making. GIS applications are tools that allow users to create interactive queries (user-created searches), analyze spatial information, edit data in maps, and present the results of all these operations.

"Harbor" shall mean the receiving waters known as Honolulu Harbor and Kalaeloa Barbers Point Harbor.

"Harbor Property" shall mean any real property owned, leased or operated by HDOT-Harbors.

"Hawai'i Small MS4 General Permit" shall mean the Hawai'i National Pollutant Discharge Elimination System (NPDES) General Permit Authorizing Discharges of Storm Water and Certain Non-Storm Water Discharges from Small Municipal Separate Storm Sewer Systems for municipal stormwater discharges. Hawai'i Administrative Rules 11-55, Appendix K.

"HDOH" shall mean the Hawai'i Department of Health and any of its successor departments, agencies, or instrumentalities.

"HDOT" shall mean the Hawai'i Department of Transportation, including all of its divisions.

"HDOT-Harbors" shall mean the Harbors Division of HDOT.

"Illicit Discharge" shall mean any discharge to a municipal separate storm sewer that is not comprised entirely of storm water except discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and discharges resulting from fire fighting activities. 40 C.F.R. § 122.26(b)(2).

'Industrial General Storm Water Permit' shall mean the Hawai'i National Pollutant Discharge Elimination System (NPDES) General Permit Authorizing Discharges Associated with Industrial Activity. Hawai'i Administrative Rules 11-55, Appendix B.

'MS4' shall mean the small municipal separate storm sewer systems owned and operated by HDOT at Honolulu and Kalaeloa Barbers Point Harbors.

'New Development' shall mean new construction or installation of a building or structure or the creation of impervious surfaces that disturb greater than or equal to one acre, or less than one acre if it is part of a larger common plan of development or sale that would disturb one acre or more.

'Notice to Proceed' shall mean the written notice to commence the activity for which the contract was awarded.

'Outfall' shall mean a 'point source' as defined by 40 C.F.R. § 122.2 at the point where a municipal separate storm sewer discharges to waters of the United States and does not include open conveyances connecting to municipal separate storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream or other waters of the Unites States and are used to convey waters of the United States. 40 C.F.R. § 122.26(b)(9).

'Parties' means the United States, on behalf of EPA; the State, on behalf of HDOH; and HDOT.

'Redevelopment' shall mean development that would create or add impervious surface area on an already developed site. Redevelopment also includes, but is not limited to any construction project that requires demolition or complete removal of existing structures or impervious surfaces at a site and replacement with new impervious surfaces. Maintenance activities such as top-layer grinding, repaving (where all pavement is not removed), and reroofing are not considered to be redevelopment. Interior remodeling projects and improvements are also not considered to be redevelopment.

'Responsible Officer' shall mean an official of HDOT in charge of stormwater program functions for either HDOT-Harbors, or any other person who performs similar policy or decision making functions for HDOT and is authorized as set forth at 40 C.F.R. § 122.22.

'Source Control' shall mean measures to prevent pollutants from coming into contact with stormwater runoff or preventing polluted runoff from discharging into small MS4.

'Standard Operating Procedure' shall mean detailed, written instructions to achieve uniformity of the performance of a specific function as detailed in the SWMP.

'State' shall mean the State of Hawai'i.

'SWMP' shall mean a Stormwater Management Plan developed and implemented as required by the Hawai'i Small MS4 General Permit and modified as required by this Consent Decree.

"Tenant' shall mean a person, group, partnership, corporation, or any other entity that has an executed lease, revocable permit or disposition instrument under chapter 171, Hawai'i Revised Statutes to use or occupy land, a building, structure or other property owned by HDOT-Harbors. This term includes HDOT-Harbor's approved sub-tenants and entities using container or terminal facilities.

'Tenant Activities' shall mean recurring activities conducted by Tenants including but not limited to fish cleaning; equipment, vessel or vehicle cleaning; or equipment, vessel or vehicle maintenance.

'Treatment Control' shall mean measures that treat stormwater and non-stormwater that has come into contact with pollutants.

'Vessel' shall mean any watercraft or other contrivance used as a means of transportation on water.

'Vessel Operator' shall mean the owner or operator of any Vessel within or on Harbors or any property owned or operated by HDOT-Harbors.

'Year' shall mean a calendar year.

## III. COMPLIANCE WITH THE CLEAN WATER ACT

4. HDOT shall fully comply with all requirements of the Clean Water Act, as well as with the terms and conditions of all applicable NPDES Permits, including the Hawai'i Small MS4 General Permit.

5. HDOT-Harbors shall develop, and submit for approval prior to the entry of the Consent Decree, a pollution prevention plan for the stockpiles at Kalaeloa Barber's Point Harbor which shall include: (i) BMP measures to temporarily stabilize the stockpiles located at the Kalaeloa Barber's Point Harbor, (ii) a final stabilization plan which shall include a schedule with annual milestones. HDOT shall implement the plan no later than entry of the Consent Decree.

## IV. APPROVAL PROCESS

6. Approval of Deliverables. After review of any plan, report, or other item that is required to be submitted pursuant to this Consent Decree, EPA, after a reasonable opportunity for review and comment by HDOH, shall in writing, within a reasonable amount of time: (i) approve the submission; (ii) approve the submission upon specified conditions; (iii) approve part of the submission and disapprove the remainder; or (iv) disapprove the submission.

a. If the submission is approved pursuant to Subparagraph (i) above, HDOT shall take all actions required by the plan, report, or other document, in accordance with the schedules and requirements of the plan, report, or other document, as approved. If the submission is conditionally approved or approved only in part, pursuant to Subparagraph (ii) or (iii), HDOT shall, upon written direction of EPA, take all actions required by the approved plan, report, or other item that EPA determines are technically severable from any disapproved portions or conditions placed on conditionally approved portions, subject to HDOT's right to dispute only the specified conditions or the disapproved portions under Section X of this Decree (Dispute Resolution).

b. If the submission is disapproved in whole or in part pursuant to Subparagraph (iii) or (iv), HDOT shall, within 30 days or such other time as agreed to in writing, correct all deficiencies and resubmit the plan, report, or other item, or disapproved portion thereof, for approval, in accordance with the preceding Subparagraph. If the resubmission is approved in whole or in part, HDOT shall proceed in accordance with the preceding Subparagraph.

7. Any Stipulated Penalties applicable to the original submission, as provided in Section VIII of this Decree, shall accrue during the 30-day period or other period

specified for resubmission, but shall not be payable unless the resubmission is untimely or is disapproved in whole or in part; provided that, if the original submission was so deficient as to constitute a material breach of HDOT's obligations under this Decree, the Stipulated Penalties applicable to the original submission shall be due and payable notwithstanding any subsequent resubmission.

8. If a resubmitted plan, report, or other item, or portion thereof, is disapproved in whole or in part, EPA, after a reasonable opportunity for review and comment by HDOH, may again require HDOT to correct any deficiencies, in accordance with the preceding Paragraphs, or may itself correct any deficiencies, subject to HDOT's right to invoke Dispute Resolution and to the right of EPA and HDOH to seek Stipulated Penalties as provided in the preceding Paragraphs.

## V. CERTIFICATION OF REPORTS AND SUBMISSIONS

9. Except as otherwise expressly provided in this Consent Decree, any report or other document submitted by HDOT pursuant to this Decree that makes any representation concerning compliance or noncompliance with any requirement of this Decree, the Act or its implementing regulations, or any applicable permit, shall be certified by a Responsible Officer of HDOT. The certification shall be in the following form:

> I certify under penalty of law that I have examined and am familiar with the information submitted in this document and all attachments and that this document and its attachments were prepared either by me personally or under my direction or supervision in a manner designed to ensure that qualified and knowledgeable personnel properly gather and present the information contained therein. I further certify, based on my personal knowledge or on my inquiry of those individuals immediately responsible for obtaining the information, that the information is true, accurate and complete. I am aware that there are significant penalties for submitting

false information, including the possibility of fines and imprisonment for knowingly and willfully submitting a materially false statement.

## VI. INJUNCTIVE RELIEF

10. HDOT Organization Structure

a. The HDOT Director shall maintain direct oversight of all staff located in the Office of Environmental Compliance, including Environmental Compliance Program staff. The Environmental Compliance staff coordinates with Highways, Airports, and Harbors Divisions to achieve and maintain compliance with all environmental regulations and permits.

b. Within 180 days of entry of the Consent Decree, HDOT shall reorganize the current Office of Special Compliance as an Office of Environmental Compliance and include a central point position managing the office under the direct supervision of the HDOT Director. Once established, the new manager shall report directly to the HDOT Director. The manager shall have the responsibility and authority to ensure HDOT complies with all federal, state, and local environmental regulations and permits, relating to MS4 compliance. HDOT shall use its best efforts to hire a Manager for the new Office of Environmental Compliance within 180 days of entry of the Consent Decree. If the position is not filled within 180 days, HDOT will engage a compliance management consultant until the position is filled.

c. HDOT shall ensure that applicable HDOT Office of Environmental Compliance staff have the authority and responsibility to oversee compliance with all environmental requirements, relating to MS4 compliance, including the stormwater permits and stormwater management plans for the Highways, Airports, and Harbors

Divisions. HDOT shall ensure that HDOT Office of Environmental Compliance staff have the training and professional qualifications, sufficient to assess compliance, to identify actual or potential non-compliance, and to identify and require implementation of remedies.

d. The HDOT Office of Environmental Compliance staff shall perform audits of each operational division of HDOT in accordance with Appendix A.

11. Stormwater Management Plan (SWMP)

a. Modification of Stormwater Management Plan Elements

i. HDOT-Harbors shall modify the 2009 SWMPs for Honolulu Harbor and Kalaeloa Barbers Point Harbor to integrate changes described below. The modified SWMPs shall be provided to EPA and HDOH no later than 90 days of entry of the Consent Decree. HDOT-Harbors may choose to develop one SWMP for both Harbors.

ii. Within 90 days of entry of the Consent Decree, HDOT-Harbors shall post the SWMPs on HDOT-Harbors' stormwater management website. HDOT-Harbors shall solicit comments from Tenants and the public, through a variety of mechanisms. HDOT-Harbors shall provide a schedule for receipt of comments, not to exceed 45 days. Among other mechanisms, HDOT-Harbors shall solicit comments on the SWMP by publishing notices regarding its availability for review and comment in one local newspaper. HDOT-Harbors shall continue to maintain records of comments received as described in SWMP Section 3.2.

12. Implementation Timeline. HDOT-Harbors shall implement the modified SWMP no later than the close of the public comment period as described in Paragraph 11.a.ii. above.

13. Annual Compliance Report. HDOT-Harbors shall modify the Annual Compliance Report (ACR) format to include a qualitative SWMP implementation assessment, by the first ACR due after entry of the Consent Decree.

a. The qualitative assessment shall discuss whether implementation timelines have been met, whether metrics tracked by HDOT-Harbors are effective in measuring specific activities, and whether specific activities have been effective in reducing the discharge of pollutants from the MS4. Where available, the assessment shall include a discussion of water quality monitoring data. Where monitoring data is not available, HDOT-Harbors shall evaluate the need for water quality monitoring in determining SWMP effectiveness.

b. The assessment shall include a budget broken down by major components of the SWMP.

c. The ACR shall include a discussion of changes to the SWMP to incorporate new activities, modify existing activities, or reflect changes to the MS4.

14. Education, Participation, and Outreach. In addition to continuing to implement SWMP Section 2.0 and 3.0, HDOT-Harbors shall implement the following changes to the Public Education, Participation, and Outreach measures.

a. Improved Awareness Message/Program Branding and Integration

i. By the entry of the Consent Decree, HDOT-Harbors shall develop, integrate, and promote a message that conveys the need for and importance of stormwater awareness. The awareness message shall be prominently displayed in all printed and electronic communication with Tenants and during all staff, Tenant, or public training. The stormwater awareness message shall be described in the modified SWMP.

ii. In addition to SWMP Section 2.2, by the entry of the Consent Decree, HDOT-Harbors shall identify and implement no less than three forms of disseminating stormwater awareness information to Tenants and the public, including but not limited to workshops, public presentations, brochures, trade shows, expos, advertisements through various media (e.g., radio, television, newspapers, social media, etc.), volunteer opportunities, or multi-agency events (e.g., City and County of Honolulu Earth Month or Make a Difference Month). The forms of disseminating stormwater awareness information and anticipated schedules shall be described in the modified SWMP.

1) HDOT-Harbors shall continue to hold "Tenant Stormwater Pollution Prevention Awareness Training" as described in the 2011 ACR. HDOT-Harbors shall track whether or not Tenants attend and shall use its best effort to ensure that at least 80% of Tenants attend this training. Failure to attend training will impact a Tenant's risk ranking in accordance with the Tenant Inspection Program Manual, attached as Appendix B.

iii. At least once per calendar year, beginning in 2014, HDOT-Harbors shall place an advertisement in one local newspaper describing HDOT-Harbors' efforts to protect and improve stormwater quality, its efforts to work with other agencies, volunteers, and community organizations regarding stormwater awareness, and contact numbers for the public to report stormwater problems. The advertisement shall prominently display HDOT-Harbors' stormwater awareness message. The advertisement and anticipated schedule for placement shall be described in the modified SWMP.

b. Enhanced Stormwater Management Website

i. HDOT-Harbors shall update and maintain its stormwater management website to include, but not be limited to: 1) links to its National Pollutant Discharge Elimination System permits and this Consent Decree; 2) the amended SWMP; 3) contact information for public comments on the SWMP; 4) ACRs; 5) Staff, Tenant stormwater training materials; 6) inspection forms and risk ranking criteria; 7) vehicle and equipment wash applications; 8) BMP fliers and other BMP resources appropriate for various types of Tenants, including minimum BMPs; 9) spill prevention control and countermeasures guidance; 10) contacts for reporting stormwater violations to HDOT-Harbors, HDOH, and EPA; 11) Tenant Environmental Manager of the Year award; and 12) EPA's and the City and County of Honolulu's stormwater websites. The stormwater management website shall prominently display and integrate HDOT-Harbors' stormwater awareness message.

ii. HDOT may choose to develop one website that covers stormwater information for all Divisions. If HDOT chooses to maintain separate websites for each Division, the websites must link to each other.

iii. HDOT-Harbors shall ensure the stormwater management website is easily accessible by the public, including, but not limited to, a prominent link on HDOT's homepage. HDOT-Harbors shall provide for a mechanism to track the number of visitors to the webpage and report this information in the ACR.

c. Signage and Inlet Stenciling

i. By entry of the Consent Decree, HDOT-Harbors shall identify no less than 50 locations on Harbor Property that are suitable for the placement of signs that advise against dumping or discarding pollutants where they may enter either Harbor or HDOT-Harbors' MS4. Suitable areas shall include, but not be limited to: 1) visible public locations, such as harbor entrances, comfort stations, meeting areas, and garbage collection stations; 2) high traffic Tenant areas or areas with a history of illicit discharges; and 3) locations at wharfs and piers. The signs shall include a prohibition against dumping or discarding pollutants, information about illicit discharges, the HDOT-Harbors stormwater awareness message, and the stormwater hotline for reporting stormwater problems. HDOT-Harbors shall install the signs no later than 90 days after the entry of the Consent Decree. On an annual basis, HDOT-Harbors shall evaluate the need for additional signs, taking into account changing Tenant use patterns at the Harbors, and report this information in the ACR.

ii. Within 90 days after the entry of the Consent Decree, HDOT-Harbors shall stencil all storm drain inlets on Harbor Property. HDOT-Harbors may elect to recruit volunteers and Tenants to assist with the stenciling effort. HDOT-Harbors shall consider the use of medallions or permanent storm drain inlet markers. HDOT-Harbors shall inspect the legibility of the stencil or label nearest each inlet prior to the wet season every year, record all inlets with illegible stencils, and re-stencil or re-label the inlet 60 days after inspection.

d. Minimum Best Management Practice Guidance

i. By entry of the Consent Decree, HDOT-Harbors shall develop a comprehensive set of information sheets, describing minimum BMPs for common Tenant activities. The list of minimum BMPs shall be included in the modified SWMP.

ii. HDOT-Harbors shall update Tenant lease agreements upon renewal, Tenant revocable permits, or other materials given to Tenants, to reference or include the minimum BMPs and require their implementation and maintenance.

iii. By entry of the Consent Decree, HDOT-Harbors shall develop information sheets describing recommended BMPs for Vessel Operators. The BMPs shall be available on the stormwater management website or printed as fliers or brochures. The list of recommended BMPs for Vessel Operators shall be included in the modified SWMP.

e. Enhanced Tenant Inventory

i. HDOT-Harbors shall maintain an electronic inventory of Tenants as described in the Tenant Inspection Manual. Among other items, this inventory includes a contact for each Tenant, location information, a description of the nature of business activity, and whether the Tenant maintains coverage under the Industrial General Stormwater Permit (Industrial General Permit) issued by HDOH. This inventory shall be continually updated based and be compatible with GIS or other mapping system (see Paragraph 20.a).

f. Tenant Survey

i. At least once per calendar year, beginning in 2014, HDOT-Harbors shall provide a questionnaire to all Tenants to assess their knowledge regarding stormwater awareness and pollution prevention. The questionnaire shall be included in the modified SWMP.

ii. The results of the questionnaire shall be used to update Tenant training materials. HDOT-Harbors shall use its best efforts to ensure no less than 60% of all Tenants respond to the survey. The results of the annual survey shall be included in the ACRs.

g. Educational Materials for Tenants

i. At least twice per calendar year, beginning in 2014, HDOT-Harbors shall provide educational materials to all Tenants to educate them on stormwater awareness issues and the terms and conditions of their lease or revocable permit, Tariff and/or Wharfage provisions related to stormwater management. Among others, HDOT-Harbors may use the following methods: 1) include a brochure or educational fact sheet with an invitation to the Annual Tenant Training; 2) hand out brochures at the Annual Tenant Training; 3) hand out brochures or educational materials during inspections. The materials shall include: 1) a brief description of responsibilities of the Harbor Tenants regarding stormwater pollution prevention; 2) a fact sheet and/or brochures describing HDOT-Harbors endorsed minimum BMPs; 3) where applicable, a description of where lease or revocable permit obligations relating to stormwater management can be found; 4) the purpose, scope, and potential ramifications of HDOT-Harbors recurring inspections and the availability of the Tenant Inspection Manual for Tenant review; 5) a concise and readily understandable definition of illicit discharges as well as procedures for reporting illicit discharges via the HDOT-Harbors stormwater hotline; and 6) resources for obtaining additional information regarding stormwater pollution prevention, such as a link to HDOT-Harbors' stormwater website.

h. New Tenant Awareness Package and Site Visit

i. By entry of the Consent Decree, HDOT-Harbors shall develop a New Tenant Information Package to ensure that new Tenants are aware of the stormwater requirements in the Tenant lease agreements and Tenant revocable permits, apply required BMPs based on activities at the site, and understand how to identify and report illicit discharges. The New Tenant Information Package should include educational materials describing the responsibilities of the Tenant and resources for obtaining additional information regarding stormwater pollution, including the stormwater awareness message and information on minimum BMPs.

ii. As of entry of the Consent Decree HDOT-Harbors shall begin to conduct inspections of new Tenants as described in the Tenant Inspection Manual. An Inspection shall be completed within three months of the Tenant occupying an existing facility, or the Tenant's completion, construction, and occupancy of a newly constructed facility.

15. Employee Training

a. Employee Survey and Awareness Training

i. At least once per calendar year, beginning by the entry of the Consent Decree, HDOT-Harbors shall survey all HDOT-Harbors' employees to assess their knowledge regarding stormwater awareness and pollution prevention. The results of the survey shall be used to update employee training materials. Each year HDOT-Harbors shall ensure no less than 80% of employees respond to the survey. The results of the annual survey shall be included in the ACR.

ii. Beginning by the entry of the Consent Decree, at least once per calendar year, HDOT-Harbors shall provide information to all HDOT-Harbors' employees about its stormwater pollution prevention program. The information can be in the form of posters, mailings, group email, or workshops. The information shall include: 1) an explanation of HDOT-Harbors' organizational structure including the responsibilities of Harbor employees regarding stormwater pollution prevention; 2) HDOT-Harbors' endorsed minimum BMPs; and 3) a concise and readily understandable definition of illicit discharges, as well as procedures for reporting illicit discharges via the HDOT-Harbors stormwater hotline.

b. Illicit Discharge Detection and Elimination Program Training

i. HDOT-Harbors will conduct Illicit Discharge Detection and Elimination Program Training in accordance with the Tenant Inspection Program and Outfall Reconnaissance Inventory and Inspection Program (ORIIP) Manuals, as attached as Appendices B and C. HDOT-Harbors will also conduct annual training of Marine Cargo Specialists and Grounds Supervisors on Illicit Discharge Detection and Elimination procedures.

ii. For staff whose job duties include implementing the Tenant Inspection Program, the training shall include the following, as described in the Tenant Inspection Manual, attached as Appendix B: 1) HDOT-Harbors' risk ranking procedures; 2) the purpose, implementation, and maintenance of BMPs; and 3) inspection procedures.

HDOT-Harbors shall also ensure that all inspectors understand and are proficient in applying HDOT-Harbors' Enforcement Response Plan (see Paragraph 19).

iii. For all staff whose primary job duties are related to implementing the ORIIP, the training shall include the following, as described in the ORIIP Manual attached as Appendix C: 1) procedures to be used when observing outfalls; 2) procedures to be used to track non-stormwater discharges to their source; and 3) HDOT-Harbors' illicit discharge definition. HDOT-Harbors shall also ensure that all applicable staff understand and are proficient in applying HDOT-Harbors' Enforcement Response Plan (se Paragraph 19).

c. Construction Site Runoff Control Program Training

i. For three years after entry of the Consent Decree, HDOT-Harbors shall ensure that all staff and consultants whose primary job duties are related to implementing the Construction Site Runoff Control Program have received specialized training from a consultant approved by EPA and HDOH, in accordance with Paragraph 6. HDOT-Harbors shall submit the name(s) and qualifications within 30 days of entry of this Consent Decree. After this time period, training shall be as described in the Construction Site Runoff Control Program Manual attached as Appendix E. At a minimum, HDOT-Harbors shall ensure: 1) staff tasked with plan review and permitting are proficient in HDOT-Harbors' adopted Construction BMP Manual and Hawaii's Construction General Permit Stormwater Pollution Control Plan requirements; and 2) staff tasked with inspections are proficient in inspection procedures developed by HDOH and EPA, HDOT-Harbors' adopted Construction BMPs Manual, and the Construction General Permit Stormwater Pollution Control Plan requirements. HDOT-

Harbors shall ensure all applicable staff understand and are proficient in applying HDOT-Harbors' Enforcement Response Plan.

d. Post-Construction Stormwater Management Program Training

i. For three years after entry of the Consent Decree, HDOT-Harbors shall ensure that all staff whose primary job duties are related to implementing the Post-Construction Stormwater Management Program have received specialized training from a consultant approved by EPA and HDOH, in accordance with Paragraph 6. HDOT-Harbors shall submit the name(s) and qualifications within 30 days of entry. After this time period, training shall be as described in the Post Construction Management Program Manual attached as Appendix F. At a minimum, HDOT-Harbors shall ensure: 1) staff tasked with plan review and permitting are proficient in HDOT-Harbors' Post-Construction Technical Standards and the use of the Permanent Post-Construction BMP Checklist; 2) staff tasked with inspections are proficient in inspection procedures developed by HDOH and EPA and HDOT-Harbors' Post-Construction Technical Standards; and 3) all relevant staff understand and are proficient in applying HDOT-Harbors' Enforcement Response Plan.

16. Illicit Discharge Detection and Elimination. In addition to continuing to implement SWMP Section 4.0, HDOT-Harbors shall implement the following changes to the Illicit Discharge Detection and Elimination program.

a. Improved Definition of Illicit Discharges. By entry of the Consent Decree, HDOT-Harbors shall develop and promote a list and description or examples of illicit discharges that are considered to be significant contributors of pollutants. The list and description of illicit discharges shall be capable of being used in education and outreach activities. As part of the list, HDOT-Harbors shall clearly denote all conditionally authorized discharges to the storm sewer system, as well as describe or give examples of discharges that are prohibited. This definition shall be included in the modified SWMP.

b. Site Assessments

i. In addition to the Tenant inspections discussed in Paragraph 16.e below, HDOT-Harbors shall conduct site assessments of high-risk areas in accordance with the Tenant Inspection Program and ORIIP Manual, attached as Appendices B and C. The site assessments are intended to: 1) identify active or recent illicit discharges; and 2) increase the field presence of HDOT-Harbors personnel, and thus deter illicit discharges. The site assessments shall begin within 30 days after entry of the Consent Decree.

ii. HDOT-Harbors shall provide outreach activities during site assessments that include, but are not limited to, providing BMP fliers and other materials and a schedule of upcoming trainings and other outreach activities. HDOT-Harbors shall also identify areas that would benefit from signs.

iii. HDOT-Harbors shall respond to violations identified during site assessments and initiate enforcement in accordance with the Enforcement Response Plan.

c. Outfall Inspections

i. HDOT-Harbors shall implement the ORIIP, which shall accomplish the following goals: 1) identify illicit discharges, 2) assess Best Management Practice performance, and 3) assess system integrity. Any changes to the ORIIP shall be reported in the ACR.

1) The ORIIP shall include a prioritization schedule for dry weather inspections. As defined in the ORIIP, HDOT-Harbors shall rank all known outfalls as Potential, Suspect, Obvious, or Unlikely and at a minimum, all outfalls shall be inspected every two years, however, outfalls characterized as Potential, Suspect or Obvious inspected annually. HDOT-Harbors shall re-prioritize all outfalls on an annual basis. The prioritization schedule shall be included in the ACR. All outfall inspections shall be conducted in accordance with the procedures described in the ORIIP.

2) The wet weather inspections shall be conducted in accordance with the procedures described in the ORIIP.

ii. HDOT-Harbors shall create and maintain records of all dry and wet weather observations and investigations in accordance with the Tenant Inspection Program Manual, ORIIP, and the Enforcement Response Plan.

d. Illicit Discharge Tracking and Elimination. Upon observing a non-stormwater flow, HDOT-Harbors shall conduct Source Identification in accordance with the ORIIP. If the flow is illicit and originates within HDOT-Harbors' property or HDOT property, HDOT-Harbors shall ensure the connection is disconnected or flow from the source is discontinued in accordance with the Enforcement Response Plan. If the flow originates outside of HDOT-Harbors' or HDOT's property, HDOT-Harbors will notify the adjoining jurisdiction or property owner in writing that the flow is entering HDOT-Harbors' MS4 and copy HDOH on the letter or email.

e. Tenant Inspections

i. HDOT-Harbors shall implement the Tenant Inspection Program Manual, attached as Appendix B. As described in the Tenant Inspection Manual, the risk ranking system shall be re-evaluated each calendar year based on information gathered during inspections, outreach, and through the Tenant survey and training process. Any changes to the Tenant Inspection Manual shall be reported in the ACR.

ii. By the entry of the Consent Decree, HDOT-Harbors shall inspect and conduct outreach at all Tenant facilities at a minimum of twice per year for high-risk Tenants and once per year for medium-risk Tenants, once every five years with annual reconnaissance for low-risk Tenants, as described in the Tenant Inspection Manual. HDOT-Harbors shall conduct any needed enforcement in accordance with the Enforcement Response Plan.

1) During inspections, HDOT-Harbors shall provide outreach activities that include, but are not limited to, providing BMP fliers and other materials for posting in common areas and a schedule of upcoming training and other outreach activities.

iii. If a reconnaissance inspection identifies a substantive change to a facility's operation, size or activities, HDOT-Harbors shall conduct an inspection within 30 days of the reconnaissance inspection to determine if the facility's risk ranking needs to change.

17. Construction Site Runoff Control. HDOT-Harbors shall implement the Construction Site Runoff Control Program Manual. The Construction Site Runoff Control Program Manual, shall include the following elements: 1) Plan Review Procedures, including use of a Construction Design Review Checklist, which includes a check whether a Notice of Intent to be covered under Hawaiʻi's Construction General Permit has been filed, if applicable, 2) BMP Standards and Technical Specifications as

described in Paragraph 17.a below, and 3) inspections and follow-up enforcement as described in Paragraph 17.b below.

a. HDOT-Harbors shall require the use of the *City and County of Honolulu Storm Water BMP Manual—Construction* for all Construction Sites and for paving projects per Tables 1 through 3 below.

i. The *City and County of Honolulu Storm Water BMP Manual—Construction* shall be available to the public and shall be clearly referenced within HDOT-Harbors' stormwater management website, along with the Construction Plan Review Checklist, in construction specifications, and in the permit applications for connection and/or discharge.

ii. HDOT-Harbors shall require that all Construction Sites on Harbor Property comply with the *City and County of Honolulu Storm Water BMP Manual—Construction.*

**Table 1. Minimum Set of Best Management Practices for All Construction Sites**

| | |
|---|---|
| Erosion Controls | Scheduling |
| | Preservation of Existing Vegetation |
| | Slope Protection |
| | Run-on Diversion |
| Sediment Controls | Silt Fence |
| | Storm Drain Inlet Protection |
| | Sand Bag Barrier |
| | Stabilized Construction Site Entrance/Exit |
| Non-Stormwater Management | Water Conservation Practices |
| | Dewatering Operations |
| Waste Management | Material Delivery and Storage |
| | Stockpile Management |
| | Spill Prevention and Control |
| | Solid Waste Management |
| | Concrete Waste Management |
| | Sanitary/Septic Waste Management |

**Table 2. Additional Best Management Practices Applicable to Construction Sites Disturbing 1 Acre or More**

| | |
|---|---|
| Erosion Controls | Hydraulic Mulch |
| | Hydroseeding |
| | Soil Binders |
| | Geotextiles and Mats |
| | Wood Mulching |
| | Slope Drains |
| Sediment Controls | Silt Fence |
| | Fiber Rolls |
| | Sediment Basin |
| | Gravel Bag Berm |
| | Street Sweeping and/ or Vacuum |
| | Sand Bag Barrier |
| | Storm Drain Inlet Protection |
| | Scheduling |
| | Check Dam |
| Additional Controls | Wind Erosion Controls |
| | Stabilized Construction Entrance/ Exit |
| | Stabilized Construction Roadway |
| | Entrance/ Exit Tire Wash |
| | Advanced Treatment Systems |
| Non-Stormwater Management | Water Conservation Practices |
| | Dewatering Operations (see HAR 11-55 Appendix G) |
| | Vehicle and Equipment Washing |
| | Vehicle and Equipment Fueling |
| | Vehicle and Equipment Maintenance |
| Waste Management | Material Delivery and Storage |
| | Stockpile Management |
| | Spill Prevention and Control |
| | Solid Waste Management |

**Table 3. Minimum Required Best Management Practices for Roadway Paving or Repair Operation**

| | |
|---|---|
| 1. | Restrict paving and repaving activity to exclude periods of rainfall or predicted rainfall unless required by emergency conditions. |
| 2. | Install gravel bags and filter fabric or other equivalent inlet protection at all susceptible storm drain inlets and at manholes to prevent spills of paving products and tack coat. |
| 3. | Prevent the discharge of release agents including soybean oil, other oils, or diesel to the stormwater drainage system or receiving waters. |

| | |
|---|---|
| 4. | Minimize non-stormwater runoff from water use for the roller and for evaporative cooling of the asphalt. |
| 5. | Clean equipment over absorbent pads, drip pans, plastic sheeting or other material to capture all spillage and dispose of properly. |
| 6. | Collect liquid waste in a container, with a secure lid, for transport to a maintenance facility to be reused, recycled or disposed of properly. |
| 7. | Collect solid waste by vacuuming or sweeping and securing in an appropriate container for transport to a maintenance facility to be reused, recycled or disposed of properly. |
| 8. | Cover the "cold-mix" asphalt (i.e., pre-mixed aggregate and asphalt binder) with protective sheeting during a rainstorm. |
| 9. | Cover loads with tarp before haul-off to a storage site, and do not overload trucks. |
| 10. | Minimize airborne dust by using water spray or other approved dust suppressant during grinding. |
| 11. | Avoid stockpiling soil, sand, sediment, asphalt material and asphalt grinding materials or rubble in or near stormwater drainage system or receiving waters. |
| 12. | Protect stockpiles with a cover or sediment barriers during a rain. |

b. Construction Site Inspections

i. As described in the Construction Site Runoff Control Program Manual, HDOT-Harbors shall develop and maintain an electronic database for all active Construction Sites to track inspections and enforcement actions. This database shall be compatible with the Asset Management System. See Paragraph 20.b.

ii. By the entry of the Consent Decree, HDOT-Harbors shall temporarily assign one full-time position whose duties will include inspection erosion and sediment control. HDOT-Harbors shall continue this temporary assignment until a full-time position is established and filled.

iii. By December 31, 2015, HDOT-Harbors shall proceed to reorganize the engineering environmental unit, and request legislative and Governor approval to fund and establish a permanent full-time position. The section's functional statement and duties will require the positions to have the additional responsibilities to inspect erosion and sediment control and shall include routine and event-driven inspections of Construction Projects for compliance with stormwater-related requirements. HDOT-Harbors will also supplement resources and technical expertise through the use of professional consultant services.

iv. As described in the Construction Site Runoff Control Program Manual: 1) the position designated to inspect erosion and sediment control shall meet with the HDOT-Harbors Project Engineer(s) and general contractor prior to any land disturbance activities on HDOT-Harbors' property to review BMPs required for the Construction Project and 2) HDOT-Harbors shall inspect every Construction Site at least once every two weeks between October and March and bimonthly between April and September. Each inspection shall be reported in the ACR and shall include the referenced Construction Site, and the stage of the project and the dates of inspections.

v. HDOT-Harbors shall undertake enforcement actions in accordance with the Enforcement Response Plan.

18. Post-Construction Stormwater Management Program. In addition to continuing to implement SWMP Section 6.0, HDOT-Harbors shall implement the following changes to the Post-Construction Stormwater Management Program.

a. Retrofits of Recently Completed Projects

i. By 180 days after the entry of the Consent Decree, HDOT-Harbors shall create an inventory of New Development and Redevelopment Projects that have been constructed or for which grading or land disturbance permits have been issued since May 19, 2003.

ii. The inventory shall identify the project name, project identifier, location, total acreage, size of impervious area, total cost, storm sewer system flow pathway and associated outfall, current Tenant if applicable, and a description of activity. The inventory shall also describe if any structural or non-structural post-construction BMPs were installed or implemented. If no such controls were installed, the inventory should so state.

iii. HDOT-Harbors shall evaluate the feasibility of retrofitting all projects on the inventory with adequate Post-Construction BMPs. HDOT-Harbors shall develop a ranking system based on water quality improvements, suitability (e.g., land area), economic value, and cost analysis for all projects identified in the inventory. A detailed scope of the feasibility study shall be submitted by 270 days after the entry of the Consent Decree, for EPA and HDOH's review and approval. A final feasibility study shall be submitted no later than 240 days after EPA's and HDOH's approval of the scope of the feasibility study.

iv. No later than four years after EPA approval of the final feasibility study, HDOT-Harbors shall start the construction of the retrofits of the three highest ranked projects. If there are delays beyond HDOT-Harbors control that prevent the start of construction of any of the three projects, HDOT-Harbors will submit revised schedule to EPA and HDOH in accordance with Paragraph 6, as soon as HDOT-Harbors becomes aware of the potential for delay.

b. Project Applicability

i. Upon entry of the Consent Decree, HDOT-Harbors shall require all New Development and Redevelopment Projects to comply with the Post-Construction Stormwater Management Program. HDOT-Harbors shall not advertise any Construction Project nor award any construction contract unless and until the project design has been reviewed to ensure that appropriate permanent post-construction BMPs have been included in the project design and are included in the bid package, as necessary. The Post-Construction Stormwater Management Program Plan shall include: 1) a Permanent Post-Construction BMP Checklist, 2) BMP Standards and Technical Specifications as described in Paragraph 18.c below, 3) Inspection of Post-Construction BMPs as described in Paragraph 18.d below, 4) a tracking database as described in Paragraph 18.e below, 5) a plan for long-term Operation and Maintenance as described in Paragraph 18.f below, and 6) requirements for inspections to verify maintenance of permanent post-construction BMPs with follow-up enforcement as needed, as described in Paragraph 18.f below.

c. BMP Standards and Technical Specifications. HDOT-Harbors shall develop or adopt technical standards that govern the selection, installation, and maintenance of post-construction control measures implemented for New Development and Redevelopment Projects on HDOT-Harbors' Property. The technical standards shall be provided to all designers and contractors and incorporated into construction and development plans prior to HDOT-Harbors' approval. The technical standards shall consider design storm duration and/or intensity, pollutants of concern generated at the site, maintainability, and other unique harbor features.

d. Oversight of Post-Construction Control Measure Installation. HDOT-Harbors shall have an inspection program for future New Development and Redevelopment Projects. Inspections will be conducted at multiple stages of construction to ensure the proper installation of all Source and Treatment Control measures. Inspections shall occur: 1) prior to commencement of construction; 2) during active construction to ensure construction is occurring in accordance with approved plans; and 3) upon completion of construction to ensure proper installation and maintainability. The inspections may be combined with other inspections provided they are conducted by trained personnel. Each inspection shall be reported in the ACR and shall be clearly linked to the referenced project and note the stage of the project and the dates of inspections.

e. Tracking Database. By entry of the Consent Decree, HDOT-Harbors shall implement an electronic inventory of Post-Construction BMP measures on all New Development and Redevelopment Projects. The inventory shall be used to record the location and maintenance obligations for Post-Construction BMP measures and be compatible with GIS or other mapping systems. See Paragraph 20.a below. The electronic system, at a minimum, should contain the following information: 1) project identifier; 2) location; 3) acreage; 4) control type and description; 5) date of acceptance; 6) date of maintenance agreement; 7) operation and maintenance plan; 8) maintenance records; 9) inspection dates and summary; 10) corrective actions; and 11) replacement or repair date.

f. Long-Term Operation and Maintenance

i. General. By entry of the Consent Decree, HDOT-Harbors shall ensure that all New Development and Redevelopment Projects subject to post-construction control measures requirements have an operation and maintenance plan, monitoring plan where applicable, and a process of verification of ongoing maintenance of installed controls. The operation and maintenance plan shall also include an estimate of anticipated annual maintenance costs for upkeep of Post-Construction BMP measures.

ii. Tenant Operation and Maintenance. If the Post-Construction BMP measures are to be maintained by the Tenant, written conditions shall be placed in the revocable permit or lease agreement upon renewal, which require the Tenant to assume responsibility for the implementation of the operation and maintenance plan including an annual inspection. HDOT-Harbors shall require their Tenants to submit annual reports to HDOT-Harbors, demonstrating proper operation and maintenance.

g. Inspection and Enforcement Program

i. HDOT-Harbors shall conduct an annual inspection of all Post-Construction BMP measures to determine if controls and BMPs are in place, working properly, and if the operation and maintenance plan has been fully implemented. For Post-Construction BMP measures installed and maintained by Tenants, HDOT-Harbors may conduct this inspection as part of the Tenant Inspection Program. Inspection findings shall be documented in the database of post-construction control measures described in Paragraph 18.e. above.

ii. HDOT-Harbors shall undertake enforcement action in accordance with the Enforcement Response Plan, as appropriate.

19. Enforcement Response Plan. Within 30 days of entry, HDOT-Harbors shall submit an Enforcement Response Plan, for review and approval in accordance with Paragraph 6. After approval, HDOT-Harbors shall implement the Enforcement Response Plan and include it in the modified SWMP.

a. The Enforcement Response Plan shall be designed to obtain compliance and deter non-compliance from all dischargers into HDOT-Harbors' MS4, utilize the full extent of Harbors' authority, including the authority to issue civil fines, and:

i. Incorporate the definitions of Class I and Class II Violations set forth below, which are based on: 1) potential to discharge or cause environmental harm; 2) magnitude of the violation (e.g. failure to apply for Industrial or Construction Permit General Permit coverage); 3) duration of the violation; and 4) compliance history of the violator.

1) Class I Violations: violations which are related to submittal of permit applications, BMP failure due to lack of maintenance, ongoing or imminent discharges of pollutants, other activities capable of causing imminent impact to the environment, or where the violator has a previous history of non-compliance.

2) Class II Violations: violations that pose no significant impact on the environment and are easily preventable, or administrative in nature. Class II violations include record keeping, reporting, BMP maintenance or installation problems, or other activities when there is ample time for correction prior to the discharge of pollutants, and where the violator has not had a previous history of non-compliance.

b. Within 30 days of entry of this Consent Decree, HDOT-Harbors shall enter into a Memorandum of Agreement with HDOH to refer violations for escalated enforcement. This agreement shall remain in place until HDOT-Harbors is granted authority pursuant to state law to issue civil fines. HDOT-Harbors shall use its best efforts to obtain authority to issue civil fines by December 31, 2014.

20. Storm Sewer System Operation and Maintenance. Within 30 days of entry of this Consent Decree, HDOT-Harbors shall submit a Storm Sewer System Operation and Maintenance Program (SSS O&M Plan), for review and approval in accordance with Paragraph 6. After approval, HDOT-Harbors shall implement the SSS O&M plan and include it in the modified SWMP. The SSS O&M Plan shall establish recurring schedules for inspection and cleaning of the entire storm sewer system as described below. The SSS O&M Plan shall describe: 1) the range of operation and maintenance activities to be performed, 2) timelines and recurring schedules for each activity, 3) departments and personnel responsible for activity implementation, and 4) dates and timelines for procurement of necessary equipment. The SSS O&M Plan shall address the provisions in Paragraphs 20.a. through d.

a. Storm Sewer System Mapping. Within 180 days after the delivery of the geodatabase delivered by the Army Corps of Engineers under the Development of Geographic Information System (GIS) Layers for State of Hawaiʻi, Department of Transportation, Harbors Division Project as described in Appendix H (Army Corps of Engineers Scope of Work), HDOT-Harbors shall create and submit a comprehensive storm sewer system map that identifies all HDOT-Harbors assets including inlets, manholes, pipes, above-ground drainage features, post-construction control measures, and outfalls. HDOT-Harbors shall include areas where Harbor Property discharges directly to the Harbors or their tributaries and are at risk for flooding. The map shall be developed in GIS format and shall include relevant information for each asset class. For pipes, drainage features and outfalls this shall include the type of material, size, condition, and date of installation, if known. Data for inlets shall include type, condition and presence of stencil. The map shall allow for the determination of outfall drainage basins including the identification of up-gradient tributaries both within the HDOT-Harbors storm sewer system and where the system is connected to offsite tributary storm drain systems to the extent that information is included in the geodatabase delivered by the Army Corps of Engineers under the Army Corps of Engineers Scope of Work. To the extent that such information is not included in the geodatabase, HDOT-Harbors shall submit a schedule for adding the information by October 31, 2014, or another date agreed upon by EPA and HDOH. The map and associated GIS shall provide foundation data for the Asset Management System described below.

b. Asset Management System. HDOT-Harbors shall develop and maintain an Asset Management System, which shall include an inventory of HDOT-Harbors' assets and a schedule for recurring inspection, cleaning, other maintenance, and renewal. The Asset Management System shall be capable of generating and tracking work orders for inspection, cleaning, and other maintenance and shall be capable of assisting HDOT-Harbors with prioritization of capital improvement projects. The Asset Management System shall be fully implemented not later than December 31, 2015 or within 180 days of completion of Storm Sewer System Mapping described in Paragraph 20.a.

c. Storm Sewer System Inspections. As described in the SSS O&M Plan, and in accordance with the schedule described in the SSS O&M Plan, HDOT-Harbors shall conduct physical inspections of the storm sewer system to identify structural defects, trash and debris accumulation, and other constraints that limit the flow of stormwater. HDOT-Harbors shall also inspect areas where Harbor Property discharges directly to the Harbors or their tributaries and are at risk for flooding. The inspection of the storm sewer system can occur concurrently with the cleaning program required in Paragraph 20.d. Until the Asset Management System is operational, results of the inspection shall be maintained as described in the SSS O&M Plan. After the Asset Management System is operations, the schedule shall be maintained in the Asset Management System.

d. Storm Sewer System Cleaning. The SSS O&M Plan shall include a cleaning schedule for the storm sewer system, and shall include an initial cleaning of all inlets, pipes (as necessary), drainage features and outfalls (as necessary) by 270 days after the entry of the Consent Decree, or another date agreed upon by EPA and DOH. Cleaning shall be accomplished by removing accumulated debris, trash, and sediment. HDOT-Harbors shall develop a recurring cleaning cycle that ensures that each inlet, and drainage feature are cleaned no less than once every five years following the initial cleaning. Outfalls will be cleaned as necessary.

i. In the cleaning schedule, HDOT-Harbors shall identify "hot spots" where there is a greater risk for potential discharges of pollutants to the storm sewer system, and describe the process for defining hot spots in the SSS O&M Plan. HDOT-Harbors shall implement appropriate BMPs, including more frequent cleaning and maintenance to minimize potential discharges of pollutants to the storm sewer system.

Until the Asset Management System is operational, this data shall be maintained as described in SSS O&M Plan.

ii. HDOT-Harbors shall require the tenant to develop and implement a schedule for routine cleaning of rail tracks at Kalaeloa Barbers Point Harbor to prevent discharge of pollutants to the receiving water.

## VII. CIVIL PENALTY

21. Within seven days after entry of this Consent decree, HDOT shall pay a civil penalty of ***$1,200,000 plus interest*** from the date of HDOT's signature on this Decree. $600,000 shall be paid to the United States and $600,000 to HDOH. Interest shall be otherwise calculated in accordance with 28 U.S.C. § 1961. Interest shall continue to accrue until payment is made.

22. Method of Payment.

a. Payment shall be made by FedWire Electronic Funds Transfer (EFT) to the U.S. Department of Justice in accordance with instructions to be provided to HDOT, following lodging of the Consent Decree, by the Financial Litigation Unit of the U.S. Attorney's Office for the District of Hawai'i. At the time of payment, HDOT shall simultaneously send written notice of payment and a copy of any transmittal documentation (which should reference DOJ case number 90-5-1-1-07488/1 and the civil action number of this case) to the United States in accordance with Section XIV (Notification).

b. All payments to be made to the State of Hawai'i shall be made via a State of Hawaii Journal Voucher, to account No. S 15 342 H 1559 000 322 00 371.

Upon payment, HDOT shall provide a signed copy of the completed Journal Voucher, sent to:

Clean Water Branch
Environmental Management Division
Department of Health
Ala Moana Boulevard, Room 301
Honolulu, HI 96814-4920

## VIII. STIPULATED PENALTIES

23. Stipulated Penalty Amounts. If HDOT fails to comply fully and timely with the requirements of this Decree, including the compliance dates for each and every measure set forth in Section VI (Injunctive Relief) and with all requirements set forth in any applicable permits, HDOT shall pay Stipulated Penalties in the following amounts:

a. for each failure to conduct audits of each division according to the schedule and as described in Paragraph 10.d: $1,000 per day per violation;

b. for each failure to implement and track Tenant Stormwater Awareness Training as described in Paragraph 14(a)(ii)(1) and 14(f): $10,000 per annual training or per annual survey;

c. for each failure to update and maintain the stormwater management website as described by Paragraph 14(b): $1,000 per month per violation;

d. for each failure to install signs as required by Paragraph 14(c): $250 per day per sign;

e. for each failure to review plans, including using appropriate checklists, as required by Paragraphs 17 and 18: $2,500 for each plan;

f. For each failure to develop and maintain an electronic database of all active construction sites as required by Paragraph 17, and post-construction control measures as required by Paragraph 18: $1,500 per construction site or post-construction control measure;

g. For each failure to develop a complete inventory of New Development and Redevelopment Projects since May 19, 2003 and conduct an evaluation of retrofit feasibility: $2,500 per project;

h. For the failure to develop BMP standards and technical specifications as required by Paragraph 18: $1,000 per day;

i. for each failure to properly install and maintain appropriate BMPs (including post-construction control measures) in accordance with applicable plans, permits, and guidance documents: $1,500 per day per violation;

j. for failure to conduct and record the inspections required by Paragraphs 16, 17, 18, and 20: $1,000 for each of the first ten violations; $2,500 for each of the next ten violations; and $5,000 for each subsequent violation;

k. for each failure to create a storm sewer system map, an asset management system, or storm sewer system cleaning plan, as required by Paragraph 20: $500 per violation per day;

l. for each failure to implement the storm sewer cleaning on the schedule required by Paragraph 20(d): $500 per day;

m. for failure to provide reports required under this Consent Decree, including the Annual Compliance Report: $500 per day for the first ten days of each violation; $1,000 per day for the next ten days of each violation; and $2,500 per day for each subsequent day of violation;

n. for each failure to timely submit or re-submit plans: $500 per day per plan;

o. for failure to conduct or document the training required by Paragraph 16: $1,000 per employee;

p. for failure to pay the civil penalty or accrued interest: $1,000 for each day that the payment is late; and

q. for violation of any other provision of this Consent Decree: $500 per day per violation.

24. Accrual of Stipulated Penalties. Stipulated Penalties under this Section shall begin to accrue on the day after performance is due or on the day a violation occurs, whichever is applicable, and shall continue to accrue until performance is satisfactorily completed or until the violation ceases. Stipulated Penalties shall accrue simultaneously for separate violations of this Consent Decree. Penalties shall accrue regardless of whether HDOT has been notified of a violation but need not be paid until a demand is made. HDOT shall pay any Stipulated Penalty within 30 days of receiving written demand therefore.

25. Demand. The United States and/or HDOH, may seek Stipulated Penalties under this Section.

26. Waiver of Stipulated Penalties. The United States or HDOH may, in the unreviewable exercise of its discretion, reduce or waive Stipulated Penalties otherwise due that sovereign under this Consent Decree. The determination by one sovereign not to seek Stipulated Penalties, or subsequently to waive or reduce the amount it seeks, shall not preclude the other sovereign from seeking Stipulated Penalties.

27. Payment. HDOT shall, as directed by the United States in its demand, pay Stipulated Penalties owing to the United States by EFT in accordance with Section VII, Paragraph 22.a, above. Any payment of Stipulated Penalties shall be accompanied by a transmittal memorandum referencing DOJ No. 90-5-1-1-07488/1 and the civil action number and stating that payment of Stipulated Penalties is being made. HDOT shall pay any Stipulated Penalties owing to HDOH in accordance with Paragraph 22.b.

28. Interest. If HDOT fails to pay Stipulated Penalties according to the terms of this Consent Decree, HDOT shall be liable for interest on such penalties, as provided for in 28 U.S.C. § 1961, accruing as of the date payment became due.

29. No Effect on Obligation to Comply. The payment of Stipulated Penalties shall not alter in any way HDOT's obligation to comply with the requirements of this Decree.

30. No Waiver of Other Remedies. Subject to the provisions of Section XII of this Consent Decree (Effect of Settlement/Reservation of Rights), the Stipulated Penalties provided for in this Consent Decree shall be in addition to any other rights, remedies, or sanctions available to the United States and HDOH for HDOT's violation of this Consent Decree or applicable law. Where a violation of this Consent Decree is also a violation of the Clean Water Act, HDOT shall be allowed a credit, for any Stipulated Penalties paid, against any statutory penalties imposed for such violation.

31. Effect of Dispute Resolution. Stipulated Penalties shall continue to accrue during any dispute resolution period, but need not be paid until the following:

a. If the dispute is resolved by agreement or by a decision of EPA that is not appealed to this Court, HDOT shall pay accrued Stipulated Penalties determined to be owing to the United States and HDOH within 15 days of the agreement or the receipt of EPA's decision or order;

b. If the dispute is appealed to the Court and the United States and HDOH prevail in whole or in part, HDOT shall pay all accrued Stipulated Penalties determined by the Court to be owed to the United States and HDOH within 30 days of receipt of the Court's decision or order, except as provided in Subparagraph c, below;

c. If the District Court's decision is appealed by HDOT or by the United States and HDOH, HDOT shall pay all accrued Stipulated Penalties determined by the District Court to be owing to the United States and HDOH into an interest-bearing escrow account within 30 days of receipt of the Court's decision or order. Stipulated Penalties shall be paid into this account as they continue to accrue, at least every 30 days. Within 15 days of receipt of the final appellate court decision, the escrow agent shall pay the balance of the account to the United States and HDOH, or to HDOT, in accordance with the court's mandate.

## IX. FORCE MAJEURE

32. Definition of Force Majeure. A "Force Majeure" event is any event beyond the control of HDOT, its contractors, or any entity controlled by HDOT that delays the performance of any obligation under this Consent Decree despite HDOT's best efforts to fulfill the obligation. "Best efforts" includes anticipating any potential Force Majeure event and addressing the effects of any such event (a) as it is occurring and (b) after it has occurred, to prevent or minimize any resulting delay to the greatest extent possible. In no case shall any of the following circumstances give rise to a claim of Force Majeure: unanticipated or increased costs or expenses associated with implementation of this

Decree or changed financial circumstances; failure to apply for a required permit or approval, or to provide in a timely manner information required to obtain a permit or approval, that is necessary to meet the requirements of this Decree; failure by HDOT to approve contracts; failure by HDOT to secure federal funding; or failure by HDOT to fill all staffing positions.

33. Required Notification. HDOT shall notify EPA and HDOH orally or by email as soon as possible, but not later than 72 hours after the time HDOT first knew of, or in the exercise of reasonable diligence under the circumstances should have known of, any event that might delay completion of any requirement of this Decree, whether or not the event is a Force Majeure event. HDOT shall make the oral or email notification to the United States required by this Paragraph by calling Ellen Blake at (415) 972-3496 or emailing: blake.ellen@epa.gov; in the event that HDOT is orally unable to reach Ellen Blake, such notification may be effective if HDOT leaves a detailed message explaining that notice is being provided pursuant to this Paragraph. HDOT shall make oral notification to HDOH by calling the HDOH Clean Water Branch, Enforcement Section Supervisor at (808) 586-4309 or emailing: CleanWaterBranch@doh.hawaii.gov; in the event that HDOT is orally unable to reach the Enforcement Section Supervisor, such notification may be effective if HDOT leaves a detailed message explaining that notice is being provided pursuant to this Paragraph. The United States and HDOH may designate alternative representatives to receive oral notification at their discretion by sending HDOT a written designation in accordance with Section XIV (Notification). Within seven days of providing oral notice, HDOT shall provide written notice to EPA and HDOH. The written notice HDOT submits pursuant to this Paragraph shall indicate

whether HDOT claims that the delay should be excused due to a Force Majeure event. The written notice shall describe in detail the basis for HDOT's contention that it has experienced, or may experience, a Force Majeure delay (if it intends to make such a claim); the anticipated length of the delay; the precise cause or causes of the delay; and the measures taken or to be taken to prevent or minimize the delay and the timetable by which those measures will be implemented. Failure to comply with the procedures of this Paragraph shall preclude HDOT from asserting any claim of Force Majeure.

34. Procedures for Extension. If the United States agrees that a Force Majeure event has occurred or will occur, the United States may agree to extend the time for HDOT to perform the affected requirements for the time necessary to complete those obligations. An extension of time to perform the obligations affected by a Force Majeure event shall not, by itself, extend the time to perform any other obligation. Where the United States agrees to an extension of time, the appropriate modification shall be made pursuant to Section XV of this Consent Decree (Modification).

35. Dispute Resolution. If the United States does not agree that a Force Majeure event has occurred, or does not agree to the extension of time sought by HDOT, the United States' position shall be binding, unless HDOT invokes Dispute Resolution under Section X of this Consent Decree. In any such dispute, HDOT bears the burden of proving, by a preponderance of the evidence, that each claimed Force Majeure event is a Force Majeure event; that HDOT gave the notice required by Paragraph 33, above; that the Force Majeure event caused any delay HDOT claims was attributable to that event; and that HDOT exercised best efforts to prevent or minimize any delay caused by the event.

## X. DISPUTE RESOLUTION

36. Exclusive Remedy. Unless otherwise expressly provided for in this Decree, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes between HDOT and the United States and HDOH arising under this Decree. However, the procedures set forth in this Section shall not apply to actions by the United States or HDOH to enforce obligations of HDOT that have not been disputed in accordance with this Section. The procedures set forth in this Section shall not apply to disputes between HDOH and the United States.

37. Informal Dispute Resolution. Any dispute subject to dispute resolution under this Consent Decree shall first be the subject of informal negotiations. The dispute shall be considered to have arisen when HDOT sends the United States and HDOH a written Notice of Dispute. Such Notice of Dispute shall state clearly the matter in dispute. The period of informal negotiations shall not exceed 20 days from the date the dispute arises, unless that period is modified by written agreement of the United States, HDOH, and HDOT. If the Parties cannot resolve a dispute by informal negotiations, then the position advanced by the United States (after consultation with HDOH) shall be considered binding unless, within 15 days after the conclusion of the informal negotiation period, HDOT invokes formal dispute resolution procedures set forth in Paragraph 38, below.

38. Formal Dispute Resolution.

a. Within 15 days after the conclusion of the informal negotiation period, HDOT may invoke formal dispute resolution procedures by serving on the United States and HDOH a written Statement of Position regarding the matter in dispute. The Statement of Position shall include, but may not be limited to, any factual data, analysis, or opinion supporting HDOT's position and any supporting documentation relied upon by HDOT.

b. The United States and HDOH shall serve their Joint Statement of Position within 45 days of receipt of HDOT's Statement of Position. The Joint Statement of Position shall include, but may not be limited to, any factual data, analysis, or opinion supporting that position and any supporting documentation relied upon by the United States and HDOH. The Joint Statement of Position shall be binding on HDOT, unless HDOT files a motion for judicial review of the dispute in accordance with Paragraph 39, below.

39. Petitions to the Court. In the event that the Parties cannot resolve a dispute by informal or formal negotiations as set forth above, the following procedures shall apply:

a. HDOT may seek judicial review of the dispute by filing with the Court and serving on the United States and HDOH a Motion requesting judicial resolution of the dispute. The Motion shall be filed within 10 days of receipt of the Joint Statement of Position set forth in Paragraph 38.b, above.

b. The Motion shall attach all Statements of Position and shall contain a written statement of HDOT's position on the matter in dispute, including any supporting factual data, analysis, opinion, and documentation, and shall set forth the relief requested and any schedule within which the dispute must be resolved for orderly implementation of the Consent Decree. HDOT shall serve such Motion on the United States and HDOH electronically and by overnight delivery.

c. The United States and HDOH shall jointly respond to HDOT's Motion within 30 days of the service of the Motion. The United States and HDOH agree to serve their Joint Response electronically and by overnight delivery.

d. HDOT may file a reply memorandum within 10 days of service of the Joint Response.

e. Standard and Scope of Review. In any dispute brought under this Paragraph, HDOT shall bear the burden of demonstrating that its position clearly complies with the Clean Water Act and the Act's implementing regulations and that Defendant is entitled to relief under applicable law. The United States reserves the right to argue that its position is reviewable only on the administrative record and must be upheld unless arbitrary and capricious or otherwise not in accordance with law.

40. Effect on Other Obligations. The invocation of dispute resolution procedures under this Section shall not, by itself, extend, postpone, or affect in any way any obligation of HDOT under this Consent Decree, unless and until final resolution of the dispute so provides. Stipulated Penalties with respect to the disputed matter shall continue to accrue from the first day of noncompliance, but payment shall be stayed pending resolution of the dispute as provided in Paragraph 38, above. If HDOT does not prevail on the disputed issue, Stipulated Penalties shall be assessed and paid as provided in Section VIII (Stipulated Penalties).

## XI. INFORMATION COLLECTION AND RETENTION

41. The United States, HDOH, and their representatives, including attorneys, contractors, and consultants, shall have the right of entry into any facility covered by this Consent Decree, at all reasonable times, upon presentation of credentials, to:

a. monitor the progress of activities required under this Consent Decree;

b. verify any data or information submitted to the United States or HDOH in accordance with the terms of this Consent Decree;

c. obtain samples and, upon request, splits of any samples taken by HDOT or its representatives, contractors, or consultants;

d. obtain documentary evidence, including photographs and similar data; and

e. assess HDOT's compliance with this Consent Decree.

42. Upon request, HDOT shall provide EPA and HDOH, or their authorized representatives, splits of any samples taken by HDOT. Upon request, EPA and HDOH shall provide HDOT splits of any samples taken by EPA or HDOH.

43. Until five years after the termination of this Consent Decree, HDOT shall retain, and shall instruct its contractors and agents to preserve, all non-identical copies of all documents, records, or other information (including documents, records, or other information in electronic form) in its or its contractors' or agents' possession or control, or that come into its or its contractors' or agents' possession or control, and that relates in any manner to HDOT's performance of its obligations under this Consent Decree. This information-retention requirement shall apply regardless of any contrary institutional policies or procedures. At any time during this information-retention period, the United States or HDOH may request copies of any documents, records, or other information required to be maintained under this Paragraph.

44. At the conclusion of the information-retention period provided in the preceding Paragraph, HDOT shall notify the United States and HDOH at least 90 days prior to the destruction of any documents, records, or other information subject to the requirements of the preceding Paragraph and, upon request by the United States or HDOH, HDOT shall deliver any such documents, records, or other information to EPA or HDOH. HDOT may assert that certain documents, records, or other information is privileged under the attorney-client privilege or any other privilege recognized by federal law. If HDOT asserts such a privilege, it shall provide the following: (1) the title of the document, record, or information; (2) the date of the document, record, or information; (3) the name and title of each author of the document, record, or information; (4) the name and title of each addressee and recipient; (5) a description of the subject of the document, record, or information; and (6) the privilege asserted by HDOT. However, no documents, records, or other information created or generated pursuant to the requirements of this Consent Decree shall be withheld on grounds of privilege.

45. HDOT may also assert that information required to be provided under this Section is protected as Confidential Business Information (CBI) under 40 C.F.R. Part 2. As to any information that HDOT seeks to protect as CBI, HDOT shall follow the procedures set forth in 40 C.F.R. Part 2.

46. This Consent Decree in no way limits or affects any right of entry and inspection, or any right to obtain information, held by the United States or HDOH pursuant to applicable federal or State laws, regulations, or permits, nor does it limit or affect any duty or obligation of HDOT to maintain documents, records, or other information imposed by applicable federal or State laws, regulations, or permits.

## XII. EFFECT OF SETTLEMENT

47. This Consent Decree resolves the civil claims of the United States and HDOH for the violations alleged in the Complaint filed in this action through the date of lodging.

48. The United States and HDOH reserve all legal and equitable remedies available to enforce the provisions of this Consent Decree, except as expressly stated in Paragraph 47. This Consent Decree shall not be construed to limit the rights of the United States or HDOH to obtain penalties or injunctive relief under the Act or its implementing regulations, or under other federal or State laws, regulations, or permit conditions, except as expressly specified in Paragraph 47.

49. This Consent Decree is not a permit, or a modification of any permit, under any federal, State, or local laws or regulations. HDOT is responsible for achieving and maintaining complete compliance with all applicable federal, State, and local laws, regulations, and permits; and HDOT's compliance with this Consent Decree shall be no defense to any action commenced pursuant to any such laws, regulations, or permits. The United States and HDOH do not, by their consent to the entry of this Consent Decree, warrant or waver in any manner that HDOT's compliance with any aspect of this Consent Decree will result in compliance with provisions of the Act or its implementing regulations or with any other provisions of federal, State, or local laws, regulations, or permits. Notwithstanding the United States' or HDOH's review and approval of any data, reports, or plans submitted pursuant to this Decree, HDOT shall remain solely responsible for compliance with this Decree.

50. This Consent Decree does not limit or affect the rights of HDOT or of the United States or HDOH against any third parties, not party to this Consent Decree, nor does it

limit the rights of third parties, not party to this Consent Decree, against HDOT, except as otherwise provided by law.

51. This Consent Decree shall not be construed to create rights in, or grant any cause of action to, any third party not party to this Consent Decree.

## XIII. MISCELLANEOUS

52. Headings. Headings in this Decree are provided for convenience only and shall not affect the substance of any provision.

53. Costs of Suit. The Parties shall bear their own costs of this action, including attorneys' fees, except that the United States and HDOH shall be entitled to collect the costs (including attorneys' fees) incurred in any action necessary to collect any portion of the civil penalty or any Stipulated Penalties due but not paid by HDOT.

## XIV. NOTIFICATION

54. When written notification or communication is required by the terms of this Decree, such notification or communication shall be addressed to the following individuals at the addresses specified below (or to such other addresses as may be thereafter designated by written notice to the parties):

As to the United States:

Chief, Environmental Enforcement Section
Environment & Natural Resources Division
U.S. Department of Justice
Box 7611, Ben Franklin Station
Washington, D.C. 20044-7611
Re: DOJ # 90-5-1-1-07488/1

As to EPA:

Chief, Water II Enforcement Office
Enforcement Division, ENF 3-2
U.S. EPA, Region 9

75 Hawthorne St.
San Francisco, CA 94105

As to HDOH:

Clean Water Branch
Enforcement Section Supervisor
Department of Health
Ala Moana Boulevard, Room 301
Honolulu, Hawai'i 96814-4920

and

Edward G. Bohlen
State of Hawai'i
Department of the Attorney General
Environmental Division
465 South King Street
Honolulu, Hawai'i 96813

As to HDOT:

Ford Fuchigami
Interim Director, Hawai'i Department of Transportation
869 Punchbowl Street
Honolulu, Hawai'i 96813-5097

and

H. Ramsey Ross
State of Hawai'i
Department of the Attorney General
Land/Transportation Division
465 South King Street
Honolulu, Hawai'i 96813

55. Notifications to or communications with HDOT, HDOH, EPA, or the United States shall be deemed submitted:

a. when required to be sent by mail, on the date they are postmarked and sent by certified mail, return receipt requested;

b. when required to be sent by overnight delivery, on the date they are picked up by the overnight delivery service; or

c. when required to be made electronically, on the date they are sent by electronic mail with confirmation of receipt.

## XV. MODIFICATION AND TERMINATION

56. Modification. The deadlines set forth in Section VI (Injunctive Relief) of this Decree may be modified, and those and other non-material modifications of this Decree shall be made by written agreement of the parties with notification to the Court. Where any modification constitutes a material change to any term of this Decree, it shall be effective only upon written agreement of the Parties and approval by the Court.

57. Request to Terminate Decree. No sooner than five years after entry of this Decree, HDOT may request the United States and HDOH's consent to termination of this Decree. In seeking such consent, HDOT shall provide a written report to the United States and HDOH that demonstrates:

a. HDOT has paid all civil penalties, Stipulated Penalties, and interest due under this Decree;

b. There are no unresolved matters subject to Dispute Resolution pursuant to Section X (Dispute Resolution);

c. No enforcement action under this Decree is pending; and

d. HDOT has fully and successfully completed the compliance requirements set forth in Section V (Injunctive Relief).

58. Response to Request for Termination

a. If the United States and HDOH agree that the Decree may be terminated, the Parties shall submit, for the Court's approval, a joint stipulation terminating the Decree.

b. If the United States and HDOH do not agree that the Decree may be terminated, HDOT may invoke Dispute Resolution under Section X of this Decree. However, HDOT shall not seek Dispute Resolution of any dispute regarding termination, under Paragraph 38 of Section X, until 60 days after service of its Request for Termination.

## XVI. INTEGRATION

59. This Consent Decree and its Appendices constitute the final, complete, and exclusive agreement and understanding among the Parties with respect to the settlement embodied in the Decree and supersede all prior agreements and understandings, whether oral or written, concerning the settlement embodied herein. Other than the Appendices, which are attached to and incorporated in this Decree, and submittals that are subsequently submitted and approved pursuant to this Decree, no other document, nor any representation, inducement, agreement, understanding, or promise, constitutes any part of this Decree or the settlement it represents, nor shall it be used in construing the terms of this Decree.

## XVII. APPENDICES

60. The following appendices are attached to and incorporated into this Consent Decree:

Appendix A: Audit Provision

Appendix B: Tenant Inspection Program Manual

Appendix C: Outfall Reconnaissance Inventory and Inspection Plan Manual

Appendix D: Enforcement Response Plan (to be submitted for approval)

Appendix E: Construction Site Runoff Control Program Manual

Appendix F: Post-Construction Stormwater Management Program Manual

Appendix G: Storm Sewer System Operation and Maintenance Program (to be submitted for approval)

Appendix H: Development of Geographic Information System (GIS) Layers for State of Hawai'i, Department of Transportation, Harbors Division Project by ACOE

## XVIII. ENTRY AND FINAL JUDGMENT

61. Authority to Sign Decree. The undersigned representatives of HDOT certify that they are authorized to enter into and to execute this Decree and to legally bind HDOT to the terms and conditions of the Decree and that they meet the requirements for authorized signatory found in 40 C.F.R. § 122.22. The undersigned representatives of HDOH and the United States each certifies that he or she is authorized to enter into and to execute this Decree and to legally bind the Party that he or she represents to the terms and conditions of the Decree.

62. Counterparts. This Consent Decree may be signed in counterparts, and its validity shall not be challenged on that basis.

63. Designation of Agent for. HDOT shall identify on the attached signature page the name and address of an agent who is authorized to accept service of process by mail on HDOT's behalf with respect to all matters arising under or relating to this Decree. HDOT agrees to accept service in that manner and to waive the formal service requirements of

Federal Rule of Civil Procedure 4 and 5 and any applicable local rules of this Court, including, but not limited to, service of summons.

64. Public Notice. This Consent Decree shall be lodged with the Court for a period of not less than 30 days for public notice and comment in accordance with 28 C.F.R. § 50.7. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or considerations indicating that the Consent Decree is inappropriate, improper, or inadequate. HDOT agrees not to oppose entry of this Consent Decree by the Court or to challenge any provision of the Decree, unless the United States has notified HDOT in writing that it no longer supports entry of the Decree.

65. Final Judgment. Upon approval and entry of this Consent Decree by the Court, this Consent Decree shall constitute a final judgment of the Court as to the United States, HDOH, and HDOT. The Court finds that there is no just reason for delay and therefore enters this judgment as a final judgment under Federal Rule of Civil Procedure 54 and 58.

66. Retention of Jurisdiction. The Court shall retain jurisdiction over this case until termination of this Consent Decree, for the purpose of resolving disputes arising under this Decree or entering orders modifying this Decree, pursuant to Sections X and XV, or effectuating or enforcing compliance with the terms of this Decree.

SO ORDERED AND APPROVED.

DATED: Honolulu, Hawaii, November 5, 2014.

UNITED STATES DISTRICT COURT
DISTRICT OF HAWAII

/s/ J. Michael Seabright
J. Michael Seabright
United States District Judge

We hereby consent to entry of the foregoing Consent Decree, subject to the Notice and Comment Provisions of 28 C.F.R. § 50.7 and Paragraph 64 of this Decree:

FOR THE UNITED STATES OF AMERICA

Date: 8/30/14

Sam Hirsch

SAM HIRSCH
Acting Assistant Attorney General
Environment and Natural Resources Div.
U.S. Department of Justice
Washington, D.C. 20530

Date: 9/5/14

James A. Lofton

JAMES A. LOFTON
Counsel to the Chief
Environmental Enforcement Section
Environment and Natural Resources Div.
U.S. Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
(202) 514-2445
jim.lofton@usdoj.gov

We hereby consent to entry of the foregoing Consent Decree, subject to the Notice and Comment Provisions of 28 C.F.R. § 50.7 and Paragraph 64 of this Decree:

FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY

Date: ________________ ________________________________________

CYNTHIA GILES
Assistant Administrator
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
Ariel Rios Building, 2241-A
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Date: ____________________ ____________________________________________

KELLY BRANTNER
Office of Civil Enforcement
Water Enforcement Division
U.S. Environmental Protection Agency,
Mail Code 2243A
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

We hereby consent to entry of the foregoing Consent Decree, subject to the Notice and Comment Provisions of 28 C.F.R. § 50.7 and Paragraph of this Decree:

FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY

Date: 6/27/14

Cynthia Giles

CYNTHIA GILES
Assistant Administrator
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
Ariel Rios Building, 2241-A
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Date: 6/27/14

Kelly K Brantner

KELLY K. BRANTNER
Office of Civil Enforcement
Water Enforcement Division
U.S. Environmental Protection Agency,
Mail Code 2243A
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

We hereby consent to entry of the foregoing Consent Decree, subject to the Notice and Comment Provisions of 28 C.F.R. § 50.7 and Paragraph 64 of this Decree:

FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY

Date: 8/20/14

JARED BLUMENFELD
Regional Administrator
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street
San Francisco, California 94105

Date: 8/14/2014

ELLEN BLAKE
Assistant Regional Counsel
U.S. EPA, Region 9
75 Hawthorne Street
San Francisco, California 94105
(415) 972-3496
Blake.ellen@epa.gov

We hereby consent to entry of the foregoing Consent Decree, subject to the Notice and Comment Provisions of 28 C.F.R. § 50.7 and Paragraph 64 of this Decree:

FOR THE HAWAIʻI DEPARTMENT OF HEALTH

Date: 8/14/14

GARY GILL
Deputy Director for Environmental Health,
Hawaiʻi Department of Health
1250 Punchbowl Street
Honolulu, Hawaiʻi 96813

Date: 8/14/14

EDWARD G. BOHLEN
Deputy Attorney General
Health and Human Services Division
Department of the Attorney General
465 South King St., Room 200
Honolulu, Hawaiʻi 96813
(808) 587-2994
Edward.G.Bohlen@hawaii.gov

We hereby consent to entry of the foregoing Consent Decree, subject to the Notice and Comment Provisions of 28 C.F.R. § 50.7 and Paragraph 64 of this Decree:

FOR THE HAWAI'I DEPARTMENT OF TRANSPORTATION

Date: 8.13.14

FORD FUCHIGAMI
~~Interim~~ Director, Hawai'i Department of Transportation
869 Punchbowl Street
Honolulu, Hawai'i 96813

Date: 8/13/14

H. RAMSEY ROSS
Deputy Attorney General
Land/Transportation Division
Department of the Attorney General
465 South King St., Room 300
Honolulu, Hawai'i 96813
(808) 587-2994
H.Ramsey.Ross@hawaii.gov

# APPENDIX A

## ENVIRONMENTAL COMPLIANCE AUDITS

### A. General Provisions

1. This Appendix provides details of the semi-annual NPDES MS4 compliance audits required by Paragraph 10.d of the Consent Decree. The semi-annual audits shall include evaluation of common stormwater program elements at each of HDOT's three divisions (Airports, Highways and Harbors), as stated in Paragraph A.3 below, throughout the state on a per element schedule. The audits shall be completed to fulfill the following goals:
    a. Determine and achieve compliance with the federal regulations and state MS4 permits and regulations and this Consent Decree (see Paragraph A.2, below);
    b. Ensure information gathered during the audits is used to promote information and technology transfer between divisions; and
    c. Identify deficiencies and potential violations that are discovered by the third party auditor and allow for timely self-correction of the deficiencies and potential violations by HDOT.
2. The audits shall be designed to assess current regulatory and administrative compliance with the following items throughout each of HDOT's divisions:
    a. The Hawaii NPDES General Permit Authorizing Discharges of Storm Water and Certain Non-Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (Hawaii Small MS4 General Permit), Hawaii Administrative Rules, chapter 11-55, Appendix K;
    b. NPDES permit, Permit NO. HI S000001, MS4 Permit for the HDOT-Highways, Oahu District;
    c. NPDES Permit, Permit No. HIS000005, MS4 Permit for the HDOT-Airports, Honolulu International Airport;
    d. Applicable Storm Water Management Plans (SWMPs);
    e. This Consent Decree; and
    f. Future NPDES MS4 permits and SWMPs issued to HDOT. This obligation shall not delay or prevent termination of the Consent Decree.
3. The audits shall include, but not be limited to, an evaluation of the following MS4 Program Elements as they relate to compliance at each of HDOT's three divisions:
    a. Public Education/Outreach and Participation/Involvement
    b. Illicit Discharge Detection and Elimination (including commercial/tenant oversight programs)
    c. Construction Site Runoff Control
    d. Post-Construction Runoff Control/ Permanent BMPs
    e. Pollution Prevention/ Good Housekeeping
    f. An analysis of how Staffing, Funding, Organizational Structure, Availability of Resources and Storm Water Program Sustainability impact MS4 compliance
4. HDOT shall audit Program Elements for the Harbors, Airports and Highways Divisions in accordance with the schedule defined in the Work Plan described in Paragraph B.1, below.

5. The audits shall be conducted by a qualified third party environmental consulting firm retained by HDOT and selected by a committee consisting of representatives of the HDOH and HDOT. The selection committee shall choose an audit firm which is experienced with environmental auditing and the permits and regulations described in Paragraph A.2, above.
6. The requirements of this Appendix related to the consulting firm's qualifications, authority to conduct the audits, and production of the HDOT Audit Reports (Audit Reports) shall be incorporated in any contract relating to the audits entered into by HDOT and the selected consulting firm to the extent allowed by State Procurement Code.
7. Any violations by HDOT discovered though the execution of the Environmental Compliance Audit detailed in this Appendix are neither "voluntarily discovered" within the terms of EPA's revised *Incentives for Self-Policing: Discovery, Disclosure, Correction and Prevention of Violations Policy* (Audit Policy) nor voluntarily disclosed to EPA under EPA penalty policies. Accordingly, any such violations are ineligible for penalty mitigation or other favorable treatment under the Audit Policy.
8. HDOT agrees not to attempt to use any state audit and/or privilege laws to restrict EPA's or HDOH's ability to review the Audit Reports at HDOT facilities to determine if the audits have been properly completed and HDOT has corrected any uncorrected non-compliance, potential violation, or deficiency as per its certification (see Paragraph F below). Also, HDOT agrees not to attempt to use any state audit and/or privilege laws to restrict EPA's or HDOH's ability to obtain, review and/or use the Audit Reports in any action to enforce the audit provisions of the Consent Decree. Neither information contained in the Audit Reports, nor underlying information upon which the Audit Reports relied, that indicates regulatory violations at any HDOT facility, shall be claimed as confidential business information by HDOT or its consulting firm.

**B. Work Plan/ Procurement of Services**

1. Within 90 days after entry of the Consent Decree, HDOT shall submit a draft audit work plan (Audit Work Plan) to EPA and HDOH for their review and approval. In developing the Audit Work Plan, HDOT shall consult EPA's guidance on auditing small MS4s: http://www.epa.gov/npdes/pubs/ms4guide_withappendixa.pdf The Audit Work Plan shall include the following audit schedule and describe each task necessary to accomplish the Audit Scope with targeted time frames for the consulting firm to complete:
    a. 3 months after contract notice to proceed: Evaluation of Post Construction/Permanent BMP programs for all three HDOT divisions;
    b. 9 months after contract notice to proceed: Evaluation of Construction Site Runoff Control programs for all three HDOT divisions;
    c. 15 months after contract notice to proceed: Evaluation of Public Outreach/Public Involvement for all three HDOT divisions;
    d. 21 months after contract notice to proceed: Evaluation of Illicit Discharge Detection and Elimination, Industrial Commercial Activities/Tenant Programs for all three HDOT Divisions;
    e. 27 months after contract notice to proceed: Evaluation of Pollution Prevention/Good Housekeeping for all three HDOT Divisions;
    f. 33 months after contract notice to proceed: Evaluation of Staffing, Funding, Organizational Structure, Availability of Resources and Storm Water Program Sustainability for all three HDOT divisions.

2. The Audit Work Plan shall include all details necessary to develop an HDOT Request for Proposal. This includes but is not limited to: required qualifications of the audit firm, minimum documents to be reviewed (e.g. SWMPs, training records, inspection reports, etc.), minimum number of field verifications, as necessary, for each program element evaluated, deliverables (notices of potential violations, draft and final audit reports), and reporting deadlines.
3. EPA, after consultation with HDOH, may reject the Audit Work Plan in whole or in part. If EPA rejects the Audit Work Plan or any portion of it, EPA shall identify the reason(s) in writing to HDOT for such rejection and may require HDOT to redraft the Audit Work Plan in its entirety or any rejection portion. If EPA does not provide written notice to HDOT of its determination within 45 days of HDOT's submission of the Audit Work Plan (or, as applicable, the revised Audit Work Plan), HDOT's proposed Audit Work Plan shall be deemed approved by EPA and HDOH.
4. Within 30 days of approval of the Audit Work Plan or another length of time agreed to by EPA and HDOH, HDOT shall advertise a Request for Proposal for the Audit Work Plan. Advertisement for the Request for Proposal shall not exceed 45 days.
5. Within 30 days of the end of the Request for Proposal period, the HDOT and HDOH selection committee shall conduct the professional services selection of an audit firm and provide the recommendation to the Director.
6. Within 15 days of the selection committee recommendation to the Director of Transportation, or another length of time agreed to by EPA and HDOH, HDOT shall notify the potential audit firm with a letter of selection, pending negotiation of fees.
7. Within 30 days or another length of time agreed to by EPA and HDOH, HDOT shall as approved by the Director of Transportation, award the selected audit firm and proceed to process the contract for the Audit Work Plan.
8. Within 7 days of each milestone listed below, HDOT shall notify EPA and HDOH that the following milestones were completed:
    a. Request for Proposal advertisement;
    b. Awarding of Contract;
    c. Notice to Proceed.

## C. Audits

1. HDOT shall take all appropriate measures to facilitate the audit firm in performing the audits in accordance with the approved Audit Work Plan.
2. HDOT shall grant the audit firm full access to, and unrestricted review of all HDOT records, documents and information that the audit firm requires to complete the audits.

## D. Reporting/Audit Reports

1. HDOT shall require the audit firm to provide preliminary written notice of any potential violations identified in any audit to HDOT, EPA and HDOH within 2 business days following an audit of a program element in Paragraph B.1, above.
2. HDOT shall require the audit firm to complete a draft audit report to HDOT within 45 days of completing an audit of a program element.
3. HDOT shall review the draft audit report to correct any factual inaccuracies within 30 days after receiving the draft audit report.

4. HDOT shall require the audit firm to complete a final audit report within 120 days, or another length of time agreed to by EPA and DOH, of completing an audit of a program element.
5. HDOT shall submit original draft and final audit reports to EPA and HDOH with the Annual Compliance Report (ACR).
6. HDOT shall provide a detailed summary of any actions taken as a result of the audit reports and dates at which those actions were taken with the ACR.
7. The HDOT Audit Reports shall contain:
    a. A specific statement of the procedures followed, HDOT sites and activities visited and all materials reviewed during the audits;
    b. Retrospective analysis of activities that may be outmoded, ineffective, insufficient, or excessively burdensome, and recommendations to modify, streamline, or expand them in accordance with what has been learned;
    c. An identification of deficiencies (items which, if not corrected, will lead to potential violations) and potential violations with the applicable SWMPs, this Consent Decree, and/or applicable permit and regulations, and recommendations for improvement;
    d. Identification of best practices and opportunities for information/technology transfer to be applied across all divisions; and
    e. An analysis of the practices implemented for each Division's program elements and a determination as to whether identified best practices can be universally implement across all three Divisions. If best practices cannot be universally implemented, the report shall clearly describe the identified impediments.
8. HDOT shall correct any deficiency or potential violation identified in the Audit Reports or otherwise discovered by HDOT as part of the audit process set forth herein within the time frames identified in Paragraph E below.

## E. Corrections of Potential Violations and Deficiencies

1. HDOT shall correct any potential violations within 14 days of notification as described in D.1 of this Appendix, or another period of time agreed to by EPA and DOH. In order for EPA and DOH to agree to an extension, HDOT must provide a corrective action workplan, including a final compliance date, to EPA and HDOH.
2. HDOT shall correct any deficiencies within 21 days of receiving the draft Audit Report, or another period of time agreed to by EPA and HDOH. In order for EPA and HDOH to agree to an extension, HDOT must provide a corrective action workplan, including a final compliance date, to EPA and HDOH.
3. If HDOT corrects any violation discovered through the Audit process within the time frames described above, it shall not be subject any related stipulated penalties under Paragraph 30.
4. Notwithstanding anything in E.3 of this Appendix, the United States and HDOH reserve all legal and equitable remedies available to enforce the provisions of this Consent Decree or to obtain penalties or injunctive relief under the Act or its implementing regulations, or under other federal or State laws, regulations, or permit conditions, if HDOH or EPA independently discovers a violation of a permit, law, or statute.

5. Similarly, United States and HDOH, reserve all legal and equitable remedies available to enforce the provisions of this Consent Decree or to obtain penalties or injunctive relief under the Act or its implementing regulations, or under other federal or State laws, regulations, or permit conditions, if an activity or violation poses an immediate threat to human health or the environment.

**F. Certifications**

1. HDOT shall provide the following information and certifications to EPA and HDOH regarding completion of each audit and correction of any non-compliance or potential violation identified in the Audit Reports or otherwise discovered by HDOT as part of the audit process within an Environmental Compliance Audit section of the ACR. An authorized HDOT official shall certify that, to the best of the official's knowledge and information, the audits were conducted in accordance with the Work Plan described above, the Audit Reports are submitted to HDOT, EPA and HDOH in the ACR as described above, and all items of non-compliance identified in the Audit Reports have been corrected or steps have been taken to correct them. If all items have not been corrected, HDOT must include a schedule for correcting the issue.

# Final

# Harbors Tenant Inspection Manual


**State of Hawaii**
**Department of Transportation**
**Harbors Division**
**79 South Nimitz Highway**
**Honolulu Hawaii 96813-5898**

**August 2014**

Version 9.0

# Final

# Harbors Tenant Inspection Manual

**State of Hawaii**
**Department of Transportation**
**Harbors Division**
**79 South Nimitz Highway**
**Honolulu, Hawaii 96813-4898**

**August 2014**

Version 9.0

## Record of Revision

| Revision No. | Revision Date | Description | Sections Revised |
|---|---|---|---|
| 1.0 | November 2009 | Initial Release | All |
| 2.0 | November 2012 | Second Revision | All |
| 3.0 | June 2013 | Third Revision | 3.0, 4.0, and 5.0 |
| 4.0 | July 2013 | Fourth Revision | 3.0, 4.0, and 5.0 |
| 5.0 | December 2013 | Fifth Revision | All |
| 6.0 | February 2014 | Sixth Revision | 2.0, 3.0, 4.0, and 5.0 |
| 7.0 | April 2014 | Seventh Revision | 2.0 and 5.0 |
| 8.0 | May 2014 | Eighth Revision | 2.0, 4.0, and 5.0 |
| 9.0 | August 2014 | Ninth Revision | 1.0 |
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# List of Acronyms

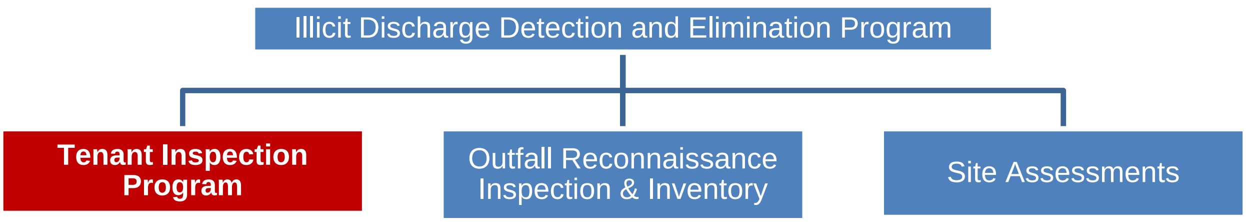
| | |
|---|---|
| AFFF | Aqueous Film Forming Foam |
| AST | Aboveground Storage Tank |
| BMP | Best Management Practice |
| CCH | City and County of Honolulu |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CESQG | Conditionally Exempt Small Quantity Generator |
| CFR | Code of Federal Regulations |
| CWA | Clean Water Act |
| CWB | Clean Water Branch |
| DLNR | Department of Land and Natural Resource |
| ECO | Environmental Compliance Officer |
| EHS | Extremely Hazardous Substance |
| EMS | Environmental Management System |
| EPCRA | Emergency Planning and Community Right-to-Know Act |
| ERP | Enforcement Response Plan |
| ºF | Degree of Fahrenheit |
| FWPCA | Federal Water Pollution Control Act |
| HAR | Hawaii Administrative Rules |
| HAZCOM | Hazard Communication |
| HCDA | Hawaii Community Development Authority |
| HDOH | State of Hawaii, Department of Health |
| HDOT | State of Hawaii, Department of Transportation |
| HEPCRA | Hawaii Emergency Planning and Community Right-to-Know Act |
| HERL | Hawaii Environmental Response Law |
| HRS | Hawaii Revised Statutes |
| HSERC | Hawaii Emergency Response Commission |
| IDDE | Illicit Discharge Detection and Elimination |
| LEPC | Local Emergency Planning Committees |
| LQG | Large Quantity Generator |
| MS4 | Municipal Separate Storm Sewer System |
| MSDS | Material Safety Data Sheet |
| NAICS | North American Industrial Classification System |
| NAV | Notice of Apparent Violation |
| NCP | National Contingency Plan |
| NFVO | Notice and Finding of Violation Order |
| NGPC | Notice of General Permit Coverage |
| NOI | Notice of Intent |
| NPDES | National Pollutant Discharge Elimination System |
| NRC | National Response Center |
| OSC | On-Scene Coordinator |
| OSHA | Occupational Safety and Health Administration |

| | |
|---|---|
| OWS | Oil/Water Separator |
| P2 | Pollution Prevention |
| PCB | Polycyclic Chlorinated Biphenyls |
| psi | pound-force per square inch |
| RCRA | Resource Conservation and Recovery Act |
| SARA | Superfund Amendments and Reauthorization Act |
| SCP | State Contingency Plan |
| SHOT | Stormwater Hotline Occurrence Tracking |
| SHWB | Solid and Hazardous Waste Branch |
| SIC | Standard Industrial Code |
| SPCC | Spill Prevention, Control, and Countermeasure |
| SQG | Small Quantity Generator |
| sVGP | Small Vessel General Permit |
| SWDA | Solid Waste Disposal Act |
| SWMP | Storm Water Management Plan |
| SWPC | Storm Water Pollution Control |
| TIM | Tenant Inspection Manual |
| TPQ | Threshold Planning Quantity |
| TSCA | Toxic Substance Control Act |
| USC | United States Code |
| USCG | United States Coast Guard |
| UST | Underground Storage Tank |
| VGP | Vessel General Permit |

## 1.0 TENANT INSPECTION MANUAL

This Tenant Inspection Manual [TIM] is a component within the State of Hawaii Department of Transportation [HDOT], Harbors Division's environmental program, designed to eliminate polluted discharges to its storm drain system and State waters from Harbor's tenants. The TIM is also a part of the greater Illicit Discharge Detection and Elimination [IDDE] program implemented by HDOT Harbors Division (hereinafter referred to as "Harbors"). This manual is for Harbors personnel tasked with the responsibility of environmental compliance. As part of the TIM, Harbors has implemented a stormwater risk ranking system for all Harbors tenants that allows for improved allocation of environmental oversight to those areas of harbor operations where environmental impacts are highest, as well as to provide an objective assessment of tenant activities at their facilities.

**Figure 1-1 IDDE Structure Chart**




"Tenant" shall mean a person, group, partnership, corporation, or any other entity that has an executed lease, revocable permit or disposition instrument under chapter 171, Hawaii Revised Statutes [HRS] to use or occupy land, a building, structure, or other property owned by Harbors. This term also includes Harbors' approved sub-tenants and entities using container or terminal facilities.

### 1.1 HDOT Harbors Division Environmental Organization

Harbors environmental organization is centralized within the Engineering Branch at the Hale Awa Ku Moku Building, located at 79 South Nimitz Highway, Honolulu Hawaii 96813. The Environmental Section Supervisor reports to the Engineering Program Manager. The Engineering Program Manager reports to Deputy Director, who in turn reports to the Director of Transportation.

Harbors Environmental Section consists of one supervisor and several staff environmental health specialists and/or environmental engineers. The Environmental Section Supervisor continuously evaluates workloads and assigns new tasks based on location, technical expertise, and current workload. This management structure allows for immediate access to the Environmental Section by Harbors Districts, while maximizing utilization and therefore spreading the workload more evenly.

The Harbors TIM is overseen by the Harbors Environmental Section. This manual is for use by the Harbors Environmental Section and others associated with the Tenant Inspection Program. One copy of *HDOT Harbors Division Administrative Organizational Chart* is enclosed in Attachment 1 with Environmental Section highlighted in green.

## 1.2 Applicability

Harbors implements this Tenant Inspection Program at the following harbors:

- Honolulu Harbor (Oahu District)
- Kalaeloa Barbers Point Harbor (Oahu District)

These two harbors operate under small Municipal Separate Storm Sewer System [MS4] permits. The Permit File Numbers are ***HI 03KB482*** for Honolulu Harbor and ***HI 03KB488*** for Kalaeloa Barbers Point Harbor. This program applies to all active tenants inventoried in the database as well as new tenants to-be-added to the database.

Inspection and risk ranking criteria (covered in this manual) are related to vessel operations conducted solely on-land.

## 1.3 Tenant Requirements

All Harbors tenant lease agreements and revocable permits include language stating that the tenant is responsible for compliance with all environmental laws and regulations. For example, tenants conducting industrial activities within their exclusive areas must seek separate National Pollutant Discharge Elimination System [NPDES] permit coverage from the State of Hawaii Department of Health [HDOH], if required. Environmental Protection Agency [EPA] regulated hazardous substances and marine pollutants are not allowed to be used, treated, stored, or disposed, unless they are incidental to normal operations of the tenant’s business.

All new tenant lease agreements and revocable permits require that, prior to bringing any EPA regulated hazardous substance or chemical on site, the tenant must obtain Harbors consent. Details of the lease agreements and revocable permits are included in Attachment 2. Summaries of a list of major pertinent environmental regulations are enclosed in Attachment 9.

Failure to comply with clauses specified in the lease agreement or revocable permit may result in civil/criminal penalties or termination of the lease or revocable permit. Severe environmental violations are to be reported to HDOH, EPA or other appropriate regulatory agency for escalated enforcement.

Tenants desiring to develop improvement projects on Harbors property must obtain approval from Harbors prior to initiation of the project. The tenants are responsible for obtaining permits from appropriate regulatory agencies and for furnishing proof to Harbors before commencing with construction activities. These permits include, but are not limited to, NPDES permits, building permits, grading permits, dredging permits, special management area [SMA] permits, permits to discharge into the State Harbors Drainage System, and permits for discharging/connection to the State Harbors Drainage System. For a project requiring an NPDES permit during construction, required BMPs should be implemented to minimize the discharge of pollutants. Harbors will inspect the tenant project BMPs on a regular basis. Violations observed during inspections will be documented, and enforcement actions will be taken following the procedures in Enforcement Response Plan [ERP] (Harbors, 2014). A comprehensive list of BMPs related to construction is documented in *Construction Site Runoff Control Program* (Harbors, 2013).

## 1.4 Vessel Owners Responsibility

Harbors tenants owning or operating vessel(s) are subject to requirements of the Vessel General Permit [VGP] regulated by EPA. In addition, any vessel maintenance, repair, washing, and fueling activities must be conducted following United States Coast Guard [USCG] regulations. Inspection and risk ranking criteria (covered in this manual) are related to vessel operations conducted solely on-land. Details of the pertinent VGP are included in Attachment 12.

# 2.0 TENANT INSPECTIONS

## 2.1 Overview

Harbors conducts various types of inspections of its tenants to prevent the discharge of pollutants to its storm drain system and State waters. Tenant inspection types include: **new inspections**, conducted within three months of new tenant occupancy; **routine inspections**, conducted at frequencies based on a tenant's risk ranking; **investigation inspections**, when a suspected illicit discharge is observed; **annual reconnaissance inspections**, conducted for low-risk ranked tenants; **follow-up inspections** which may be required when corrective actions must be confirmed; or **final inspections**, which are conducted prior to lease termination.

Note that tenants areas, occupying or using subsurface or submerged land (e.g., easement holders), are excluded from the TIM. To date, Harbors has inspected and risk-ranked each tenant. Each tenant has been assigned a risk designation of high, medium, or low, based on the results of the inspections and risk ranking procedures. The most up-to-date risk designation of each tenant determines the frequency of routine tenant inspections.

Harbors Environmental Section maintains a tenant database that includes information such as company name, harbor, contact information (primary and alternative if available), mailing address, email address if available, and risk ranking. In addition, the database includes other information such as tenant general information (major operations conducted at the site), inspection results (e.g., inspection dates, materials stored on site, list of potential pollution sources, etc.), risk ranking, NPDES permit number (if any), and enforcement actions (e.g., required corrective actions).

## 2.2 Inspection Types

### *2.2.1 Initial Site Inspection/New Tenant Inspection*

The initial site inspection (or new tenant inspection) is conducted within three months of the new tenant occupying an existing facility, or the tenant's completion, construction, and occupancy of a newly constructed facility. The purpose of the new tenant inspection is to identify any environmental asset, initiate and assign a risk ranking, and to convey the applicable environmental regulations contained in the Harbors SWMP program for the new tenant. In addition, it can also help identify applicable BMPs for the new tenant.

This type of inspection will use ***Environmental Compliance, BMP, and P2 Inspection Checklist for Tenants*** (enclosed in Attachment 4) as a primary tool. Information obtained from the inspection will be recorded in the database and a risk ranking will be properly assigned for the new tenant.

Ongoing coordination with Harbors Property Management Section enables site inspections of new tenant operations. Notification of a new lease or revocable permit will trigger a new tenant inspection. If necessary (e.g., significant operational or exclusive use area changes occur for an existing tenant), a new tenant inspection will be conducted within three months at an existing tenant's facility when a lease or revocable permit is replaced with a new one. If a violation is observed during the inspection, HDOT will 1) document the violation in the inspection report, 2) disclose and explain the violation to the tenant and/or responsible party at the time of inspection, and 3) follow-up in accordance with the steps described in *Section 5.0 – Enforcement*, and the inspection report will be completed within 20 days.

### *2.2.2 Routine Tenant Inspection*

Routine tenant inspections are required under Harbors storm water management program and will utilize the revised *Environmental Compliance, BMP, and P2 Inspection Checklist for Tenants* (enclosed in Attachment 4) as a primary tool. The primary purpose of the inspection is to evaluate whether the facility causes or contributes to water pollution, how facility operations comply with Harbors storm water management program, major environmental laws, applicable BMPs, pollution prevention [P2], and relevant clauses contained within a lease agreement (or revocable permit). The tenants are inspected and evaluated based on risk ranking criteria discussed in *Section 4.3 – Risk Ranking Criteria*. Information obtained through inspection is recorded in the database. The frequency of routine tenant inspections is based on the risk ranking designation of each tenant.

Tenants with a "High Risk" designation are inspected every six months, tenants with a "Medium Risk" designation are inspected annually, and tenants with a "Low Risk" designation are inspected every five years. In the meantime, tenants with a "Low Risk" designation are subject to an annual reconnaissance inspection as described in Section 2.2.3.

Updated risk rankings for the tenants are maintained in the database (i.e. *Harbors_Tenants.mdb*) by Harbors Engineering Branch Environmental Section. The database will be updated using the information gathered on a regular basis (e.g., monthly). Some tenants may have more than one facility. It is possible that each of their facilities is on a separate inspection schedule based on their physical locations, drainage area, and risk ranking.

If a potential violation is observed during the inspection, the inspector is to issue a verbal warning on the spot and record the warning as part of the inspection report. A copy of inspection report will be provided to the tenant upon completion. If necessary, a follow-up inspection will be conducted, see Section 2.2.6.

If a violation is observed during the inspection, HDOT will 1) document the violation in the inspection report, 2) disclose and explain the violation to the tenant and/or responsible party at the time of inspection, and 3) follow-up in accordance with the steps described in *Section 5.0 – Enforcement*, and the inspection report will be completed within 20 days.

### *2.2.3 Reconnaissance Inspections for "Low Risk" Tenants*

Tenants with "Low" risk ranking designations are subject to annual reconnaissance inspections. Reconnaissance inspections are conducted to ensure that tenants have not changed his/her activities or operations such that a new risk assessment is warranted. This type of inspection includes driving a state-marked vehicle to observe low-risk rank tenants based on their previous year's evaluation. *Low-Risk Tenant Reconnaissance Inspection Form* (enclosed in Attachment 6) will be utilized as a primary tool.

If a reconnaissance inspection identifies a substantive change to a facility's operation, size or activities, HDOT-Harbors shall conduct an inspection within 30 days of the reconnaissance inspection to determine if the facility's risk ranking needs to change.

If a violation is observed during the inspection, HDOT will 1) document the violation in the inspection report, 2) disclose and explain the violation to the tenant and/or responsible party at the time of inspection, and 3) follow-up in accordance with the steps described in *Section 5.0 – Enforcement*, and the inspection report will be completed within 20 days.

### *2.2.4 Final Site Inspection*

Final inspections are necessary to identify potential environmental issues needing resolution prior to lease termination. This type of inspection will use *Environmental Compliance, BMP, and P2 Inspection Checklist for Tenants* (enclosed in Attachment 4) as a primary tool. Tenants with environmental assets such as fuel tanks, maintenance areas, or hazardous materials and/or waste storage activities pose a potential risk to the environment and public, which subsequently place Harbors as the landowner in a vulnerable position. Prior to terminating leases (or revocable permits) for these tenants, past inspection records shall be reviewed.

Examples of potential environmental issues include environmental site assessments related to Underground Storage Tank [UST] closure, disposal of solid and hazardous wastes, and removal of contaminated oil. In addition, tenants can be required to conduct appropriate environmental investigations, assessments, and remediation to ascertain the presence and extent of environmental contamination resulting from their operations.

If a violation is observed during the inspection, HDOT will 1) document the violation in the inspection report, 2) disclose and explain the violation to the tenant and/or responsible party at the time of inspection, and 3) follow-up in accordance with the steps described in *Section 5.0 – Enforcement*, and the inspection report will be completed within 20 days.

### *2.2.5 Investigation Inspection*

Whenever a pollution complaint or suspected illicit discharge regarding a tenant is observed and/or reported to Harbors, a formal investigation inspection, if necessary, will be started by the next working day. The investigation will be documented using *Stormwater Hotline Occurrence Tracking [SHOT] Form* (enclosed in Attachment 5) by Harbors Environmental Section within seven days after the inspection. The inspector is to verify whether or not an illicit discharge has occurred. If one has occurred, the source of the pollutants is to be identified and, as applicable, a verbal and/or written warning (e.g., *Notice of Apparent Violation*) is issued to the violator. The illicit discharge must be eliminated and follow-up inspections shall be conducted as necessary.

If a violation is observed during the inspection, HDOT will 1) document the violation in the inspection report, 2) disclose and explain the violation to the tenant and/or responsible party at the time of inspection, and 3) follow-up in accordance with the steps described in *Section 5.0 – Enforcement*, and the inspection report will be completed within 20 days.

Written investigation records will be kept as part of the environmental compliance program. If the source is traced to a tenant, the tenant’s risk ranking will be re-evaluated.

### *2.2.6 Follow-up Inspection*

When an illicit discharge or (potential) violation from a tenant facility or activity is discovered, a follow-up inspection will be conducted. The follow-up inspection will be scheduled to correspond to dates outlined in the enforcement letter issued to the responsible party to ensure that proper corrective actions are taken. (See *Section 5.0 – Enforcement* for a description of the enforcement letter.) This type of inspection will be conducted utilizing the applicable sections of the *Environmental Compliance, BMP, and P2 Inspection Checklist for Tenants* (enclosed in Attachment 4).

A follow-up inspection report will be completed within seven days after the inspection. Uncorrected violations identified in the inspection will be addressed according to the steps described in *Section 5.0 – Enforcement*.

## 3.0 TRAINING

Inspector, tenant, and employee training are designed to ensure that stormwater pollution prevention requirements and responsibilities are clearly shared and understood by all personnel responsible for preventing stormwater pollution at Harbors.

### 3.1 Harbors Inspector Training

All inspectors responsible for TIM implementation must read and be familiar with this manual. In addition, new inspectors are required to complete no less than 24 hours on-the-job training with experienced inspectors. During the inspections, the new inspectors will observe how the experienced inspectors conduct tenant inspections as well as conduct their own inspections with assistance from the experienced ones. New inspectors will continue to have frequent interactions with the experienced inspectors to discuss inspection issues as they arise. See Attachment 10 for training materials for the Inspector.

### 3.2 Harbors Tenant Training

*Tenant Annual Storm Water Pollution Prevention Awareness Training* will be provided to Harbors tenants. This annual training will discuss issues related to stormwater pollution awareness including regulatory background, NPDES program requirements, general permit allowable discharges, illicit discharge detection and elimination program, construction site run-off control, post construction run-off control, stormwater drainage system protection, fueling activities, waste management, spill prevention and response, recommended best management practices, common sources of stormwater pollution, common operations causing potential illicit discharges, low-impact development, pollution prevention and good housekeeping, tenant inspections, enforcement response program, and other environmental compliance measures applicable to Harbors.

New tenants will be provided with a *New Tenant Information Package* (enclosed in Attachment 11) along with their lease agreement and/or revocable permit so that they are aware of the environmental requirements and responsibilities prior to their tenancy with Harbors. The *New Tenant Information Package* will include educational materials describing the responsibilities of the tenant and resources for obtaining additional information regarding stormwater pollution (e.g., stormwater awareness message, information on pollution prevention and good housekeeping, etc.). This package ensures that new tenants are aware of the stormwater requirements in the tenant lease agreements and/or revocable permit, apply appropriate BMPs based on activities to be conducted on the premises, and understand how to identify and report illicit discharges.

Harbors will provide a questionnaire annually to all tenants to assess their knowledge regarding stormwater awareness and pollution prevention. Additionally, Harbors will provide tenants educational materials, at least twice per calendar year, to educate them on stormwater awareness issues and terms and conditions of their lease or revocable permit, tariff and/or wharfage provisions related to stormwater management.

## 4.0 FIELD IMPLEMENTATION

Harbors Environmental Section will be responsible for overseeing, implementing, and updating the TIM. Status, results and summaries from the TIM will be reported annually in the ACR.

### 4.1 Inspection Basics

TIM inspections are scheduled with tenant representatives prior to the inspection date. The inspections cover the general areas of interest encompassed by the first three pages of the *Environmental Compliance, BMP, and P2 Inspection Checklist for Tenants* (enclosed in Attachment 4). Inspectors responsible for TIM implementation are to be trained in accordance with Section 3 of this manual. Inspectors must consider allowable non-stormwater discharges, prohibited stormwater discharges, all risk ranking categories and implementation of stormwater BMPs. TIM inspection reports will be drafted within 30 days of the tenant inspection and finalized within 30 days, unless a different schedule is described in this manual.

### 4.2 Allowable non-Stormwater Discharges

The overall inspection objective of this Tenant Inspection Program is elimination of illicit and polluted discharges to the stormwater drainage system and State waters. However, certain non-stormwater discharges are permitted by regulations. The following non-stormwater discharges may be discharged into Harbors stormwater drainage system, provided that such discharges do not contain pollutants in amounts that will cause or contribute to a violation of an applicable water quality standard.

- Water line flushing;
- Landscape irrigation;
- Diverted stream flows;
- Rising ground waters;
- Uncontaminated ground water infiltration;
- Uncontaminated pumped ground water;
- Discharges from potable water sources and foundation drains;
- Air conditioning condensate;
- Irrigation water;
- Springs;
- Water from crawl space pumps and footing drains;
- Lawn watering runoff;
- Water from individual residential car washing;
- Flows from riparian habitats and wetlands;
- Dechlorinated swimming pool discharges;
- Residual street wash water;
- Discharges or flows from fire fighting activities.

The risk ranking is determined based on the information obtained through existing facility inventories as well as knowledge from previous tenant inspections. The risk ranking determinations are compiled into Table *Harbors Tenant Inspection Tracking List* contained in the database (i.e., *Harbors_Tenants.mdb*).

## 4.3 Risk Ranking Criteria

Harbors tenant facilities will be ranked as high, medium or low as determined by a cumulative score of the 14 individual risk criteria listed in this section. Harbors Environmental Section will assign individual risk scores for each of the 14 risk criteria based on visual observation, activity evaluation, discharge potential to Harbors storm drain system and nation's waters nearby, and applicability of necessary BMPs. Based on the observations and activity evaluation, Environmental Section will assign an evaluation score from zero to five in each category with the exception of one category (related to training attendance records) which ranges from negative two to four. Certain individual criteria include a trigger for automatic designation of high risk ranking, regardless of the cumulative score. Description of each risk criteria is discussed in this section. Risk rankings are defined as follows:

- **Low**: Score of 5 or less (inspected every five years and subject to annual reconnaissance inspection)
- **Medium**: Score from 6 through 16 (inspected annually)
- **High**: Score more than 16 or a 5 in certain individual criteria (inspected semiannually)

Subsequent confirmation or reclassification of the risk ranking will be conducted as part of the routine and reconnaissance inspections. Following inspections, Harbors environmental inspectors will re-evaluate each tenant based on the ranking criteria, determine if the current risk ranking classification is adequate, and make changes if warranted.

### *4.3.1 Vessel Maintenance and Repair (VM)*

Tenant facilities are ranked based on the vessel maintenance and repair activities. Vessel maintenance and repair activities include parts replacement, washing, removing and/or replacement of fluids and greases, dismantling, sandblasting, sanding, and painting.

0 Neither maintenance nor repair activities are conducted on-site.

1 Maintenance and repair activities on any size vessel are conducted entirely indoors (with proper dust control BMPs), with no or minimal potential for discharge of pollutants.

2 Minor maintenance and repair for small vessels is conducted (with proper dust control BMPs) with minimal potential for discharge of pollutants.

3 Maintenance activities on large vessels are conducted outdoors and out of the water (with proper dust control BMPs), with minimal potential for discharge of pollutants.

4 Major maintenance and repair activities on any size vessel are conducted in a partially confined or unconfined area with moderate potential for discharge of pollutants.

5 Maintenance and repair activities on any size vessel are conducted in an unconfined area or in an area with significant potential for discharge of pollutants (e.g., within 50 feet of nearest storm drain inlet or surface water).
(Automatic trigger to high risk designation)

### *4.3.2 Vessel Fueling (VF)*

Tenant facilities are ranked based upon the type and method of vessel fueling. Vessel fueling includes transferring fuel between vessels as well as transferring fuel from a mobile fuel truck or a stationary aboveground storage tank to a vessel through hoses.

0 No fuel transfer activities are conducted on-site.

1 Fueling of small vessel is conducted by a fueling company with proper spill containment and diversion.

2 Fueling of small vessels are conducted with spill containment and diversion.

3 Fueling of large vessels are conducted in designated area with spill containment and diversion.

4 Fueling of small vessels are conducted in areas WITHOUT spill containment and diversion.

5 Fueling of large vessels are conducted in areas WITHOUT spill containment or diversion. (***Automatic trigger to high risk designation***)

### *4.3.3 Vessel Rinsing (VR)*

Tenant facilities are ranked based upon vessel rinsing activities. Vessel rinsing activities include the removal of salt, sediment, and sea life from the exterior of a vessel using water, detergent, and/or mechanical devices. Harbors permits vessel rinsing without any necessary containment, ONLY for the removal of salt from the exterior of the vessel using fresh water with low power (<100 pound-force per square inch [psi]). Other rinsing activities must be properly contained, and the rinse water must be properly disposed of in a shore-based sanitary sewer.

0 No vessel rinsing is conducted on-site.

1 Vessel rinsing is conducted in an area designed to contain wash water and debris, with no or minimal potential discharge of pollutants.

2 Vessel rinsing is conducted in an uncontained area with no direct connection to Harbors storm drainage system, with a minimal potential for discharge of pollutants.

3 Vessel rinsing is conducted in an uncontained area with no direct connection to Harbors storm drainage system, but having a moderate potential for discharge of pollutants.

4 Vessel rinsing is conducted in an uncontained area directly connected to Harbors storm drainage system, and has a moderate potential for discharge of pollutants.

5 Vessel rinsing is conducted in an uncontained area directly connected to Harbors storm drainage system and has a significant potential for discharge of pollutants. (***Automatic trigger to high risk designation***)

### *4.3.4 Equipment and/or Vehicle Maintenance and Repair (EM)*

Tenant facilities are ranked based on equipment and/or vehicle maintenance and repair activities. Vehicle and/or equipment maintenance and repairs include activities including, but not limited to, parts replacement, parts washing, removal and/or replacement of fluids or greases, dismantling, sandblasting, sanding, and painting.

0 No equipment/vehicle maintenance and/or repair activities are conducted on-site.

1 Maintenance/repair activities are conducted entirely indoors, on a small scale, with minimal potential for discharge of pollutants.

2 Maintenance/repair activities are conducted entirely indoors, on a large scale, with minimal potential for discharge of pollutants.

3 Maintenance/repair activities are conducted in a covered area with minimal to moderate potential for discharge of pollutants.

4 Maintenance/repair activities are conducted outdoors within containment or in an area with moderate potential for discharge of pollutants.

5 Maintenance/repair activities are conducted outdoors or in an area with significant potential for discharge of pollutants. (***Automatic trigger to high risk designation***)

### *4.3.5 Equipment and/or Vehicle Fueling (EF)*

Tenant facilities are ranked based on the amount of fueling and the containment and/or diversion structures available. Fueling refers to the fuel dispensing from a tank truck, aboveground storage tank [AST], UST, or portable container to equipment and vehicles, or the fueling from an AST loading rack. Small scale fueling is limited to less than 25 gallons per fueling).

0 No equipment/vehicle fueling activities are conducted on-site.

1 Equipment/vehicle fueling is conducted by a fueling company with spill containment and diversion.

2 Equipment/vehicle fueling is conducted on a small scale (i.e., less than 25 gallons per fueling) in areas with spill containment and diversion.

3 Equipment/vehicle fueling is conducted on a large scale in areas with spill containment and diversion.

4 Equipment/vehicle fueling is conducted on a small scale WITHOUT spill containment and diversion, but not in areas adjacent to Harbors storm drainage system and nation’s water.

5 Equipment and/or vehicle fueling is conducted on a large scale in areas WITHOUT spill containment and diversion, or on any scale in areas adjacent to Harbors storm drainage system and nation’s waters WITHOUT spill containment and diversion. (***Automatic trigger to high risk designation***)

### *4.3.6 Equipment and/or Vehicle Washing (EW)*

Tenant facilities are ranked based on the methods used for equipment and/or vehicle washing. All washing activities must obtain consent from the Harbors and take place in approved and designated areas. This category includes the water washing of ground service equipment, maintenance equipment, company vehicles, and rental cars.

0 No equipment/vehicle washing is conducted on-site.

1 Equipment/vehicle washing is consented by the Harbors and conducted in a covered wash area following an approved method, with no or minimal potential discharge of pollutants.

2 Equipment/vehicle washing is consented by the Harbors and conducted in an

uncovered wash area following an approved method, with minimal potential discharge of pollutants.

3 Equipment/vehicle washing is consented by the Harbors and conducted in an uncovered wash area following an approved method, with moderate potential discharge of pollutants (e.g., adjacent to Harbors storm drainage system or nation's water).

4 Equipment/vehicle washing is contained and in an area with no direct connection to Harbors storm drainage system and nation's water, but conducted WITHOUT Harbors consent.

5 Equipment/vehicle washing is not contained, conducted WITHOUT Harbors consent, or in an area that directly discharges to Harbors storm drainage system and nation's waters. (***Automatic trigger to high risk designation***)

### *4.3.7 Aboveground Oil Storage (size of container ≥ 55 gallons ONLY) (OS)*

According to 40 CFR 112, oil is defined as "oil of any kind of in any form, including, but not limited to: fats, oils, or greases of animal, fish, or marine mammal origin; vegetable oil, including oils from seeds, nuts, fruits, or kernels; and other oils and greases, including petroleum, fuel oil, sludge, synthetic oils, mineral oils, oil refuse, or oil mixed with wastes other than dredged spoil." These oils are commonly stored in ASTs and 55-gallon drums. Oil stored in containers with capacity less than 55 gallons are evaluated under Section 3.2.8 – Container Storage. Note that tenants shall not install an AST without first obtaining a written consent from the Harbors.

The term "properly stored" indicates that ASTs and drums meet the SPCC requirements for secondary containment, including: containers are clearly labeled; container material and construction are compatible with the stored material; secondary containment is sufficient to contain the entire capacity of the largest single container plus sufficient freeboard to contain precipitation; the bypass valve is sealed and retained stormwater is properly managed; container integrity is appropriately tested; and drums are in good condition, neatly organized, and sealed when not in use.

Tenant facilities are ranked based on the oil storage protocols employed at the facilities.

0 No oil product is stored on-site.

1 Less than 1,320 gallons of oil is properly stored in a covered area and has no or minimal potential for discharge of pollutants.

2 Less than 1,320 gallons of oil is properly stored in an uncovered area and has minimal potential for discharge of pollutants.

3 More than 1,320 gallons of oil is properly stored with minimal potential for discharge of pollutants, and the facility has an SPCC Plan.

4 More than 1,320 gallons of oil is properly stored with minimal to moderate potential for discharge of pollutants, but the facility does not have a SPCC Plan.

5 Oil is improperly stored and/or managed and has a significant potential for discharge of pollutants. (***Automatic trigger to high risk designation***)

### *4.3.8 Container Storage (size of container < 55 gallons ONLY) (CS)*

Tenant facilities are ranked based on the container storage methods employed and the toxicity of materials stored. This category includes materials such as chemical products, new oil, and used oil stored in containers with capacity less than 55-gallon.

Storage methods are evaluated to ensure that materials are properly stored and managed. The term "properly stored" indicates that containers are correctly labeled, not passed their expiration date, in good condition, sealed when not in use, neatly organized, and compatible with other materials stored in the same area.

0 No containers are stored on-site.

1 All containers are properly managed and stored entirely indoors and have no or minimal potential for discharge of pollutants.

2 All containers are properly managed and stored under the cover, and have minimal potential for discharge of pollutants.

3 Containers are properly managed and stored outdoors with minimal potential for discharge of pollutants (e.g., distance from site to the nearest storm drain inlet or surface water is greater than 100 feet or 30 meters).

4 Containers are improperly managed but stored indoors or under the cover with moderate potential for discharge of pollutants.

5 Containers are improperly managed and stored outdoors with significant potential for discharge of pollutants. (***Automatic trigger to high risk designation***)

### *4.3.9 Waste Handling and Disposal (excluding Used Oil) (WH)*

Tenant facilities are ranked based on municipal, solid, or hazardous waste handling and disposal. Waste handling may include making a hazardous waste determination and proper management. If the waste is characterized as a hazardous waste, the accumulation start date shall be added to the labeling. Additionally, the facility shall ensure that the waste is properly disposed of within the regulated accumulation time, which depends upon the facility waste classification detailed in 40 CFR 262.

0 No waste is stored on-site.

1 All wastes are non-hazardous and stored indoors or outdoors in covered areas, and have no or minimal potential for discharge of pollutants.

2 All wastes are non-hazardous and stored outdoors uncovered, and have moderate potential for discharge of pollutants.

3 Hazardous wastes are generated and tenant is classified as a CESQG[1]. Hazardous wastes are properly managed, stored, and disposed of. Storage areas have no or minimal potential for discharge of pollutants.
[1] Please refer to Attachment 9 (3. Waste Management Regulations, Item B).

4 Hazardous wastes are generated and the tenant is classified as a SQG[2] or LQG[3]. Hazardous wastes are properly managed, stored and/or disposed of. Storage areas have no or minimal potential for discharge of pollutants.
[2] Please refer to Attachment 9 (3. Waste Management Regulations, Item B).
[3] Please refer to Attachment 9 (3. Waste Management Regulations, Item B).

5 Hazardous wastes are generated and the tenant is classified as a CESQG, SQG, or LQG. Hazardous wastes are improperly managed, stored, and/or disposed of. Storage areas have significant potential for discharge of pollutants. (***Automatic trigger to high risk designation***)

### *4.3.10 Spill History (SH)*

Tenant facilities are ranked based on past oil and/or chemical spills at their facilities and/or inspection and investigation report.

0 No history of oil/chemical spills on-site.

1 One to three oil/chemical spills in minimal quantity (e.g., less than five gallons for oil) in the past three years.

2 One to three oil/chemical spills in moderate quantity (e.g., oil spill greater than 5 gallons but less than 25 gallons; for all other chemicals please refer to 40 CFR 302.4) in the past three years.

3 One to three oil/chemical spills greater than the reportable quantity (see 40 CFR 302.4) in the past three years and spill kit is onsite.

4 One to three oil/chemical spills greater than the reportable quantity (see 40 CFR 302.4) in the past three years and no spill kit is onsite.

5 More than two oil/chemical spills entered into Harbors storm drainage system. Or more than five oil/chemical spills of any quantity in one calendar year. (***Automatic trigger to high risk designation***)

### *4.3.11 Enforcement History (EH)*

Tenants are ranked based on the history of past compliance with environmental regulations (including federal, state, and local), and the corresponding response actions taken by the tenant following a Notice of Apparent Violation [NAV], any verbal warning, or inspection. Class II enforcement actions include deficiencies and/or potential violations identified during any type of inspection (e.g., not following applicable BMPs during operations). Class I enforcement actions include violation of environmental law or regulations and HDOT Harbors rules that results in an NAV. A tenant is considered "taking corrective action immediately" to the warnings/violations, if responding to a Class II enforcement action within 20 days, or a Class I enforcement action within 14 days.

0 No verbal or written warnings were issued in the past two years.

1 Class II violations (such as verbal/written warnings and potential violations identified in an inspection report) were issued in the past two years and corrective actions were immediately taken by the tenant.

2 Class I violations (identified in an inspection report and/or documented in an NAV) were issued in the past two years and corrective actions were taken by the tenant.

3 Class II violations were issued in the past two years, but corrective actions were NOT immediately taken by the tenant.

4 Class I violations were issued in the past two years, but corrective actions were NOT immediately taken by the tenant.

5 Civil penalties or administrative actions were assessed for non-compliance in the past two years. (***Automatic trigger to high risk designation***)

### 4.3.12 *Training Attendance History (TH)*

Tenants are ranked based on the past training attendance. Harbors requires tenants to reduce the discharge of pollutants to the MEP, and prohibit unauthorized non-stormwater discharges into Harbors stormwater drainage system and nation's waters. In order to achieve these goals, Harbors has been providing *Annual Storm Water Pollution Prevention Awareness Training* to the tenants, with the topics focusing on stormwater management, pollution prevention, good housekeeping, and commonly recommended BMPs. This annual awareness training is one of measures pertinent to public education and outreach program.

-2 The tenant has attended all annual trainings during its tenancy.

-1 The tenant has attended the most recent training.

2 The tenant has not attended the most recent training.

4 The tenant has never attended the training and has been found to be non-compliant.

### 4.3.13 *Site Condition and General Housekeeping*

Tenants are ranked based on physical condition where on-site activities take place (i.e., indoors or outdoors), the general housekeeping condition, and implementation of BMPs to minimize the discharge of pollutants and to prevent soil and debris from entering Harbors stormwater conveyance system. The term "indoors" refers to operations situate, conduct, or carry out in the interior of a building or under cover.

0 All activities are conducted indoors and have no or minimal potential for discharge of pollutants. General housekeeping and grounds are in good condition.

1 All activities are conducted indoors and have minimal potential for discharge of pollutants. General housekeeping and grounds are in average or fair condition.

2 Activities are conducted indoors and outdoors, and general housekeeping and grounds are in good condition (e.g., sources of pollutants are properly managed).

3 Activities are conducted indoors and outdoors and have minimal to moderate potential for discharge of pollutants. General housekeeping and grounds are in fair and above average condition.

4 Activities are conducted outdoors and have moderate potential for discharge of pollutants. General housekeeping and grounds are in fair condition.

5 Activities are conducted outdoors and pose a significant threat to the environment. (***Automatic trigger to high risk designation***)

### *4.3.14 Lease Agreement and/or Revocable Permit Requirements (RP)*

Tenants are ranked based on the history of past compliance with lease agreement and/or revocable permit and the corresponding response actions taken by the tenant following an inspection, action letter, and verbal warning. Examples of the tenant *Lease Agreement* and *Revocable Permit* are included in Attachment 2. A tenant is considered "taking corrective action immediately" to the warnings/violations, if responding to a Class II enforcement action within 20 days, or a Class I enforcement action within 14 days.

Violations of any item below will ***automatically trigger a tenant to a high risk designation***, if described in tenant Lease Agreement and/or Revocable Permit.

- The tenant shall not use, store, treat, dispose, discharge, release, generate, create, or otherwise handle any hazardous substance, or allow the same by any third person, on the premises without first obtaining the written consent of Harbors.
- The tenant shall not conduct illegal activities at the premises.
- The tenant shall not conduct any act which results or may result in the creation, commission or maintenance of a nuisance on the premises.
- The tenant shall not conduct permanent lodging or sleeping quarters at the premises. However, a rest area for the comfort and convenience of employees during working hours is allowed.
- The tenant shall not install an UST/AST without first obtaining the written consent of Harbors.
- Except for materials that are lawfully sold in the ordinary course of the tenant's business and for which the tenant has obtained all required authorizations from appropriate authorities including the prior written permission of Harbors, the tenant shall cause any hazardous substances to be removed from the premises for disposal.
- The tenant shall maintain the premises in a strictly clean, neat, safe, orderly and sanitary condition, free of waste, rubbish and debris and shall provide for the safe and sanitary handling and disposal of all trash, garbage and other refuse from the premises.
- The tenant shall not sell, transfer, assign, lease, mortgage, and sublease premises whatsoever.
- Consumption of any intoxicating beverage, unless under an operation licensed by appropriate government agencies, is not allowed in the premises.
- The tenant shall keep Harbors fully informed at all times regarding all environmental law related matters affecting the tenant or the premises.
- The tenant shall obtain an NPDES permit from HDOH, if applicable.

## 4.4 Routine Inspection Frequency Based on Risk Ranking

All tenants shall be inspected by the Environmental Section or its representative in accordance with this Section. The frequency of tenant inspections will be determined by tenant risk ranking designation of high, medium, or low threat. At a minimum, Harbors will inspect each tenant in each ranking class as follows:

- **Low** ranked tenants shall be inspected at least **once every five years and are subject to an annual reconnaissance inspection**.
- **Medium** ranked tenants shall be inspected **at least annually**; and
- **High** ranked tenants, shall be inspected **at least semiannually**;

## 4.5 Tenant Risk Ranking Re-evaluation

Tenant risk ranking is re-evaluated using tenant routine and reconnaissance inspection results as applicable. When a violation is observed or reported, and if the source is traced to a tenant, the tenant's risk ranking will be re-evaluated. Environmental Section will prepare an inspection schedule based on the results of the risk ranking re-evaluation. The inspection schedules is maintained and updated by Environmental Section in the database.

# 5.0 ENFORCEMENT

The primary objective of Harbors environmental enforcement program is to: a) ensure tenants comply with the environmental regulations, lease agreements, and/or revocable permits; b) correct any violation(s); and c) require tenants to operate their facilities in accordance with Harbors environmental policy and applicable BMPs.

## 5.1 Scope of Authority

The enforcement options available to Harbors range from administrative actions (including verbal/written warnings, eviction notices, and penalties) to the issuance of citations and a district court verdict of a misdemeanor or fine. Three general areas of the environmental enforcement are enclosed in Attachment 2 as following:

- HRS Title 15 Chapter 266 authorizes Harbors to issue citations and summons for violations of its rules and have its actions enforced through the district courts by verdict of a misdemeanor or fine.
- HAR Title 19 Chapters 41 to 44 establishes uniform safety measures, operational standards and requirements, and the conduct for all tenants at State of Hawaii harbors.
- The tenant lease agreement or revocable permit that provides Harbors with the right of entry to conduct inspection and authority to terminate the permit or lease.

For suspected illicit discharges and pollution concern, which need immediate response, the inspector will call the Harbors Traffic Control at (808) 587-2076 upon discovery. However, individual inspectors (such as Environmental Section personnel or their designees) may not have the authority to pursue all areas of enforcement and would follow ERP for appropriate actions (e.g., refer cases to the appropriate individuals or agencies when necessary).

There are two types of violations – Class I Violation and Class II Violation, which are based on potential to discharge or cause environmental harm, magnitude of the violation (e.g., failure to apply for Industrial General Permit Coverage), duration of the violation, and violator's compliance history.

- Class I Violations: violations which are related to submittal of permit applications, BMP failure due to lack of maintenance, ongoing or imminent discharges of pollutants, other activities capable of causing imminent impact to the environment, or where the violator has a previous history of non-compliance.
- Class II Violations: violations that pose no significant impact on the environment which are easily preventable, or administrative in nature. Class II violations include record keeping, reporting, BMP maintenance or installation problems, or other activities when there is ample time for correction prior to the discharge of pollutants, and where the violator has not had a previous history of non-compliance.

## 5.2 Enforcement Actions and Documentation

The levels of enforcement actions to be utilized by inspectors, in order of increasing severity, are as follows:

- Oral or Verbal Warning
- Written Warning (e.g., Tenant Inspection Report or Letter with Tenant Inspection Report)
- Notice of Apparent Violation [NAV]
- Issuance of Summons or Citation
- Notice and Finding of Violation Order ([NFVO], see ERP for detailed description)

The following sections contain brief descriptions of each level of enforcement action and procedures for implementation.

### *5.2.1 Oral or Verbal Warning*

An oral or verbal warning is a spoken reprimand or a disciplinary measure, which will be issued verbally to a tenant where the finding is a minor discrepancy with one or two BMPs. It could also serve the purpose of outreach to the tenants. In most cases, oral or verbal warnings provide a more efficient way for the tenant to take corrective actions.

### *5.2.2 Written Warning*

A written warning will be issued to a tenant where the finding is limited to conditions that do not pose an imminent threat to the environment and/or the public. Conditions that warrant a written warning may include but not limited to:

- Improper storage of batteries
- Improper waste management
- Lack of or out-of-date spill plans
- Lack of good housekeeping
- Lack of proper labeling on drums
- Lack of placing drip pans or absorbent sheets beneath a vehicle

For any deficiency observed during an inspection, a recommended corrective action will be identified in the *Tenant Inspection Report*, which could be served as a written warning. A copy of the *Tenant Inspection Report* will be mailed/emailed or otherwise delivered to the tenant upon completion. If (potential) violation is observed during inspection, an enforcement letter combined with the *Tenant Inspection Report* will be mailed to the tenant with a compliance deadline (typically within 20 calendar days). These documents will become a part of the permanent tenant file.

When necessary, a follow-up inspection will be conducted to verify that the infractions were corrected. If the tenant does not respond to the written warning by the deadline, the Environmental Section will issue an NAV and follow the steps described in the ERP for further enforcement (e.g., report the case to the State Attorney General). Meanwhile, a copy of the *Tenant Inspection Report*, together with the inspection checklist, would be forwarded to corresponding agencies and offices when necessary.

### *5.2.3 Notice of Apparent Violation*

An NAV letter will be issued to a tenant in the circumstance of a Class I or II violation. It is used to send a stronger message than a written warning. It documents Harbors efforts to have the tenant voluntarily come into compliance with the environmental laws and implementing applicable BMPs. It also serves as a basis for future penalties, should the occurrence of violations continue or even increase. The NAV shall be sent to the tenant by certified mail with a compliance deadline (typically within 20 calendar days), when necessary. The NAV will become part of the tenant's permanent file.

### *5.2.4 Issuance of Summons/Citation*

The issuance of the Summons/Citation by Harbors requires that the tenant appear before a District Judge to address the violation and corrective action. This action may lead to fines and/or a criminal penalty and is utilized in severe cases where negligent non-compliance is repeated and/or significant harm to property or environment has occurred. Situations which call for summons or citation will be referred to the appropriate State Attorney General Representative for implementation. Harbors and its designees will function as documentation and witness to actions requiring this level of response. Therefore, it is essential to accurately and thoroughly record actions that might escalate to this level.

### *5.2.5 Notice and Finding of Violation Order and Further Action*

A detailed discussion is included in ERP.

## 5.3 Description of Enforcement Steps

The goal of Harbors environmental enforcement program is to motivate tenants to voluntarily comply with their environmental obligations. The designated staff (e.g., Environmental Section staff, Harbor Police, Marine Cargo Specialists, Property Management Section staff) at Harbors will assist tenants, without being prescriptive, on how the tenant can achieve environmental compliance. Such assistance includes suggesting that the tenant consult a professional if needed. Tenant's risk ranking will be re-evaluated at least annually.

In the event that an enforcement action is required, the designated staff will identify the appropriate enforcement response to achieve compliance. If the tenant cannot achieve compliance by implementing the appropriate corrective action, the designated staff will “escalate” the enforcement response by issuing a more severe action. Harbors has developed a tiered approach of escalating enforcement actions based on the severity of the violation and the tenant’s compliance response history. A description of the different levels of enforcement action is included in Section 5.2.

For potential violation observed during routine tenant inspection, the designated staff will record the potential violation, observed during routine tenant inspection, on Harbors revised *Environmental Compliance, BMP, and P2 Inspection Checklist for Tenants*. Potential violation, reported to the Environmental Section (e.g., using *Suspected Illicit Discharge Reporting Form*). These potential violations will be evaluated (through follow-up inspection if warranted) and classified as Class I or Class II violation, if applicable.

The following is a step-by-step progression of a general enforcement action if a potential violation or illicit discharge is observed. The process is also depicted in Figure 5-1. The indicated timeframes may be amended through an extension granted by Harbors, if requested by the tenant. The enforcement actions proceed along two separate courses depending upon whether the violation is considered Class I or Class II violation. All noncompliance findings will be documented and kept on file by the Harbors Environmental Section.

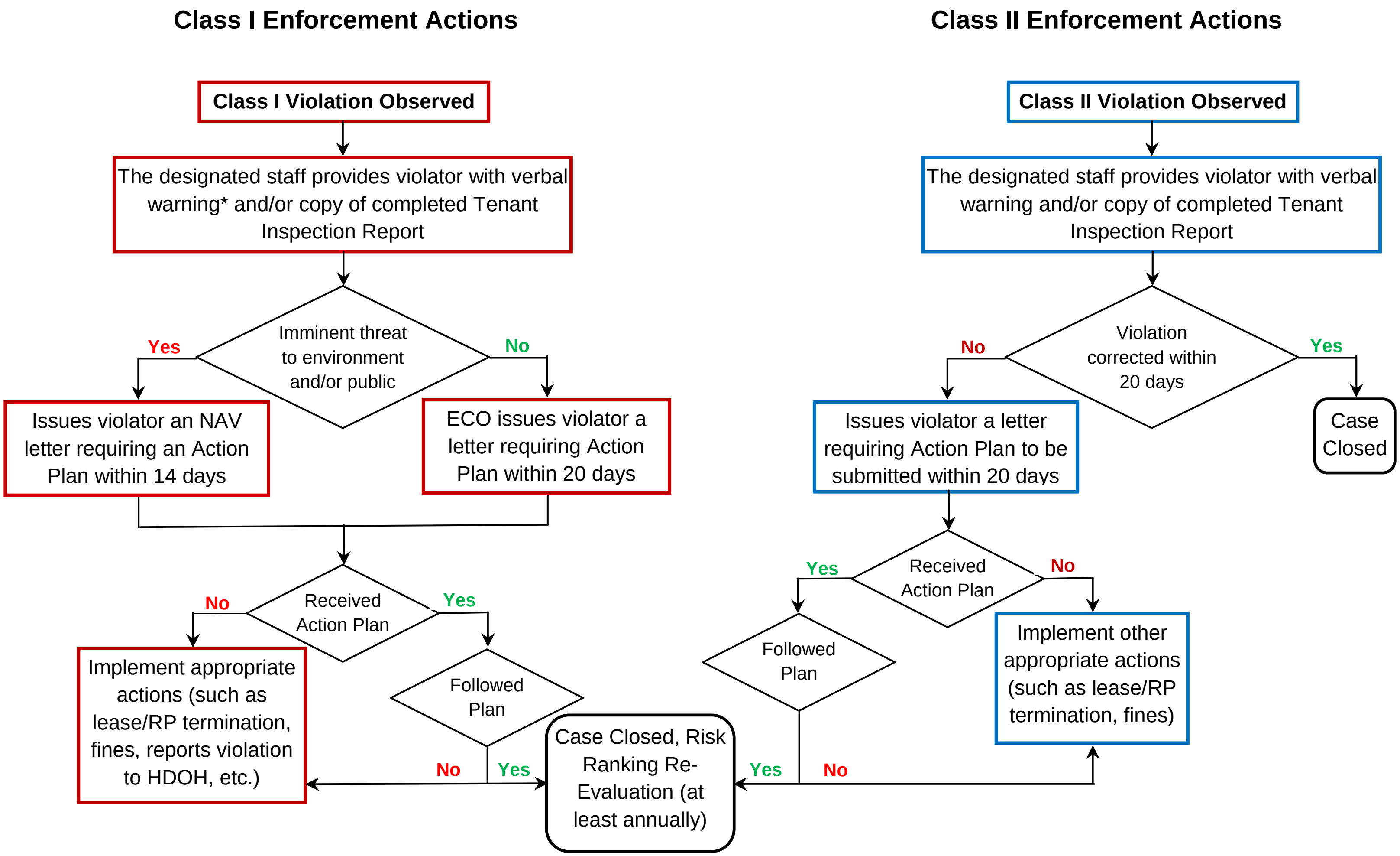
- If the potential violation is considered Class II, the tenant will be issued with an oral or verbal warning and provided a copy of *Tenant Inspection Report* upon completion. The designated staff will re-inspect the tenant within 20 calendar days of observation, if warranted, to ensure that the violation has been corrected.
  - If the tenant fails to take corrective action, the designated staff will issue a written warning letter to the tenant, requiring an Action Plan within 20 calendar days upon receipt of the letter. The Action Plan shall denote the tasks that the tenant is required to complete to come into compliance within reasonable timeframe.
  - If the tenant fails to take any corrective action and is not able to submit the Action Plan to the Harbors within 20 calendar days, other appropriate actions will be implemented (e.g., issuing fines, terminating the lease or revocable permit, etc.).

- If the potential violation is considered Class I but not posing imminent threat to the environment or the public, the designated staff will issue an oral or verbal warning to the tenant and then provide a written warning letter requiring corrective action or an Action Plan to be submitted within 20 calendar days upon receipt of the letter. The Action Plan shall denote the tasks that the tenant is required to complete to come into compliance within reasonable timeframe.
  - If the tenant fails to take corrective action and is not able to provide an Action Plan within 20 calendar days, other appropriate actions will be implemented (e.g., issuing fines, terminating the lease or revocable permit, etc.).

- If the potential violation is considered Class I and poses an imminent threat to the environment or the public, the designated staff will provide an oral/verbal warning and direct the responsible party to stop the activity relating the imminent threat immediately. Additionally, the designated staff will draft a letter that will require the tenant to correct action or submit an Action Plan immediately to correct the violation within 7 calendar days upon receipt of the letter.

- o If the tenant fails to take any corrective action and is not able to submit an Action Plan correcting the violation within 7 calendar days, the violation will be escalated to appropriate agencies and offices in accordance with the ERP. In addition, the designated staff can also implement other appropriate actions such as termination of the lease or revocable permit.

## Figure 5-1 HDOT Harbors Tenant Enforcement Action Flow Chart




* If there is an imminent threat to the environment or public health, the designated staff will inform violator to cease activity related to imminent threat immediately.

# 6.0 REFERENCES


Airports 2011, NPDES Inspection and Enforcement Manual: State of Hawaii Department of Transportation, Airport Division, Version 5.0, June 2011.

Caltrans 2003, *Storm Water Management Enforcement Guidance Manual*: State of California Department of Transportation, Division of Construction, CTSW-RT-03-110.31.30-1, December 2003.

CCH 2011, *Storm Water Best Management Practice Manual for Construction*: State of Hawaii, City and County of Honolulu, Department of Environmental Services, November 2011.

CCH 2012, *Storm Water Management Program Plan*: State of Hawaii, City and County of Honolulu, Department of Environmental Services, June 22, 2012.

EPA 1989, *Guidance for Developing Control Authority Enforcement Response Plans*: Office of Water Enforcement and Permits. September 1989.

EPA 2000, *Stormwater Phase II Final Rule*: United States Environmental Protection Agency, EPA 833-F-00-001, Fact Sheet 1.0 (revised December 2005), January 2000.

Harbors 2009, *Inspection and Enforcement Manual:* State of Hawaii Department of Transportation, Harbors Division, November 2009.

Harbors 2013, Construction Site Runoff Control Program: State of Hawaii Department of Transportation, Harbors Division, December 2013.

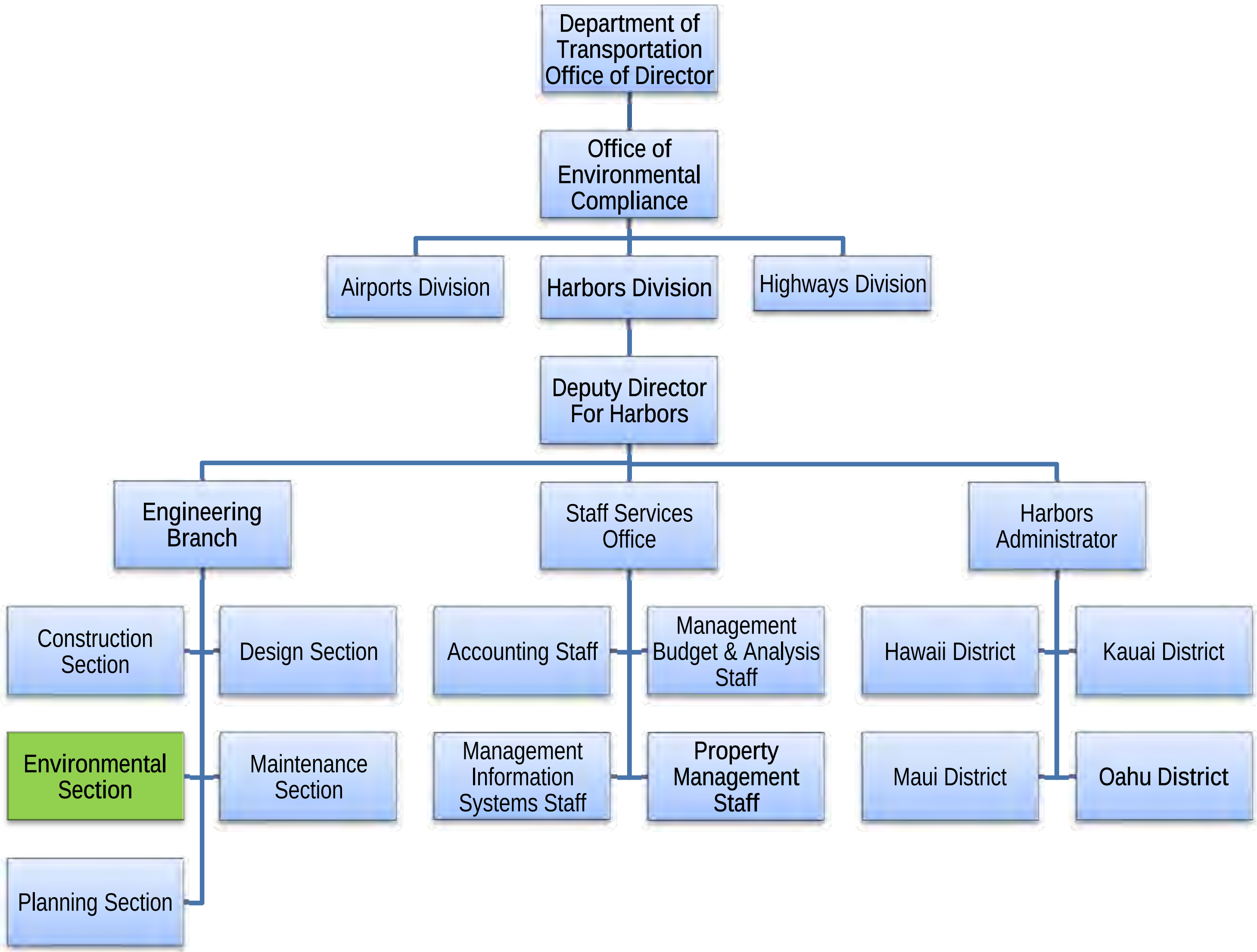
Harbors 2014, Enforcement Response Plan: State of Hawaii Department of Transportation, Harbors Division, January 2014.

NOAA 2005, *Managing Boat Wastes – A Guide for Hawaii Boaters:* National Oceanic and Atmospheric Administration, UH Sea Grant College Program and SOEST, Project #A/AS-1, under Institutional Grant No. NA050AR4171048, December 2005.

# Attachment 1

# HDOT Harbors Division Administrative Organizational Chart

# State of Hawaii Department of Transportation, Harbors Division Administrative Organizational Chart



# Attachment 2

# HDOT Harbors Rules and Regulations and Examples of Tenant Lease Agreement and Revocable Permit

## HARBORS RULES AND REGULATIONS FOR ENVIRONMENTAL COMPLIANCE

The Harbors environmental inspectors have been given enforcement actions that include verbal warnings, written citations, and potential tenant eviction.

***Hawaii Revised Statutes Title 15 Chapter 266***

**HRS 266-2** describes the powers and duties of the State of Hawaii Department of Transportation Harbors Division. **HRS 266-3** establishes the Director of Transportation authority to establish and enforce rules to control and manage all commercial harbors and roadsteads, all commercial harbor improvements, and all vessels and shipping within the commercial harbors and roadsteads. The Harbors then relies on **HRS 266-24**, which permits the Director of Transportation the authority to designate persons to enforce Chapter 266 and all rules and orders issued pursuant thereto and of all other laws of the state.

Such officers, employee's agents, and representatives of Harbors have police powers to serve and execute warrants and arrest offenders, and the power to serve notices and orders. When arresting or issuing a citation to a purported violator of any provision of Chapter 266, the Director of Transportation's designee, hereinafter referred to as "enforcement officer" can issue a summons or citation (similar to a traffic ticket) warning or directing the violator to appear and answer the charge before a district judge, or take the purported violator without delay before a district judge.

Penalties for violating the provision of Chapter 266 or rules or orders issued pursuant to Chapter 266 are issued by the district court and includes a finding or guilty or not guilty verdict of a misdemeanor and a fine. Fines arising from environmental protection violations include reimbursing the HDOT for the entire amount of the HDOH or EPA fine under HRS **§266-28** and can include an additional amount of not more than $10,000 for each day of violation under HRS **§266-25**.

***Hawaii Administrative Rules Title 19 Chapters 41 to 44***

HDOT adopted these chapters to regulate operations at the state harbors. **Chapter 42-126 and 42-127** specifically apply to environmental regulation. These rules require that no litter be left within a state harbor, except in properly marked bins. In addition, oil, oily refuse, sludge, chemicals, or other hydrocarbons should only be deposited in designated collection points. Specifically, Chapter 42-127 can be applied to activities such as maintenance or washing that has the potential to generate pollutants to be discharged into state waters. Below is an excerpt from Chapter 42-127:

> *"No person shall place, throw, deposit, or discharge, or cause to be placed, thrown, deposited, or discharged into the waters of any harbor, river or shore waters of the State any litter, or other gaseous, liquid or solid materials which render the water unsightly, noxious or otherwise unwholesome so as to be detrimental to the public health and welfare or a navigational hazard. No person shall discharge oil sludge, oil refuse, fuel oil*

*or molasses either directly or indirectly, or pump bilges or ballast tanks containing other than clean water into the waters of any harbor, river or into any shore waters in the State."*

In addition, Chapter 42 contains language on storage, usage, and/or handling requirements for hazardous materials or other regulated potential pollutants or hazardous substances. These chapters detail specific environmental practices where enforcement is implemented through arrest or citation and presented before the district judge. The major components of Chapter 42, related to enforcement, inspection, safety, cleanliness, use of facilities, and construction, are summarized below.

**Chapter 42-15** – Compliance with Federal, State, and County Laws, Ordinances and Rules

- Use of state harbors and harbors facilities is subject to compliance with all applicable federal, state, and county laws, ordinances, rules and regulations. Particular attention is directed to:
    - Rules of the United States Public Health Service and of the state department of health, relating to the use of rat guards and other measures to prevent rodents from leaving the vessel.
    - Rules of the state department of health pertaining to air and water pollution.
    - Rules of the fire department of each county.

**Chapter 42-16** – Citation for Violation

- Citations issued, pursuant to HRS 266-24.1, to a commercial firm for violation of this part may be issued to any agent, officer, or manager of the firm.

**Chapter 42-50** – <u>Inspection</u>

All small craft and smaller commercial vessels moored or berthed at a state-owned or controlled pier, wharf, quay, bulkhead, landing dolphin, anchorage, mooring, or other facilities located in the shore waters, navigable streams, harbors, ports, and roadsteads of the State shall be subject to inspection by the department or any peace officer of the State or its political subdivisions at any time where necessary and proper for the purpose of enforcing these rules.

**Chapter 42-52** - Small Craft and Smaller Commercial Vessel Repairs, Reconstruction or Major Modification

- Minor repairs to small craft and smaller commercial vessels may be made at the assigned berth and shall be completed within thirty days.
- If repairs are estimated to, or actually do, require that the vessel be out of service for more than thirty days, prior approval shall be sought from the department to initiate or complete the repairs in the harbor.
- Prior approval shall be sought from the department for any repairs requiring the use of cranes, lifts, and any similar devices within the harbor.
- Repair, reconstruction or major modification that would interfere with the free flow of other vessels, pedestrian, or vehicle traffic shall only be accomplished in an area

designated by the department. Failure to seek approval as required by this section shall be grounds for the revocation of the use permit.

**Chapter 42-103** Vessel Loaded with Explosives

- No vessel containing more than five hundred founds of Class A, one tone of Class B, and/or ten tons of Class C explosives (net explosive content) shall enter or be loaded in any harbor in the State except on prior written permission of the harbor master of the district concerned, or the director.
- No Class A explosives, as defined by the United States Coast Guard in its regulations in existence as of June 1, 1993, will be admitted in any harbor in quantities in excess of the limitations established by the USCG for the various harbors unless otherwise authorized by the director in writing. Other cargos may not be moved concurrently with Class A explosive cargo.

**Chapter 42-104** Handing of Explosives

- All handling and loading or unloading of explosives shall be done in a safe and careful manner and shall be accordance with the federal regulations pertinent thereto in force at the time. Explosives shall be off-loaded prior to the off-loading of any other cargo.

**Chapter 42-105** Hauling of Explosives

- All hauling of explosives away from or to the pier shall be done in a safe and careful manner and shall be in accordance with rules of the state department of labor and industrial relations.

**Chapter 42-106** – Containers for Flammable Liquids

- No empty containers which have been used to hold flammable liquids shall be delivered onto any wharf or structure under control of the department unless the same are securely closed with metal screw plugs.
- Any such containers shall be delivered onto a wharf or structure only at such times as a carrier is prepared to take immediately delivery.

**Chapter 42-107** – Nitrate of Soda, Nitrate of Ammonia, Sulfur, and Other Similar Materials

- No nitrate of soda, nitrate of ammonia, sulfur, or other similar material shall be stored or left upon any wharf for more than four hours unless packed in sound and non-leaking containers. Such material shall be under the continuous care of a competent guard satisfactory to the harbor master until removed.
- Masters, owners, or agents of vessels or consignees of cargoes of nitrate of soda, sulfur, or other similar materials during the process of loading, unloading, and removing such cargoes, must at all times keep the wharf swept clean and free of such materials.
- If loose nitrate of soda, sulfur, or other similar material is to be discharged onto or loaded from any wharf or structure at any harbor, it shall be placed directly into the carrier and immediately removed. A protective device approved by the harbor master shall be used

during the period of loading or unloading to prevent the material being handled from falling upon the wharf structure.

- During the process of handling nitrate of soda, sulfur, or other similar material on any wharf at any harbor under control of the department, it shall be obligatory on the part of the master, owners, or agents of a vessel to provide containers of not less than 50 gallons capacity filled with a solution of nitrate of soda and water at distances of not more than 50 feet apart, with suitable buckets placed alongside each container, for the purpose of fighting any fire which may occur in such cargo.

**Chapter 42-108** – Dangerous Acids; Electric Storage Batteries

- Acids of a dangerous character such as sulfuric, muriatic, and nitric acids shall be removed from the wharf immediately upon discharge from any vessel and no such acid shall be put upon a wharf under control of the department for shipment until the carrier is ready to receive it. Prior permission of the harbor master shall be secured in the event it becomes necessary to handle such cargo at other times.
- Electric storage batteries containing electrolyte or corrosive battery fluid of non-spillable type, protected against short circuits and completely and securely boxed, shall be exempt from this provision.

**Chapter 42-109** – Flammable Substances; Leaky Containers

- No gasoline, distillate, kerosene, benzene, naphtha, turpentine, paints, oils, or other flammable substances in leaky containers shall be delivered onto any wharf under control of the department for shipment.
- All such substances unloaded from any vessel in leaky containers shall be removed immediately.

**Chapter 42-110** – Heating Combustibles on Vessels

- No combustible material such as pitch, tar resin, or oil shall be flame heated on board any vessel within the harbors or streams of the State without the permission of a harbor master.

**Chapter 42-111** – Fumigation of Vessel

- No vessel shall be fumigated or smoked at any wharf under control of the department without the prior permission in writing from the director, the chief, or the harbor master.
- If fumigation is to be with cyanogen products or hydrocyanic acid gas in any form, however generated, the applicant or applicant’s agent shall be in possession of a permit as required by HDOH rules and shall have a guard on duty so long as any danger exists, in order that no one, unless properly entitled to do so, be allowed to board such vessel.

**Chapter 42-112** – Use of Fuel Burning Steam Generating Appliances

- All fuel burning steam generating appliances when used on any wharf under control of the department or on any scow, pile driver, or other vessel working alongside or near

any wharf under control of the department shall be equipped with spark arresters satisfactory to the harbor master.
- At the close of each day's work, all ashes, cinders, waste, or other deposits caused by such appliances upon any wharf shall be promptly removed and shall not be disposed of in or upon any waters of the harbor.

**Chapter 42-113** – Repair, Manufacturing, Construction, or Maintenance Work on Wharf
- No person shall make any repair or do any kind of manufacturing, construction, or maintenance work on any wharf without the permission of the harbor master.

**Chapter 42-114** – <u>Smoking Prohibited</u>
- Smoking is positively prohibited at all times within any cargo shed, or upon any wharf apron, and during the time cargo is being loaded, unloaded, or stored on any unshedded pier under control of the department, and no person shall enter into, stand in, or under, or pass through any such wharf or structure with a lighted pipe, cigar, cigarette, match, fire, or any flame of whatever nature, excepting only within those areas designated by the harbor master and plainly marked "Smoking Area."
- No smoking or lighting of a match or any other fire-creating device shall be permitted within 50 feet of any fueling operation.

**Chapter 42-115** – <u>Use of Explosives</u>
- The use of explosives on land, on any wharf, or in a shed or other structure under control of the department, or in the water in the immediate vicinity of the same, without the written approval of the harbor master is strictly prohibited.

**Chapter 42-116** – Keeping Wharf in Sanitary Condition and Clear of Fire Hazard
- Vessel owners, charterers, agents, or private terminal operators utilizing wharves and sheds under the control of the department for the handling of merchandise shall keep such wharves and sheds in a clean and sanitary condition, clear of materials which create a fire hazard and shall ensure that passageways and established fire lanes are not obstructed.

**Chapter 42-117** – Standards of Cleanliness
- All vessels moored at a state-owned mooring or berthing facility shall be kept, at all times, in a condition of reasonable cleanliness and sanitation so as not to constitute a common nuisance or potential source of danger to public health.

**Chapter 42-118** – Charges for Cleaning Wharves
- In cases where the department takes over the cleaning of wharves the charge therefore shall be assessed against the vessel which is responsible for the necessary of cleaning.

**Chapter 42-119** – Identification of Mobile Equipment

- All mobile equipment used on any property under the control of the department in connection with the handling of cargo or shipping containers, such as folk lifts, cranes, tractors, and straddle trucks, shall be clearly identified as to the owner thereof.

**Chapter 42-121** – Fowl, Animal, or Livestock

- No fowl, animal, or livestock of any kind shall be allowed to remain on any wharf under control of the department for a period longer than six hours without being properly fed and watered. After any fowl, animal, or livestock unloaded on a state wharf, it shall be removed from the same wharf within twenty-four hours.
- No shipment of such fowl, animal, or livestock subject to quarantine shall be unloaded on a state wharf by any shipping company or its agents unless first passed by the state department of agriculture or unless arrangement have been made of acceptance of quarantine. All such fowl, animal, or livestock requiring quarantine shall be removed from the wharf within eighteen hours.
- All expenses incurred in the care and maintenance of such fowl, animal, or livestock while on a state wharf shall be paid by the consignee thereof and shall constitute a lien upon the same until such charges are paid.

**Chapter 42-122** – Private Use of State Harbor Property or Facilities; Business Activities; Signs

- No regular or extensive use of any state harbor property or facility for private gain or purpose shall be permitted without corresponding and reasonable benefits and returns to the public.
- No person shall engage in any business or commercial activity at any state harbor without the prior written approval of the department. Without limiting its generality, the term “engage in any business or commercial activity” as used in this section includes (1) solicitation, and (2) distribution of advertisement or circulars, intended for private gain or purpose.
- No person shall post or display any signs at any state harbor without the prior written approval of the department, except that approval will not be required for the posting or displaying of any sign on a vessel which relates solely to the sale of such vessel if the maximum dimension of such sign does not exceed three feet.

**Chapter 42-123** – Placement of Goods and Equipment

- Any person handling goods or using equipment on a wharf or within a shed under control of the department or bringing goods whereon or therein for shipment, shall place, store, or stack such goods or equipment in such a way as not to be an impediment to the approaches to same nor an obstacle to the removal of other goods, not to cause damage to the shed or wharf.
- No goods shall be so placed as to restrict or prevent the use of mooring bitts, cleats, or any other device used for mooring purposes.
- No goods shall be so placed as to restrict or prevent the use of tracks, water connections, fire hydrants, gutters, liquid connections or drains, telephone or electric connections.

**Chapter 42-124** – Closing of Wharves for Safety Reasons

- The harbor master may close the wharves or any portion thereof and regulate and control the use of the same whenever in the harbor master's opinion it is advisable to do so for reasons of safety, fire prevention, or probable interference with cargo handling or vessel operations.
- No person shall enter upon any wharf so closed without the permission of the harbor master.

**Chapter 42-125** – Liability for Damage to or Loss of Merchandise and Cargo

- The department shall not be liable for any damage to or loss of merchandise or other property on any wharf under its control.
- It shall be the responsibility of shipping concerns or their agents to exert every effort to protect cargo from the effect of weather conditions while same is stored on state wharves. This responsibility shall include the proper closing of all openings such as outside doors and windows, and the placing of cargo on pallets or dunnage so that it will not be damaged by moisture from the shed floors. Unless the above precautions are taken and unless carelessness on the part of department employees can be shown, no claim for damaged cargo due to inclement weather shall be considered.

**Chapter 42-126** – Littering or Polluting Land Areas Prohibited

- No person shall throw, place, leave, deposit, abandon, or cause or permit to be thrown, placed, left, deposited or abandoned any litter within a state harbor, except in receptacles designated by the department for the disposal of such materials. "Litter" as used in this section includes any and all types of debris and substances, whether liquid or solid, and materials such as garbage, refuse, rubbish, glass, cans, bottles, paper, wrappings, fish or animal carcasses or any other substances which render harbor lands or facilities unsightly, noxious or otherwise unwholesome to the detriment of the public health and welfare and effective and safe operation of the harbor.
- No person shall deposit oil, oily refuse, sludge, chemicals, or other hydrocarbons on state property except in specially designated collection points. These items may not be left in or near standard refuse containers or anywhere else on harbors property. Penalties, including but not limited to the revocation of mooring permits and the right to use the facilities, may be invoked.

**Chapter 42-127** – Littering or Polluting of Water Prohibited

- No person shall place, throw, deposit, or discharge, or cause to be place, thrown, deposited, or discharges into the waters of any harbor, river or shore waters of the State any litter, or other gaseous, liquid or solid materials which render the water unsightly, noxious or otherwise unwholesome so as to be detrimental to the public health and welfare or a navigational hazard.

- No person shall discharge oil sludge, oil refuse, fuel oil, or molasses either directly or indirectly, or pump bilges or ballast tanks containing other than clean water into the waters of any harbor, river or into any shore waters in the State.

**Chapter 42-128** – Disposal of Salvage of Derelict Craft

- When any owner, agent, or individual contemplates or plans the disposal or salvage of a derelict craft, vessel or other object of any size, type or description, by transporting across, within or on navigable waters, whether a part or whole craft or whether a floating or suspended object of any sort which might, if sunk, lost or abandoned in the harbors, channels or shore waters, become a hazard to navigation, to dredging or to other operation of state or federal government, or the public in those waters, that person shall obtain the written permission of the harbor master before taking such action.

**Chapter 42-129** – Duty of Persons Who Lose, Drop, or Abandon Any Floating or Sinking Object

- Should any owner, operator, charter, agent, or individual, without permission of the harbor master, lose, sink, drop, or abandon any floating or sinking object in or on the navigable waters and shore waters of the State, that person shall immediately notify the harbor master and shall immediately take such action as is necessary for removal of the object.
- Upon failure on the part of the owner, operator, charterer, agent or individual to remove such object the department will take such actions through federal or commercial channels as are necessary for such removal and will charge all costs incurred by the department in effecting the necessary removal to the owner. The harbor master may require the posting of a bond to assure payment.

**Chapter 42-130** – Approved Backflow Prevention Device Required for Water Supply System

- No person shall connect a vessel's water supply system, siphon or other water water-operated device, equipment or mechanism connected to the water supply system or operate any water-operated device, equipment or mechanism connected to the water supply system, unless an approved backflow prevention device has been installed at the faucet or other point of connection. An "approved backflow prevention device" means a backflow prevention device that meets the requirements contained in Standard 1001, American Society of Sanitary Engineers as it existed on June 1, 1993, or the Uniform Plumbing Code adopted by the International Association of Plumbing and Mechanical Officials.

**Chapter 42-131** – Dumping of Materials at Sea

- When any owner, agent or individual contemplates the dumping of sinkable materials at sea by hauling across, within or on the navigable and/or shore waters of the State that person shall notify and obtain the permission of the department as specified in §19-42-161 and §19-42-162 prior to movement and shall not fail to perform any duty imposed thereby. All dumping at sea of sinkable objects or materials shall be done in the areas

designated by the Secretary of the Army for such disposal and in accordance with the Corps of Engineers requirements and applicable state agency requirements.
- The dumping of floating objects is strictly prohibited.

**Chapter 42-132** – Waste Outlets; Permit Required
- Notwithstanding the issuance of a permit pursuant to §19-42-161, no person shall do any of the following within a state commercial harbor without first having obtained a permit from the HDOH (not applicable to vessels):
    - o Discharge any wastes from shore into the waters of a state commercial harbor so as to reduce the quality of the water below the standards of water quality adopted for such waters by the HDOH.
    - o Construct, install, modify, alter, or operate any treatment works or part thereof or any extension of addition thereto which discharges from shore into the waters of a state commercial harbor.
    - o Construct or use new outlet for the discharge of any wastes from shore into the waters of a state commercial harbor.

**Chapter 42-133** – Loading or Unloading Flammable Liquids
- Loading or unloading of flammable liquids shall be in strict accordance with applicable federal laws and regulations.

**Chapter 42-134** – Appliances and Electrical Wiring
- All cooking or heating appliances or any other machinery, equipment, utensils, or apparatus which are used by small craft or smaller commercial vessels at a state commercial harbor and could be the cause of fire shall be so constructed, installed, wired, situated, maintained, and used so as not to constitute a potential fire hazard. The failure to conform to any statute, rule, regulation, standard, or ordinance affecting fire safety may be considered by the department in determining any violation of this section.
- Particular attention is directed to the applicable provisions of the state boating rules of the Department of Land and Natural Resources. In addition, the approval of any machinery, equipment, utensils, or apparatus by Underwriter' Laboratories, Factory Mutual System, Marine Testing Institute, Inc., or any other nationally recognized electrical testing agency, may be considered by the department in determining compliance with this section.
- All electrical equipment must be properly grounded.

**Chapter 42-135** – Fire Extinguishing Equipment for Small Craft
- Any small craft utilizing the waters of the state commercial harbor shall be provided with approved fire extinguishers as prescribed in the applicable provisions of the state boating rules of the DLNR. The fire extinguishers shall at all times be maintained in good and serviceable condition for immediate and effective use an shall be mounted on wall brackets so located as to be readily accessible. In addition, if any person is living aboard any small craft or contrivance, which is not a visiting small craft temporarily using the

harbor, the small craft or contrivance shall be equipped with at least one approved hand portable fire extinguisher containing ten pounds of dry chemicals placed on each separate level or floor of habitable living space. Each extinguisher shall be mounted on a wall bracket so placed as to be readily accessible.

Chapter 42-136 – Fueling

- All fueling operations shall be done in compliance with the stricter of any applicable federal, state, or county rules. The fueling of vessels at a state commercial harbor where a marine fueling station has been established, or where authorized tank trucks or tank trailers are available shall be accomplished only at a station, or by tank trucks or tank trailers with a state permit. A permit shall be issued only if:
    - Proper application has been submitted;
    - Established fees have been paid to the department by the applicant;
    - There exists a comprehensive general liability insurance policy or policies, or a certificate of insurance in lieu thereof evidencing that a policy has been issued and is in force with a combined single limit of not less than $500,000. The specification of limits contained in this section shall not be construed in any way to be a limitation on the liability of the permittee for any injury or damage proximately caused by it. The insurance shall (A) be issued by an insurance company or surety company authorized to do business in the State; (B) name the State as an additional insured; (C) provide that the department shall be notified at least thirty (30) days prior to any termination, cancellation, or material change in its insurance coverage; (D) cover all injuries, losses, or damages arising from, growing out of, or caused by any acts or omissions of the permittee, its officers, agents, employees, invitees, or licensees, in connection with the permittee's use or occupancy of the premises; and (E) be maintained and kept in effect at the permittee's own expense throughout the life of the permit. The permittee shall submit evidence to the department of renewals of other actions to indicate that the insurance policy remains in effect as prescribed in this section.
- Prior to fueling a vessel at a state commercial harbor, the operator shall:
    - Securely moor the vessel;
    - Stop all engines, motors, fans, and devices which could provide sparks;
    - Extinguish all fires;
    - Close all ports, windows, doors, and hatches; and
    - Clear the area of people not directly involved with the operation of the vessel or servicing of the vessel.
- Persons fueling a vessel at a state commercial harbor shall:
    - Refrain from smoking, striking matches, or throwing switches; and
    - Keep the nozzle of the fuel hose, or fuel can in continuous contact with fuel tank opening to guard against static sparks.
- After fueling is completed, the following action shall be taken:
    - Close fill openings;
    - Wipe up all spilled fuel;

- Open all ports, windows, doors, and hatches;
- Permit vessel to ventilate for at least five minutes; and
- Check that there are no fuel fumes in the vessel's bilges or below deck spaces before starting machinery or lighting fires.

- Fueling a vessel from a fuel barge or tanker barge shall be allowed only when it is down in accordance with operational procedures approved by the USCG.

**Chapter 42-137** – Fishing Prohibited

- Fishing, as defined in HRS 187A-1 is prohibited from all piers, wharves, and bulkhead walls in Kewalo Basin and Honolulu Harbor except Piers 5, 6, and 7; and all piers and wharves in Barbers Point Harbor. Casting of fishing lines beyond the shallow marginal reef and into the boat channel is prohibited from the Waikiki side of the Kewalo Basin entrance channel. Fishing with nets is prohibited in the basin and channel areas of Kewalo Basin, Barbers Point Harbor, and Honolulu Harbor except for the use of hand-held scoop nets for landing hooked fish at Piers 5, 6, and 7 in Honolulu Harbor and the shallow marginal reef at the Waikiki side of the Kewalo Basin entrance channel and as provided in these rules and HAR 188-34.

**Chapter 42-138** – Lifesaving Equipment Required

- Any small craft and smaller commercial vessel utilizing the waters of a state commercial harbor shall be equipped with lifesaving equipment as required by and approved by the USCG. Wearable PFDs must be readily accessible and throwable devices must be immediately available for use
  - Boats 16 feet or over in length shall carry one Type I, II, or III (wearable) PFD for each person on board and one Type IV (throwable) PFD in each boat.
  - Boats less than 16 feet in length and all canoes and kayaks shall carry one Type I, II, III, or IV PFD for each person on board.

**Chapter 42-139** – Fire Signal for Small Craft or Smaller Commercial Vessel in Harbor

- Five prolonged blasts on a vessel's whistle, horn or other sound producing device indicates (1) a fire on board small craft or smaller commercial vessel not under way or (2) a fire at any facility to which the small craft or smaller commercial vessel may be moored. The words "prolonged blasts" used in this section shall mean a blast from four to six seconds duration. The fire signal shall not be used for other purposes in any state harbor.

**Chapter 42-140** – Liquor Prohibited on State Piers and Waterfront Properties without Permit

- No person shall consume any liquor as defined in HRS 281-1, on any state pier or waterfront property not under lease except by prior permission from the department for each occasion.

**Chapter 42-141** – Responsibility for Vessel Gangplanks

- It shall be the responsibility of the vessel to provide a reliable and safe means of access and egress to and from the vessel and the pier for crew members, passengers, and visitors to the vessel.

**Chapter 42-161** – Dredging, Filling, and Construction

- Any person, firm, or corporation desiring to perform any dredging, filling, or erecting of any construction within commercial harbors and entrance channels belonging to or controlled by the State, shall first obtain a permit therefore from the department.
- The application for any dredging, filling, or construction shall be in the form prescribed by the department, accompanied by maps and drawings which shall clearly show the location, scope, character, and details of the proposed work, and shall be further accompanies by a fee of $50 to cover costs of the necessary investigation. This fee is not refundable whether or not a permit is granted.

**Chapter 42-162** – Jurisdiction of Other Agencies

- The United States Army Corps of Engineers, the State Department of Health, and the Department of Land and Natural Resources may have certain jurisdiction over navigable waters.
- The approval of these agencies shall also be secured before performing work within their jurisdictions. When directed, the applicant shall notify the USCG of such work for publication of a "Notice to Mariners."

**Chapter 42-163** – Installation of Buoys

- Any person desiring to install mooring or anchorage buoys in any harbor under the jurisdiction of the department, shall apply to the department in writing for permission to install such buoys.
- Applications must be accompanied by comprehensive plans showing the exact proposed location of buoys and anchors, as well as plans and specifications of the type and size of buoy and anchoring equipment. The director may grant permission for the installation of moorings or buoys in any area under the department jurisdiction if, in the director's judgment, it is advisable and will not be a menace to or interfere with navigation. The right is reserved by the director to revoke any license or permission for installation at any time, if the director's opinion revocation is necessary or advisable. Upon revocation, the owner shall remove the moorings or buoys without delay.

**Chapter 42-164** – Construction of Structures

- No buildings or structures of any nature shall be erected or constructed on state property, nor shall existing structures be modified, without obtaining the prior permission of the division and any other governmental agency as required by law. The division may require plans, specifications, and other pertinent data to accompany any request for construction or modification of state facilities. In General, approval shall be dependent on an agreement to return the property to its original state when vacating the property, if requested by the division.

Note: The majority of Chapter 42 deals with loading and unloading of hazardous materials and does not apply to storage of materials and waste that are used/stored at harbor tenant facilities or construction sites. In the case of improper use, manage, or storage of hazardous substances or wastes, Harbors will follow the terms and conditions contained in the tenant lease agreement or revocable permit, or construction contracts as stated below.

Enforcement Officers may issue penalties under HAR Title 19 for the following circumstances:

- A responsible party in violation of an environmental regulation, but where a Written Warning is not an effective tool.
- A responsible party in violation of a Harbors requirement, but not in violation of HDOH stormwater regulations.
- A transient vessel owner in violation of a Harbors requirement, BMP, or HDOH stormwater regulation, although not subject to a tenant lease agreement, revocable permit, construction contract.

# Lease Agreement Addendum 1

# Environmental Compliance - Lessee's Duties

## ADDENDUM 1

## ENVIRONMENTAL COMPLIANCE – LESSEE'S DUTIES

A. Definitions.

For purposes of this Lease, Lessee agrees and understands that the following terms shall have the following meanings:

"Environmental Laws" shall mean all federal, state and local laws of every nature including statutes, ordinances, rules, regulations, codes, notices, standards, directives of every kind, guidelines, permits, licenses, authorizations, approvals, interpretations of the foregoing by any court, legislative body, agency or official, judicial decisions, orders, rulings or judgments, or rules of common law which currently are in effect or which may come into effect through enactment, issuance, promulgation, adoption or otherwise, which in any way pertain to, relate to, or have any relevance to the environment, health or safety. These environmental laws include, but are not limited to, regulations and orders of the federal Environmental Protection Agency and of the State of Hawaii Department of Health.

"Hazardous Substance" shall mean and include any chemical, substance, organic or inorganic material, controlled substance, object, condition, waste, living organism, or combination thereof which is, may be, or has been determined by proper state or federal authority under any environmental law to be, hazardous to human health or safety or detrimental to the environment. This term shall include, but not be limited to, petroleum hydrocarbons, asbestos, radon, polychlorinated biphenyls (PCBs), methane, and other materials or substances that are regulated by state or federal authorities.

B. Lessee's Activities and Duties.

1. **Compliance with Environmental Laws.** Lessee agrees, at its sole expense and cost, to comply with all environmental laws that apply to the leased premises during the term of this lease, and Lessee's occupancy of, and activities on, the leased premises. This duty shall survive the expiration or termination of this lease which means that the Lessee's duty to comply with environmental laws shall include complying with all environmental laws, regulations and orders that may apply, or be determined to apply, to the occupancy and activities of the Lessee on the leased premises after the expiration or termination of this lease. Failure of the Lessee to comply with any environmental laws shall constitute a breach of this lease for which the Lessor shall be entitled, in its discretion, to terminate this lease and take any other action at law or in equity it deems appropriate. Lessee shall conform its operations with 49 CFR, Part 195 (Pipeline Safety), and shall install Time Domain Reflectivity (TDR) cable leak detection and monitoring equipment, which meet or exceed industry standards, adjacent to the fuel pipelines and related facilities, to provide an indication of any leak occurrence from any fuel pipeline or containment

device. In addition, the Lessee shall install a secondary containment wall/vaulting to prevent releases into the environment. The Lessee shall also develop, implement, and follow a written integrity management program that addresses the risks of each pipeline, and provides for periodic assessment of the integrity of each pipeline through internal inspection, pressure testing, or other equally effective assessment means, on a regular basis.

2. **Hazardous Substances.** Lessee shall not use, store, treat, dispose, discharge, release, generate, create, or otherwise handle any Hazardous Substance, or allow the same by any third person, on the leased premises (with the exception of the intended routine management of the petroleum products within the proposed pipeline) without first obtaining the written consent of the Lessor and complying with all environmental laws, including giving all required notices, reporting to, and obtaining permits from, all appropriate authorities, and complying with all provisions of this lease.

3. **Notice to Lessor.** Lessee shall keep Lessor fully informed at all times regarding all environmental law related matters affecting the Lessee or the leased premises. This duty shall include, without limited the foregoing duty, providing the Lessor with a current and complete list and accounting of all hazardous substances of every kind which are present on or about the leased premises and with evidence that the Lessee has in effect all required and appropriate permits, licenses, registrations, approvals and other consents that may be required of or by federal and state authorities under all environmental laws. This duty shall also include providing immediate written notice of any investigation, enforcement action, remediation, or other regulatory action, order of any type, or any legal action, initiated, issued, or any indication of an intent to do so, communicated in anyway to the Lessee by any federal or state authority, or individual, which relates in any way to any environmental law, or any hazardous substance, and the Lessee or the leased premises. As part of this written notice to the Lessor, the Lessee shall also immediately provide the Lessor with copies of all written communications from individuals, or state and federal authorities, including copies of all correspondence, claims, complaints, warnings, reports, technical data and any other documents received or obtained by the Lessee. At least thirty days prior to termination of this lease, or termination of the possession of the leased premises by Lessee, Lessee shall provide the Lessor with written evidence satisfactory to the Lessor that Lessee has fully complied with all environmental laws, including any orders issued by any governmental authority to the Lessee that relate to the leased premises.

4. **Notice to Authorities.** Lessee shall provide written notice to the Environmental Protection Agency and the State of Hawaii Department of Health at least sixty days prior to the termination of this lease, or sixty days prior to Lessee's termination of possession of the leased premises, whichever occurs first, that Lessee intends to vacate the leased premises and terminate its operations on those leased premises. Lessee shall allow the agents or representatives of said authorities access to the leased premises at any and all reasonable times for the purpose of inspecting the leased premises, and taking samples of any material for inspection or testing for compliance with any environmental laws. Lessee shall provide copies of said written notices to Lessor at the time said notices are provided to said authorities.

5. **Disposal/Removal.** Except for materials that are lawfully sold in the ordinary course of the Lessee's business, Lessee shall cause any hazardous substances to be removed from the leased premises for disposal, and to be transported from the leased premises solely by duly licensed hazardous substances transporters, to duly licensed facilities for final disposal as

required by all applicable environmental laws. Lessee shall provide Lessor with copies of documentary proof, including manifests, receipts, or bills of lading, which reflect that said hazardous substances have been properly removed and disposed of in accordance with all environmental laws.

6. **Environmental Investigations and Assessments**. The Lessee, at its sole cost and expense, shall cause to be conducted such investigations and assessments of the leased premises to determine the presence of any hazardous substance on, in, or under the leased premises as may be directed from time to time by the Lessor, in its sole discretion, or by any federal or state authority. The extent and number of any environmental investigations and assessments shall be determined by the Lessor or the federal or state authority directing said investigations and assessments to be conducted. Lessee shall retain a competent and qualified person or entity that is satisfactory to the Lessor or governmental authority, as the case may be, to conduct said investigations and assessments. Lessee shall direct said person or entity to provide the Lessor or governmental authority, if so requested, with testable portions of all samples of any soils, water, ground water, or other material that may be obtained for testing, and provide to the Lessor and the governmental authority written results of all tests on said samples upon completion of said testing.

7. **Remediation.** In the event that any hazardous substance is used, stored, treated, disposed on the premises, handled, discharged, released, or determined to be present on the leased premises, Lessee shall, at its sole expense and cost, remediate the leased premises of any hazardous substances, and dispose/remove said hazardous substance in accordance with paragraph 4. This duty to remediate includes strictly complying with all environmental laws and directives to the Lessee to remediate said hazardous substance from the Lessor. This duty to remediate shall include replacement of any materials, such as soils, so removed with material that is satisfactory to the Lessor and governmental authority, as the case may be. In the event Lessee does not remediate the leased premises to the same condition as it existed at the commencement of the lease, as determined by the Lessor, Lessee understands and agrees that Lessor may exercise its rights under the paragraph entitled Lessor’s Right to Act, and until such time as the remediation is complete to the satisfaction of the Lessor, Lessee shall be liable for lease rent in the same manner and amount as if the lease had continued in effect during the period of remediation.

8. **Restoration and Surrender of Premises.** The Lessee hereby agrees to restore the leased premises, at its sole cost and expense, including the soil, water and structures on, in, or under the leased premises to the same condition as the premises existed at the commencement of this lease, fair wear and tear to the structures excepted. In the event Lessee does not restore the leased premises to the same condition as it existed at the commencement of the lease, as determined by the Lessor, Lessee understands and agrees that Lessor may exercise its rights under the paragraph entitled Lessor’s Right to Act, and until such time as the restoration is complete to the satisfaction of the Lessor, Lessee shall be liable for lease rent in the same manner and amount as if the lease had continued in effect during the period of restoration.

9. **Lessor’s Right to Act**. In the event Lessee fails for any reason to comply with any of its duties under this lease or under any environmental laws within the time set for doing so, or within a reasonable time as determined by the Lessor, Lessor shall have the right, but not the obligation, in its sole discretion, to perform those duties, or cause them to be performed. Lessee

hereby grants access to the leased premises at all reasonable hours to the Lessor, its agents, and anyone designated by the Lessor in order to perform said acts and duties. Any cost, expense, or liability of any type that may be incurred by the Lessor in performing said acts or duties shall be the sole responsibility of the Lessee, and Lessee hereby agrees to pay for those costs and expenses, and indemnify the Lessor for any liability incurred. This obligation shall extend to any costs and expenses incident to enforcement of Lessor's right to act, including litigation costs, attorneys fees, and the costs and fees for collection of said cost, expense or liability.

10. **Release and Indemnity**. Lessee hereby agrees to release the Lessor, its officers, agents, successors, and assigns from any liability of any kind, including, but not limited to, any liability for any damages, penalties, fines, judgments, or assessments that may be imposed or obtained by any person, agency, or governmental authority against the Lessee by reason of any hazardous substance that may be present by whatever means on, in or under the leased premises. The Lessee hereby agrees to indemnify, defend with counsel suitable to the Lessor, and hold harmless the Lessor from any liability that may arise in connection with, or by reason of, any occurrence involving any hazardous substance that may be alleged to be connected or related in any way with the leased premises, the Lessor's ownership of the premises, or this lease, including the presence of any hazardous substance on the leased premises.

11. **Surety/Performance Bond for Cleanup/Restoration**. At its sole cost and expense, Lessee shall provide the Lessor with a Bond, or other security satisfactory to Lessor, in the amount of $100,000.00 to assure removal of any hazardous substances, and the remediation and restoration of the leased premises during the term of, and at the conclusion of the lease so as to comply with the terms of this lease to the satisfaction of the Lessor, and in order to comply with environmental laws. Lessee shall provide written evidence that said Bond or security has been secured by the Lessee, which evidence shall indicate the term during which said Bond or other security shall irrevocably remain in effect.

12. **Insurance.** Effective at the commencement of this lease, Lessee shall obtain and keep in force a comprehensive liability and property damage policy of insurance issued by an insurer licensed to do business in the State of Hawaii, with limits of indemnity coverage no less than $1,000,000. Said policy of insurance shall provide coverage for personal injury or damage to property caused by hazardous substances or any occurrence that may constitute a violation of any environmental law by the Lessee. Said policy of insurance shall name the Lessor as an additional insured. Lessee shall provide proof of said insurance satisfactory to the Lessor which shall include, at a minimum, the coverage provided, and the term during which said policy shall be effective.

DEPARTMENT OF TRANSPORTATION
**HARBORS DIVISION**
79 South Nimitz Highway
Honolulu, Hawaii 96813

REVOCABLE PERMIT NO. H-12-XXXX

The STATE OF HAWAII, hereinafter called the "STATE," hereby grants to the "PERMITTEE" permission to enter, use and occupy on a month-to-month basis, the premises described in item 2, and designated on Exhibit "A," attached hereto and made a part hereof, for the purpose(s) specified in item 4; and the PERMITTEE agrees to pay the rental specified in item 5, and to perform all other obligations imposed upon it by the Terms and Conditions hereof.

1. PERMITTEE:

2. PREMISES: ______________________________, as shown on attached Exhibit "A"

3. LOCATION:

4. PURPOSE:

5. RENTAL:

6. SECURITY DEPOSIT:

7. EFFECTIVE DATE:

Dated at Honolulu, Hawaii, ______________________

BOARD OF LAND AND NATURAL RESOURCES

By ______________________
Chairperson and Member

STATE OF HAWAII

By ______________________
Harbors Administrator

Approved by the Board
at its meeting held on

______________________

By ______________________
Its

1. **TERM.** This Permit is granted on a month-to-month basis only, for a period not to exceed

**Page 2 (TERMS AND CONDITIONS CONTINUED)**

one (1) year from the effective date hereof. Any renewal of this Permit shall be on a month-to-month basis for a period not to exceed one (1) year. Notice of renewal need not be reduced to writing, it
being agreed that such renewal shall be automatic unless a party hereto shall give the other party ten (10) working days' notice of its intention not to renew or unless the Board of Land and Natural Resources shall fail to approve the renewal. Further, this Permit will not be renewed, or a new Permit granted should the PERMITTEE not be current in its obligations to the STATE.

2. **PERMITTEE'S PRIOR INSPECTION.** The PERMITTEE warrants that it has inspected the Premises and all improvements thereon, knows the condition thereof, accepts the premises in an “as is” condition, including soil, water, structures, and fully assumes all risks incident to the use and enjoyment of the Premises, but excluding any Hazardous Substances that may be found to exist on the premises on the commencement date of this permit and which existing hazardous substance shall be governed by paragraph 26 of this permit.

3. **SECURITY DEPOSIT.** The PERMITTEE, upon execution of this Permit, shall deposit with the STATE in legal tender or in such other form as may be acceptable to the STATE an amount equal to two (2) months' rental as security for the faithful performance on its part of all the terms and conditions, including the special terms and conditions, if any, specified in paragraph 26 of this Permit. The said deposit will be returned, without interest, to the PERMITTEE upon the termination of this Permit only if it has faithfully performed said terms and conditions to the satisfaction of the STATE. In the event the PERMITTEE does not so perform, the STATE may declare the deposit forfeited or apply it as an offset to any amounts owed by the PERMITTEE to the STATE under this Permit or to any damages or loss to the STATE caused by the breach by the PERMITTEE of such terms and conditions. The exercise of this option is without prejudice to the right of the STATE to exercise its rights under the Environmental Compliance-Permittee’s Duties provision below including, but not limited to, the requirement for obtaining a surety/performance bond and the STATE’s rights thereunder. Furthermore, the exercise of the STATE’s rights under this provision concerning Security deposit is without prejudice to the rights of the STATE to institute action for debt or damages against the PERMITTEE or to take any other or further action against the PERMITTEE provided by law for the enforcement of the rights of the STATE under this Permit.

4. **INSURANCE.** The PERMITTEE shall, concurrently with the execution of this Permit, deliver to the STATE, a Commercial Liability Insurance policy or policies, or a certificate of insurance in lieu thereof, evidencing that such policy has been issued and is in force, with a combined single limit of not less than $1,000,000.00 for bodily injury and damage to property per occurrence and $2,000,000.00 aggregate. The specification of limits contained herein shall not be construed in any way to be a limitation on the liability of the PERMITTEE for any injury or damage or for any rent, service charge or other charges under this Permit.

Such insurance shall (a) be issued by an insurance company or surety company authorized to do business in the State of Hawaii or approved in writing by the Director of Transportation; (b) name the State of Hawaii as an additional insured; (c) provide that the Department of Transportation shall be notified at least thirty (30) days prior to any termination, cancellation or material change in its insurance coverage; (d) cover all injuries, losses or damages arising from,

**Page 3 (TERMS AND CONDITIONS CONTINUED)**

growing out of or

caused by any acts or omissions of the PERMITTEE, its officers, agents, employees, invitees or licenses, in connection with the PERMITTEE's use or occupancy of the Premises including any act or omission related to any Hazardous Waste; and (e) be maintained and kept in effect at the PERMITTEE's own expense throughout the life of this Permit, evidenced by furnishing the STATE without notice or demand a like certificate upon each renewal thereof.

Permittee will immediately provide written notice to the contracting department or agency should any of the insurance policies evidenced on its Certificate of Insurance form be cancelled, limited in scope, or not renewed upon expiration.

The State of Hawaii is added as an additional insured as respects to operations performed for the State of Hawaii.

It is agreed that any insurance maintained by the State of Hawaii will apply in excess of, and not contribute with, provided by this policy. **See also Environmental Compliance – Permittee's Duties below**.

5. **INDEMNITY.** The PERMITTEE shall at all times with respect to the Premises use due care for public safety and shall defend, hold harmless and indemnify the STATE, its officers, agents and employees from and against all claims or demands for damages, including claims for property damage, personal injury or death, (a) arising on the Premises, or by reason of any fire or explosion thereon; or (b) arising from, growing out of, or caused by any act or omission on the part of the PERMITTEE its officers, agents, employees, invitees or licenses in connection with the PERMITTEE'S use or occupancy of the Premises. **See also Environmental Compliance – Permittee's Duties below**.

6. **METHOD OF PAYMENT OF RENTAL AND SERVICE CHARGE ON DELINQUENT RENTALS AND OTHER CHARGES.** The monthly rental shall be payable in advance, without notice or demand, at the Harbors Division Fiscal Office on Oahu and at the appropriate District Office on Hawaii, Maui or Kauai, on the first (1st) day of each and every month during the life of this Permit.

Interest; Service Charge: Without prejudice to any other remedy available to the STATE, the PERMITTEE agrees without further notice or demand as follows: (a) To pay interest at the rate of one percent (1%) per month, compounded monthly on all delinquent payments; (b) To pay a service charge of $30.00 a month for all delinquent payments, or such other charge as may be prescribed by rules adopted by the STATE, provided that in no event shall a service charge in excess of $50.00 be levied under this Permit; and (c) That the term "delinquent payments" as used herein means fees, rents, service charges and other charges payable by the PERMITTEE to the STATE, which are not paid when due.

7. **ACCEPTANCE OF RENT NOT A WAIVER.** The acceptance of rent by the STATE shall not constitute a waiver of any breach by the PERMITTEE of any of the terms and conditions upon which this Permit is granted and to which the PERMITTEE agrees, or of the

**Page 4 (TERMS AND CONDITIONS CONTINUED)**

STATE's right to terminate or revoke this Permit. Failure by the STATE to insist upon strict performance hereof by the PERMITTEE, or to exercise any option herein reserved, shall not be construed as a waiver or as a relinquishment of any of its rights under this Permit.

8. **RESERVATION OF RIGHT TO INCREASE OR DECREASE RENT.** The STATE reserves the right to increase or decrease the monthly rental at any time upon thirty (30) days' advance written notice.

9. **UTILITIES AND OTHER CHARGES.** The PERMITTEE shall be responsible for and pay all charges for water, electricity, telephone and other utilities and all charges for sewer, garbage and trash disposal; where any of such services are provided by the STATE at the request of the PERMITTEE, it shall pay the STATE's charges therefore.

10. **WASTE, STRIP AND NUISANCE; MAINTENANCE.** The PERMITTEE shall not make, permit or suffer any waste, strip, nuisance or any other unlawful, improper or offensive use of the Premises.

The PERMITTEE shall maintain the Premises, improvements thereon, all equipment and other personal property of the PERMITTEE upon the Premises in a strictly clean, neat, safe, orderly and sanitary condition, free of waste, rubbish and debris and shall provide for the safe and sanitary handling and disposal of all trash, garbage and other refuse from the Premises**. See also Environmental Compliance – Permittee's Duties below**.

11. **NOTICES.** All notices, demands and requests which may be given or which are required to be given by either Party to the other pursuant to this Agreement, shall be in writing and shall be deemed effective either: (a) on the date personally delivered to the address below, as evidenced by written receipt therefore, whether or not actually received by the person to whom addressed; (b) on the third (3rd) business day after being sent, by certified or registered mail, addressed to the intended recipient at the address specified below whether or not actually received by the person to whom addressed or any return receipt is executed; (c) on the first (1st) business day after being deposited into the custody of a nationally recognized overnight delivery service such as Federal Express Corporation, DHL, Emery or Purolator, addressed to such party at the address specified below, or (d) on the date of transmission by facsimile or electronic mail to the respective numbers or addresses specified provided that a "hard" copy is post-marked the same date by first-class certified mail or sent via nationally recognized overnight delivery service to the address specified below. All notices to a Party shall be made to the address below unless the Party gives notice of a change of name or address or number, and thereafter, notices to that Party shall be given as demanded in that notice:

a. If to Lessee/Permittee: Name: ______________________________

______________________________

Address: ______________________________

City: ______________________________

Zip Code: ______________________________

Phone: (808) ________________________

Fax: (808) ________________________

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b. If to DOT: State of Hawaii Department of Transportation
869 Punchbowl Street, 5th Floor
Honolulu, Hawaii 96813-5097
Attn: Director
Phone: (808) 587-2150
Fax: (808) 587-2167

c. With a copy to: State of Hawaii Department of Transportation
Harbors Division
Property Management Section
79 South Nimitz Highway
Honolulu, HI 96813
Attn: Harbors Administrator
Phone: (808) 587-1940
Fax: (808) 587-2504

12. **ENTRY BY STATE.** The STATE or its agents and employees may enter the Premises at all reasonable hours to inspect the Premises and determine if the PERMITTEE is complying with the terms and conditions of this Permit or for any other proper purpose. The PERMITTEE shall not make any claim for damages or set off of rent, service charge or other charges by reason or on account of such entry.

13. **REPAIRS.** The PERMITTEE shall, at its own expense, keep and maintain the Premises in condition similar to that which existed on the effective date of this Permit, ordinary wear and tear and damage by acts of God excepted. **See also Environmental Compliance – Permittee's Duties below**.

14. **STRUCTURAL IMPROVEMENTS, ALTERATIONS OR ADDITIONS.** No substantial improvement, alteration or addition of a structural nature shall be made, installed or constructed on, under or within the Premises by the PERMITTEE unless it first submits its plans and specifications thereof to the STATE for its approval and unless said plans and specifications are in fact approved in writing by the STATE. A total of four (4) sets of the proposed plans, stamped by a licensed engineer authorized to conduct business in the State, shall be submitted to the State for its review and approval. Such plans and specifications shall not be submitted unless they are in full compliance with all applicable statutes and rules and regulations. Any improvements, alterations or additions shall be accomplished at the sole cost and risk of the PERMITTEE and the STATE shall not be responsible for any damage to or destruction of any such improvements, alterations or additions or any personal property on the Premises. The Permittee shall also provide notice to the responsible agencies, including the Office of Environmental Quality, and otherwise comply with H.R.S. Chapter 343 to determine if such improvement, alteration or addition requires environmental assessments or statements. **See Environmental Compliance – Permittee's Duties below**.

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15. **REMOVAL OF IMPROVEMENTS OR ADDITIONS.** The PERMITTEE may remove, at its own cost and risk, any and all improvements or additions or any portions thereof, constructed or installed by it upon the Premises, at any time during the life of this Permit or within thirty (30) days after the termination or revocation hereof; provided that, the PERMITTEE shall give, prior to said termination or revocation, written notice of its intent to remove the same and that in the event of such removal, the Premises shall be restored by the PERMITTEE to a condition similar to that which existed immediately prior to the construction or installation thereof; ordinary wear and tear excepted and damage by acts of God excepted; provided further that, until such removal and restoration has been completed to the satisfaction of the STATE, the PERMITTEE shall continue to pay the rent set forth in item 5 herein. Failure of the PERMITTEE to give notice of intention to remove prior to termination or revocation shall be deemed to be an abandonment of said improvements or additions. **See also Environmental Compliance – Permittee's Duties below**.

16. **OPTION TO REQUIRE REMOVAL OF IMPROVEMENTS OR ADDITIONS.** The STATE, with respect to any improvements or additions or any portions thereof constructed or installed by the PERMITTEE on the Premises, reserves the right within twenty (20) working days after the date of termination or revocation of this Permit to require the PERMITTEE to remove the same at the PERMITTEE's cost and risk within thirty (30) days after said termination or revocation. Upon failure of the PERMITTEE to effect such removal within the specified time, the STATE may effect such removal, and restore the Premises to a condition similar to that which existed immediately prior to the construction or installation of the improvements or additions by its own employees or by an independent contractor and assess the PERMITTEE the total cost thereof.

17. **COMPLIANCE WITH LAWS; DISCRIMINATION PROHIBITED.** The PERMITTEE shall comply with all laws, ordinances and rules and regulations of all governmental agencies, applicable to the Premises or relating to and affecting any business or other commercial activity conducted on the Premises.

The use and enjoyment of the Premises shall not be in support of any policy which discriminates against anyone based upon race, creed, color, sex or national origin.

The PERMITTEE, for itself, its personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree as a covenant running with the land that in the event facilities are constructed, maintained, or otherwise operate on the said property described in this permit for a purpose for which a United States Department of Transportation program or activity is extended or for another purpose involving the provision of similar services or benefits. The PERMITTEE shall maintain and operate such facilities and services in compliance with all other requirements imposed pursuant to Title 49, Code A, Office of the Secretary, Part 21, Non-Discrimination in Federally-Assisted programs of the Department of Transportation-Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations may be amended.

That in the event of breach of any of the above non-discrimination covenants, the STATE shall have the right to terminate this permit and re-enter and repossess said land and the facilities thereon, and hold the same as if said permit had never been made or issued.

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The PERMITTEE assures that it will undertake an affirmative action program as required by
14 CFR Part 152, Subpart E, to insure that no person shall on the grounds of race, creed, color, national origin, or sex, be excluded from participating in any employment activities covered in 14 CFR Part 152, Subpart E. The PERMITTEE assures that no person shall be excluded on these grounds from participating in or receiving the services or benefits of any program or activity covered by this subpart. The PERMITTEE assures that it will require that its covered suborganizations provide assurances to the STATE that they similarly will undertake affirmative action programs and that they will require assurances from their suborganizations as required by 14 CFR Part 152, Subpart E, to the same effect.

18. **TRANSFERABILITY.** This Permit and the Premises or any part thereof, inclusive of any and all rights or obligations accruing or arising under it, shall not be sold, transferred, assigned, leased, mortgaged, sublet or otherwise alienated or encumbered in any manner whatsoever.

19. **PROPERTY TAXES.** The PERMITTEE shall pay all real property taxes lawfully assessed against the Premises.

20. **TERMINATION AND REVOCATION.** This Permit may be terminated by either party without cause upon thirty (30) days advance written notice; provided that, in the event the PERMITTEE fails to pay any rental, service charge, fees or charges when due or otherwise breaches any of the terms and conditions, the STATE may revoke this Permit upon five (5) working days written notice.

21. **RIGHT TO RE-ENTER AND ASSUME POSSESSION.** The STATE reserves the right and PERMITTEE agrees that, upon breach of any one or more of the terms and conditions of this Permit and/or termination thereof under paragraph 19 herein, the STATE may without necessity of court action, enter upon and administratively take possession of the Premises from PERMITTEE.

22. **RESTORATION.** The PERMITTEE shall within thirty (30) days of the termination or revocation of this Permit, restore the Premises, at its own cost and risk to a condition similar to that which existed prior to the effective date of this Permit, reasonable and ordinary wear and tear and damage by acts of God excepted, and peacefully surrender possession thereof to the STATE. In the event the PERMITTEE fails to effect such restoration of the Premises, the STATE may accomplish the same by its own employees or by an independent contractor and assess the PERMITTEE the total cost thereof. **See also Environmental Compliance – Permittee's Duties below**.

23. **HOLD OVER TENANCY**. If the PERMITTEE does not vacate the Premises upon the revocation or termination of the Permit, the PERMITTEE shall pay the STATE hold over rent. The rent for each day, or part of a day, during which the PERMITTEE remains in possession will be the amount payable immediately prior to the revocation or termination of the Permit. During any hold over period, the PERMITTEE shall be deemed an illegal occupant and acceptance of such payment by the STATE shall not constitute a waiver of any of the terms and conditions of

**Page 8 (TERMS AND CONDITIONS CONTINUED)**

this permit and shall not preclude the STATE from pursuing any other rights or remedies the STATE may be entitled to pursue under this Permit, including but not limited to assuming possession of the Premises as provided in paragraph 20 above or bringing an ejectment action for the recovery of Premises, without first giving notice to quit or making a demand for possession.

24. **COURT COSTS AND ATTORNEY'S FEES.** The PERMITTEE shall pay any and all court costs and attorney's fees incurred or paid by the STATE in collecting rents, penalties, service charges, fees or other charges due from or payable by the PERMITTEE under this Permit in removing from the Premises the PERMITTEE and any improvements or additions constructed or installed by it thereon, or in recovering any damages or losses caused by the PERMITTEE's breach of any of the terms or conditions of this Permit.

25. **INTERPRETATION.** The use of any gender shall include all genders, the use of the singular shall include the plural and the use of the plural shall include the singular, as the context may require.

26. **CONFLICTING TERMS AND CONDITIONS.** When an inconsistency exists between these Terms and Conditions and the Special Terms and Conditions, the Special Terms and Conditions shall govern.

27. **SPECIAL TERMS AND CONDITIONS.**

**ENVIRONMENTAL COMPLIANCE – PERMITTEE’S DUTIES**

A. Definitions.

For purposes of this Revocable Permit, Permittee agrees and understands that the following terms shall have the following meanings:

“Environmental Laws” shall mean all federal, state and local laws of every nature including statutes, ordinances, rules, regulations, codes, notices, standards, directives of every kind, guidelines, permits, licenses, authorizations, approvals, interpretations of the foregoing by any court, legislative body, agency or official, judicial decisions, orders, rulings or judgments, or rules of common law which currently are in effect or which may come into effect through enactment, issuance, promulgation, adoption or otherwise, which in any way pertain to, relate to, or have any relevance to the environment, health or safety. These environmental laws include, but are not limited to, regulations and orders of the federal Environmental Protection Agency and of the State of Hawaii Department of Health.

“Hazardous Substance” shall mean and include any chemical, substance, organic or inorganic material, controlled substance, object, condition, waste, living organism, or combination thereof which is, may be, or has been determined by proper state or federal authority under any environmental law to be, hazardous to human health or safety or detrimental to the environment. This term shall include, but not be limited to, petroleum hydrocarbons, asbestos, radon, polychlorinated biphenyls (PCBs), methane, and other materials or substances that are regulated by state or federal authorities.

B. **Permittee's Activities and Duties**.

1. **Compliance with Environmental Laws**. Permittee agrees, at its sole expense and cost, to comply with all environmental laws that apply to the premises during the term of this Revocable Permit, and Permittee's occupancy of, and activities on, the premises. This duty shall survive the expiration or termination of this Revocable Permit which means that the Permittee's duty to comply with environmental laws shall include complying with all environmental laws, regulations and orders that may apply, or be determined to apply, to the occupancy and activities of the Permittee on the premises after the expiration or termination of this Revocable Permit. Failure of the Permittee to comply with any environmental laws shall constitutes a breach of this Revocable Permit for which the State shall be entitled, in its discretion, to terminate this Revocable Permit and take any other action at law or in equity it deems appropriate.

2. **Hazardous Substances**. Permittee shall not use, store, treat, dispose, discharge, release, generate, create, or otherwise handle any Hazardous Substance, or allow the same by any third person, on the premises without first obtaining the written consent of the State and complying with all environmental laws, including giving all required notices, reporting to, and obtaining permits from, all appropriate authorities, and complying with all provisions of this Revocable Permit.

3. **Notice to the State**. Permittee shall keep the State fully informed at all times regarding all

Environmental law related matters affecting the Permittee or the premises. This duty shall include, without limit to the foregoing duty, providing the State with a current and complete list and accounting of all hazardous substances of every kind which are present on or about the premises and with evidence that the Permittee has in effect all required and appropriate permits, licenses, registrations, approvals and other consents that may be required of or by federal and state authorities under all environmental laws. This duty shall also include providing immediate written notice of any investigation, enforcement action, remediation or other regulatory action, order of any type, or any legal action, initiated, issued, or any indication of an intent to do so, communicated in anyway to the Permittee by any federal or state authority or individual which relates in any way to any environmental law or any hazardous substance and the Permittee or the premises. This written notice to the State shall include the Permittee immediately providing the State with copies of all written communications from individuals or state and federal authorities, including copies of all correspondence, claims, complaints, warnings, reports, technical data and any other documents received or obtained by the Permittee. At least thirty (30) days prior to termination of this Revocable Permit, or termination of the possession of the premises by Permittee, which ever shall first occur, Permittee shall provide the State with written evidence satisfactory to the State that Permittee has fully complied with all environmental laws, including

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any orders issued by any governmental authority to the Permittee that relate to the premises.

4. **Notice to Authorities**. Permittee shall provide written notice to the Environmental Protection Agency and the State of Hawaii Department of Health at least sixty (60) days prior to the termination of this Revocable Permit, or sixty (60) days prior to Permittee's termination of possession of the premises, whichever occurs first, the fact that Permittee intends to vacate the premises and terminate its operations on those premises. Permittee shall allow the agents or representatives of said authorities' access to the premises at any and all reasonable times for the purpose of inspecting the premises and taking samples of any material for inspection or testing for compliance with any environmental laws. Permittee shall provide copies of said written notices to the State at the time said notices are provided to said authorities.

5. **Disposal/Removal**. Except for materials that are lawfully sold in the ordinary course of
the Permittee's business and for which the Permittee has obtained all required authorizations from appropriate authorities including the prior written permission of the State to have said substance on the premises, Permittee shall cause any hazardous substances to be removed from the premises for disposal. This duty shall include the transportation of said hazardous substance from the premises solely by duly licensed hazardous substance transporters to duly licensed facilities for final disposal as required by all applicable environmental laws. Permittee shall provide the State with copies of documentary proof, including manifests, receipts or bills of lading, which reflect that said hazardous substances have been properly removed and disposed of in accordance with all environmental laws.

6. **Environmental Investigations and Assessments**. The Permittee, at its sole cost and expense, shall cause to be conducted such investigations and assessments of the premises to determine the presence of any hazardous substance on, in, or under the premises as may be directed from time to time by the State, in its sole discretion, or by any federal or state authority. The extent and number of any environmental investigations and assessments shall be determined by the State or the federal or state authority directing said investigations and assessments to be conducted. Permittee shall retain a competent and qualified person or entity that is satisfactory to the State or governmental authority, as the case may be, to conduct said investigations and assessments. Permittee shall direct said person or entity to provide the State or governmental authority, if so requested, with testable portions of all samples of any soils, water, ground water or other material that may be obtained for testing and provide directly to the State and the governmental authority at the sole expense of the Permittee written results of all tests on said samples upon completion of said testing.

7. **Remediation**. In the event that any hazardous substance is used, stored, treated, disposed
on the premises, handled, discharged, released, or determined to be present on the premises, or to have migrated from the premises, Permitteee shall, at its sole expense and cost, remediate the premises, or any location off the premises to which it is determined that the hazardous substance has migrated, of any hazardous substances. Said duty to remediate includes the removal and disposal of said hazardous substances in accordance with paragraph 5. This duty to remediate

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includes strictly complying with all environmental laws and directives to remediate said hazardous substance issued from the State or any federal or State governmental authority charged with enforcing the
Environmental laws. This duty to remediate shall include replacement of any materials, such as soils, removed with material that is satisfactory to the State and governmental authority, as the case may be.

8. **Restoration and Surrender of Premises**. The Permittee hereby agrees to restore the premises, at its sole cost and expense, including the soil, water and structures on, in, or under the premises, to the same condition as the premises existed at the commencement of this Revocable Permit, fair wear and tear to the structures excepted. In the event Permittee does not restore the premises to the same condition as it existed at the commencement of the Revocable Permit, as determined by the State, the Permittee understands and agrees that the State may exercise its rights under the paragraph entitled State's Right to Act, and until such time as the restoration is complete to the satisfaction of the State, Permittee shall be liable for Revocable Permit rent in the same manner and amount as if the Revocable Permit had continued in effect during the period of restoration.

9. **State's Right to Act**. In the event the Permittee fails for any reason to comply with any
of its duties under this Revocable Permit or under any environmental laws within the time set for doing so, or within a reasonable time as determined by the State, the State shall have the right, but not the obligation, in its sole discretion, to perform those duties, or cause them to be performed. Permittee hereby grants access to the premises at all reasonable hours to the State, its agents and anyone designated by the State in order to perform said acts and duties. Any cost, expense or liability of any type that may be incurred by the State in performing said acts or duties shall be the sole responsibility of the Permittee and Permittee hereby agrees to pay for those costs and expenses and indemnify the State for any liability incurred. This obligation shall extend to any costs and expenses incident to enforcement of State's right to act, including litigation costs, attorneys' fees and the costs and fees for collection of said cost, expense or liability.

10. **Release and Indemnity**. Permittee hereby agrees to release the State, its officers, agents,
successors and assigns from any liability of any kind, including, but not limited to, any liability for any damages, penalties, fines, judgments or assessments that may be imposed or obtained by any person, agency or governmental authority against the State and/or the Permittee by reason of any hazardous substance that may be present by whatever means on, in or under the premises. The Permittee hereby agrees to indemnify, defend with counsel suitable to the State, and hold harmless the State from any liability that may arise in connection with, or by reason of, any occurrence involving any hazardous substance that may be alleged to be connected or related in any way with the premises, the State's ownership of the premises, or this Revocable Permit, including the presence of any hazardous substance on the premises. Permittee understands and agrees that any assessments, fines or penalties that may be assessed against the Permittee or the State by reason of any environmental law violation concerning the premises shall be paid, complied with, and in every way satisfied by the Permittee and not the State.

**Page 12 (TERMS AND CONDITIONS CONTINUED)**

11. **Surety/Performance Bond for Cleanup/Restoration**. At its sole cost and expense, Permittee shall provide the State with a Bond, or other security satisfactory to State, in the amount of **$ N/A** to assure removal of any hazardous substances and the remediation and restoration of the premises during the term o f, and at the conclusion of the Revocable Permit so as to comply with the terms of this Revocable Permit to the satisfaction of the State and in order to comply with environmental laws. Permittee shall provide written evidence that said Bond or security has been secured by the Permittee which evidence shall indicate the term during which said Bond or other security shall irrevocably remain in effect.

12. **Insurance.** Effective at the commencement of this Revocable Permit, Permittee shall obtain and keep in force a comprehensive liability and property damage policy of insurance issued by an insurer licensed to do business in the State of Hawaii with limits of indemnity coverage no less than $1,000,000.00 per occurrence and $2,000,000.00 aggregate. Said policy of insurance shall provide coverage for personal injury and damage to property caused by hazardous substances or any occurrence that may constitute a violation of any environmental law by the Permittee or the State. Said policy of insurance shall name the State as an additional insured. Permittee shall provide proof of said insurance satisfactory to the State which shall include, at a minimum, the coverage provided and the term during which said policy shall be effective.

Permittee will immediately provide written notice to the contracting department or agency should any of the insurance policies evidenced on its Certificate of Insurance form be cancelled, limited in scope, or not renewed upon expiration.

The State of Hawaii is added as an additional insured as respects to operations performed for the State of Hawaii.

It is agreed that any insurance maintained by the State of Hawaii will apply in excess of, and not contribute with, provided by this policy.

28. **AMERICANS WITH DISABILTIES ACT**

A. The PERMITTEE shall comply with the rules and regulations relating to the Americans with Disabilities Act (ADA) 28 C.F.R. Part 36 entitled, "Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities." The ADA Title III Regulation prohibits discrimination on the basis of disability by public accommodations and requires places of public accommodation and commercial facilities to be designed, constructed, and altered in compliance with the accessibility standards established by 28 C.F.R Part 36. Plans to construct or alter the existing improvements shall be reviewed and preapproved by the STATE prior to any construction commencing. PERMITTEE's failure to comply with this provision shall be considered a breach of the terms and conditions of this agreement which may result in the revocation of this permit and termination of PERMITTEE's occupancy.

# Attachment 3

# Best Management Practices

# Storm Water

# BEST MANAGEMENT PRACTICES

## Vehicle and Equipment Washing

Wash water from vehicle and equipment cleaning activities performed outdoors or in areas where wash water flows onto the ground can generate dry weather runoff contaminated with detergents, heavy metals, oils and greases, toxic substances, sediments, and other pollutants.

Releasing pollutants directly or indirectly into the storm drain system or the harbor by vehicle or equipment washing is a violation of the Harbor Municipal Separate Storm Sewer System (MS4) General Permit. Proper employee training, BMP implementation, and pollution prevention methods are required for compliance with the Harbor's Storm Water Management Plan (SWMP).

### BMP Implementation

**Primary Option:** Off-site Washing

Facilities with small fleets should consider contracting with a commercial car wash. Commercial car wash facilities often recycle their water or are required to treat their wash water discharge prior to release into the sanitary sewer system. Pressure cleaning and steam cleaning should be done off-site to avoid generating runoff with high pollutant concentrations.

**Secondary Option:** On-Site Washing

**NOTE: ON-SITE WASHING IS ALLOWED ONLY AFTER WASHING PROCEDURES ARE SUBMITTED TO THE HDOT HARBORS DIVISION FOR FORMAL APPROVAL**

Vehicle and equipment washing should be conducted only in designated areas specifically designed to collect and hold generated wash and rinse water.

*"For small jobs, berm the area surrounding the vehicle and use a wet/dry vacuum to capture the wash water for discharge to the sanitary sewer. For larger jobs, use a combination of berms and a vacuum truck, such as those used to clean storm and sanitary sewer systems, to capture and safely dispose of wash water. If detergents are used, clean the pavement to prevent this material from being carried to the storm drain during the next rainstorm."* [1]

The contained wash water effluent should be recycled, discharged to the sanitary sewer system (permit may be required) or collected for off-site disposal at a permitted facility. Additionally, designated wash areas should be paved and contained using berms and a sump. Use hose nozzles with automatic shut off and bio-degradable soaps where appropriate. Inspect paved surfaces within the wash area and clean periodically to remove buildup of particulate matter or other pollutants. Vehicle maintenance, chemical storage, and other activities that could release pollutants are prohibited in washing areas. Train employees on proper cleaning, maintenance, and wash water disposal procedures. Documentation of this training should include a list of attendees, the date, the topic covered, and signatures of attendees.

[1] EPA Municipal Vehicle and Equipment Washing BMP Fact Sheet

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*The SWMP is administered by the Environmental Section under the Engineering Branch.*

*Phone: 808-587-1962*

*Website:* http://hidot.hawaii.gov/harbors/library/storm-water-management/

# Storm Water

# BEST MANAGEMENT PRACTICES

## Vehicle and Equipment Fueling

Transfer and storage of bulk petroleum products (i.e. gasoline, diesel fuel, and motor oil) have the potential to pollute storm water run-off. Implementation of BMPs is required to prevent or reduce petroleum pollutants from entering the storm water drainage system. Both administrative controls, such as employee training and inspections, and structural controls, such as an automatic shut-off device and secondary containment, are necessary for an effective pollution prevention program.

### BMP Implementation

**Primary Option:** Off-site Fueling

Utilize off-site commercial fueling facilities whenever feasible.

**Secondary Option:** On-Site Fueling

Vehicle fueling should be conducted only in designated areas specifically designed to contain spills and prevent contact with storm water.

- Avoid positioning upstream or adjacent storm drainage features.
- Utilize impervious surfaces and containment designed to prevent storm water run-on/off.
- Ensure spill kits are available (immediately clean up and properly dispose of used absorbent materials).
- Equip dispensing nozzles with automatic shut-off controls.
- Utilize drip pans if remote or mobile fueling is required.

Secondary containment must be provided for aboveground storage tanks if the facility's aggregate shell capacity of containers 55 gallons or greater exceeds 1,320 gallons.

- Containment required to be 110% of largest tank capacity.
- Containment required to have locking drain valve.
- Record containment inspections and uncontaminated rain water discharges.
- Develop Spill Prevention, Control, and Countermeasures (SPCC) Plan required per Federal/State regulations.

Periodic inspections should be performed of petroleum handling equipment and other structural controls. Train employees (document) on proper fueling and spill response responsibilities. Report all spills in accordance with the Hawaii Department of Health's (HDOH) Spill Reporting and Emergency Response requirements and document response actions.

EPA Website for SPCC Guidance
http://www.epa.gov/oem/content/spcc/

HDOH Spill Reporting and Emergency Response website:
http://hawaii.gov/health/environmental/hazard/spill.html

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# Storm Water

# BEST MANAGEMENT PRACTICES

## Outdoor Material Storage

Responsible storage of chemicals, such as paints, solvents, and cleaners can significantly reduce polluted storm water runoff. Containerized products (such as bottles, cans, and drums) and bulk material must be handled properly in all stages of storage, use, and disposal. In many cases, businesses can implement simple housekeeping practices in order to store materials more effectively. Proper storage practices reduce the likelihood of accidental spills or releases of hazardous materials during storm events. In addition, health and safety conditions at the facility will improve.

### BMP Implementation

Outdoor material storage should be placed only in designated areas specifically designed to contain spills and prevent contact with storm water. Store liquids in an area where containers cannot be knocked over and releases can be contained.

- Avoid positioning upstream or adjacent to storm drainage features.
- Place bagged materials on pallets and under cover.
- Utilize impervious surfaces and containment devices (e.g., dikes, curbs) to contain possible leaks and prevent storm water run-on/off.
- Store all containers under cover to protect from rain and sun.
- Close and secure any opened containers, and utilize drip pans for dispensing from containers.
- Cover stockpiles with plastic or comparable material when not in use or at the end of each day.
- Provide physical diversion to protect stockpiles from concentrated runoff.
- As necessary, place silt fence, fiber filtration tubes, or straw wattles around stockpiles.

Appropriate spill response procedures, including notification, initial response and follow-up actions, should be developed and posted.

- Keep a spill kit appropriate for the materials in a readily accessible location, stocked, and ready for use (re-stock after each use).
- Clean up spills immediately using absorbent material or containment booms for liquid spills. Immediately sweep up and properly dispose of used absorbent materials.
- Always use dry methods to clean spills (sweeping) and never hose down the spill area.

Periodic inspections should be performed to verify that the conditions of containers, secondary containment devices, and other structural controls are acceptable. Train employees (document) on proper storage, handling and spill response responsibilities. Report all spills in accordance with the Hawaii Department of Health Spill Reporting and Emergency Response requirements (http://hawaii.gov/health/environmental/hazard/spill.html).

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# Storm Water

# BEST MANAGEMENT PRACTICES

## General BMPs for Businesses

The storm drainage system at our harbor facilities collects rainfall from storm events and releases it directly, without treatment, into the harbor. As rainfall travels over surfaces such as roofs, roads, and parking lots, it picks up oils, metals, fertilizers, pesticides, sediments, and other contaminants before entering the harbor. Storm water pollution degrades our waters and reduces the quality of natural habitats for fish and wildlife.

Implementing Best Management Practices (BMPs) and good housekeeping practices will help maintain water quality in the harbors.

### BMP Implementation

**Cleaning**

- Use non-toxic substitutes for chemicals whenever possible.
- Control litter by sweeping and picking up trash regularly.
- Dry sweep floors, processing and storage areas, access roads, parking lots, and sidewalks. Do not wash down with a hose.
- Properly contain and dispose of mop water and sweepings.

**Maintenance**

- Inspect vehicles and equipment for leaks regularly.
- When draining fluids, use a drip pan and/or funnel to prevent spills.

**Landscaping**

- Whenever possible, use environmentally safe alternatives or low-toxicity chemicals.
- Use landscaping pesticides and fertilizers in the smallest amounts necessary and never apply immediately before or during rainfall.

**Spill Response**

- Keep a spill kit appropriate for materials in-use readily available and stocked. Re-stock when used.
- Clean up spills immediately to minimize safety hazards and prevent spills from reaching a storm drain inlet.
- Use absorbent materials to clean small spills rather than hosing down the area. Remove the absorbents promptly and dispose of properly.

Train employees (document) on proper storage, handling and spill response requirements. Report all spills in accordance with the Hawaii Department of Health (HDOH) Spill Reporting and Emergency Response requirements and document response actions.

HDOH Spill Reporting and Emergency Response website:
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# Storm Water

# BEST MANAGEMENT PRACTICES

## Solid and Hazardous Waste Management

Maintenance activities can generate a variety of hazardous waste that cannot be disposed as routine trash, garbage or other solid waste. Hazardous waste and other regulated material and debris shall be disposed in the proper manner and in accordance with all applicable federal and state laws. Examples of hazardous wastes are:

- Waste oil, used or spent hydraulic fluid, and other petroleum-based fluids.
- Waste paint and paint debris (used brushes, rollers, chips, rags).
- Used or spent paint thinners and other industrial solvents.
- Rags and other cleaning materials that are contaminated with grease, oil, paint, thinners, or other industrial chemicals.
- Discarded electronic equipment (may contain lead or mercury).

Arrangements must be made with a licensed vendor to remove these items prepare the necessary documentation for disposal, and to remove them from the piers and adjacent state property. Do not discard hazardous wastes and other regulated debris in state provided dumpers or anywhere else on state property. All tenants must provide documentation to Harbors Division demonstrating that prior arrangements have been made for the proper disposal of all generated hazardous waste.

**Note: The only Hazardous Materials allowed to be used and stored on state property are those needed in the course of your business, in accordance with the terms and conditions of your lease or revocable permit and, if required, after review and approval from Harbors Division.**

### BMP Implementation

**Primary Option:**

- Schedule general maintenance activities on a more frequent basis to eliminate the need for large-scale maintenance, the use of large amounts of hazardous materials, and the generation of large amounts of hazardous waste.
- Only use recyclable items for maintenance and routine operations to reduce solid waste generation. Recycle such items as batteries, petroleum-based liquids (e.g., engine oil, gear lube, hydraulic fluid), cardboard, rags, glass and plastic containers, newspaper, and electronic devices.

**Secondary Options:**

- Only use environmentally friendly materials for maintenance to reduce the need for regulated disposal.
- Reduce the inventory of hazardous materials stored on site to avoid regulated disposal due to shelf-life expiration. **REMEMBER – If you do not need it, do not store it!**

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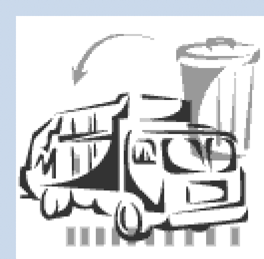

# Storm Water

# BEST MANAGEMENT PRACTICES

## Material Delivery and Handling

Responsible management of material delivery and handling can significantly reduce pollution to storm water runoff. Bulk and containerized products (such as bottles, cans, and drums) must be handled properly in all stages of delivery, use and storage. Proper delivery and handling practices reduce the likelihood of accidental spills or releases of hazardous materials during storm events. Proper practices will also improve health and safety conditions at the facility.

### BMP Implementation

Material delivery and handling should take place only in designated areas situated near warehouse entrances and staging/storage areas and distant from site drainage inlets and watercourses. The best locations for deliveries are where risks of accidents are reduced and any releases can be contained.

- Maintain accurate and up-to-date records of materials delivered and stored on-site.
- Minimize on-site inventory and handling of hazardous materials.
- Stage containers on pallets, under cover, and, when possible, in secondary containment.

Employees with emergency spill cleanup training should be present during unloading of dangerous materials or liquid chemicals. Appropriate spill response procedures should be developed and posted. Additionally:

- Keep a spill kit appropriate for the received materials readily available, stocked, and ready for use (re-stock after each use).
- Clean up spills immediately using absorbent material or containment booms for liquid spills. Immediately sweep up and properly dispose of used absorbent materials.
- Always use dry methods to clean spills (sweeping) and never hose down the spill area.

Periodic inspections should be performed to verify that the conditions of containers, stockpiles, secondary containment devices, and other structural controls are acceptable. Train employees (document) on proper material delivery, handling and spill response requirements. Report all spills in accordance with the Hawaii Department of Health's (HDOH) Spill Reporting and Emergency Response requirements and document response actions.

HDOH Spill Reporting and Emergency Response website:
http://hawaii.gov/health/environmental/hazard/spill.html

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# Storm Water

# BEST MANAGEMENT PRACTICES

## Building and Remodeling

The storm drainage system at our harbor facilities collects rainfall from storm events and releases it directly, without treatment, into the harbor. Sediment is the pollutant of most concern during construction due to the removal of soil cover. Heavy metals and nutrients attach to soil particles that, if allowed to reach the storm drain, degrade water quality. Other items of concern include paints, thinners, mortars and construction rubble/debris.

Implementing Best Management Practices (BMPs) and good housekeeping practices will help maintain water quality in the harbor.

**NOTE: SUBMITTAL OF BUILDING OR REMODELING PLANS TO THE HDOT HARBORS DIVISION FOR FORMAL APPROVAL IS REQUIRED**

### BMP Implementation

**Soil Erosion and Sedimentation**

- Minimize removal of existing vegetation.
- Reduce traffic on disturbed soils and divert runoff around them.
- Re-vegetate as soon as possible using native seed mix and mulch.
- Frequently sweep soil back from streets and sidewalks.
- Dry sweep paved surfaces rather than hosing down or using blowers.
- Use sediment control devices, including silt fences, inlet protection, diversion ditches, and swales to minimize off-site migration of soil.

**Housekeeping During Work**

- Properly store and dispose of materials such as paints and solvents.
- Properly contain and dispose of mop water, sweepings, and sediments.
- Use non-toxic substitutes for chemicals when possible.
- Inspect vehicles and equipment for leaks regularly and fix problems as soon as possible.
- Keep a spill kit of absorbent material, such as kitty litter or sand, and safety equipment, such as safety glasses and gloves, in case a spill does occur. Never hose down an area to clean up after a spill.
- Control litter by sweeping and picking up trash on a regular basis.
- Cover dumpsters and replace leaking ones.

Train employees (document) on proper materials storage, handling and spill response responsibilities. Report all spills in accordance with the Hawaii Department of Health's (HDOH) Spill Reporting and Emergency Response requirements found at the link below and document response actions.
http://hawaii.gov/health/environmental/hazard/spill.html

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# Controlling Vessel Discharges

# BEST MANAGEMENT PRACTICES

## Vessel Maintenance Activities

Debris from vessel maintenance activities performed over unprotected water can result in detergents, heavy metals, oils and greases, toxic substances, sediments, and other pollutants that fall directly into Harbors water.

Releasing pollutants directly or indirectly into the harbor during hull maintenance activities is a violation of the Clean Water Act. Proper employee training, BMP implementation, and pollution prevention methods are required for compliance with the Clean Water Act and to protect waters under Harbors jurisdiction. Maintenance activities include:

- Painting
- Grinding and Chipping
- Using chemicals for rust and paint removal
- Washing exterior surfaces (with or without chemicals)
- Engine repair

### BMP Implementation

**Primary Option:** Perform vessel maintenance activities while vessel is in dry dock, slipway or haul-out facility, or outside of waters under the jurisdiction of Harbors Division.

**Secondary Options:**

- Use anti-foulant paints with less toxic ingredients.
- Never use anti-foulant paint containing Tributyltin (TBT). Anti-foulant paints and other compounds containing TBT are prohibited for use throughout the United States.
- Install a tarpaulin or other containment device underneath all painting, grinding, or chipping activities. Properly dispose of all captured debris removed from hull.
- Never use chemicals such as Naval Jelly (Phosphoric Acid) for rust or paint removal while vessel is still afloat.
- Never use any compounds that contain Tetrachloroethylene (TCE) for hull maintenance.
- Maintain the hull and all exterior surfaces more frequently to prevent the build-up of rust, marine growth, and aquatic nuisance species (invasive species).
- Wash exterior surfaces with fresh water only. Contain all wash water and properly dispose in a shore-based sanitary sewer. Low pressure (<100psi) washing only. Never use detergents or other chemicals while washing.
- Cleaning with dry methods (sweeping, vacuuming, or damp mopping) is preferred.

*The EPA has issued a draft* ***Small Vessel General Permit****. If finalized, it would authorize discharges incidental to the normal operation of* ***non-military and non-recreational vessels less than 79 feet in length and commercial fishing vessels****. The draft permit specifies best management practices for several broad discharge management categories including* ***fuel management, engine and oil control, solid and liquid maintenance, gray water management, fish hold effluent management, and ballast water management****.*

*Implementation Date:* ***December 18, 2013***

*Here is the website for more info:* [http://cfpub.epa.gov/npdes/vessels/vgpermit.cfm#final](http://cfpub.epa.gov/npdes/vessels/vgpermit.cfm#final)

# Storm Water

# BEST MANAGEMENT PRACTICES

## Building Power Washing

Building power washing, using a high-pressure water system, generates wash water (wastewater), which could contain contaminants (such as detergents, oils, dirt, greases, paint chips, metals, and grime). The discharge of these contaminants into a storm drain is considered an "Illicit Discharge." No wastewater should be discharged into storm drains.

Detergents, even biodegradable ones, can be poisonous to fish. Phosphates, an ingredient in some detergents, are plant nutrients that can cause excessive growth of nuisance plants in the water. Building power washing also removes debris that, if discharged, can clog storm drain inlets and grates and reduce or even prevent storm water drainage to the collection system.

**Note: Building power washing, without proper containment and prior written consent from HDOT Harbors Division, is prohibited. It is also NOT acceptable to let wastewater from washing sit in areas such as parking lots, driveways, or walkway to evaporate, because contaminants can accumulate and flow into storm drains or state waters during the next rainfall event.**

### BMP Implementation

**Primary Option:**

- Apply dry wash methods (e.g., wiping with wet rags, wet mopping) that do not generate wastewater or cause wastewater to flow freely to the ground. Rinse water must be disposed of properly (e.g., into the sanitary sewer).

**Secondary Option:**

- Power washing with a (portable) containment system to completely contain and capture the wastewater. The system must be adequately designed to prevent water from entering a storm drain or from running off-site. A containment pad, berms, and pump system can be used to capture wastewater and divert it to a holding tank for proper disposal (see below).

Other Things To-Be-Considered:

- Building power washing is allowed only after the BMPs are approved in writing by HDOT Harbors Division.
- When power washing old paint off a building, the wastewater will contain paint chips that need to be collected, evaluated, and disposed of properly. Old paint stripped off commercial buildings may contain heavy metals (such as Pb, Cr, Cd, or Hg), and may need to be disposed of as a hazardous waste.
- Options for wastewater disposal include: (1) obtaining permission to direct the wastewater to the City's publicly owned treatment works [POTW] through a sanitary sewer on-site; (2) collecting the wastewater from the site and arranging for disposal at a POTW or industrial waste disposal facility.

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# Storm Water

# BEST MANAGEMENT PRACTICES

## Sidewalk and Walkway Power Washing

Unpainted concrete sidewalk/walkway power washing, using a high-pressure water system, generates wash water, which could contain contaminants (such as oils, dirt, greases, and grime). Power washing also removes debris that, if discharged, can clog storm drain inlets and grates and reduce or even prevent storm water drainage to the storm conveyance system. Therefore, wash water from sidewalk/walkway power washing must be properly handled.

**Note: Before wash water enters storm conveyance system, the discharger must use appropriate Best Management Practices [BMPs] to reduce pollution associated with non-storm water discharges, to the Maximum Extent Practicable [MEP]. The discharger is responsible for complying with HDOT, City, State, and Federal rules and regulations.**

### BMP Implementation

**Recommended Washing Procedure:**

- Sweep and/or clean the surface of any visible pollutants and dispose of the collected material in trash containers. Clean surface oil with rags or absorbents. If using granular material (e.g., cat litter), thoroughly sweep and properly dispose of before washing.
- After visible pollutants are removed, use water ONLY to clean the area (i.e., no soap, acids, or other additives). Generated wash water should be properly drained or disposed of (e.g., directed to landscape or permeable areas within the premises, filtered through geotextile filter at the drain inlet then discharged into the storm drain).
- If any visible pollutants remain in the residual wash water, collect all water and pump into the City's publicly owned treatment works [POTW] through a sanitary sewer on-site. Approval by the City is required.

### Other Things To-Be-Considered:

- If there is no storm drain system nearby and discharge on a paved lot or street will create a nuisance or hazardous condition, the effluent may be disposed of at a POTW or industrial waste disposal facility.
- Discharge to a POTW requires approval by the City.
- If sidewalk/walkway is painted and power washing has the potential to remove the paint, please refer to the **Building Power Washing BMP** flyer.

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# Storm Water

# BEST MANAGEMENT PRACTICES

## Storm Drain Inlet Protection

Storm water runoff occurs naturally. As the runoff flows over land or impervious surfaces (such as paved streets, parking lots, and building rooftops), it can collect debris, chemicals, sediment and other pollutants that could adversely affect water quality if discharged untreated. Storm drain inlet protection measures prevent potential pollutants from entering inlets and eventually our coastal receiving waters.

Storm drain inlet protection can consist of an impounding area around or upstream of a storm drain inlet and/or a sediment filter. The impounding area temporarily ponds runoff to allow sediment to settle, before entering the storm drain. Sediment and debris can also be removed by filtering.

**ONLY RAIN AND PERMITTED DISCHARGES ARE ALLOWED TO ENTER HARBORS STORM WATER CONVEYANCE SYSTEMS.**

### Harbors Tenants shall implement following BMPs for drain inlets located exclusively within the leased area.

- Stencil catch basins and inlets to warn against dumping of pollutants into the storm drainage system.
- Install fabric filter at each on-site storm drain inlet. The fabric should overlap the sides of the inlet.
- Clean on-site catch basins and storm drain inlets in high pollutant load areas as frequently as needed and before the wet season to remove sediment and debris.
- Notify Harbors Division if repairs are needed for deteriorated storm drains and their piping.
- For storm drain inlet protection as part of construction project, please refer to Harbors Construction Site Runoff Control Program.

Inspection and Maintenance:

- If the fabric becomes clogged, torn, or degraded, it should be replaced.
- Properly dispose of wastes collected from storm drain inlet cleaning activities.

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# Attachment 4

# Environmental Compliance, BMP, and P2 Inspection Checklist for Tenants

# State of Hawaii Department of Transportation Harbors Division
# Environmental Compliance, BMP, and P2 Inspection Checklist for Tenant

Harbor: ______________________ Date/Time: ______________________
Inspector(s): ______________________ Weather Conditions: ______________________

Type of Inspection: ☐ Regular Inspection ☐ Follow-up Inspection ☐ Final Inspection
☐ New Tenant Inspection - Date of Occupancy:

Tenant Business Name: ______________________
Tenant Permit(s): ______________________
Facility Location: ______________________
Facility Mailing Address: ______________________
Tenant Representative: ______________________
Phone Number: ______________________ Mobile Number: ______________________
Fax Number: ______________________ E-mail Address: ______________________
EPA ID No. (if any): IWDP No. (if any):

**Facility Description:**

**Site Drainage Description (including stenciling):**

**Any illicit discharge into Harbors storm water drainage system?** ☐ Yes ☐ No ☐ N/A
If "Yes", please describe here:

**Related Risk Ranking Criterion:**

**Operations:**

| | |
|---|---|
| ☐ Vessel Maintenance | ☐ Vessel Washing |
| ☐ Vessel Fueling | ☐ Vehicle/Equipment Fueling |
| ☐ Vehicle/Equipment Maintenance | ☐ Vehicle/Equipment Washing |
| ☐ Petroleum Product Storage | ☐ Material Storage |
| ☐ Hazardous Material Storage | ☐ Material Handling |
| ☐ Waste Handling | ☐ Building Maintenance |

**NPDES Compliance** ☐ Yes ☐ No ☐ N/A If "Yes", please complete this section
NPDES Permit Number: ______________________ Expiration Date: ______________________
DMR Compliance: ☐ Yes ☐ No ☐ N/A Last round of sampling:
SPCC Compliance: ☐ Yes ☐ No ☐ N/A

- The facility maintains records of monitoring data for a minimum of five years? ☐ Yes ☐ No ☐ N/A
- The facility has a SWMP and/or SWPCP? ☐ Yes ☐ No ☐ N/A
- The facility has filed a Discharge/Connection Permit with Harbors? ☐ Yes ☐ No ☐ N/A
- Discharge points exhibit unusual characteristics (e.g., sheen, color) ☐ Yes ☐ No ☐ N/A

**Material Inventory:**

| No. | Inspection Item | Yes | No | N/A | Remarks |
|---|---|---|---|---|---|
| | **Storage** | | | | |
| 1 | **SPCC Compliance**: Facility with an aggregate shell capacity of 1,320 gallons or more of petroleum products. | | | | |
| 2 | **AST Containment**: ASTs are situated over an impervious surface, have adequate secondary containment and integrity protection, and containment drain valves are kept locked. | | | | |
| 3 | **AST Overflow Protection**: Bulk product ASTs are equipped with overflow protection alarms or automatic shutdown pumps. | | | | |
| 4 | **AST Malfunction**: Visible piping, tanks, and hoses in good condition (e.g., no exhibit signs of leakage, wear, or malfunction). | | | | |
| 5 | **Oily Equipment**: Oily or leaking equipment is stored under cover or with drip pans. Drip pans are emptied or replaced as needed. | | | | |
| 6 | **Storm Water Management**: Storm water accumulation in secondary containment is minimized, managed, disposed correctly, and logged. | | | | |
| 7 | **Salvaged Equipment/Vehicle**: Fluids and batteries are removed from salvaged equipment/vehicle before storage. | | | | |
| 8 | **Outdoor Material Storage**: Outdoor storage areas have coverings that prevent contact of these items with storm water. Materials are kept above the ground higher than the level of runoff. | | | | |
| 9 | **Labeling**: Containers are properly labeled. | | | | |
| 10 | **Compatibility**: Containers are stored in an organized manner, compatible with other stored materials, labeled correctly, and not stored past allowable holding times. | | | | |
| 11 | **EPCRA**: The facility is required to report chemical inventory (Tier II) and/or Toxic Release Inventory (TRI) report. | | | | |
| | **Fueling** | | | | |
| 12 | **Fueling BMPs**: Fueling area engineering controls and BMPs are effective in preventing storm water run on/off. | | | | |
| 13 | **Fueling Inspections**: Equipment in fueling areas is in good condition (e.g., do not exhibit signs of leakage, wear, or malfunction). An inspection log is available for inspection. | | | | |
| | **Washing** | | | | |
| 14 | **Vessel/Vehicle/Equipment Washing**: Vehicle or equipment washing is conducted with approval from HDOT Harbors. | | | | |
| 15 | **Hand Washing**: Hand or dish washing is conducted over a sink that is plumbed to sanitary sewer or is disposed of appropriately. | | | | |
| | **Vessel/Vehicle/Equipment Maintenance** | | | | |
| 16 | **Vessel/Vehicle/Equipment Maintenance Area**: Maintenance is conducted in a designated area, preferably covered. | | | | |
| 17 | **Preventive Maintenance**: Preventive maintenance is performed on vehicles and equipment to prevent leaks. Vehicle and equipment are monitored periodically for leaks and drip pans are used. | | | | |
| 18 | **Maintenance Logs**: Records are kept. | | | | |
| 19 | **Parts Washer**: Parts washer fluid is disposed appropriately with an authorized disposal contractor. | | | | |
| | **Material Handling** | | | | |
| 20 | **Material Handling Area**: Loading areas are free of unattended stains or pavement in normal deteriorated condition that would indicate good material handling practices. | | | | |
| | **Spill Response** | | | | |
| 21 | **Spills and Stains** are cleaned thoroughly. | | | | |
| 22 | **Spill Kits** are kept in all high risk areas and are refilled as needed. | | | | |
| 23 | **Spill Recording**: Records are kept of spills and releases in the SWPCP or SPCC Spill and Discharge Log. | | | | |
| 24 | **Harbors Environmental Hotline**: Emergency storm water contact numbers have been posted on site. | | | | |

| No. | Inspection Item | Yes | No | N/A | Remarks |
|---|---|---|---|---|---|
| | **Building Maintenance & Housekeeping** | | | | |
| 25 | **Sweeping**: Trash, debris, and dirt are swept up regularly. | | | | |
| 26 | **Deck/Floor Washing**: Dry sweeping or mopping is conducted instead of spraying/hosing down. | | | | |
| 27 | **Sumps and OWS Maintenance**: Structural controls such as containment sumps or OWSs are emptied and serviced regularly. | | | | |
| 28 | **Cleanliness**: All work areas and storage areas are neat and clean. | | | | |
| | **Waste Handling** | | | | |
| 30 | **Trash Bins**: Trash bins are kept closed when not in use and are not overflowing. | | | | |
| 31 | **Used Batteries**: Spent lead acid batteries are protected from contact with stormwater runoff and placed in secondary containment while awaiting disposal. Batteries are disposed in a timely manner. | | | | |
| 32 | **EPA Generators**: Wastes are disposed properly, records are kept and hazardous waste generator status is known. Facility has an Environmental Protection Agency (EPA) hazardous waste generator identification number and follows appropriate regulations/requirements (CESQG, SQG, LQG). | | | | |
| 33 | **Hazardous Waste Containment**: Hazardous waste and used oil storage areas have impermeable surfaces, adequate secondary containment, and integrity protection. | | | | |
| 34 | **Chemical Toilets** are cleaned by contractors in a manner that does not allow chemicals (i.e. blue liquid) to enter the Harbor. | | | | |
| | **Training** | | | | |
| 35 | **HDOT Harbors Annual Training**: A representative has attended the most recent HDOT Harbors Storm Water Awareness Training. | | | | If "No", the latest training attended: |
| 36 | **Material Handling Training**: Records of training are available for employees involved in material handling (e.g. forklift operators). | | | | Most recent training date: |
| 37 | **Container Storage Training**: Records of training are available for employees involved in inspection of ASTs or chemical storage areas. | | | | Most recent training date: |
| 38 | **Fueling Training**: Records of training are available for employees involved in large scale vehicle and equipment fueling. | | | | Most recent training date: |
| 39 | **Hazardous Waste Training**: Records of training are available for employees involved hazardous/universal waste handling/disposal activities. | | | | Most recent training date: |
| | **General Observed BMPs** | | | | |
| 40 | General Housekeeping ☐ Excellent ☐ Good ☐ Average ☐ Fair ☐ Poor or Unacceptable | | | | |
| 41 | Recordkeeping ☐ Excellent ☐ Good ☐ Average ☐ Fair ☐ Poor or Unacceptable ☐ Not Applicable | | | | |
| 42 | All personnel are well-trained ☐ Excellent ☐ Good ☐ Average ☐ Fair ☐ Poor or Unacceptable | | | | |
| 43 | Need follow-up inspection ☐ Yes ☐ No | | | | |

| | Tenant Risk Ranking Criteria | | Score |
|---|---|---|---|
| 1 | **Vessel Maintenance and Repair** | | |
| | 0 | Neither maintenance nor repair activities are conducted on-site. | |
| | 1 | Maintenance and repair activities on any size vessel are conducted entirely indoors (with proper dust control BMPs), with no or minimal potential for discharge of pollutants. | |
| | 2 | Minor maintenance and repair (30 day or less duration) for small vessels is conducted in their berth (with proper dust control BMPs) with minimal potential for discharge of pollutants. | |
| | 3 | Maintenance and repair activities on large vessels are conducted outdoors and out of the water (with proper dust control BMPs), with minimal potential for discharge of pollutants. | |
| | 4 | Major maintenance and repair activities on any size vessel are conducted in a partially confined or unconfined area with moderate potential for discharge of pollutants. | |
| | 5 | Maintenance and repair activities on any size vessel are conducted in an unconfined area or in an area with significant potential for discharge of pollutants. (**Automatic trigger to high risk designation**) | |
| 2 | **Vessel Fueling** | | |
| | 0 | No fuel transfer activities are conducted on-site. | |
| | 1 | Fueling of small vessel is conducted by a fueling company with proper spill containment and diversion. | |
| | 2 | Fueling of small vessel is conducted with spill containment and diversion. | |
| | 3 | Fueling of large vessel is conducted in designated area with spill containment and diversion. | |
| | 4 | Fueling of small vessel is conducted in areas WITHOUT spill containment and diversion. | |
| | 5 | Fueling of large vessels is conducted in areas WITHOUT spill containment or diversion. (**Automatic trigger to high risk designation**) | |
| 3 | **Vessel Rinsing** | | |
| | 0 | No vessel rinsing is conducted on-site. | |
| | 1 | Vessel rinsing is conducted in an area designed to contain wash water and debris, with no or minimal potential discharge of pollutants. | |
| | 2 | Vessel rinsing is conducted in an uncontained area with no direct connection to Harbors stormwater drainage system, or having a minimal potential for discharge of pollutants. | |
| | 3 | Vessel rinsing is conducted in an uncontained area with no direct connection to Harbors storm drainage system, but having a moderate potential for discharge of pollutants. | |
| | 4 | Vessel rinsing is conducted in an uncontained area directly connected to Harbors storm drainage system, and has a moderate potential for discharge of pollutants. | |
| | 5 | Vessel rinsing is conducted in an uncontained area directly connected to Harbors storm drainage system, and has a significant potential for discharge of pollutants, or not in compliance with EPA VGP or sVGP. (**Automatic trigger to high risk designation**) | |
| 4 | **Vehicle and/or Equipment Maintenance and Repair** | | |
| | 0 | No equipment/vehicle maintenance and/or repair activities are conducted on-site. | |
| | 1 | Maintenance/repair activities are conducted entirely indoors, on a small scale, with minimal potential for discharge of pollutants. | |
| | 2 | Maintenance/repair activities are conducted entirely indoors, on a large scale, with minimal potential for discharge of pollutants. | |
| | 3 | Maintenance/repair activities are conducted in a covered area with minimal to moderate potential for discharge of pollutants. | |
| | 4 | Maintenance/repair activities are conducted outdoors within containment or in an area with moderate potential for discharge of pollutants. | |
| | 5 | Maintenance/repair activities are conducted outdoors or in an area with significant potential for discharge of pollutants, or any time there is an illicit discharge present. (**Automatic trigger to high risk designation**) | |
| 5 | **Vehicle and/or Equipment Fueling** | | |
| | 0 | No equipment and/or vehicle fueling activities are conducted on-site. | |
| | 1 | Equipment/vehicle fueling is conducted by a fueling company with spill containment and diversion. | |
| | 2 | Equipment/vehicle fueling is conducted on a small scale (i.e., less than 25 gallons per fueling) in areas with spill containment and diversion. | |
| | 3 | Equipment/vehicle fueling is conducted on a large scale in areas with spill containment and diversion. | |
| | 4 | Equipment/vehicle fueling is conducted on a small scale WITHOUT spill containment and diversion, but not in areas adjacent to Harbors storm drainage system and nation’s water. | |
| | 5 | Equipment/vehicle fueling is conducted on large scale WITHOUT spill containment and diversion, or on any scale in areas adjacent to Harbors storm drainage system WITHOUT spill containment and diversion. (**Automatic trigger to high risk designation**) | |
| 6 | **Vehicle and/or Equipment Washing** | | |

| | | Tenant Risk Ranking Criteria | Score |
|---|---|---|---|
| | 0 | No equipment/vehicle washing is conducted on-site. | |
| | 1 | Equipment/vehicle washing is conducted with Harbors consent and in covered wash area following an approved method, with no or minimal potential discharge of pollutants. | |
| | 2 | Equipment/vehicle washing is conducted with Harbors consent and in uncovered wash area following an approved method with minimal potential discharge of pollutants. | |
| | 3 | Equipment/vehicle washing is conducted with Harbors consent and in uncovered wash area following an approved method with moderate potential discharge of pollutants (e.g., adjacent to Harbors storm drainage system or nation's water). | |
| | 4 | Equipment/vehicle washing is contained and in an area with no direct connection to Harbors storm drainage system and nation's water, but conducted WITHOUT Harbors consent. | |
| | 5 | Equipment/vehicle washing is not contained, conducted WITHOUT Harbors consent, and in an area directly discharging to Harbors storm drainage system and nation's waters. (**Automatic trigger to high risk designation**) | |
| 7 | **Aboveground Oil Storage (size of container ≥ 55-gallon ONLY)** | | |
| | 0 | No oil product is stored on-site. | |
| | 1 | Less than 1,320 gallons of oil is properly stored in a covered area and has no or minimal potential for discharge of pollutants. | |
| | 2 | Less than 1,320 gallons of oil is properly stored in an uncovered area and has minimal potential for discharge of pollutants. | |
| | 3 | More than 1,320 gallons of oil is properly stored with minimal potential for discharge of pollutants, and the facility has an SPCC Plan. | |
| | 4 | More than 1,320 gallons of oil is properly stored with minimal to moderate potential for discharge of pollutants, but the facility does not have a SPCC Plan. | |
| | 5 | Oil is improperly stored and/or managed and has a significant potential for discharge of pollutants. (**Automatic trigger to high risk designation**) | |
| 8 | **Container Storage (size of containers < 55-gallon)** | | |
| | 0 | No containers are stored on-site. | |
| | 1 | All containers are properly managed and stored entirely indoors and have no or minimal potential for discharge of pollutants. | |
| | 2 | All containers are properly managed and stored under cover, and have minimal potential for discharge of pollutants. | |
| | 3 | Containers are properly managed and stored outdoors with minimal potential for discharge of pollutants (e.g., distance from site to the nearest storm drain inlet or surface water is greater than 100 feet or 30 meters). | |
| | 4 | Containers are improperly managed but stored indoors or under the cover, with moderate potential for discharge of pollutants. | |
| | 5 | Containers are improperly managed and stored outdoors with significant potential for discharge of pollutants. (**Automatic trigger to high risk designation**) | |
| 9 | **Waste Handling and Disposal (excluding Used Oil)** | | |
| | 0 | No waste is stored on-site. | |
| | 1 | All wastes are non-hazardous and stored indoors or outdoors in covered areas, and have no or minimal potential for discharge of pollutants. | |
| | 2 | All wastes are non-hazardous and stored outdoors uncovered, and have moderate potential for discharge of pollutants. | |
| | 3 | Hazardous wastes are generated and tenant is classified as a CESQG. Hazardous wastes are properly managed, stored, and disposed of. Storage areas have no or minimal potential for discharge of pollutants. | |
| | 4 | Hazardous wastes are generated and the tenant is classified as a SQG or LQG. Hazardous wastes are properly managed, stored and/or disposed of. Storage areas have no or minimal potential for discharge of pollutants. | |
| | 5 | Hazardous wastes are generated and the tenant is classified as a CESQG, SQG, or LQG. Hazardous wastes are improperly managed, stored, and/or disposed of. Storage areas have significant potential for discharge of pollutants. (**Automatic trigger to high risk designation**) | |
| 10 | **Spill History** | | |
| | 0 | No history of oil/chemical spills on-site. | |
| | 1 | One to three oil/chemical spills in minimal quantity (e.g., less than five gallons for oil) in the past three years. | |
| | 2 | One to three oil/chemical spills in moderate quantity (e.g., oil spill of 5 gallons or greater but less than 25 gallons; for all other chemicals please refer to 40 CFR 302.4) in the past three years. | |

| Tenant Risk Ranking Criteria | | | Score |
|---|---|---|---|
| | 3 | One to three oil/chemical spills greater than the reportable quantity (see 40 CFR 302.4) in the past three years. | |
| | 4 | More than three oil/chemical spills greater than reportable quantity in the past three years. | |
| | 5 | More than two oil/chemical spills entered into Harbors storm drainage system. Or more than five oil/chemical spills of any quantity in one calendar year. (**Automatic trigger to high risk designation**) | |
| **11** | **Enforcement History** | | |
| | 0 | No verbal or written warnings were issued in the past two years. | |
| | 1 | Class II violations (such as verbal/written warnings and potential violations identified in an inspection report) were issued in the past two years and corrective actions were immediately taken by the tenant. | |
| | 2 | Class I violations (identified in an inspection report and/or documented in an NAV) were issued in the past two years and corrective actions were taken by the tenant. | |
| | 3 | Class II violations were issued in the past two years, but corrective actions were NOT immediately taken by the tenant. | |
| | 4 | Class I violations were issued in the past two years, but corrective actions were NOT immediately taken by the tenant. | |
| | 5 | Civil penalties were assessed for non-compliance in the past two years. (**Automatic trigger to high risk designation**) | |
| **12** | **Training Attendance History** | | |
| | -2 | The tenant has attended all annual trainings during its tenancy. | |
| | -1 | The tenant has attended the most recent training. | |
| | 2 | The tenant has not attended the most recent training. | |
| | 4 | The tenant has never attended the training. | |
| **13** | **Site Condition and General Housekeeping** | | |
| | 0 | All activities are conducted indoors and have no or minimal potential for discharge of pollutants. General housekeeping is in good condition. | |
| | 1 | All activities are conducted indoors and have minimal potential for discharge of pollutants. General housekeeping is in average or fair condition. | |
| | 2 | Activities are conducted indoors and outdoors, and general housekeeping is in good condition (e.g., sources of pollutants are properly managed). | |
| | 3 | Activities are conducted indoors and outdoors and have minimal to moderate potential for discharge of pollutants. General housekeeping is in fair or above average condition. | |
| | 4 | Activities are conducted outdoors and have moderate potential for discharge of pollutants. General housekeeping is in fair condition. | |
| | 5 | Activities are conducted outdoors and pose a significant threat to the environment. (***Automatic trigger to high risk designation*** ) | |
| **14** | **Lease Agreement and/or Revocable Permit Requirements** | | |
| | 0 | Tenant appears to be in compliance with environmental requirements in their tenant lease or revocable permit. | |
| | 5 | Tenant is not in compliance with their revocable permit or lease. (**Automatic trigger to high risk designation**) | |

**Total Risk Ranking Score:** 0

**Tenant Risk Ranking Category:** ______

# Attachment 5

# Stormwater Hotline Occurrence Tracking Form

**Hawaii Department of Transportation – Harbors Division**

# Stormwater Hotline Occurrence Tracking (SHOT) Form

| LINE ITEM | FORM FIELD | | |
|---|---|---|---|
| **Caller Information** | | | |
| **Caller Name** | | | |
| Caller Company | | | |
| Telephone Number | | | |
| Email Address | | | |
| Date/Time Received | | | |
| **Occurrence Information (Fill in Corresponding Section, if checked)** | | | |
| ☐ Information Request | ☐ Discharge Reporting | ☐ Complaint | ☐ Commendation |
| **Information Request** | | | |
| Information Requested | | | |
| Actions Taken | | | |
| Additional Information | | | |
| **Discharge Reporting** | | | |
| Address or Location of Discharge | | | |
| Time/Date of Discharge | | | |
| Substance/Amount Discharged (if known) | | | |
| Media into which the discharge occurred: ☐ Air ☐ Water ☐ Natural Ground ☐ Concrete/Asphalt ☐ Stream ☐ Ocean Other:________________ | | | |
| Responsible Party (if known) | | | |
| Cause of Discharge (if known) | | | |
| Clean-up Actions Taken (if applicable) | | | |
| Notifications Made/Actions Taken by Harbors Division | | | |
| Follow Information | | | |

| LINE ITEM | FORM FIELD |
|---|---|
| **Complaint** | |
| Nature of Complaint | |
| Complaint Details | |
| Notifications Made/Actions Taken by Harbors Division | |
| **Commendation** | |
| Commendation Details | |
| Notifications Made/Actions Taken by Harbors Division | |

**Points of Contact for Immediate Response**

In the event of an emergency needing immediate response, call the numbers listed below:

| **Point of Contact** | **Telephone Number** |
|---|---|
| Harbors Traffic Control Center | 808-587-2076 |
| Marine Cargo Specialist | 808-587-2053 |
| City and County of Honolulu Environmental Concern Hotline | 808-768-3300 |
| Department of Health, Clean Water Branch | 808-586-4309 |
| National Response Center (United States Coast Guard) | 1-800-424-8802 |

# Attachment 6

# Low-Risk Tenant Reconnaissance Inspection Form

**State of Hawaii Department of Transportation Harbors Division**
**Low-Risk Tenant Reconnaissance Inspection Form**

Harbor: ______ Date/Time: ______
Inspector(s): ______ Weather Conditions: ______

Tenant Business Name: ______
Tenant Permit(s): ______
Facility Location: ______
Facility Mailing Address: ______
Tenant Representative: ______
Phone Number: ______ Mobile Number: ______
Fax Number: ______ E-mail Address: ______
EPA ID No. (if any): IWDP No. (if any):

**Facility Description:**

**Site Drainage Description (including stenciling):**

**Any illicit discharge into Harbors storm water drainage system?** ☐ Yes ☐ No ☐ N/A

If "Yes", please describe here: ☐ Please check here if a follow-up inspection is necessary.

**Related Risk Ranking Criterion:**

**Remarks:**

☐ No significant changes (Please check here if no status change. Otherwise, please specify any changes below)

**Site Overview**

# Attachment 7

# Suspected Illicit Discharge Reporting Form

**Hawaii Department of Transportation – Harbors Division**

# Suspected Illicit Discharge Reporting Form

**General Information: Use this form to report a suspected illicit discharge. If you are unsure, please contact your supervisor or HAR-EE. Examples of illicit discharges: uncontained vehicle/equipment/building/sidewalk washing, sink discharging directly to ground or storm drain inlet, petroleum spills/sheens, unpermitted vessel discharges, uncontained vessel painting/chipping/sandblasting/cleaning, etc.**

## Observer Information

| | | | |
|---|---|---|---|
| Name: | | | |
| Office Code: | | Telephone Number: | |
| Report Date: | | | |

## Description of Suspected Illicit Discharge

| | | | |
|---|---|---|---|
| Address or Location: | | Date and Time: | |
| Description: (Include Substance and Amount, if known) | | | |

Media into which the discharge occurred:
☐ Air ☐ Natural Soil ☐ Concrete/Asphalt Pavement ☐ Stream ☐ Ocean ☐ Other:_______________

| | |
|---|---|
| Responsible Party: (if known) | |
| Cause of Discharge: (if known) | |
| Clean-up Actions: (if applicable) | |
| Notifications Made: | |

**Please forward completed form and/or picture(s) to HAR-EE office. Fax Number: (808) 587-1964**

## Point of Contact for Reporting

| Agency | Telephone Number |
|---|---|
| Harbor Traffic Control (Aloha Tower) | (808) 587-2076, (808) 368-5993 (Cellular) |
| Hawaii Department of Transportation Harbors Division, Engineering Environmental Section [HAR-EE] | (808) 587-1962, (808) 587-1976, (808) 587-1960 |

Additional Follow-up By HAR-EE (to be filled by HAR-EE):

# Attachment 8

# List of Alternative Products for Cleaning

## Alternative Products for Cleaning

| | |
|---|---|
| Battery Acid | Use baking soda to absorb a spill. |
| Bleach | As a substitute, try borax powder available at grocery stores. |
| Brass Cleaner | Use vinegar and a clean dry rag to remove tarnish. |
| Drain Opener | Pour ¼ cup baking soda down the drain, follow with ½ cup vinegar. Allow the effervescent mix to bubble for 30 minutes. Finish the job by flushing the drain with boiling water. For tough clogs, try using a plumber's snake. |
| Fiberglass Stain | Baking soda and water mixed into a paste works great on Formica. |
| Floor Cleaner | Use one cup of white vinegar in two gallons of water. |
| General Cleanser | Dissolve one teaspoon of borax in one quart of warm water. For tough jobs, use a ½ cup of borax and a splash of vinegar in water. |
| Hand Cleaner | Instead of paint thinner try washing soda (sodium bicarbonate), found in the laundry section of most grocery stores. Washing soda is caustic, so be sure to use plenty of water. |
| Mildew Remover | Mix equal parts of lemon juice and salt or vinegar and salt. Use a plastic spray bottle to spray on outside canvas. |
| Paper Towels | Use cloth rags that can be washed and re-used. |
| Scouring Powders | Baking soda with a plastic "bun" scrubber works great on porcelain head and shower tiles. |
| Shower Cleaner | Wet surface, sprinkle with baking soda, and scrub. |
| Soap | Use phosphate-free products available at most grocery and health food stores. |
| Wood Polish | For interior wood use one teaspoon lemon juice with two teaspoons vegetable oil. Apply mixture with a clean, dry cloth. |

# Attachment 9

# List of Major Environmental Regulations

## Major Environmental Regulations

Harbors has identified a major list of environmental regulations applicable to their activities and operations. The list includes stormwater management under the Clean Water Act [CWA]; petroleum products storage under the Spill Prevention, Control, and Countermeasure [SPCC] rule; waste management including hazardous waste, used oil, and universal waste; storage tank management; and hazardous substance/chemical storage under the Emergency Planning and Community Right-to-Know Act [EPCRA]. These regulations are reflected and implemented through using Harbors revised *Environmental Compliance, BMP, and P2 Inspection Checklist for Tenants* (Attachment 4) during inspections.

### 1. Clean Water Act and National Pollutant Discharge Elimination System

The CWA (contained in 33 United States Code [USC] §§ 1251 to 1387) is the primary federal statute that addresses water pollution in the United States. It establishes the basic structure for regulating discharges of pollutants into waters of the United States and establishing quality standards for surface waters. It also establishes a number of programs designed to restore and protect the quality of nation’s waters by eliminating the discharge of pollutants into surface waters. The CWA traces its roots to the Federal Water Pollution Control Act [FWPCA], which was originally enacted in 1948.

In 1972, congressional amendments to the FWPCA established the National Pollutant Discharge Elimination System [NPDES]. As authorized by the CWA, the NPDES program was established to control discharges of pollutants to navigable waters from point sources (e.g., industrial plants and municipal wastewater treatment facilities). Those discharges were authorized by permits issued under the program. The permits usually set numerical limitations on the authorized discharges (i.e., the composition and the concentration of pollutants in the effluent) and impose other conditions on the permittee. They give the permittee the right to discharge specified pollutants from specified outfalls for a limited period of time.

In 1987, the FWPCA was amended to include stormwater discharges as a significant source of water pollution. The NPDES program was also expanded to include non-point sources (e.g., stormwater runoff from construction sites, croplands, urban areas, etc.). Stormwater runoff is commonly transported through Municipal Separate Storm Sewer Systems [MS4s], and is often discharged directly into local water bodies without any treatment. To prevent harmful pollutants from being washed or dumped into an MS4, operators must submit a Notice of Intent [NOI] to seek coverage under NPDES program, and develop a stormwater management program to reduce the contamination of stormwater runoff and prohibit illicit discharges.

In 1990, the Environmental Protection Agency [EPA] promulgated regulations (contained in 40 Code of Federal Regulations [CFR] Parts 122, 123, and 124) to establish permit programs for stormwater discharges. It required medium and large cities or certain counties with populations of 100,000 or more, and construction activities disturbing five acres or more of land to obtain

NPDES permit coverage for their stormwater discharges. These regulations are referred to as the “Phase I Program.” In 1999, the EPA published the Storm Water Phase II Final Rule and expended the Phase I Program by extending NPDES coverage to small MS4s in and/or outside the urbanized areas, and to construction activities that disturb between one and five acres of land to obtain NPDES permit coverage for their stormwater discharges (EPA, 2000).

Generally, coverage under NPDES program is required for any discharge of a pollutant from a point source to nation’s waters. Individual homes that are connected to a municipal system, use a septic system, or do not discharge to any surface water do not need to apply for an NPDES permit. However, industrial, municipal, and other facilities must obtain permits if their discharges flow directly to surface waters. In addition, most stormwater discharges are considered point sources and require coverage under NPDES program. In most cases, the NPDES program is administered by authorized states.

For the State of Hawaii, the EPA has delegated authority to the HDOH Clean Water Branch [CWB], to administer the NPDES program including permit coverage issuance (to municipalities, industries, and construction projects), enforcement, program related regulatory & policy development, and other pertinent program elements. Meanwhile, the EPA continues to maintain overall enforcement authority. State water quality regulations have been codified in the Hawaii Administrative Rules [HAR] Title 11 Chapter 54 (Water Quality Standards) and HAR Title 11 Chapter 55 (Water Pollution Control). Hawaii Revised Statutes [HRS] Title 19 Chapter 342D provides the State with the procedures, rules, and regulations for the enforcement of the State’s Clean Water Program.

## A. 40 CFR Parts 122 to 124 – EPA Administered Permit Programs: The National Pollutant Discharge Elimination System

The regulatory provisions contained in these parts implement the NPDES program under sections 301, 318, 402, and 405 of the CWA. These parts cover the basic EPA permitting requirements (40 CFR Part 122) and minimum requirements for administering the approved state program (40 CFR Part 123); as well as procedures for EPA processing of permit applications and appeals (40 CFR Part 124). These provisions also establish the requirements for public participation in the EPA and state permit coverage issuance and enforcement and related variance proceedings, and in the approval of state NPDES programs.

## B. HAR Title 11 Chapter 54 – Water Quality Standards

This chapter establishes water quality standards applicable for the state waters (defined in HAR 11-54-1 and HRS 342D-1) that shall be maintained and protected to ensure protection of human health. To ensure compliance, all state waters are subject to monitoring and to the numerical limitations for acute and chronic toxicity as established in this chapter. These regulations detail the following: definitions; general policy on water quality and anti-degradation; classification of state waters and water uses; basic water quality criteria applicable to all waters; uses and specific criteria applicable to inland waters, marine waters, and recreational areas; zones of mixing; water quality certification and components; revisions; and severability.

### C. HAR Title 11 Chapter 55 – Water Pollution Control

This chapter became effective on October 22, 2007. This chapter establishes the application of general and individual NPDES permits for facilities in the State of Hawaii. The NPDES permit conditions include, but are not limited to, basic water quality criteria, permit coverage, onshore/offshore construction, sampling requirements and definitions, duties to comply/reapply/mitigate, operation and maintenance, inspection and entry, monitoring and recordkeeping, signatory requirement, reporting requirements, modification, renovation, penalties, remediation, civil and criminal liability, oil and hazardous substance liability, hearings, appeals, severability, public interest, and field citations. HAR Title 11 Chapter 55 also establishes general permit conditions for specific activities with the potential to impact the stormwater, including industrial activities ( HAR 11-55 Appendix B), construction activities (HAR 11-55 Appendix C), and construction activity dewatering (HAR 11-55 Appendix G).

## 2. Spill Prevention, Control and Countermeasure Rule

### A. 40 CFR Part 112 – Oil Pollution Prevention

Originally published in 1973 under the authority of Section 311 of the CWA, the Oil Pollution Prevention regulation (40 CFR Part 112) sets forth requirements for prevention of, preparedness for, and response to oil discharges at specific non-transportation related facilities. To prevent oil from reaching navigable waters and adjoining shorelines, and to contain discharges of oil, the regulation requires these facilities to develop and implement SPCC plans and establishes procedures, methods, and equipment requirements (Subparts A, B, and C). On December 5, 2008, the Federal Register published EPA's final rule to amend the SPCC rule. This regulation includes requirements for facilities to prepare, amend, and implement SPCC plans to prevent discharges of oil to navigable waters and adjoining shorelines.

To determine if a facility is subject to the SPCC rule, it must meet three criteria:

- It must be non-transportation-related;
- It must have an aggregate aboveground storage capacity greater than 1,320 gallons or a completely buried underground storage capacity greater than 42,000 gallons; and
- There must be a reasonable expectation of a discharge into or upon navigable waters of the United States or adjoining shorelines.

When calculating oil storage capacity, the facility should not count containers less than 55 gallons; completely buried tanks that are subject to all of the technical requirements of the Underground Storage Tank [UST] Regulation (40 CFR Part 280) or all of the technical requirements of a state UST program (HAR 11-281) approved under 40 CFR Part 281;

containers that are permanently closed as defined in 40 CFR Part 112.2; or parts of the facility used exclusively for wastewater treatment and not used to satisfy any requirement of 40 CFR Part 112. Preparation of the SPCC plan is the responsibility of the facility owner or operator.

### B. 40 CFR Part 110 – Discharge of Oil

The regulations of this part apply to the discharge of oil prohibited by Section 311(b) (3) of the CWA. For purposes of Section 311(b)(4) of the Act, discharges of oil in such quantities that the Administrator of the EPA has determined may be harmful to the public health or welfare or the environment of the United States include discharges of oil that:

Violate applicable water quality standards; or
Cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

According to 40 CFR Part 110.6, “Any person in charge of a vessel or of an onshore or offshore facility shall, as soon as he or she has knowledge of any discharge of oil from such vessel or facility in violation of Section 311(b)(3) of the Act, immediately notify the National Response Center [NRC] (800-424-8802). If direct reporting to the NRC is not practicable, reports may be made to the United States Coast Guard [USCG] or EPA predesignated On-Scene Coordinator [OSC] for the geographic area where the discharge occurs. All such reports shall be promptly relayed to the NRC. If it is not possible to notify the NRC or the predesignated OSC immediately, reports may be made immediately to the nearest USCG unit, provided that the person in charge of the vessel or onshore or offshore facility notifies the NRC as soon as possible.” The procedures for such notice are set forth in USCG regulations (33 CFR 153, Subpart B) and in the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300, Subpart E).

## 3. Waste Management Regulations

The Resource Conservation and Recovery Act (42 USC §§ 6901), commonly referred to as RCRA, is the primary law governing the disposal of solid and hazardous waste in United States. Congress passed RCRA on October 21, 1976, which amended the Solid Waste Disposal Act [SWDA] of 1965. RCRA gives EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste (40 CFR Parts 260 through 272). RCRA also set forth a framework for the management of non-hazardous solid wastes (40 CFR Parts 273 through 279). The 1986 amendments to RCRA further address environmental problems that could result from underground tanks storing petroleum and other hazardous substances (40 CFR Parts 280 through 282).

RCRA set national goals for protecting human health and the environment from the potential hazards of waste disposal, conserving energy and natural resources, reducing the amount of waste generated, and ensuring that wastes are managed in an environmentally-sound manner. To achieve these goals, RCRA established three distinct programs as follows:

- ❖ The hazardous waste program regulated under RCRA Subtitle C.
- ❖ The solid waste program regulated under RCRA Subtitle D.
- ❖ The UST program regulated under RCRA Subtitle I.

For the State of Hawaii, the EPA has delegated authority to HDOH Solid and Hazardous Waste Branch [SHWB] to administer the solid and hazardous waste management control program including permit issuance, inspections, compliant response, enforcement, technical assistance & training, program related regulatory & policy development, and other pertinent program elements. Meanwhile, EPA continues to maintain overall enforcement authority.

State solid and hazardous waste management control regulations are codified in the HAR Title 11 Chapter 58.1 (Solid Waste Management Control, in draft), Chapters 260 through 271 and 280 (Hazardous Waste Management), Chapter 273 (Universal Waste Management), Chapter 279 (Management of Used Oil), Chapter 281 (Underground Storage Tanks), and Chapter 282 (Deposit Beverage Container Recycling). Functionally, the SHWB consists of three implementing sections (Hazardous Waste Section, Office of Solid Waste Management, and Underground Storage Tank Section), one support group (Pollution Prevention and Waste Minimization Program), and program administration.

### A. Solid Waste Management Control - HAR Title 11 Chapter 58.1 (In Draft)

The purpose of this chapter is to establish minimum standards governing the design, construction, installation, operation, and maintenance of solid waste disposal, recycling, reclamation, and transfer systems. These standards are intended to prevent pollution of the drinking water supply or waters of the State of Hawaii; prevent air pollution; prevent the spread of disease and the creation of nuisances; protect the public health and safety; conserve natural resources; and preserve and enhance the beauty and quality of the environment.

These regulations detail the following: general provisions (Subchapter 1); requirements for solid waste disposal facilities (Subchapter 2); requirements for solid waste storage, handling, and processing facilities (Subchapter 3); requirements for solid waste reclamation facilities (Subchapter 4); requirements for special waste management (Subchapter 5); solid waste management responsibilities (Subchapter 6); penalties, remedies, and severability (Subchapter 7).

### B. Hazardous Waste Regulations - 40 CFR Parts 260 through 272 and HAR Title 11 Chapters 260 through 271 & 280

Enforced by EPA, 40 CFR Parts 260 through 272 establishes regulations for hazardous waste management including identification and listing of hazardous waste; standards applicable for generators of hazardous waste; standards applicable to transporters of hazardous waste; standards for owners and operators of hazardous waste treatment, storage, and disposal facilities; standards for the management of specific hazardous wastes and specific types of hazardous waste management facilities; standards for owners and operators of hazardous waste facilities operating under a standardized permit; land disposal restrictions; EPA administered permit programs; and requirements for authorization and approval of state hazardous waste programs.

Enforced by HDOH, HAR Title 11 Chapters 260 through 271 and 280 establishes rules governing hazardous waste management in the State of Hawaii. HAR 11-260 through 11-270, are patterned after the regulations promulgated in 40 CFR 260 through 270, respectively. All references in tables and appendices to provisions of the CFR shall be construed to mean the state rule analogue of the referenced federal regulation (e.g., 40 CFR 260.1 shall be construed to mean section 11-260-1 of the HAR). The list of regulations applicable to Harbors is discussed below.

<u>40 CFR Part 260 (HAR Title 11 Chapter 260) – Hazardous Waste Management System: General</u>

This Part provides purpose, scope, applicability, definitions, references, general standards, and overview information applicable to the remainder of the hazardous waste rules.

<u>40 CFR Part 261 (HAR Title 11 Chapter 261) – Identification and Listing of Hazardous Waste</u>

These regulations can be used to determine whether the waste is a solid waste and then to determine if it is a hazardous waste based on the characteristics exhibited by the waste and listed wastes (i.e., ignitability, corrosivity, reactivity, and toxicity; 40 CFR Subpart C). List of hazardous wastes regulated by the EPA is contained in 40 CFR Subpart D. They also specify special requirements for hazardous waste generated by conditionally exempt small quantity generators [CESQG], residues of hazardous waste in empty containers, polychlorinated biphenyls [PCB] wastes regulated under Toxic Substance Control Act [TSCA], recyclable materials, and universal waste.

<u>40 CFR Part 262 (HAR Title 11 Chapter 262) – Standards Applicable To Generators of Hazardous Waste</u>

This Part establishes standards for generators of hazardous waste including but not limited to hazardous waste determination; EPA identification numbers; general requirements for hazardous waste manifest; pre-transportation requirements for hazardous waste packaging, labeling, marking, placarding, and accumulation time; recordkeeping and reporting; and imports/exports of hazardous waste.

These standards can be utilized to make a hazardous waste determination, identifying the operator's generator status based on quantity of hazardous waste generated per calendar month, and managing the hazardous waste in accordance with the requirements for different generators. The hazardous waste generators are classified into Large Quantity Generator [LQG], Small Quantity Generator [SQG], and CESQG. A generator's "status" is defined by the type of hazardous waste created and the quantity of waste that is generated and stored onsite. It is important that container weight and universal waste weight is not included in the total. Detailed discussion for each type of generator is listed below:

CESQGs generate 100 kilograms (220 pounds) or less of hazardous waste and 1 kilogram (2.2 pounds) or less of acutely hazardous waste in one calendar month. A CESQG must identify all the hazardous waste generated. CESQG cannot accumulate 1,000 kilograms (2,205 pounds) or more of hazardous waste and more than 1 kilogram (2.2 pounds) of acute hazardous waste at any time. A CESQG does not need to acquire an EPA RCRA identification number. Use of a Hazardous Waste Manifest form is not required but recommended.

SQGs generate more than 100 kilograms (220 pounds) and less than 1,000 kilograms (2,205 pounds) of hazardous waste and 1 kilogram (2.2 pounds) or less of acutely hazardous waste in one calendar month. An SQG may accumulate hazardous waste on site for 180 days without a permit (or 270 days if shipping a distance greater than 200 miles). A SQG cannot accumulate 6,000 kilograms (13,228 pounds) or more of hazardous waste and more than 1 kilogram (2.2 pounds) of acute hazardous waste at any time. An SQG needs to acquire an EPA RCRA identification number, and needs to use a Hazardous Waste Manifest form. There must always be at least one employee available to respond to an emergency. This employee is the emergency coordinator responsible for coordinating all emergency response measures. SQGs are not required to have detailed, written contingency plans.

LQGs generate 1,000 kilograms (2,205 pounds) or more of hazardous waste or 1 kilogram (2.2 pounds) or more of acute hazardous waste in one calendar month. An LQG does not have a limit on the amount of hazardous waste accumulated on site, but may store hazardous waste on-site for up to 90 days. An LQG needs to acquire an EPA RCRA ID Number, needs to use a Hazardous Waste Manifest form, and must submit a biennial hazardous waste report. There must always be at least one employee available to respond to an emergency. This employee is the emergency coordinator responsible for coordinating all emergency response measures. Furthermore, an LQG needs to comply with the requirements for personnel training, preparedness and prevention, detailed contingency plans and emergency procedures.

In addition, the generator must comply with the applicable requirements associated with the containment used to store hazardous waste. All generators must ensure that hazardous waste is delivered to a person or facility that is authorized to manage it.

<u>40 CFR Part 263 (HAR Title 11 Chapter 263) – Standards Applicable To Transporters of Hazardous Waste</u>

This Part establishes standards which apply to persons transporting hazardous waste within the United States if the transportation requires a manifest under 40 CFR Part 262 (or HAR 11-262). Note that these regulations do not apply to on-site transportation of hazardous waste by generators/owners/operators of permitted hazardous waste management facilities. A transporter of hazardous waste must also comply with other applicable Parts within 40 CFR (and/or HAR Title 11), where applicable. This Part also describes the standards for transporter; EPA identification numbers; transfer facility requirements; compliance with the manifest system and recordkeeping; and immediate action and clean up.

## C. Universal Waste Management – 40 CFR Part 273 and HAR Title 11 Chapter 273

This Part establishes requirements for managing of acceptable universal wastes, including batteries, pesticides, mercury-containing equipment, and lamps (bulbs). This Part provides an alternative set of management standards in lieu of regulation under 40 CFR Parts 260 through 272. It lists definitions of universal waste; standards for small and large quantity handlers of universal waste (e.g., applicability, prohibitions, notification, waste management, labeling and marking, accumulation time limits, employee training, response to releases, off-site shipments, tracking universal waste shipments, exports, etc.); standards for universal waste transporters; standards for destination facilities; import requirements, and petitions to include other wastes under 40 CFR Part 273. The universal waste regulations discussed within this paragraph are not applicable to the conditionally exempt small quantity generators of hazardous waste (40 CFR Part 273.8).

## D. Standards for the Management of Used Oil - 40 CFR Part 279 and HAR Title 11 Chapter 279

On July 30, 2003, EPA established standards for the management of recycled used oil. These standards were further corrected and published on July 14, 2006, as a final rule. This Part establishes used oil management requirements including definitions of used oil; applicability, specifications, prohibitions; standards for used oil generators, transporter and transfer facilities, processors, burners who burn off-specification used oil for energy recovery, fuel marketers (e.g., applicability, hazardous waste mixing, storage, on-site burning, off-site shipments, restrictions, notification, transportation, rebuttable presumption, storage, tracking, residue management, reporting); standards for used oil collection centers and aggregation points; standards for disposal of used oil; and used oil and used oil fuel permitting system.

## E. UST Regulations - 40 CFR Part 280 and HAR Title 11 Chapter 281

This Part applies to all owners and operators of a UST system as defined in 40 CFR 280.12 except as otherwise provided in paragraphs (b), (c), and (d) of 40 CFR 280.10. This Part establishes UST regulations including:

- Program scope and interim prohibition (i.e., applicability, definitions, and interim prohibition for deferred UST systems);
- Design, construction, installation and notification (i.e., performance standards for new UST systems, upgrading of existing UST systems, and notification requirements);
- General operating requirements for spill and overfill control, operation and maintenance of corrosion protection, compatibility, repairs allowed, and reporting and recordkeeping;
- Release detection (i.e., general requirements for all UST systems, requirements for petroleum and hazardous substance UST systems, methods of release detection for tanks and piping, and release detection recordkeeping);
- Release reporting, investigation, and confirmation (reporting of suspected releases, investigation due to off-site impacts, release investigation and confirmation steps, and reporting and cleanup of spills and overfills);
- Release response and corrective action for UST systems containing petroleum or hazardous substances (i.e., initial response, initial abatement measures, initial site characterization, free product removal, investigations for soil and groundwater cleanup, corrective action plan, and public participation);
- Out-of-service UST systems and closure (i.e., temporary closure, permanent closure and change-in-service, assessing the site at closure or change-in-service, applicability to previously closed UST systems, and closure records); and
- Financial responsibility.

### F. HAR Title 11 Chapter 104.1 - Management & Disposal of Infectious Waste

This chapter establishes minimum requirements for the management, treatment, transport, storage, and disposal of infectious waste and treated infectious waste in order to ensure practices that will protect the health and safety of persons living in the State of Hawaii. This chapter includes definition of infectious waste and storage, prohibited acts, categories of infectious waste; handling, transportation, and disposal requirements of untreated infectious waste within a generating facility; treatment and storage of treated infectious waste within a generating facility; transportation of infectious waste for treatment away from the generating facility and disposal of treated/untreated infectious waste, required elements of infectious waste management plan, exemption for placenta; and enforcement, penalties and severability.

## 4. Emergency Planning and Community Right-To-Know Act

The EPCRA of 1986 (42 USC §§ 11002 and 11003), a federal law, was created to help communities plan for emergencies involving hazardous substances. It establishes requirements for federal, state, local governments, and industry regarding emergency planning and "Community Right-to-Know" reporting on hazardous and toxic chemicals. The EPCRA provisions help increase the public's knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment, States and communities, working with facilities, can use the information to improve chemical safety and protect public health and the environment. There are four major provisions of EPCRA, including:

- Emergency Planning (EPCRA Sections 301 through 303; 40 CFR Part 355)
- Emergency and Accidental Release Notification (EPCRA Section 304; 40 CFR Part 355)
- Hazardous Chemical Storage Reporting (EPCRA Sections 311 and 312 (Tier II); 40 CFR Part 370)
- Toxic Chemical Release Inventory (commonly referred to as TRI or Form R; EPCRA Section 313; 40 CFR Part 372)

In 1993, the Hawaii Emergency Planning and Community Right-to-Know Act [HEPCRA] became law (HRS 128E). It promulgated the federal EPCRA requirements in the State of Hawaii. This statute establishes planning, reporting, emergency notification, and public information access requirements related to hazardous chemicals. It also creates the Hawaii State Emergency Response commission [HSERC], which is established within the HDOH, as well as Local Emergency Planning Committees [LEPC], which are located in each county of Hawaii to implement emergency response planning and related actions. If a facility stores extremely hazardous substances [EHS] above threshold planning quantities [TPQs] published in 40 CFR 355 Appendices A and B, or if the facility stores 10,000 pounds or more of a hazardous material, the facility is subject to HEPCRA.

## A. 40 CFR Part 355 – Emergency Planning and Notification

This Part establishes the list of EHS, TPQs, and facility notification responsibilities necessary for the development and implementation of state and local emergency response plans. These regulations include purpose, definition, emergency planning, emergency release notifications, penalties, and the regulated list of extremely hazardous substances and their TPQs.

## B. 40 CFR Part 370 – Hazardous Chemical Reporting: Community Right-to-Know

This Part establishes reporting requirements which provide the public with important information on the hazardous chemicals in their communities for the purpose of enhancing community awareness of chemical hazards and facilitating development of state and local emergency response plans. These regulations include purpose, definitions, penalties; reporting requirements (i.e., applicability, material safety data sheets [MSDS] reporting, inventory reporting, and mixtures); public access and availability of information (i.e., request and provision for information; and inventory forms (i.e., Tier I emergency and hazardous chemical inventory form, and Tier II emergency and hazardous chemical inventory form).

## C. 40 CFR Part 372 – Toxic Chemical Release Reporting: Community Right-to-Know

This Part sets forth requirements for the submission of information relating to the release of toxic chemicals under Section 313 of Title III of the Superfund Amendments and Reauthorization Act [SARA] of 1986. The information collected under this Part is intended to inform the general public and the communities surrounding covered facilities about releases of toxic chemicals, to assist research, to aid in the development of regulations, guidelines, and standards, and for other purposes. These regulations also set forth requirements for suppliers to notify persons to whom they distribute mixtures or trade name products containing toxic chemicals that they contain such chemicals.

These regulations include scope and purpose, definitions, persons subject to this part, recordkeeping, and compliance and enforcement; reporting requirements (i.e., covered facilities for toxic chemical release reporting, and North American Industry Classification System [NAICS] codes (also refers to as Standard Industrial Codes [SIC]) to which this Part applies, thresholds for reporting, alternate thresholds and certification, lower thresholds for chemicals of special concern, reporting requirements and schedule for reporting, and exemptions); supplier notification requirements (i.e., notification about toxic chemicals); specific toxic chemical listings; and toxic chemical release reporting forms and instructions.

## D. HAR Title 11 Chapter 451 – State Contingency Plan

Adopted on August 2, 1995, this chapter establishes the Hawaii State Contingency Plan [SCP] in order to implement, administer, and enforce the HRS chapter 128D (Hawaii Environmental Response Law [HERL]). These regulations are based on the National Contingency Plan [NCP] (administrative rules under Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA], which is also known as “Superfund”). The SCP identifies hazardous substances, pollutants, or contaminants, which are subject to the requirements and procedure. It also designates any release of hazardous substances, pollutants, or contaminants in quantities equal to or exceeding their reportable quantities, or any threat of release of hazardous substances, pollutants, or contaminants which poses or which may pose a substantial endangerment to public health or welfare, the environment, or natural resources, and all action taken pursuant to HRS chapter 128D, or these rules. The SCP details notification of releases, hazardous substance response, natural resources, activities by other persons, administrative records, and entry and access.

# Attachment 10

# Training Materials for Inspector

## INSPECTION DESCRIPTION

The risk ranking process determines the list of tenants to be inspected and appropriate inspection frequency. The primary purpose of the inspection is to evaluate how facility operations comply with Harbors stormwater management program, major environmental laws, applicable BMPs, pollution prevention [P2], and relevant clauses contained within a lease agreement (or revocable permit). Environmental compliance, BMP, and P2 information for each of the fourteen inspection criteria are discussed in Section I.

The second purpose for the inspection is to develop and maintain an accurate inventory of environmental assets owned and/or operated by each tenant. These assets are discussed in Section II. The third purpose for the inspection is to confirm compliance with environmental laws regulated by EPA, HDOH, HDOT, and other agencies. In addition, these routine inspections will identify any potential violation and assist in providing any corrective action, if necessary. Inspections are conducted under the following circumstances:

- **Routine Inspections** are required under stormwater management program and based on individual tenant's risk ranking;
- **Follow-up Inspections** are to be conducted, after investigation inspection, to verify that necessary corrective actions are implemented;
- **Initial Site Inspections** or **New Tenant Inspections** are conducted to evaluate new tenant operations;
- **Final Site Inspections** are conducted to evaluate environmental conditions in tenant areas subject to lease (or revocable permit) termination.
- **Reconnaissance Inspections** are conducted at low risk-ranked tenant facilities as an annual evaluation tool.
- **Investigation Inspections** are to investigate reported illicit discharges to receiving water and/or Harbors stormwater drainage system;

Other inspections include **Joint Inspections**, which are conducted jointly with HDOH and/or EPA representatives. The above-listed inspections are further discussed below.

### Section I - Compliance, BMP, and P2 Information

Compliance is the state of being in accordance with the relevant federal and regional authorities and their requirements. In order to assist tenants to remain in compliance with Harbor's stormwater management program, major environmental laws, and relevant clauses (or Terms and Conditions) contained within lease agreement and/or revocable permit, Harbors has identified and implemented several means of disseminating related information to tenants. These means include, but are not limited to, providing *Annual Storm Water Pollution Prevention Awareness Training*, sending out informative brochures, providing technical support and assistance during inspections, and mailing out the inspection reports to keep tenants informed of their compliance status.

BMPs are defined as a schedule or schedules of activities, prohibitions or designations of practices, maintenance procedures, and other management practices to prevent or reduce the pollution to receiving water and/or Harbors stormwater drainage system. BMPs include treatment requirements, operating procedures, and practices to control runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

BMPs related to treatment control utilize physical devices or systems that remove pollutants from stormwater. BMPs related to operational practices intend to prevent pollutants from entering surface waters and/or Harbors stormwater drainage system, by altering activities to eliminate and minimize the pollution. BMPs related to spill response rely on a combination of structural controls, employee awareness, and relevant training to be effective methods for protection of environment.

Harbors always encourages the tenants to implement applicable BMPs and P2 measures to further aid in preventing discharge of pollutants. The tenants should be aware of the requirements of the inspection checklist and understand how their operations could impact the environment. Applicable BMPs associated with the fifteen inspection criteria are included in Attachment 3. Some of them are based on the November 2011 City and County of Honolulu [CCH] publication (CCH, 2011), "*Storm Water Best Management Practice Manual for Construction*." Brief descriptions of typical operations and the accompanying key inspection criteria are discussed below.

**1. Elimination of Non-Stormwater Discharges to Stormwater Drainage System**

This is a general BMP applicable to all tenants. Non-stormwater discharges can be classified as 1) activity-based (subtle) or 2) overt (hard-pipe connection). Activity-based non-stormwater discharges may include wash water, tank overflows, and spillage. Overt non-stormwater discharges are flows piped to Harbors stormwater drainage system. These flows may include processed wastewater, treated cooling water, and treated sanitary wastewater. Non-stormwater discharges can be detected during storm drains and tenant routine inspection. In addition, overt connections can also be detected during the outfall reconnaissance inspection and engineering plan review process. The key inspection criteria for activity-based and overt discharges are listed in Table 1.

Certain non-stormwater discharges are permitted by regulations, and therefore, exempted from the program. The discharge of pollutants to Harbors stormwater drainage system shall be reduced to the MEP. The following non-stormwater discharges may be discharged into Harbors stormwater drainage system, provided that such discharges do not contain pollutants in amounts that will cause or contribute to a violation of an applicable water quality standard.

- Water line flushing;
- Landscape irrigation;

- Diverted stream flows;
- Rising ground waters;
- Uncontaminated ground water infiltration;
- Uncontaminated pumped ground water;
- Discharges from potable water sources and foundation drains;
- Air conditioning condensate;
- Irrigation water;
- Springs;
- Water from crawl space pumps and footing drains;
- Lawn watering runoff;
- Water from individual residential car washing;
- Flows from riparian habitats and wetlands;
- Dechlorinated swimming pool discharges;
- Residual street wash water;
- Discharges flows resulted from firefighting activities.

**Table 1**
**Elimination of Non-Stormwater Discharges to Stormwater Drainage System**

| Subject | Key Inspection Criteria |
|---|---|
| Activity-based | • Identify facility areas exposed to stormwater which are wet during dry weather, or are stained.<br>• Inspect discharge points to the stormwater drainage system to identify uncharacteristic volume, color, turbidity, odor, floatables, or foaming. |
| Overt | • Inspect each discharge point to the stormwater drainage system during dry weather.<br>• Ask the tenant to identify the discharge pathway of all floors and drains. Review as-built drawings as needed to verifying piping schematics. |

## 2. Vessel, Equipment, and Vehicle Maintenance and Repair

The outstanding features of Hawaii's climate include mild temperatures throughout the year (70s to 90s degrees of Fahrenheit [ºF]), moderate humidity, persistence of northeasterly trade winds, significant differences in rainfall within short distances, and infrequent severe storms. Generally, weather in Hawaii is very consistent, with only minor changes in temperature throughout the year. For the majority of Hawaii, there are only two seasons – summer (from May to October) and winter (from November to April).

Due to the mild climate in Hawaii, vessel, equipment, and vehicle maintenance and repair activities are usually conducted in uncovered areas. Accordingly, the potential for discharge of pollutants to the environment from these activities is very high. Therefore, conducting maintenance and repair activities in authorized areas are critical to the success of this BMP.

Additional state and federal regulations apply to some aspects of maintenance operations. These include, but are not limited to, federal and state solid and hazardous waste regulations, sewer use ordinances, and the Uniform Fire Code. Issues related to maintenance areas can be addressed with a combination of these regulatory tools. The key inspection criteria related to vessel (dry-docked or on-land ONLY), equipment, and vehicle maintenance and repair are listed in Table 2.

**Table 2**
**Vessel, Equipment, and Vehicle Maintenance and Repair**

| Subject | Key Inspection Criteria |
|---|---|
| Work Area | • Verify that maintenance/repair works occur in an authorized area.<br>• Verify that storm drain inlets are protected from potential discharge of pollutants, and cleaned on a regular basis.<br>• Verify that maintenance/repair areas are not hosed down; instead, the areas are cleaned using dry methods. |
| Equipment | • Verify that greasy and leaking equipment are stored under cover with oil drip pans or other secondary containment.<br>• Verify that all fluids are drained and batteries are removed from salvage vessels, vehicles, and equipment. |
| Materials | • Evaluate hazardous materials (potentially hazardous substances) utilized and make suggestions for substitutions with recycled or less toxic products.<br>• Verify recycling or proper disposal of grease, oils, antifreeze, brake fluid, cleaning solutions, hydraulic and transmission fluids, solvents, paints, batteries, and filters. |
| Training | • Verify that maintenance/repair employees have received proper awareness training on stormwater BMPs and a hazard communication [HAZCOM] course. |

## 3. Vessel, Equipment, and Vehicle Fueling

Fuel transfer activities at Harbors tenant facilities occur at various locations and circumstances. Designated fueling areas are designed to prevent the run-on of stormwater and the run-off of spills. Certain fuel oil storage and transfer operations are regulated under 40 CFR Part 112 (Oil Pollution Prevention and Response; Non-Transportation-Related Onshore and Offshore Facilities, commonly known as the SPCC Program). USTs used for fuel oil storage are regulated under HAR Title 11 Chapter 281. Furthermore, it is very common that vessel fueling operations occur while the vessel is still in the water. Due to the great potential of release to immediate receiving waters, fueling operations in water must adhere to USCG regulations, which is not discussed in this section.

Some Harbors tenants are subject to 40 CFR Part 112 and will need to develop and implement a SPCC plan, which is further discussed in Section 4.1.11 (*Emergency Spill Cleanup Plan*). The key components of the BMPs related to fueling activities address some practical measures that should be followed independently and/or in conjunction with the tenant's SPCC plan. The key inspection criteria related to vessel (dry-docked or on-land ONLY), equipment, and vehicle fueling are listed in Table 3.

**Table 3**
**Vessel, Equipment, and Vehicle Fueling**

| Subject | Key Inspection Criteria |
|---|---|
| Fueling Area | • Ensure that the spill kits are readily available.<br>• Assess fueling area design, and make recommendations for installing a cover, dead-end sump, berms, or impervious surfacing if appropriate.<br>• Inspect sump or oil/water separator and query tenant on maintenance schedule.<br>• Query tenant on fueling location of mobile equipment. |
| Operations | • Check for staining in fueling areas, and evaluate whether adequate spill cleanup methods are routinely implemented.<br>• Evaluate cleanup practices (i.e., spent absorbent should be picked up and stored in an appropriate container, fueling areas should not be hosed down, and employees should be trained on fueling, spill cleanup practices, release notifications, and informed of SPCC plan if there is one). |
| Equipment | • Evaluate secondary containment devices (either portable or permanent used during fueling operations).<br>• Inspect visible piping, tanks, and hoses for signs of leakage, wear, or malfunction. |

**4. Vessel, Equipment, and Vehicle Washing**

Most of Harbors tenants are located in close proximity to the ocean, which would cause a relatively high rate of corrosion on metals. Therefore, there is an increased need to remove accumulated sediment from vessel (dry-docked or on-land), equipment, and vehicle. Wash racks equipped with oil/water separators and containment devices should be utilized for all washing operations on land, except for removal of salt from the exterior of the vessel using fresh water with low power, as noted in ***Tenant Inspection Manual - Section 4.3.3***.

Prior to conducting any vessel, equipment, or vehicle washing activity on site, the tenant must obtain a written consent from the Harbors. Unauthorized washing on Harbors property would result in an NAV or more severe enforcement.

All washing operations should be conducted in a manner that will contain potential pollutants. This can be accomplished through prohibiting the use of surfactants, using minimal water, utilizing secondary containments, and/or use less hazardous and more biodegradable materials.

A list of alternative products is included in Attachment 8 (NOAA, 2005). If possible, after necessary pretreatment, wash water should be discharged to sanitary sewer through a permitted connection or to a permitted underground injection well. The key inspection criteria related to vessel (on-land ONLY), equipment, and vehicle washing are listed in Table 4.

**Table 4**
**Vessel, Equipment, and Vehicle Washing**

| Subject | Key Inspection Criteria |
|---|---|
| Washing Area | • Evaluate area for optimal characteristics including cover, containment, surface integrity, slope, and run-on/run-off. |
| Wash Water Treatment | • Assess maintenance, cleaning, and disposal of materials from sumps and oil/water separators. |
| Equipment | • Inspect wash water collection, pretreatment, and reclamation system components for potential discharges.<br>• Evaluate storage and use of cleaning agents. |
| Permits | • Evaluate whether vessel or vehicle washing activity and related washing method is authorized by Harbors.<br>• Evaluate whether discharges to the sanitary sewer or an underground injection well are authorized. |
| Operations | • Evaluate whether all washing operations take place in approved areas. |

## 5. Container Storage

Storage of chemical products and new/used oil on-site is subject to federal (EPCRA; 40 CFR Part 355, 370, and 372) and state regulations (HAR Title 11 Chapter 451). In addition, storage of used oil is subject to specific management standards under 40 CFR Part 279 and HAR Title 11 Chapter 279.

The SPCC regulations (40 CFR Part 112) specify certain secondary containment requirements for aboveground storage of oil. This BMP extends the secondary containment requirement to all containers used for storage of oil and potentially hazardous substances outdoors. Waste handling and disposal is discussed in 7 - *Waste Handling and Disposal*. The key inspection criteria related to container storage are listed in Table 5.

**Table 5**
**Container Storage**

| Subject | Key Inspection Criteria |
|---|---|
| Storage Area | • Evaluate adequacy of secondary containment so that it is sufficient to hold the volume of the largest container plus additional 10% or greater capacity for accommodating precipitation.<br>• Evaluate containers, aboveground tanks, and piping for protection guards, such as bollards, to prevent vehicle or forklift damage. |
| Equipment | • Verify that aboveground oil tanks are equipped with overflow protection devices, which will shut down transfer pumps automatically, and relevant warning signs for operators.<br>• Inspect container integrity for signs of failure. |
| Operations | • Verify that all containers are clearly labeled to prevent misuse or accidental release.<br>• Evaluate management of secondary containment structures to prevent accumulation of stormwater and/or free product, and verify that tenant maintains the log for discharge of uncontaminated stormwater from secondary containment. |

## 6. Material Storage and Handling

This BMP related to the loading/unloading and temporary storage of non-petroleum materials and cargo. Fuel oil loading/unloading activities are covered in 3 - *Vessel, Equipment, and Vehicle Fueling*. Oil and potentially hazardous substance storage is covered in 5 - *Container Storage*.

Material storage and handling operations at a tenant's facility can include bilge servicing, sewage transfer, fire suppressant loading, cargo handling, neo-bulk cargo staging (e.g., construction materials such as lumber), dry-bulk handling (e.g., sand, aggregate, coal, scrap metal, Portland cement, etc.), other break-bulk cargo handling (e.g., miscellaneous general cargo), and associated temporary storage. Additionally, this BMP can also address pumping operations affiliated with the cleaning of tanks, sumps, piping, or pier areas. The key inspection criteria related to material storage and handling are listed in Table 6.

**Table 6**
**Material Storage and Handling**

| Subject | Key Inspection Criteria |
|---|---|
| Loading Area | • Evaluate design and identify opportunities to improve cover, grading, berms, downspout and storm drain locations, and parking orientation.<br>• Evaluate non-structural loading areas in proximity to storm drains, stains, or pavement degradation. |
| Bulk Storage | • Inspect all temporary storage areas and maintain good housekeeping in the areas. |
| Equipment | • Verify that adequate supplies of cleanup materials are readily available at material handling locations. |
| Operations | • Verify that leaks from transferring operation and spillage from hose disconnections are contained, absorbed, and disposed of properly.<br>• Review written operation plans and/or emergency spill cleanup plans. |
| Training | • Query tenant on spill prevention and response training of employees.<br>• Forklift drivers must receive proper training (Occupational Safety and Health Administration [OSHA] federal regulation 29 CFR 1910.178). |

**7. Waste Handling and Disposal**

Solid waste storage and management is regulated under HAR Title 11 Chapter 58.1 (in draft). Storage of hazardous waste is subject to specific management standards under the federal RCRA (40 CFR Parts 260 to 272) and state regulations (HAR Title 11 Chapters 260 through 271 and 280). These standards include the requirement for secondary containment of all hazardous waste containers as a spill prevention measure. Universal waste management is regulated under 40 CFR Part 273 and HAR Title 11 Chapter 273. Management and disposal of infectious waste is regulated under HAR Title 11 Chapter 104.1.

This BMP is intended to prevent or reduce the discharge of pollutants to the environment from waste handling activities by tracking waste from generation and storage to disposal. It also intends to reduce waste generation and disposal through source control (i.e., reduction, reuse, and recycling). In addition, this BMP aims on preventing run-on and run-off at waste management areas.

Waste handling and disposal related activities are regulated by both federal and state laws (see 5 – *Container Storage*). The high cost and regulation pertaining to waste handling and disposal provide incentives for reducing waste generation and identifying opportunities for reuse and recycling. Components of this BMP target both the required waste management activities and waste reduction efforts. The key inspection criteria related to waste handling and disposal are listed in Table 7.

**Table 7**
**Waste Handling and Disposal**

| Subject | Key Inspection Criteria |
|---|---|
| Storage Area | • Inspect all used oil and hazardous waste storage areas to assess integrity of secondary containment.<br>• Inspect all waste storage areas to ensure that dumpsters are covered and not leaking.<br>• Ensure that sediments and wastes are not tracked off site; |
| Operations | • Inspect all waste storage areas to ensure that incompatible wastes (such as acids and bases) are segregated and that all waste containers are labeled/marked and dated properly (refer to HAR Title 11 Chapters 260 through 280: Hazardous Waste Management for labeling requirements);<br>• Inspect waste storage containers for integrity (must be covered when not being filled as well as rust and dent-free).<br>• Inspect waste storage areas for signs of leaks or spills.<br>• Verify that all wastes are disposed of properly, and if applicable, query tenants on their hazardous waste generator status (CESQG, SQG, or LQG), obtain related EPA identification number, and verify that records related to waste generation and disposal are being kept.<br>• Evaluate training of employees handling waste. |
| Waste Reduction | • Maintain minimal inventory of chemical products to reduce potential spill and waste generation.<br>• Identify less toxic chemical substitutes to reduce hazardous waste generation.<br>• Reuse or recycle materials whenever possible.<br>• Evaluate processes generating wastes to identify modifications (e.g. double cleaning of parts, material substitutions or eliminations, etc.) that would minimize wastes. |

## 8. Pier, Building, and Ground Maintenance

Pier maintenance includes pier and marine structure repairing, and routine maintenance works (i.e., painting, carpentry, plumbing, and cleaning of operational areas). Building maintenance includes activities such as painting, roofing, pressure washing, and construction of a building. Ground maintenance includes cleaning of operational areas and application of fertilizers, biocides, herbicides, and pesticides. It also includes maintenance of the stormwater drainage system. These activities generate debris and pollutants that could come into contact with stormwater run-on and run-off. The key inspection criteria related to pier, building, and ground maintenance are listed in Table 8.

**Table 8**
**Pier, Building, and Ground Maintenance**

| Subject | Key Inspection Criteria |
|---|---|
| Pier Maintenance | • Evaluate temporary controls (such as tarps, booms, restricted use of wash water, and storm drain covers) to contain debris and pollutants.<br>• Evaluate cleaning methods for paved surfaces (such as sweeping over washing, and proper storage and disposal of sweeper debris).<br>• Evaluate cleaning schedule for the stormwater drainage system. |
| Building Maintenance | • Evaluate temporary controls (such as tarps, booms, restricted use of wash water, and storm drain covers) to contain debris and pollutants. |
| Ground Maintenance | • Evaluate cleaning methods for paved surfaces (such as sweeping over washing, and proper storage and disposal of sweeper debris).<br>• Encourage conservative utilization of fertilizers, biocide, herbicides, and pesticides with intention of maximizing absorption and minimizing run-off to stormwater drainage system.<br>• Recommend leaving or planting native vegetation to reduce irrigation, fertilizer, biocide, herbicide, and pesticide needs. When applying biocide, herbicide, or pesticide, follow the manufacturer's recommendations and instructions, and avoid spray in high winds or when rainfall is imminent to reduce overspray and run-off.<br>• Encourage collecting and composting of green waste to prevent blockages in the stormwater drainage system.<br>• Evaluate cleaning schedule for the stormwater drainage system. |

## 9. Stormwater Pollution Prevention Education and Outreach

The SWMP has been developed and implemented for harbors covered under the NPDES program. The plan includes sections on tenant education and outreach related to stormwater pollution prevention and good housekeeping. Tenants covered under their own NPDES permit are required to have their own Storm Water Pollution Control [SWPC] or similar plan and to provide training for their employees, which is often a part of their corporate policy. In addition, Harbors provides *Annual Storm Water Pollution Prevention Awareness Training* to the tenants. The tenants are required to attend this annual training, share the information with their employees, and provide feedback.

This section identifies potential components of stormwater pollution prevention training programs. Inspection criteria would be limited to confirmation of employee training and review of stormwater training materials and recordkeeping. The key inspection criteria related to stormwater pollution prevention education and outreach are listed in Table 9.

**Table 9**
**Stormwater Pollution Prevention Education and Outreach**

| Subject | Key Inspection Criteria |
|---|---|
| Education | • Increase awareness of what is (or is not) allowed to enter the storm drains.<br>• Increase awareness of the detrimental environmental impacts resulted from fuel, antifreeze, lubricants, pesticides, detergents, paint, and waste residue.<br>• Identify stormwater collection system components. |
| BMP | • Encourage labeling/stenciling of storm drains to discourage illicit discharges or illegal dumping.<br>• Promote the proper storage, use, and disposal of potentially harmful chemicals.<br>• Promote the proper storage and disposal of wastes.<br>• Encourage acquisition of alternative and less toxic chemicals (such as short shelf-life pesticides, non-chlorinated solvents, water-based paints, and non-aerosol products).<br>• Encourage waste minimization and recycling.<br>• Provide mechanism for reporting of apparent violations and enhance awareness of possible penalties affiliated with illicit discharge/dumping.<br>• Encourage efficient and safe BMPs in areas with industrial activity. |

## 10. Oil/Water Separator

An oil/water separator [OWS] is a device designed to separate gross amounts of oil and suspended solids from stormwater or wastewater effluents (from restaurants, oil refineries, petrochemical plants, chemical plants, natural gas processing plant, or other industrial sources). It is installed as a pretreatment device for wastewater, prior to discharge to a sanitary sewer, cesspool, recycling system, treatment plant, or other collection points. OWS can also be installed at locations with high fuel recovery potential, such as fuel truck loading areas where spilled product can be recovered for proper use or disposal.

In terms of stormwater, an OWS is typically installed in operational areas prone to frequent small spills and drips that have a significant cumulative impact on stormwater quality. The stormwater OWS is utilized as a flow-through polishing device rather than a reclamation device.

The OWS comes in a range of sizes and designs, depending on the volume of flow and characterization of the influent. All OWSs warrant regular maintenance in order to be effective and efficient in wastewater treatment. The key inspection criteria related to OWS are listed in Table 10.

**Table 10**
**Oil/Water Separator**

| Subject | Key Inspection Criteria |
|---|---|
| Performance | • Regularly inspect effluent from OWS for sheen, odor, clarity, floatables, and/or other abnormal observations |
| Operations | • Query tenant on OWS inspection, cleaning frequency, and waste disposal.<br>• Query tenant on major maintenance activities or routine parts replacement.<br>• Query tenant on employee training, particularly with OWS that requires valves or switches. |
| Permits | • Evaluate whether discharges to the sanitary sewer is authorized. |
| Document Review | • Review the permit for basic components, including expiration date, permit conditions, discharge limits, and general provisions contained in the permit.<br>• Verify that permit is renewed as necessary.<br>• Review the Operation and Maintenance Records. |

## 11. Emergency Spill Cleanup Plan

An Emergency Spill Cleanup Plan is developed in support of other BMPs, including those that are focused on maintenance and repair, fueling, washing, outdoor material storage and handling, outdoor container storage, and waste handling and disposal (see 2 to 7). Owners and operators of facilities, which store/process petroleum or petroleum-based products in certain quantities, may be subject to 40 CFR Part 112 and will need to develop and implement an SPCC plan (see 2 – *Oil Pollution Prevention*).

For tenants that store use oil in quantities under the threshold (not subject to SPCC regulations) and conduct operations with high potential of spilling any potentially hazardous substances, an Emergency Spill Cleanup Plan should be developed, which is tailored to the activities conducted by the tenants as a pollution prevention tool. The key inspection criteria related to an Emergency Spill Cleanup Plan are listed in Table 11.

**Table 11**
**Emergency Spill Cleanup Plan**

| Subject | Key Inspection Criteria |
|---|---|
| Program Evaluation | • Evaluate whether or not the tenant is subject to the SPCC program; if so, verify that they have submitted a copy of the current SPCC plan to Harbors.<br>• Evaluate whether or not the tenant conducts operations which would warrant an Emergency Spill Cleanup Plan, and make recommendations. |
| Document Review | • Review the existing plan for basic components, including facility description, site plan, notification procedures, cleanup instructions, cleanup materials, and responsible parties.<br>• Review spill response records, if there are any.<br>• Verify that contingencies (such as spill kits) identified in the plan are present and stocked.<br>• Verify that employees are trained in Emergency Spill Cleanup Plan components. |
| Training | • Query tenant on spill prevention and response training of employees.<br>• Query tenant's employee on emergency spill cleanup. |

## Section II - Environmental Asset Inventory

The environmental asset consists of natural environment and built environment. The natural environment encompasses all living and non-living things occurring naturally on Earth or some region thereof. It can be distinguished by components, including complete ecological units, which function as natural systems without massive human intervention, and universal natural resources and physical phenomena that lack clear-cut boundaries (such as air, water, and climate). The built environment comprises the areas and components that are strongly influenced by humans.

During tenant routine inspections, an inventory of environmental assets will be verified and updated. A tenant database has been developed and maintained, in which operations and equipment having environmental significance are assessed and documented. Key environmental asset categories include aboveground storage tanks, mobile storage tanks, underground storage tanks, hazardous material storage areas, spill kits, waste storage areas, paint booths, paint shops, vehicle wash areas, pre-treatment systems, and maintenance areas for vessels, equipment, and vehicles.

Tracking environmental assets allows for a comprehensive evaluation of operations at each harbor, and more effective communication with tenants regarding changes in applicable regulations or policies. Database queries generate reports containing environmental assets are used during routine inspections, illicit discharge investigations, enforcement actions, and lease (or revocable permit) termination proceedings. Therefore, verifying and updating electronic records of environment assets is an essential component.

# INSPECTION PROCEDURES

Inspection procedures are designed to maintain compliance with the applicable environmental regulations at Harbors.

## Step 1: Pre-inspection Preparation

Prior to conducting routine inspections, inspectors (Environmental Section personnel or their designees) shall collect and analyze available background information of the tenant to be inspected. Pre-inspection preparation begins by generating a tenant profile from the database (i.e. *Harbors_Tenants.mdb*), which lists all known environmental assets affiliated with the tenant as well as past inspection records. Prior to inspection, relevant property management files and layout maps, identifying leased areas, should be reviewed. In addition, other applicable files such as SPCC plans, SWPC plans, past enforcement actions, facility plans for improvement projects, and correspondence should be reviewed.

The key reviewing criteria include, but not limited to, the following:

- Compare facility diagrams with drainage maps for that area of the harbor to identify potential drainage pathways at and around the facility.
- Pay attention to changes that have occurred at the tenant's facility (either operations or the facility structures).
- Pay attention to changes in Harbors environmental policies since the previous inspection.
- Identify and review the BMPs that are applicable to the tenant's operations.
- Identify any special safety consideration and inspection scheduling limitations prior to contacting the tenant to arrange the inspection.

Upon finishing reviewing of background information, the inspectors should develop an inspection plan to highlight the key components of the inspection. The major purpose of the tenant inspection is to identify potential environmental concerns and provide outreach if necessary. In addition, the inspection also serves the purpose of acquiring specific information from the tenant (e.g., copies of permits, plans, and training records) and conveying specific information to the tenant in a direct fashion. The inspection plan should include following components at least:

1. <u>Objectives</u> - Define purpose of inspection and intended accomplishments.
2. <u>Tasks</u> - Identify specific tasks and information to be collected and/or reviewed.
3. <u>Procedures</u> - Identify any special procedure to be used.
4. <u>Resources</u> - Establish personnel and equipment needs.
5. <u>Schedule</u> - Given the inspection frequency, assess how much time will be needed.
6. <u>Coordination</u> - Determine whether this inspection warrants coordination with other Harbors personnel or regulatory agencies.

**Step 2: Entry**

Leases and revocable permits, issued by Harbors, provide inspectors the right to enter tenant's facility for the purpose of inspection. Even though advanced notification of tenants to-be-inspected is not required, it does give tenants enough time to gather necessary records, make sure at least one tenant representative available to accompany the inspector, and prepare them to discuss environmental concerns or questions. Unannounced inspections could provide a more accurate sense of day-to-day operations, and are generally utilized when inappropriate corrective actions warrant a higher level of enforcement. The tenant inspections usually serve the dual purpose of environmental outreach and compliance. Therefore, scheduling the inspection a few days in advance may foster a more productive working relationship with Harbors tenants.

Usually, the inspection begins by the inspector introducing themselves to reception and asking for the point of contact with the tenant. When more than one inspector on site (either from Harbors, a combination of Harbors and their designees, or a combination of Harbors and HDOH/EPA representatives), the inspectors should identify their respective roles in the inspection, as well as who will be leading the inspection for the team. This will ensure efficient communication between the tenant and the inspection team.

In the rare instance, when access to a tenant facility is denied, the inspector should notify Harbors Environmental Section supervisor and obtain a copy of the relevant lease agreement or revocable permit from Property Management Section, highlighting the *Inspection of Premises* section (contained within lease agreement) or *Entry by State* section (contained within revocable permit).

Lease language typically states:

"The LESSEE shall permit the LESSOR and its employees, representatives and agents, at all reasonable times during the said term of this lease, to enter the Premises for any governmental purpose, including, without limitation, examining the state of repair and condition."

Revocable permit language typically states:

"The STATE or its agents and employees may enter the Premises at all reasonable hours to inspect the Premises and determine if the PERMITTEE is complying with the terms and conditions of this Permit or for any other proper purpose. The PERMITTEE shall not make any claim for damages or set off of rent, service charge or other charges by reason or on account of such entry."

If the tenant exhibits hostile behavior, inspectors should request Harbor Police to provide escort during the inspection. At no time should an inspector feel compelled to conduct the inspection in an unsafe environment. Some tenant facilities may pose safety concerns and have specific safety protection requirements. Hence, the inspector should refrain from inspecting operational areas until a tenant representative could provide accompaniment.

**Step 3: Tenant Conference**

Depending on the size of the tenant's facility to-be-inspected, a tenant conference could be conducted onsite prior to the start and/or the end of the inspection if plausible. It may consist merely of the inspector describing the purpose and order of the inspection to the tenant representative. This will allow the tenant representative to locate additional documents or key personnel necessary to fulfill the objectives of the inspection. Pre-inspection preparation may have identified key areas and relevant issues. If so, the inspector should convey these concerns to the tenant representative to ensure that they are reviewed.

It is imperative that a tenant representative accompanies the inspector during the entire inspection to describe operations and answer questions, as well as address considerations related to safety, environment, and liability. Often the tenant representative will include other employees with specialized roles during specific portions of the inspection.

Records, such as monitoring results, waste disposal manifests, or SPCC documentation, may be reviewed before, during, or after the tenant inspection. Sometimes, a tenant inspection may result in one or more follow-up activities. Therefore, prior to the end of the inspection, it will be helpful to take a few minutes to review relevant records and recap any deficiency, violation, or concern, which may require follow-up by either the inspector or the tenant representative.

**Step 4: Inspection**

Conducting an effective inspection requires observing operations that have the potential to impact the environment, posing questions to the tenant as necessary to gain a clear picture of whether or not the operations are complying with relevant environmental regulations, and recording observations for future use.

The inspector should use the pre-inspection preparation to identify areas of concern requiring the most attention for each tenant, and communicate the inspection plan with the tenant representative. As each area is observed, the inspector should evaluate how operations conform to Harbors revised *Environmental Compliance, BMP, and P2 Inspection Checklist for Tenants* (Attachment 4) and note deficiencies observed. In addition, the inspector should provide an oral guidance to the tenants concerning possible environmental improvements that may suit their operations (e.g., storage techniques, product substitutions, labeling requirements, or proper housekeeping protocols).

The tenant inspection provides an opportunity for the inspector to convey information to the tenants in the context of their operation, as well as a time for the tenants to ask for guidance on particular environmental concerns. Sometimes, follow-up activities are necessary following the tenant inspection, for both the inspector and the tenant, which contribute to the goal of achieving environmental compliance in tenant operations.

**Step 5: Documentation and Recordkeeping**

Accurate inspection documentation and recordkeeping are critical to the success of Harbors environmental program. Photo documentation provides a simple and straightforward method to illustrate whether environmental compliance has been achieved and is essential in follow-up activities. If conducting mulTIMle inspections on one day, the inspection should begin the photo documentation with a picture of an overview of tenant facility or an area where the operator of the facility can be easily identified. The inspector should record photo numbers on Harbors revised *Environmental Compliance, BMP, and P2 Inspection Checklist for Tenants* (Attachment 4).

**Environmental Compliance, BMP, and P2 Inspection Checklist for Tenants**

Harbors revised *Environmental Compliance, BMP, and P2 Inspection Checklist for Tenants* is the primary recordkeeping tool utilized during the inspection (Attachment 4). Inspectors may find it helpful to fill out portions of the form in advance, such as the tenant contact information and notes within each relevant section on the environmental assets or issues of concern. Additionally, some information collected during the inspection may be helpful for other Harbors sections, such as Property Management Section, to update their database.

As reviewing listed sections (e.g., Stormwater, Maintenance and Repair, Fueling, Washing, etc.), the inspector should take time to complete each section with comments and observations. Each lined item should be checked whether the item is “Y” (for yes), “N” (for no), or “N/A” (for not applicable). Any item checked with “N” require at a minimum comments, explanation, and/or further investigation. A copy of the inspection report will be sent to the tenant upon completion. It will become a part of the permanent Harbors tenant file.

# Attachment 11

# New Tenant Information Package

# PROTECT
## OUR OCEAN WATER
MALAMA I KE KAI

We are all responsible to make sure that pollutants don't end up in our ocean. To prevent "Illicit Discharges" into the storm water drainage system, there are Good Housekeeping activities and/or **Best Management Practices** (BMPs) that must be incorporated into your operations.

**Sweep, Rake, Vacuum & Mop vs. Washing**
Do NOT hose off sidewalks, parking areas and garages. Sweep, Rake, Vacuum & Mop and properly dispose of debris.

**Use Non-Toxic Products**
Choose non-toxic products over toxic ones. If needed, use them sparingly and properly dispose of unused portions. Minimize quantities stored on site.

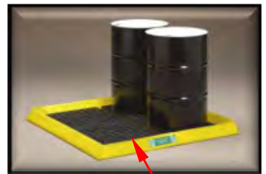
**NO Vehicle Washing**
Unless authorized in writing by DOT Harbors. When washing vehicles, use soap sparingly and divert water runoff to landscaping or the sanitary sewer. Wash water should be collected in a bucket and poured in a sink. Do not allow soapy water to go onto the ground or into storm drains.

**Reduce Use of Landscape Chemicals**
Minimize the use of lawn and garden products, pesticides, herbicides, fertilizers and other chemicals. Avoid over-irrigating.

In general, **BMP's** can be followed by incorporating the **4 C's**:

CONTAIN IT, CONTROL IT, CAPTURE IT & COMMUNICATE IT

**Contain It:** Isolate your work area to prevent any potential flow or discharge from leaving the area.



Spill Containment

Wash Containment

**Control It:** Locate the nearest storm drain(s) and take measures to prevent pollutants from entering or discharging into them.

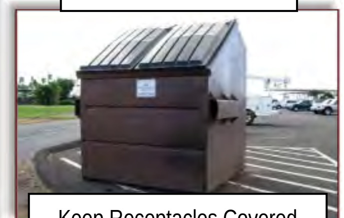
Stenciling


Protect Drains Properly

**Capture It:** Be prepared with clearly marked spill kits in appropriate areas to contain spills. Capture debris from rainwater runoff, cover trash, sweep, rake, vacuum and mop versus wash. Properly dispose of debris in trash receptacles.

Capture Oil


Be Prepared



Keep Receptacles Covered

**Communicate It:** Report illicit discharges, suspected discharges, and pollution concerns to Harbors Environmental at **(808) 587-1962** or to contacts listed in the **REPORT ILLICIT DISCHARGES** box. (BACK PAGE)

**Best Management Practices (BMPs)** for your industry can be found on the DOT Website:

http://hidot.hawaii.gov/harbors/library/storm-water-management/

**Select** Harbors Division **SCROLL DOWN** the webpage and find **BMP Flyers** under:

**Harbors Best Management Practices (BMP) Fliers**

- General BMPs

1. BMPs for Building and Remodeling
2. BMPs for Vehicle and Equipment Fueling
3. BMPs for Solid and Hazardous Waste Management
4. BMPs for Material Delivery and Handling
5. BMPs for Material Storage
6. BMPs for Vehicle Washing
7. BMPs for Vessel Maintenance Activities

- National Menu of Stormwater BMPs:
- EPA Construction BMPs:
- EPA Post-construction BMPs:

**SCROLL DOWN** further to find "**Spill Prevention Control & Counter Measures (SPCC)**".

**Spill Prevention Control and Counter Measures (SPCC)**

**Environmental Protection Agency's (EPA's) main website for SPCC guidance.**

- Tier 1 Qualified Facility SPCC Plan Template
  For facilities meeting the Tier I facility definition per 40 CFR 112.3(g)(1) and (2)of the SPCC rule. Contains SPCC Plan template in editable Microsoft Word format.
- SPCC Plan, Qualified Facilities Applicability
  Find out of your facility is subject to the SPCC Rule and if it meets the requirements of a Tier I or Tier II facility.

Addition information can be accessed from links at the bottom of the web-page.

Contact the **Department of Health Clean Water Branch** to see if your operation requires an **NPDES Permit.**

HARBORS DIVISION Aloha
Questions:
Call (808) 587-1962

## ENVIRONMENTAL COMPLIANCE IS REQUIRED IN YOUR REVOCABLE PERMIT OR LEASE

**ALL** tenants are **REQUIRED** to comply with **ALL** Local, State and Federal **ENVIRONMENTAL LAWS** applicable to the activities on the permitted or leased Premises during and/or after the expiration or termination of the Revocable Permit or Lease. Failure of tenant to comply with ANY Environmental Laws constitutes a breach of the agreement, which may result in **TERMINATION** of the Revocable Permit or Lease and **LEGAL REMEDIES**, including, but not limited to, remediating at tenant's sole cost. Questions Call: (808) 587-1944.

Non-Compliance could result in **CITATIONS** and **FINES** issued by the Hawaii State Department of Health **(DOH)** and/or the Environmental Protection Agency **(EPA).** Let's work together to keep our environment clean.

**REPORT ILLICIT DISCHARGES**

| | |
|---|---|
| Harbors Environmental: (M-F 8:00 AM to 4:30 PM) | (808) 587-1962 |
| Harbors Traffic Control (24/7): | (808) 587-2076 |
| U.S. Coast Guard: | (808) 842-2600 |
| Hawaii Department of Health, Clean Water Branch: | (808) 586-4309 |
| USEPA: | (808) 541-2721 |

HARBORS DIVISION
**PROTECT OUR OCEAN WATER**
MALAMA I KE KAI
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION

**Storm water pollution affects us all. Storm drains are not connected to the wastewater treatment plant** *(sewer system)*, **so everything flowing into the storm drain goes directly into our ocean UNTREATED!**

Storm water pollution comes from a variety of sources including:

- Oil, fuel, machinery fluids, etc.
- Litter, pesticides, fertilizers, etc.
- Construction materials, i.e., Cement, paints, solvents, cleaners, detergents, metal, insulation, wood, etc.
- Bacteria from human and animal waste.
- Wash water from sinks, laundry, showers, vehicle washing, etc.

For More Information Call:

(808) 587-1962

# Attachment 12

# VGP Requirement on Incidental Discharges from Vessels

The EPA's NPDES vessel program regulates incidental discharges from the normal operation of all non-recreational, non-military vessels of 79 feet or greater in length which discharge in waters of the United States through the Vessel General Permit [VGP]. In addition, the ballast water discharge provisions apply to any non-recreational vessel of less than 79 feet or commercial fishing vessels of any size. Military vessels or recreational vessels are regulated by other EPA programs under CWA Section 312.

The EPA has promulgated 2013 VGP (effective on December 19, 2013 and expiring at midnight December 19, 2018) and is still in the process of finalizing the Small Vessel General Permit (sVGP) to authorize discharges incidental to the normal discharges of commercial vessel operations. According to the VGP, vessels, greater than or equal to 300 gross tons or having the capacity to hold or discharge more than 8 cubic meters (2,113 gallons) of ballast water, must submit a signed and certified, complete and accurate Notice of Intent [NOI] to the EPA to obtain coverage, which permits discharges incidental to the normal operation of a vessel including, but not limited to:

- Deck washdown and runoff and above water line hull cleaning
- Bilgewater/Oily water separator effluent
- Ballast water
- Anti-fouling hull coatings/hull coating leachate
- Aqueous film forming foam [AFFF]
- Boiler or economizer blowdown
- Cathodic protection
- Chain locker effluent
- Controllable pitch propeller and thruster hydraulic fluid and other oil sea interfaces including lubrication discharges from paddle wheel propulsion, stern tubes, thruster bearings, stabilizers, rudder bearings, azimuth thrusters, and propulsion pod lubrication, and wire rope and mechanical equipment subject to immersion
- Distillation and reverse osmosis brine
- Elevator pit effluent
- Firemain systems
- Freshwater layup
- Gas turbine washwater
- Graywater
- Motor gasoline and compensating discharge
- Non-oily machinery wastewater
- Refrigeration and air condensate discharge
- Seawater cooling overboard discharge (including non-contact engine cooling water; hydraulic system cooling water, refrigeration cooling water)
- Seawater piping biofouling prevention
- Boat engine wet exhaust
- Sonar dome discharge
- Underwater ship husbandry

- Welldeck discharges
- Graywater mixed with sewage from vessels
- Exhaust gas scrubber wash water discharge
- Fish hold effluent

Note that if the vessel is less than 300 gross tons and has the capacity to carry less than 8 cubic meters of ballast water, but is larger than 79 feet, the owner of the vessel does not need to submit an NOI. However, the vessel must still comply with all applicable provisions of the VGP.

If the owner or operator of the vessel violates any of the limits in the VGP, s/he must conduct a corrective action assessment investigating the nature, cause, and potential options for eliminating the problems. Depending upon the extent of the problem, the VGP provides deadlines for resolving the issues. In addition, the owner or operator of the vessel must conduct routine visual inspections of all accessible areas of the vessel in order to verify that effluent limits are being met. On an annual basis, a more comprehensive inspection must be conducted. The findings of each routine visual inspection and annual inspection must be documented in the official ship logbook or as a component of other recordkeeping documentation.

As part of the reporting requirements, all vessel owners or operators subject to the VGP must submit an annual report to the EPA. Cruise ships and vessels with ballast water treatment systems must submit laboratory report(s) containing analytical data to the EPA and/or the USCG. If vessels have any instance of noncompliance, the owner or operator must report those instances of noncompliance to the EPA on an annual basis.

# Outfall Reconnaissance Inventory and Inspection Program

**FINAL**

**Stormwater Best Management Practices**
**Honolulu and Kalaeloa Barbers Point Harbors, Hawaii**

**Prepared for**
**Hawaii Department of Transportation**
**Harbors Division**

**Prepared by**

**Weston Solutions, Inc.**
**841 Bishop Street, Suite 2301**
**Honolulu, HI 96813**

**April 2014**

## Storm Water Best Management Practices
## Honolulu and Kalaeloa Barbers Point Harbors, Hawaii

I understand, agree to, and will conform to the information set forth in this Outfall Reconnaissance Inventory and Inspection Program. Conformance to these plans is required of all personnel conducting inspections.

| Name | Signature | Date |
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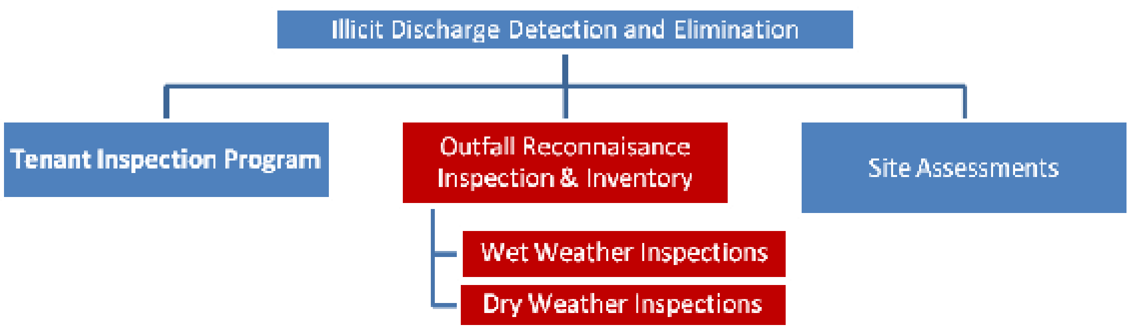
# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACR | Annual Compliance Report |
| amsl | Above Mean Sea Level |
| BMP | Best Management Practice |
| CAC | Common Access Card |
| CB | Citizens' Band |
| DHS | U.S. Department of Homeland Security |
| DOT – Harbors | Hawaii Department of Transportation – Harbors Division |
| HASP | Health and Safety Plan |
| HDOH | Hawaii Department of Health |
| IDDE | Illicit Discharge Detection and Elimination |
| NIOSH | National Institute for Occupational Safety and Health |
| ORIIP | Outfall Reconnaissance Inventory and Inspection Program |
| OSHA | Occupational Safety and Health Administration |
| PPE | Personal Protective Equipment |
| SSHSP | Site Specific Health and Safety Plan |
| TWIC | Transportation Worker Identification Card |
| WESTON | Weston Solutions, Inc. |

## . INTRODUCTION

The Outfall Reconnaissance Inventory and Inspection Program (ORIIP) is an element of the Harbors Illicit Discharge Detection and Elimination (IDDE) Program. This program includes maintaining an outfall inventory and conducting dry and wet weather inspections at Harbors' storm water discharge points. The original ORIIP was designed to fix the geospatial location and record basic physical characteristics of individual storm drain outfalls and evaluate outfalls for illicit discharges. This ORIIP is an evolution of the original ORIIP program and includes dry and wet weather inspections as well as source tracking and elimination of potential illicit discharges. The results of inspections conducted as part of this program will be used to eliminate polluted discharges and will be used to help guide future outfall monitoring and pollution prevention efforts. Figure 1-1 shows the IDDE Program structure and highlights the ORRIP.

**Figure 1-1 IDDE Structure Chart**




This ORIIP establishes a framework for completing outfall and sheet flow inspections in the Honolulu and Kalaeloa Barbers Point Harbors, located on the island of Oahu, Hawaii. It includes wet and dry weather inspection procedures, training and equipment needs for field personnel, illicit discharge[1] detection and notification guidelines, documentation and tracking procedures, the relationship to the enforcement response plan, and other stormwater management related information.

## 1.1 APPLICABILITY

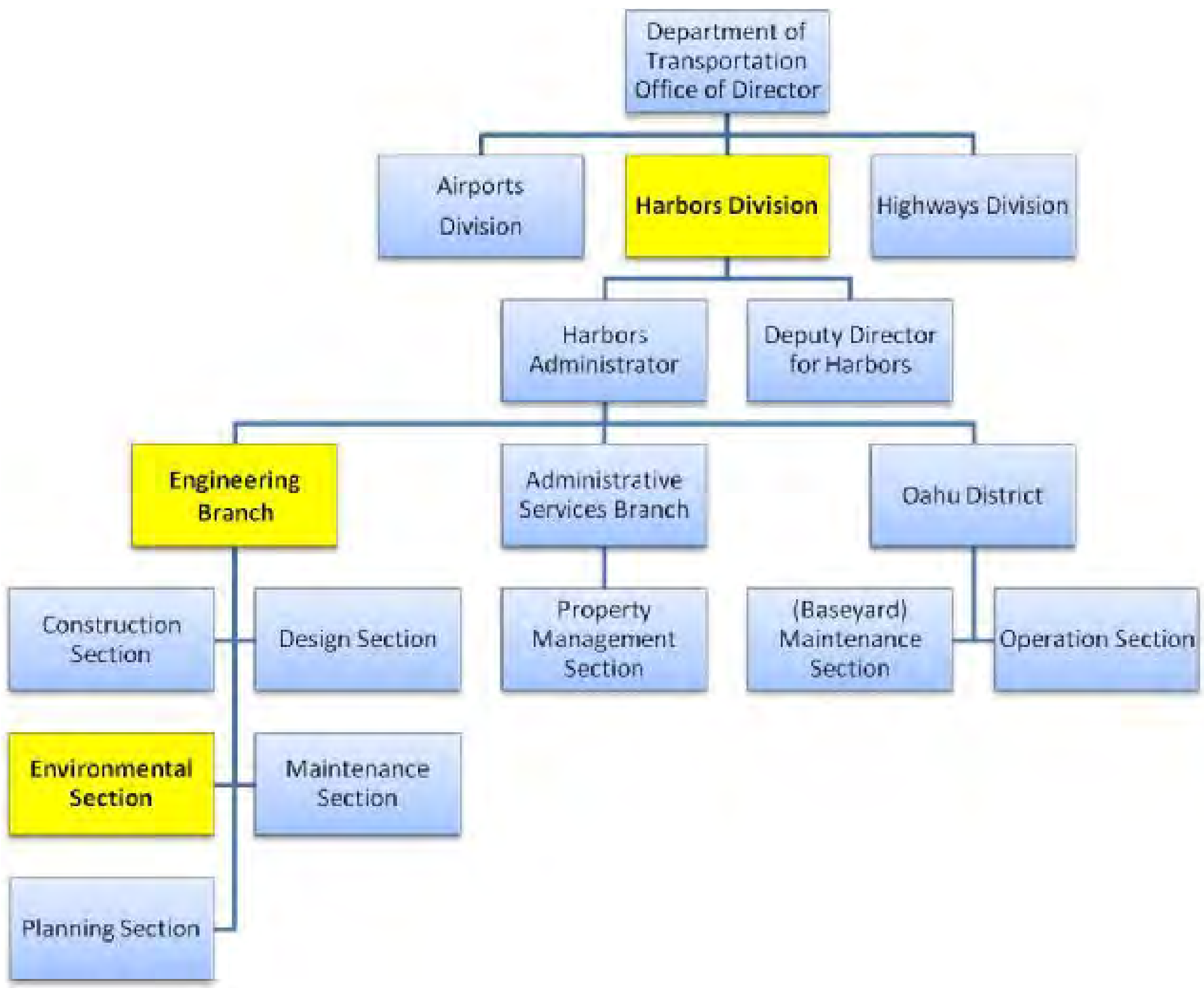
The ORIIP is implemented at Honolulu and Kalaeloa Barbers Point Harbors as well as the adjacent Harbors' properties associated with the Harbors' National Pollutant Discharge Elimination System (NPDES) regulated storm drain system. All outfalls are located at Honolulu

[1] Illicit Discharge shall mean any discharge to a municipal separate storm sewer that is not composed entirely of storm water except discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and discharges resulting from firefighting activities. 40 C.F.R. § 122.26(b)(2).

Harbor and Kalaeloa Barbers Point Harbor, Hawaii or adjacent areas. Maps of the Harbors' Honolulu and Kalaeloa Barbers Point NPDES regulated storm drain systems are provided in Figures 1 and 2, respectively. A list of all the outfalls, current characterization, pictures, and construction details are provided as Appendix C.

The ORIIP is to be implemented under the direction of the Harbors Environmental Section. The following organizational chart highlights the groups involved with the ORIIP.

ORGANIZATIONAL CHART FOR ORIIP IMPLEMENTATION



## . OUTFALL INVENTORY

As part of the ORIIP, Harbors maintains a complete inventory of all storm water outfalls at the Honolulu and Kalaeloa Barbers Point Harbors. The database is maintained by Harbors Environmental Section and includes the following information associated with each outfall: type of material, size, condition, and date of installation (if known).

The database is updated annually by the Harbors Environmental Section if changes are required. The inventory and database is used to support cleaning schedules for the Oahu District drain cleaning program. Details of the drain cleaning program are further detailed in the Operations and Maintenance Program Manual.

The data collected during wet and dry weather inspections help to create a more complete picture of the potential illicit discharges that exist with an existing stormwater system. The data will allow stormwater personnel to focus on problem areas and improve stormwater management efforts. Prioritized inspection areas will be developed on an annual basis to take into account previous annual outfall inspections, tenant activities, construction, and the likelihood that illicit discharges will be present. This will allow for field personnel to complete manageable areas of the Harbors. The prioritized inspection areas will be reported in the Annual Compliance Report.

The ORIIP Form is attached to this document as Appendix B. Section 4 and 5 of the ORIIP form present potential indicators of illicit discharges and Section 6 identifies the outfall characterization based on those indicators. A characterization of “Potential” is selected with the presence of two or more indicators. A characterization of “Suspect” is selected with one or more indicators with a severity of 3. An “Obvious” characterization is selected when an illicit discharge is determined to exist.

A database of tenants with contact information is maintained by Harbors Environmental Section. Some tenants may require notice prior to inspections (in certain locations to coordinate safely with site activities). ORIIP personnel shall familiarize themselves with the tenants’ notification requirements to ensure field schedules are maintained.

## . ORIIP INSPECTIONS

The following section provides procedures and reference information planning, scheduling and safely performing dry and wet weather outfall inspections at the applicable Harbors. Harbors Environmental Section will conduct dry and wet weather observations of outfalls, as described below. A flowchart presenting the ORIIP process is attached as Appendix E.

### 3.1 PREPARATORY PROCEDURES

The following procedure is to be followed for gaining access for dry weather inspections at Honolulu and Kalaeloa Barbers Point Harbor. Harbors Environmental Section will schedule the outfall inspection based on the environmental conditions required. Harbors Environmental Section will confirm that all field personnel have access to the Harbor, and have applied and been approved for a Transportation Worker Identification Credential (TWIC) card or a Common Access Card (CAC). Access to these restricted areas is enforced by Department of Transportation (DOT) Harbors, Department of Homeland Security, and the United States Coast Guard. Field personnel should have documentation and identification available upon request while in these restricted areas. It is common for the Coast Guard to approach personnel and ask questions about field activities. Large commercial shipping vessels and tug boat operators often notify the Harbors Traffic Control about ORIIP personnel's presence in the harbor.

Harbors Environmental Section will verify that there are no conflicts with the various commercial fueling activities in the harbor. They will also notify the Harbors Traffic Control of when the ORIIP activities will be implemented.

#### 3.1.1 PREPARING FIELD EQUIPMENT

The challenges presented by the tidal fluctuation can complicate inspection scheduling and add another dimension to jobsite safety. For this reason, field personnel need to ensure that all of the equipment that will be used during ORIIP activities has been inspected for defects and is in full working order prior to field work. The following sections describe the equipment and resources required to complete the ORIIP.

#### 3.1.2 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) is essential for the safe completion of ORIIP. Appendix D attached to this ORIIP contains the equipment required to safely complete field activities. Field personnel shall familiarize themselves with the proper operation and maintenance of all equipment needed to complete the ORIIP.

#### 3.1.3 INSPECTION EQUIPMENT

Field activities will require a variety of equipment. Wet and dry weather require different equipment and different levels of effort. Appendix A attached to this ORIIP contains the equipment required to complete field activities.

## 3.2 FIELD LOGISTICS

This section describes the procedures that field personnel should observe during field activities. All inspections should follow these procedures. Unexpected situations may arise in the harbor due to weather, other vessel movements, etc. that require deviations from procedures. In such cases, the Site Manager will assess the situation and use discretion with safety of all field personnel in mind. Communication should be maintained between crew members and the Harbors Traffic Control (during activities in Harbor waters).

### 3.2.1 PERSONNEL

All operations and personnel having the potential for exposure to site hazards are subject to the requirements of this ORIIP and the Site Specific Health and Safety Plan (SSHSP). The Site Manager will be identified prior to mobilization and will be the highest ranking personnel in the field. The Site Manager will serve as the Site Safety Officer (SSO) for the activities and will be responsible for implementation of the ORIIP Plan and oversight of the field personnel. The Site Manager will be selected by Harbors Environmental Section prior to mobilization.

The Site Manager working under the task is responsible for the following:

1) Providing field personnel with appropriate training, medical certification, and ensuring that personnel have read, understand, and will comply with this ORIIP;
2) Providing equipment that is safe for operations and free from any obvious hazards;
3) Providing and documenting inspections of equipment and tasks, as necessary, to comply with applicable regulations;
4) Providing documentation that field personnel have appropriate training and medical certification and ensuring that personnel have read, understand, and will comply with this ORIIP;
5) Overseeing field personnel with respect to ensuring a safe work environment and that work practices are consistent with the provisions of this ORIIP, the Occupational Safety and Health Administration (OSHA), and standard industry practices; and
6) Conducting an initial project briefing and daily “tailgate” safety meetings.

Personnel will pre-notify impacted parties, mobilize the required equipment, and conduct the inspections. ORIIP personnel will need to coordinate the loading and transportation of the kayak and other gear to one of the boat launch locations.

Inspections performed from the water must be supported by an on-shore crew. All movements through the harbor waters will be coordinated with the Harbors Traffic Control. Communication between the kayak and off-shore crews shall be maintained whenever possible to ensure the safety of all personnel. Kayak personnel will inspect each outfall and complete the ORIIP Form for each location, as described by Section 3.3. As described in more detail in Section 3.3.2, and the Enforcement Response Plan, upstream nodes will be observed by the on-shore crew when an illicit discharge is suspected and personnel will use their best efforts to identify the source and contact the responsible party and/or the appropriate regulatory agencies. Harbors Environmental Section will follow up where necessary, as described by the Enforcement Response Plan.

### 3.2.2 HARBORS TRAFFIC CONTROL COMMUNICATION

The ORIIP Site Manager shall coordinate with DOT Harbors District Office to notify the Harbors Traffic Control prior to inspections and any movement in the Harbor waters. Citizens' Band (CB) radios are used by field personnel to communicate with the Harbors Traffic Control (Channel 12). Specific vernacular are used during these communications. ORIIP personnel will notify the Harbors Traffic Control of their plans to change location and to request a no wake zone. Wakes can be a danger to inspection personnel.

Typical communications about a change of location in the harbors are as follows:

**ORIIP personnel:** *"Aloha Tower, this is Harbors Engineering."*
**Harbors Traffic Control:** *"Harbors Engineering, this is Aloha Tower."*
**ORIIP personnel:** *"Aloha Tower, Harbors Engineering would like to request to move from current location (e.g., Pier #51) to future location (e.g., Pier #38).*
**Harbors Traffic Control:** *Their response varies depending on other vessels' movements (i.e., "Okay, Harbors Engineering, proceed to Pier #38).*

### 3.2.3 MOBILIZATION

Mobilizing the equipment to the various sites around the harbor will require personnel with a working knowledge of pier locations and restricted area locations. Personnel will have TWIC or CAC cards available and all required PPE and equipment. Dry weather inspections will require a much higher level of effort.

Boat launch locations for Honolulu Harbor are located at Piers 5, 23, 36, and at the Sand Island launch ramp adjacent to the Hawaiian Marine Educational and Training Center. Honolulu Harbor locations are located near Revetments P05-01, P23-03, and P36-01 (see Figure 1 for details). If necessary, Kalaeloa boat launch locations are located at the Kalaeloa Barbers Point Harbor Revetments BP-01 and BP-24 (see Figure 2 for details).

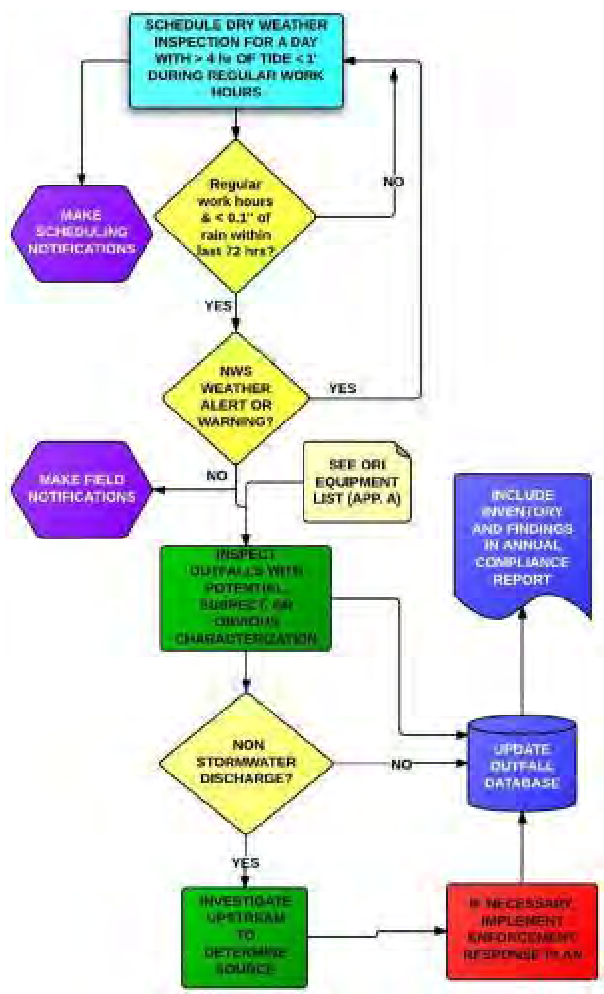
### 3.3 DRY WEATHER OUTFALL INSPECTIONS

Dry weather inspections are conducted for illicit discharge detection and assessment of the outfall structures. For the ORIIP, dry weather is considered when there is less than 0.1" of rain during a 72 hour period preceding an inspection. Dry weather inspections are to be conducted annually on outfalls with an overall outfall characterization of potential, suspect or obvious as determined by the previous year's inspection findings. All outfalls (including those with an overall outfall characterization of unlikely, see section 6 of the ORIIP form in Appendix B) are to be inspected every 2 years.

Dry weather inspections should coincide with low-tide conditions to increase probability that the outfall will be exposed. Field events should be scheduled such that field personnel can safely enter areas beneath the piers, inspect outfall conditions, and exit said areas during tidal periods corresponding to water levels

below 1-foot above mean lower low water (mllw). Areas that have been determined to be too dangerous to enter have been identified on the maps provided in Figures 1 and 2. Observations of these outfalls must be conducted at an upstream node or in way that does not require personnel to enter beneath the pier. At no time, regardless of tidal conditions, will personnel be allowed to enter under the pier in these areas.

In addition to the identified areas, water levels higher than 1-foot mllw are considered too dangerous for personnel to be under any piers. Schedules should indicate time frames where inspections of outfalls beneath the piers can take place and field crews should plan accordingly to efficiently complete the ORIIP. Equipment should be inspected prior to field activities to maximize operations during extreme low tide.




Inspections cannot be scheduled in areas where vessels are being actively fueled. DOT Harbors District Office needs to be contacted once a draft schedule has been produced (based on tidal considerations), so fueling schedules can be reconciled with ORIIP activities.

Inspections should all be accomplished during daylight hours. Other harbor activity can affect the schedule, including loading and unloading of cargo ships, storms, high surf, etc. These and other factors all need to be considered during the scheduling production.

Field personnel need to be able to recognize scheduling conditions that could pose a safety threat during inspections. ORIIP activities should be postponed if any situation arises that poses an unacceptable safety threat to field personnel (e.g., tsunami warning, hurricane warning, etc.). Field personnel should make real time decisions about the conditions in the water, to ensure timely, but safe inspections. The Harbors Environmental Section will be responsible for postponing and rescheduling any ORIIP inspection.

Outfall inspections are conducted using the ORIIP Form, attached as Appendix B. The form has seven sections that cover both wet and dry inspection scenarios. Field personnel will use the form to describe flow conditions using physical factors like odor, turbidity, color, and the presence of floatables or sheen in order to recognize illicit discharges. Information required to complete the ORIIP Form includes background data, outfall description, quantitative flow characterization, and physical indicators of flowing and non-flowing outfalls. The current list of outfalls is attached as Appendix C.

### 3.3.1 OBSERVATION OF FLOWS

Potential problems are indicated by outfalls that are flowing in dry weather and/or foul odors or discolored water in or around the outfall pipe. Common illicit discharges observed during dry weather include discharges of wash water, process water, sewage, contaminated condensate runoff, or other forms of waste. Not all non-stormwater discharges are illicit. For example, non-contaminated landscape irrigation runoff or air conditioner condensate discharges are allowable non-stormwater discharges. As described below, any dry weather discharge should be documented.

When flows are observed, ORIIP personnel will attempt to first determine the source of the flow, while considering groundwater or tidal influence. Field crews will photograph and/or video the discharge, estimate the flow volume, and, if necessary, collect a sample. Field crews will document the source after conducting a quick visual inspection of the surrounding area. If the source cannot be easily observed, field crews should follow the procedure described in Section 3.3.2. If further investigation is needed, Harbors Environmental Section will follow up, identify the source and contact the responsible party and the appropriate regulatory agencies where necessary, as described by the Enforcement Response Plan.

### 3.3.2 SOURCE IDENTIFICATION

This section outlines the basic tools to be used to trace the source of a suspected illicit discharge. Source tracing begins when an unknown dry weather flow is identified through the ORIIP, field assessment/testing, or a complaint call. When the source of the non-stormwater discharge is not known, one of two primary methods will be used to locate the source of an illicit discharge: Method A – Drainage Area Investigations or Method B – Storm Drain Network Investigations. The method used will depend on the type of information collected or reported, level of understanding of the drainage network, and existing knowledge of operations and activities on the surrounding properties.

<u>Method A – Drainage Area Investigations</u>
The source of some illegal discharges can be determined through a survey or analysis of the drainage area of the problem outfall. Drainage area investigations are particularly useful when the discharge observed at the outfall has a distinct or unique characteristic that can allow field crews to quickly determine the type of activity or non-point source that is generating the discharge. One-time illegal discharges (such as a surface spill or intentional dumping into the storm drain system) are usually best investigated using Method A, given the short-term nature of the discharge.

Drainage area investigations should begin with a discussion between the field crews, inspectors, engineers, and other knowledgeable staff to identify the type of site most likely to produce the observed discharge. The following table shows some of the activities or land uses most likely associated with specific discharge problems.

| **COMMON DISCHARGES AND POTENTIAL SOURCES** | **OBSERVED DISCHARGE POTENTIAL CAUSES** |
|---|---|
| Sediment | Construction activity without proper erosion and sediment controls<br>Outdoor work areas or material storage areas |
| Oil | Fueling operations<br>Vehicle or machinery maintenance activities |
| Sudsy discharge | Power washing of buildings<br>Vehicle or equipment washing operations<br>Mobile cleaning crew dumping<br>Laundry or Cleaner greywater discharge |
| Grease | Restaurant sink drain connection to stormwater system |
| Sewage | Failing or leaking septic systems |

Staff will make a list of likely discharge sources and then field crews will conduct a windshield survey of the drainage area to confirm and identify potential sources of the discharge. Once potential discharge sites are identified, staff will conduct individual site inspections to locate the specific source of the illegal discharge. In some cases, dye testing may be needed to confirm that a suspected activity is actually draining into the storm drain network. All drainage area investigations will be documented on the ORIIP Form in Appendix B.

<u>Method B – Storm Drain Network Investigations</u>
The source of some illicit connections or discharges can be located by systematically isolating the area from which the polluted discharge originates. This method involves progressive investigation at manholes in the storm drain network to narrow down the location where the illegal discharge is entering the drainage system. Field crews should work progressively upstream from the outfall and inspect manholes until indicators reveal the discharge is no longer present. Manhole observations can be time consuming, but they are generally a necessary step before conducting other tests.

Storm drain network investigations include the following steps: 1. Consult the drainage system map and identify the major branches. If the drainage map is incomplete, sketches of the system shall be made and the system shall be identified for adding to DOT Harbor’s drainage system map. 2. Starting from the outfall, observe the next upstream manhole or junction to see if there is evidence of polluted discharge. As with the ORIIP inspections, field crews are looking for the presence of flow during dry weather, foul odors, colors or stained deposits, oily sheen, floatable materials, and/or other unusual observations. 3. Repeat observations at each upstream manhole or junction until a junction is found with no evidence of discharge; the discharge source is likely located between the junction with no evidence of discharge and the next downstream junction. 4. Work downstream from the "clean" manhole or junction to isolate the location where the polluted discharge is entering the storm drain system. 5. Document all findings.

If the flow is illicit and originates within the Harbors property DOT Harbors shall ensure the connection is disconnected or flow from the source is identified. If the flow originates outside of DOT Harbors' or DOT's property, DOT Harbors will inform the adjoining jurisdiction or property owner in writing that the flow is entering DOT Harbors small Municipal Separate Storm Sewer System (MS4) and copy the Hawaii Department of Health (HDOH).

When visual inspections are not enough to isolate the source of the illegal discharge, a number of additional field tests can be performed. These include: Dye testing, Video Testing/Camera-ing/TVing, smoke testing. When a dry weather flow is observed and the source of the flow is not determined via Method A or B above, DOT Harbors will pursue alternative methods necessary to identify the source of the dry weather flow within 90 days.

Forms and information will be included in the Annual Compliance Report as well as reviewed prior to the following ORIIP event. Any illicit discharges which are determined to be coming from a tenant or construction site will initiate a re-evaluation of the tenant or construction site in accordance with the Tenant Inspection Manual or the Construction Site Runoff Control Program.

## 3.4 WET WEATHER OUTFALL INSPECTIONS

The goal for wet weather inspections is to assess HDOT Harbors' Best Management Practice (BMP) performance. Wet weather inspections are only conducted during regular business hours when rainfall greater than 0.1" per hour is recorded. Personnel must field verify that adequate precipitation has occurred to initiate sufficient flow through the drainage system to make useful observations.

The weather station located at Honolulu International Airport (Station ID 91182, PHNL) as reported by the National Oceanic and Atmospheric Administration (NOAA) is in proximity of Honolulu Harbor but could potentially not be representative of the actual rainfall. Field observations must be conducted to support PHNL rainfall data.

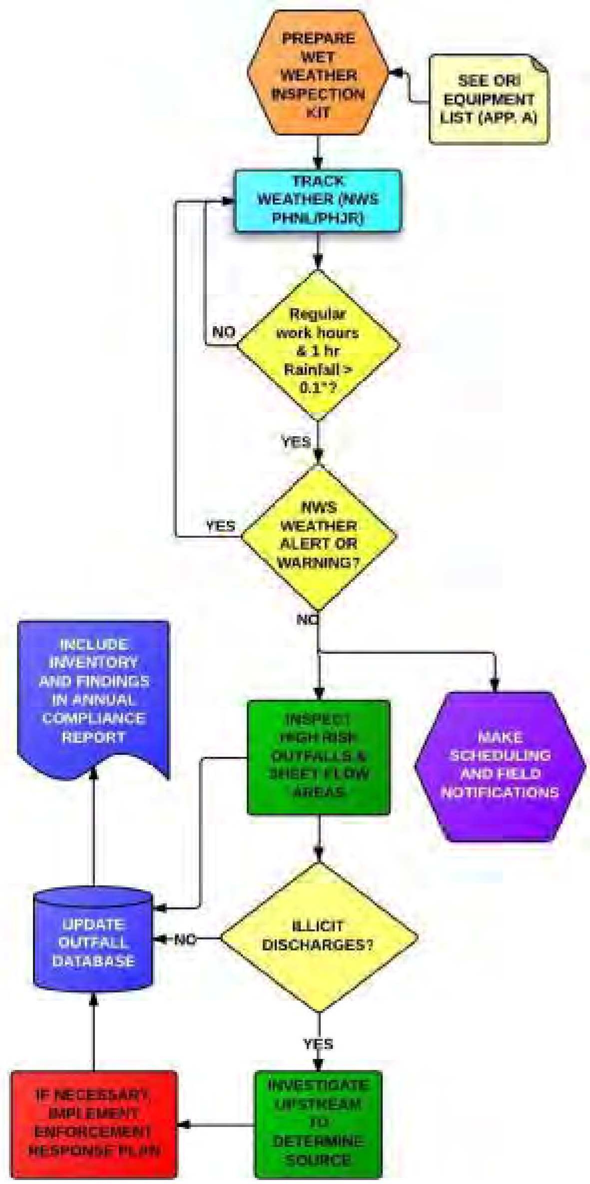
The weather station located at Kalaeloa Airport (PHJR) as reported by NOAA is in proximity of Kalaeloa Barbers Point Harbor but could potentially not be representative of the actual rainfall. Field observations must be conducted to support PHJR rainfall data.

Harbors Environmental Section will conduct wet weather ORIIP inspections of the identified high risk outfalls each year, provided appropriate wet weather events occur during regular business hours. High risk outfalls are those associated with drainage from high risk tenants or those that drain from areas under construction.

Wet weather inspections must be completed from the pier side. Due to high hazard safety conditions under the piers, no personnel shall attempt to conduct under pier inspections during wet weather. These inspections need to be completed during rain events, so scheduling the event ahead of time is not practical. Inspection personnel need to be flexible based on weather conditions.

Inspections will not be conducted at night, on weekends, or on holidays. Wet weather inspections will not be conducted during emergency situations such as hurricanes, tsunamis, or during severe storm conditions that may cause risk to field personnel.

During a rain event, field personnel will notify impacted parties, mobilize required equipment, and conduct a wet weather inspection using the ORIIP Form (Appendix B). If criteria such as rainfall intensity, duration, and occurrence during regular work hours are met, Harbors Environmental Section will conduct wet weather inspections at the identified high risk outfalls each year.




Wet weather observation of sheet flows over the pier edge and from undeveloped areas will also be conducted. Field personnel will be standing on the pier or nearest landside location. Upstream nodes will be observed if necessary. The annual wet weather inspection shall include visual inspection of color, odor, clarity, solids, foam, oil sheen and other signs of non-stormwater discharges. Photo and/or video documentation shall be collected for each outfall. If an illicit discharge is observed, investigative techniques detailed in Section 3.3.2 will be used to track down and eliminate the source.

## . ENFORCEMENT

Enforcement will be conducted upon discovery of an illicit discharge and will follow different paths depending on the source of the discharge.

### 4.1 TENANTS

Tenant enforcement will follow the procedures and guidelines as detailed in the Harbors Tenant Inspection Manual. Per the manual, if enforcement procedures do not result in timely corrective actions, the staff will follow procedures described in the Enforcement Response Plan.

### 4.2 NON-TENANT INCLUDING OUTSIDE AGENCY

If there is an illicit discharge from public or other non-tenant/non-construction/non-agency entity, the inspector will attempt to find out if the person or source is associated with a group maintaining any type of contract with Harbors. If they have no contractual affiliation with Harbors, the staff will follow procedures described in the Enforcement Response Plan.

### 4.3 CONSTRUCTION SITE

If the source of an illicit discharge is a construction site, Harbors will respond as detailed in the Construction Site Runoff Control Program and the Enforcement Response Plan.

### 4.4 OPERATIONS AND MAINTENANCE

If an illicit discharge is observed due to accumulated sediment, trash or other pollutant related to drainage system cleaning, response will be conducted as detailed in the Oahu District Operations and Maintenance Plan.

## . TRAINING

Inspector training is designed to provide that all personnel responsible for conducting outfall inspections are aware of the process and safety precautions required during the inspections. The training starts with a pre-mobilization meeting where photos, documents, and schedules are reviewed and all field personnel have the opportunity to ask questions about this ORIIP and the SSHSP. The pre-mobilization meeting will include 1) procedures to be used when observing outfalls; 2) procedures to be used to track non-stormwater discharges to their source; and 3) DOT Harbors' illicit discharge definition.

### 5.1 ON THE JOB TRAINING

In addition to attending the pre-mobilization meeting, new inspectors will gain inspection experience by spending at least one work day on the job conducting outfall inspections with experienced inspectors. During the inspection, the new inspectors will observe how the experienced inspectors conduct outfall inspections as well as conduct their own inspections with assistance from the experienced personnel. New inspectors will continue to have frequent interactions with the experienced inspectors to discuss inspection issues as they arise.

### 5.2 DOCUMENTATION

Attendance at the pre-mobilization meeting will be documented using the signature pages at the front of this document and the SSHSP. On the job training will be documented using the ORIIP form (in Appendix B) during the outfall inspections by listing both the experienced mentor and the trainee in the "Investigators" section of the form.

## . HEALTH AND SAFETY

The safety of ORIIP personnel is of the highest priority. All personnel performing field work related to the ORIIP shall familiarize themselves with the SSHSP. All project activities shall be performed in accordance to the SSHSP, applicable local policies and procedures, and OSHA regulations. Unforeseeable site conditions or changes in the scope of work may warrant a reassessment of protection levels and controls stated.

The SSHSP has been attached to this document as Appendix D.

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**Figure 1 – Honolulu Harbor**

**Figure 2 – Kalaeloa Barbers Point Harbor**

# ORIIP APPENDIX A

# ORIIP EQUIPMENT LIST

# Checklist for ORI inspection

| Item | Quantity | Notes |
|---|---|---|
| Tablet PC[1] | 1 | Power cord<br>Car Adapter<br>Make sure batteries are fully charged before use |
| Camera[1] | 2 | Make sure batteries are fully charged before use |
| GPS unit[1] | 1 | |
| Video Camera[1] | 2 | Gopros for post inspection review |
| Kayak | 1 | |
| Flow measurement devices[2] | 1 | Include a graduated cylinder, a tape measure, ping pong balls and a watch |
| Temperature gauge | 1 | Use the weather station |
| Metal clipboard | 1 | |
| Rope | 1 | 100' for rescue operations |
| Personal Floatation Devices | 2 | Personnel in kayak |
| CB Radio[1] | 1 | For communication with tower |
| 2 way radio | 2 | For communication shore to kayak |
| Rigid Pipe[1] | 1 | Open manhole covers |
| Wrecking bar[1] | 1 | |
| Hammer[1] | 1 | |
| Air Horn | 1 | Store on person in kayak |
| Muti-Gas Meter | 1 | Confined Space Entry check near fueling ops |
| Sunscreen | 2 | |
| Gloves[1] | 2 | |
| Field notebook[1] | 1 | |
| Rain gauge[1] | 1 | |
| Outfall location maps[1] | 1 | |
| ORI binder[1] | 1 | Content:<br>a) ORI Plan<br>b) Table of outfalls inspected previous year<br>c) Summary of dry weather flows previous year<br>d) Summary of previous year ORI results<br>e) Pictures of outfalls inspected in previous year<br>f) ORI field sheets<br>g) Copy of float plan<br>h) Health and Safety Plan<br>i) Boat inspection form<br>j) Confined space entry form |

[1] Items needed for wet weather inspection.
[2] To calculate the flowrate, dimensions of the outfall with a flow should be measured.

# ORIIP APPENDIX B

## ORIIP FORM

# OUTFALL RECONNAISSANCE INVENTORY FORM

## Section 1: Background Data

| | | | |
|---|---|---|---|
| Outfall ID: | | Today's date / Time (Military): | |
| Investigators: | | | |
| Temperature (°F): | Rainfall (in.): Last 24 hours: ______ Last 72 hours: ______ | | |
| Latitutde: | Longitude: | GPS Unit: | GPS Landmark: |
| Camera: | | Photo #s: | |
| Land Use in Drainage Area (Check all that apply):<br>☐ Industrial<br>☐ Commercial<br>Other: ______ | | Known Industries: ______ | |

## Section 2: Outfall Description

| LOCATION | MATERIAL | | SHAPE | | DIMENSIONS (IN.) | SUBMERGED |
|---|---|---|---|---|---|---|
| ☐ **Closed Pipe** | ☐ RCP<br>☐ PVC<br>☐ Steel<br>☐ Other: ______ | ☐ CMP<br>☐ HDPE | ☐ Circular<br>☐ Eliptical<br>☐ Box<br>☐ Other: ______ | ☐ Single<br>☐ Double<br>☐ Triple<br>☐ Other: ______ | Diameter/Dimensions:<br>______ | In Water:<br>☐ No<br>☐ Partially<br>☐ Fully<br>With Sediment:<br>☐ No<br>☐ Partially<br>☐ Fully |
| ☐ **Open drainage** | ☐ Concrete<br>☐ Earthen<br>☐ rip-rap<br>☐ Other: ______ | | ☐ Trapezoid<br>☐ Parabolic<br>☐ Other: ______ | | Depth: ______<br>Top Width: ______<br>Bottom Width: ______ | |
| ☐ **In-Stream** | **(applicable when collecting samples)** | | | | | |
| **Flow Present?** | ☐ Yes ☐ No ***If No, Skip to Section 5*** | | | | | |
| **Flow Description (If present)** | Constant: ☐ Trickle ☐ Moderate ☐ Substantial<br>Tidal: ☐ Trickle ☐ Moderate ☐ Substantial | | | | | |

## Section 3: Quantitative Characterization

| FIELD DATA FOR FLOWING OUTFALLS | | | | |
|---|---|---|---|---|
| **PARAMETER** | | **RESULT** | **UNIT** | **EQUIPMENT** |
| ☐Flow #1 | Volume | | | |
| | Time to fill | | | |
| ☐Flow #2 | Flow depth | | In | |
| | Flow width | 0' " | Ft, In | |
| | Measured length | 0' " | Ft, In | |
| | Time of travel | | Sec | |

# Outfall Reconnaissance Inventory Form

**Section 4: Physical Indicators for Flowing Outfalls Only**
Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No *(If No, Skip to Section 5)*

| INDICATOR | CHECK if Present | DESCRIPTION | RELATIVE SEVERITY INDEX (1-3) | | |
|---|---|---|---|---|---|
| Odor | ☐ | ☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other: | ☐ 1 – Faint | ☐ 2 – Easily detected | ☐ 3 – Noticeable from a distance |
| Color | ☐ | ☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other: | ☐ 1 – Faint colors in sample bottle | ☐ 2 – Clearly visible in sample bottle | ☐ 3 – Clearly visible in outfall flow |
| Turbidity | ☐ | See severity | ☐ 1 – Slight cloudiness | ☐ 2 – Cloudy | ☐ 3 – Opaque |
| Floatables -Does Not Include Trash!! | ☐ | ☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other: | ☐ 1 – Few/slight; origin not obvious | ☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen) | ☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials) |
| Upstream Investigation | ☐ | Description of discharge source: | | | ☐ Illicit Discharge (Trigger to Obvious) |
| Other Observations | | | | | |

**Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls**
Are physical indicators that are not related to flow present? ☐ Yes ☐ No *(If No, Skip to Section 6)*

| INDICATOR | CHECK if Present | DESCRIPTION | COMMENTS |
|---|---|---|---|
| Outfall Damage | ☐ | ☐ Spalling, Cracking or Chipping ☐ Peeling Paint ☐ Corrosion | |
| Deposits/Stains | ☐ | ☐ Oily ☐ Flow Line ☐ Paint ☐ Sediment ☐ Trash ☐ Other: | |
| Abnormal Vegetation | ☐ | ☐ Excessive ☐ Inhibited | |
| Poor pool quality | ☐ | ☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive Algae ☐ Other: | |
| Pipe benthic growth | ☐ | ☐ Brown ☐ Orange ☐ Green ☐ Other: | |
| Other Observations | | | |

**Section 6: Overall Outfall Characterization**

☐ Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

**Section 7: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?**

# ORIIP APPENDIX C

# OUTFALL INVENTORY

| IDENT | LAT | LONG_ | Characterization |
|---|---|---|---|
| 18" Outfall | 21.30298080790 | -157.86416931700 | Unlikely |
| 24" Outfall | 21.30271146810 | -157.86440754500 | Unlikely |
| P01-01 | 21.29616499960 | -157.86914800000 | Unlikely |
| P02-05 | 21.30001468090 | -157.86667865500 | Unlikely |
| P02-06 | 21.30020248880 | -157.86653049100 | Unlikely |
| P02-11 | 21.30108431700 | -157.86580222900 | Unlikely |
| P02-13 | 21.30138333630 | -157.86554475600 | Unlikely |
| P03-02 | 21.30259485750 | -157.86450800300 | Unlikely |
| P04-00 | 21.30344429410 | -157.86359695600 | Unlikely |
| P04-01 | 21.30367337560 | -157.86362402300 | Unlikely |
| P04-BOX | 21.30374728890 | -157.86362955000 | Unlikely |
| P05-01 | 21.30385827500 | -157.86394188000 | Unlikely |
| P05-02 | 21.30384492440 | -157.86434603100 | Unlikely |
| P05-03 | 21.30459493210 | -157.86473701100 | Unlikely |
| P05-HECO1 | 21.30527213230 | -157.86405112600 | Unlikely |
| P05-HECO2 | 21.30547500000 | -157.86416900000 | Potential |
| P05-HECO3 | 21.30552606890 | -157.86421213700 | Potential |
| P05-HECO4 | 21.30555995300 | -157.86423393300 | Unlikely |
| P05-HECO5 | 21.30625400020 | -157.86465900000 | Potential |
| P05-UT | 21.30495130870 | -157.86450755700 | Unlikely |
| P05-UT2 | 21.30502708370 | -157.86439448500 | Unlikely |
| P05-UT3 | 21.30508263030 | -157.86428836100 | Unlikely |
| P07-03 | 21.30637890590 | -157.86474748400 | Unlikely |
| P08-01 | 21.30644148820 | -157.86481404600 | Unlikely |
| P08-02 | 21.30641343110 | -157.86485809100 | Unlikely |
| P08-03 | 21.30639400000 | -157.86491300000 | Unlikely |
| P08-04 | 21.30626247570 | -157.86514509400 | Unlikely |
| P08-05 | 21.30624705200 | -157.86518550400 | Potential |
| P08-06 | 21.30622421920 | -157.86523226800 | Unlikely |
| P08-07 | 21.30616940780 | -157.86531660300 | Unlikely |
| P08-08 | 21.30609208200 | -157.86545519000 | Unlikely |
| P08-09 | 21.30599937860 | -157.86561524100 | Potential |
| P08-10 | 21.30588301170 | -157.86583189500 | Unlikely |
| P08-11 | 21.30577678640 | -157.86603162800 | Unlikely |
| P08-12 | 21.30567149850 | -157.86622593300 | Unlikely |
| P09-01 | 21.30585368470 | -157.86625402500 | Unlikely |
| P09-02 | 21.30630207600 | -157.86632057800 | Unlikely |
| P09-03 | 21.30593939640 | -157.86626790000 | Potential |
| P09-04 | 21.30662917780 | -157.86636783600 | Unlikely |
| P09-05 | 21.30723858780 | -157.86628225500 | Unlikely |
| P10-01 | 21.30766077950 | -157.86607590600 | Unlikely |
| P10-02 | 21.30775201860 | -157.86596485500 | Unlikely |
| P10-03 | 21.30810707980 | -157.86555325300 | Unlikely |
| P11-01 | 21.30820859470 | -157.86540472200 | Unlikely |
| P11-02 | 21.30826423690 | -157.86533710100 | Unlikely |
| P11-03 | 21.30832198590 | -157.86526691900 | Unlikely |

| | | | |
|---|---|---|---|
| P11-04 | 21.30837913030 | -157.86519747200 | Potential |
| P11-05 | 21.30842519180 | -157.86514149400 | Unlikely |
| P11-06 | 21.30846018290 | -157.86509897000 | Potential |
| P11-07 | 21.30849430240 | -157.86505750500 | Unlikely |
| P11-08 | 21.30854574160 | -157.86499499100 | Potential |
| P11-09 | 21.30860019700 | -157.86492881200 | Potential |
| P11-10 | 21.30863997210 | -157.86488047300 | Potential |
| P11-11 | 21.30867650160 | -157.86483607900 | Unlikely |
| P11-12 | 21.30873004840 | -157.86477100500 | Unlikely |
| P11-13 | 21.30877101080 | -157.86472122300 | Unlikely |
| P11-14 | 21.30881170710 | -157.86467176600 | Unlikely |
| P11-15 | 21.30884641930 | -157.86462958000 | Potential |
| P11-16 | 21.30889487880 | -157.86457068600 | Unlikely |
| P11-17 | 21.30894256510 | -157.86451273400 | Unlikely |
| P11-18 | 21.30900843530 | -157.86443268200 | Unlikely |
| P11-19 | 21.30907234820 | -157.86442761100 | Unlikely |
| P11-20 | 21.30918627280 | -157.86446175800 | Unlikely |
| P12-01 | 21.30940435510 | -157.86462800300 | Unlikely |
| P12-02 | 21.30938269510 | -157.86469421700 | Unlikely |
| P12-03 | 21.30943230390 | -157.86480995500 | Unlikely |
| P12-04 | 21.30959859750 | -157.86473528100 | Unlikely |
| P12-05 | 21.30962371930 | -157.86464765500 | Unlikely |
| P12-06 | 21.30978346530 | -157.86446591600 | Unlikely |
| P12-07 | 21.30991211830 | -157.86449835300 | Unlikely |
| P12-08 | 21.31014451890 | -157.86460537200 | Unlikely |
| P15-01 | 21.31178100010 | -157.86543100000 | Unlikely |
| P19-01 | 21.31337899970 | -157.86709300000 | Suspect |
| P19-02 | 21.31212239620 | -157.86731921200 | Unlikely |
| P19-03 | 21.31196742920 | -157.86734118600 | Unlikely |
| P19-04 | 21.31179885090 | -157.86735928100 | Unlikely |
| P19-05 | 21.31166861270 | -157.86738441200 | Unlikely |
| P19-06 | 21.31226624650 | -157.86729796000 | Unlikely |
| P19-07 | 21.31243900030 | -157.86726400000 | Unlikely |
| P19-08 | 21.31286865590 | -157.86717785400 | Unlikely |
| P20-01 | 21.31158900020 | -157.86740600000 | Unlikely |
| P21-01 | 21.31025246390 | -157.86806006100 | Unlikely |
| P21-02 | 21.31021551050 | -157.86818811700 | Unlikely |
| P21-03 | 21.31009847330 | -157.86861326100 | Unlikely |
| P21-04 | 21.31012477510 | -157.86886496100 | Unlikely |
| P21-05 | 21.31008093450 | -157.86903607400 | Unlikely |
| P21-06 | 21.31013851630 | -157.86881547900 | Unlikely |
| P21-07 | 21.31027342480 | -157.86798742900 | Unlikely |
| P22-01 | 21.31044999970 | -157.86925400000 | Unlikely |
| P23-01 | 21.31242601660 | -157.87008525300 | Unlikely |
| P23-02 | 21.31241399960 | -157.87022300000 | Unlikely |
| P23-03 | 21.31227799960 | -157.87062000000 | Unlikely |
| P24-01 | 21.31222061860 | -157.87062067400 | Unlikely |

| | | | |
|---|---|---|---|
| P25-01 | 21.31081799990 | -157.87016200000 | Unlikely |
| P25-02 | 21.31077925640 | -157.87013985200 | Unlikely |
| P26-01 | 21.31088351870 | -157.87144579300 | Unlikely |
| P26-02 | 21.31062783750 | -157.87159036700 | Unlikely |
| P27-01 | 21.31055069190 | -157.87152917700 | Unlikely |
| P29-02 | 21.31003400040 | -157.87203200000 | Unlikely |
| P29-03 | 21.31102300030 | -157.87340900000 | Unlikely |
| P31-01 | 21.31160157280 | -157.87452860300 | Unlikely |
| P31-02 | 21.31183634410 | -157.87489273700 | Potential |
| P31-03 | 21.31204943420 | -157.87522324400 | Unlikely |
| P32-01 | 21.31222495260 | -157.87549547800 | Unlikely |
| P32-02 | 21.31237818540 | -157.87573314500 | Unlikely |
| P32-03 | 21.31279500030 | -157.87639800000 | Unlikely |
| P32-04 | 21.31303468380 | -157.87675139300 | Potential |
| P33-01 | 21.31326941770 | -157.87711545500 | Unlikely |
| P33-02 | 21.31351633040 | -157.87749844300 | Unlikely |
| P34-01 | 21.31398312820 | -157.87788914500 | Unlikely |
| P34-02 | 21.31429320470 | -157.87772287500 | Unlikely |
| P34-03 | 21.31447349770 | -157.87761829000 | Unlikely |
| P34-04 | 21.31473480510 | -157.87747207200 | Unlikely |
| P34-05 | 21.31491813060 | -157.87736729100 | Unlikely |
| P34-06 | 21.31509200220 | -157.87725707600 | Unlikely |
| P34-07 | 21.31523090700 | -157.87716770100 | Unlikely |
| P34-08 | 21.31574298660 | -157.87688070000 | Unlikely |
| P34-09 | 21.31559710000 | -157.87696347900 | Unlikely |
| P34-10 | 21.31548882360 | -157.87703394800 | Unlikely |
| P34-11 | 21.31536187980 | -157.87710139900 | Unlikely |
| P35-01 | 21.31588171970 | -157.87679882600 | Unlikely |
| P35-02 | 21.31652599970 | -157.87642500000 | Unlikely |
| P35-03 | 21.31698257620 | -157.87625756300 | Unlikely |
| P35-04 | 21.31711738530 | -157.87651184300 | Unlikely |
| P35-05 | 21.31726499970 | -157.87680500000 | Unlikely |
| P36-01 | 21.31726339730 | -157.87772203800 | Unlikely |
| P37-01 | 21.31701507500 | -157.87818623600 | Unlikely |
| P37-02 | 21.31647199990 | -157.87851200000 | Unlikely |
| P38-01 | 21.31675794490 | -157.87942203400 | Unlikely |
| P38-02 | 21.31793745810 | -157.87888014800 | Unlikely |
| P38-03 | 21.31881992570 | -157.87828523300 | Unlikely |
| P38-04 | 21.31899694940 | -157.87802239700 | Potential |
| P38-05 | 21.31974499970 | -157.87756300000 | Unlikely |
| P38-Outfall | 21.31986288010 | -157.87726994700 | Unlikely |
| P39-Outfall | 21.32014205360 | -157.87767625200 | Unlikely |
| P41-01 | 21.31975993680 | -157.88270345000 | Unlikely |
| P41-02 | 21.31887400020 | -157.88281700000 | Potential |
| P41-03 | 21.31990700020 | -157.88255200000 | Potential |
| P42-01 | 21.31723472790 | -157.88332439200 | Unlikely |
| P42-PSI | 21.31701343020 | -157.88334616500 | Unlikely |

| | | | |
|---|---|---|---|
| P44/45-01 | 21.31558400000 | -157.88717900000 | Unlikely |
| P44/45-02 | 21.31566467580 | -157.88690645300 | Unlikely |
| P44/45-03 | 21.31677423110 | -157.88622608900 | Unlikely |
| P44/45-04 | 21.31711503390 | -157.88609087700 | Unlikely |
| P44/45-05 | 21.31648800020 | -157.88440800000 | Suspect |
| P51A-01 | 21.31383000090 | -157.88658491900 | Unlikely |
| P51A-02 | 21.31330614110 | -157.88309714500 | Unlikely |
| P51A-03 | 21.31320934700 | -157.88251433300 | Unlikely |
| P51A-04 | 21.31352153570 | -157.88439407400 | Unlikely |
| P51A-05 | 21.31362557370 | -157.88505981700 | Unlikely |
| P51A-06 | 21.31367533670 | -157.88532278700 | Unlikely |
| P51A-07 | 21.31373484490 | -157.88561263300 | Unlikely |
| P51A-08 | 21.31377534410 | -157.88586645600 | Unlikely |
| P51B-02 | 21.31348469600 | -157.88417225000 | Unlikely |
| P51B-03 | 21.31345339660 | -157.88398378300 | Unlikely |
| P51B-04 | 21.31318816690 | -157.88238680400 | Unlikely |
| P51B-05 | 21.31323319360 | -157.88265790600 | Unlikely |
| P51B-06 | 21.31332955360 | -157.88323809500 | Unlikely |
| P51B-07 | 21.31342833950 | -157.88383290600 | Unlikely |
| P51C-01 | 21.31309491410 | -157.88182530400 | Unlikely |
| P51C-02 | 21.31294569790 | -157.88092684000 | Unlikely |
| P51C-03 | 21.31288555500 | -157.88061034400 | Unlikely |
| P51C-04 | 21.31298474870 | -157.88116196700 | Unlikely |
| P51C-05 | 21.31302657730 | -157.88141383000 | Unlikely |
| P51C-06 | 21.31306597620 | -157.88166460900 | Unlikely |
| P52-01 | 21.31246183560 | -157.87953865000 | Unlikely |
| P52-02 | 21.31121747280 | -157.87763551200 | Unlikely |
| P52-03 | 21.31162131580 | -157.87822137900 | Unlikely |
| P52-04 | 21.31200359850 | -157.87882055600 | Unlikely |
| P52-05 | 21.31271807110 | -157.87988403300 | Unlikely |
| P53-01 | 21.31002140380 | -157.87575785000 | Unlikely |
| P53-02 | 21.31044972730 | -157.87642071100 | Unlikely |
| P53-03 | 21.31084879700 | -157.87704022300 | Unlikely |
| BP-01 | 21.32095751000 | -158.11665704000 | Unlikely |
| BP-02 | 21.32112457000 | -158.11521837000 | Unlikely |
| BP-03 | 21.32130711000 | -158.11503544000 | Unlikely |
| BP-04 | 21.32150734000 | -158.11482397000 | Unlikely |
| BP-05 | 21.32168272000 | -158.11462778000 | Unlikely |
| BP-06 | 21.32190778000 | -158.11440102000 | Unlikely |
| BP-07 | 21.32211327000 | -158.11416865000 | Unlikely |
| BP-08 | 21.32230633000 | -158.11394392000 | Unlikely |
| BP-09 | 21.32250129000 | -158.11375334000 | Unlikely |
| BP-10 | 21.32268719000 | -158.11351535000 | Unlikely |
| BP-11 | 21.32286973000 | -158.11333242000 | Unlikely |
| BP-12 | 21.32306995000 | -158.11312094000 | Unlikely |
| BP-13 | 21.32360850000 | -158.11252472000 | Unlikely |
| BP-14 | 21.32380346000 | -158.11233414000 | Unlikely |

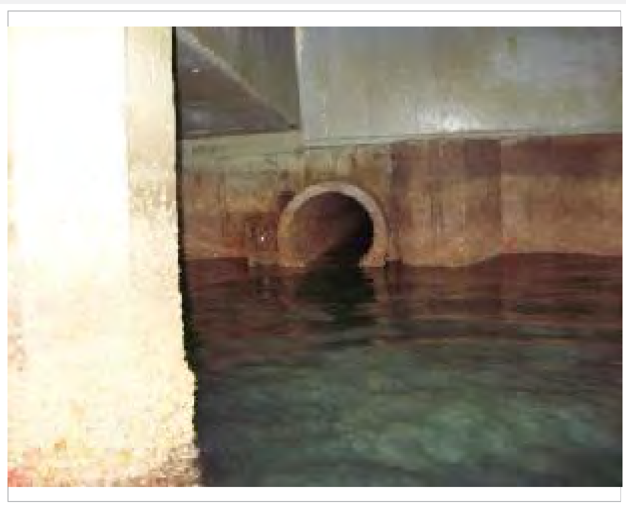
| | | | |
|---|---|---|---|
| BP-15 | 21.32416663000 | -158.11193410000 | Unlikely |
| BP-16 | 21.32433675000 | -158.11175881000 | Unlikely |
| BP-17 | 21.32451928000 | -158.11157587000 | Unlikely |
| BP-18 | 21.32468413000 | -158.11142147000 | Unlikely |
| BP-19 | 21.32483466000 | -158.11124055000 | Unlikely |
| BP-20 | 21.32497993000 | -158.11108054000 | Unlikely |
| BP-21 | 21.32514478000 | -158.11092614000 | Unlikely |
| BP-22 | 21.32530247000 | -158.11075848000 | Unlikely |
| BP-23 | 21.32547785000 | -158.11056228000 | Unlikely |
| BP-24 | 21.32564270000 | -158.11040788000 | Unlikely |
| BP-25 | 21.32400368000 | -158.11212266000 | Unlikely |
| BP-26 | 21.32344555000 | -158.11271327000 | Unlikely |
| BP-27 | 21.32326301000 | -158.11289621000 | Unlikely |
| BP-28 | 21.32093677000 | -158.11542220000 | Unlikely |
| BP-29 | 21.32086439000 | -158.11654396000 | Unlikely |

# Outfall Properties

| | |
|---|---|
| Outfall ID | BP-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Box |
| Grouping | |
| Dimensions | 072 x 18 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | BP-02 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-03 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | Partially in water |



| | | |
|---|---|---|
| Outfall ID | BP-04 |  |
| LandUse | Industrial | |
| Type | Closed Pipe | |
| Material | RCP | |
| Shape | Circular | |
| Grouping | Single | |
| Dimensions | 12 | |
| Submerged | No | |

| | | |
|---|---|---|
| Outfall ID | BP-05 |  |
| LandUse | Industrial | |
| Type | Closed Pipe | |
| Material | RCP | |
| Shape | Circular | |
| Grouping | Single | |
| Dimensions | 12 | |
| Submerged | No | |

| | | |
|---|---|---|
| Outfall ID | BP-06 |  |
| LandUse | Industrial | |
| Type | Closed Pipe | |
| Material | RCP | |
| Shape | Circular | |
| Grouping | Single | |
| Dimensions | 12 | |
| Submerged | Partially in water | |

| | |
|---|---|
| Outfall ID | BP-07 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-08 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-09 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | BP-10 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-11 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-12 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 36 |
| Submerged | Partially in water |

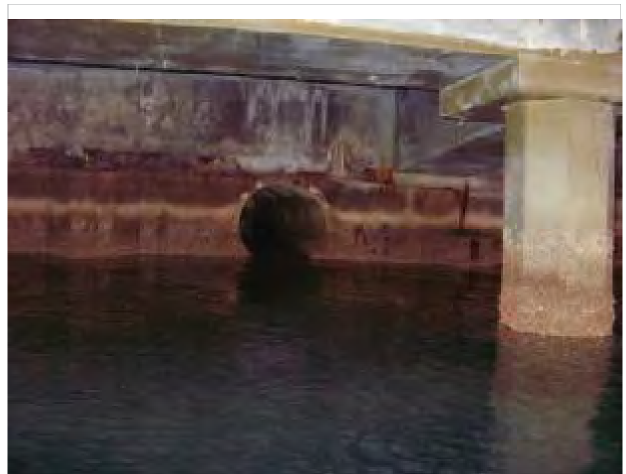
| | |
|---|---|
| Outfall ID | BP-13 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-14 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 36 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | BP-15 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-16 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-17 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 36 |
| Submerged | Partially in water |



| | |
|---|---|
| Outfall ID | BP-18 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 36 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | BP-19 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-20 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-21 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-22 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-23 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-24 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-25 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-26 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-27 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-28 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | PVC |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | BP-29 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P01-01 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P02-05 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 16 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P02-06 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P02-11 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P02-13 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P03-02 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P04-00 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P04-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P04-BOX |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Box |
| Grouping | Single |
| Dimensions | 096 x 48 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P05-01 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P05-02 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P05-03 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 16 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P05-HECO2 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P05-HECO3 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Semicircle |
| Grouping | Single |
| Dimensions | 36 |
| Submerged | Partially in water |

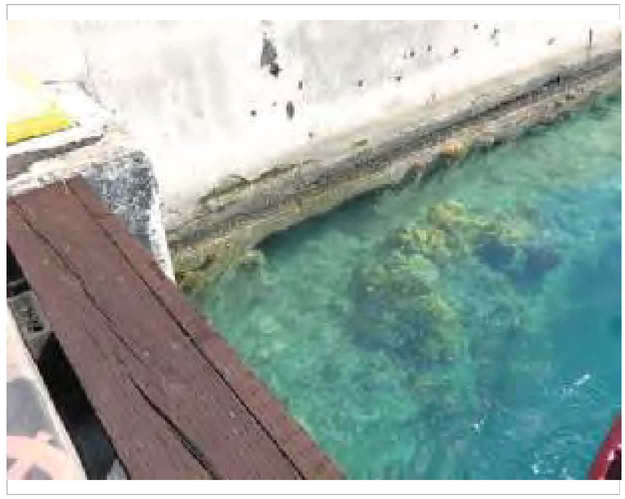
| | |
|---|---|
| Outfall ID | P05-HECO4 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P05-HECO5 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P05-UT |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Quadruple |
| Dimensions | |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P05-UT2 |
| LandUse | Commercial |
| Type | |
| Material | |
| Shape | |
| Grouping | |
| Dimensions | |
| Submerged | |

| | |
|---|---|
| Outfall ID | P05-UT3 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 3 |
| Submerged | No |

| | | |
|---|---|---|
| Outfall ID | P07-03 |  |
| LandUse | Commercial | |
| Type | Closed Pipe | |
| Material | RCP | |
| Shape | Box | |
| Grouping | | |
| Dimensions | 096 x 36 | |
| Submerged | Fully in water | |

| | | |
|---|---|---|
| Outfall ID | P08-01 |  |
| LandUse | Commercial | |
| Type | Closed Pipe | |
| Material | RCP | |
| Shape | Circular | |
| Grouping | Single | |
| Dimensions | 12 | |
| Submerged | No | |

| | | |
|---|---|---|
| Outfall ID | P08-02 |  |
| LandUse | Commercial | |
| Type | Closed Pipe | |
| Material | RCP | |
| Shape | Box | |
| Grouping | Single | |
| Dimensions | 12 | |
| Submerged | No | |

| | |
|---|---|
| Outfall ID | P08-03 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P08-04 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 1 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P08-05 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P08-06 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P08-07 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Box |
| Grouping | Single |
| Dimensions | 024 x 24 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P08-08 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P08-09 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 2 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P08-10 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Triple |
| Dimensions | 006, 4, 3 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P08-11 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Double |
| Dimensions | 012, 8 |
| Submerged | No |

| | | |
|---|---|---|
| Outfall ID | P08-12 |  |
| LandUse | Commercial | |
| Type | Closed Pipe | |
| Material | RCP | |
| Shape | Circular | |
| Grouping | Single | |
| Dimensions | 24 | |
| Submerged | | |

| | | |
|---|---|---|
| Outfall ID | P09-01 |  |
| LandUse | Commercial | |
| Type | Closed Pipe | |
| Material | RCP | |
| Shape | Circular | |
| Grouping | Single | |
| Dimensions | 12 | |
| Submerged | No | |

| | | |
|---|---|---|
| Outfall ID | P09-02 |  |
| LandUse | Commercial | |
| Type | Closed Pipe | |
| Material | RCP | |
| Shape | Circular | |
| Grouping | Single | |
| Dimensions | 12 | |
| Submerged | No | |

| | |
|---|---|
| Outfall ID | P09-03 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P09-04 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P09-05 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P10-01 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P10-02 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P10-03 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P11-01 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 012, 6 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P11-02 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P11-03 |
| LandUse | |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 6 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P11-04 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 012, 6 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P11-05 |
| LandUse | |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | No |

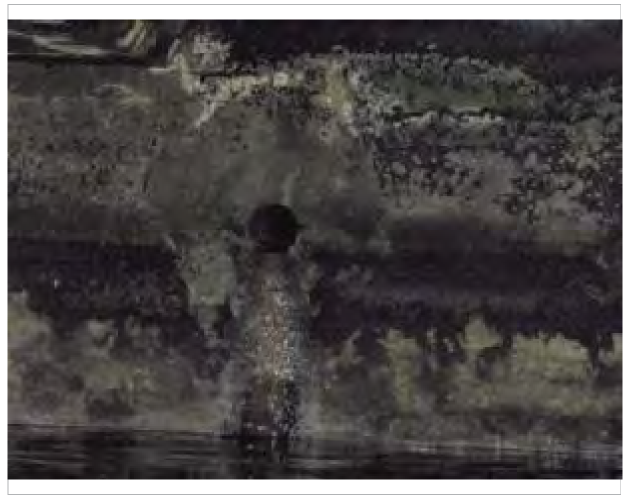
| | |
|---|---|
| Outfall ID | P11-06 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P11-07 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P11-08 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P11-09 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P11-10 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | |



| | |
|---|---|
| Outfall ID | P11-11 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P11-12 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P11-13 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P11-14 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P11-15 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 36 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P11-16 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | |

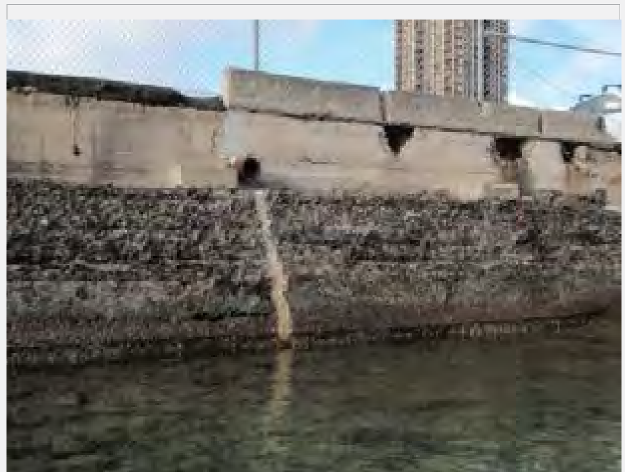
| | |
|---|---|
| Outfall ID | P11-17 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 36 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P11-18 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P11-19 |
| LandUse | |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P11-20 |
| LandUse | |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 036 x 6, 3 x 1 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P12-01 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 6 |
| Submerged | No |



| | |
|---|---|
| Outfall ID | P12-02 |
| LandUse | |
| Type | Closed Pipe |
| Material | Clay |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 6 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P12-03 |
| LandUse | |
| Type | Closed Pipe |
| Material | Clay |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | Fully in water |

| | |
|---|---|
| Outfall ID | P12-04 |
| LandUse | |
| Type | Closed Pipe |
| Material | Clay |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 6 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P12-05 |
| LandUse | |
| Type | Closed Pipe |
| Material | Clay |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P12-06 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P12-07 |
| LandUse | |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P12-08 |
| LandUse | |
| Type | Closed Pipe |
| Material | Clay |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

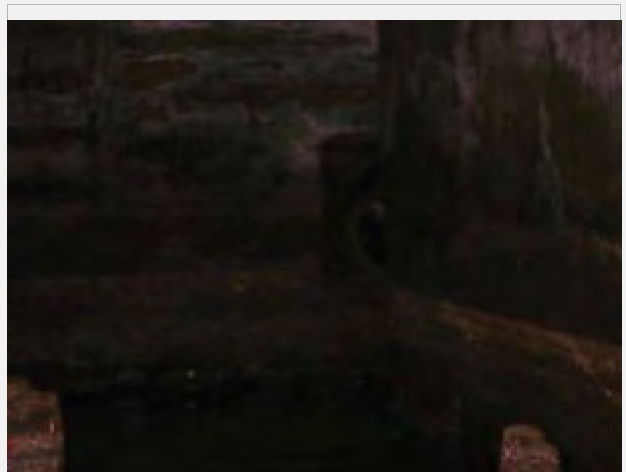
| | |
|---|---|
| Outfall ID | P15-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 8 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P19-01 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | |
| Grouping | |
| Dimensions | 30 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P19-02 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P19-03 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P19-04 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |



| | |
|---|---|
| Outfall ID | P19-05 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P19-06 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P19-07 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P19-08 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P20-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | |
| Dimensions | 18 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P21-02 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P21-03 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Box |
| Grouping | Single |
| Dimensions | 048 x 30 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P21-04 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P21-05 |
| LandUse | |
| Type | |
| Material | |
| Shape | |
| Grouping | |
| Dimensions | |
| Submerged | |

| | |
|---|---|
| Outfall ID | P21-06 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Box |
| Grouping | Single |
| Dimensions | 010 x 10 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P21-07 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P22-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P23-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P23-02 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P23-03 |
| LandUse | |
| Type | Closed Pipe |
| Material | PVC |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P24-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P25-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P25-02 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 6 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P26-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P26-02 |
| LandUse | |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 9 |
| Submerged | No |

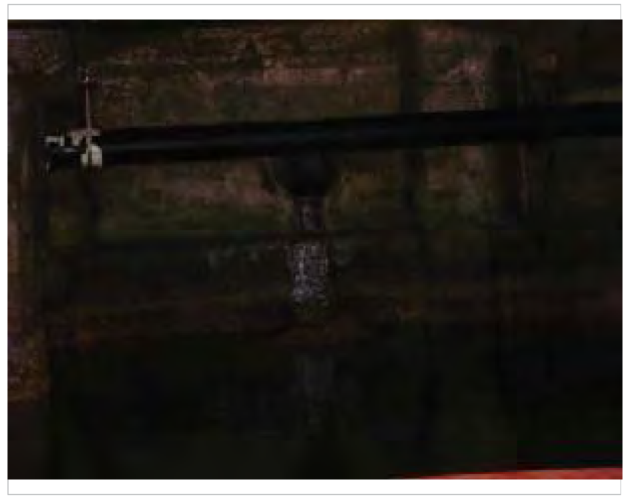
| | |
|---|---|
| Outfall ID | P27-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P29-02 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 36 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P29-03 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Box |
| Grouping | Single |
| Dimensions | 060 x 24 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P31-01 |
| LandUse | Industrial |
| Type | |
| Material | |
| Shape | |
| Grouping | |
| Dimensions | |
| Submerged | |

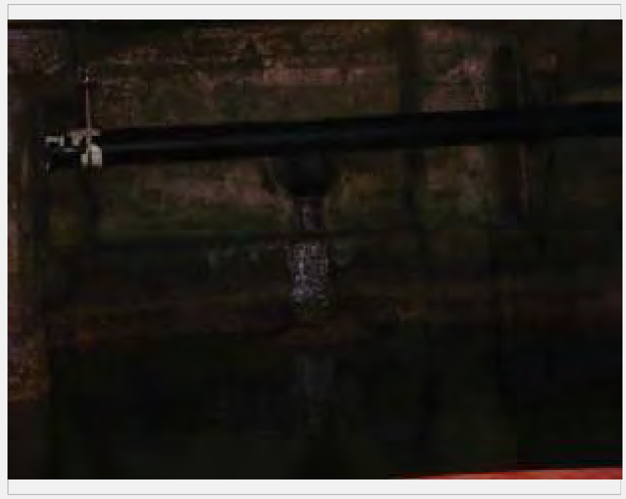
| | |
|---|---|
| Outfall ID | P31-02 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |



| | |
|---|---|
| Outfall ID | P31-03 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P32-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 36 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P32-02 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |



| | |
|---|---|
| Outfall ID | P32-03 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | No |

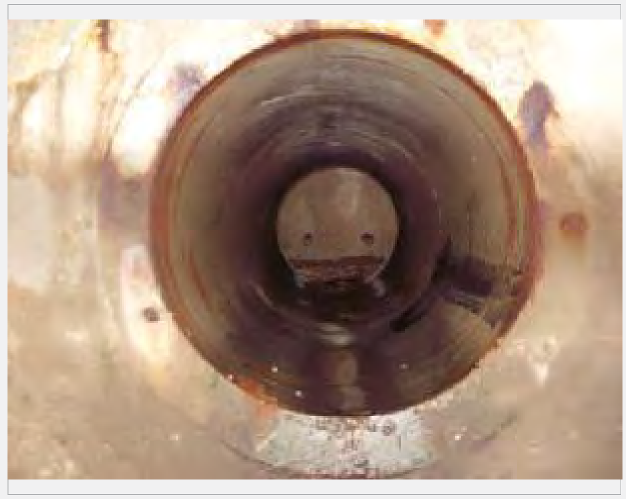
| | |
|---|---|
| Outfall ID | P32-04 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 9 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P33-01 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P33-02 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | No |

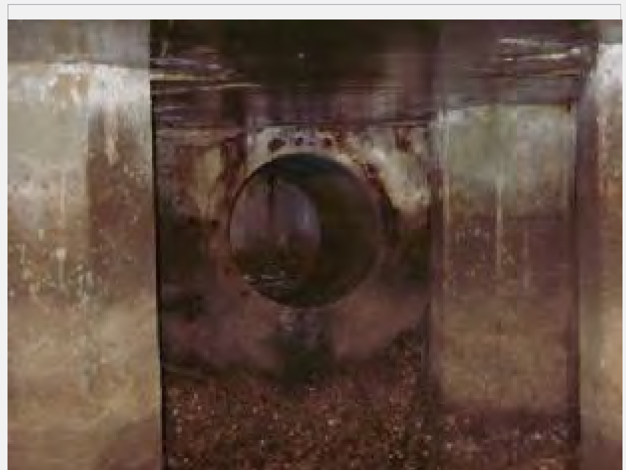
| | |
|---|---|
| Outfall ID | P34-01 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P34-02 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |



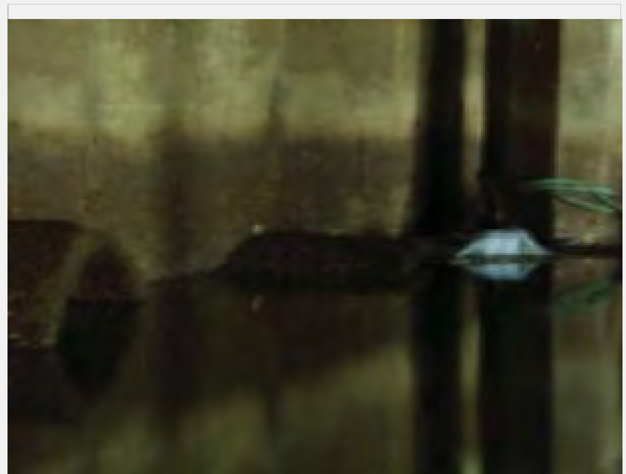
| | |
|---|---|
| Outfall ID | P34-03 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P34-04 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |



| | |
|---|---|
| Outfall ID | P34-05 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P34-06 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 042 x 2 |
| Submerged | Partially in water |



| | |
|---|---|
| Outfall ID | P34-07 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P34-08 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P34-09 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P34-10 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P34-11 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P35-01 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 018, 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P35-02 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P35-03 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P35-04 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 36 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P35-05 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | PVC |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 36 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P36-01 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | PVC |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P37-01 |
| LandUse | |
| Type | Closed Pipe |
| Material | PVC |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | |

| | |
|---|---|
| Outfall ID | P37-02 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | PVC |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P38-01 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | PVC |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | |

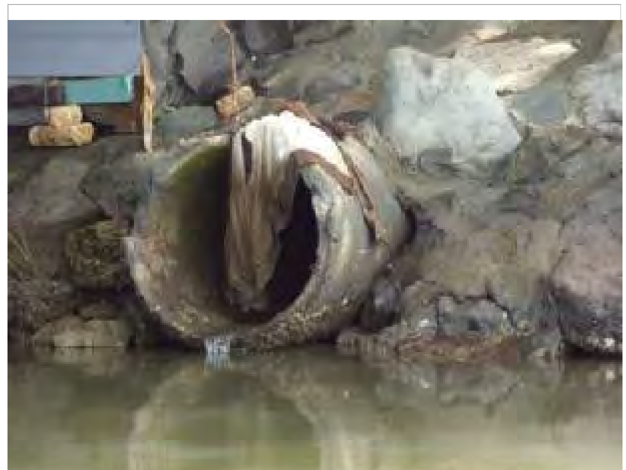
| | |
|---|---|
| Outfall ID | P38-02 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | PVC |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P38-03 |
| LandUse | Commercial |
| Type | |
| Material | |
| Shape | |
| Grouping | |
| Dimensions | |
| Submerged | |

| | |
|---|---|
| Outfall ID | P38-04 |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P38-05 |
| LandUse | Commercial |
| Type | Open Drainage |
| Material | Earthen |
| Shape | Parabolic |
| Grouping | |
| Dimensions | 360in wide on top and bottom, |
| Submerged | |

| | |
|---|---|
| Outfall ID | P38-OUTFALL |
| LandUse | Commercial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | No |



| | |
|---|---|
| Outfall ID | P39-OUTFALL |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P41-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P41-02 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P41-03 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Box |
| Grouping | Single |
| Dimensions | 108 x 96 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P42-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 24 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P42-PSI |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 3 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P44/45-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P44/45-02 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | |
| Dimensions | 36 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P44/45-03 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | Partially in water |

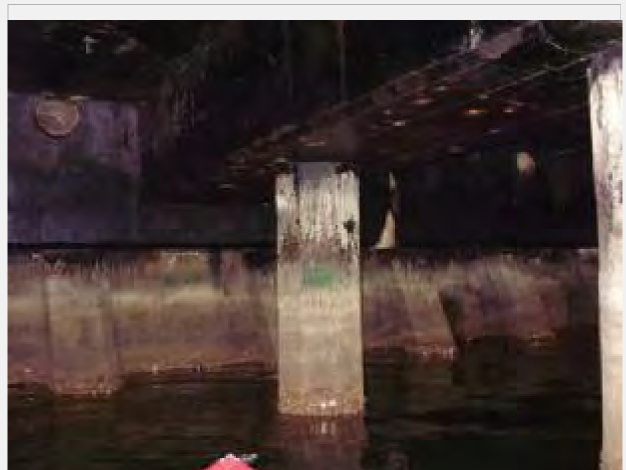
| | |
|---|---|
| Outfall ID | P44/45-04 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P44/45-05 |
| LandUse | |
| Type | Open Drainage |
| Material | Earthen |
| Shape | Other |
| Grouping | |
| Dimensions | 012in top width, 1/4in deep |
| Submerged | |

| | |
|---|---|
| Outfall ID | P51A-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 30 |
| Submerged | Partially in water |

| | | |
|---|---|---|
| Outfall ID | P51A-02 |  |
| LandUse | | |
| Type | Closed Pipe | |
| Material | RCP | |
| Shape | Circular | |
| Grouping | Single | |
| Dimensions | 36 | |
| Submerged | Partially in water | |

| | | |
|---|---|---|
| Outfall ID | P51A-03 |  |
| LandUse | Industrial | |
| Type | Closed Pipe | |
| Material | RCP | |
| Shape | Circular | |
| Grouping | Double | |
| Dimensions | 9 | |
| Submerged | No | |

| | | |
|---|---|---|
| Outfall ID | P51A-04 |  |
| LandUse | Industrial | |
| Type | Closed Pipe | |
| Material | RCP, cardboard fiber | |
| Shape | | |
| Grouping | | |
| Dimensions | 018in x 1, 2 x 12in | |
| Submerged | No | |

| | |
|---|---|
| Outfall ID | P51A-05 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 36 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P51A-06 |
| LandUse | |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 9 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P51A-07 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P51A-08 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Double |
| Dimensions | 9 |
| Submerged | No |

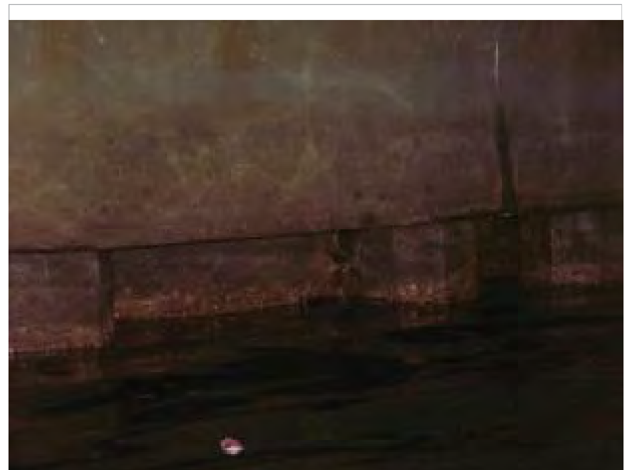
| | |
|---|---|
| Outfall ID | P51B-04 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P51B-05 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P51B-06 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 9 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P51B-07 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 18 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P51C-02 |
| LandUse | |
| Type | Closed Pipe |
| Material | PVC |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 6 |
| Submerged | No |



| | |
|---|---|
| Outfall ID | P51C-03 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 6 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P51C-04 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 6 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P51C-05 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 6 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P51C-06 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | Steel |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 6 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P52-02 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Box |
| Grouping | Single |
| Dimensions | 96 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P52-03 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | PVC |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P52-04 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | PVC |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P52-05 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Box |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P53-01 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | No |

| | |
|---|---|
| Outfall ID | P53-02 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | RCP |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 036,12 |
| Submerged | Partially in water |

| | |
|---|---|
| Outfall ID | P53-03 |
| LandUse | Industrial |
| Type | Closed Pipe |
| Material | PVC |
| Shape | Circular |
| Grouping | Single |
| Dimensions | 12 |
| Submerged | |

# ORIIP APPENDIX D

# SITE SPECIFIC HEALTH AND SAFETY PLAN

# SITE-SPECIFIC HEALTH AND SAFETY PLAN

Honolulu and Kalaeloa Barbers Point Harbors
Outfall Reconnaissance Inventory

**Prepared By:**
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ETC Project No. 13-6009

March 2013

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## 1.0 INTRODUCTION

The Outfall Reconnaissance Inventory and Inspection Program (ORIIP) is an element of the Hawaii Department of Transportation, Harbors Divisions (Harbors) illicit Discharge Detection and Elimination (IDDE) Program. The ORIIP requires a visual inspection of Harbors outfalls to be performed annually during dry weather conditions (less than 0.1" of rain during a 72 hour period). The dry weather outfall reconnaissance inventory (ORI) will be conducted during low tide and will describe each outfall's conditions, flow characteristics, and descriptions of the surrounding areas. Records of the ORI will be kept for inclusion in the Annual Compliance Report (ACR).

The purpose of the ORI is to detect illicit discharges and illegal connections to the Harbors Small Municipal Separate Storm Sewer System (MS4) and to produce a greater understanding of the site specific conditions at the Harbors. Non-stormwater discharges will be tracked upstream in an attempt to determine the source. Illicit runoff conditions will be reported and, where a violation is identified, a warning or citation will be issued, recorded and included in the ACR.

### 1.1 Project Location

The project is located at the Honolulu Harbor on the southern central portion of the island of Oahu in the State of Hawaii.

### 1.2 Purpose and Objectives

The purpose of this Health and Safety Plan is to establish standard safety and health procedures for EnviroServices & Training Center (ETC) personnel and any other personnel involved in the performance of ORI activities. All project activities shall be performed in accordance with this Health and Safety Plan. Specific hazard control methodologies have been evaluated and selected in an effort to minimize the potential for accident or injury. This Health and Safety Plan is a dynamic document and is subject to change based on review and implementation of additional tasks.

All site activities will be performed in accordance with this Health and Safety Plan, applicable ETC policies and procedures, and the Occupational Safety and Health Administration (OSHA) guidelines. The levels of personal protection and the procedures specified in this Health and Safety Plan are based on the best information available from reference documents and current site data; therefore, these recommendations represent the minimum health and safety requirements to be observed by all personnel engaged in this project. Unforeseeable site conditions or changes in the scope of work may warrant a reassessment of protection levels and controls stated. All adjustments to this Health and Safety Plan must be approved by ETC's on-site Safety Officer.

### 1.3 Regulations and Guidelines

The regulations listed in this section provide the employers and employees with the minimum information and indicate the minimum training necessary to accomplish the purpose and objectives of this Health and Safety Plan. All on-site personnel will adhere to the following requirements and regulations:

1) 29 Code of Federal Regulations (CFR) 1910;
2) 29 CFR 1926; and
3) ETC's Health and Safety Program.

### 1.4 Personnel

All operations and personnel having the potential for exposure to site hazards are subject to the requirements of this Health and Safety Plan. The Project Manager will serve as the Site Safety Officer (SSO) and will be responsible for the implementation of the Health and Safety Plan and oversight of the on-site personnel. Table 1 provides a list of key participants, including organization names and telephone numbers.

**TABLE 1: KEY PARTICIPANTS**

| TITLE | NAME | ORGANIZATION | PHONE NUMBER |
|---|---|---|---|
| Environmental Manager | Mr. Randal Leong | HDOT Harbors | (808) 587-1962 |
| Environmental Health Specialist | Mrs. Ying Zhang | HDOT Harbors | (808) 587-1960 |
| EH&S Manager | Mr. Jim Galariada | HDOT Harbors | (808) 587-1976 |
| Office Health and Safety Manager | Mr. Damon Hamura | ETC | (808) 839-7222 ext 230 |
| Project Manager / Site Safety Officer | Mrs. Katie Davis | ETC | (808) 839-7222 ext 224 (office)<br>(808) 226-0728 (mobile) |

## 2.0 HAZARD IDENTIFICATION

This section of the Health and Safety plan addresses chemical, physical, and biological hazards anticipated during field activities. The following subsections identify the site specific hazards of concern. Safety procedures to mitigate each identified risk are outlined in Section 4.0.

### 2.1 Chemical Hazards

ORI activities may expose personnel to hazardous chemicals either in the actual stormwater discharge or the chemicals placed in sample containers for sample preservation. Therefore, direct contact with stormwater and preservatives should be avoided. The constituents of concern for ORI activities include: carbon monoxide (CO), sulfuric acid ($H_2SO_4$), hydrogen sulfide ($H_2S$). The potential modes of exposure to these chemicals are ingestion, absorption, and inhalation. The chemical data sheets for these potential hazards, which include chemical specific hazard information (exposure limits, physical descriptions, etc.) obtained from published sources (OSHA, National Institute for Occupational Safety and Health [NIOSH]) are included in Appendix I. The exposure limits, acute hazards, and symptoms of exposure have been summarized in Table 2 below.

**TABLE 2: EXPOSURE LIMITS AND SYMPTOMS TO EXPOSURE**

| Compound | PEL[a] | TLV[b] | STEL[c] | IDLH[d] | Acute Hazards/Symptoms |
|---|---|---|---|---|---|
| Carbon Monoxide | 50 ppm | 25 ppm | NA | 1200 ppm | **Inhalation:** Headache. Confusion. Dizziness. Nausea. Weakness. Unconsciousness. |
| Hydrogen Sulfide | 20 ppm | 10 ppm | 15 ppm | 100 ppm | **Inhalation:** Headache. Dizziness. Cough. Sore throat. Nausea. Labored breathing. Unconsciousness. Symptoms may be delayed. |
| | | | | | **Skin:** Irritation. |
| | | | | | **Eyes:** Irritation. |
| Sulfuric Acid | 1 mg/m$^3$ | 0.2 mg/m$^3$ | NA | 15 mg/m$^3$ | **Inhalation:** Corrosive. Burning sensation. Sore throat. Cough. Labored breathing. Shortness of breath. Symptoms may be delayed. |
| | | | | | **Skin:** Corrosive. Redness. Pain. Blisters. Serious skin burns. |
| | | | | | **Eyes:** Pain. Severe deep burs. |
| | | | | | **Ingestion:** Burning sensation. Shock or collapse. |

[a]PEL – An 8-hour time-weighted average or ceiling concentration above which unprotected workers may not be exposed.
[b]TLV – The time-weighted average concentration for a normal 8-hour work day to which workers may be exposed without adverse effect.
[c]STEL – A 15-minute time-weighted average exposure that should not be exceeded at any time during the workday.
[d]IDLH – The maximum level from which a worker could escape without any escape-impairing symptoms or any irreversible health effects.
NA – Not available.

### 2.2 Physical Hazards

ORI personnel should be aware of a number of physical hazards including but not limited to traffic hazards, sharp edges, falling objects, slippery footing, inclement weather, working in water, and lifting injuries from removing manhole covers.

Hazardous weather conditions associated with ORI activities may include wind, lightning, flooding, heightened wave activity, etc. Common sense should dictate whether ORI activities be conducted during inclement weather.

Working over water presents the risk of drowning, being struck by a boat, being struck or cut by pier surfaces, and other water based hazards. Personal protective equipment (PPE) and the buddy system should be implemented at all times to mitigate this risk.

### 2.3 Biological Hazards

ORI personnel may come into contact with biological hazards such as rodents or insects such as mosquitoes, bees, and wasps. Work over water also introduces the risk of exposure to ocean organisms such as algae, urchins, jellyfish, and sharks. Care should be taken to avoid areas known to be inhabited by dangerous organisms.

Persons with any insect allergies should inform his or her supervisor prior to work and have the appropriate treatment on hand at all times.

Bloodborne pathogens are a potential concerns during first aid procedures and ORI activities. Illicit discharges to the stormwater system may exist from overflow or cross contamination of the sanitary sewer system. Personnel should don the proper PPE (e.g. gloves, goggles, and aprons) to mitigate this concern.

## 3.0 FIELD ACTIVITIES

The field activities associated with this project are specifically laid out in Section 3 of the February 2014, Department of Transportation Harbors Divisions, *Outfall Reconnaissance Inventory and Inspection Program,* which has been attached to this document as Appendix II.

## 4.0 JOB HAZARD ANALYSIS

The job hazard analysis is an ongoing process from the initiation of the Health and Safety Plan preparation through the implementation and completion of the project. Modifications should be made in the field by the Site Safety Officer to account for changes in site conditions or the discovery of new hazards. The initial site specific job hazard analysis is presented in Table 3.

**TABLE 3: JOB HAZARD ANALYSIS**

| **DATE PREPARED:** March 2014 | **PREPARED BY:** Bryan Starks | | **JOB DESCRIPTION:** Outfall Reconnaissance Inventory |
|---|---|---|---|
| **STEP/TASK** | **HAZARDS** | | **HAZARD CONTROLS** |
| Mobilization/ Demobilization | Vehicle/Object Collision | | • Ensure vehicle has sufficient fuel.<br>• Drive defensively.<br>• Use turn indicators and hazard lights if necessary.<br>• Carry cell phone in case of emergencies.<br>• Do **not** use cell phone while operating the vehicle. |
| | Parking On-Site | | • Safely park off roadways and use traffic cones to warn oncoming traffic (if not in marked spot).<br>• Use turn indicators and hazard lights if necessary. |
| | Loading/Unloading Vehicle | | • Request assistance with lifting heavy objects. |
| ORI | **Chemical Hazards** | Unknown Illicit Discharges | • The substances that personnel may encounter in manholes, drains, or outfalls are unknown. Proper protection for the worst case scenario should be taken.<br>• Avoid direct contact with unknown substances. |
| | | Potential Hazardous Liquids (Including Sulfuric Acid) | • Proper PPE should be worn to prevent exposure to potentially hazardous chemicals.<br>• Always use gloves and safety goggles with splash protection when handling Hazardous chemicals.<br>• Sample preservatives (sulfuric acid) should be added to sample jars on land after collection so boat personnel are not exposed to unnecessary risk associated with preservation chemicals. |
| | | Potential Hazardous Gases | • Personnel should be equipped with gas meter and take regular readings.<br>• Personnel should be alert to odors and symptoms such as headache, nausea, dizziness, and central nervous deprecation.<br>• If any suspicion of hazardous gas should arise, relocate to a safe, well ventilated area.<br>• Carbon monoxide and hydrogen sulfide are two gases known to be in manholes.<br>• Carbon monoxide is a colorless, odorless gas that is also poisonous and flammable. Inhalation causes headache, dizziness, weakness of limbs, confusion, nausea, unconsciousness and finally death. If a person breaths large amounts of this chemical, move the exposed person to fresh air immediately. If breathing has stopped perform mouth to mouth resuscitation. Keep affected person warm and at rest. Get |

| DATE PREPARED: March 2014 | PREPARED BY: Bryan Starks | | JOB DESCRIPTION: Outfall Reconnaissance Inventory |
|---|---|---|---|
| **STEP/TASK** | **HAZARDS** | | **HAZARD CONTROLS** |
| ORI Continued | **Chemical Hazards Continued** | Potential Hazardous Gases Continued | medical attention as soon as possible.<br>• Hydrogen sulfide is a colorless gas having the odor of rotten eggs. It is flammable and poisonous. Causes of olfactory fatigue, causing the sense of smell to be an unreliable indication of presence. Exposure to very high concentrations causes immediate death. Also death or permanent injury may occur after very short exposure in small quantities. It acts directly upon the nervous system resulting in paralysis of respiratory centers. If inhaled, move victim to fresh air. If no pulse is detected, provide CPR. If not breathing provide artificial respiration. Seek medical assistance.<br>• If oxygen concentration is less than 19% or over 23.5% it is considered a hazardous atmosphere and should not be entered without a permit. |
| | **Physical Hazards** | High Traffic Areas | • Check traffic before crossing roads.<br>• Use proper PPE, including steel toed shoes & reflective safety vest.<br>• All traffic rules and regulations should be obeyed. |
| | | Slip/Trip/Fall Sharp Edges | • Do not enter manholes, pipes, and other confined spaces unless certified.<br>• Survey conditions before entering site.<br>• Wear proper shoes to avoid slip and fall.<br>• Be aware of your surroundings.<br>• Do not lean over edge of pier.<br>• Always conduct outfall investigation in pairs. |
| | | Inclement Weather | • Site Safety Officer will determine if conditions are safe to conduct ORI. |
| | | Lifting Injuries | • Request help lifting or moving heavy objects such as manhole covers. |
| | | Drowning | • Conduct all ORI activities in pairs.<br>• Personnel working over or near water shall be provided with USCG-approved personal flotation device, which shall be worn whenever there is a potential drowning hazard. |
| | | Confined Spaces | • A confined space is any space that is large enough for a work to enter and perform work, not designed for continuous worker occupancy and is difficult to enter or exit.<br>• A confined space that has one or more of the following characteristic: contains or has the potential to contain a hazardous atmosphere; contains a material that has the potential to engulf an entrant; or contains any other recognized safety or health hazard, such as unguarded machinery, exposed live wires, or heat stress, requires a permit before entry. DO NOT enter if any of these hazards are present. Entry is only permitted after obtaining permit and wearing Level B PPE.<br>• Confined spaces can subject personnel to accumulation of toxic or flammable contaminates, contain physical hazards, or have an oxygen-deficient atmosphere. |

| **DATE PREPARED:**<br>March 2014 | **PREPARED BY:**<br><br>Bryan Starks | | **JOB DESCRIPTION:**<br><br>Outfall Reconnaissance Inventory |
|---|---|---|---|
| **STEP/TASK** | **HAZARDS** | | **HAZARD CONTROLS** |
| ORI Continued | **Physical Hazards Continued** | Confined Spaces Continued | • Any entrant and entry supervisor must be present and properly trained.<br>• Entrants should be familiar with specific duties required of them.<br>• Know and understand the hazards of the specific confined space (all confined spaces are different and complex).<br>• Use the equipment required for safe entry.<br>• Communicate with attendant as necessary and/or required.<br>• Alert the attendant immediately if any warning signs or symptoms of exposure are detected, or any condition not allowed by the permit is detected.<br>• Exit from the space immediately if any order to evacuate is given by the attendant or entry supervisor, the entrant recognizes any warning signs or symptoms of exposure, the entrant detects a prohibited condition, or an evacuation alarm is activated.<br>• No task involving a confined space may begin until an initial evaluation is made of the hazards including:<br>o An evaluation of oxygen content, flammable/explosive atmosphere, and potential or known contaminates.<br>o An evaluation of potential sources of engulfment, internal configurations or conditions that could trap or asphyxiate entrants, or other recognizable safety or health hazards.<br>• ORI personnel will take atmospheric reading using a gas meter outside of the pier, at the midpoint, and at the outfall.<br>• ORI personnel will record gas monitor readings on the confined space permit. |
| | **Biological Hazards** | Animals | • Personnel should be aware of organisms in their area.<br>• Do not touch organisms growing on piers. Pier based organisms can cut the skin, secrete irritants and toxins and cause other harm to personnel. |
| | | Insects | • Inform Site Safety Officer of any allergies.<br>• Be aware of surroundings and inspect area around storm drains before approaching. |
| | | Illicit Discharge (Sewage) | • Wear proper PPE.<br>• Avoid contact with unknown illicit discharge. |

APPENDIX I

NIOSH Chemical Safety Sheets

# International Chemical Safety Cards

## HYDROGEN SULFIDE

ICSC: 0165

Sulfur hydride
$H_2S$
Molecular mass: 34.1
(cylinder)

ICSC # 0165
CAS # 7783-06-4
RTECS # MX1225000
UN # 1053
EC # 016-001-00-4
April 10, 2000 Validated

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Extremely flammable. | NO open flames, NO sparks, and NO smoking. | Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out; in other cases extinguish with water spray, powder, carbon dioxide. |
| **EXPLOSION** | Gas/air mixtures are explosive. | Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding) if in liquid state. Do NOT use compressed air for filling, discharging, or handling. | In case of fire: keep cylinder cool by spraying with water. |
| **EXPOSURE** | | AVOID ALL CONTACT! | IN ALL CASES CONSULT A DOCTOR! |
| **• INHALATION** | Headache. Dizziness. Cough. Sore throat. Nausea. Laboured breathing. Unconsciousness. Symptoms may be delayed (see Notes). | Ventilation, local exhaust, or breathing protection. | Fresh air, rest. Half-upright position. Artificial respiration may be needed. No mouth-to-mouth artificial respiration. Refer for medical attention. |
| **• SKIN** | ON CONTACT WITH LIQUID: FROSTBITE. | Cold-insulating gloves. | ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention. |
| | Redness. Pain. Severe deep | Safety goggles, or eye protection | First rinse with plenty of water for |

| | | | |
|---|---|---|---|
| • EYES | burns. | in combination with breathing protection. | several minutes (remove contact lenses if easily possible), then take to a doctor. |
| • INGESTION | | Do not eat, drink, or smoke during work. | |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Evacuate danger area! Consult an expert! Remove all ignition sources. Ventilation. Remove gas with fine water spray. Personal protection: gas-tight chemical protection suit including self-contained breathing apparatus. | Fireproof. Separated from strong oxidants. Cool. Keep in a well-ventilated room. Install continous monitoring system with alarm. | F+ symbol<br>T+ symbol<br>N symbol<br>R: 12-26-50<br>S: 1/2-9-16-36-38-45-61<br>UN Hazard Class: 2.3<br>UN Subsidiary Risks: 2.1 |

**SEE IMPORTANT INFORMATION ON BACK**

**ICSC: 0165**



# International Chemical Safety Cards

## HYDROGEN SULFIDE

**ICSC: 0165**

**IMPORTANT DATA**

**PHYSICAL STATE; APPEARANCE:**
COLOURLESS COMPRESSED LIQUEFIED GAS , WITH CHARACTERISTIC ODOUR OF ROTTEN EGGS.

**PHYSICAL DANGERS:**
The gas is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

**CHEMICAL DANGERS:**
Heating may cause violent combustion or explosion. The substance decomposes on burning producing toxic gases (sulfur oxides). Reacts violently with strong oxidants, causing fire and explosion hazard. Attacks many metals and some plastics.

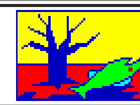
**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: 10 ppm as TWA; 15 ppm as STEL; (ACGIH 2004).
MAK: 5 ppm, 7.1 mg/m$^3$;
Peak limitation category: I(2); Pregnancy risk group: C;
(DFG 2006).
OSHA PEL†: C 20 ppm 50 ppm 10-minute maximum peak
NIOSH REL: C 10 ppm (15 mg/m$^3$) 10-minute

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation.

**INHALATION RISK:**
A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

**EFFECTS OF SHORT-TERM EXPOSURE:**
The substance is irritating to the eyes and the respiratory tract . The substance may cause effects on the central nervous system . Exposure may result in unconsciousness. Exposure may result in death. Inhalation of gas may cause lung oedema (see Notes). The effects may be delayed. Medical observation is indicated. Rapid evaporation of the liquid may cause frostbite.

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**

| | |
|---|---|
| | NIOSH IDLH: 100 ppm See: 7783064 |
| **PHYSICAL PROPERTIES** | Boiling point: -60°C<br>Melting point: -85°C<br>Solubility in water, g/100 ml at 20°C: 0.5<br>Relative vapour density (air = 1): 1.19<br>Flash point: Flammable Gas<br>Auto-ignition temperature: 260°C<br>Explosive limits, vol% in air: 4.3-46 |
| **ENVIRONMENTAL DATA** | The substance is very toxic to aquatic organisms.  |

**NOTES**

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. The substance blocks the sense of smell. The odour warning when the exposure limit value is exceeded is insufficient. Card has been partly updated in October 2004: see sections Occupational Exposure Limits, EU classification, Emergency Response. Card has been partly updated in October 2006: see sections Occupational Exposure Limits.

Transport Emergency Card: TEC (R)-20G2TF or 20S1053

NFPA Code: H4; F4; R0;

**ADDITIONAL INFORMATION**

**ICSC: 0165** **HYDROGEN SULFIDE**



| | |
|---|---|
| **IMPORTANT LEGAL NOTICE:** | Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values. |

# International Chemical Safety Cards

## CARBON MONOXIDE

ICSC: 0023

Carbon oxide
Carbonic oxide
CO
Molecular mass: 28.0
(cylinder)

ICSC # 0023
CAS # 630-08-0
RTECS # FG3500000
UN # 1016
EC # 006-001-00-2
April 19, 2007 Validated

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Extremely flammable. Heating will cause rise in pressure with risk of bursting. | NO open flames, NO sparks, and NO smoking. | Shut off supply; if not possible and no risk to surroundings, let the fire burn itself out; in other cases extinguish with carbon dioxide, water spray, powder. |
| **EXPLOSION** | Gas/air mixtures are explosive. | Closed system, ventilation, explosion-proof electrical equipment and lighting. Use non-sparking handtools. | In case of fire: keep cylinder cool by spraying with water. Combat fire from a sheltered position. |
| **EXPOSURE** | | AVOID EXPOSURE OF (PREGNANT) WOMEN! | IN ALL CASES CONSULT A DOCTOR! |
| **• INHALATION** | Headache. Confusion. Dizziness. Nausea. Weakness. Unconsciousness. | Ventilation, local exhaust, or breathing protection. | Fresh air, rest. Artificial respiration may be needed. Refer for medical attention. See Notes. |
| **• SKIN** | | | |
| **• EYES** | | | |
| **• INGESTION** | | | |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Evacuate danger area! Remove all ignition sources. Consult an expert! Personal protection: self-contained breathing apparatus. Ventilation. | Fireproof. Cool. Keep in a well-ventilated room. | Note: E<br>F+ symbol<br>T symbol<br>R: 12-23-48/23-61 |

| | | |
|---|---|---|
| | | S: 53-45<br>UN Hazard Class: 2.3<br>UN Subsidiary Risks: 2.1<br>Signal: Danger<br>Flame-Cylinder-Skull-Health haz<br>Extremely flammable gas<br>Contains gas under pressure; may explode if heated<br>Fatal if inhaled<br>May damage fertility or the unborn child if inhaled<br>Causes damage to blood if inhaled<br>Causes damage to blood and central nervous system through prolonged or repeated exposure if inhaled |

**SEE IMPORTANT INFORMATION ON BACK**

| | |
|---|---|
| **ICSC: 0023** | Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values. |

# International Chemical Safety Cards

## CARBON MONOXIDE

**ICSC: 0023**

| | | |
|---|---|---|
| **IMPORTANT DATA** | **PHYSICAL STATE; APPEARANCE:**<br>ODOURLESS, TASTELESS, COLOURLESS COMPRESSED GAS.<br><br>**PHYSICAL DANGERS:**<br>The gas mixes well with air, explosive mixtures are easily formed. The gas penetrates easily through walls and ceilings.<br><br>**CHEMICAL DANGERS:**<br>May react vigorously with oxygen, acetylene, chlorine, fluorine, nitrous oxide.<br><br>**OCCUPATIONAL EXPOSURE LIMITS:**<br>TLV: 25 ppm as TWA BEI issued (ACGIH 2006).<br>MAK: 30 ppm 35 mg/m³<br>Peak limitation category: II(1); Pregnancy risk group: B; BAT issued;<br>(DFG 2008).<br>OSHA PEL†: TWA 50 ppm (55 $mg/m^3$)<br>NIOSH REL: TWA 35 ppm (40 $mg/m^3$) C 200 ppm (229 $mg/m^3$)<br>NIOSH IDLH: 1200 ppm See: 630080 | **ROUTES OF EXPOSURE:**<br>The substance can be absorbed into the body by inhalation.<br><br>**INHALATION RISK:**<br>A harmful concentration of this gas in the air will be reached very quickly on loss of containment.<br><br>**EFFECTS OF SHORT-TERM EXPOSURE:**<br>The substance may cause effects on the blood , resulting in carboxyhaemoglobinemia and cardiac disorders . Exposure at high levels may result in death. Medical observation is indicated.<br><br>**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**<br>The substance may have effects on the cardiovascular system and central nervous system . May cause toxicity to human reproduction or development. |
| **PHYSICAL PROPERTIES** | Boiling point: -191°C<br>Melting point: -205°C<br>Solubility in water, ml/100 ml at 20°C: 2.3<br>Relative vapour density (air = 1): 0.97 | Flash point: Flammable Gas<br>Auto-ignition temperature: 605°C<br>Explosive limits, vol% in air: 12.5-74.2 |

| | |
|---|---|
| **ENVIRONMENTAL DATA** | |

**NOTES**

Carbon monoxide is a product of incomplete combustion of coal, oil, wood. It is present in vehicle exhaust and tobacco smoke. Depending on the degree of exposure, periodic medical examination is suggested. No odour warning if toxic concentrations are present. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available.

Transport Emergency Card: TEC (R)-20S1016 or 20G1TF

NFPA Code: H3; F4; R0

Card has been partially updated in November 2008: see Occupational Exposure Limits.

**ADDITIONAL INFORMATION**

**ICSC: 0023** **CARBON MONOXIDE**



| | |
|---|---|
| **IMPORTANT LEGAL NOTICE:** | Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values. |

# International Chemical Safety Cards

## SULFURIC ACID

ICSC: 0362

Sulfuric acid 100%
Oil of vitriol
$H_2SO_4$
Molecular mass: 98.1

ICSC # 0362
CAS # 7664-93-9
RTECS # WS5600000
UN # 1830
EC # 016-020-00-8
February 10, 2000 Validated

| TYPES OF HAZARD/ EXPOSURE | ACUTE HAZARDS/ SYMPTOMS | PREVENTION | FIRST AID/ FIRE FIGHTING |
|---|---|---|---|
| **FIRE** | Not combustible. Many reactions may cause fire or explosion. Gives off irritating or toxic fumes (or gases) in a fire. | NO contact with flammable substances. NO contact with combustibles . | NO water. In case of fire in the surroundings: powder, foam, carbon dioxide |
| **EXPLOSION** | Risk of fire and explosion on contact with base(s) , combustible substances , oxidants , reducing agents or water . | | In case of fire: keep drums, etc., cool by spraying with water but NO direct contact with water. |
| **EXPOSURE** | | PREVENT GENERATION OF MISTS! AVOID ALL CONTACT! | IN ALL CASES CONSULT A DOCTOR! |
| **• INHALATION** | Corrosive. Burning sensation. Sore throat. Cough. Laboured breathing. Shortness of breath. Symptoms may be delayed (see Notes). | Ventilation, local exhaust, or breathing protection. | Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention. |
| **• SKIN** | Corrosive. Redness. Pain. Blisters. Serious skin burns. | Protective gloves. Protective clothing. | Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention. |
| **• EYES** | Corrosive. Redness. Pain. Severe deep burns. | Face shield or eye protection in combination with breathing protection. | First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor. |
| | Corrosive. Abdominal pain. | Do not eat, drink, or smoke | Rinse mouth. Do NOT induce |

| | | | |
|---|---|---|---|
| **• INGESTION** | Burning sensation. Shock or collapse. | during work. | vomiting. Refer for medical attention. |

| SPILLAGE DISPOSAL | STORAGE | PACKAGING & LABELLING |
|---|---|---|
| Consult an expert! Evacuate danger area! Do NOT absorb in saw-dust or other combustible absorbents. Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. | Separated from combustible and reducing substances, strong oxidants, strong bases, food and feedstuffs , incompatible materials . See Chemical Dangers. May be stored in stainless steel containers. Store in an area having corrosion resistant concrete floor. | Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs.<br>Note: B<br>C symbol<br>R: 35<br>S: 1/2-26-30-45<br>UN Hazard Class: 8<br>UN Packing Group: II |

**SEE IMPORTANT INFORMATION ON BACK**

| | |
|---|---|
| **ICSC: 0362** | Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values. |

# International Chemical Safety Cards

## SULFURIC ACID

**ICSC: 0362**

**I M P O R T A N T D A T A**

**PHYSICAL STATE; APPEARANCE:**
COLOURLESS , OILY , HYGROSCOPIC LIQUID , WITH NO ODOUR.

**PHYSICAL DANGERS:**

**CHEMICAL DANGERS:**
The substance is a strong oxidant and reacts violently with combustible and reducing materials. The substance is a strong acid, it reacts violently with bases and is corrosive to most common metals forming a flammable/explosive gas (hydrogen - see ICSC 0001). Reacts violently with water and organic materials with evolution of heat (see Notes). Upon heating, irritating or toxic fumes (or gases) (sulfur oxides) are formed.

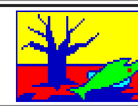
**OCCUPATIONAL EXPOSURE LIMITS:**
TLV: 0.2 mg/m³
Thoracic fraction
A2 (suspected human carcinogen);
(sulfuric acid contained in strong inorganic acid mists)
(ACGIH 2005).
MAK: (Inhalable fraction) 0.1 mg/m³;
Peak limitation category: I(1); Carcinogen category: 4; Pregnancy risk group: C;
(DFG 2004).
OSHA PEL: TWA 1 mg/$m^3$

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

**INHALATION RISK:**
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.

**EFFECTS OF SHORT-TERM EXPOSURE:**
Corrosive. The substance is very corrosive to the eyes, the skin and the respiratory tract. Corrosive on ingestion. Inhalation of an aerosol of this substance may cause lung oedema (see Notes).

**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
Lungs may be affected by repeated or prolonged exposure to an aerosol of this substance. Risk of tooth erosion upon repeated or prolonged exposure to an aerosol of this substance. Strong inorganic acid mists containing this substance are carcinogenic to humans.

| | |
|---|---|
| | NIOSH REL: TWA 1 mg/m$^3$<br>NIOSH IDLH: 15 mg/m$^3$ See: 7664939 |
| **PHYSICAL PROPERTIES** | Boiling point (decomposes): 340°C<br>Melting point: 10°C<br>Relative density (water = 1): 1.8<br>Solubility in water:<br>miscible<br>Vapour pressure, kPa at 146°C: 0.13<br>Relative vapour density (air = 1): 3.4 |
| **ENVIRONMENTAL DATA** | The substance is harmful to aquatic organisms.  |

**NOTES**

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. NEVER pour water into this substance; when dissolving or diluting always add it slowly to the water. Other UN numbers: UN1831 Sulfuric acid, fuming, hazard class 8, subsidiary hazard 6.1, pack group I; UN1832 Sulfuric acid, spent, Hazard class 8, Pack group II. Card has been partly updated in October 2005. See sections Occupational Exposure Limits, Emergency Response.

Transport Emergency Card: TEC (R)-80S1830 or 80GC1-II+III

NFPA Code: H 3; F 0; R 2; W
Card has been partially updated in January 2008: see Fire fighting.

**ADDITIONAL INFORMATION**

**ICSC: 0362** **SULFURIC ACID**



| | |
|---|---|
| **IMPORTANT LEGAL NOTICE:** | Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values. |

APPENDIX II

Department of Transportation – Harbors Division's

Outfall Reconnaissance Inventory and Inspection Program

(Section 3 Excerpt)

# Outfall Reconnaissance Inventory and Inspection Program

**FINAL**

## Stormwater Best Management Practices
## Honolulu and Kalaeloa Barbers Point Harbors, Hawaii

**Prepared for**
**Hawaii Department of Transportation**
**Harbors Division**

**Prepared by**

**Weston Solutions, Inc.**
**841 Bishop Street, Suite 2301**
**Honolulu, HI 96813**

**February 2014**

**Storm Water Best Management Practices**
**Honolulu and Kalaeloa Barbers Point Harbors, Hawaii**

I understand, agree to, and will conform to the information set forth in this Outfall Reconnaissance Inventory and Inspection Program. Conformance to these plans is required of all personnel conducting inspections.

| Name | Signature | Date |
|---|---|---|
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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACR | Annual Compliance Report |
| amsl | Above Mean Sea Level |
| BMP | Best Management Practice |
| CAC | Common Access Card |
| CB | Citizens' Band |
| DHS | U.S. Department of Homeland Security |
| DOT – Harbors | Hawaii Department of Transportation – Harbors Division |
| HASP | Health and Safety Plan |
| HDOH | Hawaii Department of Health |
| IDDE | Illicit Discharge Detection and Elimination |
| NIOSH | National Institute for Occupational Safety and Health |
| ORIIP | Outfall Reconnaissance Inventory and Inspection Program |
| OSHA | Occupational Safety and Health Administration |
| PPE | Personal Protective Equipment |
| SSHSP | Site Specific Health and Safety Plan |
| TWIC | Transportation Worker Identification Card |
| WESTON | Weston Solutions, Inc. |

## 3.0 ORIIP INSPECTIONS

The following section provides procedures and reference information planning, scheduling and safely performing dry and wet weather outfall inspections at the applicable Harbors. Harbors Environmental Section will conduct dry and wet weather observations of outfalls, as described below. A flowchart presenting the ORIIP process is attached as Appendix E.

## 3.1 PREPARATORY PROCEDURES

The following procedure is to be followed for gaining access for dry weather inspections at Honolulu and Kalaeloa Barbers Point Harbor. Harbors Environmental Section will schedule the outfall inspection based on the environmental conditions required. Harbors Environmental Section will confirm that all field personnel have access to the Harbor, and have applied and been approved for a Transportation Worker Identification Credential (TWIC) card or a Common Access Card (CAC). Access to these restricted areas is enforced by Department of Transportation (DOT) Harbors, Department of Homeland Security, and the United States Coast Guard. Field personnel should have documentation and identification available upon request while in these restricted areas. It is common for the Coast Guard to approach personnel and ask questions about field activities. Large commercial shipping vessels and tug boat operators often notify the Harbors Traffic Control about ORIIP personnel's presence in the harbor.

Harbors Environmental Section will verify that there are no conflicts with the various commercial fueling activities in the harbor. They will also notify the Harbors Traffic Control of when the ORIIP activities will be implemented.

### 3.1.1 PREPARING FIELD EQUIPMENT

The challenges presented by the tidal fluctuation can complicate inspection scheduling and add another dimension to jobsite safety. For this reason, field personnel need to ensure that all of the equipment that will be used during ORIIP activities has been inspected for defects and is in full working order prior to field work. The following sections describe the equipment and resources required to complete the ORIIP.

### 3.1.2 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) is essential for the safe completion of ORIIP. Appendix D attached to this ORIIP contains the equipment required to safely complete field activities. Field personnel shall familiarize themselves with the proper operation and maintenance of all equipment needed to complete the ORIIP.

### 3.1.3 INSPECTION EQUIPMENT

Field activities will require a variety of equipment. Wet and dry weather require different equipment and different levels of effort. Appendix A attached to this ORIIP contains the equipment required to complete field activities.

## 3.2 FIELD LOGISTICS

This section describes the procedures that field personnel should observe during field activities. All inspections should follow these procedures. Unexpected situations may arise in the harbor due to weather, other vessel movements, etc. that require deviations from procedures. In such cases, the Site Manager will assess the situation and use discretion with safety of all field personnel in mind. Communication should be maintained between crew members and the Harbors Traffic Control (during activities in Harbor waters).

### 3.2.1 PERSONNEL

All operations and personnel having the potential for exposure to site hazards are subject to the requirements of this ORIIP and the Site Specific Health and Safety Plan (SSHSP). The Site Manager will be identified prior to mobilization and will be the highest ranking personnel in the field. The Site Manager will serve as the Site Safety Officer (SSO) for the activities and will be responsible for implementation of the ORIIP Plan and oversight of the field personnel. The Site Manager will be selected by Harbors Environmental Section prior to mobilization.

The Site Manager working under the task is responsible for the following:

1) Providing field personnel with appropriate training, medical certification, and ensuring that personnel have read, understand, and will comply with this ORIIP;
2) Providing equipment that is safe for operations and free from any obvious hazards;
3) Providing and documenting inspections of equipment and tasks, as necessary, to comply with applicable regulations;
4) Providing documentation that field personnel have appropriate training and medical certification and ensuring that personnel have read, understand, and will comply with this ORIIP;
5) Overseeing field personnel with respect to ensuring a safe work environment and that work practices are consistent with the provisions of this ORIIP, the Occupational Safety and Health Administration (OSHA), and standard industry practices; and
6) Conducting an initial project briefing and daily “tailgate” safety meetings.

Personnel will pre-notify impacted parties, mobilize the required equipment, and conduct the inspections. ORIIP personnel will need to coordinate the loading and transportation of the kayak and other gear to one of the boat launch locations.

Inspections performed from the water must be supported by an on-shore crew. All movements through the harbor waters will be coordinated with the Harbors Traffic Control. Communication between the kayak and off-shore crews shall be maintained whenever possible to ensure the safety of all personnel. Kayak personnel will inspect each outfall and complete the ORIIP Form for each location, as described by Section 3.3. As described in more detail in Section 3.3.2, and the Enforcement Response Plan, upstream nodes will be observed by the on-shore crew when an illicit discharge is suspected and personnel will use their best efforts to identify the source and contact the responsible party and/or the appropriate regulatory agencies. Harbors Environmental Section will follow up where necessary, as described by the Enforcement Response Plan.

### 3.2.2 HARBORS TRAFFIC CONTROL COMMUNICATION

The ORIIP Site Manager shall coordinate with DOT Harbors District Office to notify the Harbors Traffic Control prior to inspections and any movement in the Harbor waters. Citizens' Band (CB) radios are used by field personnel to communicate with the Harbors Traffic Control (Channel 12). Specific vernacular are used during these communications. ORIIP personnel will notify the Harbors Traffic Control of their plans to change location and to request a no wake zone. Wakes can be a danger to inspection personnel.

Typical communications about a change of location in the harbors are as follows:

**ORIIP personnel:** *"Aloha Tower, this is Harbors Engineering."*
**Harbors Traffic Control:** *"Harbors Engineering, this is Aloha Tower."*
**ORIIP personnel:** *"Aloha Tower, Harbors Engineering would like to request to move from <u>current location</u> (e.g., Pier #51) to <u>future location</u> (e.g., Pier #38).*
**Harbors Traffic Control:** *Their response varies depending on other vessels' movements (i.e., "Okay, Harbors Engineering, proceed to Pier #38).*

### 3.2.3 MOBILIZATION

Mobilizing the equipment to the various sites around the harbor will require personnel with a working knowledge of pier locations and restricted area locations. Personnel will have TWIC or CAC cards available and all required PPE and equipment. Dry weather inspections will require a much higher level of effort.

Boat launch locations for Honolulu Harbor are located at Piers 5, 23, 36, and at the Sand Island launch ramp adjacent to the Hawaiian Marine Educational and Training Center. Honolulu Harbor locations are located near Revetments P05-01, P23-03, and P36-01 (see Figure 1 for details). If necessary, Kalaeloa boat launch locations are located at the Kalaeloa Barbers Point Harbor Revetments BP-01 and BP-24 (see Figure 2 for details).

### 3.3 DRY WEATHER OUTFALL INSPECTIONS

Dry weather inspections are conducted for illicit discharge detection and assessment of the outfall structures. For the ORIIP, dry weather is considered when there is less than 0.1" of rain during a 72 hour period preceding an inspection. Dry weather inspections are to be conducted annually on outfalls with an overall outfall characterization of potential, suspect or obvious as determined by the previous year's inspection findings. All outfalls (including those with an overall outfall characterization of unlikely, see section 6 of the ORIIP form in Appendix B) are to be inspected every 2 years.

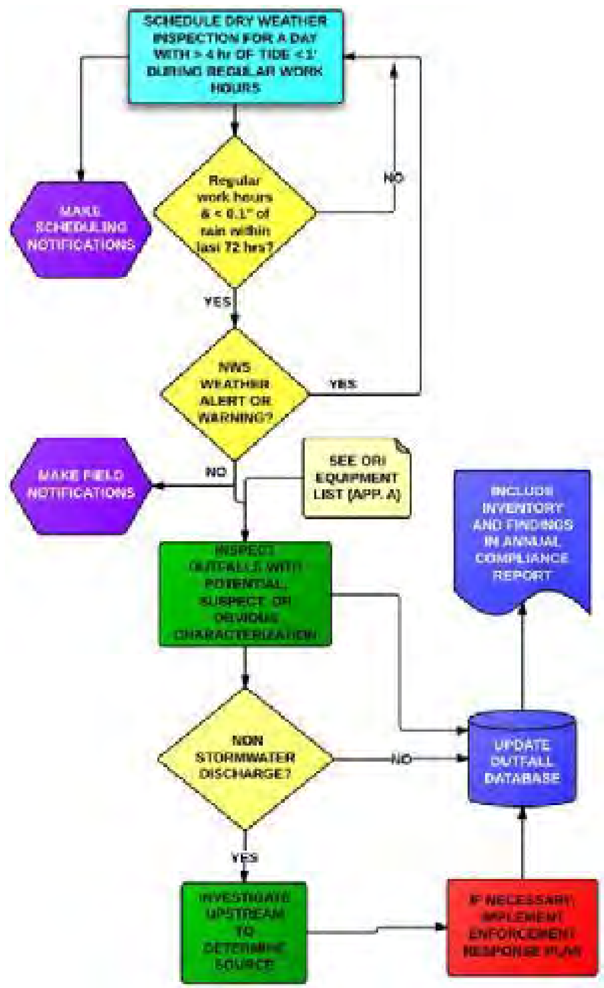
Dry weather inspections should coincide with low-tide conditions to increase probability that the outfall will be exposed. Field events should be scheduled such that field personnel can safely enter areas beneath the piers, inspect outfall conditions, and exit said areas during tidal periods corresponding to water levels below 1-foot above mean lower low water (mllw). Areas that have been determined to be too dangerous to enter have been identified on the maps provided in Figures 1 and 2. Observations of these outfalls must be conducted at an upstream node or in way that does not require personnel to enter beneath the pier. At no time, regardless of tidal conditions, will personnel be allowed to enter under the pier in these areas.

In addition to the identified areas, water levels higher than 1-foot mllw are considered too dangerous for personnel to be under any piers. Schedules should indicate time frames where inspections of outfalls beneath the piers can take place and field crews should plan accordingly to efficiently complete the ORIIP. Equipment should be inspected prior to field activities to maximize operations during extreme low tide.

Inspections cannot be scheduled in areas where vessels are being actively fueled. DOT Harbors District Office needs to be contacted once a draft schedule has been produced (based on tidal considerations), so fueling schedules can be reconciled with ORIIP activities.

Inspections should all be accomplished during daylight hours. Other harbor activity can affect the schedule, including loading and unloading of cargo ships, storms, high surf, etc. These and other factors all need to be considered during the scheduling production.

Field personnel need to be able to recognize scheduling conditions that could pose a safety threat during inspections. ORIIP activities should be postponed if any situation arises that poses an unacceptable safety threat to field personnel (e.g., tsunami warning, hurricane warning, etc.). Field personnel should make real time decisions about the conditions in the water, to ensure timely, but safe inspections. The Harbors Environmental Section will be responsible for postponing and rescheduling any ORIIP inspection.




Outfall inspections are conducted using the ORIIP Form, attached as Appendix B. The form has seven sections that cover both wet and dry inspection scenarios. Field personnel will use the form to describe flow conditions using physical factors like odor, turbidity, color, and the presence of floatables or sheen in order to recognize illicit discharges. Information required to complete the ORIIP Form includes background data, outfall description, quantitative flow characterization, and physical indicators of flowing and non-flowing outfalls. The current list of outfalls is attached as Appendix C.

### 3.3.1 OBSERVATION OF FLOWS

Potential problems are indicated by outfalls that are flowing in dry weather and/or foul odors or discolored water in or around the outfall pipe. Common illicit discharges observed during dry weather include discharges of wash water, process water, sewage, contaminated condensate runoff, or other forms of waste. Not all non-stormwater discharges are illicit. For example, non-contaminated landscape irrigation runoff or air conditioner condensate discharges are allowable non-stormwater discharges. As described below, any dry weather discharge should be documented.

When flows are observed, ORIIP personnel will attempt to first determine the source of the flow, while considering groundwater or tidal influence. Field crews will photograph and/or video the discharge, estimate the flow volume, and, if necessary, collect a sample. Field crews will document the source after conducting a quick visual inspection of the surrounding area. If the source cannot be easily observed, field crews should follow the procedure described in Section 3.3.2. If further investigation is needed, Harbors Environmental Section will follow up, identify the source and contact the responsible party and the appropriate regulatory agencies where necessary, as described by the Enforcement Response Plan.

### 3.3.2 SOURCE IDENTIFICATION

This section outlines the basic tools to be used to trace the source of a suspected illicit discharge. Source tracing begins when an unknown dry weather flowis identified through the ORIIP, field assessment/testing, or a complaint call. When the source of the non-stormwater discharge is not known, one of two primary methods can be used to locate the source of an illicit discharge: Method A – Drainage Area Investigations or Method B – Storm Drain Network Investigations. The method used will depend on the type of information collected or reported, level of understanding of the drainage network, and existing knowledge of operations and activities on the surrounding properties.

<u>Method A – Drainage Area Investigations</u>
The source of some illegal discharges can be determined through a survey or analysis of the drainage area of the problem outfall. Drainage area investigations are particularly useful when the discharge observed at the outfall has a distinct or unique characteristic that can allow field crews to quickly determine the type of activity or non-point source that is generating the discharge. One-time illegal discharges (such as a surface spill or intentional dumping into the storm drain system) are usually best investigated using Method A, given the short-term nature of the discharge.

Drainage area investigations should begin with a discussion between the field crews, inspectors, engineers, and other knowledgeable staff to identify the type of site most likely to produce the observed discharge. The following table shows some of the activities or land uses most likely associated with specific discharge problems.

| **COMMON DISCHARGES AND POTENTIAL SOURCES** | **OBSERVED DISCHARGE POTENTIAL CAUSES** |
|---|---|
| Sediment | Construction activity without proper erosion and sediment controls<br>Outdoor work areas or material storage areas |
| Oil | Fueling operations<br>Vehicle or machinery maintenance activities |
| Sudsy discharge | Power washing of buildings<br>Vehicle or equipment washing operations<br>Mobile cleaning crew dumping<br>Laundry or Cleaner greywater discharge |
| Grease | Restaurant sink drain connection to stormwater system |
| Sewage | Failing or leaking septic systems |

Staff will make a list of likely discharge sources and then field crews will conduct a windshield survey of the drainage area to confirm and identify potential sources of the discharge. Once potential discharge sites are identified, staff will conduct individual site inspections to locate the specific source of the illegal discharge. In some cases, dye testing may be needed to confirm that a suspected activity is actually draining into the storm drain network. All drainage area investigations will be documented on the ORIIP Form in Appendix B.

<u>Method B – Storm Drain Network Investigations</u>
The source of some illicit connections or discharges can be located by systematically isolating the area from which the polluted discharge originates. This method involves progressive investigation at manholes in the storm drain network to narrow down the location where the illegal discharge is entering the drainage system. Field crews should work progressively upstream from the outfall and inspect manholes until indicators reveal the discharge is no longer present. Manhole observations can be time consuming, but they are generally a necessary step before conducting other tests.

Storm drain network investigations include the following steps: 1. Consult the drainage system map and identify the major branches. If the drainage map is incomplete, sketches of the system shall be made and the system shall be identified for adding to DOT Harbor's drainage system map. 2. Starting from the outfall, observe the next upstream manhole or junction to see if there is evidence of polluted discharge. As with the ORIIP inspections, field crews are looking for the presence of flow during dry weather, foul odors, colors or stained deposits, oily sheen, floatable materials, and/or other unusual observations. 3. Repeat observations at each upstream manhole or junction until a junction is found with no evidence of discharge; the discharge source is likely located between the junction with no evidence of discharge and the next downstream junction. 4. Work downstream from the "clean" manhole or junction to isolate the location where the polluted discharge is entering the storm drain system. 5. Document all findings.

If the flow is illicit and originates within the Harbors property DOT Harbors shall ensure the connection is disconnected or flow from the source is identified. If the flow originates outside of DOT Harbors' or DOT's property, DOT Harbors will notify the Hawaii Department of Health (HDOH). HDOH shall inform the adjoining jurisdiction or property owner in writing that the flow is entering DOT Harbors small Municipal Separate Storm Sewer System (MS4) and copy DOT Harbors.

When visual inspections are not enough to isolate the source of the illegal discharge, a number of additional field tests can be performed. These include: Dye testing, Video Testing/Camera-ing/TVing, smoke testing.

Forms and information will be included in the Annual Compliance Report as well as reviewed prior to the following ORIIP event. Any illicit discharges which are determined to be coming from a tenant or construction site will initiate a re-evaluation of the tenant or construction site in accordance with the Tenant Inspection Manual or the Construction Site Runoff Control Program.

## 3.4 WET WEATHER OUTFALL INSPECTIONS

The goal for wet weather inspections is to assess HDOT Harbors' Best Management Practice (BMP) performance. Wet weather inspections are only conducted during regular business hours when rainfall greater than 0.1" per hour is recorded. Personnel must field verify that adequate precipitation has occurred to initiate sufficient flow through the drainage system to make useful observations.

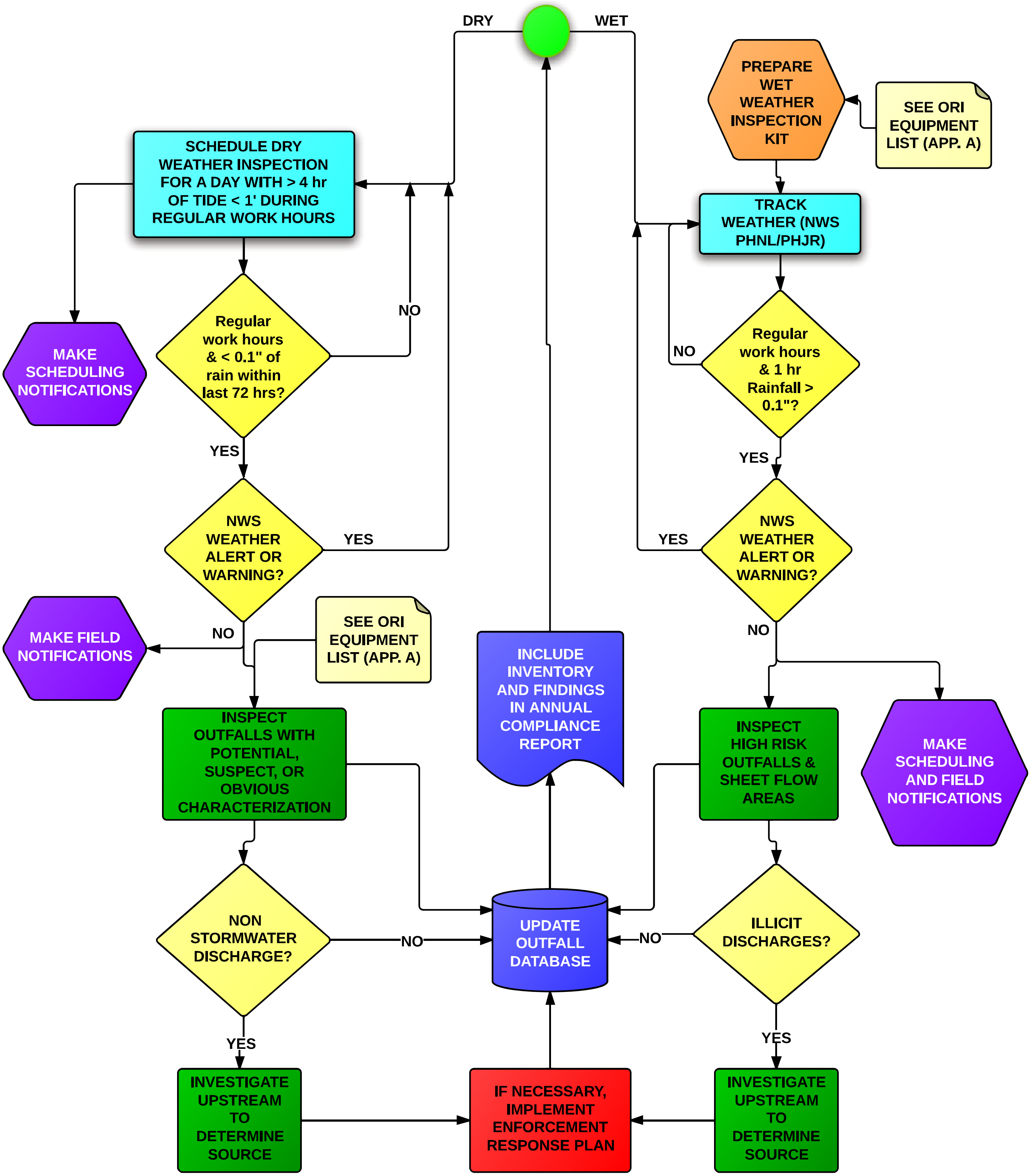
The weather station located at Honolulu International Airport (Station ID 91182, PHNL) as reported by the National Oceanic and Atmospheric Administration (NOAA) is in proximity of Honolulu Harbor but could potentially not be representative of the actual rainfall. Field observations must be conducted to support PHNL rainfall data.

The weather station located at Kalaeloa Airport (PHJR) as reported by NOAA is in proximity of Kalaeloa Barbers Point Harbor but could potentially not be representative of the actual rainfall. Field observations must be conducted to support PHJR rainfall data.

# ORIIP APPENDIX E

# ORIIP PROCESS FLOWCHART

# ORI Process Flow Chart



# CD Deliverable

# Final

# Construction Site Runoff Control Program


**State of Hawaii**
**Department of Transportation**
**Harbors Division**
**Hale Awa Ku Moku Building**
**79 South Nimitz Highway**
**Honolulu Hawaii 96813-5898**

**August 2014**

Version 10.0

# Final

# Construction Site Runoff Control Program

**State of Hawaii**
**Department of Transportation**
**Harbors Division**
**Hale Awa Ku Moku Building**
**79 South Nimitz Highway**
**Honolulu, Hawaii 96813-4898**

**“MĀLAMA I KE KAI”**
**Protect Our Ocean Water**

**August 2014**

Version 10.0

## Record of Revision

| Revision | Date | Description | Sections Affected |
|---|---|---|---|
| 1.0 | December 2012 | Initial Release | All |
| 2.0 | January 2013 | Version 2.0 | Most |
| 3.0 | February 2013 | Version 3.0 | Most |
| 4.0 | June 2013 | Version 4.0 | 3, 4, and 5 |
| 5.0 | July 2013 | Version 5.0 | 4, 5, 6, and 7 |
| 6.0 | October 2013 | Version 6.0 | All |
| 7.0 | February 2014 | Version 7.0 | All |
| 8.0 | May 2014 | Version 8.0 | All |
| 9.0 | May 2014 | Version 9.0 | 3, 4, and 5 |
| 10.0 | August 2014 | Version 10.0 | 1 |
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## List of Attachments

# List of Acronyms and Abbreviations

| | |
|---|---|
| % | Percent |
| ACR | Annual Compliance Report |
| ASCE | American Society of Civil Engineers |
| BMP | Best Management Practice |
| CCH | City and County of Honolulu |
| CFR | Code of Federal Regulations |
| CGP | Construction General Permit |
| CM | Construction Manager |
| CWA | Clean Water Act |
| CWB | Clean Water Branch |
| CZM | Coastal Zone Management |
| DA | Department of Army |
| ECO | Environmental Compliance Officer |
| EPA | Environmental Protection Agency |
| HAR | Hawaii Administrative Rules |
| HDOH | State of Hawaii, Department of Health |
| HDOT | State of Hawaii, Department of Transportation |
| MS4 | Municipal Separate Storm Sewer System |
| NAV | Notice of Apparent Violation |
| NFVO | Notice and Finding of Violation Order |
| NGPC | Notice of General Permit Coverage |
| NOI | Notice of Intent |
| NPDES | National Pollutant Discharge Elimination System |
| NTP | Notice to Proceed |
| NWP | Nationwide Permit 33 |
| PM | Project Manager |
| SWMP | Storm Water Management Plan |
| SWPPP | Storm Water Pollution Prevention Plan |
| USACE | United States Army Corps of Engineers |
| USC | United States Code |
| USCG | United States Coast Guard |
| WEF | Water Environment Federation |
| WQC | Water Quality Certification |

# Definitions of Key Terms

**Best Management Practices (BMPs)**: According to Title 40 of the Code of Federal Regulations [CFR] 122.2, they are defined as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of “waters of the United States.” BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

**Clean Water Act**: The Clean Water Act is an act passed by the U.S. Congress to control water pollution. It was formerly referred to as the Federal Water Pollution Control Act of 1972 or Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500), 33 U.S.C. 1251 et seq., as amended by Public Law 96-483, Public Law 97-117, and Public Laws 95-217, 97-117, 97-440, and 100-04.

**Code of Federal Regulations**: The document that codified all rules of the executive departments and agencies of the federal government. It is divided into fifty volumes, known as titles. Title 40 of the CFR (referenced as 40 CFR) lists all environmental regulations.

**Disturbance of Land**: Refers to the penetration, turning, or moving of soil or resurfacing of pavement or the exposure of bare soil or ground surface, including the land surface exposed by construction roads, baseyards, headquarters, and parking areas. It does not include grass or weed cutting, bush or tree trimming that leaves the soil or ground intact. It includes grubbing in its normal meaning of the use of equipment to knock down and push vegetation out of the way, typically uprooting vegetation and disturbing the ground surface.

**Harbors Enforcement Officer**: A Harbors Division employee authorized to issue criminal citations related to environmental compliance.

**Large Common Plan of Development or Sale**: It means a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan. “Common Plan” is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating construction activities may occur on a specific plot.

**Maximum Extent Practicable**: It means economically achievable measures for the control of the addition of pollutants from existing and new categories of point sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available point source pollution control practices, technologies, processes, siting criteria, operating methods or other alternatives.

**New Development:** shall mean new construction or installation of a building or structure or the creation of impervious surfaces that disturb greater than or equal to one acre, or less than one acre if it is part of a larger common plan of development or sale that would disturb one acre or more.

**Qualified Inspector:** Personnel who have met the training requirements in this document.

**Redevelopment**: shall mean development that would create or add impervious surface area on an already developed site. Redevelopment includes, but is not limited to any construction project that requires demolition or complete removal of existing structures or impervious surfaces at a site and replacement with new impervious surfaces. Maintenance activities such as top-layer grinding, repaving (where all pavement is not removed), and reroofing are not considered to be redevelopment. Interior remodeling projects and improvements are also not considered to be redevelopment.

**Storm Water Pollution Prevention Plan (SWPPP):** Hawaii Administrative Rules (HAR) 11-55, Appendix C, Section 7 requires the implementation of a SWPPP. It is a site-specific, written document that, among other things: (1) identifies potential sources of storm water pollution t the construction site; (2) describes storm water control measures to reduce or eliminate pollutants in storm water discharges from the construction site; and (3) identifies procedures the permittee will implement to comply with the terms and conditions of Notice of General Permit Coverage.

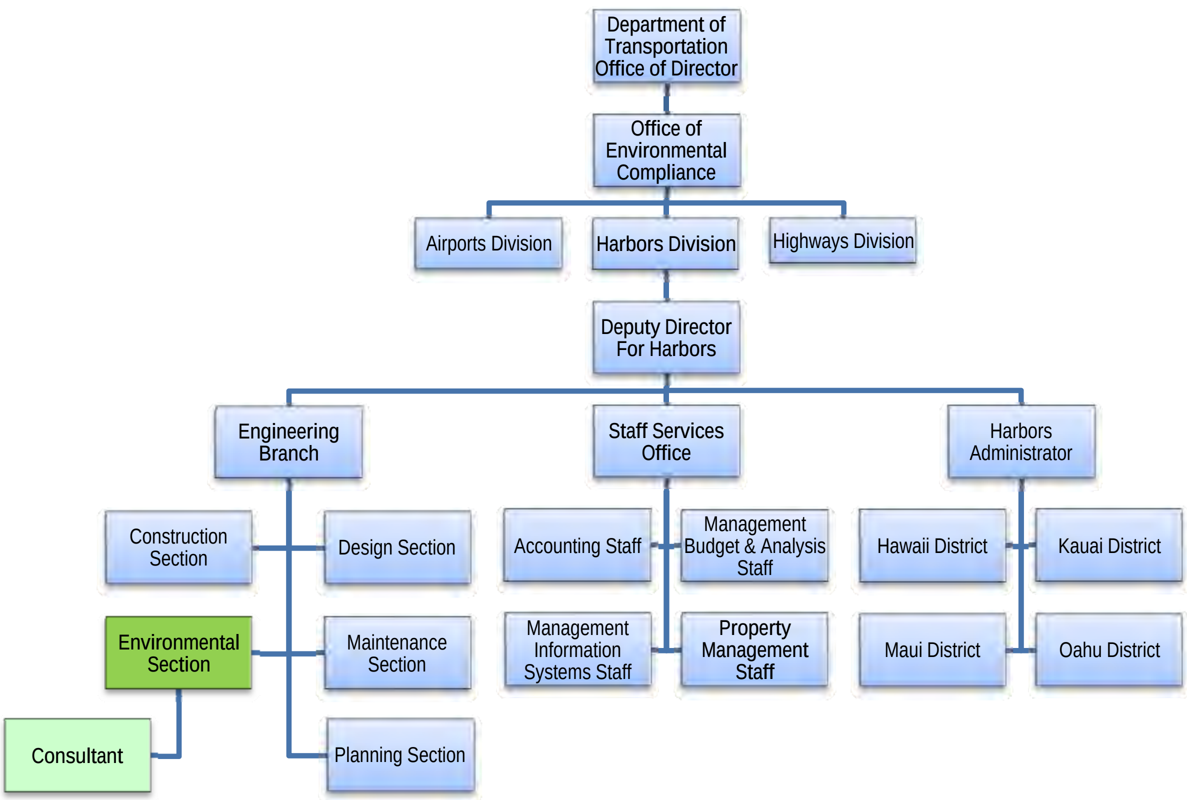
**State Waters**: It means all waters, fresh, brackish, or salt, around and within the State of Hawaii, including, but not limited to, coastal waters, streams, rivers, drainage ditches, ponds, reservoirs, canals, ground waters, and lakes; provided that drainage ditches, ponds, and reservoirs required as a part of a water pollution control system are excluded.

**Stormwater:** Stormwater runoff, snow melt runoff, and surface runoff and drainage.

**Tenant Improvement Projects**: Projects on Harbors' property undertaken by entities including tenants and easement holders who have leases or revocable permits that authorize the use of the property, or a project by any other entity with permission to construct the project on Harbors Division property.

## 1.0 INTRODUCTION

The Harbors **Construction Site Runoff Control Program** is an element of the Harbors MS4 program. This **Construction Site Runoff Control Program** seeks to limit the impact of construction activities on the storm water conveyance system and receiving water bodies. The program consists of a pre-construction design process; a during-construction inspection process; a compliance and enforcement process; a training program and a Construction Best Management Practices [BMP] field manual. This program is designed to guide Harbors personnel tasked with the responsibility of ensuring that construction projects discharging into Harbors' MS4 comply with Harbors' rules in order to protect Hawaii's ocean water from pollution.




This program is intended to be used by contractors, designers, tenants, developers, to comply with the Harbors' rules and regulations, HDOH NPDES permit requirements, and all other State, local, and Federal laws, rules and regulations through the use of the following attachments:

| | |
|---|---|
| **Attachment 1** | Construction Process Flow Charts |
| **Attachment 2** | Application for a Private Storm Drain Connection and/or Discharge Permit to the State of Hawaii Harbors Division Storm Drain System |
| **Attachment 3** | Construction Design Review Checklist |

| | |
|---|---|
| **Attachment 4** | Construction Site Best Management Practices Inspection Checklist |
| **Attachment 5** | Notification Forms for Project Less Than One Acre |
| **Attachment 6** | List of City and County of Honolulu BMPs for Construction |
| **Attachment 7** | Temporary Stormwater Pollution, Dust, and Erosion Control Specifications |
| **Attachment 8** | HDOT Harbors Rules and Regulations for Construction Site |
| **Attachment 9** | Suspected Illicit Discharge Reporting Form |
| **Attachment 10** | Training Materials |

## 2.0 CONSTRUCTION PROJECT DEFINITIONS AND GENERAL REQUIREMENTS

Construction projects are defined as activities that result in the disturbance of the land, including clearing, grading, excavating, and other similar activities. It also includes construction related activities that support the construction projects such as stockpiles, borrow areas, concrete truck washouts, fueling areas, material storage areas, and equipment storage areas (EPA, 2007). Construction activities that do not disturb land, such as interior remodeling (with no outside exposure of construction materials or construction waste to storm water), are not subject to the Harbors **Construction Site Runoff program**.

### 2.1 Applicability

Harbors implements this **Construction Site Runoff Control Program** at the following harbors:

- Honolulu Harbor (Oahu District)
- Kalaeloa Barbers Point Harbor (Oahu District)

These two harbors operate under small Municipal Separate Storm Sewer System [MS4] permits. The Permit File Numbers are ***HI 03KB482*** for Honolulu Harbor and ***HI 03KB488*** for Kalaeloa Barbers Point Harbor.

All construction projects are subject to the Harbors **Construction Site Run off Control Program** unless explicitly exempted under the conditions in 2.2. The Construction Site Runoff Control program requirements for Harbors and tenant construction projects are depicted in Figure 2-1.

Construction projects at Harbors are managed in two ways: 1) HDOT Harbors projects, which are managed by Division personnel, or 2) Tenant Improvement projects, which are managed by the entity authorized to undertake the project. Each of these types of projects is subject to the Harbors **Construction Site Runoff Control Program**.

Overall control of HDOT Harbors projects is by Harbors Engineering Branch. Specific responsibilities assigned to sections within the Harbors Engineering Branch implement the Harbors Construction Program as shown in Table 2-1.

### 2.2 Exempted Projects Less Than One Acre

The following activities, provided they do not impact the storm drainage system and disturb less than one acre, are exempt from any documented project review and construction site inspection requirements under the Harbors **Construction Site Runoff Control Program**. These sites will, however, be included in the *Illicit Discharge Detection and Elimination Program* including site assessment inspections:

- Minor land disturbance activities performed by a property owner or employee on a single lot (such as minor landscaping activities and interior improvements).
- Post, pole, sign and fencing installation.
- Utility repair work.
- Parking lot, driveway, and other paved surfaces repair.
- Repair and maintenance activities.

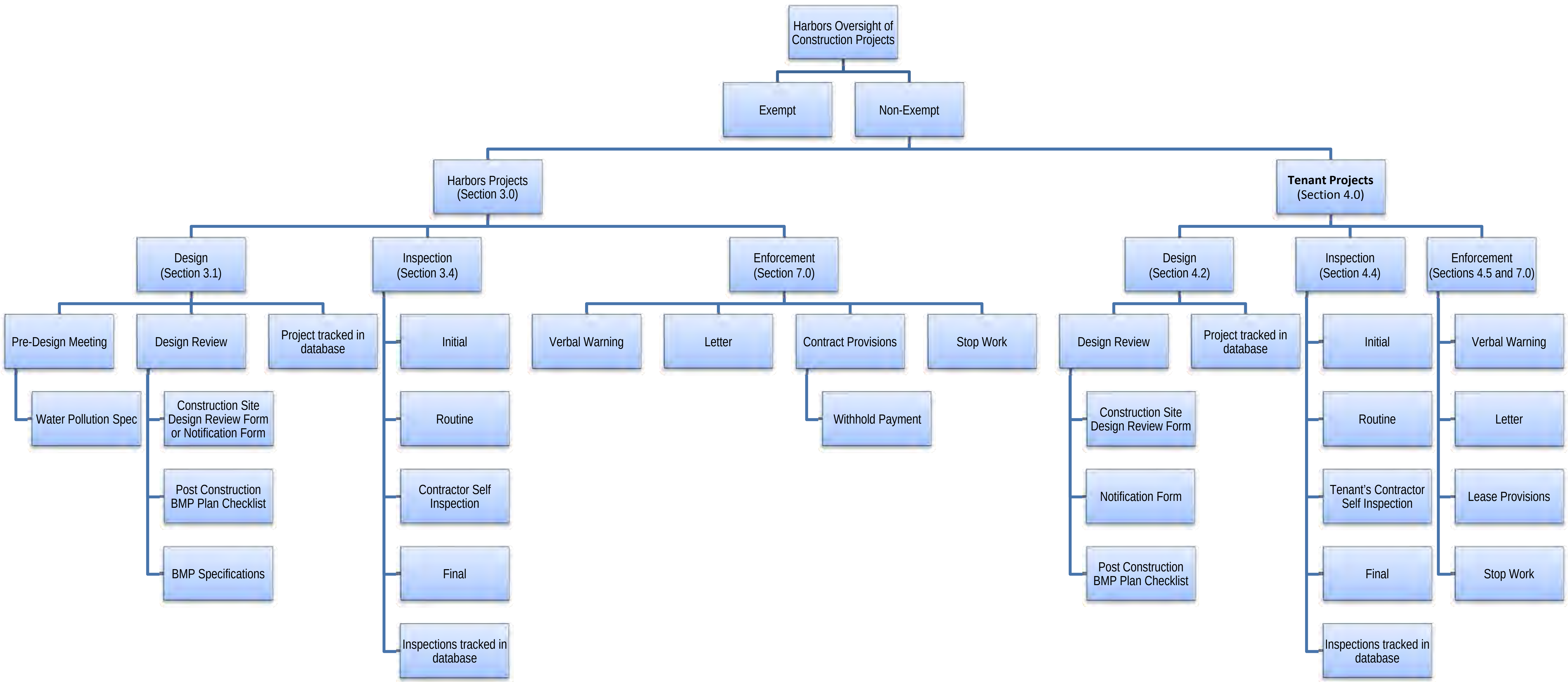
**Table 2-1 Harbors Functional Groups for Harbors Projects**

| Functional Group | Area of Responsibility |
|---|---|
| Environmental Section and Consultant | Responsible for overall implementation of the **Construction Site Runoff Control Program** including plan review, site inspection, and enforcement. |
| Planning Section,<br>Design Section,<br>Maintenance Section, | Responsible for development of BMPs through the project design and planning phase. |
| Construction Section | Responsible for development and implementation of BMPs through the project construction phase (from the award stage to completion). Authority includes enforcement of construction contract terms. |

**Table 2-2 Harbors Functional Groups for Tenant Projects**

| Functional Group | Area of Responsibility |
|---|---|
| Environmental Section and Consultant | Responsible for overall implementation of the Construction Site Runoff Control Program including plan review, site inspection, enforcement |
| Property Management Section | Responsible for implementation of land use agreement (e.g. lease, revocable permit, construction right of entry) including enforcement |

**Figure 2-1: Construction Site Runoff Control Program Overview**



## 3.0 HDOT HARBORS CONSTRUCTION PROJECTS

HDOT Harbors' construction projects are those that are developed with state funding to improve facilities managed by the Harbors. These projects are typically assigned to a Harbors Project Manager [PM] who oversees the project during the design phase and a different Construction Manager [CM] during the construction phase. Harbors PM and CM are typically employees from the Engineering Branch. Construction projects subject to the Harbors **Construction Site Runoff Control Program** must be managed according to the program requirements.

### 3.1 Pre-Design Meeting

The Harbors PM shall convene a Pre-Design meeting with Environmental Section at the Preliminary Design Phase to discuss the *Construction Site Design Review Checklist* (Attachment 3), as well as the *Permanent Post-Construction BMP Plan Checklist* if applicable, which is contained in Appendix B of the ***Post-Construction Storm Water Management in New Development and Redevelopment***. The *Construction Design Review Checklist* discussions may also continue into the Design Phase. These discussions and meetings will allow the Harbors PM and Environmental Section to discuss the project during the design phase for applicable site-specific and post-construction BMPs.

### 3.2 Project Review During Design

All projects must be reviewed by the Harbors PM, CM, and Environmental Section before construction activities commence. The process is presented in *Construction Process Flow Chart for HDOT Harbors Project* (Attachment 1).

#### 3.2.1 Projects Less Than One Acre

For non-exempt Harbors' projects (see section 2.2) which disturb less than one acre of land, the summary of design phase submittal requirements is listed below.

- One (1) complete *Notification Form for Project Less Than One Acre* (HDOT HAR-EE Form SD<1_NF; Attachment 5). The Notification Form must be signed and dated by the PM and Harbors Environmental Section.

These projects are also subject to initial, recurring, and final BMP inspections.

#### 3.2.2 Projects Subject to NPDES (NOI-C) Program

The Construction Design Review Checklist (Attachment 3) and Permanent Post-Construction BMPs Plan Checklist (contained in Appendix B of the **Post-Construction Storm Water Management in New Development and Redevelopment**) will be prepared by the Harbors

Engineering Branch with each design submittal phase. Plan sheets showing Construction Site BMPs and Post-Construction BMPs will be included in the construction drawings. All projects will be required to have Post-Construction BMPs unless it is determined by the Harbors PM and Environmental Section that these are not feasible for the project.

During the Design Phase, a project review package containing the items listed below will be submitted from the PM to the Harbors Environmental Section if it applies to the project:

- Completed Construction Design Review Checklist;
- Permanent Post-Construction BMPs Plan Checklist;
- Completed NPDES permit applications for Harbors projects;
- Construction Site BMPs and Post-Construction BMPs plan sheets and BMP installation details;
- Post-Construction Stormwater Mitigation Plan [PSMP]; and
- Storm Water Pollution Prevention Plan [SWPPP].

The Harbors Environmental Section will review the project plans to ensure that the plans meet the requirements of the Harbors **Construction Site Runoff Control Program**. If it is determined that the environmental impacts of the construction activities have not been adequately addressed, the project review package must be revised and resubmitted until concurrence is received from the Environmental Section. Upon concurrence, the project will be advertised, bids opened and the contract awarded.

## 3.3 Project Review after Contract Award

The contractor awarded the project will submit an SWPPP to the CM for inclusion in the project review package following the review procedures as outlined in the flowchart in Attachment 1. The Environmental Section will notify the CM when the project review package has conformed to environmental rules, regulations, and policies utilizing an interoffice memorandum. Following approval, the Harbors Division will issue a **Notice to Proceed** [NTP] to the contractor, with a copy to the PM and the Environmental Section. The NTP will indicate the following:

- As the first order of work, the contractor shall install all site-specific BMPs within a designated number of calendar days, which is to be determined by the Harbors CM.
- Before the contractor will be allowed to commence with any construction activity, the site-specific BMPs shall be subject to an initial inspection to ensure conformance with approved plans.

## 3.4 Construction Site Best Management Practice Inspections

Several different types of inspections are performed as a part of the Harbors **Construction Site Runoff Control Program**. These inspections include documented inspections held prior to, during, and at the conclusion of construction, and contractor self-inspections triggered by the CGP. The *Construction Site Best Management Practices Inspection Checklist* (Attachment 4) will be employed during documented inspections. Inspection records will be kept at the Environmental Section for at least three years, and inspection results will be recorded in a database maintained by the Environmental Section.

Documented BMP inspections must be completed (using the form found in Attachment 4) by qualified inspectors, including the Harbors CM, Harbors Construction Inspector, Environmental Section, or an authorized consultant.

### 3.4.1 Initial Inspection

After the issuance of the NTP, an initial inspection will be conducted by a qualified inspector using *Construction Site Best Management Practices Inspection Checklist* (Attachment 4) prior to the beginning of construction activities to ensure that site-specific BMPs have been properly installed. The contractor will be notified whether the site-specific BMPs are (or are not) installed in accordance with the SWPPP (or other similar documented plans, e.g., BMP Plan) and in compliance with the Harbors SWMP. No construction activities involving ground disturbance shall commence until the site-specific BMPs are determined to be in full compliance.

### 3.4.2 Recurring BMP Inspection

A qualified inspector will conduct BMP inspections at the construction site no less than once every two weeks between the months of October through March, and once every two months, otherwise. Any observed non-compliance will be addressed under the procedures defined in Section 7.0. Within five (5) calendar days, the Inspector will provide the contractor and the Harbors Environmental Section with a copy of the completed checklist and a short summary of non-compliant items.

The Inspector may suspend recurring inspections until the final inspection only if the following conditions are met.

- Construction is currently inactive ("inactive" means that no construction activity will occur for a period of 30 days or longer); and
- Exposed soil has been stabilized; and
- Remaining construction activities before completion will have minimal or no adverse impact to storm water management.

This determination will be dependent on the construction project and site conditions. Justification for suspending inspections will be documented on the final inspection form in the *"Additional Notes"* section. The Inspector should continue to monitor the site to ensure that such activities have not changed to warrant the resumption of inspections.

### 3.4.3 Final Inspection

Once the contractor has completed all construction activities, a final inspection will be conducted at the site. This inspection will be conducted simultaneously, if applicable, with a post-construction BMP final inspection to ensure that the soil is stabilized, site-specific BMPs have been removed, and post-construction BMPs are properly installed. The Harbors PM, CM, and Environmental Section will conduct the inspection in conjunction with the final inspection of the project for compliance with the contract documents. Deficiencies noted during the final inspection must be corrected, and then the CM can issue the project final acceptance and make final payment.

### 3.4.4 Contractor Self-Inspection Requirements

The contractor has the primary responsibility for inspection and maintenance of their site-specific BMPs in order to ensure that the BMPs are properly implemented, functioning effectively, and to make appropriate maintenance and repairs as needed (e.g., deteriorated fabric filter replacement). All changes to the original BMPs are required to be documented on the facilities' site-specific BMP plans or similar documents.

For projects that require a NPDES permit: the Contractor shall keep their Construction BMP Inspection Checklists on-site and made available to the Inspector for review when requested, and shall perform self-inspections at a frequency according to the following or according to their HDOH administered CGP:

- Weekly;
- Within 24 hours of any rainfall of 0.25 inches or greater; daily during periods of prolonged rainfall; and within 24 hours after the end of the rainfall.

In addition, the Contractor shall not cause or contribute to a violation of the basic water quality criteria, specified in HAR 11-54-4, and shall timely inspect the receiving waters, storm water runoff and control measures and BMPs to detect violations of and conditions (e.g., storm water discharges and receiving waters for turbidity, color, floating oil and grease, floating debris and scum, materials that will settle, substances that will produce taste in the water or detectable off-flavor in fish, and inspect for items that may be toxic or harmful to human or environmental health) which may cause violations of the basic water quality criteria.

## 4.0 TENANT IMPROVEMENT PROJECTS

Tenant improvement projects are those that are developed by tenants, easement holders or other authorized entities on Harbors property. These projects are typically managed by tenant(s) with concurrence from Harbors Property Management Section and Harbors Engineering Branch.

### 4.1 Regulatory Programs

In addition to Harbors' **Construction Site Runoff Control Program**, tenants are required to ensure their own compliance with all other County, State, and Federal rules and regulations. A specific construction project may require additional permits beyond those described herein. It will be the responsibility of the tenant to determine which permits may be required for a specific activity. HDOT Harbors and the HDOH may be contacted to aid in the determination of regulations regarding a specific project.

#### 4.1.1 NPDES Permit for Construction Sites

The CWA established the NPDES program for construction sites that disturb one acre or greater of land, which includes activities that disturb less than one acre of land if they are a part of a larger common plan of development or sale that will ultimately disturb one acre or more of total land area. Construction projects which fall under the NPDES program require the submittal of a NOI to HDOH CWB at least 30 calendar days prior to the start of construction activities. Permitting forms are available at the HDOH e-Permitting portal. Upon issuing of Notice of General Permit Coverage [NGPC] by the HDOH, the permit becomes effective within 30 days. Additionally, the tenant must notify the HDOH one week prior to the start of construction activities.

| |
|---|
| HDOH website address for the e-Permitting portal:<br>https://eha-cloud.doh.hawaii.gov/epermit/View/home.aspx |

Tenants will be responsible for obtaining NPDES permits for their construction projects and shall provide proof to Harbors Engineering Branch before commencing with construction activities.

#### 4.1.2 NPDES for Dewatering

Due to their proximity to the ocean, the groundwater level at Harbors properties are relatively high and are significantly influenced by tidal activity. Dewatering operations may be required during the course of a construction project. These activities are regulated by the HDOH under HAR 11-55 Appendix G. Refer to these rules for application submittal requirements.

Construction projects which require dewatering fall under the NPDES program and an NOI must be filed at least 30 calendar days prior to the start of dewatering activities. After the NOI has been submitted to the HDOH, the permit becomes effective within 30 days. Additionally, the applicant must notify the HDOH one week prior to the start of construction activities.

The tenant shall be responsible for obtaining the NPDES permit for dewatering operations and shall provide proof to the Harbors Engineering Branch before commencing with dewatering activities. Additionally, tenants engaging in dewatering activities that discharge into Harbors small MS4s need to submit an application for a *Private Storm Drain Connection and/or Discharge Permit* to the Harbors Engineering Branch, for the issuance of a permit (Attachment 2).

## 4.2 Project Review During Design

Non-exempt tenant projects must be reviewed by the Harbors Engineering Branch prior to commencing any construction activities. The process is demonstrated in ***Construction Process Flow Chart for Tenant Improvement Project*** in Attachment 1.

### 4.2.1 Projects Less Than One Acre

For non-exempt tenant projects (see section 2.2) disturbing less than one acre of land, the summary of design phase submittal requirements is listed below.

- One (1) complete *Notification Form for Project Less Than One Acre* (HDOT HAR-EE Form SD<1_NF; Attachment 5). The Notification Form must be signed and dated by the Project Owner/Operator.
- Two (2) copies of a sketched plan outlining the anticipated activities and the location of all proposed sediment and erosion control devices.
- The sketched plan is not required to be prepared by a licensed engineer, surveyor, or architect. If an individual with one of these licenses prepares the plan, they must sign and seal the plans. Provide one (1) copy of the plan/sketch if e-mailed, and two (2) copies if submitted as hardcopy.
- The sketched plan should include: (i) A site location drawing of the proposed project, indicating the location of the proposed project in relation to roadways, jurisdictional boundaries, streams and rivers; (ii) The boundary lines of the site on which the work is to be performed; (iii) The location of temporary and/or permanent vegetative and structural storm water management and sediment control measures; and (iv) A topographic map of the site. If feasible, the required information may be combined onto one sketch plan.
- A narrative description of the storm water management and sediment control plan to be used during land disturbing activities. Note: This may be included on the plans instead of in a written narrative. Include a general description of topographic and soil conditions of the property. Include a general description of adjacent property and a description of

existing structures, buildings, and other fixed improvements on surrounding properties.

### 4.2.2 Projects Subject to NPDES (NOI-C) Program

The tenant or its authorized representative shall submit the Construction Design Review Checklist (Attachment 3) and Permanent Post-Construction BMPs Plan Checklist (contained in Appendix B of the ***Post-Construction Storm Water Management in New Development and Redevelopment*** manual) with each design submittal phase. The tenant or its authorized representative shall include plan sheets specifically titled "Site-Specific BMPs" and "Post-Construction BMPs" in their design.

At the end of the Design Phase, the tenant or its authorized representative shall submit copies of the project review package to the Harbors Engineering Branch for review. The number of copies will be determined by the Engineering Program Manager. The project review package to be submitted shall contain the following:

- Project location information;
- Project schedule;
- Completed *Construction Design Review Checklist* and *Permanent Post-Construction BMPs Plan Checklist*;
- Completed proof of permits;
- SWPPP and Post-Construction Stormwater Mitigation Plan;
- Contact information to allow the reviewer to obtain additional information if necessary.

## 4.3 Project Review

The Harbors Engineering Branch Environmental Section will review the plans to ensure that the environmental impact of the construction project has been limited to the maximum extent practicable. If it is determined that the environmental impacts of the construction have not been adequately addressed, the tenant or their authorized representative shall revise and resubmit the project review package until consent is granted by the Harbors.

The Harbors Engineering Branch will notify the tenant or their authorized representative to proceed with the following caveats when the project review package has been evaluated and accepted:

- The tenant's Contractor, as the first order of work and prior to performing construction activities involving ground disturbance, shall install all site-specific BMPs and inform the Harbors Engineering Branch.
- Before the tenant contractor will be allowed to commence with any construction activity, the site-specific BMPs shall be subject to an initial inspection to ensure conformance and compliance with approved plans and permits.

## 4.4 Construction Site BMP Inspections

A critical part of the oversight process is the requirement for inspection of the BMPs. Several different types of inspections are performed as a part of the Harbors **Construction Site Runoff Control Program**, including documented BMP inspections held prior to, during, and at the conclusion of construction, and contractor self-inspections required by the CGP. *Construction Site Best Management Practices Inspection Checklists* (Attachment 4) will be employed during documented BMP inspections and will be recorded in a database.

Documented BMP inspections must be completed by qualified inspectors, including the Environmental Section or an authorized consultant.

### 4.4.1 Initial Inspections

After the consent is granted for the project, Harbors will conduct an initial inspection prior to commencement of construction activities to ensure that the site-specific BMPs have been properly installed. The Tenant shall be notified whether the site-specific BMPs are (or are not) in full compliance with the Harbors SWMP. No construction activities shall commence until the site-specific BMPs are determined by Harbors to be in full compliance.

### 4.4.2 Recurring BMP Inspections

The Harbors Engineering Branch Environmental Section will conduct regular site inspections following the initial inspection (biweekly from October to March and bimonthly otherwise). Any instance of non-compliance observed will be documented with photographs as well as on the *Construction Site Best Management Practices Inspection Checklist* (Attachment 4). The Environmental Section will provide Tenant warnings in conformance with the Enforcement Response Plan.

If the inspector determines that project construction has reached to a point where exposed soil has been stabilized and any remaining construction activities prior to project completion would have negligible storm water impact, the Environmental Section has the discretion to suspend further inspections until the final inspection. However, the Environmental Section will continue to monitor the project site to ensure that such activities have not changed so as to warrant the resumption of regular inspections.

### 4.4.3 Final Inspections

Once the Tenant has completed all construction activities associated with a particular project, a final inspection must be conducted at the site. This inspection will be conducted simultaneously with a post-construction BMP final inspection, if applicable, to ensure that the soil is stabilized, site-specific BMPs have been removed, and post-construction BMPs are properly installed.

The Environmental Section shall be notified of the completion of construction activities and a final inspection shall be scheduled. Any deficiencies noted during the final inspection must be rectified and re-inspected prior to the ending of the project. Final concurrence of the project by the Harbors will be dependent upon a satisfactory final inspection.

### 4.4.4 Tenant Self-Inspection Required by the CGP

Site-specific BMPs are usually temporary measures that require frequent maintenance to keep up their effectiveness and may require relocation and re-installation, particularly as the construction project progresses. Therefore, the Tenant (or the Tenant's Contractor) has the primary responsibility for inspection and maintenance of their site-specific BMPs in order to ensure that the BMPs are properly implemented, functioning effectively, and to make appropriate maintenance and repairs as needed (e.g., sediment removal). All changes to the original BMPs should be documented within the site plans.

The contractor shall keep their Construction BMP Inspection Checklists on-site and made available to the Harbors for review upon request. The Contractor shall perform self-inspections for projects that are subject to NPDES program according to following schedule.

- Weekly;
- Within 24 hours of any rainfall of 0.25 inches or greater; daily during periods of prolonged rainfall; and within 24 hours after the end of the rainfall.

In addition, the contractor shall not cause or contribute to a violation of the basic water quality criteria, specified in HAR 11-54-4, and shall timely inspect the receiving waters, storm water runoff and control measures and BMPs to detect violations of and conditions (e.g., storm water discharges and receiving waters for turbidity, color, floating oil and grease, floating debris and scum, materials that will settle, substances that will produce taste in the water or detectable off-flavor in fish, and inspect for items that may be toxic or harmful to human or environmental health) which may cause violations of the basic water quality criteria.

## 4.5 Enforcement

A detailed discussion on enforcement is presented in Harbors ***Enforcement Response Plan***. Enforcement of tenant construction projects will be undertaken by the Environmental Section and/or other staff who possess enforcement authority through established policies and procedures as described in Harbors ***Enforcement Response Plan***. There are several enforcement mechanisms and penalties to ensure compliance with local ordinances, permits, and contract documents. The enforcement actions proceed along different routes depending upon whether the project is a Harbors project or a Tenant Improvement Project (Attachment 1).

## 5.0 TRAINING PROGRAM

Training is one of the essential keys to a successful storm water program. The Harbors Division's policy and practice is to provide education and training to ensure that all of its employees have the knowledge and skills necessary to perform their functions effectively and efficiently.

Harbors engineers, inspectors, and consultants whose job duties are related to implementing this program receive annual training directly pertinent to their responsibilities associated with the program. Harbors engineers and inspectors who have attended the annual training are considered qualified inspectors. See Tables 2-1 and 2-2 for a description of Harbors staff responsibilities for Harbors and Tenant Projects respectively.

The Environmental Section staff includes an Erosion and Sediment Control Engineer working alongside a Consultant assigned to assist with and coordinate the overall Storm Water Program.

### 5.1 Training for Harbors Staff and Consultants

Harbors engineers, inspectors, and consultants who have construction storm water responsibilities will receive initial and annual refresher training provided by a qualified trainer. In calendar years 2014, 2015 and 2016, the qualified trainer will be a consultant approved by EPA and HDOH. (After 2016, Harbors may use its own experienced employees to train new employees.) These training sessions will provide a detailed review of storm water pollution prevention concepts and practices; and a discussion of the procedures and protocols of the Harbors **Construction Site Runoff Control Program**, as described below.

All participants will be required to sign in and information regarding how many employees attend the training will be reported in the Annual Compliance Report [ACR].

After 2016, Harbors will hold annual refresher training which will include a review of storm water pollution prevention concepts and practices, a review of the Harbors **Construction Site Runoff Control Program**, relevant highlights over the past year, issues/problems encountered during the implementation of the program, and suggestions for improvements to the program. Input from training participants will be evaluated and any necessary program amendments included in the ACR.

### 5.2 Initial Training Content

In calendar years 2014, 2015, and 2016, Harbors will use an approved consultant to provide an initial training to Harbors engineers, inspectors, and their consultants who have construction storm water responsibilities. After that time period, Harbors can provide the training itself to new employees. The initial training will cover the following:

- **General Program Management**. This portion will consist of overall program administration and implementation and be administered to the Construction, Design, Maintenance, and Planning Sections. The content of the training will include:
  - Goals and objectives of the Construction Site Runoff Control Program;
  - Regulatory Background;
  - Inventory of Construction Sites;
  - The ***City and County of Honolulu Best Management Practice Manual for Construction*** (CCH, 2011);
  - Hawai'i's Construction General Permit Stormwater Pollution Control Plan requirements;
  - Plan Review including the use of the Construction Design Review Checklist (Attachment 3) and Permanent Post-Construction BMPs Plan Checklist (contained in Appendix B of the Post-Construction Storm Water Management in New Development and Redevelopment); and Concurrence;
  - The roles and responsibilities of Harbors staff regarding implementation of the Construction Site Runoff Control Program to achieve compliance;
  - Proper installation and maintenance of BMPs for Construction Sites; and
  - Overview of the Inspection Program and Enforcement Requirements.

- **Construction Site BMP Inspections**. In addition to the above training, construction site inspectors will receive training that consists of construction site inspection procedures including the procedures developed by HDOH and EPA, use of the *Construction Site Best Management Practices Inspection Checklist* (Attachment 4), enforcement procedures and formalized on-the-job instruction. To support implementation of the **Construction Site Runoff Control Program**, new inspectors will gain inspection experience by conducting at least three construction site BMP inspections with the experienced Erosion and Sediment Control Engineer and/or the Consultant. During the inspections, the new inspectors will observe how the experienced inspectors conduct the inspections as well as conduct their own inspections with assistance from the experienced ones. New inspectors will continue to have frequent interactions with experienced inspectors to discuss inspection issues as they arise. Training inspections will be noted on the inspection report and tracked to ensure that new employees conduct at least three inspections with an experienced inspector.

Training effectiveness will be evaluated through a survey of the participants. All participants will be required to sign in and information regarding how many employees attend the training will be reported in ACR. Input from the survey will be evaluated and used for the development of future training sessions. Additionally, the evaluation findings and any necessary program improvements will be included in the ACR.

## 6.0 OUTREACH TO CONSTRUCTION CONTRACTORS

Harbors provides outreach to construction contractors and consultants to raise their awareness and understanding of the issues and causes of storm water pollution and to explain their responsibilities. This outreach is conducted primarily through informational exchanges between the Harbors PM, CM, and their contractors. The informational exchanges cover the following topics:

- The provisions, conditions, and requirements of the Program that apply to their projects;
- The availability of guidance material prepared by Harbors and other agencies for construction contractors and consultants; including the Harbors Construction Site Design Review Checklist, the EPA Construction BMP library, the EPA Post-construction BMP library, and the City and County of Honolulu Best Management Practices Manual for Construction; and
- General responsibilities of construction contractors regarding implementation of the Harbors Construction Site Runoff Control Program, and the preparation and requirements of their SWPPP.

### 6.1 Informational Exchange Sessions

Harbors utilizes three types of informational exchange sessions, as needed, to provide outreach to construction contractors on storm water pollution prevention concepts and practices and preparation of SWPPP (or other similar documents) for construction activities.

- Pre-Bid Meeting, Storm Water Permit Compliance Requirements: Pre-bid meetings may be conducted to discuss a given upcoming construction project. The Harbors PM provides general information to construction contractors regarding the requirements in the Permit(s) and the Harbors Construction Site Runoff Control Program, which apply to the project. This information generally includes a discussion of the need for the developing a project-specific SWPPP (or other similar documents).
- Pre-Construction Meeting, Storm Water Permit Compliance Requirements: The Harbors CM provides project-specific guidance to construction contractors on topics such as SWPPP (or other similar documents) preparation, selection of BMPs, BMP inspections, and relevant operation and maintenance.
- Additional Informational Exchanges: The Harbors PM, CM, Environmental Section will hold informal training sessions with construction contractors, as needed, during the course of construction projects.

The topics covered in informational exchanges will be updated as needed to reflect modification to the Harbors Construction Site Runoff Control Program.

## 6.2 Harbors SWMP Website

Harbors prepares and posts key Construction Site Runoff Control Program related forms and documents at its website at: http://hidot.hawaii.gov/harbors/library/storm-water-management/.

# 7.0 ENFORCEMENT

Enforcement of construction projects will be undertaken by the Harbors Qualified Inspector, Environmental Section and/or other staff who have internal enforcement authority through established policies and procedures as detailed in the Enforcement Response Plan and this document. There are several enforcement mechanisms and penalties to ensure compliance with local ordinances, permits, and contract documents. The enforcement actions proceed along different routes depending upon whether the project is a Harbors Project or a Tenant Improvement Project.

## 7.1 Scope of Authority

The enforcement options available to Harbors range from administrative actions (including written warnings and **Stop Work Orders**) to the issuance of citations, a district court verdict of a misdemeanor or fine, withholding of contractor's payment, and lease / revocable permit termination. Three general areas authorizing environmental enforcement are enclosed in Attachment 8 as follows:

- HRS Title 15 Chapter 266 authorizes Harbors to issue citations and summons for violations of its rules and have its actions enforced through the district courts by verdict of a misdemeanor or fine.
- HAR Title 19 Chapters 41 to 44 establishes uniform safety measures, operational standards and requirements, and the conduct for a responsible party at State of Hawaii harbors.
- The Construction Contract that provides Harbors with the right of entry to conduct inspection and authority to issue a **Stop Work Order** and to withhold a contractor's payment.

## 7.2 Harbors Construction Enforcement

Enforcement at construction projects will be undertaken by the Harbors Qualified Inspector in accordance with the terms of the construction contract. Non-compliance with the BMP Plan discovered during BMP inspections will be immediately corrected by the contractor.

There are four possible enforcement outcomes from construction site inspections. Oral or verbal warnings, written warnings, stop work orders, and summons or citations. If no corrective actions are taken, the Harbors Inspector has the authority to issue a stop work order, depriving the contractor of the basis to request payment. If necessary, further actions in accordance with the Enforcement Response Plan may be taken.

Any illicit discharge originating from the construction site will be investigated and appropriate actions taken in accordance with Harbors ***Enforcement Response Plan***.

### 7.2.1 Oral or Verbal Warning

An oral or verbal warning is a spoken reprimand or a disciplinary measure, which will be issued verbally to a responsible party where the finding is a minor discrepancy with one or two BMPs, not leading to an imminent discharge. It could also serve the purpose of outreach. In most cases, oral or verbal warnings provide a more efficient way for the responsible party to take corrective actions. For more significant threats, oral/verbal warnings will generally be given prior to and in addition to issuance of a written warning.

### 7.2.2 Written Warning

A written warning will be issued to a responsible party where the finding is limited to conditions that do not pose an imminent threat to the environment and/or the public. Conditions that warrant a written warning may include, but are not limited to:

- Improper storage of potentially hazardous substances
- Improper waste management
- Lack of construction site runoff control BMPs
- Lack of good housekeeping

For any discrepancy observed during an inspection, a recommended corrective action will be identified in the *Construction Site BMP Inspection Report*, which will serve as a written warning. One copy of the Construction Site BMP Inspection Report will be sent to the responsible party within five calendar days. If any major discrepancy is observed during inspection, a warning letter combined with the *Construction Site BMP Inspection Report* will be sent to the responsible party with a compliance deadline (typically within seven calendar days). These documents will become a part of the SWMP ACR.

When necessary, a follow-up inspection will be conducted to verify that the infractions were corrected. If the responsible party does not respond to the written warning by the deadline in the above warning letter, the CM or Environmental Section will issue a Notice of Apparent Violation [NAV] and proceed with escalated enforcement as described below and Harbors ***Enforcement Response Plan***, if necessary. A copy of the NAV and the *Construction Site BMP Inspection Report* will also be forwarded to the HDOH. Habitual warnings at a site may lead to escalation.

### 7.2.3 Issuance of Stop Work Order and Summons/Citation

The issuance of a **Stop Work Order** by Harbors will be documented with a formal letter and will require the responsible party to stop any construction activity upon receiving of the order, and rectify any deficiency noted in the letter as soon as possible. In the meantime, Harbors will withhold the payment to the contractor for a Harbors project. **Stop Work Order** is generally appropriate where the responsible party has not responded properly to written warnings and issuance of an NAV by Harbors, or where there is an ongoing violation and/or significant harm to public health, property, or the environment has occurred. In appropriate cases, Harbors will also pursue fines and/or penalties as described below.

The issuance of Summons/Citations by Harbors requires that the responsible party appear before a District Judge to address the violation and corrective action. This action may lead to fines and/or a criminal penalty and is utilized in severe cases where negligent non-compliance is repeated and/or significant harm to public health, property, or the environment has occurred. Situations which call for summons or citation will be referred to the appropriate State Attorney General Representative for implementation. Harbors and its designees will function as documentation and witness to actions requiring this level of response. Therefore, it is essential to accurately and thoroughly record actions that might escalate to this level.

## 7.3 Harbors Tenant Construction Enforcement

Enforcement at tenant construction projects will be undertaken by the Harbors Qualified Inspector in accordance with the terms of the lease, revocable permit or construction right-of-entry, as applicable. Non-compliance with the BMP Plan discovered during BMP inspections will be immediately corrected by the contractor. If no corrective actions are taken, the Harbors Inspector has the authority to issue a written warning (refer to Section 7.2.2), a NAV (refer to Section 7.2.2), and/or stop work order (refer to Section 7.2.3), stopping the tenant project and depriving its contractor of the basis to request payment. If necessary, further actions in accordance with the Enforcement Response Plan may be taken.

Any illicit discharge originating from the construction site will be investigated and appropriate actions taken in accordance with the Enforcement Response Plan.

## 8.0 CONSTRUCTION BMP FIELD MANUAL

The Harbors adopts the ***City and County of Honolulu Best Management Practice Manual for Construction*** (CCH, 2011) as a Construction BMP Field Manual to guide both Harbors' construction projects and tenant improvement projects. Harbors will periodically evaluate whether updates to the manual are necessary and revise as needed.

> Website address to download City and County of Honolulu Best Management Practice manual for Construction:
> http://www.cleanwaterhonolulu.com/storm/learning_center/BMP_manual_2011-11.pdf

The purpose of the Construction BMP Field Manual is to provide guidance on the installation and maintenance of BMPs that address construction activities. Each BMP identified in the manual includes a general description, application, limitations, installation and implementation requirements, and maintenance and inspections.

### 8.1 BMP Selection

The Designer and the Contractor shall evaluate which BMPs will be applicable for a particular construction project. The first step in the selection process will be to determine which construction activities may result in potential pollutants. Once those activities are identified, the BMPs can be chosen according to the CCH "*Rules Relating to Soil Erosion Standards and Guidelines* (CCH, 1999)," which can be downloaded from their website. Although projects conducted at Honolulu and Kalaeloa Barbers Point Harbors may not be required to obtain grading permits, the projects may still be classified following CCH methods based on size. Small projects that disturb less than one acre of land, will follow Figure 3 of the CCH document (CCH, 1999), and projects greater than one acre will follow Figure 4 of the same document.

> Website address to download **Rules Relating to Soil Erosion Standards and Guidelines** issued by City and County of Honolulu: http://www.usspecbook.com/HI/specs/646

## 9.0 REFERENCES

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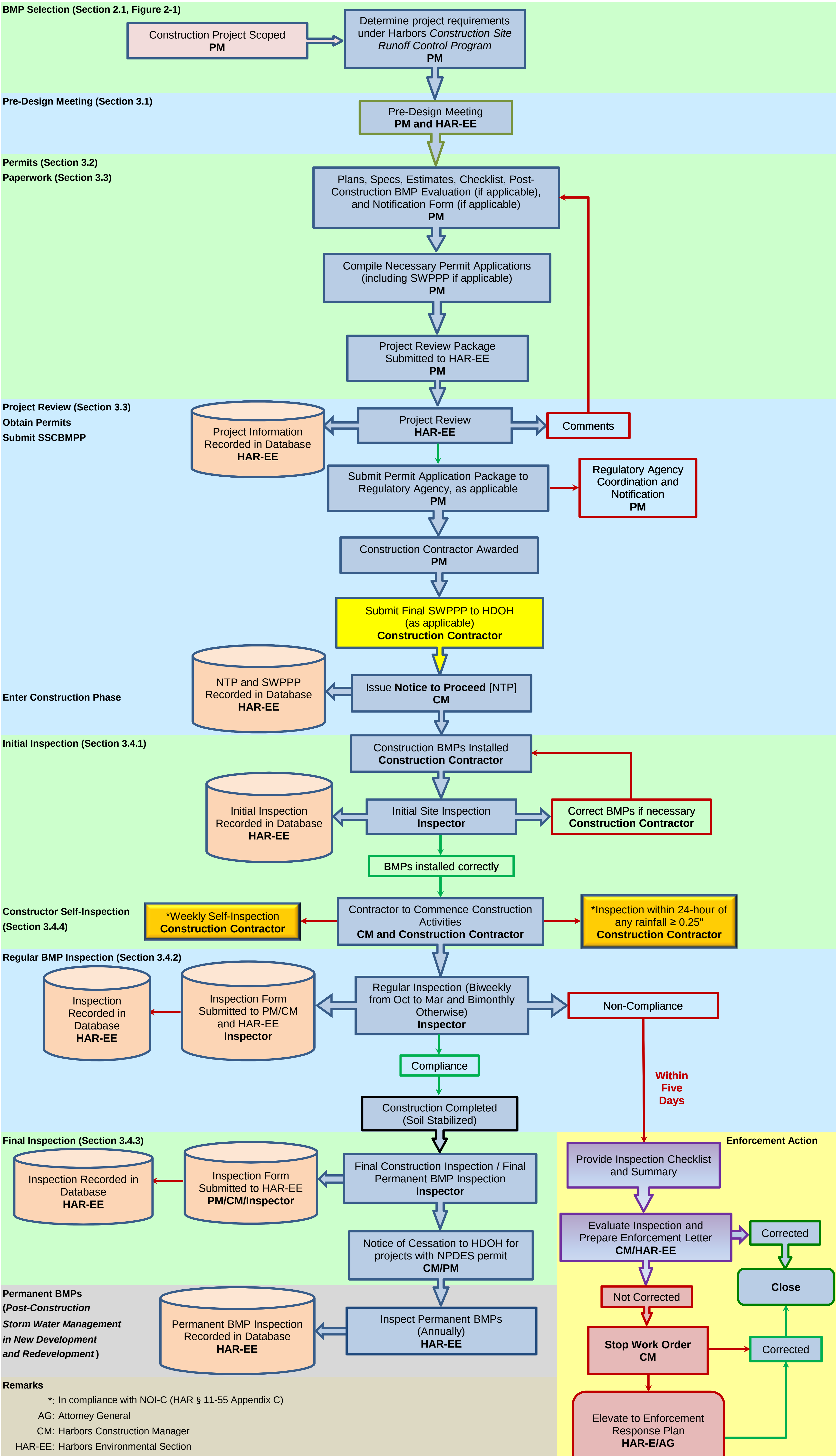
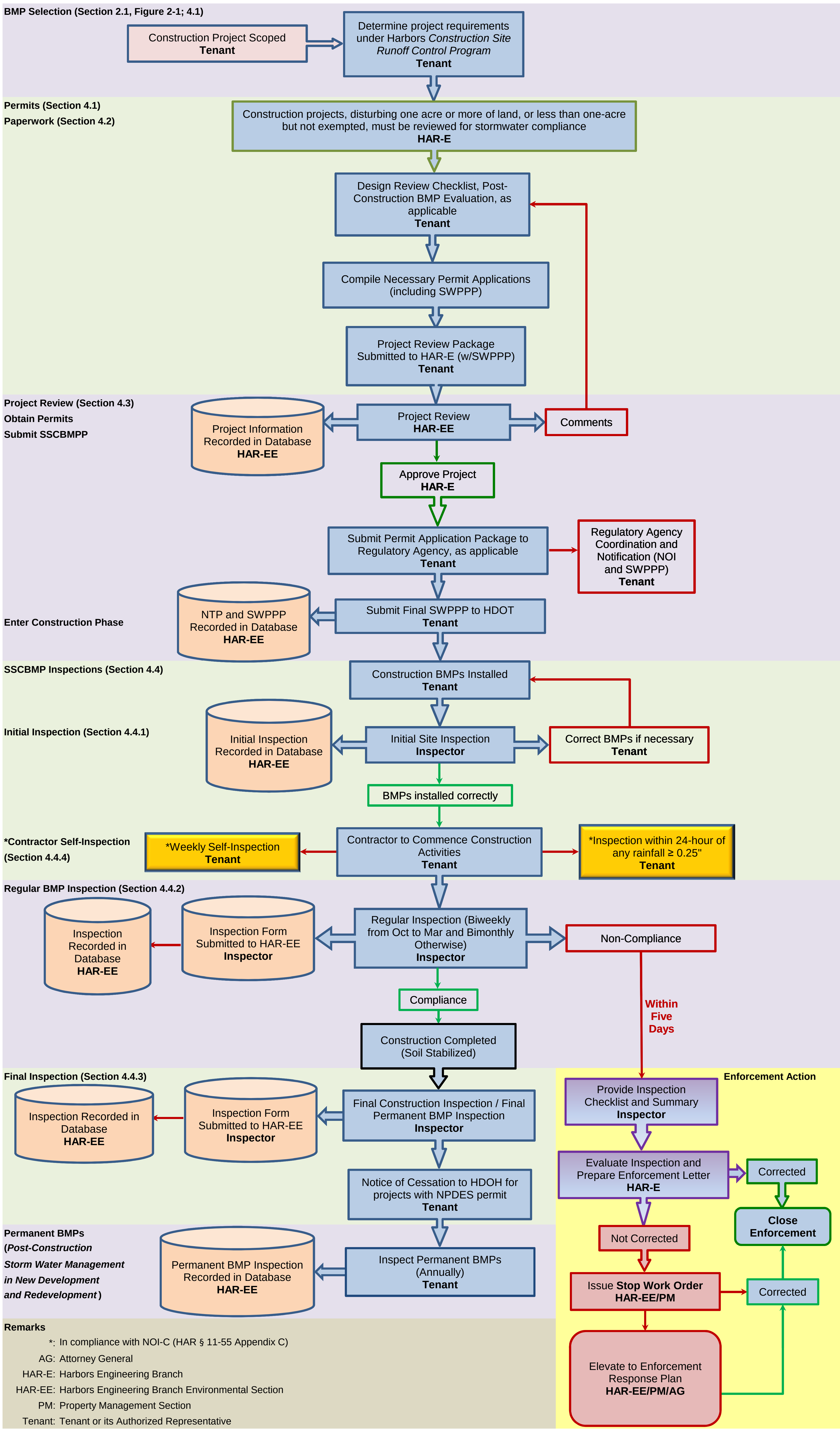
# Attachment 1

# Construction Process Flow Charts

Construction Process Flow Chart for HDOT Harbors Project



Construction Process Flow Chart for HDOT Tenant Improvement Project



# Attachment 2

# Application for a Private Storm Drain Connection and/or Discharge Permit to the State of Hawaii Harbors Division Storm Water System

FOR OFFICE USE ONLY

Harbors. I.D. No.: ______________ Harbor: ______________ HDOH NPDES File No. (if applicable) ____________

**Permit for Connection to the State Harbors Drainage System**

Application Date:________________

Note: This form is to be used for connection to Harbors small MS4 system. Permanent structure(s) will be constructed at the location(s) below if approved. Otherwise, please use ***Permit to Discharge into the State Harbors Drainage System*** form.

Pursuant to Hawaii Administrative Rules, Chapter 11-55, application is hereby made to connect to the State Harbors drainage system at the location(s) specified below and at no other place.

1. Name of Harbor: ________________________________
2. Tax Map Key No: ________________________________
3. Location: ________________________________
________________________________
4. Description of Connection(s): ________________________________
________________________________

Licensee*, the undersigned, hereby agrees to the following:

1. That the Licensee shall bear the entire cost of engineering, construction, and maintenance of the private drainage system.
2. That the Licensee shall indemnify and hold the State free and harmless from all suits and actions caused by the Licensee's acts or failure to act in connection with engineering construction and maintenance of the Licensee's private drainage system and its connection to the State Harbors Division's drainage system.
3. That the construction of the drainage system shall be made in accordance with plans and specifications approved by the Harbors Division, and subject to compliance with all applicable statutes, ordinances, and rules and regulations of Federal, State or City agencies having the effect of the law. If a National Pollutant Discharge Elimination System (NPDES) Permit is warranted, the Licensee shall obtain the permit as required by the State Department of Health and submit a copy to the State Department of Transportation Harbors Division with this form.
4. That prior to any construction work, the Licensee shall obtain permission to perform work on State Harbors from the Engineering Program Manager, Harbors Division, and comply with Harbors *Construction Site Runoff Control Program* and *Post-Construction Storm Water Management in New Development and Redevelopment*.
5. That in the event any portion of the State Harbor drainage system is damaged or destroyed during the construction of the private drain connection, the Licensee shall bear the entire cost of engineering and construction, or replacement of the damaged system.
6. That no additions or alterations to the private drainage system will be made without the prior written consent of the Harbors Division.
7. That the private drainage system shall remain at the Licensee's property and that the Licensee will be solely responsible for its maintenance and upkeep.
8. That in the event, the private drainage system within the State right-of-way shall at any time interfere with any public use, the Licensee will relocate the private drainage system at the Licensee's sole expense.
9. That any time the private drainage system discharges pollutants or other objectionable material into

the State Harbors drainage system which exceeds applicable water quality standards of the State of Hawaii as identified in Section 11-54-4, Hawaii Administrative Rules, or otherwise misuses the system, or causes a violation of any provisions of the State's NPDES permit, the State, by written notice, may terminate this licensee and have the system removed at the Licensee's expense. In addition, the Licensee shall be liable for any and all penalties as a result of discharges from the Licensee's system.

10. That discharge into the State Harbors drainage system shall be composed entirely of storm water, or other discharges permitted by the Harbors Small Municipal Separate Storm Sewer System (MS4) permit. In the event the discharge into the State Harbors drainage system includes storm water associated with industrial activity as defined by Federal regulations, the Licensee shall obtain appropriate NPDES permit(s) and shall provide data on the characterization of the constituents, quantity of the effluent and discharge at the Licensee's expense within one (1) year after the date of connection, and annually thereafter or as the need may arise as determined by the Harbors Division.
11. That the Harbors Division, or its authorized representative, may during reasonable hours and upon notification to the Licensee, enter any building or premises to inspect or investigate, measure or test any effluent that is discharged directly or indirectly to the State Harbors drainage system.
12. That the Licensee will notify the Harbors Environmental Section (587-1962) at least 24 hours before commencing construction work, to arrange for necessary inspectional services.
13. That the Licensee shall require this permit to be part of the contract with its construction contractor.
14. That this agreement shall be made a condition of any subsequent transfer of property ownership.

| | |
|---|---|
| Print Name of Licensee | Company Name |
| Licensee's Title | Company Address |
| | City, State, Zip Code |
| Signature of Licensee Date | E-mail Address |
| Telephone No. | Fax No. |

Reviewed By:

| | |
|---|---|
| Environmental Section | Date |

Approved By:

| | |
|---|---|
| Engineering Program Manager | Date |

**CONSTRUCTION DATA**

Work Started: ______

Work Completed: ______

Inspector:

*Licensee shall be the authorized representative of the party seeking to connect and discharge to the Harbors Small MS4 under this permit.

Attach: Drain Connection Plan (3 sets)

## Drain Connection Worksheet

| If "**No**" is checked, please provide justification beneath each item. | | |
|---|---|---|
| | | |
| **Item** | **Yes** | **No** |
| 1. Site Map showing subject discharge point(s) to Harbors drainage system in NAD 83 Geographic coordinates (latitude, longitude) is attached. | ☐ | ☐ |
| 2. Storm Water Flow Map is attached. | ☐ | ☐ |
| 3. Quantity of storm water and site process water entering Harbors drainage system is attached. | ☐ | ☐ |
| 4. Description of Best Management Practices and location(s) are attached. | ☐ | ☐ |
| 5. Drain Construction/Structure Plan is attached. | ☐ | ☐ |
| 6. Type of Discharge and copy of NPDES permit issued by HDOH (if applicable). | ☐ | ☐ |

Please refer to *City and County of Honolulu Storm Water Best Management Practice Manual – Construction, November 2011,* for more information.

FOR OFFICE USE ONLY

Harbors. I.D. No.: ______________ Harbor: ______________ HDOH NPDES File No.___________

**Permit to Discharge into the State Harbors Drainage System**

Application Date:________________

Note: This form is to be used for discharge to Harbors small MS4 system ONLY. No permanent structure will be constructed at the location(s) specified below. Otherwise, please use ***Permit for Connection to the State Harbors Drainage System*** form.

Pursuant to Hawaii Administrative Rules, Chapter 11-55, application is hereby made to discharge into the State Harbors drainage system at the location(s) specified below and at no other place.

1. Name of Harbor: ______________________________
2. Tax Map Key No: ______________________________
3. Location: ______________________________

4. Type of Discharge
   - ☐ Storm water associated with industrial activities ☐ Hydrotesting water
   - ☐ Storm water associated with construction activities ☐ Dewatering
   - ☐ Others (Specify):

5. Complete the *Drain Discharge Worksheet* on Page 3.

Licensee*, the undersigned, hereby agrees to the following:

1. That the Licensee shall indemnify and hold the State free and harmless from all suits and actions resulting from the licensee's discharge operations.
2. That the Licensee shall provide appropriate best management practices and/or treatment devices for the removal of soil particles, and/or other pollutant(s) in the discharge, and such discharge shall meet the basic water quality criteria applicable to all waters, as identified in Section 11-54-4, and any other applicable sections in Chapter 11-54, Hawaii Administrative Rules, at the point of discharge into State waters.
3. That the Licensee shall obtain National Pollutant Discharge Elimination System (NPDES) permit as required by the State Department of Health and submit a copy to the State Department of Transportation Harbors Division with this form, if necessary.
4. That a copy of any effluent monitoring required by the NPDES permit shall be furnished to the State Department of Transportation Harbors Division.
5. That the Licensee shall make all restoration to any State Harbors property damaged during the Licensee's discharge operations in accordance with the State Department of Transportation Harbors Division requirements.
6. That the Licensee shall discontinue the discharge, should the State Department of Health determine that the receiving waters are being polluted, or the discharge does not meet the effluent requirements of the NPDES permit, or the Licensee's operations are not in the best interest of the general public. In addition, the Licensee shall be liable for any and all penalties as a result of discharges from the Licensee's system.
7. That if the State Department of Transportation Harbors Division determines that any material or substance from the Licensee's discharge operations have settled into any storm sewer, the

Licensee shall immediately remove and clear any material and substance to the satisfaction of the State Department of Transportation Harbors Division.

8. That the Licensee shall comply with Harbors *Construction Site Runoff Control Program* and *Post-Construction Storm Water Management in New Development and Redevelopment*, and inspect and clean the Harbors drainage system prior to discharging.
9. That the Licensee shall notify the Harbors Environmental Section (587-1862) at least 24 hours before commencing discharge and at the conclusion of the discharge operation to arrange for necessary inspectional services.
10. That the Licensee shall require this permit to be part of the contract with its construction contractor.

| | |
|---|---|
| Print Name of Licensee | Company Name |
| Licensee's Title | Company Address |
| | City, State, Zip Code |
| Signature of Licensee Date | E-mail Address |
| Telephone No. | Fax No. |

Reviewed By:

| | |
|---|---|
| Environmental Section | Date |

Approved By:

| | |
|---|---|
| Engineering Program Manager | Date |

**CONSTRUCTION DATA**

Work Started: __________

Work Completed: __________

Inspector:

*Licensee shall be the authorized representative of the party seeking to discharge into the Harbors Small Municipal Separate Storm Sewer System (MS4) under this permit.

Attach: Drain Discharge Plan (3 sets)

## Drain Discharge Worksheet

| If “**No**” is checked, please provide justification beneath each item. | | |
|---|---|---|
| | | |
| **Item** | **Yes** | **No** |
| 1. Site Map showing subject discharge point(s) to Harbors drainage system in NAD 83 Geographic coordinates (latitude, longitude) is attached. | ☐ | ☐ |
| 2. Storm Water Flow Map is attached. | ☐ | ☐ |
| 3. Quantity of storm water and site process water entering Harbors drainage system is attached. | ☐ | ☐ |
| For Construction Project<br>(Please refer to *City and County of Honolulu Storm Water Best Management Practice Manual – Construction, November 2011,* for more information) | | |
| 4. Description of erosion controls and location(s) are attached. | ☐ | ☐ |
| 5. Project schedule is attached. | ☐ | ☐ |

# Attachment 3

# Construction Site Design Review Checklist

**Hawaii Department of Transportation – Harbors Division**

# Construction Site Design Review Checklist

| Project Description | |
|---|---|
| Project Title: | |
| Project Job No: | Acreage of Site: |
| Name of Design Firm: | |
| Projected Construction Timeframe: | |
| Description of Project: | |

| Site Information | | | |
|---|---|---|---|
| Construction Site Location: | | | |
| Latitude: | | Longitude: | |
| Tax Map Key No(s).: | | | |
| Disturbed Area (to nearest tenth of an acre): | | Total Project Area (to nearest tenth of an acre): | |
| Existing Percentage of Impervious Area: | | Percentage of Impervious Area After Completion: | |

| Nearest Water Body Information | |
|---|---|
| Name of Nearest Receiving Water Body(s) and Distance: | |
| Any New or Modified Storm Drain Connections: | |
| Description of Existing Storm Drains On or Adjacent to Project Area: | |

| Design Submittal (Check one): |
|---|
| ☐ Preliminary Design ☐ Semi-Final Design ☐ Final Design |

| Signature and Certifications | |
|---|---|
| **Designer**: I certify that the design is complete, accurate, and addresses the items on this checklist to the best of my knowledge. | |
| Print Name: | Job Title: |
| Signature: | Date: |
| **Review**: HDOT Harbors Project Manager and Environmental Section. | |
| Harbors Project Manager Signature: | Print Name: |
| | Date: |
| Harbors Environmental Section Signature: | Print Name: |
| | Date: |

| Existing and Proposed Site Features | Yes | No | N/A |
|---|---|---|---|
| 1. The following site features should be included on the plans, if deemed necessary based on project type, size, and scope. | | | |
| • Existing and proposed topography, features, and storm water flow paths | ☐ | ☐ | ☐ |
| • Preliminary location, size in square feet, and limits of disturbance | ☐ | ☐ | ☐ |
| • Locations of existing and proposed roads, curbs, gutters, storm drains, inlets, buildings, signs, sidewalks, traffic signals, light standards, guardrails, and other structures | ☐ | ☐ | ☐ |
| • Location of internal swales and ditches, and other drainage facilities | ☐ | ☐ | ☐ |
| • Maps of predominant soils from USDA soil surveys | ☐ | ☐ | ☐ |
| • Boundaries of existing predominant vegetation and proposed limits of clearing and grubbing | ☐ | ☐ | ☐ |
| • Existing and proposed utilities and easements | ☐ | ☐ | ☐ |
| • Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings | ☐ | ☐ | ☐ |
| 2. If the project or site includes, is adjacent to, or otherwise may impact any of the following, they should be included on the plans. | | | |
| • Perennial and intermittent streams or other surface water | ☐ | ☐ | ☐ |
| • Location and boundaries of resource protection areas such as wetlands, lakes, ponds, and other setbacks (e.g., stream buffers, drinking water well setbacks, septic setbacks) | ☐ | ☐ | ☐ |
| • Location of floodplain/floodway limits and relationship of site to upstream and downstream properties and drainages | ☐ | ☐ | ☐ |
| • The limits of the existing and proposed maps and plans shall extend past the project limits if any existing condition has an impact to the project. Include future projects that have the potential to start prior to the subject project. | ☐ | ☐ | ☐ |
| • Stream flow velocity for stream work | ☐ | ☐ | ☐ |
| 3. Identify potential pollutants related to non-storm water on site. | ☐ | ☐ | ☐ |

| Scheduling | Yes | No | N/A |
|---|---|---|---|
| 1. Include sequencing of construction activities with the implementation of construction site BMPs is provided? | ☐ | ☐ | ☐ |
| 2. Show how the rainy season relates to soil-disturbing and re-stabilization activities? | ☐ | ☐ | ☐ |
| 3. Include detail on the implementation and deployment of soil stabilization, sediment control, non-storm water management, construction material management, waste management, pollution control, spill control practices, and inspection and maintenance BMPs? | ☐ | ☐ | ☐ |
| 4. If the project is performed in multiple phases, are the phase-specific BMPs that take into account relevant potential pollutants? | ☐ | ☐ | ☐ |

| **Construction Site BMPs** (Please refer to *City and County of Honolulu Storm Water BMP Manual – Construction, November 2011,* for more information) | Yes | No | N/A |
|---|---|---|---|
| **1. Soil Stabilization Practices (Plans address or include the following practices and situations?)** | | | |
| • Preservation of existing vegetation | ☐ | ☐ | ☐ |
| • Stabilization of construction entrance | ☐ | ☐ | ☐ |
| • Protection of stockpiles | ☐ | ☐ | ☐ |
| • Bank stabilization | ☐ | ☐ | ☐ |
| • Topsoil management | ☐ | ☐ | ☐ |
| • Mulching, seeding, and/or planting with installation/application procedures and requirements | ☐ | ☐ | ☐ |
| • Velocity reduction devices in storm water flow paths | ☐ | ☐ | ☐ |
| • Geotextiles, plastic covers, turf reinforce mats, and/or erosion control blankets/mats, with installation/application procedures and requirements | ☐ | ☐ | ☐ |
| • Temporary drains, swales, earth dikes, and/or lined ditches | ☐ | ☐ | ☐ |

| | | | |
|---|---|---|---|
| • Slope drains, subsurface drains | ☐ | ☐ | ☐ |
| • Top and toe of slope diversion ditches/berms | ☐ | ☐ | ☐ |
| **2. Sediment Control Practices (Plans address or include the following practices and situations?)** | | | |
| • Location of potential sediment sources | ☐ | ☐ | ☐ |
| • Does on-site drainage enter into off-site drainage | ☐ | ☐ | ☐ |
| • Dust/Silt fence, wattles, perimeter socks, and matting rolls | ☐ | ☐ | ☐ |
| • Watering | ☐ | ☐ | ☐ |
| • Soil binders, including acrylic polymers | ☐ | ☐ | ☐ |
| • Storm drain inlet protection | ☐ | ☐ | ☐ |
| • Temporary sediment basin | ☐ | ☐ | ☐ |
| • Sediment trap | ☐ | ☐ | ☐ |
| • Flared culvert end sections | ☐ | ☐ | ☐ |
| • Outlet protection | ☐ | ☐ | ☐ |
| • Temporary stream crossing | ☐ | ☐ | ☐ |
| • Ingress/Egress sediment control | ☐ | ☐ | ☐ |
| • Slope roughening/terracing/rounding | ☐ | ☐ | ☐ |
| • Sand bag barrier | ☐ | ☐ | ☐ |
| • Brush or rock filter | ☐ | ☐ | ☐ |
| • Shoveling, sweeping, and disposing | ☐ | ☐ | ☐ |
| **3. Non-Storm Water Management Practices (Plans address or include the following practices and situations?)** | | | |
| • Employee training | ☐ | ☐ | ☐ |
| • Vehicle and equipment cleaning, refueling, and maintenance | ☐ | ☐ | ☐ |
| • Dewatering operations | ☐ | ☐ | ☐ |
| • Paving operations | ☐ | ☐ | ☐ |
| • Concrete washout procedure | ☐ | ☐ | ☐ |
| • Structure construction and painting | ☐ | ☐ | ☐ |
| • Water conservation | ☐ | ☐ | ☐ |
| • Good housekeeping practices | ☐ | ☐ | ☐ |
| **4. Construction Material Management, Waste Management and Spill Control Practices (Plans address or include the following practices and situations?)** | | | |
| • Material delivery, use, and storage | ☐ | ☐ | ☐ |
| • Spill prevention control, spill kit | ☐ | ☐ | ☐ |
| • Hazardous waste properly stored in designated areas | ☐ | ☐ | ☐ |
| • Sanitary/Septic waste management | ☐ | ☐ | ☐ |
| • Liquid waste managed with storage containment devices | ☐ | ☐ | ☐ |
| • Contaminated soil management | ☐ | ☐ | ☐ |
| • Concrete waste management | ☐ | ☐ | ☐ |
| • Fertilizer, pesticide, herbicide, fungicide, and biocide management | ☐ | ☐ | ☐ |

| Inspection and Maintenance Responsibility | Yes | No | N/A |
|---|---|---|---|
| **(Plans address or include the following practices and situations?)** | | | |
| 1. Long-term inspection entity, operation, and maintenance identified | ☐ | ☐ | ☐ |
| 2. Minimum maintenance frequency identified | ☐ | ☐ | ☐ |
| 3. Recordkeeping | ☐ | ☐ | ☐ |
| 4. Schedule and/or triggers for inspection of BMP measures | ☐ | ☐ | ☐ |
| 5. Rain gauge monitoring | ☐ | ☐ | ☐ |
| 6. Incident report | ☐ | ☐ | ☐ |

| Permits, Reports, and Plans | Yes | No | N/A |
|---|---|---|---|
| **Assess if the project requires any of the following that may include or impact BMPs. If not required, check N/A.** | | | |
| 1. NPDES Form C for Construction Activities is provided, if required. | ☐ | ☐ | ☐ |
| 2. NPDES Form F for Hydrotest waters discharge is provided, if required. | ☐ | ☐ | ☐ |
| 3. NPDES Form G for Dewatering discharge is provided, if required. | ☐ | ☐ | ☐ |

| | | | |
|---|---|---|---|
| 4. 401 Water Quality Certification is provided, if required. | ☐ | ☐ | ☐ |
| 5. 404 Department of Army Permit is provided, if required. | ☐ | ☐ | ☐ |
| 6. Coastal Zone Management Permit is provided, if required. | ☐ | ☐ | ☐ |
| 7. Special Management Area Permit is provided, if required. | ☐ | ☐ | ☐ |
| 8. Post-construction Stormwater Mitigation Plan is provided, if required. | ☐ | ☐ | ☐ |
| 9. Grading Permit with temporary erosion control plan is provided. (if project requires City and County approval and meets requirements) | ☐ | ☐ | ☐ |
| 10. Permit for Connection to the State Harbors Drainage System (if applicable) | ☐ | ☐ | ☐ |
| 11. Permit to Discharge into the State Harbors Drainage System (if applicable) | ☐ | ☐ | ☐ |
| 12. If multiple permits or approvals are required for the project, BMPs are consistent in all permits and plans. | ☐ | ☐ | ☐ |

# Attachment 4

# Construction Site Best Management Practices Inspection Checklist

# Construction Site Best Management Practices Inspection Checklist

| | | |
|---|---|---|
| **Date of Inspection:** | **Project Title:** | |
| **Contractor:** | **Project Job No.:** | **NGPC No.:** |
| **Inspector:** | **SWPPP Updated and Onsite:** ☐ Yes ☐ No | **Photographs Attached:** ☐ Yes ☐ No |
| **Weather:** | | |

| | **AC:** **A**dequate **C**ontainment<br>**ACoC:** **A**dequate **C**over **o**r **C**ontainment | | **Control Device(s)** | | **Require Maintenance** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **N/A** | **Yes** | **No** | **Yes** | **No** | **Description of Any Deficiency** | **Date Corrective Actions Taken** | **Notes** |
| **1.** | Stabilized Construction Ingress/Egress? | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| | Vehicular Tracking | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| **2.** | Erosion Control Device(s) - Slopes/Exposed Area | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| | Sediment Control (Silt fence, Perimeter sock) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| | Storm Drain Inlet Protection (Fabric filter, Witch's hat) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| **3.** | Dust Control/Suppressant - Sawcutting/Demolition | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| | Concrete Washout Area (AC) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| **4.** | Vehicle/Equipment Maintenance Area (ACoC) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| | Vehicle/Equipment Cleaning Area (AC) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| | Vehicle/Equipment Fueling Area (AC) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| | Vehicle/Equipment Storage Area (AC) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| **5.** | Construction Material Storage Area (ACoC) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| | Stockpiles of Aggregate (ACoC) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| **6.** | Flammable/Fuel Storage Area (ACoC) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| | Hazardous Material Storage (ACoC) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| | Waste Storage Area (ACoC) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| **7.** | Good Housekeeping Practices (Is project generally free of litter, sediment, etc.?) | ☐ | ☐ | ☐ | ☐ | ☐ | | | |
| **8.** | Spill Prevention/Control - Spill Kit | ☐ | ☐ | ☐ | ☐ | ☐ | | | |

**Major Site Activities (please check any if applicable):**

☐ Demolition ☐ Paving ☐ Excavation ☐ Hauling Materials ☐ Concrete Pouring ☐ Other, please specify:

**If any of the item listed below checked "Yes", please provide detailed information under Additional Notes.**

**A.** Is contaminated soil present? ☐ Yes ☐ No **B.** Is sediment basin(s) present? ☐ Yes ☐ No

**C.** Is any illicit discharge present? ☐ Yes ☐ No

**D.** Dewatering and/or Hydrotesting - Is this project in compliance with these NPDES storm water permitting requirements? ☐ Yes ☐ No ☐ N/A

______________________________ ______________
**Verified By (HDOT Project Inspector/Engineer's Signature)** **Date**

| Permanent Post-Construction BMP Inspection | | |
|---|---|---|
| **Please indicate inspection status here:** | ☐ Inspection During Construction Phase ☐ Final Inspection after Installation ☐ Other | |
| **Permanent post-construction BMPs are installed in accordance with construction plans.** | ☐ Yes ☐ No ☐ N/A | |
| **Notes:** | | |
| | | |

**Additional Notes:**

**A.** Management of Contaminated Soil: ______

**B.** Control and Maintenance Related to Sediment Basin(s): ______

**C.** Evidence of Discharge of Pollutant(s) to State Receiving Waters: ______

**D.** Summary of Dewatering and/or Hydrotesting Activity (please list permit numbers and verify compliance): ______

E. ______

F. ______

G. ______

**Remarks: This checklist is to be completed before commencement of grading or site-work and then every two weeks from October through March, otherwise, bimonthly. Harbors Division will not allow construction activities to commence until the project engineer or qualified project inspector have inspected the construction site to determine if the site-specific BMPs and pollution prevention devices are implemented correctly and in the appropriate locations.**

**State of Hawaii**
**Department of Transportation**
**Harbors Division**

# Attachment 5

# Notification Forms for Project Less Than One Acre

**Hawaii Department of Transportation – Harbors Division**

# Notification Form for Project Sites Disturbing Less Than One Acre

(To be used for Harbors Project)

| **Project Description** | | | |
|---|---|---|---|
| Project Title: | | | |
| Project Job No: | | Acreage of Site: | |
| Name of Design Firm: | | | |
| Projected Construction Timeframe: | | | |
| Description of Project: | | | |

| **Site Information** | | | |
|---|---|---|---|
| Construction Site Location: | | | |
| Tax Map Key No(s).: | | | |
| Disturbed Area (to nearest tenth of an acre): | | Total Project Area (to nearest tenth of an acre): | |
| Existing Percentage of Impervious Area: | | Percentage of Impervious Area After Completion: | |

| **Nearest Water Body Information** | |
|---|---|
| Name of Nearest Receiving Water Body(s) and Distance: | |
| Any New or Modified Storm Drain Connections: | |
| Description of Storm Drains On or Adjacent to Project Area (e.g., location or ID#): | |

| **Review**: HDOT Harbors Project Manager and Environmental Section. | |
|---|---|
| Harbors Project Manager Signature: | Print Name:<br>Date: |
| Harbors Environmental Section Signature: | Print Name:<br>Date: |

Notes:

1. This form is for the use on non-exempt projects that will disturb less than 1 acre and are not a part of Larger Common Plan (LCP) for development. **If this project is part of a LCP for sale or development this form may not be used.**

2. You must type or print legibly. You must include the original, signed notification form and two (2) copies of a sketched plan outlining the anticipated activities and the location of all proposed sediment and erosion control devices.

3. The following activities, if they do not affect the Harbors storm drainage system, are exempt from any formal project review and construction site-inspection requirements under the ***Harbors Construction Site Runoff Control Program***.

- Minor land disturbance activities performed by a property owner or employee on a single lot (such as minor landscaping activities). Activities must disturb no more than 10 cubic yards or ¼ acre.
- Post and pole installation (less than 2 cubic yards excavation at any one contiguous project location).
- Utility repair work (less than 2 cubic yards excavation at any one contiguous project location).
- Parking lot, driveway, and other paved surfaces repair (less than ¼ acre disturbed and no sediment leaves the property.
- All repair and maintenance activities.

**Hawaii Department of Transportation – Harbors Division**

# Notification Form for Project Sites Disturbing Less Than One Acre

(To be used for Tenant Improvement Project)

| Project Description | | | |
|---|---|---|---|
| Project Title: | | | |
| Project Job No: | | Acreage of Site: | |
| Name of Design Firm: | | | |
| Projected Construction Timeframe: | | | |
| Description of Project: | | | |

| Site Information | | | |
|---|---|---|---|
| Construction Site Location: | | | |
| Tax Map Key No(s).: | | | |
| Disturbed Area (to nearest tenth of an acre): | | Total Project Area (to nearest tenth of an acre): | |
| Existing Percentage of Impervious Area: | | Percentage of Impervious Area After Completion: | |

| Project Information | | | |
|---|---|---|---|
| **Tenant** | | | |
| Business Name | | | |
| Project Point of Contact: | | | |
| (Note: Must be tenant or tenant representative with signatory authority) | | | |
| Mailing Address: | | | |
| Phone: | | Email Address: | |
| **Engineering/Design Company** | | | |
| Company Name | | | |
| Project Point of Contact: | | | |
| Mailing Address: | | | |
| Phone: | | Email Address: | |
| **Construction Contractor** | | | |
| Company Name | | | |
| Project Point of Contact: | | | |
| Mailing Address: | | | |
| Phone: | | Email Address: | |

| Nearest Water Body Information | |
|---|---|
| Name of Nearest Receiving Water Body(s) and Distance: | |
| Any New or Modified Storm Drain Connections: | |
| Description of Storm Drains On or Adjacent to Project Area (e.g., location or ID#): | |

| Signature and Certifications | |
|---|---|
| **Project Owner/Operator**: Per my signature below, I hereby certify that this project is not part of a Larger Common Plan (LCP) for Development. I understand that additional construction activities at this site may require permit coverage and I am responsible for obtaining any federal, state, or local permits that may be required for this project.<br><br>I certify that all land-disturbing construction and associated activity pertaining to this site shall be accomplished pursuant to and in keeping with the terms and conditions of all relevant regulations including, but not limited to, the Federal Clean Water Act (33 USC 1251), Hawaii Revised Statutes 342D, Hawaii Administrative Rules §11-54 and §11-55, Honolulu Harbor and Kalaeloa Barbers Point Harbor's Small Municipal Storm Water Sewer System (Small MS4) National Pollutant Discharge Elimination System Permits (NPDES Permit Nos. HI 03KB482 and HI 03KB488), and Harbors Storm Water Management Plan. Failure to do so may result in penalties. I hereby acknowledge that personnel from the Hawaii Department of Transportation Harbors Division or Hawaii Department of Health has the right of access to the site at all times for the purpose of on-site inspections during the course of construction and to perform inspections following the project completion. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. | |
| Print Name: | Job Title: |
| Signature: | Date: |
| **Review**: HDOT Harbors Engineering Branch Environmental Section. | |
| Harbors Environmental Section Signature: | Print Name: |
| | Date: |

Notes:

1. This form is for the use on non-exempt projects that will disturb less than 1 acre and are not a part of Larger Common Plan (LCP) for development. **If this project is part of a LCP for sale or development this form may not be used.**

2. You must type or print legibly. You must include the original, signed notification form and two (2) copies of a sketched plan outlining the anticipated activities and the location of all proposed sediment and erosion control devices.

3. The following activities, if they do not affect the Harbors storm drainage system, are exempt from any formal project review and construction site-inspection requirements under the ***Harbors Construction Site Runoff Control Program***.

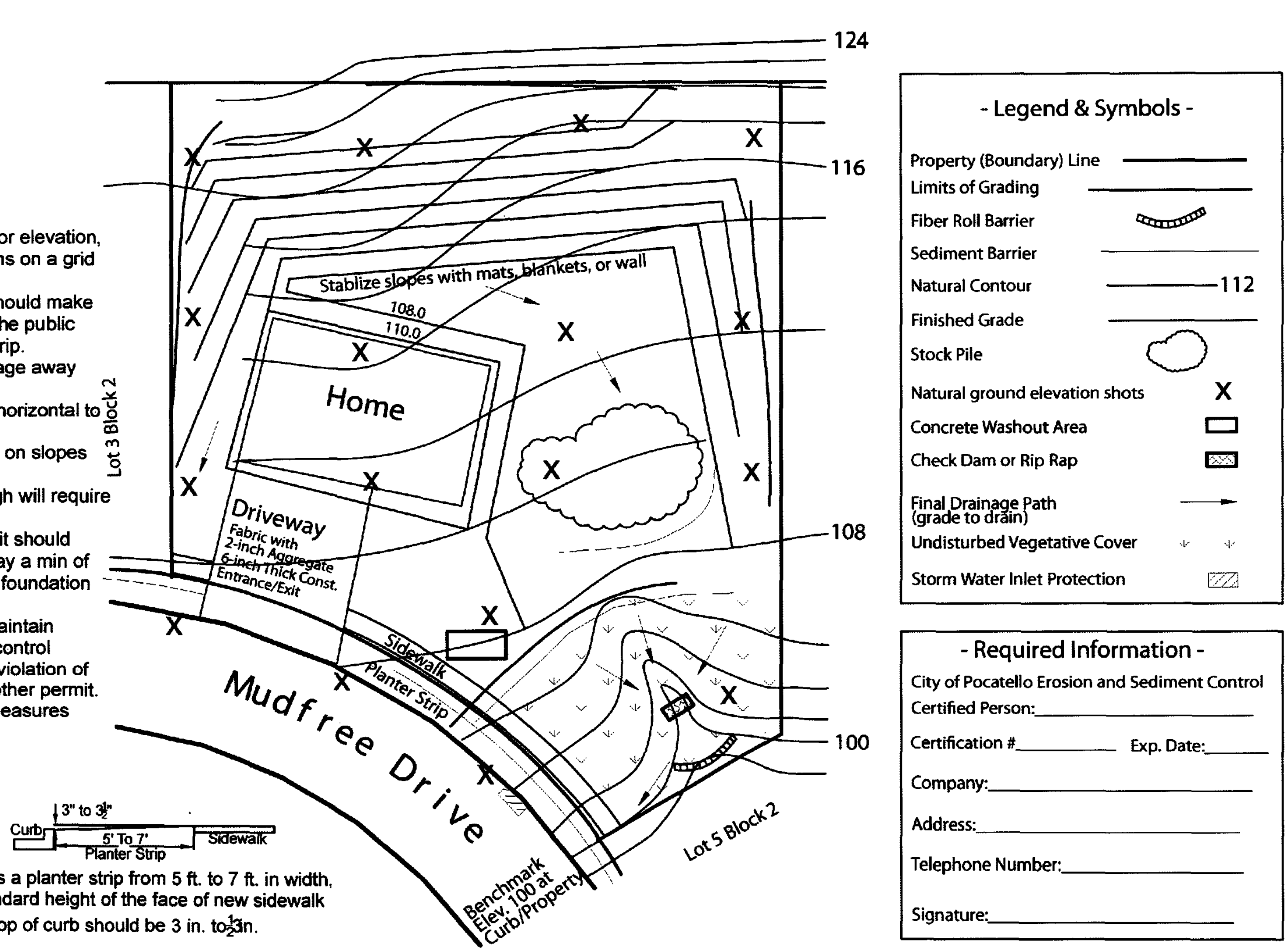
- Minor land disturbance activities performed by a property owner or employee on a single lot (such as minor landscaping activities). Activities must disturb no more than 10 cubic yards or ¼ acre.
- Post and pole installation (less than 2 cubic yards excavation at any one contiguous project location).
- Utility repair work (less than 2 cubic yards excavation at any one contiguous project location).
- Parking lot, driveway, and other paved surfaces repair (less than ¼ acre disturbed and no sediment leaves the property.
- All repair and maintenance activities.

**Figure 1: Sample Small Project Erosion and Sediment Control Plan Drawing**

N

Not to Scale

Notes:
To establish a finish floor elevation, collect ground elevations on a grid over the area of the lot.
Finish floor elevation should make a smooth transition to the public sidewalk and planter strip.
Maintain positive drainage away from all structures.
Maximum slope 2 feet horizontal to 1 foot vertical 2:1.
Erosion control matting on slopes greater the 3:1.
Any wall over 4 foot high will require separate permit.
Aggregate entrance/exit should extend from the roadway a min of 50 feet or to the house foundation (which ever is less).
Failure to adiquately maintain erosion and sediment control measures constitute a violation of the issued building or other permit.
Wind erosion control measures shall be in place.




If there is a planter strip from 5 ft. to 7 ft. in width, the standard height of the face of new sidewalk above top of curb should be 3 in. to 3½ in.

# Attachment 6

# List of City and County of Honolulu BMPs for Construction

| Serial # | Erosion Control (EC) Fact Sheets |
|---|---|
| EC-0 | Employee/Subcontractor Training |
| EC-1 | Scheduling |
| EC-2 | Preservation of Existing Vegetation |
| EC-3 | Hydraulic Mulch |
| EC-4 | Hydroseeding |
| EC-5 | Soil Binders |
| EC-7 | Geotextiles and Mats |
| EC-8 | Wood Mulching |
| EC-9 | Earth Dikes and Drainage Swales |
| EC-10 | Velocity Dissipation Devices |
| EC-11 | Slope Drains |
| EC-12 | Streambank Stabilization |
| EC-14 | Seeding, Planting and Sodding |
| EC-15 | Slope Roughening/Terracing |
| EC-16 | Topsoil Management |
| | |
| **Serial #** | **Sediment Control (SE) Fact Sheets** |
| SE-1 | Silt Fence |
| SE-2 | Sediment Basin |
| SE-3 | Sediment Trap |
| SE-4 | Check Dams |
| SE-5 | Fiber Rolls |
| SE-6 | Gravel Bag Berm |
| SE-7 | Street Sweeping and Vacuuming |
| SE-8 | Sandbag Barrier |
| SE-10 | Storm Drain Inlet Protection |
| SE-11 | Chemical Treatment |
| SE-12 | Location of Potential Sources of Sediment |
| SE-13 | Level Spreader |
| SE-14 | Rip-Rap & Gabion Inflow Protection |
| SE-15 | Vegetated Buffer Strips and Channels |
| SE-16 | Compost Socks and Berms |
| | |
| **Serial #** | **Wind Erosion Control (WE) Fact Sheets** |
| WE-1 | Wind Erosion Control |
| | |
| **Serial #** | **Tracking Control (TR) Fact Sheets** |
| TR-1 | Stabilized Construction Entrance/Exit |
| TR-2 | Stabilized Construction Roadway |
| TR-3 | Entrance/Outlet Tire Wash |

| Serial # | Non-Storm Water management (NS) Fact Sheets |
|---|---|
| NS-1 | Water Conservation Practices |
| NS-2 | Dewatering Operations |
| NS-3 | Paving and Grinding Operations |
| NS-4 | Temporary Stream Crossing |
| NS-5 | Clear Water Diversion |
| NS-6 | Illicit Connection/Discharge |
| NS-7 | Potable Water/Irrigation |
| NS-8 | Vehicle and Equipment Cleaning |
| NS-9 | Vehicle and Equipment Fueling |
| NS-10 | Vehicle and Equipment Maintenance |
| NS-11 | Pile Driving Operations |
| NS-12 | Concrete Curing |
| NS-13 | Concrete Finishing |
| NS-14 | Material over Water |
| NS-15 | Demolition Adjacent to Water |
| NS-16 | Temporary Batch Plants |

| Serial # | Waste Management (WM) and Materials Pollution Control Fact Sheets |
|---|---|
| WM-1 | Material Delivery and Storage |
| WM-2 | Material Use |
| WM-3 | Stockpile Management |
| WM-4 | Spill Prevention and Control |
| WM-5 | Solid Waste Management |
| WM-6 | Hazardous Waste Management |
| WM-7 | Contaminated Soil Management |
| WM-8 | Concrete Waste Management |
| WM-9 | Sanitary/Septic Waste Management |
| WM-10 | Liquid Waste Management |

# Attachment 7

# Temporary Water Pollution, Dust, and Erosion Control Specifications

# ARTICLE XXX – TEMPORARY STORMWATER POLLUTION, DUST, AND EROSION CONTROL
## For Project NOT Subject to NPDES NOI-C Permit

**XXX.XX Description.** This section is required for all work, including the Contractor's storage sites. It describes the following:

**(A)** A detailed site-specific Best Management Practice (BMP) Plan including diagrams and narratives; constructing, maintaining, and repairing temporary stormwater pollution, dust, and erosion control measures at the project site including local material sources, work areas and access roads; removing and disposing of wastes and hazardous wastes; and control of fugitive dust (defined as uncontrolled emission of solid airborne particulate matter from any source other than combustion). Additionally, all projects at Honolulu and Kalaeloa Barbers Point Harbors are subject to State of Hawaii, Department of Transportation (HDOT) Harbors Division, Storm Water Management Plan (SWMP) requirements, unless exempted, and are subject to Harbors BMP inspections. If any requirement conflicts with those administered by State of Hawaii, Department of Health (HDOH), the contractor shall follow the more stringent requirement.

**(B)** Compliance with applicable federal and other state permit conditions.

**(C)** Work associated with dewatering and hydrotesting activities and compliance with conditions of the NPDES general permit coverage authorizing discharges associated with construction activity dewatering and hydrotesting.

**XXX.XX General Requirements.** In order to provide for the control of water pollution, dust, and erosion arising from the construction activities of the Contractor and his subcontractors in the performance of this contract, the work performed shall comply with all applicable federal, state, and local laws and regulations concerning water pollution control including, but not limited to, the following regulations:

**(A)** State of Hawaii, HDOH, Hawaii Administrative Rules (HAR) Chapter 11-54 – Water Quality Standards and Chapter 11-55 – Water Pollution Control.

**(B)** For Oahu projects ONLY, HDOT Harbors Division, Storm Water Management Plan.

**(C)** For Oahu projects ONLY, City and County of Honolulu (CCH), Rules Relating to Soil Erosion Standards and Guidelines.

**(D)** For Oahu projects ONLY, CCH, Storm Water BMP Manual for Construction.

**(E)** 40 CFR Part 110, Environmental Protection Agency (EPA), Discharge of Oil.

**(F)** 40 CFR Part 117, EPA, Determination of Reportable Quantities for Hazardous Substances.

**(G)** 40 CFR Part 261, EPA, Identification and Listing of Hazardous Waste.

**(H)** 40 CFR Part 302, EPA, Designation, Reportable Quantities, and Notification.

**(I)** 49 CFR Part 171, U.S. Department of Transportation, Hazardous Materials Regulations.

**XXX.XX** **Materials.** Materials shall conform to the following when applicable:

**(A)** **Slope Drains.** Slope drains may be constructed of pipe, fiber, mats, erosion control fabric, geotextiles, rubble, Portland cement concrete, bituminous concrete, plastic sheets, or other materials acceptable to the Construction Engineer.

**(B)** **Grass.** Grass shall be quick growing species such as rye grass, Italian grass, or cereal grasses. Grass shall be suitable to the area and provide a temporary cover that will not compete later with permanent cover. Alternative grasses are allowable if acceptable to the Construction Engineer.

**(C)** **Fertilizer and Soil Conditions.** Fertilizer and soil conditioners shall be a standard commercial grade acceptable to the Construction Engineer.

**(D)** **Silt Fences.** Silt fences shall be synthetic filter fabric mounted on posts and embedded in compacted ground in compliance with American Society for Testing and Materials (ASTM) D6462-03, Standard Practice for Silt Fence Installation.

**(E)** **Berms.** Berms shall be gravel or sand wrapped with geotextile material. Alternate materials are allowable if acceptable to the Construction Engineer.

**(F)** **Alternate materials or methods** to control, prevent, remove, and dispose of pollution are allowable if acceptable to the Construction Engineer.

**XXX.XX** **Construction**.

**(A)** **Preconstruction Requirements**.

**(1)** **Temporary Stormwater Pollution, Dust, and Erosion Control Meeting.** The contractor shall be required to submit a site-specific BMP Plan to the Construction Engineer and address all comments by the Construction Engineer. After the Plan is accepted in writing by the Construction Engineer, the Contractor shall schedule a meeting with the Construction Engineer before the start of construction work to discuss the sequence of work, and plans and proposals for stormwater pollution, dust, and erosion control.

**(2)** **Temporary Stormwater Pollution, Dust, and Erosion Control Submittals.** The Contractor shall submit the site-specific BMP Plan for acceptance by the Construction Engineer prior to the start of work.

**(a)** Written site-specific BMP Plan shall include the following as applicable:

**1.** Identification of potential pollutants and their sources and other factors that may cause stormwater pollution, dust, and erosion.

**2.** A list of all material and heavy equipment to be used during construction. Vehicles and equipment shall be well maintained and free from any type of fluid leaks.

**3.** Construction schedule.

**4.** Name(s) of specific individual(s) designated responsible for stormwater pollution, dust and erosion controls on the project site. Include home, business, and cellular telephone numbers, fax numbers, and e-mail addresses.

**5.** Descriptions of the methods and devices used to eliminate certain pollutants (e.g., wastewater, fuels, solvents, detergents, toxic or hazardous substances) from discharging into state waters and drainage systems, and provide details of BMP to be installed or utilized. Indicate approximate dates when BMP will be installed and removed.

**6.** Description of maintenance and subsequent removal of any erosion or siltation control devices.

**7.** Method(s) of removal and disposal of solid and regulated hazardous wastes encountered or generated during construction. The Contractor is advised to procure regulated hazardous materials on an as-needed basis, as feasible. All excess regulated hazardous materials at the conclusion of this project shall remain the property of the Contractor and shall be removed from HDOT Harbors Division property upon the completion of the project.

**8.** Method(s) of removing and disposing concrete and asphalt pavement cutting slurry, concrete curing water, and hydrodemolition water.

**9.** Method(s) of containing, removing and disposing of demolition dust and debris to minimize the discharge of these pollutants into state waters and drainage systems.

**10.** Spill kit contents and location.

**11.** Fugitive dust control, including dust from grinding, sweeping, or brooming off operations or combination thereof.

**12.** Method(s) of storing and handling of regulated hazardous materials (e.g. oils, paints) and other products used for the project. Safety Data Sheets (SDS) for all regulated hazardous materials used during construction activities shall be kept on-site throughout the duration of the project and readily available upon inspection. All containers of regulated hazardous materials should be provided with secondary containment during storage. Regulated hazardous materials not specifically needed in the execution of this project shall not be brought or stored on site. As feasible, the Contractor is encouraged to use products that do not contain any regulated constituents. The use of green products is encouraged.

**13.** Method(s) of concrete washout/waste control.

**14.** Method(s) of managing material stockpiles to minimize erosion and dust.

**15.** Good housekeeping practices.

**a.** Minimize tracking of sediment offsite from project entrances and exits.

**b.** Litter management. The Contractor shall have a comprehensive housekeeping policy and shall actively enforce housekeeping requirements. Housekeeping items include, but are not limited to, cups, cans, bottles and other forms of lightweight litter, unattended containers of hazardous materials, concrete debris (e.g. dust, chips, and other sweepings), and discarded articles of disposable Personal Protective Equipment (e.g., earplugs, dust masks, and gloves). Employees who are specifically tasked with housekeeping duties shall be identified by name.

**c.** The Contractor should provide and maintain covered waste receptacles. No construction debris or other refuse that is generated as a result of project activities is to be disposed in HDOT Harbors Division-owned waste receptacles.

**16.** Provide plan(s)/drawing(s) showing location of followings when applicable:

**a.** Boundaries of the property and the locations where construction activities will occur, including:

i. Locations where earth-disturbing activities will occur (noting any sequencing of construction activities);

ii. Approximate slopes and drainage patterns with flow arrows before and after the construction;

iii. Locations where sediment, soil, or other construction materials will be stockpiled;

iv. Locations of any contaminated soil or contaminated soil stockpiles;

v. Locations of any crossings of state waters;

vi. Designated points on the site where vehicle will exit onto paved roads;

vii. Locations of structures and other impervious surfaces upon completion of construction; and

viii. Locations of construction support activity areas covered by the permit.

**b.** Locations of all state waters, including wetlands and indicate which water bodies are listed as impaired.

**c.** The boundary lines of any natural buffers.

**d.** Topography of the site, existing vegetative cover, and features (e.g., forest, pasture, pavement, structures), and drainage pattern(s) of storm water onto, over, and from the site property before and after major grading activities.

**e.** Storm water discharge locations, including locations of any storm drain inlets on-site and in the immediate vicinity of the site to receive storm water runoff from the project; and locations where storm water will be discharging to state waters (including wetlands).

**f.** Locations of all potential pollutant-generating activities.

**g.** Locations of storm water control measures; and

**h.** Locations where chemicals will be used and stored.

**17.** Procedures for notification of appropriate facility personnel, emergency response agencies, and regulatory agencies where a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Parts 110, 117, or 302, occurs during a 24-hour period. Contact information must be in locations that are readily accessible and available.

**18.** The Contractor shall date and sign the site-specific BMP Plan.

**(b)** The Contractor shall keep the approved Plan on-site or an easily accessible location throughout the duration of the project. Revisions to the Plan shall be included with the original plan. Modify contract documents to conform to revisions. Include actual date of installation and removal of BMP. Obtain written acceptance by the Construction Engineer before revising BMP. An updated Plan shall be kept on-site throughout the remainder duration of the project.

The Contractor shall follow guidelines in the "*The City and County of Honolulu Storm Water Best Management Practice Manual – Construction*," (dated November 2011) in developing, installing, and maintaining BMP for the project. Additionally, the Contractor shall follow City and County of Honolulu *Rules Relating to Soil Erosion Standards and Guidelines* (dated April 1999) **for all projects on Oahu**, and use respective Soil Erosion Guidelines for

Maui, Kauai and Hawaii County projects. Information can be found at the respective County websites.

**(B) Construction Requirements are as follows.**

**(1)** No work shall be allowed to begin until submittals detailed in Subsection XXX.XX A.2 – Temporary Stormwater Pollution, Dust, and Erosion Control Submittals are completed and accepted in writing by the Construction Engineer. The Contractor shall prevent pollutants from entering state waters. These efforts shall address areas such as those that drain to water, are over water, or drain to storm drains in the area of the project site. The Contractor shall design, operate, implement, and maintain the Plan to ensure that storm water discharges associated with construction activities will not cause or contribute to a violation of applicable state water quality standards.

**(2)** All projects at Honolulu and Kalaeloa Barbers Point Harbors are subject to HDOT Harbors Division SWMP requirements for construction at those harbors unless the project meets a specified exemption class. The requirements include, but are not limited to, construction site BMP initial, recurring (i.e. every two weeks from October through March and every two months otherwise), and final inspections at the frequencies outlined in the SWMP. No grading or land disturbance activities are allowed until the initial BMP inspection is completed and required BMPs are found to be properly installed.

**(3)** Address all comments received from the Construction Engineer.

**(4)** Modify and resubmit plans and construction schedules to correct conditions that develop during construction which were unforeseen during the design and pre-construction stages.

**(5)** Coordinate temporary control provisions with permanent control features throughout the construction and post-construction period.

**(6)** BMP shall be in place and operational until the construction is completed and accepted by Harbors.

**(7)** Install and maintain either or both stabilized construction entrances and wheel washes to minimize tracking of dirt and mud onto roadways. Restrict traffic to stabilized construction areas only. Clean dirt, mud, or other material tracked onto the road immediately. Modify stabilized construction entrances to prevent mud from being tracked onto roadways.

**(8)** Chemicals may be used as soil stabilizers for either or both erosion and dust control if acceptable to the Construction Engineer.

**(9)** Cover exposed surface of materials completely with tarpaulin or similar device when transporting aggregate, soil, excavated material or material that may be a source of fugitive dust.

**(10)** Cleanup and remove any pollutant that can be attributed to the Contractor.

**(11)** Install or modify BMP due to change in the Contractor's means and methods, or for omitted condition that should have been allowed for in the accepted site-specific BMP Plan or a BMP that replaces an accepted site-specific BMP that is not satisfactorily performing.

**(12)** Properly maintain BMP.

**(13)** Remove, replace or relocate any BMP that must be removed, replaced or relocated due to potential or actual flooding, or potential danger or damage to the project or public.

**(14)** The Contractor's designated representative specified in Subsection XXX.XX A.2.a.4 shall address any BMP concerns brought up by the Construction Engineer within 24 hours of notification, including weekends and holidays. Should the Contractor fail to satisfactorily address these concerns, the Construction Engineer reserves the right to employ outside assistance or use the Construction Engineer's own labor forces to provide necessary corrective measures. The Construction Engineer will charge the Contractor such incurred costs plus any associated project engineering costs. The Construction Engineer will make appropriate deductions from the Contractor's monthly progress estimate. Failure to apply BMP shall result in either or both the establishment and increase in the amount of retainage due to unsatisfactory progress or withholding of monthly progress payment. Continued failure to apply BMP may result in one or more of the following: the Contractor being fully responsible for all additional costs incurred by HDOT Harbors Division including any fines levied by HDOH, suspension of the Contract, or cancellation of the Contract.

**(C)** **Hydrotesting Activities**. If work includes removing, relocation or installing waterlines, and the Contractor elects to flush waterline or discharge hydrotesting effluent into state waters or drainage systems, obtain a Notice of General Permit Coverage (NGPC) authorizing discharges associated with hydrotesting waters from the HDOH Clean Water Branch (CWB). If a permit is required, prepare and submit permit application (CWB-Notice of Intent (NOI) Form F) to the HDOH CWB.

Do not begin hydrotesting activities until the HDOH CWB has issued a NGPC. Hydrotesting operations shall be in accordance with conditions in the NGPC.

Submit a copy of the NPDES Hydrotesting Waters Application and Permit to the Construction Engineer.

**(D)** **Dewatering Activities**. If excavation of backfilling operations require dewatering, and the Contractor elects to discharge dewatering effluent into state waters or existing drainage systems, obtain an NGPC authorizing discharges associated with construction activity dewatering from the HDOH CWB. If a permit is required, prepare and submit permit application (CWB-NOI Form G) to the HDOH CWB.

Do not begin dewatering activities until the HDOH-CWB has issued an NGPC. Conduct dewatering operations in accordance with the conditions in the NGPC. Submit a copy of the NPDES Dewatering Application and Permit to the Construction Engineer.

**XXX.XX Measurement.**

**(A)** Installation, maintenance, monitoring, and removal of the BMP will be paid on a lump sum basis. Measurement for payment will not apply.

**(B)** The Construction Engineer will only measure additional water pollution, dust and erosion control required and requested by the Construction Engineer on a force account basis in accordance with Subsection 109.06 – Force Account Provisions and Compensation of the *Hawaii Standard Specifications for Road and Bridge Construction, 2005*.

**XXX.XX** **Payment**. The Construction Engineer will pay for accepted pay items listed below at contract price per pay unit, as shown in the proposed schedule. Payment will be full compensation for work prescribed in this section and contract documents.

The Construction Engineer will pay for the following pay item when included in the proposed schedule:

| **Pay Item** | **Pay Unit** |
|---|---|
| Installation, Maintenance, Monitoring, and Removal of BMP | Lump Sum |

No progress payment will be authorized until the Construction Engineer accepts in writing the site-specific BMP Plan or when the Contractor fails to maintain the project site in accordance with the accepted BMP Plan.

The Contractor shall reimburse the State of Hawaii within 30-day for the full amount of all outstanding costs incurred by the State of Hawaii for all citations or fines received as a result of the Contractor's non-compliance with regulations.

## ARTICLE XXX – TEMPORARY STORMWATER POLLUTION, DUST, AND EROSION CONTROL
## For Project Subject to NPDES NOI-C Permit

**XXX.XX Description.** This section is required for all work, including the Contractor's storage sites. It describes the following:

**(A)** A detailed Storm Water Pollution Prevention Plan (SWPPP) required by a National Pollutant Discharge Elimination System (NPDES) Appendix C General Permit from the State of Hawaii Department of Health (HDOH) and prepared according to Section 7 of Appendix C, Hawaii Administrative Rules (HAR) Chapter 11-55, will satisfy this requirement. Additionally, all projects at Honolulu and Kalaeloa Barbers Point Harbors are subject to State of Hawaii, Department of Transportation (HDOT) Harbors Division, Storm Water Management Plan (SWMP) requirements, and are subject to Harbors Best Management Practice (BMP) inspections. If any requirement conflicts with those administered by HDOH, the contractor shall follow the more stringent requirement.

**(B)** Compliance with applicable federal and other state permit conditions.

**(C)** Work associated with dewatering and hydrotesting activities and compliance with conditions of the NPDES general permit coverage authorizing discharges associated with construction activity dewatering and hydrotesting.

**XXX.XX General Requirements.** In order to provide for the control of temporary stormwater pollution, dust, and erosion arising from the construction activities of the Contractor and his subcontractors in the performance of this contract, the work performed shall comply with all applicable federal, state, and local laws and regulations concerning water pollution control including, but not limited to, the following regulations:

**(A)** State of Hawaii, HDOH, HAR Chapter 11-54 – Water Quality Standards and Chapter 11-55 – Water Pollution Control.

**(B)** For Oahu projects ONLY, HDOT Harbors Division, Storm Water Management Plan.

**(C)** For Oahu projects ONLY, City and County of Honolulu (CCH), Rules Relating to Soil Erosion Standards and Guidelines.

**(D)** For Oahu projects ONLY, CCH, Storm Water BMP Manual for Construction.

**(E)** 40 CFR Part 110, Environmental Protection Agency (EPA), Discharge of Oil.

**(F)** 40 CFR Part 117, EPA, Determination of Reportable Quantities for Hazardous Substances.

**(G)** 40 CFR Part 261, EPA, Identification and Listing of Hazardous Waste.

**(H)** 40 CFR Part 302, EPA, Designation, Reportable Quantities, and Notification.

**(I)** 49 CFR Part 171, U.S. Department of Transportation, Hazardous Materials Regulations.

**XXX.XX** **Materials.** Materials shall conform to the following when applicable:

**(A)** **Slope Drains.** Slope drains may be constructed of pipe, fiber, mats, erosion control fabric, geotextiles, rubble, Portland cement concrete, bituminous concrete, plastic sheets, or other materials acceptable to the Construction Engineer.

**(B)** **Grass.** Grass shall be quick growing species such as rye grass, Italian grass, or cereal grasses. Grass shall be suitable to the area and provide a temporary cover that will not compete later with permanent cover. Alternative grasses are allowable if acceptable to the Construction Engineer.

**(C)** **Fertilizer and Soil Conditions.** Fertilizer and soil conditioners shall be a standard commercial grade acceptable to the Construction Engineer.

**(D)** **Silt Fences.** Silt fences shall be synthetic filter fabric mounted on posts and embedded in compacted ground in compliance with American Society for Testing and Materials (ASTM) D6462-03, Standard Practice for Silt Fence Installation.

**(E)** **Berms.** Berms shall be gravel or sand wrapped with geotextile material. Alternate materials are allowable if acceptable to the Construction Engineer.

**(F)** **Alternate materials or methods** to control, prevent, remove, and dispose of pollution are allowable if acceptable to the Construction Engineer.

**XXX.XX** **Construction**.

**(A)** **Preconstruction Requirements**.

**(1)** **Temporary Stormwater Pollution, Dust, and Erosion Control Meeting.** The contractor shall be required to submit a SWPPP to the Construction Engineer and address all comments by the Construction Engineer. After the SWPPP is accepted in writing by the Construction Engineer, the Contractor shall schedule a meeting with the Construction Engineer before the start of construction work to discuss the sequence of work, and plans and proposals for stormwater pollution, dust, and erosion control.

**(2) Temporary Stormwater Pollution, Dust, and Erosion Control Submittals.** The Contractor shall submit the SWPPP for acceptance by the Construction Engineer prior to the start of work.

**(a)** The following information shall be described in the SWPPP as specified in Section 7 of Appendix C, HAR 11-55, at a minimum:

**1.** **Storm water team** (by name or position), which is responsible for the development of the SWPPP, any later modifications to it, and for compliance with the requirements in the NPDES permit. The SWPPP must identify the personnel that are part of the storm water team as well as their individual responsibilities.

**2.** **Nature of construction activities** including the size of the project site (in acres) and the total area expected to be disturbed by the construction activities (in acres), construction support activity areas covered by permit, and the maximum area expected to be disturbed at any one time.

**3.** **Emergency-related projects** in response to a public emergency (e.g., natural disaster, extreme flooding conditions). If this applies to the project, documentation of the cause of the public emergency, information substantiating its occurrence, and a description of the construction necessary to re-establish affected public services shall be included in the SWPPP. The proclamation of a civil defense emergency or similar proclamation is required to be from the President of the United States or State Governor.

**4.** **Identification of other site contractors** (e.g., sub-contractors) who will be engaged in construction activities at the site, and the areas of the site over which each contractor has control. If this piece of information is not available at the time the SWPPP is submitted, the plan must be amended to include the information prior to the start of construction activities.

**5.** **Sequence and estimated dates of construction activities** including a schedule of the estimated start dates and the duration of the following activities, according to Section 7.2.5 of Appendix C, HAR 11-55:

**a.** Installation of storm water control measures.

**b.** Commencement and duration of earth-disturbing activities.

**c.** Cessation, temporarily or permanently, of construction activities on-site, or in designated portions of the project site.

**d.** Final or temporary stabilization of areas of exposed soil.

**e.** Removal of temporary storm water conveyances/channels and other storm water control measures, removal of construction equipment and vehicles, and cessation of any pollution-generating activities.

**6.** **Site map or series of maps**, showing the following features of the project, according to Section 7.2.6 of Appendix C, HAR 11-55:

**a.** Boundaries of the property and the locations where construction activities will occur, including:

i. Locations where earth-disturbing activities will occur (noting any sequencing of construction activities);

ii. Approximate slopes and drainage patterns with flow arrows before and after construction;

iii. Locations where sediment, soil, or other construction materials will be stockpiled;

iv. Locations of any contaminated soil or contaminated soil stockpiles;

v. Locations of any crossings of state waters;

vi. Designated points on the site where vehicle will exit onto paved roads;

vii. Locations of structures and other impervious surfaces upon completion of construction; and

viii. Locations of construction support activity areas covered by the permit.

**b.** Locations of all state waters, including wetlands and indicate which water bodies are listed as impaired.

**c.** The boundary lines of any natural buffers.

**d.** Topography of the site, existing vegetative cover, and features (e.g., forest, pasture, pavement, structures), and drainage pattern(s) of storm water onto, over, and from the site property before and after construction.

**e.** Storm water discharge locations, including locations of any storm drain inlets on-site and in the immediate vicinity of the site to receive storm water runoff from the project; and locations where storm water will be discharging to state waters (including wetlands).

**f.** Locations of all potential pollutant-generating activities.

**g.** Locations of storm water control measures; and

**h.** Locations where chemicals will be used and stored.

**7.** **Construction site pollutants generated by on-site activities.** For each pollutant-generating activity, an inventory of pollutants or pollutant constituents (e.g., sediment, fertilizers and/or pesticides, paints, solvents, fuels) associated with that activity, which could be exposed to rainfall and could be discharged from the construction site (include potential spills and leaks).

A list of all material and heavy equipment to be used during construction. Vehicles and equipment shall be well maintained and free from any type of fluid leaks.

**8.** **Sources of non-storm water**, including, but not limited to, the design, installation, and maintenance of the control measures to prevent its discharge.

9. **Buffer documentation**. When a State water is located within 50 feet of the project's earth disturbances, the Contractor shall describe which compliance alternative has been selected for the site, and comply with Section 5.1.2.1 of Appendix C, HAR 11-55, Appendix C.

10. **Description of storm water control measures** to be used during construction activity including information on:

    a. Type of storm water control measure to be installed and maintained, including design information;

    b. Specific sediment controls to be installed and operated prior to earth-disturbing activities, control measures to either prevent the contact of storm water with contaminated soil (if it exists) or prevent the discharge of any storm water runoff which has contacted contaminated soil (or stockpiles);

    c. Stabilization practices/techniques and additional controls planned to be used to remove sediment prior to vehicle exit;

    d. For linear projects, where the Contractor has determined that the use of perimeter controls in portions of the site is impracticable, document justification.

    e. Stabilization practices including specific vegetative and/or non-vegetative practices.

    f. Post-construction measures that will minimize the discharge of pollutants via storm water discharges after construction operations have been finished.

11. **Pollution prevention procedures.**

    a. Spill prevention and response procedures, including:

        i. Procedures for expeditiously stopping, containing, and cleaning up spills, leaks, and other releases. Identify the name or position of the employee(s) responsible for detection and response of spills or leaks;

ii. Procedures for notification of appropriate facility personnel, emergency response agencies, and regulatory agencies where a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Parts 110, 117, or 302, occurs during a 24-hour period. Contact information must be in locations that are readily accessible and available.

b. Waste management procedures on handling and disposing of all wastes generated at the site, including, but not limited to, clearing and demolition debris, sediment removed from the site, construction and domestic waste, hazardous or toxic waste, and sanitary waste.

The Contractor is advised to procure regulated hazardous materials on an as-needed basis, as feasible. All excess regulated hazardous materials at the conclusion of this project shall remain the property of the Contractor and shall be removed from HDOT Harbors Division property upon the completion of the project.

12. **Procedures for inspection, maintenance, and corrective action** to be followed for conducting site inspections, maintaining the storm water control measures, and, where necessary, taking corrective actions. Additionally, include following information in the SWPPP:

a. Personnel responsible for conducting inspections;

b. Inspection schedule. Contractor's Self-Inspections shall be conducted at applicable schedules listed below.

i. **Inspection Frequency for sites discharging to impaired waters[1]**. For any

[1] "Impaired waters" are waters identified as impaired on the State Clean Water Act Section 303(d) list, and waters with a State-established and EPA-approved Total Maximum Daily Load (TMDL). The construction site will be considered to discharge to an impaired water if the first State water to which the discharge enters is to a water on the section 303(d) list or one with a State established and EPA-approved TMDL. For a discharge that enters a storm water drainage system prior to discharge, the first State water to which discharge occurs is the water body that receives the storm water discharge from the storm water drainage system.

portion of the site that discharges to an impaired water, the inspection shall be conducted at the following intervals:

**(a)** Once every seven (7) calendar days; and

**(b)** Within 24 hours of the first day of a storm event of 0.25 inches or greater and within 24 hours after the end of the storm.

**(c)** Daily during periods of a prolonged storm event of 0.25 inches or greater.

ii. **Inspection Frequency for sites NOT discharging to impaired waters**. At a minimum, the inspection shall be conducted in accordance with one of the two schedules listed below:

**(a)** At least weekly; or

**(b)** Biweekly (once every 14 calendar days), and within 24 hours of the first day of a storm event of 0.25 inches or greater, daily during periods of a prolonged storm of 0.25 inches or greater, and within 24 hours after the end of the storm.

iii. **Reductions in inspection frequency**. For stabilized areas, the Contractor may reduce the frequency of inspections to monthly (once per month) in any area of the site where the stabilization steps have been completed as follows:

**(a)** For vegetative stabilization, all activities necessary to initially seed or plant the area to be stabilized; and/or

**(b)** For non-vegetative stabilization, the installation or application of all such non-vegetative measures.

Note that inspections are only required during the project's normal working hours.

c. Any inspection or maintenance checklists or other forms that will be used.

Contractor shall either keep a properly maintained rain gauge in a secure location to monitor rainfall at the project site, or obtain the storm event information from a weather station that is representative of the location. If a rain gauge is to be utilized to determine if a storm event of 0.25 inches or greater has occurred on the site, it must have a tolerance of at least 0.05 inches of rainfall, and an opening of at least 1-inch diameter. Install the rain gauge on the project site in an area that will not deter rainfall from entering the gauge opening. Maintain the rain gauge and replace the gauge if stolen, it does not function properly or accurately, is worn out, or needs to be relocated. Do not begin fieldwork until the rain gage is installed and the SWPPP is in place. For any day of rainfall during normal business hours that measures 0.25 inches or greater, the Contractor shall record the total rainfall measured for that day.

**13.** **Staff training documentation** that the required personnel were trained in accordance with Section 7.2.13 of Appendix C, HAR 11-55, to ensure that all activities on the site comply with the requirements of the issued permit. The list of major required personnel are as listed below:

a. Personnel responsible for the design, installation, maintenance, and/or repair of storm water controls (including pollution prevention measures);

b. Personnel responsible for the application and storage of chemicals (if applicable);

c. Personnel responsible for conducting BMP inspections;

d. Personnel responsible for taking corrective actions

At a minimum, personnel must be trained to understand the following, if related to the scope of their job duties (e.g., only personnel responsible for conducting inspections need to understand how to conduct inspections):

a. The location of all storm water controls on the site required by the issued permit, and how they are to be maintained;

b. The proper procedures to follow with respect to the permit's pollution prevention requirements; and

c. When and how to conduct inspections, record applicable findings, and take corrective actions.

The Contractor is not required to provide or document formal training for subcontractor or other outside service providers, but must ensure that such personnel understand any requirements of the permit that may be affected by the work they are subcontracted to perform. Detailed discussion is provided in Section 7.2.13.2 of Appendix C, HAR 11-55.

14. **Documentation of compliance with Safe Drinking Water Act Underground Injection Control (UIC) requirements** for certain subsurface storm water controls, if using any of the following storm water controls at the project site**:**

a. Infiltration trench (if storm water is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system);

b. Commercially manufactured precast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate storm water flow; and

c. Drywells, seepage pits, or improved sinkholes (if storm water is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system).

15. **Other information listed below.**

a. Contractor information (general and subcontractors) including legal name, street address, contact person’s name and position title, telephone number, and email address.

b. Other state, federal, or county permits including:

i. Copy of the drainage system owner's approval allowing the discharge to enter their drainage system (if applicable);

ii. Copy of the Department of the Army permit and Section 401 water quality certification (if applicable); and

iii. A list of other permits (if applicable).

**16.** Any other information as requested by the Director of HDOH and/or HDOT.

**17.** **SWPPP certification.** The owner or its duly authorized representative must certify, sign, and date the Plan in accordance with Section 15 of Appendix A, HAR 11-55.

**(b)** The Contractor shall keep the approved SWPPP on-site or at an easily accessible location throughout the duration of the project. Revisions to the Plan shall be included with the original plan. Modify contract documents to conform to revisions. Include actual date of installation and removal of BMP. Obtain written acceptance by the Construction Engineer before revising SWPPP. Additionally, the planned modifications to the BMP meeting the conditions listed in Section 7.4.1 of Appendix C, HAR 11-55, shall be documented and updated in the SWPPP according to Section 7.4 of Appendix C, HAR-55. An updated Plan shall be kept on-site throughout the remainder duration of the project.

The Contractor shall follow guidelines in the "*The City and County of Honolulu Storm Water Best Management Practice Manual – Construction*," (dated November 2011) in developing, installing, and maintaining BMP for the project. Follow CCH *Rules Relating to Soil Erosion Standards and Guidelines* (dated April 1999) for all projects on Oahu. Use respective Soil Erosion Guidelines for Maui, Kauai and Hawaii County projects. Information can be found at the respective County websites.

**(B)** **Construction Requirements are as follows.**

**(1)** No work shall be allowed to begin until submittals detailed in Subsection XXX.XX A.2 – Temporary Stormwater Pollution, Dust, and Erosion Control Submittals are completed and accepted in writing by the

Construction Engineer. The Contractor shall prevent pollutants from entering state waters. These efforts shall address areas such as those that drain to water, are over water, or drain to storm drains in the area of the project site. The Contractor shall design, operate, implement, and maintain the Plan to ensure that storm water discharges associated with construction activities will not cause or contribute to a violation of applicable state water quality standards.

**(2)** All projects at Honolulu and Kalaeloa Barbers Point Harbors are subject to HDOT Harbors Division SWMP requirements for construction at those harbors. The requirements include, but are not limited to, construction site BMP initial, recurring (i.e. every two weeks from October through March and every two months otherwise), and final inspections at the frequencies outlined in the SWMP. No grading or land disturbance activities are allowed until the initial BMP inspection is completed and required BMPs are found to be properly installed.

**(3)** Address all comments received from the Construction Engineer.

**(4)** Modify and resubmit plans and construction schedules to correct conditions that develop during construction which were unforeseen during the design and pre-construction stages.

**(5)** Coordinate temporary control provisions with permanent control features throughout the construction and post-construction period.

**(6)** BMP shall be in place and operational until the construction is completed and accepted by Harbors.

**(7)** Install and maintain either or both stabilized construction entrances and wheel washes to minimize tracking of dirt and mud onto roadways. Restrict traffic to stabilized construction areas only. Clean dirt, mud, or other material tracked onto the road immediately. Modify stabilized construction entrances to prevent mud from being tracked onto roadways.

**(8)** Chemicals may be used as soil stabilizers for either or both erosion and dust control if acceptable to the Construction Engineer.

**(9)** Cover exposed surface of materials completely with tarpaulin or similar device when transporting aggregate, soil, excavated material or material that may be a source of fugitive dust.

**(10)** Cleanup and remove any pollutant that can be attributed to the Contractor.

**(11)** Install or modify BMP due to change in the Contractor's means and methods, or for omitted condition that should have been allowed for in the accepted SWPPP or a BMP that replaces an accepted one that is not satisfactorily performing.

**(12)** Properly maintain BMP. For projects that require an NPDES Appendix C General Permit from the HDOH, inspect, prepare a **monthly compliance report,** and make repairs to BMP on a timely basis. Maintain records of BMP inspections for the duration of the project. Submit copies of the inspection reports to the Construction Engineer upon request.

**(13)** Remove, replace or relocate any BMP that must be removed, replaced or relocated due to potential or actual flooding, or potential danger or damage to the project or public.

**(14)** The Contractor's designated representative specified in Subsection XXX.XX A. 2.a.1 shall address any BMP concerns brought up by the Construction Engineer within 24 hours of notification, including weekends and holidays. Should the Contractor fail to satisfactorily address these concerns, the Construction Engineer reserves the right to employ outside assistance or use the Construction Engineer's own labor forces to provide necessary corrective measures. The Construction Engineer will charge the Contractor such incurred costs plus any associated project engineering costs. The Construction Engineer will make appropriate deductions from the Contractor's monthly progress estimate. Failure to apply BMP shall result in either or both the establishment and increase in the amount of retainage due to unsatisfactory progress or withholding of monthly progress payment. Continued failure to apply BMP may result in one or more of the following: the Contractor being fully responsible for all additional costs incurred by HDOT Harbors Division including any fines levied by HDOH, suspension of the Contract, or cancellation of the Contract.

**(15)** The owner or its duly authorized representative shall be responsible for fulfilling the reporting requirements (e.g., state of construction activities, incident notification) according to Section 12 of Appendix C, HAR 11-55, and submittal requirements (e.g., monthly compliance report, Notice of Cessation form) according to Section 13 of Appendix C, HAR 11-55.

**(C)** **Hydrotesting Activities**. If work includes removing, relocation or installing waterlines, and the Contractor elects to flush waterline or discharge hydrotesting effluent into state waters or drainage systems, obtain a Notice of General Permit Coverage (NGPC) authorizing discharges associated with hydrotesting waters from the HDOH Clean Water Branch (CWB). If a permit is required, prepare and submit permit application (CWB-Notice of Intent (NOI) Form F) to the HDOH CWB.

Do not begin hydrotesting activities until the HDOH CWB has issued a NGPC. Hydrotesting operations shall be in accordance with conditions in the NGPC. Submit a copy of the NPDES Hydrotesting Waters Application and Permit to the Construction Engineer.

**(D)** **Dewatering Activities**. If excavation of backfilling operations require dewatering, and the Contractor elects to discharge dewatering effluent into state waters or existing drainage systems, obtain an NGPC authorizing discharges associated with construction activity dewatering from the HDOH CWB. If a permit is required, prepare and submit permit application (CWB-NOI Form G) to the HDOH CWB.

Do not begin dewatering activities until the HDOH-CWB has issued an NGPC. Conduct dewatering operations in accordance with the conditions in the NGPC. Submit a copy of the NPDES Dewatering Application and Permit to the Construction Engineer.

**XXX.XX Measurement.**

**(A)** Installation, maintenance, monitoring, and removal of the BMP will be paid on a lump sum basis. Measurement for payment will not apply.

**(B)** The Construction Engineer will only measure additional water pollution, dust and erosion control required and requested by the Construction Engineer on a force account basis in accordance with Subsection 109.06 – Force Account Provisions and Compensation of the *Hawaii Standard Specifications for Road and Bridge Construction, 2005*.

**XXX.XX** **Payment**. The Construction Engineer will pay for accepted pay items listed below at contract price per pay unit, as shown in the proposed schedule. Payment will be full compensation for work prescribed in this section and contract documents.

The Construction Engineer will pay for the following pay item when included in the proposed schedule:

| **Pay Item** | **Pay Unit** |
|---|---|
| Installation, Maintenance, Monitoring, and Removal of BMP | Lump Sum |

No progress payment will be authorized until the Construction Engineer accepts in writing the SWPPP or when the Contractor fails to maintain the project site in accordance with the accepted SWPPP.

The Contractor shall reimburse the State of Hawaii within 30-day for the full amount of all outstanding costs incurred by the State of Hawaii for all citations or fines received as a result of the Contractor's non-compliance with regulations.

# Attachment 8

# HDOT Harbors Rules and Regulations for Construction Site

## HARBORS RULES AND REGULATIONS FOR ENVIRONMENTAL COMPLIANCE

The Harbors environmental inspectors have been given authority to initiate enforcement actions including verbal warnings, written citations, and potential tenant eviction.

***Hawaii Revised Statutes Title 15 Chapter 266***
**HRS 266-2** describes the powers and duties of the State of Hawaii Department of Transportation Harbors Division. **HRS 266-3** establishes the Director of Transportation authority to establish and enforce rules to control and manage all commercial harbors and roadsteads, all commercial harbor improvements, and all vessels and shipping within the commercial harbors and roadsteads. The Harbors then relies on **HRS 266-24**, which permits the Director of Transportation the authority to designate persons to enforce Chapter 266 and all rules and orders issued pursuant thereto and of all other laws of the state.

Such officers, employee's agents, and representatives of Harbors have police powers to serve and execute warrants and arrest offenders, and the power to serve notices and orders. When arresting or issuing a citation to a purported violator of any provision of Chapter 266, the Director of Transportation's designee, hereinafter referred to as "enforcement officer" can issue a summons or citation (similar to a traffic ticket) warning or directing the violator to appear and answer the charge before a district judge, or take the purported violator without delay before a district judge.

Penalties for violating the provision of Chapter 266 or rules or orders issued pursuant to Chapter 266 are issued by the district court and includes a finding or guilty or not guilty verdict of a misdemeanor and a fine. Fines arising from environmental protection violations include reimbursing the HDOT for the entire amount of the HDOH or EPA fine under HRS **§266-28** and can include an additional amount of not more than $10,000 for each day of violation under HRS **§266-25**.

***Hawaii Administrative Rules Title 19 Chapters 41 to 44***
HDOT adopted these chapters to regulate operations at the state harbors. **Chapter 42-126 and 42-127** specifically apply to environmental regulation. These rules require that no litter be left within a state harbor, except in properly marked bins. In addition, oil, oily refuse, sludge, chemicals, or other hydrocarbons should only be deposited in designated collection points. Specifically, Chapter 42-127 can be applied to activities such as maintenance or washing that has the potential to generate pollutants to be discharged into state waters. Below is an excerpt from Chapter 42-127:

> *"No person shall place, throw, deposit, or discharge, or cause to be placed, thrown, deposited, or discharged into the waters of any harbor, river or shore waters of the State any litter, or other gaseous, liquid or solid materials which render the water unsightly, noxious or otherwise unwholesome so as to be detrimental to the public health and welfare or a navigational hazard. No person shall discharge oil sludge, oil refuse, fuel oil*

*or molasses either directly or indirectly, or pump bilges or ballast tanks containing other than clean water into the waters of any harbor, river or into any shore waters in the State."*

In addition, Chapter 42 contains language on storage, usage, and/or handling requirements for hazardous materials or other regulated potential pollutants or hazardous substances. These chapters detail specific environmental practices where enforcement is implemented through arrest or citation and presented before the district judge. The major components of Chapter 42, related to enforcement, inspection, safety, cleanliness, use of facilities, and construction, are summarized below.

**Chapter 42-15** – Compliance with Federal, State, and County Laws, Ordinances and Rules

- Use of state harbors and harbors facilities is subject to compliance with all applicable federal, state, and county laws, ordinances, rules and regulations. Particular attention is directed to:
    - o Rules of the United States Public Health Service and of the state department of health, relating to the use of rat guards and other measures to prevent rodents from leaving the vessel.
    - o Rules of the state department of health pertaining to air and water pollution.
    - o Rules of the fire department of each county.

**Chapter 42-16** – Citation for Violation

- Citations issued, pursuant to HRS 266-24.1, to a commercial firm for violation of this part may be issued to any agent, officer, or manager of the firm.

**Chapter 42-50** – Inspection

All small craft and smaller commercial vessels moored or berthed at a state-owned or controlled pier, wharf, quay, bulkhead, landing dolphin, anchorage, mooring, or other facilities located in the shore waters, navigable streams, harbors, ports, and roadsteads of the State shall be subject to inspection by the department or any peace officer of the State or its political subdivisions at any time where necessary and proper for the purpose of enforcing these rules.

**Chapter 42-52** - Small Craft and Smaller Commercial Vessel Repairs, Reconstruction or Major Modification

- Minor repairs to small craft and smaller commercial vessels may be made at the assigned berth and shall be completed within thirty days.
- If repairs are estimated to, or actually do, require that the vessel be out of service for more than thirty days, prior approval shall be sought from the department to initiate or complete the repairs in the harbor.
- Prior approval shall be sought from the department for any repairs requiring the use of cranes, lifts, and any similar devices within the harbor.
- Repair, reconstruction or major modification that would interfere with the free flow of other vessels, pedestrian, or vehicle traffic shall only be accomplished in an area

designated by the department. Failure to seek approval as required by this section shall be grounds for the revocation of the use permit.

**Chapter 42-103** Vessel Loaded with Explosives

- No vessel containing more than five hundred founds of Class A, one tone of Class B, and/or ten tons of Class C explosives (net explosive content) shall enter or be loaded in any harbor in the State except on prior written permission of the harbor master of the district concerned, or the director.
- No Class A explosives, as defined by the United States Coast Guard in its regulations in existence as of June 1, 1993, will be admitted in any harbor in quantities in excess of the limitations established by the USCG for the various harbors unless otherwise authorized by the director in writing. Other cargos may not be moved concurrently with Class A explosive cargo.

**Chapter 42-104** Handing of Explosives

- All handling and loading or unloading of explosives shall be done in a safe and careful manner and shall be accordance with the federal regulations pertinent thereto in force at the time. Explosives shall be off-loaded prior to the off-loading of any other cargo.

**Chapter 42-105** Hauling of Explosives

- All hauling of explosives away from or to the pier shall be done in a safe and careful manner and shall be in accordance with rules of the state department of labor and industrial relations.

**Chapter 42-106** – Containers for Flammable Liquids

- No empty containers which have been used to hold flammable liquids shall be delivered onto any wharf or structure under control of the department unless the same are securely closed with metal screw plugs.
- Any such containers shall be delivered onto a wharf or structure only at such times as a carrier is prepared to take immediately delivery.

**Chapter 42-107** – Nitrate of Soda, Nitrate of Ammonia, Sulfur, and Other Similar Materials

- No nitrate of soda, nitrate of ammonia, sulfur, or other similar material shall be stored or left upon any wharf for more than four hours unless packed in sound and non-leaking containers. Such material shall be under the continuous care of a competent guard satisfactory to the harbor master until removed.
- Masters, owners, or agents of vessels or consignees of cargoes of nitrate of soda, sulfur, or other similar materials during the process of loading, unloading, and removing such cargoes, must at all times keep the wharf swept clean and free of such materials.
- If loose nitrate of soda, sulfur, or other similar material is to be discharged onto or loaded from any wharf or structure at any harbor, it shall be placed directly into the carrier and immediately removed. A protective device approved by the harbor master shall be used

during the period of loading or unloading to prevent the material being handled from falling upon the wharf structure.

- During the process of handling nitrate of soda, sulfur, or other similar material on any wharf at any harbor under control of the department, it shall be obligatory on the part of the master, owners, or agents of a vessel to provide containers of not less than 50 gallons capacity filled with a solution of nitrate of soda and water at distances of not more than 50 feet apart, with suitable buckets placed alongside each container, for the purpose of fighting any fire which may occur in such cargo.

**Chapter 42-108** – Dangerous Acids; Electric Storage Batteries

- Acids of a dangerous character such as sulfuric, muriatic, and nitric acids shall be removed from the wharf immediately upon discharge from any vessel and no such acid shall be put upon a wharf under control of the department for shipment until the carrier is ready to receive it. Prior permission of the harbor master shall be secured in the event it becomes necessary to handle such cargo at other times.
- Electric storage batteries containing electrolyte or corrosive battery fluid of non-spillable type, protected against short circuits and completely and securely boxed, shall be exempt from this provision.

**Chapter 42-109** – Flammable Substances; Leaky Containers

- No gasoline, distillate, kerosene, benzene, naphtha, turpentine, paints, oils, or other flammable substances in leaky containers shall be delivered onto any wharf under control of the department for shipment.
- All such substances unloaded from any vessel in leaky containers shall be removed immediately.

**Chapter 42-110** – Heating Combustibles on Vessels

- No combustible material such as pitch, tar resin, or oil shall be flame heated on board any vessel within the harbors or streams of the State without the permission of a harbor master.

**Chapter 42-111** – Fumigation of Vessel

- No vessel shall be fumigated or smoked at any wharf under control of the department without the prior permission in writing from the director, the chief, or the harbor master.
- If fumigation is to be with cyanogen products or hydrocyanic acid gas in any form, however generated, the applicant or applicant’s agent shall be in possession of a permit as required by HDOH rules and shall have a guard on duty so long as any danger exists, in order that no one, unless properly entitled to do so, be allowed to board such vessel.

**Chapter 42-112** – Use of Fuel Burning Steam Generating Appliances

- All fuel burning steam generating appliances when used on any wharf under control of the department or on any scow, pile driver, or other vessel working alongside or near

any wharf under control of the department shall be equipped with spark arresters satisfactory to the harbor master.
- At the close of each day's work, all ashes, cinders, waste, or other deposits caused by such appliances upon any wharf shall be promptly removed and shall not be disposed of in or upon any waters of the harbor.

**Chapter 42-113** – Repair, Manufacturing, Construction, or Maintenance Work on Wharf
- No person shall make any repair or do any kind of manufacturing, construction, or maintenance work on any wharf without the permission of the harbor master.

**Chapter 42-114** – Smoking Prohibited
- Smoking is positively prohibited at all times within any cargo shed, or upon any wharf apron, and during the time cargo is being loaded, unloaded, or stored on any unshedded pier under control of the department, and no person shall enter into, stand in, or under, or pass through any such wharf or structure with a lighted pipe, cigar, cigarette, match, fire, or any flame of whatever nature, excepting only within those areas designated by the harbor master and plainly marked "Smoking Area."
- No smoking or lighting of a match or any other fire-creating device shall be permitted within 50 feet of any fueling operation.

**Chapter 42-115** – Use of Explosives
- The use of explosives on land, on any wharf, or in a shed or other structure under control of the department, or in the water in the immediate vicinity of the same, without the written approval of the harbor master is strictly prohibited.

**Chapter 42-116** – Keeping Wharf in Sanitary Condition and Clear of Fire Hazard
- Vessel owners, charterers, agents, or private terminal operators utilizing wharves and sheds under the control of the department for the handling of merchandise shall keep such wharves and sheds in a clean and sanitary condition, clear of materials which create a fire hazard and shall ensure that passageways and established fire lanes are not obstructed.

**Chapter 42-117** – Standards of Cleanliness
- All vessels moored at a state-owned mooring or berthing facility shall be kept, at all times, in a condition of reasonable cleanliness and sanitation so as not to constitute a common nuisance or potential source of danger to public health.

**Chapter 42-118** – Charges for Cleaning Wharves
- In cases where the department takes over the cleaning of wharves the charge therefore shall be assessed against the vessel which is responsible for the necessary of cleaning.

**Chapter 42-119** – Identification of Mobile Equipment

- All mobile equipment used on any property under the control of the department in connection with the handling of cargo or shipping containers, such as folk lifts, cranes, tractors, and straddle trucks, shall be clearly identified as to the owner thereof.

**Chapter 42-121** – Fowl, Animal, or Livestock

- No fowl, animal, or livestock of any kind shall be allowed to remain on any wharf under control of the department for a period longer than six hours without being properly fed and watered. After any fowl, animal, or livestock unloaded on a state wharf, it shall be removed from the same wharf within twenty-four hours.
- No shipment of such fowl, animal, or livestock subject to quarantine shall be unloaded on a state wharf by any shipping company or its agents unless first passed by the state department of agriculture or unless arrangement have been made of acceptance of quarantine. All such fowl, animal, or livestock requiring quarantine shall be removed from the wharf within eighteen hours.
- All expenses incurred in the care and maintenance of such fowl, animal, or livestock while on a state wharf shall be paid by the consignee thereof and shall constitute a lien upon the same until such charges are paid.

**Chapter 42-122** – Private Use of State Harbor Property or Facilities; Business Activities; Signs

- No regular or extensive use of any state harbor property or facility for private gain or purpose shall be permitted without corresponding and reasonable benefits and returns to the public.
- No person shall engage in any business or commercial activity at any state harbor without the prior written approval of the department. Without limiting its generality, the term “engage in any business or commercial activity” as used in this section includes (1) solicitation, and (2) distribution of advertisement or circulars, intended for private gain or purpose.
- No person shall post or display any signs at any state harbor without the prior written approval of the department, except that approval will not be required for the posting or displaying of any sign on a vessel which relates solely to the sale of such vessel if the maximum dimension of such sign does not exceed three feet.

**Chapter 42-123** – Placement of Goods and Equipment

- Any person handling goods or using equipment on a wharf or within a shed under control of the department or bringing goods whereon or therein for shipment, shall place, store, or stack such goods or equipment in such a way as not to be an impediment to the approaches to same nor an obstacle to the removal of other goods, not to cause damage to the shed or wharf.
- No goods shall be so placed as to restrict or prevent the use of mooring bitts, cleats, or any other device used for mooring purposes.
- No goods shall be so placed as to restrict or prevent the use of tracks, water connections, fire hydrants, gutters, liquid connections or drains, telephone or electric connections.

**Chapter 42-124** – Closing of Wharves for Safety Reasons

- The harbor master may close the wharves or any portion thereof and regulate and control the use of the same whenever in the harbor master's opinion it is advisable to do so for reasons of safety, fire prevention, or probable interference with cargo handling or vessel operations.
- No person shall enter upon any wharf so closed without the permission of the harbor master.

**Chapter 42-125** – Liability for Damage to or Loss of Merchandise and Cargo

- The department shall not be liable for any damage to or loss of merchandise or other property on any wharf under its control.
- It shall be the responsibility of shipping concerns or their agents to exert every effort to protect cargo from the effect of weather conditions while same is stored on state wharves. This responsibility shall include the proper closing of all openings such as outside doors and windows, and the placing of cargo on pallets or dunnage so that it will not be damaged by moisture from the shed floors. Unless the above precautions are taken and unless carelessness on the part of department employees can be shown, no claim for damaged cargo due to inclement weather shall be considered.

**Chapter 42-126** – Littering or Polluting Land Areas Prohibited

- No person shall throw, place, leave, deposit, abandon, or cause or permit to be thrown, placed, left, deposited or abandoned any litter within a state harbor, except in receptacles designated by the department for the disposal of such materials. "Litter" as used in this section includes any and all types of debris and substances, whether liquid or solid, and materials such as garbage, refuse, rubbish, glass, cans, bottles, paper, wrappings, fish or animal carcasses or any other substances which render harbor lands or facilities unsightly, noxious or otherwise unwholesome to the detriment of the public health and welfare and effective and safe operation of the harbor.
- No person shall deposit oil, oily refuse, sludge, chemicals, or other hydrocarbons on state property except in specially designated collection points. These items may not be left in or near standard refuse containers or anywhere else on harbors property. Penalties, including but not limited to the revocation of mooring permits and the right to use the facilities, may be invoked.

**Chapter 42-127** – Littering or Polluting of Water Prohibited

- No person shall place, throw, deposit, or discharge, or cause to be place, thrown, deposited, or discharges into the waters of any harbor, river or shore waters of the State any litter, or other gaseous, liquid or solid materials which render the water unsightly, noxious or otherwise unwholesome so as to be detrimental to the public health and welfare or a navigational hazard.

- No person shall discharge oil sludge, oil refuse, fuel oil, or molasses either directly or indirectly, or pump bilges or ballast tanks containing other than clean water into the waters of any harbor, river or into any shore waters in the State.

**Chapter 42-128** – Disposal of Salvage of Derelict Craft

- When any owner, agent, or individual contemplates or plans the disposal or salvage of a derelict craft, vessel or other object of any size, type or description, by transporting across, within or on navigable waters, whether a part or whole craft or whether a floating or suspended object of any sort which might, if sunk, lost or abandoned in the harbors, channels or shore waters, become a hazard to navigation, to dredging or to other operation of state or federal government, or the public in those waters, that person shall obtain the written permission of the harbor master before taking such action.

**Chapter 42-129** – Duty of Persons Who Lose, Drop, or Abandon Any Floating or Sinking Object

- Should any owner, operator, charter, agent, or individual, without permission of the harbor master, lose, sink, drop, or abandon any floating or sinking object in or on the navigable waters and shore waters of the State, that person shall immediately notify the harbor master and shall immediately take such action as is necessary for removal of the object.
- Upon failure on the part of the owner, operator, charterer, agent or individual to remove such object the department will take such actions through federal or commercial channels as are necessary for such removal and will charge all costs incurred by the department in effecting the necessary removal to the owner. The harbor master may require the posting of a bond to assure payment.

**Chapter 42-130** – Approved Backflow Prevention Device Required for Water Supply System

- No person shall connect a vessel's water supply system, siphon or other water water-operated device, equipment or mechanism connected to the water supply system or operate any water-operated device, equipment or mechanism connected to the water supply system, unless an approved backflow prevention device has been installed at the faucet or other point of connection. An "approved backflow prevention device" means a backflow prevention device that meets the requirements contained in Standard 1001, American Society of Sanitary Engineers as it existed on June 1, 1993, or the Uniform Plumbing Code adopted by the International Association of Plumbing and Mechanical Officials.

**Chapter 42-131** – Dumping of Materials at Sea

- When any owner, agent or individual contemplates the dumping of sinkable materials at sea by hauling across, within or on the navigable and/or shore waters of the State that person shall notify and obtain the permission of the department as specified in §19-42-161 and §19-42-162 prior to movement and shall not fail to perform any duty imposed thereby. All dumping at sea of sinkable objects or materials shall be done in the areas

designated by the Secretary of the Army for such disposal and in accordance with the Corps of Engineers requirements and applicable state agency requirements.
- The dumping of floating objects is strictly prohibited.

**Chapter 42-132** – Waste Outlets; Permit Required
- Notwithstanding the issuance of a permit pursuant to §19-42-161, no person shall do any of the following within a state commercial harbor without first having obtained a permit from the HDOH (not applicable to vessels):
    - o Discharge any wastes from shore into the waters of a state commercial harbor so as to reduce the quality of the water below the standards of water quality adopted for such waters by the HDOH.
    - o Construct, install, modify, alter, or operate any treatment works or part thereof or any extension of addition thereto which discharges from shore into the waters of a state commercial harbor.
    - o Construct or use new outlet for the discharge of any wastes from shore into the waters of a state commercial harbor.

**Chapter 42-133** – Loading or Unloading Flammable Liquids
- Loading or unloading of flammable liquids shall be in strict accordance with applicable federal laws and regulations.

**Chapter 42-134** – Appliances and Electrical Wiring
- All cooking or heating appliances or any other machinery, equipment, utensils, or apparatus which are used by small craft or smaller commercial vessels at a state commercial harbor and could be the cause of fire shall be so constructed, installed, wired, situated, maintained, and used so as not to constitute a potential fire hazard. The failure to conform to any statute, rule, regulation, standard, or ordinance affecting fire safety may be considered by the department in determining any violation of this section.
- Particular attention is directed to the applicable provisions of the state boating rules of the Department of Land and Natural Resources. In addition, the approval of any machinery, equipment, utensils, or apparatus by Underwriter’ Laboratories, Factory Mutual System, Marine Testing Institute, Inc., or any other nationally recognized electrical testing agency, may be considered by the department in determining compliance with this section.
- All electrical equipment must be properly grounded.

**Chapter 42-135** – Fire Extinguishing Equipment for Small Craft
- Any small craft utilizing the waters of the state commercial harbor shall be provided with approved fire extinguishers as prescribed in the applicable provisions of the state boating rules of the DLNR. The fire extinguishers shall at all times be maintained in good and serviceable condition for immediate and effective use an shall be mounted on wall brackets so located as to be readily accessible. In addition, if any person is living aboard any small craft or contrivance, which is not a visiting small craft temporarily using the

harbor, the small craft or contrivance shall be equipped with at least one approved hand portable fire extinguisher containing ten pounds of dry chemicals placed on each separate level or floor of habitable living space. Each extinguisher shall be mounted on a wall bracket so placed as to be readily accessible.

Chapter 42-136 – Fueling

- All fueling operations shall be done in compliance with the stricter of any applicable federal, state, or county rules. The fueling of vessels at a state commercial harbor where a marine fueling station has been established, or where authorized tank trucks or tank trailers are available shall be accomplished only at a station, or by tank trucks or tank trailers with a state permit. A permit shall be issued only if:
  - Proper application has been submitted;
  - Established fees have been paid to the department by the applicant;
  - There exists a comprehensive general liability insurance policy or policies, or a certificate of insurance in lieu thereof evidencing that a policy has been issued and is in force with a combined single limit of not less than $500,000. The specification of limits contained in this section shall not be construed in any way to be a limitation on the liability of the permittee for any injury or damage proximately caused by it. The insurance shall (A) be issued by an insurance company or surety company authorized to do business in the State; (B) name the State as an additional insured; (C) provide that the department shall be notified at least thirty (30) days prior to any termination, cancellation, or material change in its insurance coverage; (D) cover all injuries, losses, or damages arising from, growing out of, or caused by any acts or omissions of the permittee, its officers, agents, employees, invitees, or licensees, in connection with the permittee’s use or occupancy of the premises; and (E) be maintained and kept in effect at the permittee’s own expense throughout the life of the permit. The permittee shall submit evidence to the department of renewals of other actions to indicate that the insurance policy remains in effect as prescribed in this section.
- Prior to fueling a vessel at a state commercial harbor, the operator shall:
  - Securely moor the vessel;
  - Stop all engines, motors, fans, and devices which could provide sparks;
  - Extinguish all fires;
  - Close all ports, windows, doors, and hatches; and
  - Clear the area of people not directly involved with the operation of the vessel or servicing of the vessel.
- Persons fueling a vessel at a state commercial harbor shall:
  - Refrain from smoking, striking matches, or throwing switches; and
  - Keep the nozzle of the fuel hose, or fuel can in continuous contact with fuel tank opening to guard against static sparks.
- After fueling is completed, the following action shall be taken:
  - Close fill openings;
  - Wipe up all spilled fuel;

  - o Open all ports, windows, doors, and hatches;
  - o Permit vessel to ventilate for at least five minutes; and
  - o Check that there are no fuel fumes in the vessel's bilges or below deck spaces before starting machinery or lighting fires.
- Fueling a vessel from a fuel barge or tanker barge shall be allowed only when it is down in accordance with operational procedures approved by the USCG.

**Chapter 42-137** – Fishing Prohibited

- Fishing, as defined in HRS 187A-1 is prohibited from all piers, wharves, and bulkhead walls in Kewalo Basin and Honolulu Harbor except Piers 5, 6, and 7; and all piers and wharves in Barbers Point Harbor. Casting of fishing lines beyond the shallow marginal reef and into the boat channel is prohibited from the Waikiki side of the Kewalo Basin entrance channel. Fishing with nets is prohibited in the basin and channel areas of Kewalo Basin, Barbers Point Harbor, and Honolulu Harbor except for the use of hand-held scoop nets for landing hooked fish at Piers 5, 6, and 7 in Honolulu Harbor and the shallow marginal reef at the Waikiki side of the Kewalo Basin entrance channel and as provided in these rules and HAR 188-34.

**Chapter 42-138** – Lifesaving Equipment Required

- Any small craft and smaller commercial vessel utilizing the waters of a state commercial harbor shall be equipped with lifesaving equipment as required by and approved by the USCG. Wearable PFDs must be readily accessible and throwable devices must be immediately available for use
  - o Boats 16 feet or over in length shall carry one Type I, II, or III (wearable) PFD for each person on board and one Type IV (throwable) PFD in each boat.
  - o Boats less than 16 feet in length and all canoes and kayaks shall carry one Type I, II, III, or IV PFD for each person on board.

**Chapter 42-139** – Fire Signal for Small Craft or Smaller Commercial Vessel in Harbor

- Five prolonged blasts on a vessel's whistle, horn or other sound producing device indicates (1) a fire on board small craft or smaller commercial vessel not under way or (2) a fire at any facility to which the small craft or smaller commercial vessel may be moored. The words "prolonged blasts" used in this section shall mean a blast from four to six seconds duration. The fire signal shall not be used for other purposes in any state harbor.

**Chapter 42-140** – Liquor Prohibited on State Piers and Waterfront Properties without Permit

- No person shall consume any liquor as defined in HRS 281-1, on any state pier or waterfront property not under lease except by prior permission from the department for each occasion.

**Chapter 42-141** – Responsibility for Vessel Gangplanks

- It shall be the responsibility of the vessel to provide a reliable and safe means of access and egress to and from the vessel and the pier for crew members, passengers, and visitors to the vessel.

**Chapter 42-161** – Dredging, Filling, and Construction

- Any person, firm, or corporation desiring to perform any dredging, filling, or erecting of any construction within commercial harbors and entrance channels belonging to or controlled by the State, shall first obtain a permit therefore from the department.
- The application for any dredging, filling, or construction shall be in the form prescribed by the department, accompanied by maps and drawings which shall clearly show the location, scope, character, and details of the proposed work, and shall be further accompanies by a fee of $50 to cover costs of the necessary investigation. This fee is not refundable whether or not a permit is granted.

**Chapter 42-162** – Jurisdiction of Other Agencies

- The United States Army Corps of Engineers, the State Department of Health, and the Department of Land and Natural Resources may have certain jurisdiction over navigable waters.
- The approval of these agencies shall also be secured before performing work within their jurisdictions. When directed, the applicant shall notify the USCG of such work for publication of a “Notice to Mariners.”

**Chapter 42-163** – Installation of Buoys

- Any person desiring to install mooring or anchorage buoys in any harbor under the jurisdiction of the department, shall apply to the department in writing for permission to install such buoys.
- Applications must be accompanied by comprehensive plans showing the exact proposed location of buoys and anchors, as well as plans and specifications of the type and size of buoy and anchoring equipment. The director may grant permission for the installation of moorings or buoys in any area under the department jurisdiction if, in the director’s judgment, it is advisable and will not be a menace to or interfere with navigation. The right is reserved by the director to revoke any license or permission for installation at any time, if the director’s opinion revocation is necessary or advisable. Upon revocation, the owner shall remove the moorings or buoys without delay.

**Chapter 42-164** – Construction of Structures

- No buildings or structures of any nature shall be erected or constructed on state property, nor shall existing structures be modified, without obtaining the prior permission of the division and any other governmental agency as required by law. The division may require plans, specifications, and other pertinent data to accompany any request for construction or modification of state facilities. In General, approval shall be dependent on an agreement to return the property to its original state when vacating the property, if requested by the division.

Note: The majority of Chapter 42 deals with loading and unloading of hazardous materials and does not apply to storage of materials and waste that are used/stored at harbor tenant facilities or construction sites. In the case of improper use, manage, or storage of hazardous substances or wastes, Harbors will follow the terms and conditions contained in the tenant lease agreement or revocable permit, or construction contracts as stated below.

Enforcement Officers may issue penalties under HAR Title 19 for the following circumstances:

- A responsible party in violation of an environmental regulation, but where a Written Warning is not an effective tool.
- A responsible party in violation of a Harbors requirement, but not in violation of HDOH storm water regulations.
- A transient vessel owner in violation of a Harbors requirement, BMP, or HDOH storm water regulation, although not subject to a tenant lease agreement, revocable permit, construction contract.

# Attachment 9

# Suspected Illicit Discharge Reporting Form

**Hawaii Department of Transportation – Harbors Division**

# Suspected Illicit Discharge Reporting Form

**General Information: Use this form to report a suspected illicit discharge. If you are unsure, please contact your supervisor or HAR-EE. Examples of illicit discharges: uncontained vehicle/equipment/building/sidewalk washing, sink discharging directly to ground or storm drain inlet, petroleum spills/sheens, unpermitted vessel discharges, uncontained vessel painting/chipping/sandblasting/cleaning, etc.**

## Observer Information

| | | | |
|---|---|---|---|
| Name: | | | |
| Office Code: | | Telephone Number: | |
| Report Date: | | | |

## Description of Suspected Illicit Discharge

| | | | |
|---|---|---|---|
| Address or Location: | | Date and Time: | |
| Description: (Include Substance and Amount, if known) | | | |

Media into which the discharge occurred:
☐ Air ☐ Natural Soil ☐ Concrete/Asphalt Pavement ☐ Stream ☐ Ocean ☐ Other:_______________

| | |
|---|---|
| Responsible Party: (if known) | |
| Cause of Discharge: (if known) | |
| Clean-up Actions: (if applicable) | |
| Notifications Made: | |

**Please forward completed form and/or picture(s) to HAR-EE office. Fax Number: (808) 587-1964**

## Point of Contact for Reporting

| Agency | Telephone Number |
|---|---|
| Harbor Traffic Control (Aloha Tower) | (808) 587-2076, (808) 368-5993 (Cellular) |
| Hawaii Department of Transportation Harbors Division, Engineering Environmental Section [HAR-EE] | (808) 587-1962, (808) 587-1976, (808) 587-1960 |

Additional Follow-up By HAR-EE (to be filled by HAR-EE):

# Attachment 10

# Training Materials

# STORM WATER RUNOFF AND ITS IMPACTS

Storm water runoff is rain or snowmelt that flows over land and does not percolate into the soil (EPA, 2007). Storm water runoff occurs naturally, in small amounts, from almost any type of land surface, especially during larger storm events. Impervious surfaces, such as buildings, homes, roads, sidewalks, and parking lots can significantly alter the natural hydrology of the land by increasing the volume, velocity, and temperature of runoff and by decreasing its infiltration capacity. Increasing the volume and velocity of storm water runoff can cause severe stream bank erosion, flooding, and degrade the biological habitat of these streams. Reducing infiltration can lower groundwater levels and affect drinking water supplies.

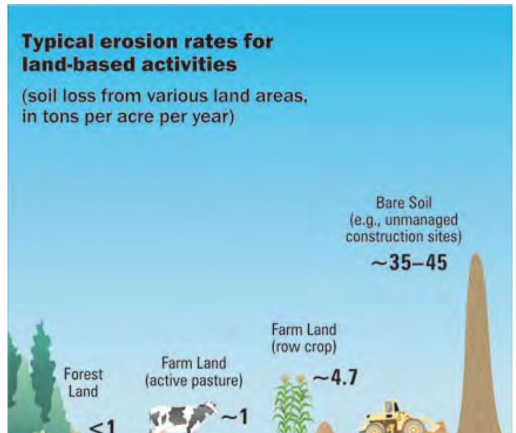



**Figure 2-1. Typical erosion rates from land-based activities.**

In addition, as storm water runoff moves across surfaces, it picks up trash, debris, and pollutants such as sediment, oil and grease, pesticides, and other toxics. Changes in ambient water temperature, sediment, and pollutants from storm water runoff can be detrimental to aquatic life, wildlife, habitat, and human health. Soil exposed by construction activities is especially vulnerable to erosion. Runoff from an un-stabilized construction site can result in the loss of approximately 35 to 45 tons of sediment per acre each year, compared to less than one ton in forested land (American Society of Civil Engineers [ASCE] and Water Environment Federation [WEF], 1992; Figure 2-1). Even during a short period of time, construction sites can contribute more sediment to streams that would be deposited naturally over several decades. Excess sediment can cloud the water reducing the amount of sunlight reaching aquatic plants, clog fish gills, smother aquatic habitat and spawning areas, and impede navigation in waterways.

## Importance of Construction Site Runoff Control Program

This **Construction Site Runoff Control Program** has been developed to address the potential pollutants that are generated as a result of construction activities conducted at Harbors. These potential pollutants pose a risk to Harbors Small MS4 and the receiving water bodies through storm water runoff. Uncontrolled storm water runoff from construction sites can significantly impact our ocean water.

## Construction Impacts

Construction activities can impact the environment through several different processes. The primary storm water pollutant at a construction site is sediment, a common result of erosion.

## Erosion and Sedimentation

Excessive erosion and sedimentation are the most visible water quality impacts. Erosion is the process by which the soil and rock are removed from the earth's surface by the action of water, wind, and gravity, and then transported and deposited in other locations. Sedimentation is the movement and settling out of suspended soil particles. It is usually easier and less expensive to prevent erosion than it is to control sediment from leaving a construction site. To control erosion at a construction site, it is important to understand the different types of erosion that can occur.

## Water Erosion

In Hawaii, water erosion is typically occurring in six different forms (i.e., raindrop erosion, sheet erosion, rill erosion, gully erosion, stream-bank erosion, and coastal erosion). Raindrop erosion involves the dislodging of soil particles by raindrops. Once the rate of rainfall is faster than the rate of infiltration into the soil, surface runoff occurs and carries the loosened soil particles down slopes. Sheet erosion is the transport of loosened soil particles by surface runoff that is flowing downhill in thin sheets. Rill erosion removes soil through the formation of concentrated runoff that creates many small channels. Gully erosion is the result of highly concentrated runoff that cuts down into the soil along the line of flow. Stream-bank erosion occurs when flowing water erodes unstable stream-banks. Coastal (or shoreline) erosion primarily occurs on both exposed and sheltered coasts through the action of currents, waves, and tidal change.

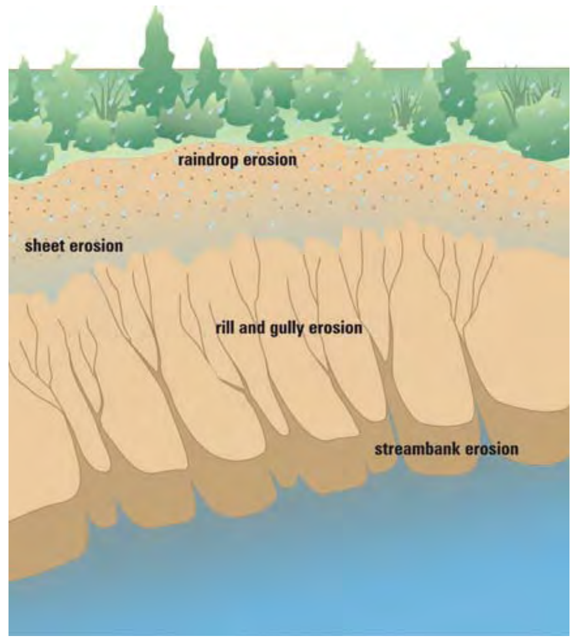



**Figure 2-2. Types of Erosion.**

Generally, water erosion begins when raindrops break down the soil structure and dislodge soil particles. Runoff carrying the soil particles becomes sheet erosion, which eventually forms smaller rills and larger gullies (Figure 2-2). The best way to stop water erosion is to keep the soil in place through vegetation, erosion control blankets, or other methods that prevent the soil from becoming dislodged during rain events.

## Wind Erosion

Wind erosion is of two primary varieties (i.e., deflation and abrasion; Blanco & Lal, 2010). Deflation occurs when the wind picks up and carries loose soil particles, and abrasion occurs when the surfaces are worn down as they are struck by airborne particles carried by wind. Deflation is divided into three categories, including surface creep, saltation, and suspension (Figure 2-3). Surface creep occurs when larger heavier particles slide or roll along

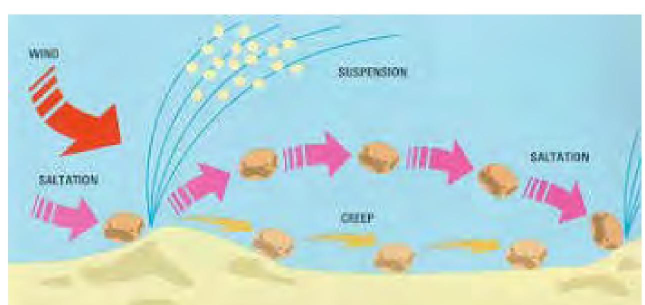



**Figure 2-3. Wind Erosion.**

the ground. Saltation occurs when particles are lifted a short height into the air and bounce and saltate across the surface of the soil. Suspension is a phenomenon when very small and light particles are lifted into the air by the wind and are carried for long distances. Saltation is responsible for the majority (50 to 70 percent [%]) of wind erosion, followed by suspension (30 to 40 %), and then surface creep (5 to 25 %; Blanco & Lal, 2010). Wind erosion is much more severe in arid areas, and during times of drought.

Wind erosion is another potential hazard at construction sites and is commonly referred to as dust. Dust is defined as solid particles or particulate matter predominantly large enough to eventually settle out from the air but small enough to remain temporarily suspended in the air for an extended period. Common sources of dust at construction sites include vehicle and equipment use, exposed areas of soil, and contractor activities such as land clearing, drilling, and demolition.

## Gravitational Erosion

Gravitational erosion, or mass movement, is the downward and outward movement of rock and sediments on a sloped surface, mainly due to the force of gravity (Gray & Sotir, 1996; Norris *et al.*, 2008). Gravitational erosion is often the first stage in the breakdown and transport of weathered material in sloped areas. It moves material from a higher elevation to a lower elevation. This type of erosion occurs continuously on all slopes (some act very slowly, while others occur very suddenly with disastrous results).

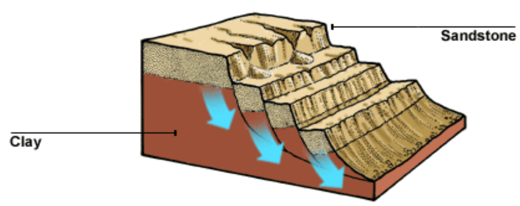



**Figure 2-4: Landslide.**

Any perceptible downward movement of rock or sediment is often referred to in general terms as a "landslide." However, landslides can be classified in a much more detailed way that reflects the mechanisms responsible for the movement and the velocity at which the movement occurs (Figure 2-4). One of the visible topographical manifestations of a very slow form of such erosion is a scree slope (Figure 2-5).

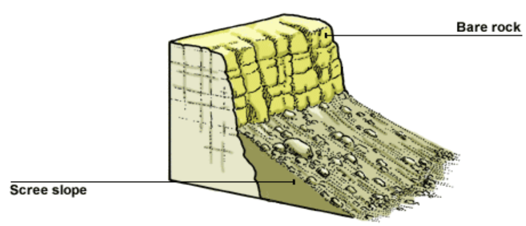



**Figure 2-5: Scree Slope.**

Slumping happens on steep hillsides (Figure 2-6). It occurs along distinct fracture zones, often within soil materials like clay that may move quite rapidly downhill upon being released. In some cases, slumping is caused by water beneath the slope weakening it. In many cases, it is

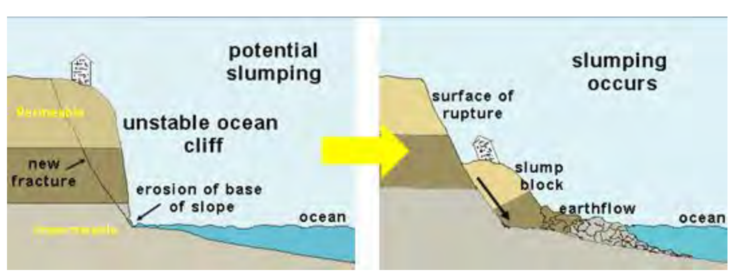



**Figure 2-6: Slumping.**

simply the result of poor engineering control or measurement. Surface creep is the slow movement of soil and rock by gravity, which is usually not perceptible except through extended observation. It can also describe the rolling of dislodged soil particles 0.5 to 1.0 millimeters in diameter by wind along the soil surface.

## Factors Affecting Erosion

The erosion process is typically influenced by climate, topography, soils, and vegetative cover. Understanding how these factors influence erosion, will help with selection, design, and implementation of appropriate controls to minimize erosion from the construction site (EPA, 2007).

**Climate**: The frequency, intensity, and duration of rainfall are the principal factors influencing erosion from a construction site. Know the weather patterns in the area and, if possible, plan soil disturbance activities for periods of dry weather. The mean annual rainfall in the areas of Honolulu and Kalaeloa Barbers Point Harbors is 23.6 inches (Giambelluca *et al.,* 2011). Generally, weather in Hawaii is very consistent, with only minor changes in temperature throughout the year. For the majority of Hawaii, there are only two seasons – summer/dry (from April to September) and winter/wet (from October to March), based on the rainfall data presented at The Weather Channel website (The Weather Channel, 2013) and U.S. Climate Data website (The US Climate Data, 2013).

**Topography**: The longer and steeper a slope, the greater the potential there is for erosion from the slope. Use practices such as diversions or fiber rolls to break up long slopes. Consider minimizing soil disturbance activities on steeper slopes.

**Soils**: Soil type can also impact erosion. Soil texture, structure, organic matter content, compaction, and permeability can all influence erosion rates.

**Vegetative Cover**: Vegetative cover provides a number of critical benefits in preventing erosion. It absorbs the energy of raindrops, slows velocity of runoff, increases infiltration, and helps bind the soil. Soil erosion can be greatly reduced by maximizing vegetative cover at construction site.

## Other Common Pollutants

In addition to sedimentation, other common pollutants, which have the potential to impact water quality, including nutrients, trace metals, pesticides, oil and grease, fuels, and other toxic chemicals. Nutrients, including nitrogen and phosphorus, are often used in fertilizers and, can cause excessive algae growth. Bacteria and viruses can contaminate storm water from animal excrement or sanitary sewer overflows. Oil and grease includes a wide array of petroleum hydrocarbons from various sources, such as leaks from vehicles and equipment and used oil disposal. Metals can enter the storm water after impact with corroded equipment. It is important to note that over half of the trace metal load carried in storm water is associated with sediments. Organics can contaminate the storm water as a result of spilled or improperly disposed cleaners and solvents.

Each construction site should be assessed to determine which pollutants may present a potential hazard, and select and implement BMPs to reduce the potential contaminants..

## Site Specific Construction Best Management Practices Plan

An SSCBMPP is a site-specific written document that identifies potential sources of storm water pollution at the construction site. It describes practices to reduce pollutants in storm water discharges from the construction site. Reduction of pollutants is often achieved by controlling the volume of storm water runoff (e.g., taking steps to allow storm water to infiltrate into the soil). In addition, it identifies procedures that the operator will implement to comply with the terms and conditions of a construction general permit.

An effective SSCBMPP is the primary key to prevent or reduce storm water pollution resulted from a construction site. If sediment and erosion controls and good housekeeping practices are followed, construction activity can result in the discharge of significantly less sediment and other common pollutants.

**FINAL**

# Post-Construction Stormwater Management in New Development and Redevelopment Honolulu and Kalaeloa Barbers Point Harbors

# Small Municipal Separate Storm Sewer Systems File Nos. HI 03KB482 and HI 03KB488

Prepared For:

State of Hawaii
Department of Transportation
Harbors Division
79 South Nimitz Highway
Honolulu, Hawaii 96813

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Version 7.0

## RECORD OF REVISION

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|---|---|---|---|
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| 5.0 | February 2014 | Version 5.0 | All |
| 6.0 | May 2014 | Version 6.0 | All |
| 7.0 | May 2014 | Version 7.0 | 5 |
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## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| % | Percent |
| ACR | Annual Compliance Report |
| BMP | Best Management Practice |
| CASQA | California Stormwater Quality Association |
| CCH | City and County of Honolulu |
| DA | Drainage Area |
| EPA | U.S. Environmental Protection Agency |
| HAR | Hawaii Administrative Rules |
| HAR-E | Harbors Division Engineering Branch |
| HAR-EC | Harbors Division Engineering Branch Construction Section |
| HAR-ED | Harbors Division Engineering Branch Design Section |
| HAR-EE | Harbors Division Engineering Branch Environmental Section |
| HAR-EM | Harbors Division Engineering Branch Maintenance Section |
| HAR-EP | Harbors Division Engineering Branch Planning Section |
| HAR-PM | Harbors Division Property Management Section |
| HDOT | State of Hawaii Department of Transportation |
| HRS | Hawaii Revised Statutes |
| LID | Low Impact Development |
| MS4 | Municipal Separate Storm Sewer System |
| NPDES | National Pollutant Discharge Elimination System |
| NRCS | Natural Resources Conservation Service |
| O&M | Operation and Maintenance |
| PM | Harbors Division Project Manager |
| POPC | Pollutants of Potential Concern |
| PSWP | Post-Construction Stormwater Mitigation Plan |
| TMDL | Total Maximum Daily Loads |
| WQF | Water Quality Flow Rate |
| WQV | Water Quality Volume |

## DEFINITIONS OF KEY TERMS

**Best Management Practices (BMPs)**: refers to those methods that are the most effective, practical means of preventing or reducing pollution from stormwater runoff. These include schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States.

**Clean Water Act**: The Clean Water Act is an act passed by the U.S. Congress to control water pollution. It was formerly referred to as the Federal Water Pollution Control Act of 1972 or Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500), 33 U.S.C. 1251 et seq., as amended by Public Law 96-483, Public Law 97-117, and Public Laws 95-217, 97-117, 97-440, and 100-04.

**Code of Federal Regulations**: The document that codified all rules of the executive departments and agencies of the federal government. It is divided into fifty volumes, known as titles. Title 40 of the CFR (referenced as 40 CFR) lists all environmental regulations.

**Disturbance of Land**: refers to the penetration, turning, or moving of soil or resurfacing of pavement with exposure of the base course or the exposure of bare soil or ground surface, including the land surface exposed by construction of roads, buildings, utilities, baseyards, staging areas, demolition, headquarters, and parking areas. It does not include grass or weed cutting, bush or tree trimming or felling that leaves soil or ground intact. It includes “grubbing” in its normal meaning of the use of equipment to knock down and push vegetation out of the way, typically uprooting vegetation and disturbing the ground surface.

**LID Site Design Strategy**: combines a hydrologically functional site design with pollution prevention measures to compensate for land development impacts on hydrology and water quality. They mimic the predevelopment site hydrology by using site design techniques that store, infiltrate, evaporate, and detain runoff to reduce off-site runoff and ensure adequate groundwater recharge.

**MS4**: EPA categorizes MS4s as either “small,” “medium,” or “large.” The Phase I Storm Water Rule covers medium and large MS4s. A medium MS4 is an MS4 located in an incorporated place or county with a population of 100,000-249,000 (according to the 1990 Census). A large MS4 is an MS4 located in an incorporated place or county with a population of at least 250,000. A small MS4 is one that is not already defined as medium or large. The Phase II Storm Water Rule covers a subset of small MS4s that are called “regulated small MS4s.” Regulated small MS4s are automatically designated if they are located in “urbanized area” (as defined by the Bureau of the Census). Other small MS4s located outside urbanized areas may be designated on a case-by-case basis by the NPDES permitting authority.

**New Development**: shall mean new construction or installation of a building or structure or the creation of impervious surfaces that disturb greater than or equal to one acre, or less than one acre if it is part of a larger common plan of development or sale that would disturb one acre or more.

**Post-Construction BMP**: refers to practices or control measures used to mitigate stormwater impacts from new development and redevelopment site. It includes LID site design strategies, source control BMPs, and treatment control BMPs. These practices treat, store, or infiltrate runoff onsite before it can affect water bodies downstream. Innovative site designs that reduce imperviousness and smaller-scale low impact development practices dispersed throughout a site are also ways to achieve the goals of reducing flows and improving water quality.

**Redevelopment**: shall mean development that would create or add impervious surface area on an already developed site. Redevelopment includes, but is not limited to any construction project that requires demolition or complete removal of existing structures or impervious surfaces at a site and replacement with new impervious surfaces. Maintenance activities such as top-layer grinding, repaving (where all pavement is not removed), and reroofing are not considered to be redevelopment. Interior remodeling projects and improvements are also not considered to be redevelopment.

**Source Control**: Means measures to prevent pollutants from coming into contact with stormwater runoff or preventing polluted runoff from discharging into small MS4.

**Treatment Control**: means measures that treat stormwater and non-stormwater that has come into contact with pollutants.

# 1.0 INTRODUCTION

The Post-Construction Stormwater Management Program is intended for the following audiences: (1) State of Hawaii Department of Transportation [HDOT] Harbors Division (hereinafter referred to as the "Harbors") staff tasked with plan review and approval for Harbors capital projects (hereinafter referred to as the "Harbors Project") and Tenant[1] Improvement projects (hereinafter referred to as the "Tenant Project," (2) Harbors staff tasked with construction oversight, (3) Harbors staff tasked with ongoing inspection and maintenance of post-construction Best Management Practices [BMPs], and (4) the development community including engineers and architects tasked with creating and submitting construction plans for approval.

This program is complementary to Harbors ***Construction Site Runoff Control Program*** in that post-construction BMPs are required by Harbors National Pollutant Discharge Elimination System [NPDES] permit, and therefore will be incorporated into site-specific construction BMP plans consistent with this manual. This manual defines requirements and provides guidance for the project specific planning, selection, and design of post-construction BMPs to minimize pollutants in post-construction runoff and to minimize the amount of polluted runoff leaving the site.

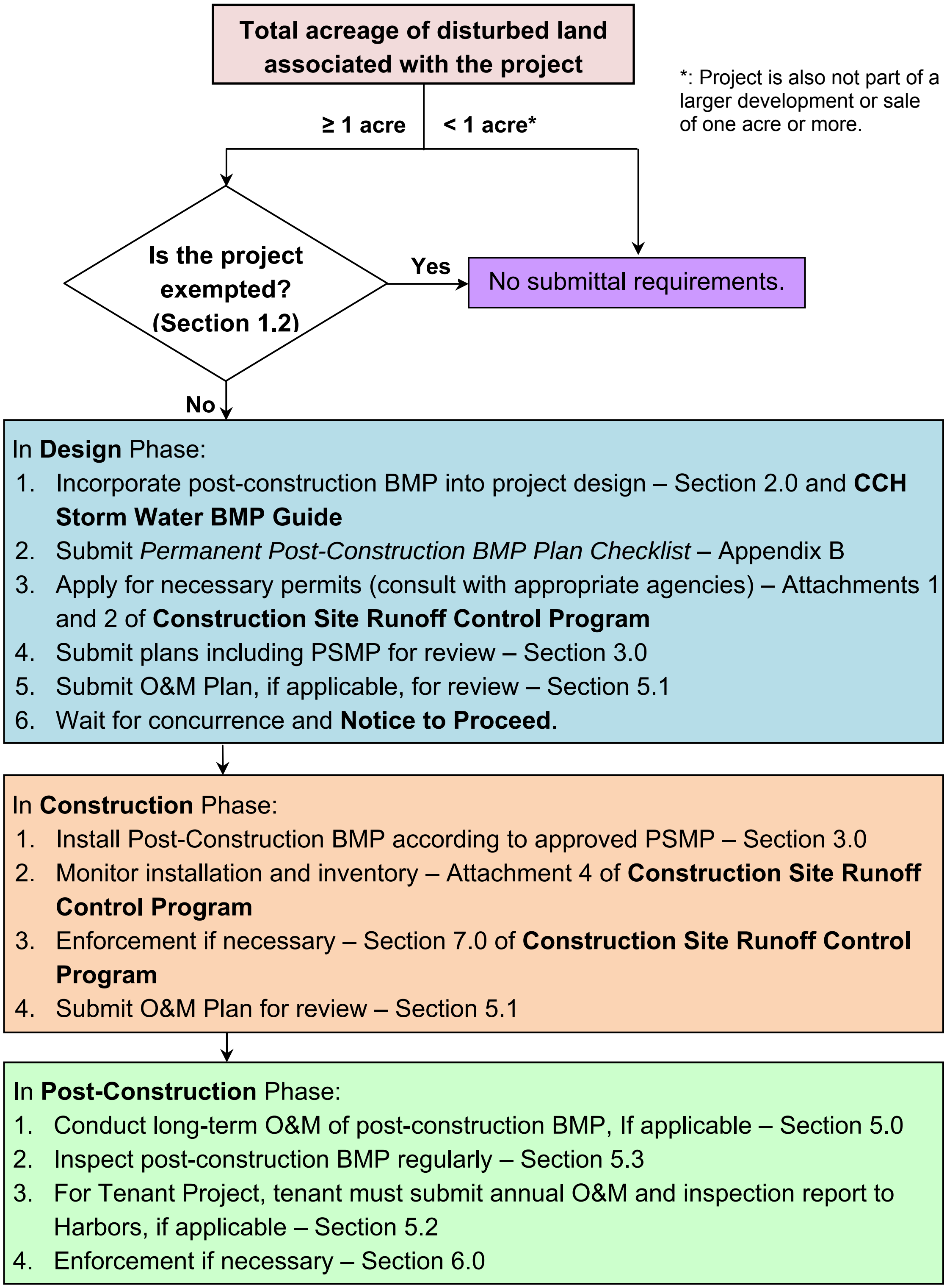
New development and redevelopment projects (hereinafter referred to as "Regulated Project") that result in a land disturbance of one (1) acre or more, are subject to Harbors **Post-Construction Stormwater Management Program**. All Regulated Projects must implement post-construction BMPs, unless the project is exempted as described in Section 1.2. BMPs shall be designed and installed accordance with the criteria, guidelines, and design standards described in this manual. Harbors has adopted City and County of Honolulu [CCH] ***Storm Water BMP Guide*** (CCH, 2012; Appendix C) and ***Rules Relating to Storm Drainage Standards*** (effective June 2013, CCH, 2000; Appendix D) to guide both Harbors and Tenant Projects.

## 1.1 Component Overview

Sections 2 to 5 of this manual describe the planning, design, construction, inspection, and long-term maintenance requirements for post-construction BMPs. The post-construction general requirements for Harbors and Tenant Projects are depicted in Figure 1-1. General requirements for Harbors reviewers and inspectors are depicted in Attachment 1 of ***Construction Site Runoff Control Program*** manual.

[1] "Tenant" shall mean a person, group, partnership, corporation, or any other entity that has an executed lease, revocable permit or disposition instrument under chapter 171, Hawaii Revised Statutes [HRS] to use or occupy land, a building, structure, or other property owned by Harbors. This term also includes Harbors' approved sub-tenants and entities using container or terminal facilities.

**Figure 1-1:**
**General Post-Construction Project Requirements Flow Chart**



The following lists the major components covered under the Harbors **Post-Construction Stormwater Management Program.**

- BMP requirements for Regulated Projects, including Low Impact Development [LID] Site Design Strategies, Source Control, and Treatment Control BMPs. These BMPs are to be included and described in a required Post-Construction Stormwater Mitigation Plan [PSMP].

- CCH Rules Relating to Storm Drainage Standards (effective June 2013; CCH, 2000).

- Plan and permit application review to ensure that a Regulated Project is incorporating post-construction BMPs in accordance with the program.

- BMP inspections to ensure that post-construction BMPs are installed and maintained properly.

- Enforcement where BMPs are not installed or maintained properly.

- Database and references under development to support and facilitate compliance with the program, including, but not limited to:
    - ***Stormwater BMP Guide*** (CCH, 2012), providing the minimum requirements needed to achieve compliance with LID Site Design Strategies, Source Control BMPs, and Treatment Control BMPs.
    - Post-Construction BMP GIS and database to keep track of all publicly and privately constructed post-construction stormwater BMPs.
    - Training for plan and permit application reviewers, inspectors, maintenance personnel, and Oahu District personnel.
    - Education for project applicants, contractors, developers, designers, and other responsible parties.

## 1.2 Exemptions

HDOT Harbors may exempt certain types of projects from this program that pose a minimum risk of stormwater pollution, including, but not limited to:

- Maintenance activities such as top-layer grinding, repaving (where all pavement is not removed) and reconfiguring surface parking lots.
- Reroofing.
- Interior remodeling and improvement.
- Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility.
- Trenching and resurfacing associated with utility work.
- Replacement of damaged pavement.

- Emergency construction activities required to immediately protect public health and safety.

## 2.0 IMPLEMENTATION PROCESS

**All new and redevelopment projects under Harbors jurisdiction undergo an environmental review during planning phase.** The project review and approval process is a critical point at which the Harbors can impose conditions or standards that will minimize the impacts of urban runoff on local water resources. Therefore, project developers must address the potential impacts of stormwater discharges associated with development activities early in the project planning and design process. Regulated Projects that have the potential to discharge pollutants to the Honolulu and Kalaeloa Barbers Point Harbors Small MS4s, will be required to identify post-construction BMPs that will be included in the project design, constructed as part of the project, and implemented and maintained in the long-term.

**Harbors will not approve construction activities, unless both PSMP and the *Permanent Post-Construction BMP Plan Checklist* (Appendix B) have been included in the submittal package and completed properly for the project during design phase.**

Development projects are segregated by two major categories of project proponents – (1) Harbors Projects and (2) Tenant Projects. The Harbors has different project review and approval processes for Harbors Projects (Section 2.1) and Tenant Projects (Section 2.2). Personnel responsibilities for design, plan review, and approval of PSMP are outlined in Section 2.3 (Tables 2-1 and 2-2).

### 2.1 Harbors Project

Personnel from Harbors Engineering Branch Environmental Section [HAR-EE] initiates the review process by evaluating whether post-construction requirements apply to the projects. The key criteria for determining the need for post-construction BMPs are (a) the acreage of the project and (b) whether it is exempt.

Where post-construction requirements apply, as described in Section 3.1 of the ***Construction Site Runoff Control Program*** Manual, the Harbors Division Project Manager [PM] shall convene a Pre-Design meeting with HAR-EE at the **Preliminary Design Phase** to discuss the *Construction Site Design Review Checklist* (HDOTa, 2014), as well as the *Permanent Post-Construction BMP Plan Checklist* (include in Attachment B) if applicable. *Construction Design Review Checklist* discussions may also continue into the **Design Phase**. These discussions and meetings will allow the PM and HAR-EE to discuss the project during the design phase for applicable site-specific post-construction BMPs.

HAR-EE will advise PM that a PSMP, describing how the project will meet Harbors **Post-Construction Stormwater Management** program requirements, must be submitted during design phase. At this stage, project environmental mitigation measures are developed and a submittal package (including plans, specifications, designs, and PSMP) is forwarded to HAR-EE for review and comment.

HAR-EE review the PSMP document and final design plans to verify that post-construction program requirements are met. HAR-EE will notify PM when the PSMP is complete and contains proper required BMPs (refer to Sections 3.2 to 3.4), utilizing an interoffice memorandum. Once this memo has been issued (and placed in the project file), Harbors can proceed with putting the project out for bid. This process ensures that Harbors Post-Construction Stormwater Management program requirements are incorporated into the project design and shown on the plans prior to bidding for construction contractors or completion of construction work by Harbors itself. The step-wise process for Harbors plan reviewers is depicted in Attachment 1 of ***Construction Site Runoff Control Program*** manual.

## 2.2 Tenant Project

Harbors tenants who wish to perform new construction, reconstruction, modification, or demolition, must submit a request to HDOT or Harbors for review and approval. As described in Section 4.2.2 of the ***Construction Site Runoff Control Program*** manual, HAR-EE will review the request received from the tenant, and determine whether the tenant project is subject to Harbors **Post-Construction Stormwater Management** program requirements. If post-construction requirements apply, HAR-EE will advise Harbors Property Management Section [HAR-PM] of the determination and require that the tenant prepare and submit a PSMP during the design phase. At this stage, project environmental mitigation measures are developed and submittal package (including plans, specifications, designs, and PSMP) is forwarded to HAR-EE for review and comment.

HAR-EE reviews the PSMP document and final design plans to verify that PSMP requirements are met. HAR-EE will notify the HAR-PM when the PSMP is complete and contains proper required BMPs (refer to Sections 3.2 to 3.4), utilizing an interoffice memorandum. Once this memo has been issued (and placed in the project file), the HAR-PM can notify the tenant the project is approved.

This process ensures that Harbors **Post-Construction Stormwater Management** program requirements are incorporated into the project design and shown on the plans prior to approval. The approval of project becomes part of the lease or revocable permit issued to the tenant. Any mitigation measures required by the environmental review process, such as implementation and maintenance of post-construction BMPs, become part of the lease or revocable permit and are inspected by tenants regularly as outlined in the PSMP.

## 2.3 Responsibilities

General responsibilities involved in the implementation of Harbors **Post-Construction Stormwater Management** program are listed in Table 2-1 for Harbors Projects and Table 2-2 for Tenant Projects. Harbors Engineering Branch consists of Construction Section [HAR-EC], Design Section [HAR-ED], Environmental Section [HAR-EE], Maintenance Section [HAR-EM], and Planning Section [HAR-EP]. A *Harbors Environmental Group Organization Chart* is enclosed in Attachment A.

For Harbors Projects, HAR-EP initiates the planning of the project. HAR-ED, HAR-EE, and HAR-EM each review project plans and specifications on different aspects. Additionally, HAR-EE reviews the submitted PSMP. The inspectors from HAR-EC conduct inspections during construction phase to ensure structural post-construction BMPs installed according to approved plans. HAR-EE also verifies that the post-construction BMPs proposed in the PSMP are installed according to approved plans. Harbors Oahu District staff is responsible for the proper operation and maintenance of the installed post-construction BMPs.

For Tenant Projects, HAR-PM will forward construction plans, specifications, and PSMP to HAR-E for review and comment. Each section under HAR-E will provide their comments, if any. During the construction phase, HAR-EE will inspect and verify that the post-construction BMPs proposed in the PSMP are installed properly. Tenants will be responsible for long-term operation and maintenance [O&M] of the installed post-construction BMPs. HAR-EE will inspect these BMPs during regular tenant inspections, at the frequency identified in Harbors ***Tenant Inspection Manual*** (HDOTc, 2014).

**Table 2-1**
**Responsibilities for Post-Construction Program Implementation**
**- Harbors Project**

| | **Harbors Engineering Branch** | | | | | **Oahu** |
|---|---|---|---|---|---|---|
| | **EC** | **ED** | **EE** | **EM** | **EP** | |
| Harbors Project Planning | | | | | X | |
| Harbors Project Design | | X | | | | |
| Harbors Project Review | | X | X | X | | X |
| Harbors Project Approval | X | | | | | |
| PSMP Review and Approval | | | X | | | |
| Inspection during Construction | X | | X | | | |
| Inspection after Construction | | | X | | | |
| Harbors Project O&M | | | | | | X |
| Provide Training | | | X | | | |
| Enforcement | X | | X | | | |

**Table 2-2**
**Responsibilities for Post-Construction Implementation**
**- Tenant Project**

| | Tenant | Harbors Engineering Branch | | | | | PM |
|---|---|---|---|---|---|---|---|
| | | EC | ED | EE | EM | EP | |
| Tenant Project Planning | X | | | | | | X |
| Tenant Project Review | | | X | X | | | |
| PSMP Review and Approval | | | | X | | | |
| Tenant Project Approval | | | | | | | X |
| Inspection during Construction | | | | X | | | |
| Inspection after Construction | | | | X | | | |
| Tenants Project O&M | X | | | | | | |
| Provide Training | | | | X | | | |
| Enforcement | | | | X | | | X |

## 3.0 BMP REQUIREMENTS AND SELECTION PROCEDURE

To comply with its NPDES permit requirements and to minimize water quality impacts from new development and redevelopment, all Regulated Projects shall consider and apply post-construction BMPs, as appropriate.

This section provides a procedure for selecting post-construction BMPs for Regulated Projects. It includes identifying a list of pollutants of potential concern [POPC] and developing a PSMP to minimize water quality impacts through LID Site Design, Source Control, and Treatment Control BMPs. The procedure for determining the combination of these BMPs and their respective sizing is based on the ***CCH Rules Relating to Storm Drainage Standards***. It is also recommended that ***CCH Storm Water BMP Guide*** be used as a guide for post-construction BMP design and implementation (CCH, 2012). A flow chart summarizing the BMP selection procedure is depicted in Figure 3-1.

**Figure 3-1**
**Post-Construction BMP Selection Procedure Flow Chart**


### 3.1 Identifying Pollutants of Potential Concern and Receiving Water Bodies

Two major water bodies within Harbors jurisdiction are Honolulu Harbor and Kalaeloa Barbers Point Harbor. Hawaii Department of Health (HDOH) lists Honolulu Harbor as impaired water for nutrients, trash, turbidity, and NH4 (HDOH, 2013). Kalaeloa Barbers point Harbor has not been fully assessed, yet. No state Total Maximum Daily Loads [TMDL] have been established for either harbor.

Urban runoff from a developed site has the potential to contribute pollutants, including trash, oil and grease, suspended solids, metals, gasoline, pesticides, and pathogens to the stormwater conveyance system and receiving waters. The pollutants that may be generated at a site are related to land use. A list of POPC is provided in Table 3-1. The ***CCH Storm Water BMP Guide*** provides a general guideline for a list of post-construction BMPs and targeted POPC.

**Table 3-1**
**Pollutants of Potential Concern**

| Priority Project Categories | General Pollutant Categories | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Sediment | Trash & Debris | Metals | Organic Compounds | Nutrients | Oxygen Demanding Substances | Oil & Grease | Bacteria & Viruses | Pesticides |
| Commercial Development > 1 acre | P[1] | P | P | P[2] | P[1] | P[5] | P | P[3] | P[5] |
| (Heavy) Industry Development | P | P | P | P | | P | P | | |
| Automotive Repair Shops | | P | P | P[4,5] | | | P | | |
| Restaurants | | P | | | | P | P | P | P[1] |
| Parking Lots | P[1] | P | P | | P[1] | P[1] | P | | P[1] |
| Fueling Facility | | P | P | P | | P | P | | |
| Driveways | P | P | P | P[4] | P[1] | P[5] | P | | P[1] |

P: Potential

1: A potential pollutant if landscaping exists on-site.

2: A potential pollutant if the project includes uncovered parking areas.

3: A potential pollutant if land use involves food or animal waste projects.

4: Including petroleum hydrocarbons.

5: Including solvents.

## 3.2 Drainage Study and Identification of Conditions of Concern

Common impacts to the regional hydrology resulting from development typically include increased runoff volume and velocity; reduced infiltration; increased flow frequency, duration, and peak; faster time to reach peak flow; and water quality degradation. These changes have the potential to permanently impact receiving water bodies, habitat integrity, and downstream channels (if any). A change to Regulated Project site's hydrology would be considered a condition of concern. To mitigate these potential impacts, the project proponent must prepare the following supporting documentation:

- **Evaluate the project's conditions of concern in a drainage study as part of the PSMP**. The drainage study and the PSMP shall be prepared by a registered civil engineer in the State of Hawaii, with experience in drainage design and water resources management. The report shall consider the project location (from the larger watershed perspective), topography, soil and vegetation conditions, percent impervious area, natural and infrastructure drainage features, wet season groundwater depth, and any other relevant hydrologic and environmental factors to be protected specific to the nearest watershed.

- **Field reconnaissance including observations of the site and upstream and downstream conditions.** Existing conditions, such as undercutting erosion, slope stability, vegetative stress, and areas susceptible to erosion and/or habitat alteration as a result of altered flow regimes should be pointed out.

- **Existing hydrologic conditions** including description of the location, type, and percent cover of onsite vegetation, description of existing impervious features, description of existing stormwater conveyance features, description of distance to downstream water bodies, description of soil type (Natural Resources Conservation Service [NRCS] hydrologic soil classification and types), description of depth to groundwater during the wet season, description of offsite vegetation types, location, and percent cover.

- **Drainage study** information including, at a minimum, existing and post-construction descriptions of impervious area and percentages, rainfall intensities, geotechnical conditions regarding any planned uses of infiltration techniques (slope stability, expansive soils, compressive soils, seepage, groundwater depth, loss of foundation or pavement sub-grade strength), site constraints (impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, high-intensity land use, vehicular traffic, restricted right-of-way, or safety concerns), flow rates, velocities, and/or durations for a peak rainfall intensity of 0.4 inches per hour and Water Quality Volume of one (1) inch. The drainage study must also include an analysis of proposed post-construction LID Site Design Strategies, Source Control, and/or Treatment Control BMPs to mitigate (downstream) impacts and attempt to maintain or improve pre-project hydrologic conditions.

### 3.3 Post-Construction Stormwater BMP Selection

Post-construction BMPs shall be considered during the planning and design phases of a project. Each applicable project shall provide an account of how each drainage area's runoff is managed and treated. The entire project area can be divided into individual/discrete Drainage Areas [DA]. Examples of how to account for individual DA on a site is provided in ***CCH Examples Illustrating Application of Rules Relating to Storm Drainage Standards*** (CCH, 2013).

Post-construction BMPs include LID Site Design Strategies, Source Control, and Treatment Control BMPs.

**Table 3-2**
**Post-Construction Best Management Practices**

| Element | | Description |
|---|---|---|
| LID Site Design Strategies | | Reducing the hydrologic impact of development and incorporating techniques that maintain or restore the site's hydrologic and hydraulic functions. |
| Source Control | | Preventing pollutants from coming in contact with runoff and preventing polluted runoff from discharging into small MS4. |
| Treatment Control | LID Retention | Retaining runoff on-site with no off-site discharge by infiltration, evapotranspiration, and harvesting/reuse. |
| | LID Biofiltration | Removing pollutants from runoff by filtering stormwater through vegetation and soils. |
| | Other Treatment | Removing pollutants from runoff by detention, settling, filtration, and vortex separation. |

To comply with this manual and be consistent with the ***CCH Rules Relating to Storm Drainage Standards***, the criteria shall be met for all Regulated Projects as follow:

1. Incorporate appropriate LID Site Design Strategies - Either retain on-site the Water Quality Volume with appropriate ID Retention Treatment Control BMPs, or biofilter the Water Quality Volume with appropriate LID Biofiltration Treatment Control BMPs, or a combination of the two, unless determined to be infeasible due to infiltration issues.
2. Incorporate appropriate Source Control BMPs.
3. If it is determined to be infeasible to retain and/or biofilter the Water Quality Volume then treat and discharge with appropriate Treatment Control BMPs any portion of the water that is not retained on-site or biofiltered using the CCH guidance in Section 1-5.2 Part II B of the ***Rules Relating to Storm Drainage Standards***, unless a waiver is granted based on the infeasibility of all Treatment Control BMPs.

Consistent with the ***CCH Storm Water BMP Guide*** and based on collected precipitation data, **1 inch is the depth for all volume-based BMPs and a peak rainfall intensity of 0.4 inches per hour shall be used for flow-based BMPs.** A flow chart summarizing the BMP selection process is provided in Figure 3-2 below.

LID Retention BMPs rely on the soil's ability to infiltrate stormwater runoff. Due to its proximity to ocean water, groundwater underneath Harbors property is relatively shallow and tidally influenced. Therefore, it is recognized that LID Retention BMPs may prove infeasible for majority of Regulated Projects. However, broader LID Site Design Strategies must be considered. For a detailed discussion on infiltration requirements, please refer to General Infiltration Requirements outlined in Section 3 of ***CCH Storm Water BMP Guide***.

Selection of Treatment Control BMPs must prioritize and maximize the removal of pollutants of potential concern. Treatment Control BMP design must also consider any impacts caused by tidal influence, which is particularly relevant to subsurface filtration systems, hydrodynamic separator systems, detention or infiltration basins, and wet ponds/wetlands.

**Figure 3-2**
**BMP Selection Process for Pollutants of Potential Concern**

**Implement LID Site Design Strategies**

- Conserve natural areas, soils and vegetation – retain functions of predevelopment hydrology, including rainfall interception, evapotranspiration, and infiltration and therefore reduce runoff.
- Minimize disturbances to natural drainages and optimize the site layout – preserve natural drainage features and design buildings and circulation to minimize the amount of roofs and paving.
- Minimize Soil Compaction – retain existing beneficial hydrologic function.
- Minimize Impervious Surface – allow natural processes to filter and reduce non-point sources of pollution.
- Direct runoff to landscaped or pervious surfaces – move runoff from impervious surfaces on to adjacent pervious surfaces (e.g., direct a roof downspout to disperse runoff onto a lawn).

⇩

**Implement Source Control BMPs at these Areas**

- Landscaped areas
- Automatic irrigation systems
- Storm drain inlets (stenciling and signage)
- Vehicle/equipment fueling
- Vehicle/equipment maintenance/repair
- Vehicle/equipment washing/cleaning
- Loading docks
- Outdoor trash storage
- Outdoor material storage
- Outdoor work areas
- Outdoor process equipment operations
- Parking areas

⇩

**Implement Treatment Control BMPs that Maximize Removal of Project Pollutant(s) of Potential Concern**

Considering Numeric Sizing Criteria and General Infiltration Requirements for:

- Infiltration basin
- Biorentention filter
- Subsurface infiltration
- Dry well
- Rain barrel
- Downspout Dispersion
- Vegetated swale
- Detention basin
- Sand filter
- Infiltration trench
- Bioretention basin
- Permeable pavement
- Dry swale
- Green roof
- Tree box filter
- Vegetated buffer strip
- Manufactured treatment device

### 3.4 Post-Construction Stormwater Mitigation Plan Development

In order to ensure that a PSMP is adequately designed and integrated into each Regulated Project, project proponents are required to prepare a PSMP by a licensed civil engineer, registered in State of Hawaii. In general, the PSMP must clearly convey the process used to identify pollutants of potential concern, conditions of concern, selected BMPs for the project as well as identifying BMP long-term maintenance requirements. The fundamental steps in preparation of PSMP are provided in Table 3-4. The CCH Storm Water BMP Guide provides a more complete list of LID Site Design Strategies, Source Control BMPs, and Treatment Control BMPs and must be utilized by project proponents. Additionally, project proponents must comply with all applicable requirements by Harbors **Post-Construction Stormwater Management Program** and not rely solely on the outline in Table 3-4.

PSMPs must contain a table of contents to assist reviewers in finding required parts of the document. PSMPs must contain a vicinity map (in scale) containing major roadways, geographic features or landmarks, the project site perimeter, general topography, downstream receiving water body, and north arrow. In addition, PSMPs must also contain a site map (including the entire property on one map or using a key map if multiple sheets are required), scale, north arrow, and legend, impervious features (including location of proposed impervious areas such as paved areas, buildings, covered areas, etc.), potential pollutant source areas (such as fueling area, garage, outdoor storage area, waste container area, wash-rack, potentially hazardous substance storage area). PSMP shall contain the information specified in Table 3-3.

**Table 3-3**
**Required Components of a Post-Construction Stormwater Mitigation Plan for Regulated Project**

| Major Components | Descriptions |
|---|---|
| Organization & Content | • Table of contents<br>• Vicinity map<br>• Project description<br>• Narrative of project activities |
| Site Map | • Entire property included on one map (use key map if multi-sheets)<br>• Drainage areas and direction of stormwater flow<br>• Private storm drain system(s)<br>• Nearby water bodies and other municipal storm drain inlets<br>• Location of stormwater conveyance systems (ditches, inlets, storm drains, etc.)<br>• Location of existing and proposed stormwater controls<br>• Location of “impervious” areas (i.e., paved areas, buildings, and covered areas)<br>• Locations where materials would be directly exposed to stormwater |

| Major Components | Descriptions |
|---|---|
| | • Location of building and activity areas (e.g., fueling area, garages, waste container area, wash racks, potential hazardous substance storage areas, etc.)<br>• Areas of potential soil erosion (including areas downstream of project) |
| Pollutants of Potential Concern | • Pollutants based upon land use<br>• Impaired water bodies downstream of the project |
| Drainage Study and Conditions of Concern (refer to ***CCH Rules Relating to Storm Drainage Standards*** and ***CCH Storm Water BMP Guide***) | • Site-specific drainage analysis indicating pre- and post-development runoff calculations.<br>• Impacts to hydrologic regime (hydromodification evaluation, as applicable) |
| Types of Post-Construction BMPs (refer to ***CCH Rules Relating to Storm Drainage Standards***) | *Example LID and Site Design BMPs*<br>• Conserve natural areas, soils, and vegetation<br>• Minimize impervious surface<br>• Direct runoff to landscaped areas<br>*Example Source Control BMPs*<br>• Covered trash storage<br>• Covered and bermed vehicle wash areas<br>• Automatic irrigation system, timed to prevent discharge<br>*Example Treatment Control BMPs*<br>• Infiltration basin<br>• Subsurface infiltration<br>• Manufactured treatment device |
| Post-Construction BMP Maintenance | • O&M Plan<br>• Access Agreement |

### *3.4.1 Introduction of Low Impact Development*

LID is a stormwater management strategy concerned with maintaining or restoring the natural hydrologic functions of a site to achieve natural resource protection objectives and fulfill environmental regulatory requirements (CCH, 2012). It utilizes a variety of natural and built features that reduce the rate of runoff, filter out its pollutants, and facilitate the infiltration of water into the ground. By reducing water pollution and increasing groundwater recharge, it helps improve the quality of receiving waters and stabilize the flow rates of nearby surface waters. The goal of LID site design is to reduce the hydrologic impact of development and to incorporate techniques that maintain or restore the site's hydrologic and hydraulic functions. The optimal LID site design minimizes runoff volume and preserves existing flow paths.

LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater **as a resource rather than a waste product**. Many practices have been used to adhere to these principles such as bioretention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements. By implementing LID principles and practices, water can be managed in a way that reduces the impact of developed areas and promotes the natural movement of water within an ecosystem or watershed. The Harbors approach will consist of specific elements that are represented in Table 3-3.

### *3.4.2 LID Site Design Strategies*

Consideration of LID Site Design Strategies are required for each Regulated Project. A Regulated Project shall be designed so as to minimize directly connected impervious surfaces and to promote infiltration using LID techniques. A Regulated Project shall minimize the introduction of POPCs generated from site runoff to the stormwater conveyance system. A Regulated Project can address these objectives through the creation of a hydrologically functional project design that attempts to mimic the natural hydrologic regime. These techniques are outlined in Section 1 of ***CCH Storm Water BMP Guide***.

Mimicking a site's natural hydrologic regime can be pursued by:

- Reducing imperviousness, conserving natural resources and areas, maintaining and using natural drainage courses in the stormwater conveyance system, and minimizing clearing and grading.
- Providing runoff storage measures dispersed throughout a site's landscape with the use of bioretention facilities and detention, retention, and infiltration practices.
- Implementing on-lot hydrologically functional landscape design and management practices.

These design principles offer an innovative approach to urban stormwater management, one that does not rely on the conventional end-of-pipe or in-the-pipe structural methods but instead uniformly or strategically integrates stormwater controls throughout the urban landscape.

The following five LID components, taken from ***CCH Storm Water BMP Guide***, must be considered for each Regulated Project (CCH, 2012).

**Conserve Natural Areas, Soils, and Vegetation**

This design strategy helps retain numerous functions of predevelopment hydrology, including rainfall interception, evapotranspiration, and infiltration. Maximizing these functions will thereby reduce the amount of runoff that must be treated. Protection of mature trees and vegetation provides habitat, prevents erosion, captures significant rainfall, provides summer shading, and reduces runoff volume and velocity, which protects and enhances downstream water quality.

**Minimize Disturbances to Natural Drainages**

Natural drainages offer a benefit to stormwater management as the soils and habitat already function as a natural filtering/infiltrating swale. Minimizing disturbances to natural drainage patterns preserves the predevelopment timing, rate, and duration of runoff as well as preserving streamside habitats. When determining the development footprint of the site, natural drainages should be avoided. By keeping the development envelope set back from natural drainages, the drainage can retain its water quality benefit to the watershed.

**Minimize Soil Compaction**

Clearing, grading, and compaction by construction traffic reduces the natural absorption and infiltration capacities of the native soils. Soil compaction damages soil structure, reduces infiltration rates, limits root growth and plant survivability, and destroys soil organisms. Subsequent tilling and/or addition of soil amendments such as compost can help, but may not restore the original infiltration capacity of the soils. By protecting native soils and vegetation in appropriate areas during the clearing and grading phase of development, the site can retain some of its existing beneficial hydrologic function.

**Minimize Impervious Surfaces**

The increased volume, increased velocity, and discharge duration of stormwater runoff from developed areas has the potential to accelerate downstream erosion and impair stream habitat in natural drainages. Studies have demonstrated a direct correlation between the degree of imperviousness of an area and the degradation of its receiving waters. Impervious surfaces (such as pavement and concrete) can neither absorb water nor remove pollutants, and thus the natural purification characteristics are lost. Reducing impervious surfaces to the minimum amount needed retains the permeability of the project site, allowing natural processes to filter and reduce non-point sources of pollution.

**Direct Runoff to Landscaped Areas**

Any impervious surface that drains into a catch basin, area drain, or other conveyance structure is a “directly connected impervious area.” As stormwater runoff flows across parking lots, roadways, and paved areas, the oils, sediments, metals, and other pollutants are collected and concentrated. If this runoff is collected by a drainage system and carried directly along impervious gutters or in closed underground pipes, it has no opportunity for filtering by plant material or infiltration into the soil. It also increases in speed and volume, which may cause higher peak flows downstream, and may require larger capacity storm drain systems, increasing flood and erosion potential. Solutions that reduce “directly connected impervious areas” prevent runoff, detain or retain surface water, attenuate peak runoff rates, benefit water quality and convey stormwater.

### *3.4.3 Source Control BMPs*

Source control BMPs are required for each Regulated Project. Proactively controlling POPC at their source is fundamental to effective stormwater quality management. Design of BMPs to minimize or prevent pollutant generation is guided by two general principles:

- Prevent stormwater from contacting operation and storage areas. These areas should be designed to prevent stormwater runoff from passing through shipping areas, vehicle maintenance yards, and other work places before it reaches storm drains. The objective is to prevent the discharge of water laden with grease, oil, heavy metals and process fluids to surface waters or sensitive resource areas.
- Prevent pollutants from contacting surfaces that come into contact with stormwater runoff. Precautionary measures should be employed to keep POPC from coming into contact with storm or wash water runoff.

In preparation of PSMP, following items need to be provided:

- All potential sources of stormwater pollutants that will be generated at the site.
- Corresponding post-construction BMPs that need to be shown on the site map included in the PSMP.
- A brief narrative description of the source control BMPs to be used including a discussion of the project applicant will ensure their continued operation.

Justification of why a particular source control could not be implemented for this project because of any special condition or situation, shall also be provided. Fact Sheets for applicable source control BMPs may be obtained from Section 2 of the ***CCH Storm Water BMP Guide*** (CCH, 2012) and/or the ***California Stormwater Quality Association [CASQA] Stormwater Quality Handbooks*** (CA, 2003). Descriptions of each Source Control Category (taken from CCH ***Storm Water BMP Guide***) are summarized in Table 3-4.

**Table 3-4**
**List of Source Control Categories**
**(taken from CCH Storm Water BMP Guide)**

| Source Control Category | General Description/Approach |
|---|---|
| Landscaped Areas | Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the maximum extent possible, maximize natural water storage and infiltration opportunities, and minimized project slopes and channels. |
| Automatic Irrigation Systems | Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into storm water drainage systems. |

| Source Control Category | General Description/Approach |
|---|---|
| | Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the storm water conveyance system. |
| Storm Drain Inlets | Storm drain signs and stencils are highly visible source controls that are placed directly adjacent to storm drain inlets. The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. |
| Vehicle/Equipment Fueling | Fueling areas have the potential to discharge oil and grease, solvents, car battery acid, coolant and gasoline to the storm drain. Spills can be a significant source of pollution because fuels contain toxic materials and heavy metals that are not easily removed by storm water treatment devices. |
| Vehicle/Equipment Repair | Several measures can be taken to prevent operations at maintenance bays from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the storm water conveyance system. In designs for maintenance bays containment is encouraged. Preventive measures include overflow containment structures are dead-end sumps. |
| Vehicle/Equipment Washing & Cleaning | Vehicle/equipment washing, and steam cleaning may contribute high concentrations of pollutants to wash waters that drain to storm water conveyance systems. Wash water may not be conveyed to a sewer without a sewer connection permit. |
| Loading Docks | Several measures can be taken to prevent operations at loading docks from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the storm water conveyance system. In designs for loading docks, containment is encouraged. Preventive measures include overflow containment structures and dead-end sumps. |
| Outdoor Trash Storage | Storm water runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or streams. Preventive measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination. |
| Outdoor Material Storage | Proper design of outdoor storage areas for materials reduces opportunity for pollutants to enter the storm water conveyance system. Materials may be in the form of raw products, by-products, finished products, and waste products. In outdoor storage areas, |

| Source Control Category | General Description/Approach |
|---|---|
| | infiltration is discouraged and containment is encouraged. |
| Outdoor Work Areas | Proper design of outdoor work areas (grinding, painting, coating, sanding, parts cleaning, etc.) reduces opportunity for pollutants to enter the storm water conveyance system. In outdoor work areas, infiltration and discharge to the storm drain are discouraged; collection and conveyance to the sanitary sewer are encouraged. |
| Outdoor Process Equipment Operation | Outdoor process equipment operations such as rock grinding or crushing, painting or coating, grinding or sanding, degreasing or parts cleaning, may contribute a variety of pollutants to the storm conveyance system. In outdoor process equipment areas, infiltration is discouraged and containment is encouraged, accompanied by collection and conveyance. |
| Parking Areas | Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through storm water runoff or non-storm water discharge. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas. |

### *3.4.4 Treatment Control BMPs*

When a site cannot retain all or portion of the Water Quality Volume on-site, the remaining portions of the water must be treated using Treatment Control BMPs specified in *Section 1-5.2 Part II* B of the ***CCH Rules Relating to Storm Drainage Standards***. Treatment Control BMPs are engineered technologies designed to remove pollutants from storm water runoff prior to discharge to the storm drain system or receiving waters. Details on BMP numeric sizing criteria and general requirements for infiltration BMPs are further discussed in Sections 3.4.5. Individual fact sheets for various treatment control BMPs may be obtained from Section 3 of the ***CCH Storm Water BMP Guide*** and/or ***CASQA Stormwater Quality Handbooks***.

Engineering details and specifications shall be included in the PSMP for the selected Treatment Control BMPs. Alternative post-construction BMPs not identified in the ***CCH Storm Water BMP Guide*** may be approved at the discretion of the Harbors, provided the alternative BMP is as effective in removal of pollutants of concern as other feasible BMPs.

### *3.4.5 Numeric Sizing Criteria*

This section presents the methodology for calculating the Water Quality Volume [WQV] and Water Quality Flow Rate [WQF], which are used to size the majority of the Treatment Control BMPs.

**Water Quality Volume**

The *WQV* is calculated using this equation: $WQV = PCA \times 3630$, where:

$WQV$ = water quality design volume (in cubic feet)
$P$ = design storm runoff depth (in inches)
$C$ = volumetric runoff coefficient
$A$ = total drainage area (in acres)

As specified in the CCH's Rules (CCH, 2000), a design storm runoff depth of **one inch** shall be used. The volumetric runoff coefficient shall be calculated using the following equation as developed by EPA for smaller storms in urban areas: $C = 0.05 + 0.009I$, where:

$C$ = volumetric runoff coefficient
$I$ = percent of impervious cover (expressed as a percentage)

**Water Quality Flow Rate**

The *WQF* is calculated using this equation: $WQF = CiA$, where:

$WQF$ = water quality design flow rate (in cubic feet per second)
$C$ = volumetric runoff coefficient
$i$ = peak rainfall intensity (in inches per hour)
$A$ = total drainage area (in acres)

As specified in the CCH's Rules (CCH, 2000), a peak rainfall intensity of **0.4 inches per hour** shall be used. The runoff coefficient shall be determined from Table 3-5 below, based on the drainage area, and shall be, at a minimum, the midpoint of the given range of values. The higher value should be used if soil conditions indicate that pervious areas will have little infiltration/interception potential. For drainage areas containing multiple land uses, the following formula may be used to compute a composite weighted runoff coefficient:

$C_C = (\sum_{i=1}^{n} C_i A_i)/A_t$, where:

$C_c$ = composite weighted runoff coefficient
$C_{1,2,\dots,n}$ = runoff coefficient for each land use cover type
$A_{1,2,\dots,n}$ = drainage area of each land use cover type (in acres)
$A_t$ = total drainage area (in acres)

**Table 3-5**
**Runoff Coefficients for Water Quality Flow Calculations (taken from CCH Storm Water BMP Guide)**

| Type of Drainage Area | Runoff Coefficient (*C*) |
|---|---|
| Industrial | |
| Light areas | 0.50 ~ 0.80 |
| Heavy areas | 0.60 ~ 0.90 |
| Unimproved areas | 0.10 ~ 0.30 |
| Lawns | |
| Sandy soil, flat, ≤ 2% | 0.05 ~ 0.10 |
| Sandy soil, average 2~7% | 0.10 ~ 0.15 |
| Sandy soil, steep ≥ 7% | 0.15 ~ 0.20 |
| Heavy soil, flat, ≤ 2% | 0.13 ~ 0.17 |
| Heavy soil, average 2~7% | 0.18 ~ 0.22 |
| Heavy soil, steep ≥ 7% | 0.25 ~ 0.35 |
| Streets | |
| Asphaltic | 0.70 ~ 0.95 |
| Concrete | 0.70 ~ 0.95 |
| Brick | 0.75 ~ 0.85 |
| Roofs | 0.75 ~ 0.95 |

## Drainage Areas

The entire area of applicable project shall be divided into individual, discrete DAs and clearly presented in a site map. DAs may be defined using grade breaks and roof ridge lines. Separate DAs shall be used for each surface type (e.g., landscaping, pervious paving, or roofs). Each type of DA surface has a unique runoff factor that estimates how much rainfall will produce effective rainfall, or runoff from that drainage area. A list of runoff factors for surfaces draining to BMPs is included in Table 3-5 of this document and Table 4 of the CCH, ***Rules Relating to Storm Drainage Standards*** (CCH, 2000; Appendix D).

## 4.0 POST-CONSTRUCTION BMP INSTALLATION

### 4.1 Installation Inspection during Construction Phase

Inspections will be conducted at multiple stages of construction to ensure the proper installation of all LID Site Design Strategies, Source and Treatment Control BMPs. For Harbors Projects, these inspections shall coincide with the site-specific construction site BMP inspections described in Sections 3.4.1 to 3.4.3 of Harbors ***Construction Site Runoff Control Program*** manual. For Tenant projects, these inspections shall coincide with the site-specific construction site BMP inspections described in Sections 4.4.1 to 4.4.3 of Harbors ***Construction Site Runoff Control Program*** manual. In either case, inspections shall include:

- Initial Inspection prior to commencement of construction;
- Recurring BMP Inspection during active construction to ensure construction is occurring in accordance with approved plan; and
- Final Inspection upon completion of construction to ensure proper installation and maintainability.

The inspections may be combined with other inspections provided they will be conducted by trained personnel, as identified in Section 7. The findings of these inspections will be recorded on the *Construction Site Best Management Practices Inspection Checklist* contained in Attachment 4 of the ***Construction Site Runoff Control Program***. Each inspection will be reported in the Annual Compliance Report [ACR] and shall be clearly linked to the referenced project and note the stage of the project and the dates of inspections.

## 5.0 POST-CONSTRUCTION BMP MAINTENANCE, INVENTORY AND RECORDKEEPING

Once built, post-construction stormwater BMPs must be properly maintained to make sure they are operating as designed and managing post-construction runoff as intended.

For Tenant projects, O&M and inspection requirements are documented in an O&M plan that must be submitted to the Harbors prior to completion of construction. All O&M activities will be the responsibility of the tenant and shall be in accordance with the Tenant O&M plan that was submitted and approved as part of the project review and approval process and recorded with the lease, revocable permit, or other contractual document provisions. The tenant O&M plan shall be consistent with the requirements in Section 5.1 below.

For Harbors project, O&M will be provided by Oahu District and/or HAR-EM consistent with the projects O&M plan that was submitted and approved as part of the project review and approval process.

Harbors will verify that appropriate mechanisms, including O&M plans, are in-place for all projects on Harbors' property that have post-construction BMPs. Maintenance requirements identified below are required by Harbors **Post-Construction Stormwater Management Program**.

### 5.1 Maintenance Requirements

Operation & Maintenance Plan:

For a Regulated Project, Harbors will require that a copy of a satisfactory O&M plan, monitoring plan where applicable (for example, sediment accumulation in a CDS unit; a sample O&M Guideline is enclosed in Appendix E), and a process of verification of ongoing maintenance of installed controls be included in the design submittal package. The O&M Plan must contain following major components:

- The designated responsible party to manage the post-construction stormwater BMP(s).
- Post-Construction operating schedule, maintenance frequency, specific maintenance activities.
- Any necessary employee training and duties.
- Recordkeeping and reporting on inspection and servicing of all post-construction BMPs (on source/treatment control) at least on an annual basis, which uses a project-specific inspection form submitted with the O&M plan.

Access Agreement: The Harbors maintains rights to access tenant properties as part of lease or revocable permit provisions. These rights extend to any access required related to post-construction BMPs. An example of the access agreement is included in Attachment 2 of Harbors ***Tenant Inspection Manual***.

### 5.2 Verification Mechanisms

Annual written verification of effective O&M of each approved post-construction BMP by the responsible party (e.g., contractor, consultant, or tenant) is required to be submitted to Harbors.

- For Harbors Projects, HAR-EC and HAR-EE will verify that post-construction BMPs reflected in the approved PSMP be implemented at the completion of construction. District office will be responsible for long-term O&M of post-construction BMPs and related recordkeeping. Records will be reported in the ACR.
- For Tenant Project, HAR-EE and HAR-PM will verify that post-construction BMPs in the approved PSMP be implemented at the completion of construction. The tenant will be responsible for long-term O&M of post-construction BMPs by conducting routine inspections, documenting all maintenance requirements, submitting annual reports (to Harbors), and retaining records for at least five years. These documents shall be made available to Harbors for inspection upon request at any time.

### 5.3 Post-Construction BMP Inspection

To ensure that post-construction stormwater BMPs are being operated and maintained in accordance with the approved O&M plan, all LID Site Design, Source and Treatment Control BMPs in the O&M plan will be inspected no less than once a year. Additionally, some BMPs may be inspected more frequently as recommended in ***CCH Storm Water BMP Guide*** (CCH, 2012; Appendix C) or manufacturer's manual, or because they are located on a tenant site which is inspected more frequently as part of the Tenant Inspection Program. When possible, inspections shall occur after a storm event to allow an evaluation of the effectiveness of the BMPs, identification of any damage that may have occurred, and a determination if any additional maintenance may be required as a result of the storm event. Specifically, O&M inspections shall be performed and documented as following:

- For Harbors Projects, inspectors from the Oahu District will inspect the post-construction stormwater BMPs as specified in the O&M plan but no less than annually.
- For Tenant Projects, the tenant is required to conduct inspections per the approved O&M plan and submit an annual report to Harbors by the annual tenant stormwater awareness training demonstrating proper O&M. HAR-EE inspectors will conduct inspections of post-construction BMP O&M records at a frequency determined by Harbors ***Tenant Inspection Program*** (i.e., every six months, annually, or every five years).
- Each Harbor and Tenant inspection shall be documented using the Inspection Checklist submitted as part of the O&M plan. HAR-EE will retain copies of all completed inspection reports and the inspection findings will be documented in the electronic Post-

Construction BMP inventory (e.g., database). All deficiencies noted during Harbors and Tenant inspections shall be conveyed to the responsible party in writing and HAR-EE shall conduct timely follow-up to ensure deficiencies are rectified.

### 5.4 Post-Construction BMP Inventory and Recordkeeping

Harbors has developed an electronic inventory to keep track of post-construction BMPs (i.e., LID Site Design Strategies, Source Control, and Treatment Control BMPs) and the pertinent frequency of inspection and O&M. This inventory includes the BMPs for both Harbors and Tenant projects that discharge into the Honolulu and Kalaeloa Barbers Point Harbors Small Municipal Separate Storm Sewer Systems [MS4s]. Approved Post-Construction BMPs, as identified in the PSMP, will be recorded in the database by HAR-EE. Future records associated with inspection and long-term O&M will be documented in the database. The electronic inventory serves as the basis for the maintenance, inspection, enforcement, and reporting elements of the program.

All existing post-construction BMPs at Honolulu and Kalaeloa Barbers Point Harbors have been logged into the electronic inventory. All new post-construction BMPs, as reflected in the approved PSMP will be logged in the electronic inventory, by HAR-EE during PSMP review and approval phase. The inventory and information for each BMP will be updated at project acceptance, if needed, or based on information obtained from future inspections and maintenance activities. The construction project review, submittal requirements, and procedures, detailed in Section 4.3 of the ***Construction Site Runoff Control Program***, provide information about new post-construction BMPs entered into the database. General relevant site information includes:

- Project Identifier, Owner Information
- Project Location (Harbor, Pier Number, Tax Map Key Number, Latitude/Longitude coordinates)
- Acreage
- Control Type and Description of post-construction BMPs
- Photographs of BMPs during construction (if available) and at acceptance
- Date of Acceptance/Construction
- Date of Agreement
- O&M plan
- Maintenance Records
- Inspection Dates and Summary
- Corrective Actions
- Replacement or Repair Date

HAR-EE is responsible for maintaining the post-construction BMP inventory and keeping it current in regards to BMPs, inspections, and maintenance.

## 6.0 ENFORCEMENT

A detailed discussion on enforcement is presented in the Enforcement Response Plan. Enforcement of tenant construction projects will be undertaken by the HAR-EE and/or other staff who possess enforcement authority through established policies and procedures as described in Harbors Enforcement Response Plan. There are several enforcement mechanisms and penalties to ensure compliance with local ordinances, permits, and contract documents. The enforcement actions proceed along different routes depending upon whether the project is a Harbors Project or a Tenant Project.

The remainder of this Section is focused on enforcement of Tenant Projects during post-construction installation and its long-term O&M by the tenant. When post-construction stormwater BMP inspections reveal improper installation or maintenance, Harbors will undertake appropriate enforcement action. The level of enforcement (summarized in Section 6.2) and associated penalty are typically issued by designated personnel after considering all relevant circumstances regarding the violation. Records of all inspections and follow-up activities for deficiencies are to be retained for a minimum of five years.

### 6.1 Scope of Authority

The enforcement options available to Harbors range from administrative actions (including verbal/written warnings, eviction notices, and penalties) to the issuance of citations and a criminal fine. Three general areas of the environmental enforcement are listed below:

- Hawaii Revised Statutes [HRS] Chapter 266 authorizes Harbors to issue citations and summons for violations of its rules and have its actions enforced through the district courts by verdict of a misdemeanor or fine.
- Hawaii Administrative Rules [HAR] Title 19 Chapters 41 to 44 establishes uniform safety measures, operational standards and requirements, and the conduct for all tenants at State of Hawaii harbors.
- The tenant lease agreement or revocable permit that provides Harbors with the right of entry to conduct inspection and authority to terminate the permit or lease.

### 6.2 Enforcement Actions

The levels of enforcement actions to be utilized by inspectors, in order of increasing severity, are as follows:

- Oral or Verbal Warning
- Written Warning (e.g., Tenant Inspection Report or Letter with Tenant Inspection Report)
- Notice of Apparent Violation [NAV]
- Issuance of Summons or Citation
- Notice and Finding of Violation Order ([NFVO], see ERP for detailed description)

Detailed discussion of these enforcement actions could be found at Harbors ***Construction Runoff Control Program*** (HDOTa, 2014), ***Tenant Inspection Manual*** (HDOTc, 2014) and the ***Enforcement Response Manual*** (HDOTb, 2014).

As defined in Harbors ***Construction Site Runoff Control Program*** and ***Tenant Inspection Manual***. There are two types of violations – Class I Violation and Class II Violation, which are based on potential to discharge or cause environmental harm, magnitude of the violation (e.g., failure to apply for Industrial General Permit Coverage), duration of the violation, and violator's compliance history. A range of issues, which could result in enforcement (either informal or formal) in terms of post-construction BMP, includes:

- Failure to maintain a BMP specified in the submitted PSMP,
- Failure to maintain a BMP consistent with O&M Plan,
- Failure to address deficiencies,
- Failure to conduct annual inspection,
- Failure to submit required inspection documentation.

In the event that an enforcement action is required, the designated staff will identify the appropriate enforcement response to achieve compliance. If the tenant cannot achieve compliance by implementing the appropriate corrective action, the designated staff will "escalate" the enforcement response as outlined in Harbors ***Enforcement Response Manual***.

## 7.0 TRAINING

Training is a major component of any successful stormwater program. Harbors will adopt ***CCH Rules Relating to Storm Drainage Standards*** and ***CCH Storm Water BMP Guide*** as a reference for those parties who apply for project approvals on selection, design, installation, O&M of stormwater BMPs via the state website and handouts.

Harbors provides training so that employees have the knowledge and skills necessary to perform their functions effectively and efficiently. Training courses provide a comprehensive review of post-construction stormwater BMPs, introduce LID practices, and provide updates on the relevant requirements of the Harbors SWMP.

Appropriate Harbors staff whose job duties are related to implementing post-construction BMPs will be trained to have a clear understanding of their responsibilities. The post-construction BMPs training will consist of overall program goals and implementation. The content of the training will include:

- Post-Construction Technical Standards and use of the *Post-Construction BMP Checklist* including the existing and ***CCH Rules Relating to Storm Drainage Standards*** and ***CCH Storm Water BMP Guide***
- Content and Requirements of PSMP and O&M Plans
- Inspection Procedures
- Implementing the Enforcement Response Plan
- Post-construction BMP Inventory database use and maintenance

**Training for Designers and Plans Reviewers**

This annual course, required for HAR-ED, HAR-EE, HAR-EM, and HAR-EP and available to other Harbors employees and consulting engineers, will cover planning and design considerations for the proper selection, design, installation, operation, and maintenance of post-construction BMPs. It also includes an introduction to LID stormwater management practices.

**Training for Inspectors, Construction Managers, and Contractors**

This annual course, required for HAR-EC, HAR-EE, HAR-EM, and HAR-PM and available to other Harbors employees, consultant construction managers, and contractors on Harbors' projects, will cover installation, O&M, and inspection considerations for post-construction stormwater BMPs. It also includes an introduction to LID stormwater management practices.

**Training for Operations and Maintenance**

This course, required for Oahu District and available to other Harbors employees, will cover proper O&M of post-construction BMPs owned and operated by Harbors.

Training effectiveness will be evaluated through a survey of the participants. All participants will be required to sign in and information regarding how many employees attend the initial training will be reported in the ACR. Input from the survey will be evaluated and used for the development of future training session. The evaluation findings and any necessary program improvements will be included in the ACR.

## 8.0 REFERENCES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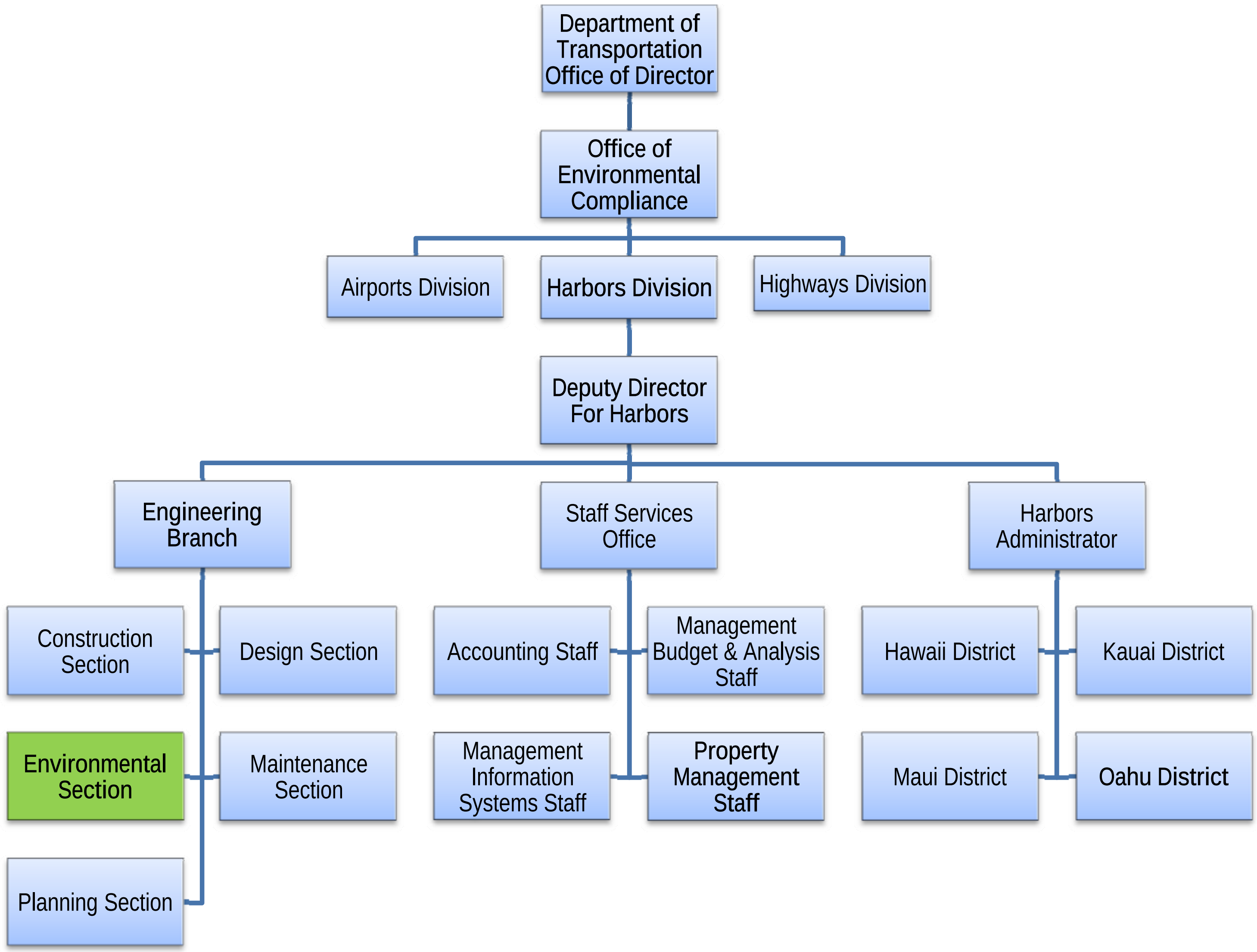
# Appendix A

# HDOT Harbors Division Administrative Organizational Chart

# State of Hawaii Department of Transportation, Harbors Division Administrative Organizational Chart



# Appendix B

# Permanent Post-Construction Best Management Practices Plan Checklist

**Hawaii Department of Transportation – Harbors Division**

# Permanent Post-Construction Best Management Practice Plan Checklist

| For a Harbors Project, please fill in this section | |
|---|---|
| Project Title: | |
| Project Location: | |
| Acreage of Site: | Harbors Project No.: |
| Name of Design Firm: | |
| Email: | Phone No.: |

| For a Tenant Improvement Project, please fill in this section | |
|---|---|
| Tenant Business Name: | Date: |
| Project Title: | |
| Project Location: | |
| Acreage of Site: | TMK No. (if any): |
| Applicant Name: | Job Title: |
| Email: | Phone No.: |

| Signature and Certifications | |
|---|---|
| **Designer**: I certify that the design is complete, accurate, and addresses the items on this checklist to the best of my knowledge. | |
| Print Name: | Job Title: |
| Signature: | Date: |
| **Review**: HDOT Harbors Project Manager and Environmental Section. | |
| Harbors Project Manager Signature: | Print Name: |
| | Date: |
| Harbors Environmental Section Signature: | Print Name: |
| | Date: |

## Part One - Low Impact Development Site Design Strategies

The following checked strategies will be incorporated and area(s) is denoted on the map:

- ☐ Conserve natural areas, soils, and vegetation
- ☐ Minimize soil compaction
- ☐ Minimize disturbances to natural drainages
- ☐ Minimize impervious surface
- ☐ Direct Runoff to Landscaped Areas
- ☐ None (all infeasible)

If "None" is checked, please provide justification here:

## Part Two – Source Control

The following checked Source Control BMP(s) will be incorporated and area(s) is denoted on the map:

- ☐ Automatic irrigation systems
- ☐ Landscaped areas
- ☐ Loading docks
- ☐ Vehicle/Equipment fueling
- ☐ Vehicle/Equipment repair
- ☐ Vehicle/Equipment washing
- ☐ Outdoor work areas
- ☐ Outdoor material storage
- ☐ Outdoor trash storage
- ☐ Outdoor process operations
- ☐ Parking areas
- ☐ Others

If "Others" is checked, please describe here (attach separate sheets if needed):

## Part Three – Treatment Control

The following checked Treatment Control BMP(s) will be incorporated and area(s) is denoted on the map:

- ☐ Infiltration basin
- ☐ Infiltration trench
- ☐ Subsurface Infiltration
- ☐ Dry well
- ☐ Bioretention basin
- ☐ Permeable pavement
- ☐ Green roof
- ☐ Bioretention filter
- ☐ Dry swale
- ☐ Downspout dispersion
- ☐ Vegetated swale
- ☐ Vegetated buffer strip
- ☐ Tree box filter

Alternative Compliance. The following alternative compliance is proposed and area(s) is denoted on the map:

- ☐ Incorporate the following alternative Treatment Control BMP(s):
  - ☐ Detention basin
  - ☐ Sand filter
  - ☐ Rain barrel
  - ☐ Manufactured treatment device
- ☐ Other (specify):

☐ Source Control BMPs are designed with reference to the City and County of Honolulu Storm Water BMP Guide.

☐ Treatment Control BMPs are designed with reference to the City and County of Honolulu Storm Water BMP Guide.

# Appendix C

# CCH Storm Water BMP Guide

# Storm Water BMP Guide

## DRAFT

**June 2012**
**[Revision date: July 2012]**

**By:**
**City and County of Honolulu**
**Department of Planning and Permitting**

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# Tables of Contents

# List of Figures

# List of Tables

# Acronyms and Abbreviations

| | |
|---|---|
| BMP | Best Management Practice |
| cfs | cubic feet per second |
| cu-ft | cubic feet |
| ENV | Department of Environmental Services, City and County of Honolulu |
| EPA | Environmental Protection Agency, United States |
| ft | feet |
| hr | hour |
| in | inches |
| LID | Low Impact Development |
| min | minutes |
| sec | seconds |
| SPCC | Spill Prevention Control and Countermeasure |
| sq-ft | square feet |
| WQF | Water Quality Flow |
| WQV | Water Quality Volume |

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# INTRODUCTION

The City and County of Honolulu Rules Relating to Storm Drainage Standards (*Rules*) specifies that regulated new development and redevelopment projects include Low Impact Development (LID) Site Design Strategies, Source Control Best Management Practices (BMPs), and Post-Construction Treatment Control BMPs to meet water quality criteria. This Storm Water BMP Guide provides general guidelines to support their implementation. More detailed information may be found in the *City and County of Honolulu Storm Water BMP Manual, New Development and Redevelopment*, which may be found on the City's website.

## Document Organization

Chapter 1 provides descriptions of the five site design strategies that must be considered for regulated projects if applicable

Chapter 2 provides the minimum requirements for the 12 source control BMPs that must be considered for regulated projects if applicable.

Chapter 3 provides design guidelines for those Treatment Control BMPs which are considered most appropriate for the City and County of Honolulu. It includes numeric sizing criteria to calculate the Water Quality Volume (WQV) and Water Quality Flow Rate (WQF), general design requirements for all Treatment Control BMPs that include infiltration as a pollutant removal/treatment mechanism, and specific BMP design and sizing information.

Reference are provided at the end of the document.

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# 1. SITE DESIGN STRATEGIES

Low Impact Development (LID) is a storm water management strategy concerned with maintaining or restoring the natural hydrologic functions of a site to achieve natural resource protection objectives and fulfill environmental regulatory requirements. LID employs a variety of natural and built features that reduce the rate of runoff, filter out its pollutants, and facilitate the infiltration of water into the ground. By reducing water pollution and increasing groundwater recharge, LID helps to improve the quality of receiving surface waters and stabilize the flow rates of nearby streams.

The goal of LID site design is to reduce the hydrologic impact of development and to incorporate techniques that maintain or restore the site's hydrologic and hydraulic functions. The optimal LID site design minimizes runoff volume and preserves existing flow paths. On the following pages are presented the five strategies considered applicable for new development and redevelopment projects.

## CONSERVE NATURAL AREAS, SOILS, AND VEGETATION

The conservation of natural areas, soils, and vegetation helps to retain numerous functions of predevelopment hydrology, including rainfall interception, evapotranspiration, and infiltration. Maximizing these functions will thereby reduce the amount of runoff that must be treated. Protection of mature trees and vegetation provides habitat, prevents erosion, captures significant rainfall, provides summer shading, and reduces runoff volume and velocity which protects and enhances downstream water quality. Specific measures are:

- Preserve/protect riparian buffers
- Preserve/protect wetlands
- Preserve/protect natural flow pathways
- Preserve/protect steep slopes
- Preserve/protect sensitive environmental areas.
- Preserve/protect undisturbed vegetated areas/corridors.
- Preserve native trees and restrict disturbance of soils beneath tree canopies.
- Limit construction activities and disturbances to areas with previously disturbed soils.
- Avoid disturbing vegetation and soil on slopes and near surface waters.
- Leave an undisturbed buffer along both sides of natural streams.

Waaloa Way

## MINIMIZE DISTURBANCES TO NATURAL DRAINAGES

Natural drainages offer a benefit to storm water management as the soils and habitat already function as a natural filtering/infiltrating swale. Minimizing disturbances to natural drainage patterns preserves the predevelopment timing, rate, and duration of runoff as well as preserving streamside habitats. When determining the development footprint of the site, natural drainages should be avoided. By keeping the development envelope set back from natural drainages, the drainage can retain its water quality benefit to the watershed. Specific measures are:

- Limit site disturbance, clearing, and grading to the smallest areas necessary
- Maintain surface flow patterns of undeveloped sites.
- Maintain existing water body alignments, sizes, and shapes.
- Minimize and control construction traffic areas
- Minimize and control construction stockpiling and storage areas
- Use construction fencing to mark where no disturbances will be allowed.

Waimanalo Stream

## MINIMIZE SOIL COMPACTION

Clearing, grading and compaction by construction traffic reduces the natural absorption and infiltration capacities of the native soils. Soil compaction damages soil structure, reduces infiltration rates, limits root growth and plant survivability, and destroys soil organisms. Subsequent tilling and/or addition of soil amendments such as compost can help, but will not restore the original infiltration capacity of the soils. By protecting native soils and vegetation in appropriate areas during the clearing and grading phase of development the site can retain some of its existing beneficial hydrologic function. Specific measures are:

- Protect soils against compaction and rutting in areas where traffic is unavoidable.
- Minimize the size of construction easements and material storage areas.
- Limit areas of heavy equipment
- Prohibit working on wet soils with heavy equipment.
- Restore compacted open space areas with tilling and soil amendments.
- Avoid extensive and unnecessary clearing and stockpiling of topsoil
- Avoid/minimize soil compaction in open space, landscaped, and proposed LID BMP areas
- Prepare soil amendments off-site

???

## MINIMIZE IMPERVIOUS SURFACES

The increased volume, increased velocity, and discharge duration of storm water runoff from developed areas has the potential to accelerate downstream erosion and impair stream habitat in natural drainages. Studies have demonstrated a direct correlation between the degree of imperviousness of an area and the degradation of its receiving waters. Impervious surfaces (such as pavement and concrete) can neither absorb water nor remove pollutants, and thus the natural purification characteristics are lost. Reducing impervious surfaces to the minimum amount needed retains the permeability of the project site, allowing natural processes to filter and reduce non-point sources of pollution. Specific measures are:

- Use open space or hybrid street plan instead of grid and curvilinear
- Reduce sidewalk widths
- Maximize utilization of compact car spaces in parking areas
- Reduce parking stalls in areas near Transit Centers
- Incorporate shared parking areas and driveways
- Reduce driveway sizes
- Consider clustering buildings that require less driveways and pathways;


Fasi Municipal Building Green Roof

## DIRECT RUNOFF TO LANDSCAPED AREAS

Any impervious surface that drains into a catch basin, area drain, or other conveyance structure is a "directly connected impervious area (DCIA)." As storm water runoff flows across parking lots, roadways, and paved areas, the oils, sediments, metals and other pollutants are collected and concentrated. If this runoff is collected by a drainage system and carried directly along impervious gutters or in closed underground pipes, it has no opportunity for filtering by plant material or infiltration into the soil. It also increases in speed and volume, which may cause higher peak flows downstream, and may require larger capacity storm drain systems, increasing flood and erosion potential. Solutions that reduce DCIA prevent runoff, detain or retain surface water, attenuate peak runoff rates, benefit water quality and convey storm water. Specific measures are:

- Design roof drains to flow to vegetated areas
- Direct flow from paved areas to stabilized landscaped/vegetated areas
- Grade paved areas to achieve sheet flow to landscaped areas
- Break up flow directions from large paved surfaces

Local Church

# 2. SOURCE CONTROL BMPS

Proactively controlling pollutants at their source is fundamental to effective stormwater quality management. There are a number of items that can be routinely designed into a project that function as source controls once a project is completed. They include such items as marking new drain inlets and posting informational signs; improving landscape planning and efficient irrigation methods; using water quality friendly building materials; properly designing outdoor material and trash storage areas; and permanently protecting slopes and channels from erosion. They also include design features for specific workplace or other activity areas such as vehicle washing areas, outdoor processing areas, maintenance bays, and fueling areas.

Design of BMPs to control workplace exposure to pollutants is guided by two general principles:

- Prevent storm water from contacting work areas. Work and storage areas should be designed to prevent storm water runoff from passing through shipping areas, vehicle maintenance yards, and other work places before it reaches storm drains. The objective is to prevent the discharge of water laden with grease, oil, heavy metals and process fluids to surface waters or sensitive resource areas.
- Prevent pollutants from contacting surfaces that come into contact with storm water runoff. Precautionary measures should be employed to keep pollutants from contacting surfaces that come into contact with runoff. This means controlling spills and reviewing operational practices and equipment to prevent pollutants from coming into contact with storm or wash water runoff.

The most common Source Control BMPs are the following, and are presented herein:

- Landscaped areas
- Automatic irrigation systems
- Storm drain Inlets
- Vehicle/equipment fueling
- Vehicle/equipment repair
- Vehicle/equipment washing/cleaning
- Loading docks
- Outdoor trash storage
- Outdoor material storage
- Outdoor work areas
- Outdoor process equipment operations
- Parking areas

The following information is provided for each of the above-listed BMPs:

- Brief description/approach
- Minimum (mandatory) design requirements
- Minimum (mandatory) operations and maintenance requirements

## LANDSCAPED AREAS

### *Description / Approach*

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the maximum extent possible, maximize natural water storage and infiltration opportunities, anMinimumd protect slopes and channels.

### *Design Guidelines*

- Conserve Natural Areas to the extent possible
- Maximize Natural Water Storage and Infiltration Opportunities to the extent possible
- Protect Slopes and Channels

### *O&M Recommendations*

- Do not use pesticides and fertilizers during wet weather or when rain is forecast, and minimize their use during dry weather.
- Do not blow or rake leaves, grass, or garden clippings into the street, gutter, or storm drain.
- Do not apply any chemicals (insecticide, herbicide, or fertilizer) directly to surface waters, unless the application is approved and permitted by the state.
- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.
- Check irrigation schedules so pesticides will not be washed away and to minimize non-storm water discharge.

## AUTOMATIC IRRIGATION SYSTEMS

### *Description / Approach*

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into storm water drainage systems.

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the storm water conveyance system.

### *Design Guidelines*

- Design irrigation systems to each landscape area's specific water requirements.
- Implement landscape plans consistent with City water conservation resolutions, which may include provision of drip irrigation, water sensors, programmable irrigation times (for short cycles), etc.
- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration.

### *O&M Recommendations*

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring.
- Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.

## STORM DRAIN INLETS


### *Description / Approach*

Storm drain signs and stencils are highly visible source controls that are placed directly adjacent to storm drain inlets. The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Stencils and signs alert the public to the destination of pollutants discharged to the storm drain.

### *Design Guidelines*

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. ENV Storm Water Branch has approved specific signage and/or storm drain message placards for use.
- Place the marker in clear sight facing toward anyone approaching the inlet from either side
- Be aware that signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.
- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

### *O&M Recommendations*

- Inspect signage regularly and maintain as appropriate to ensure legibility.
- Inspect regularly, at least annually, for structural deterioration or significant build-up of debris or sediment.

## VEHICLE/EQUIPMENT FUELING

### *Description / Approach*

Fueling areas have the potential to discharge oil and grease, solvents, car battery acid, coolant and gasoline to the storm drain. Spills can be a significant source of pollution because fuels contain toxic materials and heavy metals that are not easily removed by storm water treatment devices.

### *Design Guidelines*

- ***Covering.*** Include an overhanging roof structure or canopy over fuel dispensing areas. The cover's minimum dimensions must be equal to or greater than the area within the grade break. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area. If fueling large equipment or vehicles that prohibit the use of covers or roofs, the fueling island should be designed to accommodate the larger vehicles and equipment and to prevent storm water run-on and runoff.
- ***Surfacing.*** Pave fuel dispensing areas with Portland cement concrete (or equivalent smooth impervious surface). Extend the paved area a minimum of 6.5 ft from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 ft, whichever is less. The use of asphalt concrete is prohibited. Use asphalt sealant to protect asphalt paved areas surrounding the fueling area.
- ***Grading/Contouring.*** Slope the dispensing areas to prevent ponding, and separate it from the rest of the site by a grade break that prevents run-on. Grade the fueling areas to drain toward a dead-end sump or vegetated/landscaped area. Direct runoff from downspouts/roofs away from fueling areas towards vegetated/landscaped areas if possible.
- ***Drains.*** Label all drains within facility boundaries using paint or stencil, to indicate whether flow is to the storm drain, sewer, or oil/water separator

### *O&M Recommendations*

- Maintain clean fuel-dispensing areas using dry cleanup methods such as sweeping, or use of rags and absorbents for leaks and spills.
- If you clean by washing, place a temporary plug in the downstream drain and pump out the accumulated water. Properly dispose the water.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank. Cover storm drains in the vicinity during transfer.
- Post signs at the fuel dispenser or fuel island warning vehicle owners/operators against "topping off" of vehicle fuel tanks.
- Develop and implement a Spill Prevention Control and Countermeasure (SPCC) Plan.

## VEHICLE/EQUIPMENT REPAIR

### *Description / Approach*

Several measures can be taken to prevent operations at maintenance bays from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the storm water conveyance system. In designs for maintenance bays containment is encouraged. Preventive measures include overflow containment structures and dead-end sumps

### *Design Guidelines*

Design requirements for vehicle maintenance and repair are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. The design requirements described hereon are meant to enhance and be consistent with these code requirements.

- Locate repair/maintenance bays indoors; or design them to preclude run-on and runoff.
- Pave repair/maintenance floor areas with Portland cement concrete (or equivalent smooth impervious surface).
- Provide impermeable berms, drop inlets, trench catch basins, or overflow containment structures around repair bays to prevent spilled materials and wash-down waters from entering the storm drain system. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited.
- Label all drains within facility boundaries using paint or stencil, to indicate whether flow is to the storm drain, sewer, or oil/water separator.

### *O&M Recommendations*

- Avoid hosing down work areas. If work areas are washed, collect and direct wash water to sanitary sewer.
- Do not pour liquid waste down floor drains, sinks, outdoor storm drain inlets, or other storm drains or sewer connections.
- Do not dispose of used or leftover cleaning solutions, solvents, and automotive fluids and oil in the sanitary sewer.
- Keep drip pans or containers under vehicles or equipment that may drip during repairs.
- When steam cleaning or pressure washing parts, the wastewater must be discharged to an on-site oil water separator that is connected to a sanitary sewer or blind sump.
- Develop and implement a Spill Prevention Control and Countermeasure (SPCC) Plan.

## VEHICLE/EQUIPMENT WASHING & CLEANING


### *Description / Approach*

Vehicle washing, equipment washing, and steam cleaning may contribute high concentrations of pollutants to wash waters that drain to storm water conveyance systems. Wash water may not be conveyed to a sewer without a sewer connection permit.

### *Design Guidelines*

Incorporate at least one of the following features for equipment washing/steam cleaning:

- Be self-contained and/or covered with a roof or overhang
- Be equipped with a clarifier or other pretreatment facility
- Have a proper connection to a sanitary sewer
- Install sumps or drain lines to collect wash water. Divert wash water to the sanitary sewer, an engineered infiltration system, or an equally effective alternative.
- Direct and divert surface water runoff away from the exposed area around the wash pad, and wash pad itself to alternatives other than the sanitary sewer.
- Cover areas used for regular washing of vehicles, trucks, or equipment, surround them with a perimeter berm, and clearly mark them as a designated washing area.
- Label all drains within facility boundaries using paint or stencil, to indicate whether flow is to the storm drain, sewer, or oil/water separator.

### *O&M Recommendations*

- Mark the area clearly as a wash area.
- Post signs stating that only washing is allowed in wash area.
- Provide trash container with lids in wash area.
- Recycle, collect or treat wash water effluent prior to discharge to the sanitary sewer system.
- Do not conduct oil changes and other engine maintenance in the designated washing area. Perform these activities in a place designated for oil change and maintenance activities.
- Cover the wash area when not in use to prevent contact with rain water.
- Do not permit steam cleaning wash water to enter the storm drain.
- Develop and implement a Spill Prevention Control and Countermeasure (SPCC) Plan.

## LOADING DOCKS


### *Description / Approach*

Several measures can be taken to prevent operations at loading docks from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the storm water conveyance system. In designs for loading docks, containment is encouraged. Preventive measures include overflow containment structures and dead-end sumps.

### *Design Guidelines*

Design requirements for vehicle maintenance and repair are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. The design requirements described hereon are meant to enhance and be consistent with these code requirements.

- Cover all loading dock areas, or design them to preclude run-on and runoff.
- Do not allow runoff from depressed loading docks (truck wells) to discharge into storm drains.
- Drain below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items through water quality inlets, an engineered infiltration system, or an equally effective alternative.
- Grade and/or berm the loading/unloading area to a drain that is connected to a dead-end.
- Pave loading areas with concrete instead of asphalt.

### *O&M Recommendations*

- Develop an operations plan that describes procedures for loading and/or unloading.
- Conduct loading and unloading in dry weather if possible.
- Load and unload all materials and equipment in covered areas if feasible.
- Load/unload only at designated loading areas.
- Check loading and unloading equipment regularly for leaks.
- Look for dust or fumes during loading or unloading operations.
- Develop and implement a Spill Prevention Control and Countermeasure (SPCC) Plan.

## OUTDOOR TRASH STORAGE

### *Description / Approach*

Storm water runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or streams.

Preventive measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

### *Design Guidelines*

- Hazardous waste must be handled in accordance with legal requirements established in *Hawaii Administrative Rules Title 11 Chapter 58.1 Solid Waste Management Control,* and enforcement by the *State of Hawaii Department of Health solid and Hazardous Waste Branch.*
- Berm trash storage areas to prevent run-on from adjoining roofs and pavement, or grade areas towards vegetated/landscaped areas.
- Reduce/prevent leaking of liquid waste by incorporating at least one of the following:
  - Lined bins or dumpsters
  - Low containment berm around the dumpster area
  - Drip pans underneath dumpsters
- Prevent rainfall from entering containers with roofs, awnings, or attached lids.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on dumpsters indicating that hazardous material are not to be disposed of therein.

### *O&M Recommendations*

- Spot clean leaks and drips routinely to prevent runoff of spillage
- Post “no littering” signs
- Use only watertight waste receptacle(s) and keep the lid(s) closed
- Do not overfill or fill with any liquid.  Keep lid closed at all times.
- Periodically inspect for leaks.  If found contact the leasing company immediately.
- Never wash down or rinse with a hose. Contact leasing company for cleaning.
- Develop and implement a Spill Prevention Control and Countermeasure (SPCC) Plan.

## OUTDOOR MATERIAL STORAGE


### *Description / Approach*

Proper design of outdoor storage areas for materials reduces opportunity for pollutants to enter the storm water conveyance system. Materials may be in the form of raw products, by-products, finished products, and waste products.

In outdoor storage areas, infiltration is discouraged and containment is encouraged.

### *Design Guidelines*

Design requirements for material storage areas are governed by Building and Fire Codes, and by current City ordinances and zoning requirements. Control measures are site specific, and must meet local agency requirements.

- Materials with the potential to contaminate storm water must either be placed in an enclosure that prevents contact with runoff or spillage to the storm water conveyance system, or protected by secondary containment structures such as berms, dikes, or curbs.
- Pave the storage area with Portland cement concrete (or equivalent smooth impervious surface) to contain leaks and spills.
- Slope the storage area towards a dead-end sump to contain spills.
- Direct runoff from downspouts/roofs away from storage areas.
- Cover the storage area with an awning that extends beyond the storage area to minimize collection of storm water within the secondary containment area. A manufactured storage shed may be used for small containers.

### *O&M Recommendations*

- Protect materials from rainfall, run-on, runoff, and wind dispersal.
- Employ safeguards against accidental releases.
- Inspect storage areas regularly for leaks or spills.
- Keep storage areas clean and dry.
- Keep containers in good condition without corrosion or leaky seams.
- Cover and contain stockpiles of raw materials to prevent storm water run-on. If infeasible, implement erosion control practices around site perimeter and catch basins.
- Develop and implement a Spill Prevention Control and Countermeasure (SPCC) Plan.

## OUTDOOR WORK AREAS

### *Description / Approach*

Proper design of outdoor work areas (grinding, painting, coating, sanding, parts cleaning, etc.) reduces opportunity for pollutants to enter the storm water conveyance system.

In outdoor work areas, infiltration and discharge to the storm drain are discouraged; collection and conveyance to the sanitary sewer are encouraged.

### *Design Guidelines*

Design requirements for outdoor work areas are governed by Building and Fire Codes, and by current City ordinances, and zoning requirements.

- Create an impermeable surface such as concrete or asphalt, or a prefabricated metal drip pan, depending on the use.
- Cover the area with a roof to prevent rain from falling on the work area and becoming polluted runoff.
- Berm or perform mounding around the perimeter of the area to prevent water from adjacent areas from flowing on to the surface of the work area.
- Directly connect runoff to the sanitary sewer or other specialized containment system(s). This allows the more highly concentrated pollutants from these areas to receive special treatment that removes particular constituents. Approval for this connection must be obtained from the City.
- Locate the work area away from storm drains or catch basins.

### *O&M Recommendations*

- Dry clean the work area regularly.
- Inspect storage areas regularly for leaks or spills.
- Develop and implement a Spill Prevention Control and Countermeasure (SPCC) Plan.

## OUTDOOR PROCESS EQUIPMENT OPERATIONS


### *Description / Approach*

Outdoor process equipment operations such as rock grinding or crushing, painting or coating, grinding or sanding, degreasing or parts cleaning, may contribute a variety of pollutants to the storm conveyance system.

In outdoor process equipment areas, infiltration is discouraged and containment is encouraged, accompanied by collection and conveyance.

### *Design Guidelines*

Design requirements for outdoor processing areas are governed by Building and Fire codes, and by current local agency ordinances, and zoning requirements.

- Cover or enclose areas that would be the most significant source of pollutants; or slope the area toward a dead-end sump; or, discharge to the sanitary sewer system following appropriate treatment in accordance with conditions established by the applicable sewer agency.
- Grade or berm area to prevent run-on from surrounding areas.
- Do not install storm drains in areas of equipment repair.
- Provide secondary containment structures (not double wall containers) where wet material processing occurs (e.g., electroplating), to hold spills resulting from accidents, leaking tanks, or equipment, or any other unplanned releases (Note: if these are plumbed to the sanitary sewer, they must be with the prior approval of the City.)

### *O&M Recommendations*

- Dry clean the work area regularly.
- Inspect storage areas regularly for leaks or spills.
- Develop and implement a Spill Prevention Control and Countermeasure (SPCC) Plan.

## PARKING AREAS

### *Description / Approach*

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through storm water runoff or non-storm water discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas.

### *Design Guidelines*

- Direct pavement runoff towards vegetated/landscaped areas if possible.

### *O&M Recommendations*

- Clean leaves, trash, sand, and other debris regularly
- Routinely sweep, shovel, and dispose of litter in the trash. Sweep entire parking lot at least once before the onset of the wet season.
- Provide an adequate number of covered trash receptacles. Clean out frequently.
- Re-seal or pave only on dry days, and stop immediately before rainfall.
- Pre-heat, transfer or load hot bituminous material away from storm drain inlets.
- Do not allow any solids, liquids, or slurries to enter storm drains
- Use dry clean-up methods (absorbents) on auto spills and/or drips.
- Do not hose down unless absolutely necessary. If you must pressure wash, discharge wash water to the sanitary sewer or a vegetated area. Do not allow wash water to enter storm drains.

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# 3. TREATMENT CONTROL BMPS

Treatment Control BMPs are engineered technologies designed to remove pollutants from storm water runoff prior to discharge to the storm drain system or receiving waters. This chapter addresses BMP numeric sizing criteria, general requirements for infiltration BMPs, and individual BMP fact sheets.

## NUMERIC SIZING CRITERIA

This section presents the methodology for calculating the Water Quality Volume (WQV) and Water Quality Flow Rate (WQF), which are used to size the majority of the Treatment Control BMPs.

### *Water Quality Volume*

The Water Quality Volume (WQV) is calculated using the following equation:

$$WQV = PCA \times 3630$$

| | | | |
|---|---|---|---|
| Where: | WQV | = | water quality design volume (cubic feet) |
| | P | = | design storm runoff depth (inches) |
| | C | = | volumetric runoff coefficient |
| | A | = | total drainage area (acres) |

As specified in the *Rules*, a design storm runoff depth of 1 inch shall be used. The volumetric runoff coefficient shall be calculated using the following equation as developed by EPA for smaller storms in urban areas:

$$C = 0.05 + 0.009I$$

| | | | |
|---|---|---|---|
| Where: | C | = | volumetric runoff coefficient |
| | I | = | percent of impervious cover, expressed as a percentage |

A graph presenting the relationship between the percent of impervious cover and the unit water quality design volume for a 1-inch runoff depth is shown in Figure 1.

### *Water Quality Flow*

The design water quality flow rate (WQF) is calculated using the Rational Formula:

$$WQF = CiA$$

| | | | |
|---|---|---|---|
| Where: | WQF | = | water quality design flow rate (cubic feet per second) |
| | C | = | runoff coefficient |
| | i | = | peak rainfall intensity (inches per hour) |
| | A | = | total drainage area (acres) |

As specified in the *Rules*, a peak rainfall intensity of 0.4 inches per hour shall be used. The runoff coefficient shall be determined from Table 1 below, based on the drainage area, and shall be, at a minimum, the midpoint of the given range of values. The higher value should be used if soil conditions indicate that pervious areas will have little infiltration/interception potential. For drainage areas containing multiple land uses, the following formula may be used to compute a composite weighted runoff coefficient:

$$\boldsymbol{C_c = \left(\sum_{i=1}^{n} C_i A_i\right) \Big/ A_t}$$

| | | | |
|---|---|---|---|
| Where: | $C_c$ | = | composite weighted runoff coefficient |
| | $C_{1,2,\ldots n}$ | = | runoff coefficient for each land use cover type |
| | $A_{1,2,\ldots n}$ | = | drainage area of each land use cover type (acres) |
| | $A_t$ | = | total drainage area (acres) |

**Table 1: Runoff Coefficients for Water Quality Flow Calculations**

| Type of Drainage Area | Runoff Coefficient |
|---|---|
| Business | |
| Downtown areas | 0.70 – 0.95 |
| Neighborhood areas | 0.50 – 0.70 |
| Residential | |
| Single-family areas | 0.30 – 0.50 |
| Multi-units, detached | 0.40 – 0.60 |
| Multi-units, attached | 0.60 – 0.75 |
| Suburban | 0.25 – 0.40 |
| Apartment dwelling areas | 0.50 – 0.70 |
| Industrial | |
| Light areas | 0.50 – 0.80 |
| Heavy areas | 0.60 – 0.90 |
| Parks, cemeteries | 0.10 – 0.25 |
| Playgrounds | 0.20 – 0.40 |
| Railroad yards | 0.20 – 0.35 |
| Unimproved areas | 0.10 – 0.30 |
| Lawns | |
| Sandy soil, flat, ≤ 2% | 0.05 – 0.10 |
| Sandy soil, average 2-7% | 0.10 – 0.15 |
| Sandy soil, steep ≥ 7% | 0.15 – 0.20 |
| Heavy soil, flat, ≤ 2% | 0.13 – 0.17 |
| Heavy soil, average 2-7% | 0.18 – 0.22 |
| Heavy soil, steep ≥ 7% | 0.25 – 0.35 |
| Streets | |
| Asphaltic | 0.70 – 0.95 |
| Concrete | 0.70 – 0.95 |
| Brick | 0.75 – 0.85 |
| Drives and walks | 0.75 – 0.95 |
| Roofs | 0.75 – 0.95 |

A graph presenting the relationship between the weighted runoff coefficient and the unit water quality design flow rate is shown in Figure 2.

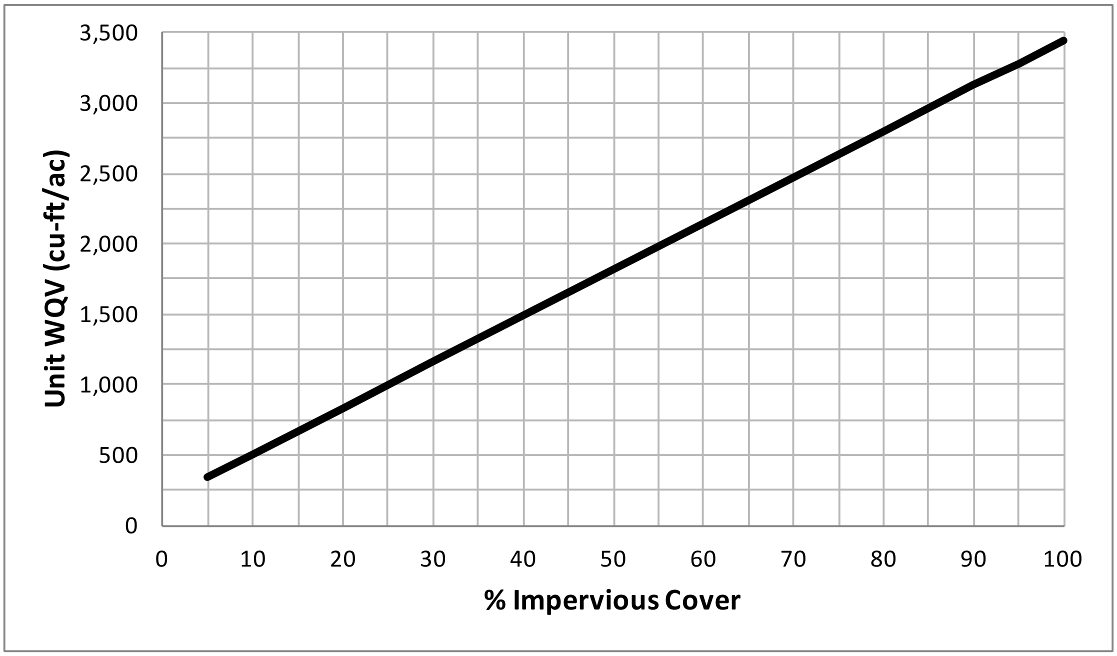



**Figure 1: Unit Water Quality Volume for 1 inch Runoff Depth**

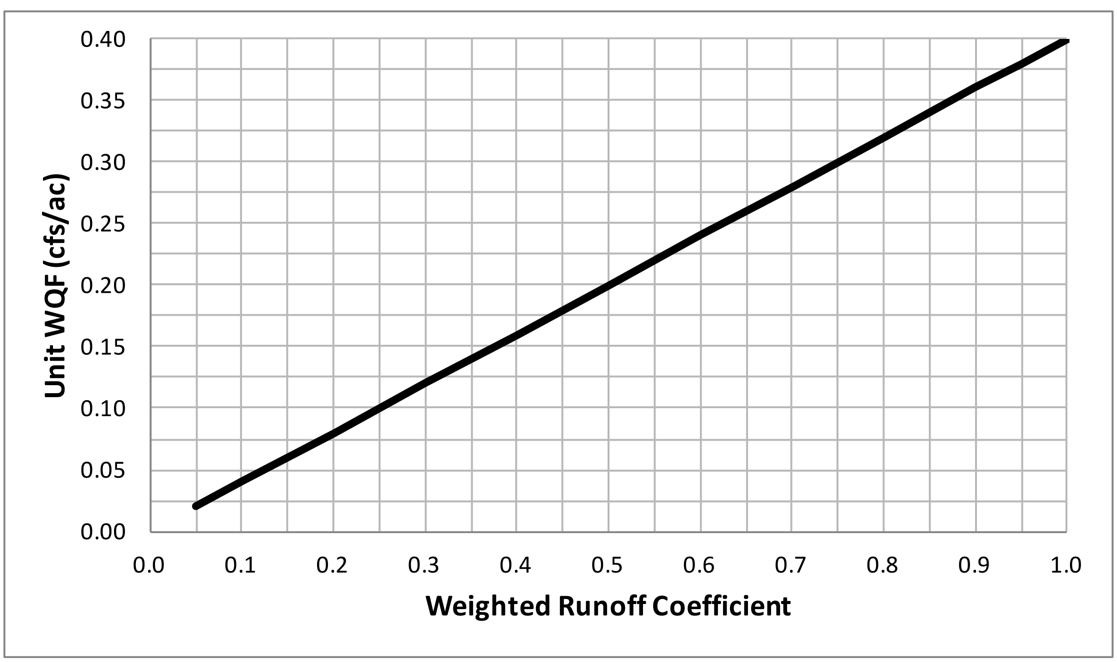



**Figure 2: Unit Water Quality Flow**

## GENERAL INFILTRATION REQUIREMENTS

LID Retention BMPs rely on the soil's ability to infiltrate storm water runoff. This section outlines the design requirements applicable to all infiltration facilities.

### *Soil Types and Textures*

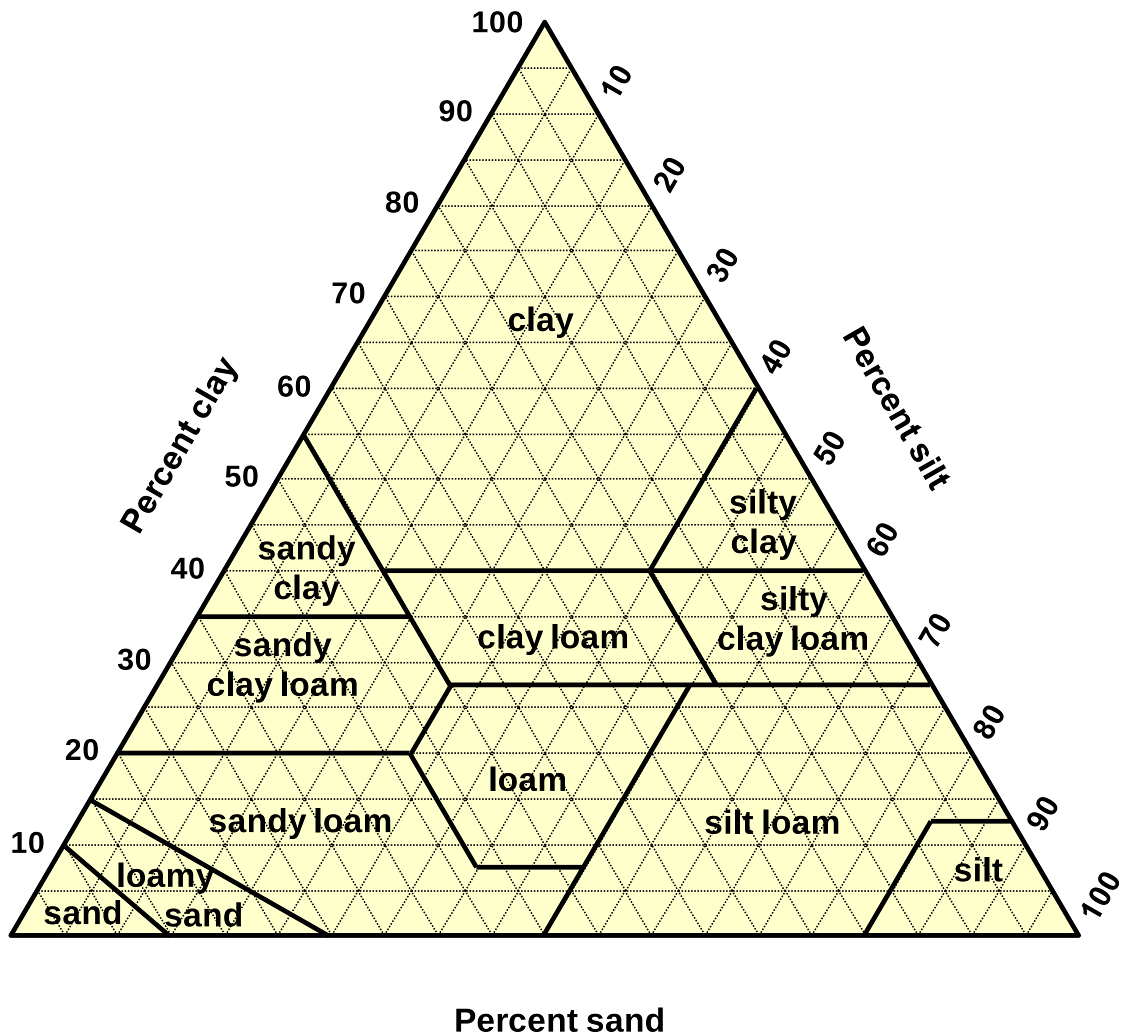
The soil types within the subsoil profile, extending a minimum of 3 feet below the bottom of the proposed facility, should be identified to verify the infiltration rate or permeability of the soil. The infiltration rate, or permeability, measured in inches per hour, is the rate at which water passes through the soil profile during saturated conditions. Although the units of infiltration rate and hydraulic conductivity of soils are similar, there is a distinct difference between these two quantities. They cannot be directly related unless the hydraulic boundary conditions are known, such as hydraulic gradient and the extent of lateral flow of water, or can be reliably estimated. Minimum and maximum infiltration rates establish the suitability of various soil textural classes for infiltration. Each soil texture and corresponding hydrologic properties within the soil profile are identified through analysis of a gradation test of the soil boring material. Table 2 presents a list of the infiltration rates for the soil textures of the U.S. Department of Agriculture Textural Triangle, presented in Figure 3.

**Table 2: Typical Soil Infiltration Rates**

| Texture Class | Hydrologic Soil Group[a] | Infiltration Rate (in/hr)[b] | Infiltration Rate (in/hr)[c] |
|---|---|---|---|
| Sand | A | 8.27 | 8.00 |
| Loamy sand | A | 2.41 | 2.00 |
| Sandy loam | A | 1.02 | 1.00 |
| Loam | B | 0.52 | 0.50 |
| Silt loam | B | 0.27 | 0.25 |
| Sandy clay loam | C | 0.17 | 0.15 |
| Clay loam | D | 0.09 | 0.09 |
| Silty clay loam | D | 0.06 | 0.09 |
| Sandy clay | D | 0.05 | |
| Silty clay | D | 0.04 | |
| Clay | D | 0.02 | 0.05 |

[a] Source: U.S. Soil Conservation Service, 1986
[b] Source: Rawls, Brakensiek and Saxton, 1982
[c] Source: ASCE, 1998

**Figure 3: USDA Soils Textural Triangle**




Soil textures acceptable for use with infiltration systems include those with infiltration rates equal to or above 0.50 inches per hour (a soil texture indicative of loam). Soil textures with rates less than 0.50 inches per hour are not suitable as it increases the risk of the BMP not draining properly and creating localized areas of standing water. It is important to note however, that Hydrologic Soil Group (HSG) "D" soils (e.g., clay loam, silty clay loam, and silty clay) in Oahu have been shown to perform better than their counterparts in the Continental United States, as is presented for a representative group of soils in Table 4. As a result, locations with HSG "D" soils should not be prematurely rejected as candidate sites for infiltration BMPs, and field tests should be performed to determine actual infiltration rates.

**Table 3: Typical Oahu Soil Infiltration Rates[a]**

| Soil Name | Depth (in) | USDA Texture | Saturated Hydraulic Conductivity (in/hr) |
|---|---|---|---|
| Kapaa | 0 – 14 | Silty clay | 0.6 – 6.0 |
| | 14 – 60 | Clay loam | 0.2 – 2.0 |
| Kunia | 0 – 22 | Silty clay | 0.2 – 2.0 |
| | 22 – 47 | Silty clay | 0.06 – 0.6 |
| | 47 - 74 | Silty clay loam | 0.2 – 0.6 |
| Waialua | 0 – 12 | Silty clay | 0.2 – 2.0 |
| | 12 - 60 | Clay, Silty clay | 0.2 – 0.6 |
| Waikane | 0 – 8 | Silty clay | 0.6 – 2.0 |
| | 8 – 60 | Silty clay | 0.06 – 0.6 |

[a] Source: USDA Natural Resources Conservation Service, 2006

### *Field Investigations*

Infiltration testing, soil logs, and the written opinion of a licensed geotechnical engineer are required for the construction of an infiltration facility.

Soil Lithology and Depth to Groundwater

An initial soil investigation should be performed to adequately evaluate soil lithology and determine if there are potential problems in the soil structure that would inhibit the rate or quantity of infiltration desired; or if there are potential adverse impacts to structures, slopes or groundwater that could result from locating the device nearby.

Geotechnical test pits or borings shall be dug to a minimum of 5 ft deep below the proposed device invert. A test pit allows visual observation of the soil horizons and overall soil conditions both horizontally and vertically in that portion of the site. Although the use of soil borings is permitted at the recommendation of a geotechnical professional, it is discouraged as a substitute for test pits as visual observation is narrowly limited in a soil boring and the soil horizons cannot be observed in-situ, but must be observed from the extracted borings.

The soil profiles should be carefully logged to determine variations in the subsurface profile. The number of requisite test pits/borings is provided in Table 5. Samples should be collected from the soil profiles at different horizons and transported to a laboratory for soil indices testing, plasticity, and chemical testing. In addition, the test pits or samples from borings should be examined for other characteristics that may adversely affect infiltration. These include evidence of significant mottling (indicative of high groundwater), restrictive layer(s), and significant variation in soil types, either horizontally or vertically.

**Table 4: Test Pit/Boring Requirements for Infiltration**

| Facility | Size | Min. No. of Test Pits/Borings |
|---|---|---|
| Infiltration Basin, Subsurface Infiltration, Dry Well, Bioretention Basin, Permeable Pavement | < 2,500 sq-ft | 1 |
| | 2,500 – 20,000 sq-ft | 2 |
| | 20,000 – 30,000 sq-ft | 3 |
| | 30,000 – 40,000 sq-ft | 4 |
| | > 40,000 sq-ft | 1 test per 10,000 sq-ft |
| Infiltration Trench | < 100 ft | 1 |
| | 100 – 200 ft | 2 |
| | 200 – 300 ft | 3 |
| | > 300 ft | 1 test per 100 ft |

An initial indication of the seasonal high groundwater water table elevation shall be determined by using a piezometer or other accepted geotechnical means. The piezometer should be installed to a depth of at least 20 ft below the proposed device invert using the direct push or other suitable method. Initial groundwater levels shall be recorded at least 24 hours after installation. The geotechnical professional will make a determination whether the groundwater elevation determined after 24 hours can be considered to be a reasonable indication of the seasonal high water table for the site.

Permeability Testing

Infiltration rate tests are used to help estimate the maximum sub-surface vertical infiltration rate of the soil below a proposed infiltration facility (e.g., infiltration trench or infiltration basin). The tests are intended to simulate the physical process that will occur when the facility is in operation; therefore a saturation period is required to approximate the soil moisture conditions that may exist prior to the onset of a runoff event. Laboratory tests are strongly discouraged, as a homogeneous laboratory sample does not represent field conditions. Infiltration tests should be conducted in the field. Tests should not be conducted in the rain or within 24 hours of significant rainfall events (greater than 0.5 inches).

For the purposes of determining a field infiltration rate, a saturated hydraulic conductivity test should be performed at the bottom of the proposed infiltration facility. The measured infiltration rate of the underlying soil shall be determined using either the Falling Head Percolation Test or the Double-Ring Infiltrometer Test. There are differences between the two methods. A Double-Ring Infiltrometer test estimates the vertical movement of water through the bottom of the test area. The outer ring helps to reduce the lateral movement of water in the soil. A percolation test allows water movement through both the bottom and sides of the test area. For this reason, it is advised that tests for infiltration basins be carried out with an infiltrometer (not percolation test) to determine the saturated hydraulic conductivity rate. This precaution is taken to account for the fact that only the surface of the basin functions to infiltrate, as measured by the test. The number of requisite permeability tests is provided in Table 6.

**Table 5: Permeability Test Requirements for Infiltration**

| Facility | Size | Min. No. of Permeability Tests |
|---|---|---|
| Infiltration Basin, Subsurface Infiltration, Dry Well, Bioretention Basin, Permeable Pavement | no manmade soils present | 1 test per 2,500 sq-ft |
| | manmade soils present | 1 test per 1,000 sq-ft |
| Infiltration Trench | no manmade soils present | 1 test per 100 ft |
| | manmade soils present | 1 test per 50 ft |

### *Design Infiltration Rates*

To account for uncertainties and inaccuracies in testing, a correction (i.e., safety) factor shall be applied to the measured infiltration rate to produce a design infiltration rate for BMP sizing calculations. Minimum safety factors shall be as follows:

**Table 6: Infiltration Rate Factors of Safety**

| Method | Min. Factor ($F_s$) |
|---|---|
| Without minimum Test Pits or minimum Permeability Tests | 5 |
| With minimum Test Pits only | 4 |
| With minimum Permeability Tests only | 3 |
| With minimum Test Pits and minimum Permeability Tests | 2 |

On the following pages are fact sheets for each Treatment Control BMP specified in the *Rules*. The following information is provided for each BMP:

- Brief description
- BMP category
- Expected pollutant removals
- Minimum design criteria
- Feasibility criteria
- Step-by-step sizing procedure
- Pretreatment considerations
- Area requirements
- Sizing example
- Other design considerations
- Typical schematic

The sizing procedures are based on simple dynamic and static principles and therefore may result in larger BMPs than are necessary. More rigorous sizing methods (such as detailed routing methods or continuous simulation models) may be used with City approval. Also, the information in the typical schematics may not coincide with the BMP's minimum design criteria. In those instances, the minimum design criteria prevails.

BMPs not included herein, such as Stormwater Wetlands, Wet Ponds, and proprietary devices, may be used with written City approval.

To facilitate comparison of the BMP characteristics, a summary of the BMP categories and expected pollutant removals is presented in Tables 7 and 8, respectively.

To assist with determining infeasibility, a summary of infeasibility criteria for LID Retention BMPs and LID Biofiltration BMPs is presented in Tables 9 and 10, respectively.

**Table 7: Treatment Control BMP Categories**

| BMP | Retention | Biofiltration | Other |
|---|---|---|---|
| Infiltration Basin | ● | | |
| Infiltration Trench | ● | | |
| Subsurface Infiltration | ● | | |
| Dry Well | ● | | |
| Bioretention Basin | ● | | |
| Permeable Pavement | ● | | |
| Harvesting / Reuse | ● | | |
| Green Roof | | ● | |
| Bioretention Filter | | ● | |
| Dry Swale | | ● | |
| Downspout Disconnection | | ● | |
| Vegetated Swale | | ● | |
| Vegetated Buffer Strip | | ● | |
| Tree Box Filter | | ● | |
| Detention Basin | | | ● |
| Manufactured Treatment Device | | | ● |
| Sand Filter | | | ● |

**Table 8: Treatment Control BMP Expected Pollutant Removals**

| BMP | Nutrients | Sediment | Trash | Pathogens | Pesticides | Oil & Grease | Metals | Organic Compounds |
|---|---|---|---|---|---|---|---|---|
| Infiltration Basin | H | H | H | H | H | H | H | H |
| Infiltration Trench | H | H | H | H | H | H | H | H |
| Subsurface Infiltration | H | H | H | H | H | H | H | H |
| Dry Well | H | H | H | H | H | H | H | H |
| Bioretention Basin | H | H | H | H | H | H | H | H |
| Permeable Pavement | H | H | L | H | H | H | H | H |
| Harvesting / Reuse | H | H | L | H | H | H | H | H |
| Green Roof | M | H | H | M | M | H | M | M |
| Bioretention Filter | M | H | H | M | U | H | H | H |
| Dry Swale | M | H | H | U | U | M | M | U |
| Downspout Disconnection | L | M | M | M | U | M | M | U |
| Vegetated Swale | L | M | L | L | U | M | M | U |
| Vegetated Buffer Strip | L | M | M | L | U | M | M | M |
| Tree Box Filter | M | H | H | M | U | H | H | H |
| Detention Basin | L | M | H | L | U | M | L/M | U |
| Manufactured Treatment Device | L | M/H | H | L | L | M/H | L | L |
| Sand Filter | L/M | H | H | M | U | H | M/H | M/H |

H = High, M = Medium, L = Low, U = Unknown

## Table 9: Infeasibility Criteria for LID Retention BMPs

| Exemption Criteria | Infiltration Basin | Infiltration Trench | Subsurface Infiltration | Dry Well | Bioretention Basin | Permeable Pavement | Harvesting Reuse |
|---|---|---|---|---|---|---|---|
| Soils beneath basin invert have measured infiltration rates less than 0.5 in/hr | ● | ● | ● | ● | ● | ● | |
| Unable to maintain a distance of at least 3 ft from BMP invert to seasonally high groundwater table | ● | ● | ● | ● | ● | ● | |
| Site has known man-made plumes or contaminated soils | ● | ● | ● | ● | ● | ● | |
| Site has high potential for concentrated pollutant/chemical spills | ● | ● | ● | ● | ● | ● | |
| Site is up-gradient of ephemeral streams (i.e. habitat type change downstream) | ● | ● | ● | ● | ● | ● | |
| Site is up-gradient of known shallow landslide-prone area | ● | ● | ● | ● | ● | ● | |
| Unable to maintain a distance of at least 50 ft to the nearest groundwater well used for drinking water | ● | ● | ● | ● | ● | ● | |
| Unable to maintain a distance of at least 35 ft to the nearest septic system | ● | ● | ● | ● | ● | ● | |
| Unable to maintain a distance of at least 10 ft from cistern/barrel to the nearest septic tank | | | | | | | ● |
| Unable to maintain a distance of at least 20 ft to the nearest building foundation | ● | ● | ● | | ● | | |
| Unable to maintain a distance of at least 10 ft to the nearest building foundation | | | | ● | | | |
| Unable to maintain a distance of at least 5 ft from cistern/barrel to the nearest building foundation | | | | | | | ● |
| Unable to maintain a distance of at least 100 ft to the nearest down-gradient building foundation | ● | ● | ● | ● | ● | | |
| Unable to maintain a distance of at least 10 ft to the nearest property line | ● | ● | ● | ● | ● | | |
| Unable to divert flows in excess of WQDS around BMP, and unable to create safe overflow mechanism for flows in excess of WQDS | ● | ● | ● | | ● | | |
| Excavation would disturb iwi kupuna or other archaeological resources | ● | ● | ● | | ● | | |
| Unable to maintain a distance of at least 5 ft from cistern/barrel to the nearest property line | | | | | | | ● |
| Site has high potential for oil and/or grease spills | | | | | | ● | |
| Site has high potential to receive sand and/or sediment loads | | | | | | ● | |
| Unable to maintain a pavement slope no greater than 5% | | | | | | ● | |
| Pavement would be above a utility vault | | | | | | ● | |
| Pavement is expected to receive more than 1,000 average daily trips | | | | | | ● | |
| Project is for a single family residential dwelling | | | | | | | ● |
| Cistern restricts access to underground utilities | | | | | | | ● |
| Harvested runoff creates a conflict with reclaimed water use | | | | | | | ● |
| Other justification for an exemption proposed by the developer/agent and is acceptable to the City | ● | ● | ● | ● | ● | ● | ● |

## Table 10: Infeasibility Criteria for LID Biofiltration BMPs

| Exemption Criteria | Bioretention Filter | Green Roof | Dry Swale | Downspout Disconnect | Vegetated Swale | Vegetated Filter Strip |
|---|---|---|---|---|---|---|
| Unable to divert flows in excess of WQDS around BMP, and unable to create safe overflow mechanism for flows in excess of WQDS | ● | | ● | | ● | ● |
| Excavation would disturb iwi kupuna or other archaeological resources | ● | | ● | | ● | ● |
| Invert of underdrain layer is below seasonally high groundwater table | ● | | ● | | | |
| Site does not receive enough sunlight to support vegetation | ● | | | | ● | ● |
| Site lacks sufficient hydraulic head to support BMP operation by gravity | ● | | ● | | | |
| Roof is for a single family residential dwelling | | ● | | | | |
| Space is unavailable due to renewable energy, electrical, and mechanical systems | | ● | | | | |
| Slope on roof exceeds 20% (11 degrees) | | ● | | | | |
| Slope of receiving vegetated area exceeds 5% | | | | ● | | |
| Diverted runoff drains within 10 feet of a retaining wall | | | | ● | | |
| Diverted runoff drains within 10 feet of property line | | | | ● | | |
| Concentrated flow cannot be established naturally | | | | | ● | |
| Sheet flow cannot be established naturally | | | | | | ● |
| Other justification for an exemption proposed by the developer/agent and is acceptable to the City | ● | ● | ● | ● | ● | ● |

## INFILTRATION BASIN

Description

An infiltration basin is a shallow impoundment with no outlet, where storm water runoff is stored and infiltrates through the basin invert and into the soil matrix.

| BMP Category | |
|---|---|
| Retention | ● |
| Biofiltration | ○ |
| Other | ○ |

Halawa District Park

| Expected Pollutant Removals | |
|---|---|
| Nutrients | High |
| Sediment | High |
| Trash | High |
| Pathogens | High |
| Pesticides | High |
| Oil & Grease | High |
| Metals | High |
| Organic Compounds | High |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Invert Slope | % | 0 |
| Maximum Interior Side Slope (length per unit height) | | 3:1 |
| Drawdown (drain) Time | hours | 48 |
| Minimum Soil Infiltration Rate | inches/hr | 0.5 |
| Minimum Freeboard | feet | 1.0 |
| Minimum Depth from basin invert to groundwater table | feet | 3 |

### *Feasibility Criteria*

See Table 9.

### *Sizing Procedure*

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Calculate the maximum allowable water storage depth ($d_{max}$) using the underlying soil infiltration rate (k) and the required drawdown time (t):

$$d_{max} = kt/(F_s \times 12)$$

Where:
- $d_{max}$ = Maximum storage depth (ft)
- $k$ = Soil infiltration rate (in/hr)
- $t$ = Drawdown (drain) time (hrs)
- $F_s$ = Infiltration rate Factor of Safety (see Chapter 4)

3. Select a design ponding depth no greater than the maximum allowable depth calculated in Step 2.

$$\boldsymbol{d_p \le d_{max}}$$

| Where: | | | |
|---|---|---|---|
| | $d_p$ | = | Design Ponding Depth (ft) |
| | $d_{max}$ | = | Maximum storage depth from step 2 (ft) |
| | k | = | Soil infiltration rate (in/hr) |

4. Calculate the basin bottom surface area ($A_b$):

$$\boldsymbol{A_b = WQV/\left(d_p + kT/12F_s\right)}$$

| Where: | | | |
|---|---|---|---|
| | $A_b$ | = | Bottom surface area (sq-ft) |
| | WQV | = | Water Quality Volume from Step 1(cu-ft) |
| | $d_p$ | = | Design ponding Depth from Step 3 (ft) |
| | k | = | Soil infiltration rate (in/hr) |
| | T | = | Fill time (time for the BMP to fill with water, hrs) |
| | $F_s$ | = | Infiltration rate Factor of Safety (see Chapter 4) |

5. Select a basin bottom width ($w_b$), and calculate the basin bottom length ($l_b$):

$$\boldsymbol{l_b = A_b/w_b}$$

| Where: | | | |
|---|---|---|---|
| | $l_b$ | = | Bottom length (ft) |
| | $A_b$ | = | Bottom surface area from Step 4 (sq-ft) |
| | $w_b$ | = | Bottom width (ft) |

6. Calculate the total area occupied by the BMP excluding pretreatment ($A_{BMP}$) using the basin bottom dimensions, embankment side slopes, and freeboard:

$$\boldsymbol{A_{BMP} = \left[w_b + 2z\left(d_p + f\right)\right] \times \left[l_b + 2z\left(d_p + f\right)\right]}$$

| Where: | | | |
|---|---|---|---|
| | $A_{BMP}$ | = | Area occupied by BMP excluding pretreatment (sq-ft) |
| | $w_b$ | = | Bottom width from Step 5 (ft) |
| | z | = | Basin interior side slope (length per unit height) |
| | $d_p$ | = | Design Ponding Depth from Step 3 (ft) |
| | f | = | Freeboard (ft) |
| | $l_b$ | = | Bottom length from Step 5 (ft) |

If the calculated area does not fit in the available space, either reduce the drainage area, increase the ponding depth (if it's not already set to the maximum depth), and/or reduce the Infiltration rate factor of safety (if minimum number of test pits and permeability tests have not been performed) and repeat the calculations.

### *Pretreatment Considerations*

Infiltration facilities are highly susceptible to clogging and premature failure from sediment, trash, and other materials. Suitable pretreatment systems maintain the infiltrate rate of the device without frequent and intensive maintenance. For measured soil infiltration rates below 3 in/hr, pretreatment is strongly recommended, and the pretreatment device should be sized for at least 25% of the WQV. For measured soil infiltration rates greater than 3 in/hr, pretreatment is mandatory to minimize groundwater contamination risks, and the pretreatment device must be sized for at least 50% of the WQV if the measured soil infiltration rate is below 5 in/hr and 100% of the WQV if the measured soil infiltration rate is greater than 5 in/hr. Pretreatment may be achieved with vegetated swales, vegetated filter strips, sedimentation basins or forebays, sedimentation manholes, and manufactured treatment devices.

### *Area Requirements*

An infiltration basin requires a footprint equivalent to 7% - 20% of its contributing impervious drainage area, excluding pretreatment. The lower value reflects the maximum allowable infiltration rate and minimum allowable factor of safety, while the upper value reflects the minimum allowable infiltration rate and maximum allowable factor of safety.

### *Sizing Example*

Calculate the size of an infiltration basin serving a 1-acre residential development. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Percent Impervious Cover, I | % | 70 |
| Design Storm Depth, P | inches | 1 |
| Basin Fill Time, T | hours | 2 |
| Drawdown (drain) Time, t | hours | 48 |
| Basin Interior Side Slope (length per unit height), z | | 3 |
| Soil Infiltration Rate, k | inches/hr | 1.0 |
| Infiltration Rate Factor of Safety, $F_s$ | | 2 |
| Freeboard, f | ft | 1 |

1. Calculate the volumetric runoff coefficient (C) and Water Quality Volume (WQV):

$$\boldsymbol{C = 0.05 + 0.009I}$$
$$\boldsymbol{C = 0.05 + 0.009 \times 70}$$
$$\boldsymbol{C = 0.68}$$

$$\boldsymbol{WQV = PCA \times 3630}$$
$$\boldsymbol{WQV = 1 \times 0.68 \times 1 \times 3630}$$
$$\boldsymbol{WQV = 2,468\ cubic\ feet}$$

2. Calculate the maximum allowable water storage depth in the basin ($d_m$):

$$\boldsymbol{d_{max} = kt/12F_s}$$
$$\boldsymbol{d_{max} = 1.0 \times 48/(12 \times 2)}$$
$$\boldsymbol{d_{max} = 2.0\ feet}$$

3. Select a design ponding depth ($d_p$) no greater than the maximum allowable depth:

$$d_p = 2.0\ feet$$

4. Calculate the basin bottom surface area ($A_b$):

$$A_b = WQV/(d_d + kT/12F_s)$$
$$A_b = 2,468/[2.0 + 1.0 \times 2.0/(12 \times 2)]$$
$$A_b = 1,185\ square\ feet$$

5. Set the basin bottom width ($w_b$) to 25 feet, and calculate the basin bottom length ($l_b$):

$$l_b = A_b/w_b$$
$$l_b = 1,185/25$$
$$l_b = 47.4\ feet$$

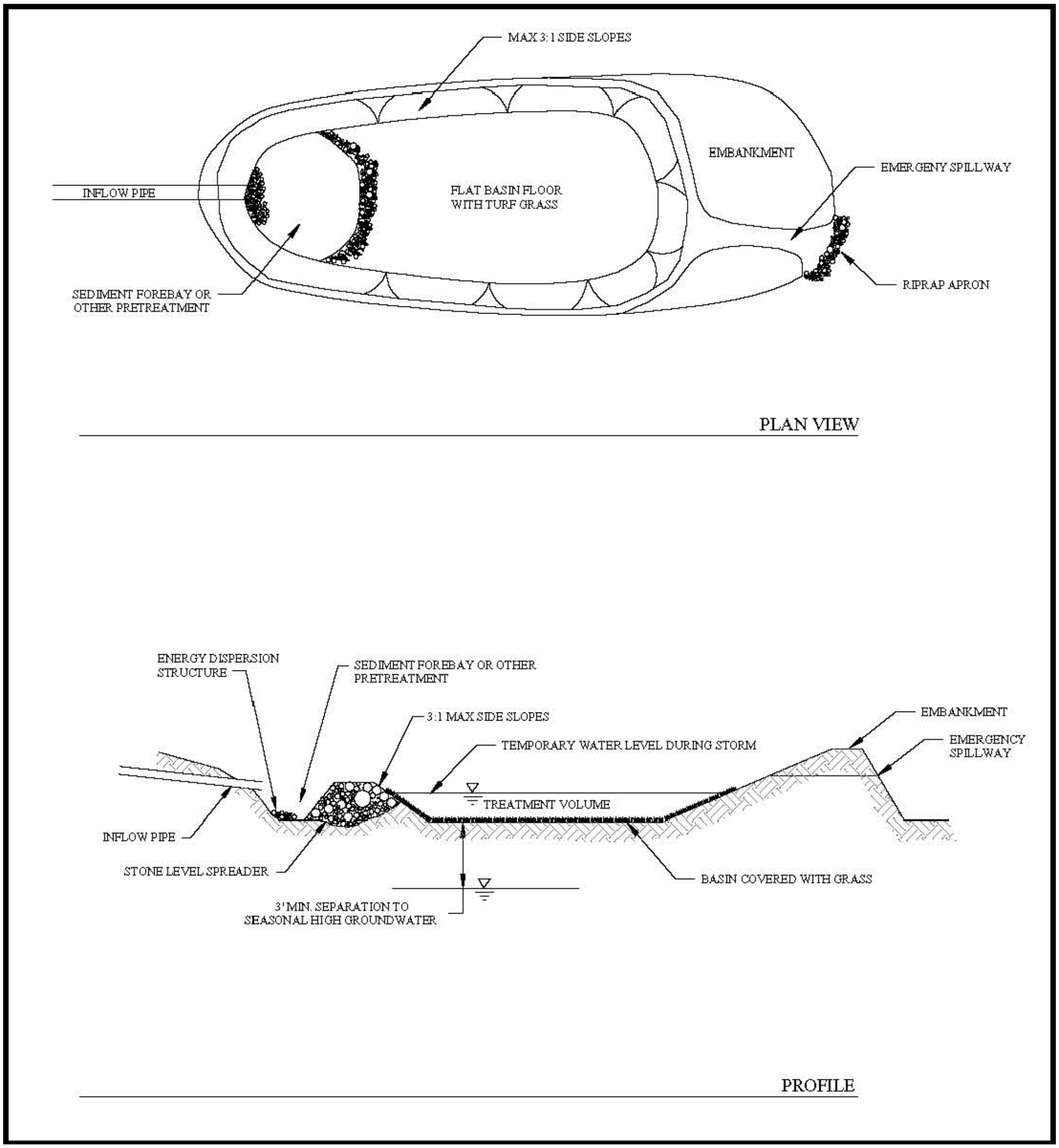
6. Calculate the total area excluding pretreatment ($A_{BMP}$):

$$A_{BMP} = [w_b + 2z(d_p + f)] \times [l_b + 2z(d_p + f)]$$
$$A_{BMP} = [25 + 2 \times 3(2 + 1)] \times [47.4 + 2 \times 3(2 + 1)]$$
$$A_{BMP} = 2,812\ square\ feet$$

## *Other Design Considerations*

- If a temporarily-filled pond creates a potential public safety issue, perimeter fencing may be considered. A vegetative screen around the basin to restrict direct view from adjacent properties may improve the aesthetics of the site and public acceptance of the facility.
- If feasible, include vehicle access to the basin invert for maintenance.
- If the area around the basin has a recreational use, a safety shelf around the perimeter of the basin can be included for times when the basin is flooded.
- The infiltration basin should be designed with an outlet structure to pass peak flows during a range of storm events, as well as with an emergency spillway to pass peak flows around the embankment during extreme storm events that exceed the combined infiltration capacity and outlet structure capacity of the facility.
- To help ensure maintenance of the design permeability rate over time, a 6 inch layer of sand may be placed on the bottom of an infiltration basin. This sand layer can intercept silt, sediment, and debris that could otherwise clog the top layer of the soil below the basin. The sand layer will also facilitate silt, sediment, and debris removal from the basin and can be readily restored following removal operations.
- Observation wells are recommended. They will indicate how quickly the basin dewaters following a storm and it will provide a method of observing how quickly the basin fills up with sediments.

**Figure 4: Schematic of an Infiltration Basin**




Stormwater Management for Maine, Vol III, BMPs Technical Design Manual. 2006.

## INFILTRATION TRENCH

### *Description*

An infiltration trench is a rock-filled trench with no outlet, where storm water runoff is stored in the void space between the rocks and infiltrates through the bottom and into the soil matrix.

| BMP Category | |
|---|---|
| Retention | ● |
| Biofiltration | ○ |
| Other | ○ |

Kauai Federal Credit Union (courtesy Group 70)

| Expected Pollutant Removals | |
|---|---|
| Nutrients | High |
| Sediment | High |
| Trash | High |
| Pathogens | High |
| Pesticides | High |
| Oil & Grease | High |
| Metals | High |
| Organic Compounds | High |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Maximum Trench Depth | feet | 8 |
| Maximum Trench Width | feet | 25 |
| Maximum Top Backfill Layer Thickness | inches | 6 |
| Maximum Bottom Sand Layer Thickness | inches | 12 |
| Drawdown (drain) Time | hours | 48 |
| Minimum Soil Infiltration Rate | inches/hr | 0.5 |
| Trench Rock Size | inches | 1.5 – 3.0 |
| Minimum Depth from trench invert to Water Table | feet | 3 |

### *Feasibility Criteria*

See Table 9.

### *Sizing Procedure*

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Calculate the maximum allowable water storage depth ($d_{max}$) using the underlying soil infiltration rate (k) and the required drawdown time (t):

$$d_{max} = kt/(F_s \times 12)$$

| | | | |
|---|---|---|---|
| Where: | $d_{max}$ | = | Maximum storage depth (ft) |
| | k | = | Soil infiltration rate (in/hr) |
| | t | = | Drawdown (drain) time (hrs) |
| | $F_s$ | = | Infiltration rate Factor of Safety (see Chapter 4) |

3. Select a ponding depth (optional), trench rock (or alternative material) depth, and sand layer depth (optional) such that the total effective storage depth is no greater than the maximum allowable depth calculated in Step 2:

$$d_t = d_p + l_b n_b + l_s n_s \le d_{max}$$

| | | | |
|---|---|---|---|
| Where: | $d_t$ | = | Total effective water storage depth (ft) |
| | $d_p$ | = | Ponding depth (ft) |
| | $l_b$ | = | Backfill material thickness (depth) (ft) |
| | $n_b$ | = | Backfill material porosity |
| | $l_s$ | = | Sand layer thickness (depth) (ft) |
| | $n_s$ | = | Sand porosity |
| | $d_{max}$ | = | Maximum storage depth from Step 2 (ft) |

4. Calculate the trench surface area ($A_{BMP}$):

$$A_{BMP} = WQV/(d_t + kT/12F_s)$$

| | | | |
|---|---|---|---|
| Where: | $A_{BMP}$ | = | BMP surface area excluding pretreatment (sq-ft) |
| | WQV | = | Water Quality Volume from Step 1(cu-ft) |
| | $d_t$ | = | Total effective water storage depth from Step 3 (ft) |
| | k | = | Soil infiltration rate (in/hr) |
| | T | = | Fill time (time for the BMP to fill with water, hrs) |
| | $F_s$ | = | Infiltration rate Factor of Safety (see Chapter 4) |

If the calculated area does not fit in the available space, either reduce the drainage area, increase the ponding depth or trench rock depth or sand layer depth (if the total effective depth is not already equal to the maximum depth), and/or reduce the Infiltration rate factor of safety (if minimum number of test pits and permeability tests have not been performed) and repeat the calculations.

### *Pretreatment Considerations*

Infiltration facilities are highly susceptible to clogging and premature failure from sediment, trash, and other materials. Suitable pretreatment systems maintain the infiltrate rate of the device without frequent and intensive maintenance. For measured soil infiltration rates below 3 in/hr, pretreatment is strongly recommended, and the pretreatment device should be sized for at least 25% of the WQV. For measured soil infiltration rates greater than 3 in/hr, pretreatment is mandatory to minimize groundwater contamination risks, and the pretreatment device must be sized for at least 50% of the WQV if the measured soil infiltration rate is below 5 in/hr and 100% of the WQV if the measured soil infiltration rate is greater than 5 in/hr. Pretreatment may be achieved with vegetated swales, vegetated filter strips, sedimentation basins or forebays, sedimentation manholes, and manufactured treatment devices.

### *Area Requirements*

An infiltration trench requires a footprint equivalent to 2% - 20% of its contributing impervious drainage area, excluding pretreatment. The lower value reflects the maximum allowable infiltration rate, minimum allowable factor of safety, and minimal ponding, while the upper value reflects the minimum allowable infiltration rate, maximum allowable factor of safety, and no ponding.

### *Sizing Example*

Calculate the size of an infiltration basin serving a 1-acre residential development. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Percent Impervious Cover, I | % | 70 |
| Design Storm Depth, P | inches | 1.0 |
| Trench Fill Time, T | hours | 2 |
| Drawdown (drain) Time, t | hours | 48 |
| Backfill porosity, $n_b$ | | 0.35 |
| Sand porosity, $n_s$ | | 0.40 |
| Soil Infiltration Rate, k | inches/hr | 1.0 |
| Infiltration Rate Factor of Safety, $F_s$ | | 2 |

1. Calculate the volumetric runoff coefficient (C) and Water Quality Volume (WQV):

$$\boldsymbol{C = 0.05 + 0.009I}$$
$$\boldsymbol{C = 0.05 + 0.009 \times 70}$$
$$\boldsymbol{C = 0.68}$$

$$\boldsymbol{WQV = PCA \times 3630}$$
$$\boldsymbol{WQV = 1 \times 0.68 \times 1 \times 3630}$$
$$\boldsymbol{WQV = 2,468\ cubic\ feet}$$

3. Calculate the maximum allowable water storage depth of the infiltration trench ($d_m$):

$$\boldsymbol{d_{max} = kt/12F_s}$$
$$\boldsymbol{d_{max} = 1.0 \times 48/(12 \times 2)}$$
$$\boldsymbol{d_{max} = 2.0\ feet}$$

4. Select a ponding depth ($d_p$), trench rock depth ($d_r$), and optional sand layer depth ($d_s$) such that the total effective storage depth ($d_t$) is no greater than the maximum allowable depth:

$$d_p = 0.0\ feet$$
$$l_b = 5.0\ feet$$
$$l_s = 0.5\ feet$$

$$d_t = d_p + l_b n_b + l_s n_s$$
$$d_t = 0.0 + 5.0 \times 0.35 + 0.5 \times 0.40$$
$$d_t = 1.95\ feet$$

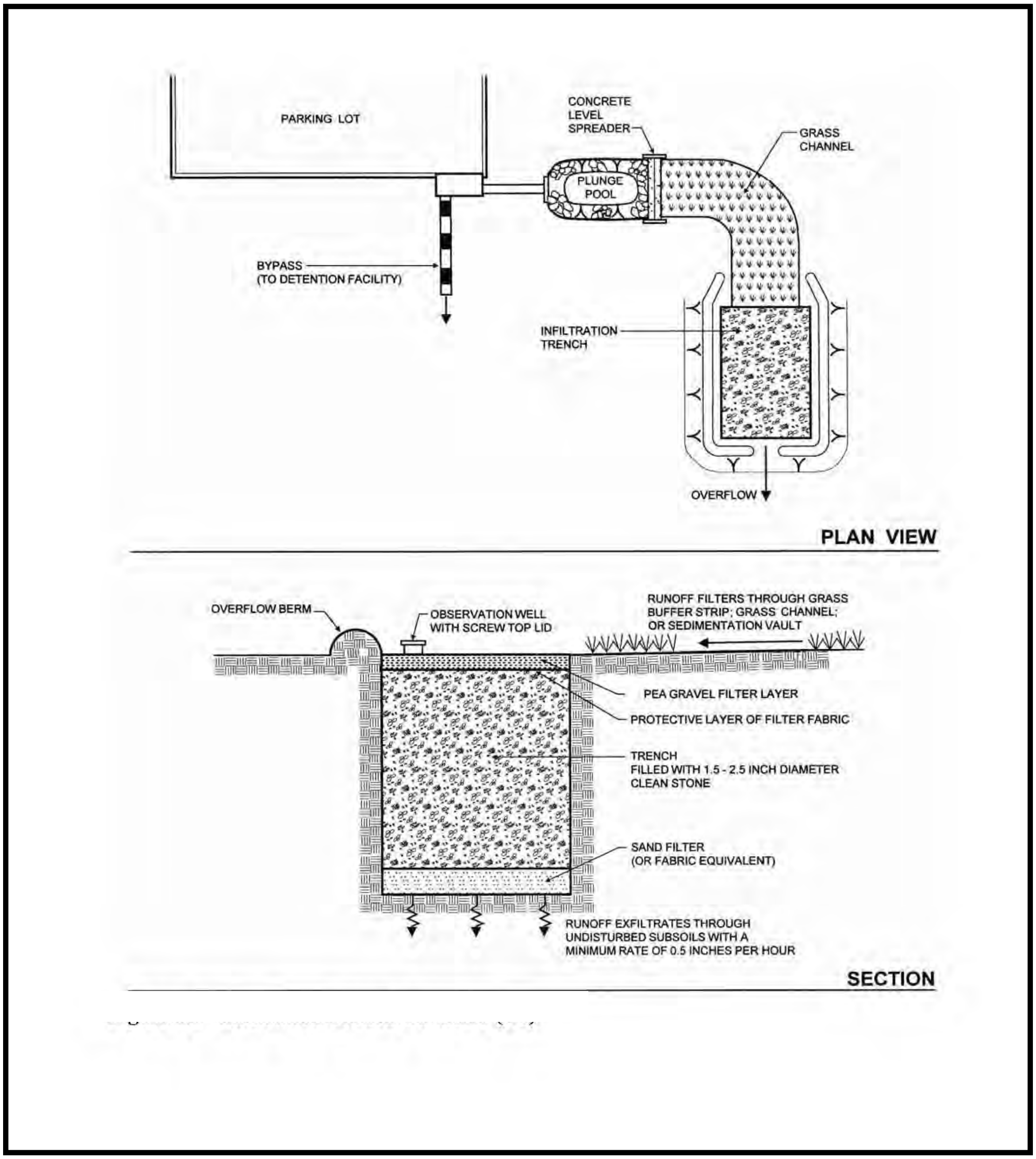
5. Calculate the BMP surface area excluding pretreatment ($A_{BMP}$):

$$A_{BMP} = WQV/(d_t + kT/12F_s)$$
$$A_{BMP} = 2,468/[1.95 + 1.0 \times 2.0/(12 \times 2)]$$
$$A_{BMP} = 1,214\ square\ feet$$

## *Other Design Considerations*

- Observation wells are recommended at 50 foot intervals over the length of the infiltration trench. They will indicate how quickly the trench dewaters following a storm and it will provide a method of observing how quickly the trench fills up with sediments.
- Infiltration trenches should not be deeper than the longest surface area dimension. Otherwise, they meet the EPA definition of Class V Injection Wells under the federal Underground Injection Control (UIC) Program, and are subject to applicable federal and state requirements.
- Vegetation may be planted over the infiltration trench provided that adequate soil media is provided above the trench.
- There must be an overflow route for storm water flows that overtop the facility or in case the infiltration facility becomes clogged.

**Figure 5: Schematic of an Infiltration Trench**



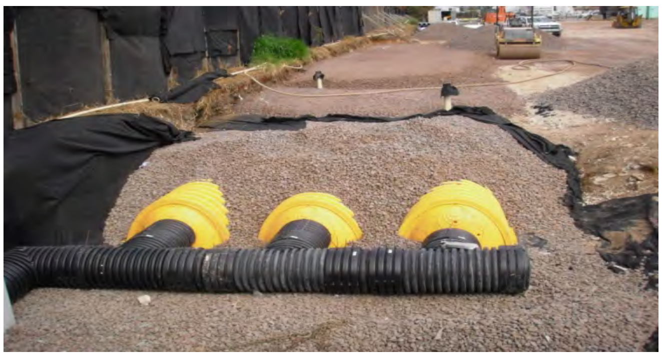

Low Impact Development, A Practitioner's Guide, Hawaii. 2006.

## SUBSURFACE INFILTRATION

### *Description*

An subsurface infiltration system is a rock storage (or alternative pre-manufactured material) bed below other surfaces such as parking lots, lawns and playfields for temporary storage and infiltration of runoff.

| BMP Category | |
|---|---|
| Retention | ● |
| Biofiltration | ○ |
| Other | ○ |



???

| Expected Pollutant Removals | |
|---|---|
| Nutrients | High |
| Sediment | High |
| Trash | High |
| Pathogens | High |
| Pesticides | High |
| Oil & Grease | High |
| Metals | High |
| Organic Compounds | High |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Drawdown (drain) Time | hours | 48 |
| Minimum Soil Infiltration Rate | inches/hr | 0.5 |
| Minimum depth from invert to water table | feet | 3 |
| Any applicable manufacturer's criteria | | |

### *Feasibility Criteria*

See Table 9.

### *Sizing Procedure*

Follow the manufacturer's guidelines for appropriate sizing calculations and selection of appropriate device/model.

### *Pretreatment Considerations*

Infiltration facilities are highly susceptible to clogging and premature failure from sediment, trash, and other materials. Suitable pretreatment systems maintain the infiltrate rate of the device without frequent and intensive maintenance. For measured soil infiltration rates below 3 in/hr, pretreatment is strongly recommended, and the pretreatment device should be sized for at least 25% of the WQV. For measured soil infiltration rates greater than 3 in/hr, pretreatment is mandatory to minimize groundwater contamination risks, and the pretreatment device must be sized for at least 50% of the WQV if the measured soil infiltration rate is below 5 in/hr and 100% of the WQV if the measured soil infiltration rate is greater than 5 in/hr. Pretreatment may be achieved with vegetated swales, vegetated filter strips, sedimentation basins or forebays, sedimentation manholes, and manufactured treatment devices.

### *Area Requirements*
The below-grade footprint requirements for commercially-available infiltration chambers vary by manufacturer. However, similarly to above-grade non-proprietary systems, the space will be minimized for sites with higher infiltration rates and lower infiltration rate factors of safety.

### *Sizing Example*
No example is provided as sizing procedures vary by manufacturer, and presenting any specific product might be interpreted as an endorsement.

### *Other Design Considerations*
Refer to manufacturer guidelines.

## DRY WELL

### *Description*

A dry well is a subsurface aggregate-filled or prefabricated perforated storage facility, where roof runoff is stored and infiltrates into the soil matrix.

| BMP Category | |
|---|---|
| Retention | ● |
| Biofiltration | ○ |
| Other | ○ |

Courtesy www.brickstoremuseum.org

| Expected Pollutant Removals | |
|---|---|
| Nutrients | High |
| Sediment | High |
| Trash | High |
| Pathogens | High |
| Pesticides | High |
| Oil & Grease | High |
| Metals | High |
| Organic Compounds | High |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Drawdown (drain) Time | hours | 48 |
| Minimum Soil Infiltration Rate | inches/hr | 0.5 |
| Aggregate Size (if used) | inches | 1.0 – 3.0 |
| Minimum Depth from well invert to Water Table | feet | 3 |

### *Feasibility Criteria*

See Table 9.

### *Sizing Procedure*

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Calculate the maximum allowable water storage depth ($d_{max}$) using the underlying soil infiltration rate (k) and the required drawdown time (t):

$$\boldsymbol{d_{max} = kt/(F_s \times 12)}$$

Where:
$d_{max}$ = Maximum storage depth (ft)
k = Soil infiltration rate (in/hr)
t = Drawdown (drain) time (hrs)
$F_s$ = Infiltration rate Factor of Safety (see Chapter 4)

3. Select a ponding depth (optional) and dry well backfill material depth such that the total effective storage depth is no greater than the maximum allowable depth calculated in Step 2:

$$d_t = d_p + l_b n_b \leq d_{max}$$

| Where: | | | |
|---|---|---|---|
| | $d_t$ | = | Total effective water storage depth (ft) |
| | $d_p$ | = | Ponding depth (ft) |
| | $l_b$ | = | Backfill material thickness (depth) (ft) |
| | $n_b$ | = | Backfill material porosity |
| | $d_{max}$ | = | Maximum storage depth from Step 2 (ft) |

4. Calculate the BMP surface area ($A_{BMP}$):

$$A_{BMP} = WQV/(d_t + kT/12F_s)$$

| Where: | | | |
|---|---|---|---|
| | $A_{BMP}$ | = | BMP surface area (sq-ft) |
| | WQV | = | Water Quality Volume from Step 1(cu-ft) |
| | $d_t$ | = | Total effective water storage depth from Step 3 (ft) |
| | k | = | Soil infiltration rate (in/hr) |
| | T | = | Fill time (time for the BMP to fill with water, hrs) |
| | $F_s$ | = | Infiltration rate Factor of Safety (see Chapter 4) |

If the calculated area does not fit in the available space, either reduce the drainage area, increase the ponding depth or rock depth (if the total effective depth is not already equal to the maximum depth), and/or reduce the infiltration rate factor of safety (if minimum number of test pits and permeability tests have not been performed) and repeat the calculations.

### *Pretreatment Considerations*
Roof gutter guards or leaf gutter screens are required for roof runoff to reduce dry well clogging from sediment, leaves, and other organic material. If the dry well receives non-roof runoff, pretreatment must be provided by vegetated swales, vegetated filter strips, or manufactured treatment devices.

### *Area Requirements*
A dry well requires a footprint equivalent to 2% - 20% of its contributing impervious drainage area. The lower value reflects the maximum allowable infiltration rate, minimum allowable factor of safety, and minimal ponding, while the upper value reflects the minimum allowable infiltration rate, maximum allowable factor of safety, and no ponding.

### *Sizing Example*
Calculate the size of a dry well serving the roof runoff from a 3,000 square-foot commercial building. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Percent Impervious Cover, I | % | 100 |
| Design Storm Depth, P | inches | 1.0 |
| Dry well Fill Time, T | hours | 2 |
| Drawdown (drain) Time, t | hours | 48 |
| Backfill material porosity, $n_b$ | | 0.35 |
| Soil Infiltration Rate, k | inches/hr | 1.0 |
| Infiltration Rate Factor of Safety, $F_s$ | | 2 |

1. Calculate the volumetric runoff coefficient (C) and Water Quality Volume (WQV):

$$C = 0.05 + 0.009I$$
$$C = 0.05 + 0.009 \times 100$$
$$C = 0.95$$

$$WQV = PCA \times 3630$$
$$WQV = 1 \times 0.95 \times (3{,}000/43{,}560) \times 3630$$
$$WQV = 238\ cubic\ feet$$

3. Calculate the maximum allowable water storage depth of the dry well ($d_{max}$):

$$d_{max} = kt/12F_s$$
$$d_{max} = 1.0 \times 48/(12 \times 2)$$
$$d_{max} = 2.0\ feet$$

4. Select a ponding depth ($d_p$) and backfill material depth ($l_b$) such that the total effective storage depth ($d_t$) is no greater than the maximum allowable depth:

$$d_p = 0.0\ feet$$
$$l_b = 5.5\ feet$$

$$d_t = d_p + l_b n_b$$
$$d_t = 0.0 + 5.5 \times 0.35$$
$$d_t = 1.925\ feet$$

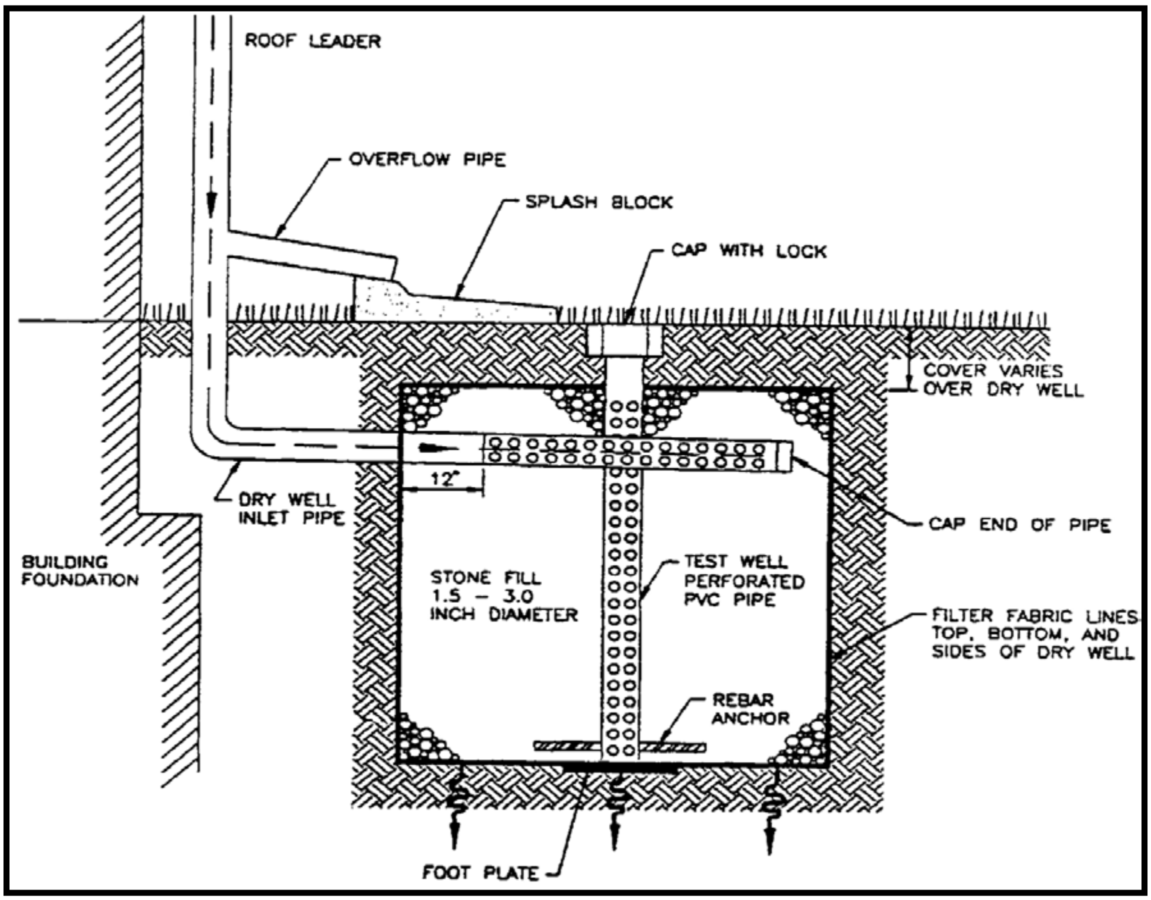
5. Calculate the BMP surface area:

$$A_{IMP} = WQV/(d_t + kT/12F_s)$$
$$A_{IMP} = 238/[1.925 + 1.0 \times 2.0/(12 \times 2)]$$
$$A_{IMP} = 118\ square\ feet$$

## *Other Design Considerations*

- Dry wells are typically deeper than they are wide or long, and therefore meet the EPA definition of Class V Injection Wells under the federal Underground Injection Control (UIC) Program, and are subject to applicable federal and state requirements.
- The dry well must be able to safely convey overflows to either vegetated areas or the storm drain system.
- The design may include an intermediate box with an outflow higher to allow sediments to settle out. Water would then flow through a mesh screen and into the dry well.
- Trees and other large vegetation should be planted away from drywells such that drip lines do not overhang infiltration beds

**Figure 6: Schematic of a Dry Well**




New Jersey Stormwater Best Management Practices Manual. 2004.

## BIORETENTION BASIN

### *Description*

Sometimes referred to as a Rain Garden, a Bioretention Basin is an engineered shallow depression that collects and filters storm water runoff using conditioned planting soil beds and vegetation. The filtered runoff infiltrates through the basin invert and into the soil matrix.

| BMP Category | |
|---|---|
| Retention | ● |
| Biofiltration | ○ |
| Other | ○ |

Kauai Federal Credit Union (Courtesy Group 70)

| Expected Pollutant Removals | |
|---|---|
| Nutrients | High |
| Sediment | High |
| Trash | High |
| Pathogens | High |
| Pesticides | High |
| Oil & Grease | High |
| Metals | High |
| Organic Compounds | High |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Mulch Thickness | inches | 2 – 4 |
| Planting Soil Depth | feet | 2 – 4 |
| Drawdown (drain) Time | hours | 48 |
| Maximum Interior Side Slope (length per unit height) | | 3:1 |
| Maximum Ponding Depth | inches | 12 |
| Minimum depth from basin invert to water table | feet | 3 |
| Minimum Freeboard | feet | 1.0 |
| Minimum Soil Infiltration Rate | inches/hr | 0.5 |

### *Feasibility Criteria*

See Table 9.

### *Sizing Procedure*

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Calculate the maximum allowable water storage depth ($d_{max}$) using the underlying soil infiltration rate (k) and the required drawdown time (t):

$$d_{max} = kt/(F_s \times 12)$$

| | | | |
|---|---|---|---|
| Where: | $d_{max}$ | = | Maximum storage depth (ft) |
| | k | = | Soil infiltration rate (in/hr) |
| | t | = | Drawdown (drain) time (hrs) |
| | $F_s$ | = | Infiltration rate Factor of Safety (see Chapter 4) |

3. Select a ponding depth, planting media thickness (depth), and reservoir layer thickness (depth, optional) such that the total effective storage depth is no greater than the maximum allowable depth calculated in Step 2:

$$d_t = d_p + l_m n_m + l_r n_r \leq d_{max}$$

| | | | |
|---|---|---|---|
| Where: | $d_t$ | = | Total effective water storage depth (ft) |
| | $d_p$ | = | Ponding depth (ft) |
| | $l_m$ | = | Planting media thickness (depth) (ft) |
| | $n_m$ | = | Planting media porosity |
| | $l_r$ | = | Reservoir layer thickness (depth) (ft) |
| | $n_r$ | = | Reservoir layer porosity |
| | $d_{max}$ | = | Maximum storage depth from Step 2 (ft) |

4. Calculate the basin bottom surface area ($A_b$):

$$A_b = WQV/(d_t + kT/12F_s)$$

| | | | |
|---|---|---|---|
| Where: | $A_b$ | = | Bottom surface area (sq-ft) |
| | WQV | = | Water Quality Volume from Step 1(cu-ft) |
| | $d_t$ | = | Total effective water storage depth from Step 3 (ft) |
| | k | = | Soil infiltration rate (in/hr) |
| | T | = | Fill time (time for the BMP to fill with water, hrs) |
| | $F_s$ | = | Infiltration rate Factor of Safety (see Chapter 4) |

5. Select a basin bottom width ($w_b$), and calculate the basin bottom length ($l_b$):

$$l_b = A_b/w_b$$

| | | | |
|---|---|---|---|
| Where: | $l_b$ | = | Bottom length (ft) |
| | $A_b$ | = | Bottom surface area from Step 4 (sq-ft) |
| | $w_b$ | = | Bottom width (ft) |

6. Calculate the total area occupied by the BMP excluding pretreatment ($A_{BMP}$) using the basin bottom dimensions, embankment side slopes, and freeboard:

$$A_{BMP} = [w_b + 2z(d_p + f)] \times [l_b + 2z(d_p + f)]$$

| | | | |
|---|---|---|---|
| Where: | $A_{BMP}$ | = | Area occupied by BMP excluding pretreatment (sq-ft) |
| | $w_b$ | = | Bottom width from Step 5 (ft) |
| | z | = | Basin interior side slope (length per unit height) |
| | $d_p$ | = | Design Ponding Depth from Step 3 (ft) |
| | f | = | Freeboard (ft) |
| | $l_b$ | = | Bottom length from Step 5 (ft) |

If the calculated area does not fit in the available space, either reduce the drainage area, increase the ponding depth or planting soil depth or gravel depth (if the total effective depth is not already equal to the maximum depth), and/or reduce the Infiltration rate factor of safety (if minimum number of test pits and permeability tests have not been performed) and repeat the calculations.

### *Pretreatment Considerations*

Infiltration facilities are highly susceptible to clogging and premature failure from sediment, trash, and other materials. Suitable pretreatment systems maintain the infiltrate rate of the device without frequent and intensive maintenance. For measured soil infiltration rates below 3 in/hr, pretreatment is strongly recommended, and the pretreatment device should be sized for at least 25% of the WQV. For measured soil infiltration rates greater than 3 in/hr, pretreatment is mandatory to minimize groundwater contamination risks, and the pretreatment device must be sized for at least 50% of the WQV if the measured soil infiltration rate is below 5 in/hr and 100% of the WQV if the measured soil infiltration rate is greater than 5 in/hr. Pretreatment may be achieved with vegetated swales, vegetated filter strips, sedimentation basins or forebays, sedimentation manholes, and manufactured treatment devices.

### *Area Requirements*

A bioretention basin requires a footprint equivalent to 4% - 13% of its contributing impervious drainage area, excluding pretreatment. The lower value reflects the maximum allowable infiltration rate and minimum allowable factor of safety, while the upper value reflects the minimum allowable infiltration rate and maximum allowable factor of safety.

### *Sizing Example*

Calculate the size of a bioretention basin serving a 1-acre residential development. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Percent Impervious Cover, I | % | 70 |
| Design Storm Depth, P | inches | 1.0 |
| Basin Fill Time, T | hours | 2 |
| Drawdown (drain) Time, t | hours | 48 |
| Basin Interior Side Slope (length per unit height), z | | 3 |
| Planting Media Porosity, $n_m$ | | 0.25 |
| Reservoir layer porosity, $n_r$ | | 0.30 |
| Soil Infiltration Rate, k | inches/hr | 1.0 |
| Freeboard, f | ft | 1.0 |
| Infiltration Rate Factor of Safety, $F_s$ | | 2 |

1. Calculate the volumetric runoff coefficient (C) and Water Quality Volume (WQV):

$$\boldsymbol{C = 0.05 + 0.009I}$$

$$\boldsymbol{C = 0.05 + 0.009 \times 70}$$
$$\boldsymbol{C = 0.68}$$

$$\boldsymbol{WQV = PCA \times 3630}$$
$$\boldsymbol{WQV = 1 \times 0.68 \times 1 \times 3630}$$
$$\boldsymbol{WQV = 2,468\ cubic\ feet}$$

2. Calculate the maximum allowable water storage depth in the basin ($d_{max}$):

$$\boldsymbol{d_{max} = kt/12F_s}$$
$$\boldsymbol{d_{max} = 1.0 \times 48/(12 \times 2)}$$
$$\boldsymbol{d_{max} = 2.0\ feet}$$

3. Select a ponding depth ($d_p$), planting media depth ($l_m$), and optional reservoir layer depth ($l_r$) such that the total effective storage depth ($d_t$) is no greater than the maximum allowable depth:

$$\boldsymbol{d_p = 0.67\ feet}$$
$$\boldsymbol{l_m = 4.0\ feet}$$
$$\boldsymbol{l_r = 1.0\ feet}$$

$$\boldsymbol{d_t = d_p + l_m n_m + l_r n_r}$$
$$\boldsymbol{d_t = 0.67 + 4.0 \times 0.25 + 1.0 \times 0.30}$$
$$\boldsymbol{d_t = 1.97\ feet}$$

4. Calculate the basin bottom surface area ($A_b$):

$$\boldsymbol{A_b = WQV/(d_t + kT/12F_s)}$$
$$\boldsymbol{A_b = 2,468/[1.97 + 1.0 \times 2.0/(12 \times 2)]}$$
$$\boldsymbol{A_b = 1,204\ square\ feet}$$

5. Set the basin bottom width ($w_b$) to 25 feet, and calculate the basin bottom length ($l_b$):

$$\boldsymbol{l_b = A_b/w_b}$$
$$\boldsymbol{l_b = 1,204/25}$$
$$\boldsymbol{l_b = 48.2\ feet}$$

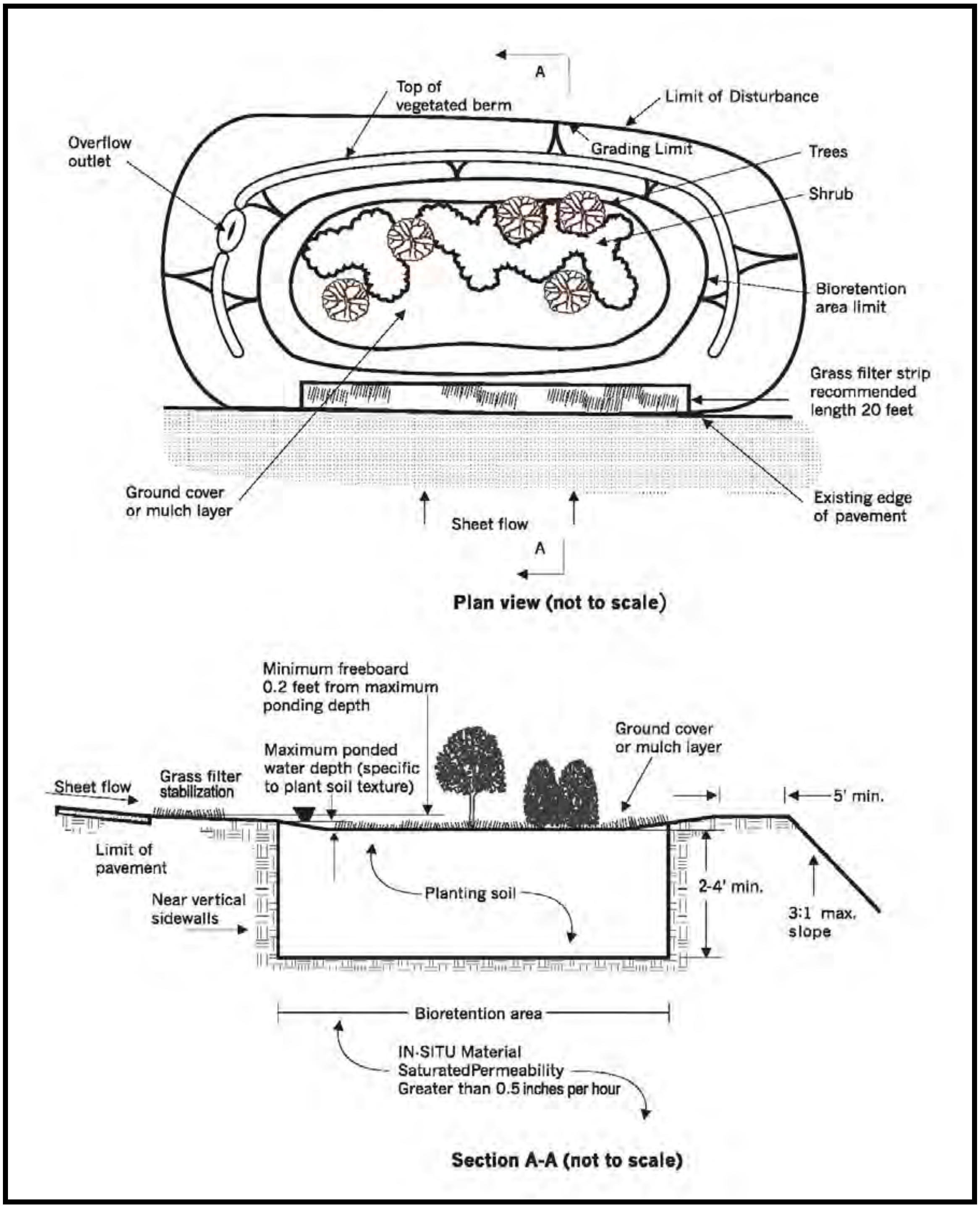
6. Calculate the total area excluding pretreatment ($A_{BMP}$):

$$\boldsymbol{A_{BMP} = \left[w_b + 2z\left(d_p + f\right)\right] \times \left[l_b + 2z\left(d_p + f\right)\right]}$$
$$\boldsymbol{A_{BMP} = [25 + 2 \times 3(0.67 + 1)] \times [48.2 + 2 \times 3(0.67 + 1)]}$$
$$\boldsymbol{A_{BMP} = 2,037\ square\ feet}$$

### *Other Design Considerations*

- The plantings should emulate a terrestrial forest community ecosystem. Native species that are tolerant to pollutant loads and varying soil moisture should be selected. The trees should be smaller ones similar to those found in the forest understory, since it is more difficult to perform maintenance with the tall trees that are normally part of the forest canopy. Ground cover, such as grasses or legumes, should be planted after the trees and shrubs are in place.
- An overflow device (e.g., domed riser, spillway) must be included to safely convey runoff from large storm events when the surface/subsurface capacity is exceeded.
- If a mulch layer is used on the surface of the planting bed, consideration should be given to problems caused by flotation during storm events.
- Observation wells are recommended. They will indicate how quickly the basin dewaters following a storm and it will provide a method of observing how quickly the basin fills up with sediments.

**Figure 7: Schematic of a Bioretention Basin**




Prince George's County Low Impact Development: An Integrated Design Approach. 1999.

## PERMEABLE PAVEMENT

### *Description*

Sometimes referred to as pervious pavement or porous pavement, permeable pavement refers to any porous, load-bearing surface that allows for temporary rainwater storage in an underlying aggregate layer until it infiltrates into the soil matrix. It includes pervious concrete, porous asphalt, interlocking paver blocks, and reinforced turf and gravel filled grids.

| BMP Category | |
|---|---|
| Retention | ● |
| Biofiltration | ○ |
| Other | ○ |

| Expected Pollutant Removals | |
|---|---|
| Nutrients | High |
| Sediment | High |
| Trash | Low |
| Pathogens | High |
| Pesticides | High |
| Oil & Grease | High |
| Metals | High |
| Organic Compounds | High |

UH Hale Wainani Dormitory (www.honoluluadvertiser.com)

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Maximum Depth of Reservoir Layer | feet | 3 |
| Drawdown (drain) Time | hours | 48 |
| Minimum depth from reservoir invert to water table | feet | 3 |
| Minimum Soil Infiltration Rate | inches/hr | 0.5 |

### *Feasibility Criteria*

See Table 9.

### *Sizing Procedure*

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Calculate the maximum allowable water storage depth ($d_{max}$) using the underlying soil infiltration rate (k) and the required drawdown time (t):

$$d_{max} = kt/(F_s \times 12)$$

Where: $d_{max}$ = Maximum storage depth (ft)

| | | |
|---|---|---|
| k | = | Soil infiltration rate (in/hr) |
| t | = | Drawdown (drain) time (hrs) |
| $F_s$ | = | Infiltration rate Factor of Safety (see Chapter 4) |

3. Select a pavement course thickness ($l_p$) and reservoir course thickness ($l_r$) such that the total effective storage depth ($d_t$) is no greater than the maximum allowable depth:

$$\boldsymbol{d_t = (l_p n_p + l_r n_r)/12 \leq d_{max}}$$

Where:

| | | |
|---|---|---|
| $d_t$ | = | Total effective water storage depth (ft) |
| $l_p$ | = | Pavement course thickness (in) |
| $n_p$ | = | Pavement course porosity |
| $l_r$ | = | Reservoir course thickness (in) |
| $n_r$ | = | Reservoir course porosity |
| $d_{max}$ | = | Maximum storage depth from Step 2 (ft) |

4. Calculate the BMP surface area ($A_{BMP}$):

$$\boldsymbol{A_{BMP} = WQV/(d_t + kT/12F_s)}$$

Where:

| | | |
|---|---|---|
| $A_{BMP}$ | = | BMP surface area (sq-ft) |
| WQV | = | Water Quality Volume from Step 1(cu-ft) |
| $d_t$ | = | Total effective water storage depth from Step 3 (ft) |
| k | = | Soil infiltration rate (in/hr) |
| T | = | Fill time (time for the BMP to fill with water, hrs) |
| $F_s$ | = | Infiltration rate Factor of Safety (see Chapter 4) |

If the calculated area does not fit in the available space, either reduce the drainage area, increase the pavement course depth or reservoir course depth or gravel depth (if the total effective depth is not already equal to the maximum depth), and/or reduce the Infiltration rate factor of safety (if minimum number of test pits and permeability tests have not been performed) and repeat the calculations.

### *Pretreatment Considerations*

Pretreatment is not required as long as the permeable pavement does not receive run-on from other surfaces. If it does, pretreatment is necessary to prevent premature failure due to clogging with fine sediment, and may be achieved with gravel filter strips, vegetated buffer strips, or vegetated swales.

### *Area Requirements*

Permeable pavement requires a footprint equivalent to 5% - 18% of its contributing impervious drainage area. The lower value reflects the maximum allowable infiltration rate and minimum allowable factor of safety, while the upper value reflects the minimum allowable infiltration rate and maximum allowable factor of safety.

### *Sizing Example*

Calculate the size of a section of permeable pavement serving the runoff from a 1-acre parking lot. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Percent Impervious Cover, I | % | 100 |
| Design Storm Depth, P | inches | 1.0 |
| Reservoir Layer Fill Time, T | hours | 2 |
| Drawdown (drain) Time, t | hours | 48 |
| Pavement Course Porosity, $n_p$ | | 0.15 |
| Reservoir Course Porosity, $n_r$ | | 0.35 |
| Soil Infiltration Rate, k | inches/hr | 1.0 |
| Infiltration Rate Factor of Safety, $F_s$ | | 2 |

1. Calculate the volumetric runoff coefficient (C) and Water Quality Volume (WQV):

$$C = 0.05 + 0.009I$$
$$C = 0.05 + 0.009 \times 100$$
$$C = 0.95$$

$$WQV = PCA \times 3630$$
$$WQV = 1 \times 0.95 \times 1 \times 3630$$
$$WQV = 3,449 \ cubic \ feet$$

2. Calculate the maximum allowable water storage depth ($d_{max}$):

$$d_{max} = kt/12F_s$$
$$d_{max} = 1.0 \times 48/(12 \times 2)$$
$$d_{max} = 2.0 \ feet$$

3. Select a pavement course thickness ($l_p$) and reservoir course thickness ($l_r$) such that the total effective storage depth ($d_t$) is no greater than the maximum allowable depth:

$$l_p = 12.0 \ inches$$
$$l_r = 24.0 \ inches$$

$$d_t = \left(l_p n_p + l_r n_r\right)/12$$
$$d_t = (12 \times 0.15 + 24 * 0.35)/12$$
$$d_t = 0.85 \ feet$$

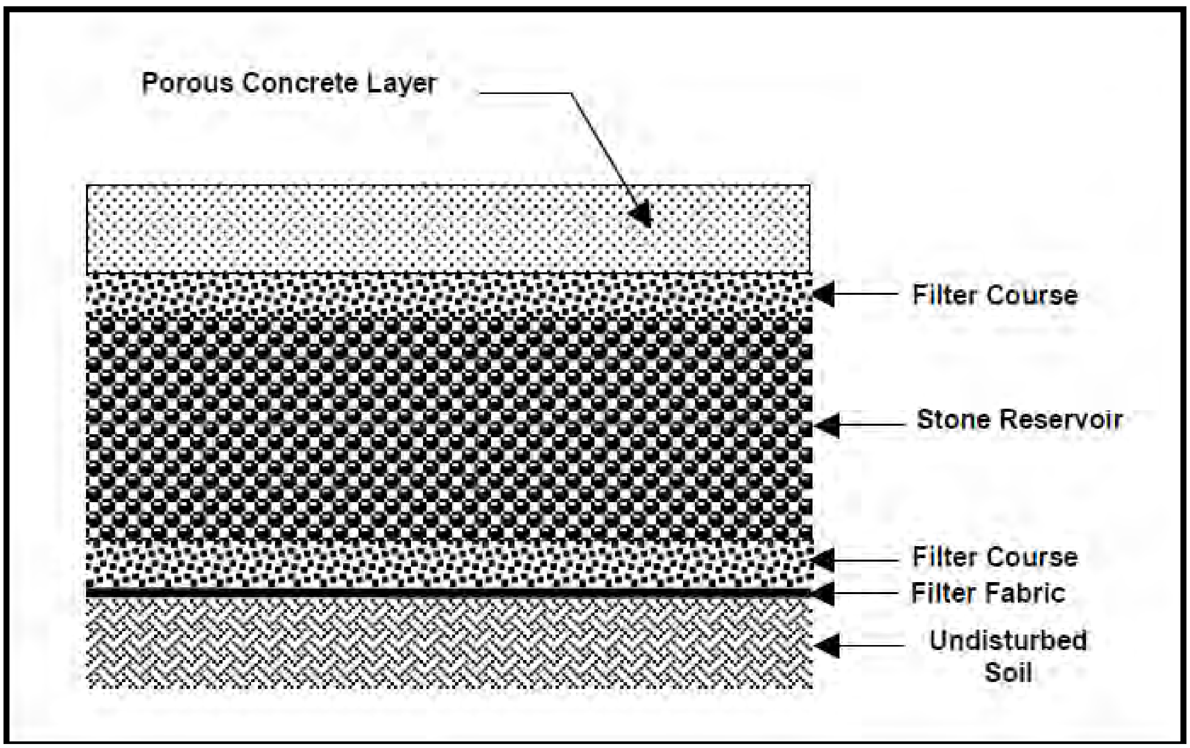
4. Calculate the pavement surface area:

$$A_{IMP} = WQV/[d_t + (kT/12F_s)]$$
$$A_{IMP} = 3,449/[0.85 + (1.0 \times 2/12 \times 2)]$$
$$A_{IMP} = 3,695 \ square \ feet$$

### *Other Design Considerations*

- All porous paving and permeable paver with storage bed systems must include measures that will allow runoff from the design storm to enter the storage bed in the event that the porous or permeable paver surface course becomes clogged or otherwise incapable of conveying the maximum design storm runoff to the bed.
- Additional design details on specific pavement systems are provided by the National Asphalt Pavement Association, the National Ready Mix Concrete Association, the Interlocking Concrete Pavement Institute, and the American Association of State Highway and Transportation Officials.
- Perforated pipes along the bottom of the bed may be used to evenly distribute runoff over the entire bed bottom. Pipes should lay flat along the bed bottom and provide for uniform distribution of water. Depending on size, these pipes may provide additional storage volume.
- Flows in excess of the design capacity of the permeable pavement system will require an overflow system connected to a downstream conveyance or other storm water runoff BMP.

**Figure 8: Schematic of a Permeable Pavement**




Georgia Stormwater Management Manual. 2001.

## HARVESTING / REUSE

### *Description*

Sometimes referred to as Capture/Reuse or Rainwater Harvesting, is the collection and temporary storage of roof runoff in rain barrels or cisterns for subsequent non-potable outdoor use (landscape irrigation, vehicle washing).

| BMP Category | |
|---|---|
| Retention | ● |
| Biofiltration | ○ |
| Other | ○ |

Hawaii Baptist Academy (Courtesy Group 70)

| Expected Pollutant Removals | |
|---|---|
| Nutrients | High |
| Sediment | High |
| Trash | Low |
| Pathogens | High |
| Pesticides | High |
| Oil & Grease | High |
| Metals | High |
| Organic Compounds | High |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Minimum overall runoff capture efficiency | % | 80 |
| Minimum overall demand met efficiency | % | 80 |

### *Feasibility Criteria*

See Table 9.

### *Sizing Procedure*

1. Define the reuse demand by selecting values for the irrigation area ($A_i$), pan evaporation coefficient ($K_p$), landscape coefficient ($K_l$), irrigation system efficiency (e), and non-irrigation demand ($D_o$). Unless specific data is available, use a value of 0.80 for $K_p$ (*Guidelines for the Reuse of Gray Water*), 0.60 for $K_l$ (warm season turfgrass, *A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California*), and 0.90 for e (well-designed system, *Estimating Irrigation Water Needs of Landscape Plantings in California*).
2. Define the runoff available for reuse by selecting values for the drainage (i.e., roof) area ($A_d$), percent of impervious cover (I), and cistern size (C).
3. Identify the project's nearest reference point (Makakilo City, Waimanalo, Waialua, Village Park, Waianae, UH Mauka, Mililani, Opaeula, Maunawili, and Kalihi Valley) and use the corresponding monthly rainfall rates and monthly pan evaporation rates ($E_{pan}$).

4. Perform a month-to-month analysis, starting with January and ending with December. Set the beginning cistern volume in January to 0.

   4a. Calculate the reference evapotranspiration rate for the month using the pan evaporation rate and the pan evaporation coefficient:

   $$\boldsymbol{ET_0 = E_{pan} \times K_p}$$

   Where: $ET_0$ = Reference evapotranspiration rate for the month (in)
   $E_{pan}$ = Pan evaporation rate for the month (in) from Step 3
   $K_p$ = Pan evaporation coefficient from Step 1

   4b. Calculate the actual evapotranspiration rate for the month using the reference evapotranspiration rate and the landscape coefficient:

   $$\boldsymbol{ET_a = ET_0 \times K_l}$$

   Where: $ET_a$ = Actual evapotranspiration rate for the month (in)
   $ET_0$ = Reference evapotranspiration rate from Step 4a
   $K_l$ = Landscape coefficient from Step 1

   4c. Calculate the total demand for the month by multiplying the irrigation area by the difference between the actual evapotranspiration rate and the rainfall, and adding the non-irrigation demand:

   $$\boldsymbol{D_t = 7.48 \times A \times (ET_a - r)/(12 \times e) + D_o}$$

   Where: $D_t$ = Total demand for the month (gal)
   $A$ = Irrigation area from Step 1 (sq-ft)
   $ET_a$ = Actual evapotranspiration rate from Step 4b (in)
   $r$ = Total rainfall for the month (in) from Step 3
   $e$ = Irrigation system efficiency from Step 1
   $D_o$ = Other non-irrigation demand for the month (gal) from Step 1

   If the total demand for the month is negative (because the rainfall amount exceeds the evapotranspiration rate and there is no non-irrigation demand), set the total demand to 0.

   4d. Calculate the amount of runoff generated for the month by multiplying the drainage area by the rainfall by the volumetric runoff coefficient:

   $$\boldsymbol{R_g = 7.48 \times A_d \times r \times (0.05 + 0.009 \times I)/12}$$

   Where: $R_g$ = Runoff generated for the month (gal)
   $A_d$ = Drainage area from Step 2 (sq-ft)
   $r$ = Total rainfall for the month (in) from Step 3
   $I$ = Percent of impervious cover from Step 2 (expressed as %)

   4e. Compare the total demand ($D_t$) to the amount of runoff in the cistern at the beginning of the month ($C_b$) plus the runoff generated during the month (R). If the monthly demand is greater, set the amount of runoff reused ($R_u$) to the sum of $C_b$ and R. If the monthly demand is less, set the amount of runoff reused to $D_t$.

4f. Compare the Cistern capacity (C) to the amount in the cistern at the beginning of the month ($C_b$) plus the Runoff generated during the month ($R_g$) minus the amount of runoff used ($R_u$). Set the amount of runoff in the cistern at the end of the month ($C_e$) to the lower of the two values.

4g. Calculate the amount of cistern overflow by the following:

$$\boldsymbol{O = C_b + R_g - D_t - C_e}$$

Where:
- O = Total Cistern overflow for the month (gal)
- $C_b$ = Amount of runoff in cistern at beginning of month (gal)
- $R_g$ = Runoff generated for the month (gal)
- $D_t$ = Total demand for the month (gal)
- $C_e$ = Amount of runoff in cistern at end of month (gal)

If the overflow is negative (because the amount of runoff in the cistern at the end of the month is less than the cistern capacity), set the overflow to 0.

4h. Calculate the amount of runoff captured in the cistern by subtracting the Overflow from the amount of runoff generated:

$$\boldsymbol{R_c = R_g - O}$$

Where:
- $R_c$ = Runoff captured in the cistern for the month (gal)
- $R_g$ = Runoff generated for the month (gal)
- O = Total cistern overflow for the month (gal)

4i. Set the beginning cistern amount for the next month equal to the ending cistern amount for the current month. Repeat steps 5 through 13 for each subsequent month. Continue on to step 5 after Steps 4a through 4i have been performed for all 12 months.

5. Calculate the overall runoff capture efficiency by dividing the cumulative runoff captured by the cumulative runoff generated:

$$\boldsymbol{E_c = 100 \times \sum_{1}^{12} R_c \Big/ \sum_{1}^{12} R_g}$$

Where:
- $E_c$ = Overall runoff capture efficiency (%)
- $R_c$ = Runoff captured from each month (gal)
- $R_g$ = Runoff generated from each month (gal)

If the calculated efficiency is below the minimum design criteria value, revise one or more of the following parameters and return to Step 3: drainage area ($A_d$), cistern size (C), irrigation area ($A_i$), and other non-irrigation demand ($D_o$).

6. Calculate the overall demand met efficiency by dividing the cumulative runoff used by the cumulative demand:

$$E_d = 100 \times \sum_1^{12} R_u \Big/ \sum_1^{12} D_t$$

Where: $E_d$ = Overall demand met efficiency (%)
$R_u$ = Runoff used from each month (gal)
$D_t$ = Total demand from each month (gal)

If the calculated efficiency is below the minimum design criteria value, revise one or more of the following parameters and return to Step 3: drainage area ($A_d$), cistern size (C), irrigation area ($A_i$), and other non-irrigation demand ($D_o$).

### *Pretreatment Considerations*
Roof gutter guards or leaf gutter screens are required for roof runoff to reduce dry well clogging from sediment, leaves, and other organic material.

### *Area Requirements*
Rain barrel / cistern sizes can vary greatly depending on the project area, roof size, and irrigation area. The size can be anywhere from less than 1,000 gallons to more than 10,000 gallons per 1,000 square feet of roof area.

### *Sizing Example*
Calculate the size of a cistern serving the roof runoff from an 800 square-foot auto repair shop in Kapolei. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Minimum overall runoff capture efficiency, $E_c$ | % | 80 |
| Minimum overall demand met efficiency, $E_d$ | % | 80 |

1. Select initial demand values for the Irrigation Area ($A_i$), pan evaporation coefficient ($K_p$), landscape coefficient ($K_l$), irrigation system efficiency (e), and non-irrigation demand ($D_o$):

$$A_i = 115\ square\ feet$$

$$K_p = 0.80$$

$$K_l = 0.60$$

$$e = 0.90$$

$$D_o = 0$$

2. Select initial values for the drainage area ($A_d$), percent of impervious cover (I), and cistern size (C):

$$A_d = 800\ square\ feet$$

$$I = 100\%$$

$$C = 5,000\ gal$$

3. The nearest reference point to Kapolei is Makakilo City.

4a. Calculate the monthly reference evapotranspiration rates ($ET_0$). The calculation for January is as follows, and the results for the entire year are provided in the table below.

$$ET_0 = E_{pan} \times K_p$$

$$ET_0 = 5.46 \times 0.8$$

$$ET_0 = 4.37\ in$$

4b. Calculate the actual evapotranspiration rates ($ET_a$). The calculation for January is as follows, and the results for the entire year are provided in the table below.

$$ET_a = ET_0 \times K_l$$

$$ET_a = 4.37 \times 0.6$$

$$ET_a = 2.62\ in$$

4c. Calculate the total demand ($D_t$). The calculation for January is as follows, and the results for the entire year are provided in the table below.

$$D_t = 7.48A_i(ET_a - r)/(12e) + D_o$$

$$D_t = 7.48 \times 115 \times (2.62 - 2.58)/(12 \times 0.9) + 0 = 3$$

$$D_t = 3\ gal$$

| Month | Rainfall (in) | P (in) | $ET_0$ (in) | $ET_a$ (in) | $D_t$ (gal) |
|---|---|---|---|---|---|
| January | 2.58 | 5.46 | 4.37 | 2.62 | 3 |
| February | 3.05 | 5.75 | 4.60 | 2.76 | 0 |
| March | 1.87 | 7.12 | 5.70 | 3.42 | 123 |
| May | 1.12 | 7.75 | 6.20 | 3.72 | 207 |
| May | 0.86 | 8.41 | 6.73 | 4.04 | 253 |
| June | 0.55 | 8.99 | 7.19 | 4.32 | 300 |
| July | 0.58 | 9.74 | 7.79 | 4.68 | 326 |
| August | 0.48 | 9.65 | 7.72 | 4.63 | 331 |
| September | 0.74 | 8.48 | 6.78 | 4.07 | 265 |
| October | 2.00 | 7.54 | 6.03 | 3.62 | 129 |
| November | 2.06 | 6.29 | 5.03 | 3.02 | 76 |
| December | 2.69 | 5.59 | 4.47 | 2.68 | 0 |

4d. Calculate the generated roof runoff ($R_g$). The calculation for January is as follows, and the results for the entire year are provided in the table below:

$$R_g = 7.48 A_d r (0.05 + 0.009 I)/12$$
$$R_g = 7.48 \times 800 \times 2.58\,(0.05 + 0.009 \times 100)/12$$
$$R_g = 1,222\ gal$$

4e. Calculate the runoff used ($R_u$) by comparing the total demand ($D_t$) to the amount of runoff in the cistern at the beginning of the month ($C_b$) plus the runoff generated during the month (R). The calculation for January is as follows, and the results for the entire year are provided in the table below:

$$C_b = 0\ gal$$
$$R_u = D_t\ = 3\ gal\ [since\ R_g + C_b > D_t]$$

4f. Calculate the amount of runoff in the Cistern at the end of the month ($C_e$) by setting it to the lower value of the amount of runoff in the Cistern at the beginning of the month ($C_b$) plus the runoff generated (Rg) minus the runoff used ($R_u$), and the cistern capacity (C). The calculation for January is as follows, and the results for the entire year are provided in the table below:

$$C_e = min(C_b + R_g - R_u\ , C)$$
$$C_e = min(0 + 1222 - 3, 5000)$$
$$C_e = 1,219\ gal$$

4g. Calculate the Cistern overflow (O). The calculation for January is as follows, and the results for the entire year are provided in the table below:

$$O = C_b + R_g - D_t - C_e$$
$$O = 0 + 1,222 - 3 - 1,219$$
$$O = 0\ gal$$

4h. Calculate the runoff captured in Cistern ($R_c$). The calculation for January is as follows, and the results for the entire year are provided in the table below:

$$R_c = R_g - O$$
$$R_c = 1,222 - 0 = 1,222\ gal$$

4i. Set $C_b$ for the next month equal to $C_e$ of the previous month and repeat the calculations.

| Month | r (in) | $D_t$ (gal) | $R_g$ (gal) | $C_b$ (gal) | $C_e$ (gal) | $R_u$ (gal) | O (gal) | $R_c$ (gal) |
|---|---|---|---|---|---|---|---|---|
| January | 2.58 | 3 | 1,222 | 0 | 1,219 | 3 | 0 | 1,222 |
| February | 3.05 | 0 | 1,445 | 1,219 | 2,664 | 0 | 0 | 1,445 |
| March | 1.87 | 123 | 886 | 2,664 | 3,426 | 123 | 0 | 886 |
| May | 1.12 | 207 | 531 | 3,426 | 3,750 | 207 | 0 | 531 |
| May | 0.86 | 253 | 407 | 3,750 | 3,904 | 253 | 0 | 407 |
| June | 0.55 | 300 | 261 | 3,904 | 3,865 | 300 | 0 | 261 |
| July | 0.58 | 326 | 275 | 3,865 | 3,814 | 326 | 0 | 275 |
| August | 0.48 | 331 | 227 | 3,814 | 3,710 | 331 | 0 | 227 |
| September | 0.74 | 265 | 351 | 3,710 | 3,796 | 265 | 0 | 351 |
| October | 2.00 | 129 | 947 | 3,796 | 4,614 | 129 | 0 | 947 |
| November | 2.06 | 76 | 976 | 4,614 | 5,000 | 76 | 514 | 462 |
| December | 2.69 | 0 | 1,274 | 5,000 | 5,000 | 0 | 1,274 | 0 |
| **Total** | **18.58** | **2,014** | **8,802** | | | **2,014** | **1,788** | **7,014** |

5. Calculate the overall runoff capture efficiency ($E_c$) and overall demand efficiency ($E_d$):

$$\boldsymbol{E_c = 100 \times \sum_{1}^{12} R_c \Big/ \sum_{1}^{12} R_g = 100 \times 7,014/8,802 = 80\%}$$

$$\boldsymbol{E_d = 100 \times \sum_{1}^{12} R_u \Big/ \sum_{1}^{12} D_t = 100 \times 2,014/2,014 = 100\%}$$

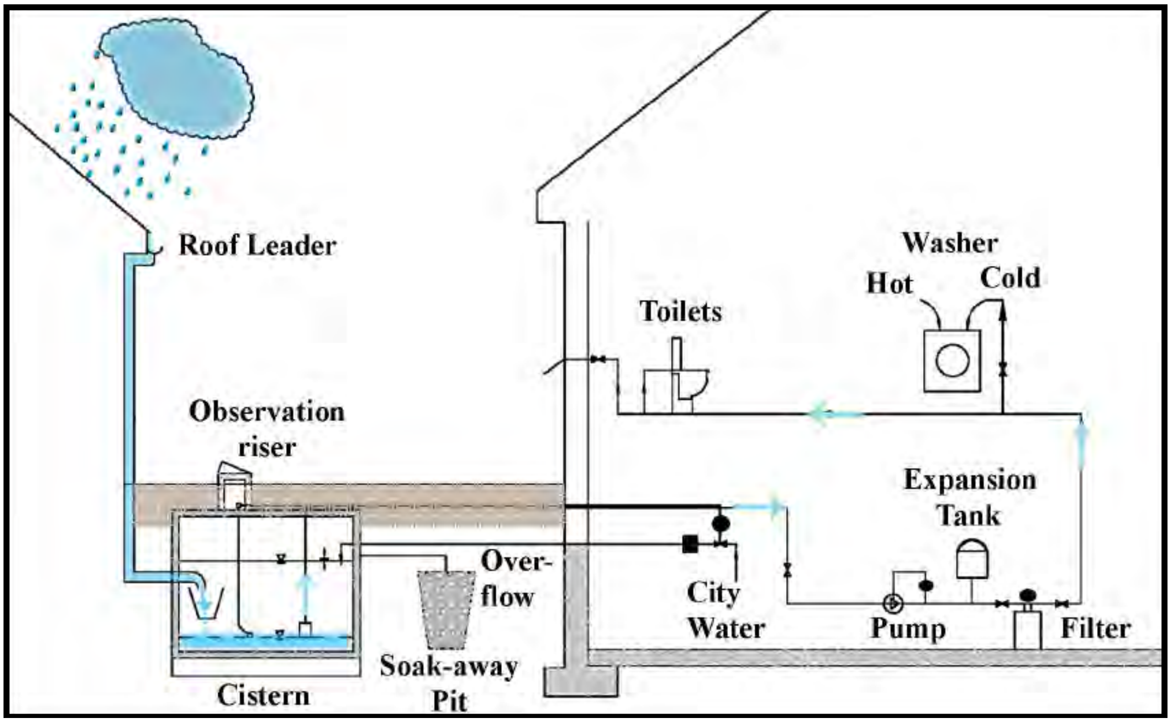
6. Calculate the Water Quality Volume (WQV) for which credit is received:

$$\boldsymbol{WQV = PCA \times 3630}$$
$$\boldsymbol{WQV = 1 \times (0.05 + 0.009 \times 100) \times (800/43,560) \times 3630}$$
$$\boldsymbol{WQV = 63\ cubic\ feet}$$

## *Other Design Considerations*

- Local pan evaporation and rainfall data may be used if available.
- Tanks should have tight fitting covers to exclude contaminants and animals, and above ground tanks should not allow penetration of sunlight to limit algae growth
- In areas where the tank is to be buried partially below the water table, special design features must be employed to keep it from "floating".

**Figure 9: Schematic of a Harvesting / Reuse System**




Pennsylvania Stormwater Best Management Practices Manual. 2006.

## Green Roof

### *Description*

Sometimes referred to as a Vegetated Roof or Eco-roof, a green roof is a roof that is entirely or partially covered with vegetation and soils for the purpose of filtering, absorbing, evapotranspirating, and retaining/ detaining the rain that falls upon it.

| BMP Category | |
|---|---|
| Retention | ○ |
| Biofiltration | ● |
| Other | ○ |

Fasi Municipal Building

| Expected Pollutant Removals | |
|---|---|
| Nutrients | Medium |
| Sediment | High |
| Trash | High |
| Pathogens | Medium |
| Pesticides | Medium |
| Oil & Grease | High |
| Metals | Medium |
| Organic Compounds | Medium |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Minimum Depth of Soil Media | inches | 2 |
| Minimum Depth of Drainage Layer | inches | 2 |
| Maximum slope on roof | % | 25 |

### *Feasibility Criteria*

See Table 10.

### *Sizing Procedure*

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Select initial values for the soil media thickness ($l_m$), drainage layer thickness ($l_d$), and allowable ponding depth ($d_p$).

3. Calculate the total effective storage depth based on the instantaneous storage capacity using the void space in the soil media and drainage layer, and the allowable ponding:

$$d_t = (d_p + l_m n_m + l_d n_d)/12$$

Where: $d_t$ = Total effective water storage depth (ft)
$d_p$ = Ponding depth (in)

| | | |
|---|---|---|
| $l_m$ | = | Planting media thickness (in) |
| $n_m$ | = | Planting media porosity |
| $l_d$ | = | Drainage layer thickness (in) |
| $n_d$ | = | Drainage layer porosity |

4. Calculate the area required ($A_{BMP}$) based on the instantaneous storage capacity:

$$A_{BMP} = WQV/d_t$$

Where:

| | | |
|---|---|---|
| $A_{BMP}$ | = | BMP area (sq-ft) |
| WQV | = | Water Quality Volume from Step 1 (cu-ft) |
| $d_t$ | = | Total effective water storage depth from Step 3 (ft) |

If the calculated area does not fit in the available space, either reduce the tributary area and/or increase one or more of the design depths (ponding, soil media, drainage layer), and repeat the calculations.

### *Pretreatment Considerations*
Green roofs do not require pretreatment.

### *Area Requirements*
A green roof requires a footprint equivalent to 11% - 100% of the contributing roof drainage area. The lower value corresponds to 4 inches of ponding and maximum depths for both the planting media and drainage layer depths, while the higher value corresponds to no ponding and minimum planting media and drainage layer depths.

### *Sizing Example*
Calculate the size of a green roof serving the roof runoff from a 1,500 square-foot fast food restaurant. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Percent Impervious Cover, I | % | 100 |
| Design Storm Depth, P | inches | 1.0 |
| Soil Media Porosity, $n_m$ | | 0.20 |
| Drainage Layer Porosity, $n_d$ | | 0.25 |

1. Calculate the volumetric runoff coefficient (C) and Water Quality Volume (WQV):

$$C = 0.05 + 0.009I$$
$$C = 0.05 + 0.009 \times 100$$
$$C = 0.95$$

$$WQV = PCA \times 3630$$
$$WQV = 1 \times 0.95 \times (1{,}500/43{,}560) \times 3630$$
$$WQV = 119\ cubic\ feet$$

2. Select initial values for the soil media depth ($d_m$), drainage layer depth ($d_d$), and ponding depth ($d_p$):

$$\boldsymbol{d_m = 3\ in}$$
$$\boldsymbol{d_d = 2\ in}$$
$$\boldsymbol{d_p = 0.5\ in}$$

3. Calculate the total effective storage depth:

$$\boldsymbol{d_t = \left(d_p + l_m n_m + l_d n_d\right)/12}$$
$$\boldsymbol{d_t = (0.5 + 3 \times 0.20 + 2 \times 0.25)/12}$$
$$\boldsymbol{d_t = 0.133\ feet}$$

4. Calculate the area ($A_{BMP}$):

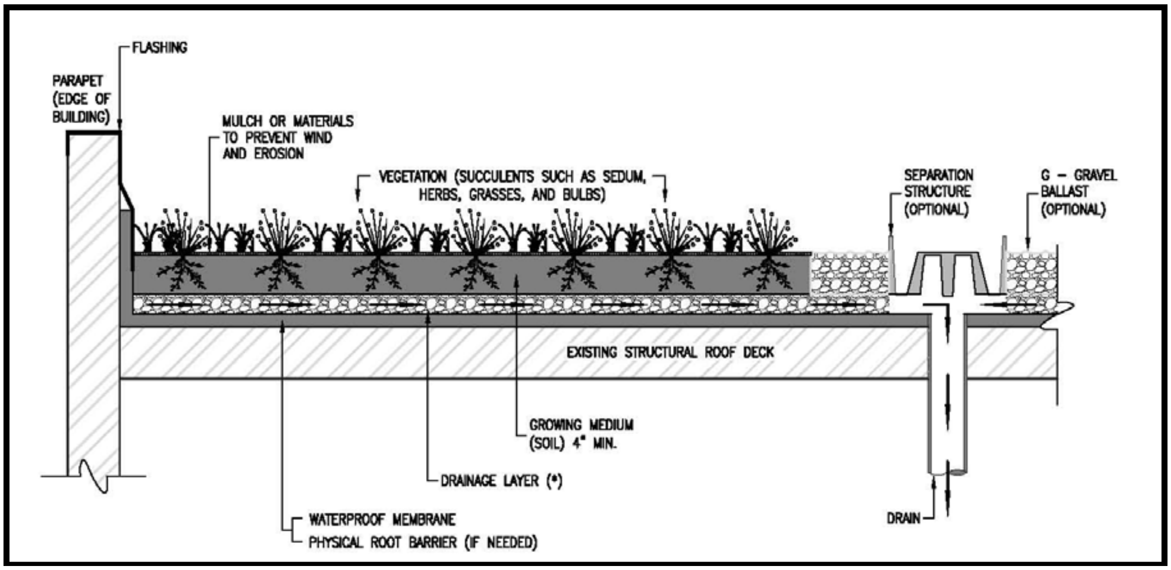
$$\boldsymbol{A_{BMP} = WQV/d_t}$$
$$\boldsymbol{A_{BMP} = 119/0.133}$$
$$\boldsymbol{A_{BMP} = 891\ square\ feet}$$

$$\boldsymbol{891\ square\ feet\ is\ available, so\ design\ is\ ok}$$

### *Other Design Considerations*

- Safety measures against wind uplift must be taken into account during design, especially for areas susceptible to high winds during the summer trade-wind period.
- The maximum load bearing capacity of the roof construction must be considered when installing vegetated roofs. The water saturated weight of the green roof system, including vegetation must be calculated as permanent load. Generally, vegetated roofs weigh between 15 and 30 lb/sq.ft. depending on the thickness of the vegetated roof system. In addition, construction elements such as pergolas and walkways cause high point loads and, therefore, have to be calculated accordingly.
- The design must include adequate roof access for delivery of construction materials and for routine maintenance.

**Figure 10: Schematic of a Green Roof**



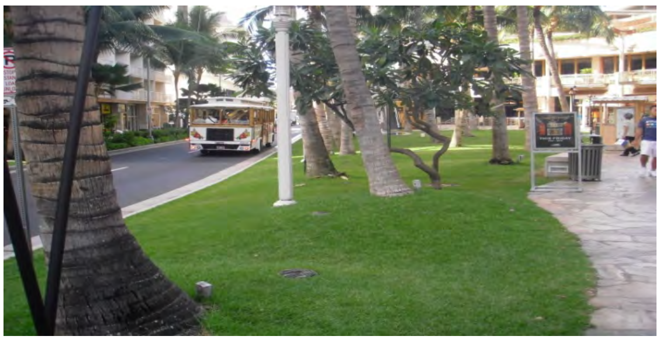

Portland Stormwater Management Manual. 2008.

## BIORETENTION FILTER

### *Description*

Sometimes referred to as a Rain Garden or Planter Box, a Bioretention Filter is an engineered shallow depression that collects and filters storm water runoff using conditioned planting soil beds and vegetation. The filtered runoff discharges through an underdrain system.

| BMP Category | |
|---|---|
| Retention | ○ |
| Biofiltration | ● |
| Other | ○ |



???

| Expected Pollutant Removals | |
|---|---|
| Nutrients | Medium |
| Sediment | High |
| Trash | High |
| Pathogens | Medium |
| Pesticides | Unknown |
| Oil & Grease | High |
| Metals | High |
| Organic Compounds | High |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Planting Soil Coefficient of Permeability | feet/day | 1.0 |
| Mulch Thickness | inches | 2 – 4 |
| Planting Soil Depth | feet | 2 – 4 |
| Drawdown (drain) Time | hours | 48 |
| Maximum Ponding Depth | inches | 12 |
| Minimum Underdrain Diameter | inches | 6 |

### *Feasibility Criteria*

See Table 10.

### *Sizing Procedure*

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Select values for the planting media depth ($l_m$) and maximum ponding depth ($d_p$).

3. Use Darcy's Law to calculate the required Filter Bed Surface Area:

$$A_b = \frac{WQV \times l_m}{k(l_m + d_p/24)(t/24)}$$

| Where: | | | |
|---|---|---|---|
| | $A_b$ | = | Filter bed surface area (sq-ft) |
| | WQV | = | Water Quality Volume from Step 1 (cu-ft) |
| | $l_m$ | = | Planting media depth from step 2 (ft) |
| | k | = | Planting media permeability coefficient (ft/day) |
| | $d_p$ | = | Maximum ponding depth, from Step 2 (in) |
| | t | = | Filter bed drain time (hr) |

4. Select a filter bed width ($w_b$), and calculate the filter bed length ($l_b$):

$$l_b = A_b/w_b$$

| Where: | | | |
|---|---|---|---|
| | $l_b$ | = | Filter bed length (ft) |
| | $A_b$ | = | Filter bed surface area from Step 3 (sq-ft) |
| | $w_b$ | = | Filter bed width (ft) |

5. Calculate the total area occupied by the BMP excluding pretreatment ($A_{BMP}$) using the filter bed dimensions, embankment side slopes, and freeboard:

$$A_{BMP} = [w_b + 2z(d_p + f)] \times [l_b + 2z(d_p + f)]$$

| Where: | | | |
|---|---|---|---|
| | $A_{BMP}$ | = | Area occupied by BMP excluding pretreatment (sq-ft) |
| | $w_b$ | = | Filter bed width from Step 4 (ft) |
| | z | = | Filter bed interior side slope (length per unit height) |
| | $d_p$ | = | Maximum Ponding Depth from Step 2 (ft) |
| | f | = | Freeboard (ft) |
| | $l_b$ | = | Filter bed length from Step 4 (ft) |

If the calculated area does not fit in the available space, either reduce the drainage area, reduce the planting soil depth (if it's not already set to the minimum), and/or increase the ponding depth (if it's not already set to the maximum depth), and repeat the calculations.

### *Pretreatment Considerations*

Pretreatment should be provided where sediments or trash may cause a concern or decreased BMP functionality, and when space permits. Pretreatment may be achieved with vegetated swales, vegetated buffer strips with pea gravel or stone diaphragm, or manufactured treatment device.

### *Area Requirements*

A bioretention filter requires a footprint equivalent to 3.3% - 3.8% of its contributing impervious drainage area, excluding pretreatment. The lower value reflects the minimum planting media depth and maximum ponding depth, while the upper value reflects the maximum planting media depth and minimum ponding depth.

### *Sizing Example*

Calculate the size of a bioretention filter serving a 1-acre residential development. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Percent Impervious Cover, I | % | 70 |
| Design Storm Depth, P | inches | 1.0 |
| Planting Soil Coefficient of Permeability, k | feet/day | 1.0 |
| Drawdown (drain) Time, t | hours | 48 |
| Interior Side Slope (length per unit height), z | | 0 |
| Freeboard, f | ft | 0.5 |

1. Calculate the volumetric runoff coefficient and Water Quality Volume (WQV):

$$\boldsymbol{C = 0.05 + 0.009I}$$
$$\boldsymbol{C = 0.05 + 0.0039 \times 70}$$
$$\boldsymbol{C = 0.68}$$

$$\boldsymbol{WQV = PCA \times 3630}$$
$$\boldsymbol{WQV = 1 \times 0.68 \times 1 \times 3630}$$
$$\boldsymbol{WQV = 2,468\ cubic\ feet}$$

2. Select a planting soil depth ($d_s$) and ponding depth ($d_p$):

$$\boldsymbol{d_s = 2.0\ ft}$$
$$\boldsymbol{d_p = 6\ in}$$

3. Calculate the Filter Bed Surface Area ($A_{BMP}$):

$$\boldsymbol{A_{BMP} = WQV \times d_s / \left[k\left(d_s + \left(d_p/24\right)\right)(t/24)\right]}$$
$$\boldsymbol{A_{BMP} = 2,468 \times 2/[1(2 + (6/24))(48/24)]}$$
$$\boldsymbol{A_{BMP} = 1,097\ square\ feet}$$

4. Set the bottom width ($w_b$) to 6 feet, and calculate the bottom length ($l_b$):

$$\boldsymbol{l_b = A_b/w_b}$$
$$\boldsymbol{l_b = 1,097/6}$$
$$\boldsymbol{l_b = 182.8\ feet}$$

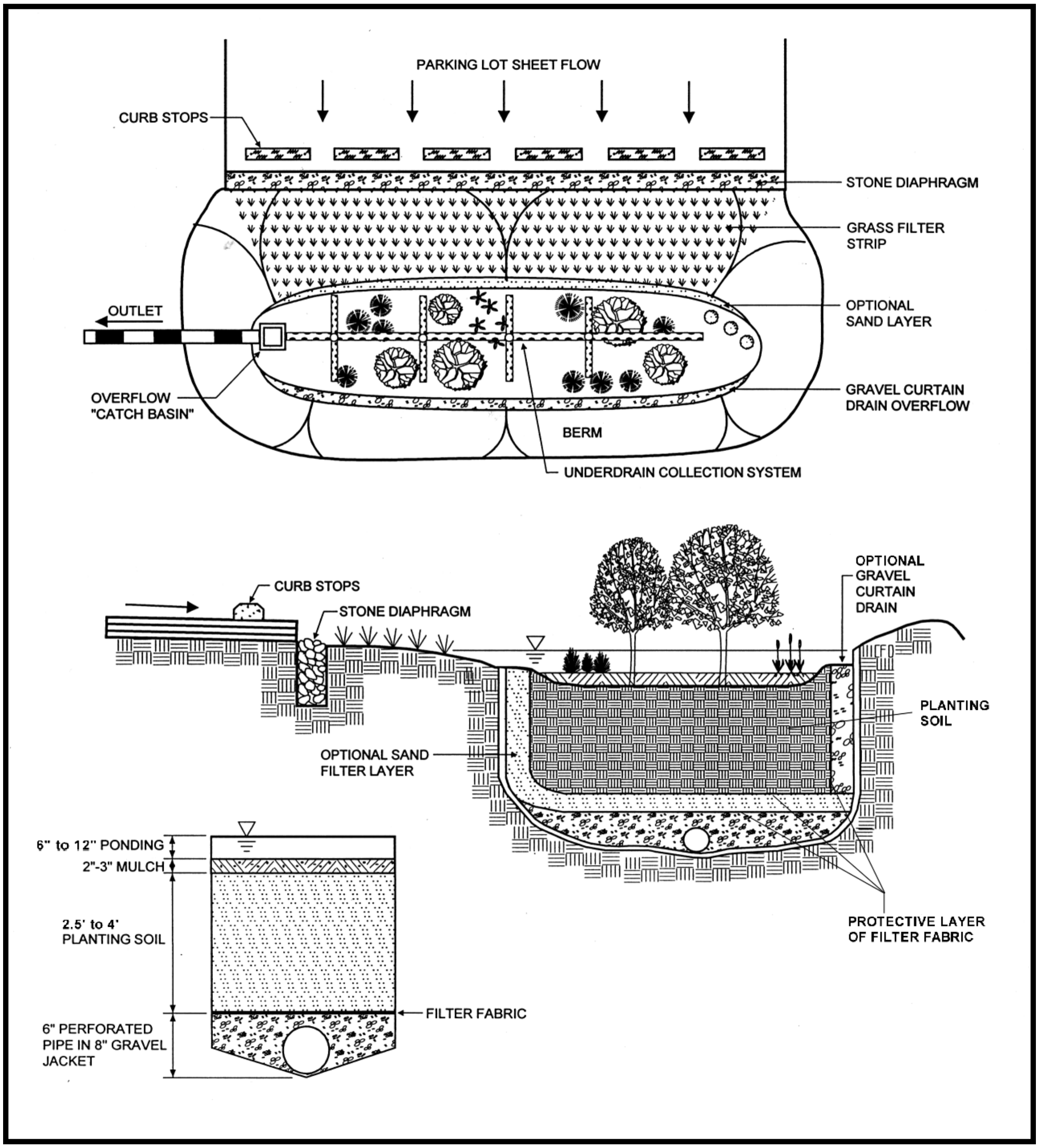
5. Calculate the total area excluding pretreatment ($A_{BMP}$):

$$A_{BMP} = [w_b + 2z(d_p + f)] \times [l_b + 2z(d_p + f)]$$
$$A_{BMP} = [6 + 2 \times 0(0.5 + 0.5)] \times [182.8 + 2 \times 0(0.5 + 0.5)]$$
$$A_{BMP} = 1,097\ square\ feet$$

### *Other Design Considerations*

- An overflow device (e.g., domed riser, inlet structure) must be included to safely convey runoff from large storm events when the surface/subsurface capacity is exceeded.
- If a mulch layer is used on the surface of the planting bed, consideration should be given to problems caused by flotation during storm events.
- A cleanout pipe should be tied into the end of all underdrain pipe runs

**Figure 11: Schematic of a Bioretention Filter**




Prince George's County Bioretention Manual. 2007.

## DRY SWALE

### Description

Sometimes referred to as a Bioretention Swale or Enhanced Swale, a Dry Swale is a shallow linear channel with a planting bed and covered with turf or other surface material (other than mulch or plants). Runoff filters through a planting bed, is collected in an underdrain system, and discharged at the downstream end of the swale.

| BMP Category | |
|---|---|
| Retention | ○ |
| Biofiltration | ● |
| Other | ○ |

Georgia Stormwater Management Manual. 2001.

| Expected Pollutant Removals | |
|---|---|
| Nutrients | Medium |
| Sediment | High |
| Trash | High |
| Pathogens | Unknown |
| Pesticides | Unknown |
| Oil & Grease | Medium |
| Metals | Medium |
| Organic Compounds | Unknown |

### Minimum Design Criteria

| Design Parameter | Units | Value |
|---|---|---|
| Maximum Interior Side Slope (length per unit height) | | 3:1 |
| Bottom width | feet | 2 - 8 |
| Maximum Longitudinal Slope w/o check dams | % | 2 |
| Maximum Longitudinal Slope w/ check dams | % | 5 |
| Maximum check dam height | inches | 12 |
| Maximum Ponding Depth at downstream end | inches | 18 |
| Media depth | inches | 18 - 36 |
| Maximum Velocity | feet/sec | 3 |
| Minimum Freeboard | inches | 6 |
| Maximum Underdrain Diameter | inches | 6 |

### Feasibility Criteria

See Table 10.

### *Sizing Procedure*

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Select values for the planting media thickness, drainage layer thickness, planting media porosity, drainage layer porosity, maximum surface ponding depth (if check dams are used), bottom width, and interior side slope (length per unit height).

3. Calculate the total effective storage depth based on the instantaneous storage capacity using the void space in the planting media and drainage layer, and the average ponding depth (assumed to be one-half the maximum ponding depth):

$$\boldsymbol{d_t = \left[\left(d_p/2\right) + l_m n_m + l_d n_d\right]/12}$$

| | | | |
|---|---|---|---|
| Where: | $d_t$ | = | Total effective water storage depth (ft) |
| | $d_p$ | = | Maximum ponding depth from Step 2 (in) |
| | $l_m$ | = | Planting media thickness from Step 2 (in) |
| | $n_m$ | = | Planting media porosity, typically around 0.25 |
| | $l_d$ | = | Drainage layer thickness from Step 2 (in) |
| | $n_d$ | = | Drainage layer porosity, typically around 0.40 |

4. Calculate the swale invert area required ($A_b$) based on the instantaneous storage capacity (neglecting the additional ponding capacity due to the shape of the swale sides):

$$\boldsymbol{A_b = WQV/d_t}$$

| | | | |
|---|---|---|---|
| Where: | $A_b$ | = | Bottom surface area (sq-ft) |
| | WQV | = | Water Quality Volume from Step 1 (cu-ft) |
| | $d_t$ | = | Total effective water storage depth from Step 3 (ft) |

5. Calculate the total area required ($A_{BMP}$) taking into account the side slopes along the length of the swale:

$$\boldsymbol{A_{BMP} = \left[b + 2 \times z \times \left(d_p + f\right)/12\right] \times (A_b/b)}$$

| | | | |
|---|---|---|---|
| Where: | $A_{BMP}$ | = | Total surface area (sq-ft) |
| | b | = | Swale bottom width from Step 2 (ft) |
| | z | = | Interior swale side slope (length per unit height) from Step 2 |
| | $d_p$ | = | Ponding depth from Step 2 (in) |
| | f | = | Freeboard (in) |
| | $A_b$ | = | Bottom surface area from Step 4 (sq-ft) |

If the minimum surface area is larger than the available space, reduce the tributary area and/or increase one or more design depths (media, gravel, ponding), and repeat the calculations.

### Pretreatment Considerations

Pretreatment for dry swales is provided by a shallow sediment forebay at the initial point of the channel. The volume of this forebay should be equal to at least 0.05 in. per impervious acre of drainage. A pea gravel diaphragm can be used along the top of the channel to provide pretreatment for lateral flows entering the swale.

### Area Requirements

A dry swale requires a footprint equivalent to 8% - 40% of its contributing impervious drainage area. The lower value corresponds to the maximum allowable values for the mentioned dependent variables, while the upper value reflects the minimum allowable values for all specified parameters.

### Sizing Example

Calculate the size of a dry swale serving a 1-acre residential development. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Percent Impervious Cover, I | % | 70 |
| Design Storm Depth, P | inches | 1.0 |
| Media porosity, $n_m$ | | 0.25 |
| Drainage layer porosity, $n_d$ | | 0.40 |
| Freeboard, f | inches | 6 |
| Drawdown (drain) Time, t | hours | 48 |

1. Calculate the volumetric runoff coefficient and Water Quality Volume (WQV):

$$C = 0.05 + 0.009I$$
$$C = 0.05 + 0.0039 \times 70$$
$$C = 0.68$$

$$WQV = PCA \times 3630$$
$$WQV = 1 \times 0.68 \times 1 \times 3630$$
$$WQV = 2,468\ cubic\ feet$$

2. Select a media thickness ($l_m$), drainage layer thickness ($l_d$), ponding depth ($d_p$), bottom width (b), and interior side slope (z):

$$l_m = 18\ in$$
$$l_d = 6\ in$$
$$d_p = 12\ in$$
$$b = 8\ ft$$
$$z = 3$$

3. Calculate the total effective storage depth:

$$d_t = \left[\left(d_p/2\right) + l_m n_m + l_d n_d\right]/12$$
$$d_t = (6 + 18 \times 0.25 + 6 \times 0.40)/12$$
$$d_t = 1.075\ feet$$

4. Calculate the minimum invert area ($A_b$) needed for the WQV and depths:

$$A_b = WQV/d_t$$
$$A_b = 2,468/1.075$$
$$A_b = 2,296\ square\ feet$$

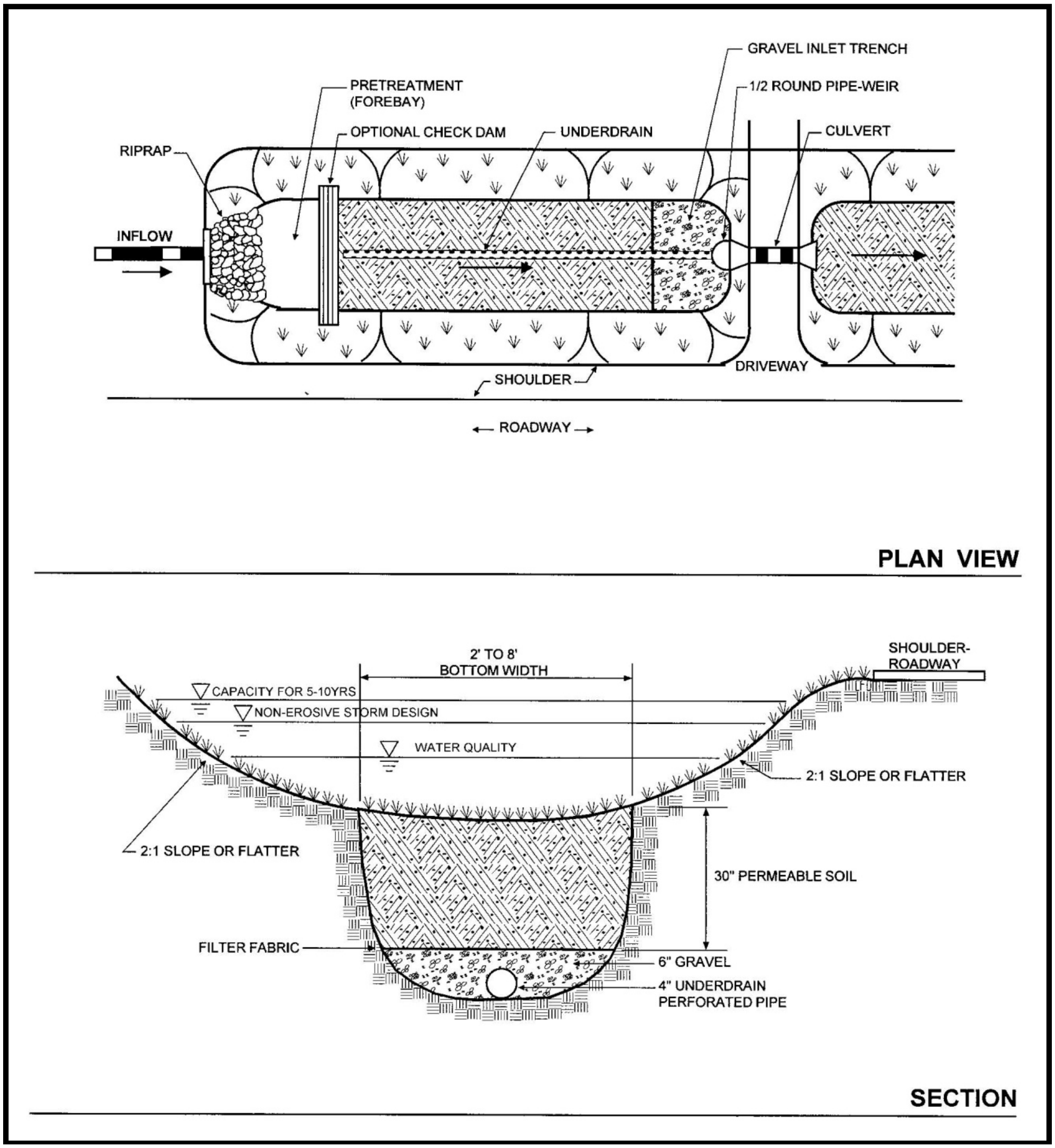
5. Calculate the total area required ($A_{BMP}$):

$$A_{BMP} = \left[b + 2 \times z \times \left(d_p + f\right)/12\right] \times (A_b/b)$$
$$A_{BMP} = [8 + 2 \times 3 \times (12 + 6)/12] \times (2,296/8)$$
$$A_{BMP} = 4,879\ square\ feet$$

### *Other Design Considerations*

- Landscape design should specify proper grass species based on specific site, soils and hydric conditions present along the channel. Vegetation should be designed for regular mowing, like a typical lawn, or less frequently (annually or semi-annually).
- Dry swales must be adequately designed to safely pass flows that exceed the design storm flows.

**Figure 12: Schematic of a Dry Swale**




Vermont Stormwater Management Handbook, Technical Support Document, Public Review Draft. 2000.

## DOWNSPOUT DISCONNECTION

### *Description*

Sometimes referred to as Rooftop Disconnection or Downspout Dispersion, is the redirection of roof runoff to a vegetated area in a dispersed manner.

| BMP Category | |
|---|---|
| Retention | ○ |
| Biofiltration | ● |
| Other | ○ |

New York State Stormwater Management Design Manual. 2010.

| Expected Pollutant Removals | |
|---|---|
| Nutrients | Low |
| Sediment | Medium |
| Trash | Low |
| Pathogens | Low |
| Pesticides | Unknown |
| Oil & Grease | Medium |
| Metals | Medium |
| Organic Compounds | Unknown |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Minimum vegetated area to roof area ratio | | 0.1:1 |
| Minimum vegetated flow path to roof flow path ratio | | 1:1 |

### *Feasibility Criteria*

See Table 10.

### *Sizing Procedure*

1. Calculate size of the vegetated area ($A_v$) using 10% of the roof drainage area ($A_r$):

$$A_v = 0.10A_r$$

Where: $A_v$ = Vegetated area (sq-ft)
$A_r$ = Roof drainage area (sq-ft)

2. Use the procedure presented previously to compute the Water Quality Volume (WQV) for which credit is received.

### *Pretreatment Considerations*

Downspout disconnections do not require pretreatment.

### Area Requirements

A downspout disconnection requires a footprint equivalent to at least 10% of its contributing impervious drainage area.

### Sizing Example

Calculate the size of a vegetated area serving the runoff from a 1,000 square foot roof. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Percent Impervious Cover, I | % | 100 |
| Design Storm Depth, P | inches | 1.0 |

1. Calculate size of the vegetated area ($A_v$) using 10% of the roof drainage area ($A_r$):

$$A_v = 0.10A_r$$

$$A_v = 0.10 \times 1,000$$

$$A_v = 100\ sq - ft$$

2. Calculate the Water Quality Volume (WQV) for which credit is received:

$$WQV = PCA \times 3630$$

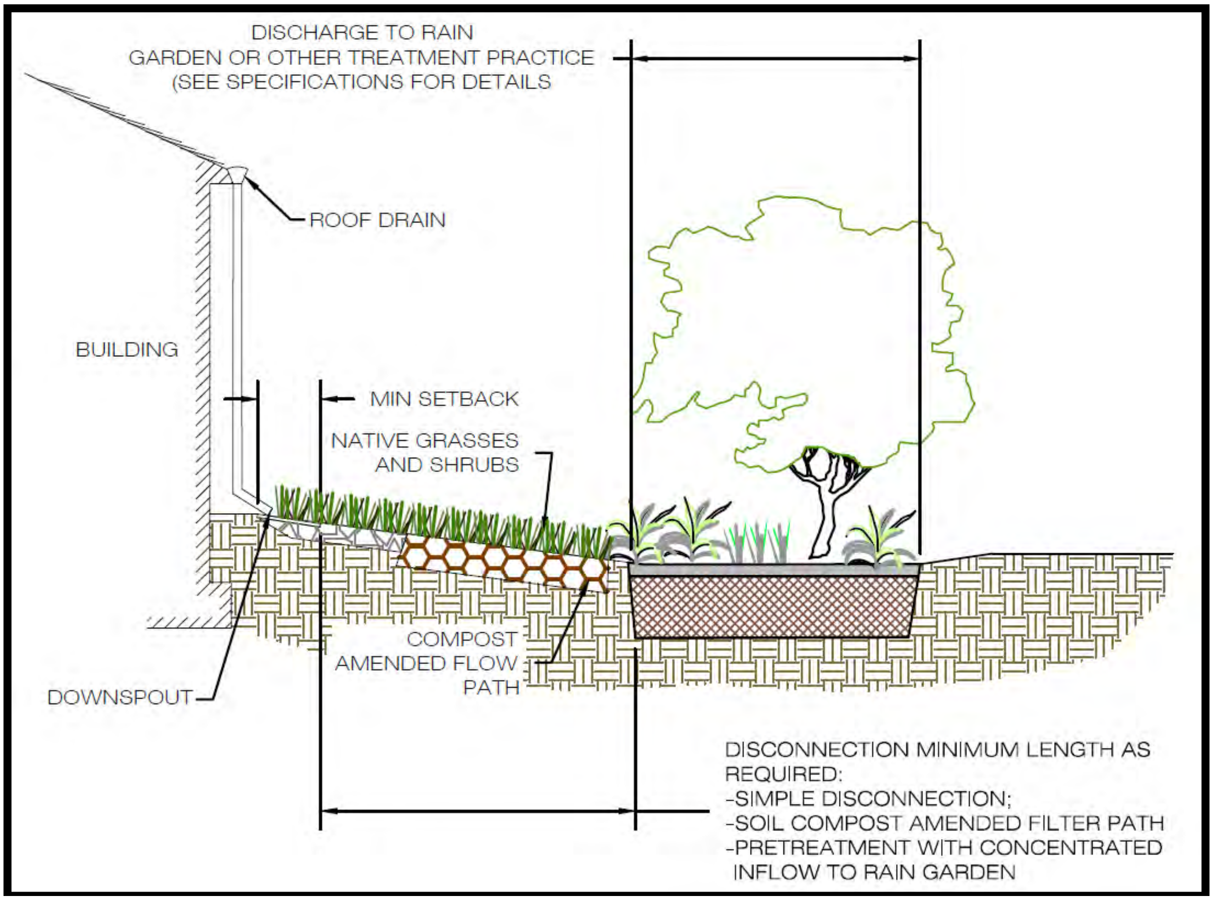
$$WQV = 1 \times (0.05 + 0.009 \times 100) \times (1,000/43,560) \times 3630$$

$$WQV = 79\ cubic\ feet$$

### Other Design Considerations

- Disconnected runoff can also be directed to rain barrels, cisterns, rain gardens, dry wells, or other BMPs.
- Disconnections over impervious soils (Hydrologic Soil Group "C" or "D") is discouraged, unless the soil is compost-amended.
- Use splash pads or level spreaders as required to distribute runoff to designated areas with infiltration capacity.
- Runoff must not flow toward building foundations or onto adjacent private property

**Figure 13: Schematic of a Downspout Disconnection**




Virginia DCR Stormwater Design Specification No. 1. 2011.

## VEGETATED SWALE

***Description***

Sometimes referred to as a Grass Swale, Grass Channel, or Biofiltration Swale, a vegetated swale is a broad shallow earthen channel vegetated with erosion resistant and flood tolerant grasses. Runoff typically enters the swale at one end and exits at the other end.

| BMP Category | |
|---|---|
| Retention | ○ |
| Biofiltration | ● |
| Other | ○ |

Kaneohe

| Expected Pollutant Removals | |
|---|---|
| Nutrients | Low |
| Sediment | Medium |
| Trash | Low |
| Pathogens | Low |
| Pesticides | Unknown |
| Oil & Grease | Medium |
| Metals | Medium |
| Organic Compounds | Unknown |

***Minimum Design Criteria***

| Design Parameter | Units | Value |
|---|---|---|
| Maximum Interior Side Slope (length per unit height) | | 3:1 |
| Manning's n value | - | 0.20 |
| Maximum Flow Velocity | feet/sec | 1 |
| Maximum Water Depth | inches | 4 |
| Minimum Hydraulic Residence Time | minutes | 7 |
| Maximum Bottom Width | feet | 10 |
| Minimum Freeboard | inches | 6 |

***Feasibility Criteria***

See Table 10.

### *Sizing Procedure*

1. Use the procedure presented previously to compute the Water Quality Flow Rate.

2. Select initial values for swale bottom width (b), depth of flow (y), swale side slope (z), swale longitudinal slope (s), and hydraulic residence time (T):

3. Calculate the cross-sectional area (A), wetted perimeter (WP), and hydraulic radius (R) using the dimensions established in Step 2:

$$\boldsymbol{A = (by/12) + \left(zy^2/144\right)}$$

$$\boldsymbol{WP = b + (2y/12)\sqrt{1 + z^2}}$$

$$\boldsymbol{R = A/WP}$$

| | | | |
|---|---|---|---|
| Where: | A | = | Cross sectional area (sq-ft) |
| | WP | = | Wetted perimeter (ft) |
| | R | = | Hydraulic radius (ft) |
| | b | = | Swale bottom width from Step 2 (ft) |
| | y | = | depth of flow for WQF from Step 2 (in) |
| | z | = | Swale side slope (length per unit height) from Step 2 |

4. Calculate the design flow rate in the swale using the selected dimensions and Manning's Equation:

$$\boldsymbol{Q = \frac{1.49AR^{2/3}s^{1/2}}{n}}$$

| | | | |
|---|---|---|---|
| Where: | Q | = | Design flow rate (cfs) |
| | A | = | Cross Sectional area from Step 3 (sq-ft) |
| | R | = | Hydraulic radius from Step 3 (ft) |
| | s | = | Longitudinal Slope from Step 2 (%) |
| | n | = | Manning's n value |

Note that the Manning's n value for water quality calculations is significantly higher than the Manning's n value typically used for flood control calculations (0.035). If the calculated flow rate is not equal to or greater than the WQF from Step 1, decrease the tributary area and/or increase one or more swale dimensions (bottom width, depth of flow, side slope, or longitudinal slope) and repeat the calculations.

5. Once an appropriate design flow rate is achieved, calculate the design flow velocity using the flow continuity equation:

$$\boldsymbol{V = Q/A}$$

| | | | |
|---|---|---|---|
| Where: | V | = | Design flow velocity (ft/sec) |
| | Q | = | Design flow rate from Step 4 (cfs) |
| | A | = | Cross sectional area from Step 3 (sq-ft) |

If the design flow velocity is greater than the maximum allowed velocity, either include check dams with vertical drops of no more than 12 inches, or revise one or more swale dimensions and repeat the calculations.

6. Multiply the velocity by the hydraulic residence time to determine the length:

$$L = 60VT$$

| Where: | | | |
|---|---|---|---|
| | L | = | Swale length (ft) |
| | T | = | Hydraulic residence time from Step 2 (min) |
| | V | = | Design flow velocity from Step 5 (ft/sec) |

7. Calculate the total area required ($A_{BMP}$) taking into account the side slopes along the length of the swale and the freeboard:

$$A_{BMP} = [b + 2z\,(y + f)/12] \times L$$

| Where: | | | |
|---|---|---|---|
| | $A_{BMP}$ | = | Total surface area (sq-ft) |
| | b | = | Swale bottom width from Step 2 (ft) |
| | z | = | Interior swale side slope (length per unit height) from Step 2 |
| | y | = | depth of flow for WQF from Step 2 (in) |
| | f | = | Freeboard (in) |
| | L | = | Swale length from Step 6 (ft) |

If the calculated are does not fit in the available area, reduce the drainage area, reduce the hydraulic residence time (if it is longer than the minimum), and/or revise one or more swale dimensions, and repeat the calculations.

### *Pretreatment Considerations*
Vegetated swales do not require pretreatment.

### *Area Requirements*
A vegetated swale requires a footprint equivalent to 2% - 4% of its contributing impervious drainage area. The lower value corresponds to maximizing the flow depth and slope, while the upper value corresponds to maximizing the bottom width and slope.

### *Sizing Example*
Calculate the size of a grass swale serving the runoff from a one acre parking lot. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Weighted Runoff Coefficient, C | | 0.95 |
| Rainfall Intensity, i | inches/hr | 0.4 |
| Interior Side Slope (length per unit height) | | 3 |
| Manning's n value | - | 0.20 |
| Longitudinal Slope, s | | 0.016 |
| Hydraulic Residence Time, T | minutes | 7 |
| Freeboard, f | inches | 6 |

1. Calculate the Water Quality Flow Rate (WQF):

$$WQF = CiA$$
$$WQF = 0.95 \times 0.4 \times 1.0$$
$$WQF = 0.38\ cubic\ feet\ per\ second$$

2. Select initial values for swale bottom width (b), depth of flow (y), swale side slope length per unit height (z), swale longitudinal slope (s), and hydraulic residence time (T):

$$b = 2.75\ ft$$
$$y = 3.5\ in$$
$$z = 3$$
$$s = 0.017$$
$$T = 7\ min$$

3. Calculate the cross-sectional area (A), wetted perimeter (WP), and hydraulic radius (R):

$$A = (by/12) + \left(zy^2/144\right)$$
$$A = (2.75 \times 3.5/12) + (3 \times 3.5 \times 3.5/144)$$
$$A = 1.06\ square\ feet$$

$$WP = b + (2y/12)\sqrt{1 + z^2}$$
$$WP = 2.75 + (2 \times 3.5/12)\sqrt{1 + 3 \times 3}$$
$$WP = 4.59\ feet$$

$$R = A/WP$$
$$R = 1.06/4.59$$
$$R = 0.23\ feet$$

4. Calculate the design flow rate (Q):

$$\boldsymbol{Q = 1.49AR^{2/3}s^{1/2}/n}$$
$$\boldsymbol{Q = 1.49 \times 1.06 \times 0.23^{0.667} \times 0.017^{0.5}/0.20}$$
$$\boldsymbol{Q = 0.39\ cfs}\ [\geq \boldsymbol{WQF, OK}]$$

5. Calculate the velocity in the swale (V):

$$\boldsymbol{V = Q/A}$$
$$\boldsymbol{V = 0.39/1.06}$$
$$\boldsymbol{V = 0.36\ fps}\ [< 1\ fps, OK]$$

6. Calculate the minimum length of the swale (L):

$$\boldsymbol{L = 60 \times V \times T}$$
$$\boldsymbol{L = 60 \times 0.36 \times 7}$$
$$\boldsymbol{L = 153\ feet}$$

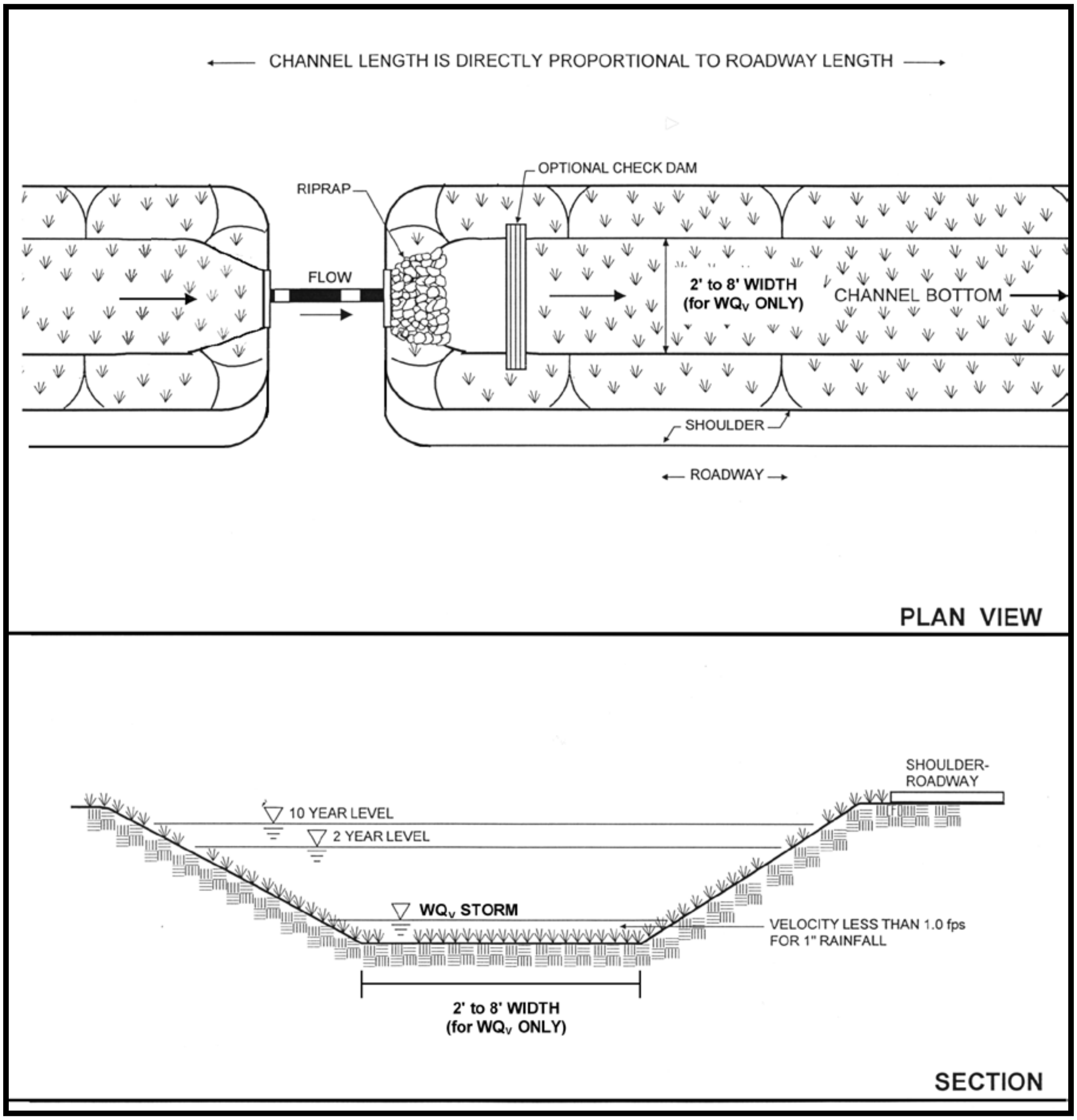
7. Calculate the total area required ($A_{BMP}$):

$$\boldsymbol{A_{IMP} = [b + 2z\,(y + f)/12] \times L}$$
$$\boldsymbol{A_{IMP} = [2.75 + 2 \times z \times (3.5 + 6)/12] \times 153}$$
$$\boldsymbol{A_{IMP} = 1,148\ square\ feet}$$

## *Other Design Considerations*

- Credit for partial infiltration may be given if the soil beneath the BMP is amended by incorporating 6 inches of compost/amendments and tilled up to 8 inches.
- In cases where a vegetated swale is located on-line, it should be sized as a treatment facility and as a conveyance system per the City and County's standards for flood control.
- Vegetate the swale with dense turf grass to promote sedimentation, filtration, and nutrient uptake, and to limit erosion through maintenance of low flow velocities.
- Check dams may be used to achieve flow velocity requirements. They are often employed to enhance infiltration capacity, decrease runoff volume, rate, and velocity, and promote additional filtering and settling of nutrients and other pollutants

**Figure 14: Schematic of a Vegetated Swale**




Maryland Stormwater Design Manual. 2000.

## VEGETATED BUFFER STRIP

### *Description*

Sometimes referred to as a Vegetated Filter Strip or Biofiltration Strip, a vegetated buffer strip is a grassy slope vegetated with turf grass that is designed to accommodate sheet flow. They may resemble natural ecological communities and remove pollutants by vegetative filtration.

| BMP Category | |
|---|---|
| Retention | ○ |
| Biofiltration | ● |
| Other | ○ |

Virginia DCR Stormwater Design Specification No. 2. 2011.

| Expected Pollutant Removals | |
|---|---|
| Nutrients | Low |
| Sediment | Medium |
| Trash | Medium |
| Pathogens | Low |
| Pesticides | Unknown |
| Oil & Grease | Medium |
| Metals | Medium |
| Organic Compounds | Medium |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Manning's n value | - | 0.25 |
| Maximum Flow Velocity | feet/sec | 1 |
| Maximum Upstream Area Flow Length | feet | 75 |
| Minimum Length | feet | 15 |
| Maximum Flow Depth | inches | 1 |

### *Feasibility Criteria*

See Table 10.

### *Sizing Procedure*

1. Use the procedure presented previously to compute the Water Quality Flow Rate.

2. Select values for the buffer strip width (w) and buffer strip longitudinal slope (s). Note that if a strip width is selected that is not the same as the width of the upstream flow path, a transition structure will be necessary to capture all the runoff and/or establish uniform sheet flow across the entire strip width.

3. Compute the design flow depth for the WQF using a simplified form of Manning's Equation assuming a shallow flow depth:

$$\boldsymbol{y = 12 \times \left(\frac{nQ}{1.49w\sqrt{s/100}}\right)^{0.6}}$$

| Where: | | | |
|---|---|---|---|
| | y | = | Design flow depth for WQF (in) |
| | n | = | Manning's n value |
| | Q | = | Water Quality Flow Rate from Step 1 (cfs) |
| | w | = | Design width from Step 2 (ft) |
| | s | = | Longitudinal slope from Step 2 (%) |

Note that the Manning's n value for water quality calculations is significantly higher than the Manning's n value typically used for flood control calculations (0.035). If the calculated depth is greater than the maximum allowed depth, reduce the tributary area, increase the design width, or increase the longitudinal slope, and repeat the calculation.

4. Calculate the Design flow velocity across the strip using the flow continuity equation:

$$\boldsymbol{V = 12Q/wy}$$

| Where: | | | |
|---|---|---|---|
| | V | = | Design flow velocity (ft/sec) |
| | Q | = | Water Quality Flow Rate from Step 1 (cfs) |
| | w | = | Design width from Step 2 (ft) |
| | d | = | Design flow depth from Step 3 (in) |

If the design flow velocity is greater than the maximum allowed velocity, revise one or more design parameters and repeat the calculations.

5. Select a design buffer strip length (L) equal to or greater than the minimum length, and calculate the total BMP area:

$$\boldsymbol{L = 20.0\ ft}$$

$$\boldsymbol{A_{BMP} = L \times w}$$

| Where: | | | |
|---|---|---|---|
| | $A_{BMP}$ | = | Vegetated buffer strip area (sq-ft) |
| | L | = | Design length (ft) |
| | w | = | Design width from Step 2 (ft) |

## *Pretreatment Considerations*

Vegetated Buffer Strips do not require pretreatment.

## *Area Requirements*

A vegetated buffer strip requires a footprint equivalent to no less than 0.4% of its contributing impervious drainage area. While there is no upper value because there is no maximum design width or design length, the minimum footprint corresponds to the minimum length and the maximum slope and minimum width combination that provide the maximum allowable design depth.

### *Sizing Example*

Calculate the size of a vegetated buffer strip serving the runoff from a one acre parking lot. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Weighted Runoff Coefficient, C | | 0.95 |
| Rainfall Intensity, i | inches/hr | 0.4 |
| Manning's n value | - | 0.25 |
| Longitudinal Slope | | 0.06 |

1. Calculate the Water Quality Flow Rate (WQF):

$$\boldsymbol{WQF = CiA}$$
$$\boldsymbol{WQF = 0.95 \times 0.4 \times 1.0}$$
$$\boldsymbol{WQF = 0.38\ cubic\ feet\ per\ second}$$

2. Select a design buffer strip width (w) and longitudinal slope (s):

$$\boldsymbol{w = 20.0\ ft}$$
$$\boldsymbol{s = 0.06}$$

3. Calculate the depth of flow for the WQF (y):

$$\boldsymbol{y = 12 \times \left(WQF \times n/1.49w\sqrt{s}\right)^{0.6}}$$
$$\boldsymbol{y = 12 \times \left(0.38 \times 0.25/1.49 \times 20\sqrt{0.06}\right)^{0.6}}$$
$$\boldsymbol{y = 0.89\ inches\ [\leq 1\ inch, OK]}$$

3. Calculate the velocity across the buffer strip (V):

$$\boldsymbol{V = 12 \times WQF/(y \times w)}$$
$$\boldsymbol{V = 12 \times 0.38/(0.89 \times 20.0)}$$
$$\boldsymbol{V = 0.26\ fps\ [\leq 1\ fps, OK]}$$

4. Select a design buffer strip length (L) at least equal to the minimum required length, and calculate the total BMP area ($A_{BMP}$):

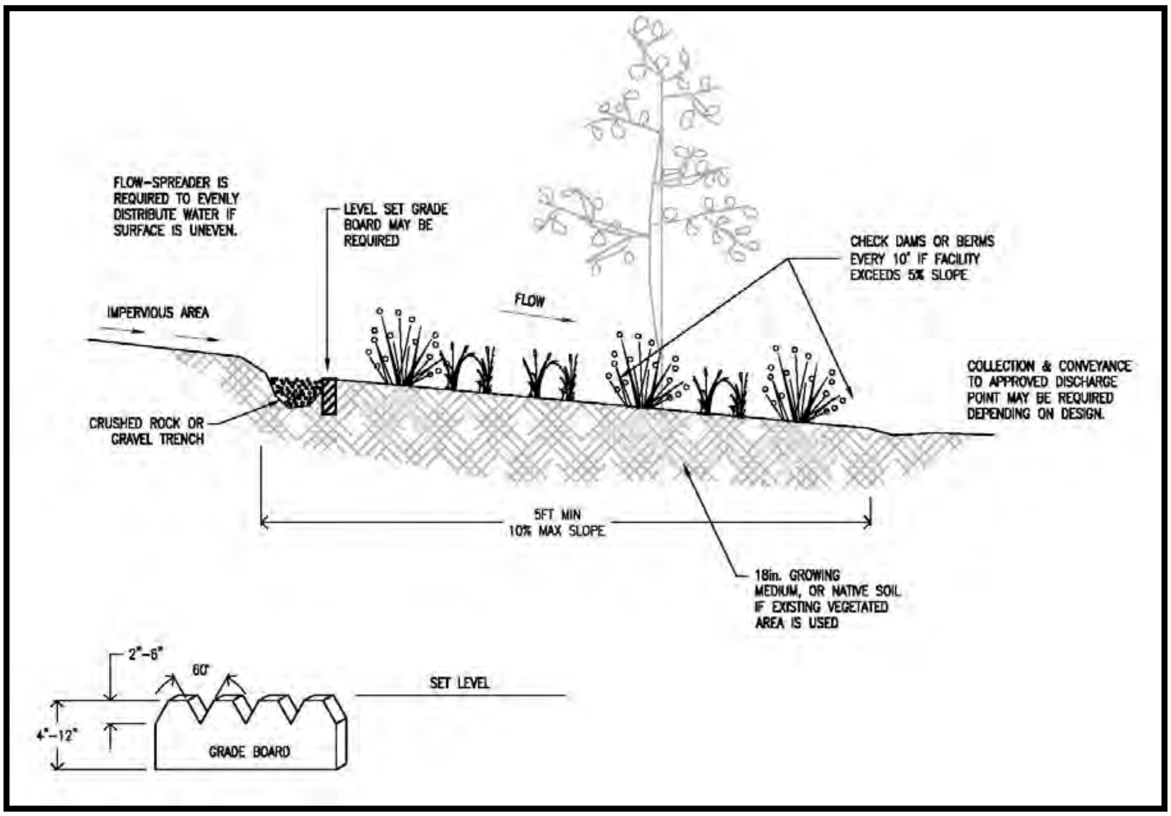
$$\boldsymbol{L = 20.0\ ft}$$

$$\boldsymbol{A_{BMP} = L \times W_d}$$
$$\boldsymbol{A_{BMP} = 20 \times 20}$$
$$\boldsymbol{A_{BMP} = 400\ square\ feet}$$

### *Other Design Considerations*

- Credit for partial infiltration may be given if the soil beneath the BMP is amended by incorporating 6 inches of compost/amendments and tilled up to 8 inches.
- A pea gravel diaphragm or engineered level spreader should be provided at the upper edge of the BMP when the width of the contributing drainage area is greater than that of the filter. Level spreader options include porous pavement strips, stabilized turf strips, slotted curbing, rock-filled trench, or concrete sills.
- The selection of plants should be based on their compatibility with climate conditions, soils and topography, and their ability to tolerate urban stresses from pollutants, variable soil moisture conditions and ponding fluctuations.

**Figure 15: Schematic of a Vegetated Buffer Strip**




Portland Stormwater Management Manual. 2008.

## TREE BOX FILTER

### *Description*

Sometimes referred to as biofiltration boxes, a tree box filter is a proprietary water quality structure utilizing settling, filtration, adsorptive/absorptive materials, vegetative components, or other appropriate technology to remove pollutants from storm water runoff.

| BMP Category | |
|---|---|
| Retention | ○ |
| Biofiltration | ● |
| Other | ○ |


www.filterra.com

| Expected Pollutant Removals | |
|---|---|
| Nutrients | Medium |
| Sediment | High |
| Trash | High |
| Pathogens | Medium |
| Pesticides | Unknown |
| Oil & Grease | High |
| Metals | High |
| Organic Compounds | High |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Any applicable manufacturer's criteria | | |
| | | |
| | | |
| | | |

### *Feasibility Criteria*

See Table 10.

### *Sizing Procedure*

Follow the manufacturer's guidelines for appropriate sizing calculations and selection of appropriate device/model.

### *Pretreatment Considerations*

No pretreatment is required.

### *Area Requirements*

The footprint requirements for proprietary tree box filters vary by manufacturer.

### *Sizing Example*
No example is provided as sizing procedures vary by manufacturer, and presenting any specific product might be interpreted as an endorsement.

### *Other Design Considerations*
- All tree box filters must be able to safely overflow or bypass flows in excess of the storm water quality design storm to downstream drainage systems.

## DETENTION BASIN

### *Description*

Sometimes referred to as a Dry Extended Detention Basin, a detention basin is a shallow man-made impoundment intended to provide for the temporary storage of storm water runoff to allow particles to settle. It does not have a permanent pool and is designed to drain between storm events.

| BMP Category | |
|---|---|
| Retention | ○ |
| Biofiltration | ○ |
| Other | ● |

Mililani Mauka

| Expected Pollutant Removals | |
|---|---|
| Nutrients | Low |
| Sediment | Medium |
| Trash | High |
| Pathogens | Low |
| Pesticides | Unknown |
| Oil & Grease | Medium |
| Metals | Low/Med |
| Organic Compounds | Unknown |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Maximum Interior Side Slope (length per unit height) | | 3:1 |
| Minimum length to width ratio | | 2:1 |
| Maximum depth | ft | 8 |
| Drawdown (drain) time for WQV | hours | 48 |
| Drawdown (drain) time for 50% of WQV | hours | 24-36 |
| Basin invert slope | % | 1-2 |
| Minimum outlet size | inches | 4 |
| Minimum freeboard | feet | 1 |

### *Feasibility Criteria*

Detention Basins are considered infeasible for any of the following conditions:

- Basin invert would be below seasonally high groundwater table
- Unable to operate off-line and unable to operate in-line w/ safe overflow mechanism
- Excavation would disturb iwi kupuna or other archaeological resources
- Unable to meet minimum length to width ratio design criteria naturally or artificially

### *Sizing Procedure*

Detention Basins are sized using detailed routing calculations to demonstrate that the storage volume is adequate. However, a reasonable first estimate can be determined using the following simple routing method which assumes triangular hydrographs for the inflow and outflow.

1. Use the procedure presented previously to compute the pre-project (i.e., undeveloped) and post-project (i.e., developed) weighted runoff coefficients.

2. Compute the peak inflow rate using the Rational Method:

   $$\boldsymbol{q_i = C_a i A}$$

   | | | | |
   |---|---|---|---|
   | Where: | $q_i$ | = | Peak inflow rate into basin (cfs) |
   | | $C_a$ | = | Post-project weighted runoff coefficient |
   | | i | = | Peak rainfall intensity (in/hr) |
   | | A | = | Drainage area (ac) |

3. Compute the peak outflow rate using the pre-project runoff coefficient, which effectively forces the detention basin to maintain pre-project discharge rates:

   $$\boldsymbol{q_o = C_b i A}$$

   | | | | |
   |---|---|---|---|
   | Where: | $q_o$ | = | Peak outflow rate leaving basin (cfs) |
   | | $C_b$ | = | Pre-project weighted runoff coefficient |
   | | i | = | Peak rainfall intensity (in/hr) |
   | | A | = | Drainage area (ac) |

4. Calculate the estimated basin storage volume:

   $$\boldsymbol{s = 3630 \times PA[1 - (q_o/q_i)]}$$

   | | | | |
   |---|---|---|---|
   | Where: | s | = | Storage volume in the basin (cu-ft) |
   | | P | = | design storm runoff depth (in) |
   | | A | = | Drainage area (ac) |
   | | $q_o$ | = | Peak outflow rate from Step 3 (cfs) |
   | | $q_i$ | = | Peak inflow rate from Step 2 (cfs) |

5. Select initial values for the detention basin total width ($w_t$), total length ($l_t$), and depth (d) based on space availability, topography and existing drainage facilities. Also select values for the interior side slopes (z) and required freeboard (f). Calculate the basin invert width and invert length:

   $$\boldsymbol{w_b = w_t - 2z(d + f)}$$

   $$\boldsymbol{l_b = l_t - 2z(d + f)}$$

   | | | | |
   |---|---|---|---|
   | Where: | $w_b$ | = | Basin bottom width (ft) |
   | | $l_b$ | = | Basin bottom length (ft) |
   | | $w_t$ | = | Basin total width (ft) |
   | | $l_t$ | = | Basin total length (ft) |
   | | z | = | Basin interior side slope (length per unit height) |
   | | d | = | Depth of flow for Storage Volume (ft) |
   | | f | = | Freeboard (ft) |

6. Calculate the resulting storage volume using the prismoidal formula for trapezoidal basins:

$$\boldsymbol{V = w_b l_b d + (w_b + l_b) z d^2 + 4 z^2 d^3 / 3}$$

| | | | |
|---|---|---|---|
| Where: | V | = | Volume of trapezoidal basin (cu-ft) |
| | $w_b$ | = | Basin bottom width from Step 5 (ft) |
| | $l_b$ | = | Basin bottom length from Step 5 (ft) |
| | d | = | Depth of flow for Storage Volume from Step 5 (ft) |
| | z | = | Basin interior side slope from Step 5 |

Compare the calculated volume (V) to the required volume (s) from Step 4. If the calculated volume is greater than or equal to the required volume, the selected dimensions ($w_t$ and $l_t$) and depth (d) are adequate for preliminary design. If the calculated volume is less than the required volume, increase one or both of the dimensions and/or the depth (d) and repeat Steps 5 and 6. If the footprint area and depth are set to maximum allowable values based on site characteristics and the calculated volume is still less than the required volume, reduce the drainage area (A) and repeat Steps 2 through 6.

### *Pretreatment Considerations*

If significant amounts of sediment or sand are anticipated at the site, sediment forebays should be located at each major inlet to provide pretreatment, preserve the capacity of the basin, and reduce maintenance requirements in the basin. The forebay consists of a separate cell that drains into the main basin, formed by an acceptable barrier, such as an earthen berm or gabion baskets, etc.). If used, the total volume of all forebays should be at least 5% of the total WQV.

### *Area Requirements*

A detention basin requires a footprint equivalent to 1% - 9% of its contributing impervious drainage area. The actual value is dependent on a number of variables, including the drainage area, pre-project and post-project runoff coefficients, and basin depth. Footprints at the lower range reflect deep basins (e.g., 8 feet) serving large drainage areas (e.g., 50 acres), while footprints at the upper range reflect shallow basins (e.g., 1 foot) serving small drainage areas (e.g., 1 acre).

### *Sizing Example*

Calculate the preliminary size of a detention basin serving the runoff from a one acre parking lot. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Rainfall Intensity, i | inches/hr | 0.4 |
| Runoff Volume, Q | inches | 1 |
| Basin Interior Side Slope (length per unit height), z | | 3 |
| Freeboard, f | ft | 1 |

1. Compute the pre-project (i.e., undeveloped) and post-project (i.e., developed) weighted runoff coefficients:

$$C_b = 0.20$$
$$C_a = 0.95$$

2. Compute the peak inflow rate:

$$q_i = C_a iA$$
$$q_i = 0.95 \times 0.40 \times 1$$
$$q_i = 0.38\ cfs$$

3. Compute the peak outflow rate:

$$q_o = C_b iA$$
$$q_o = 0.20 \times 0.40 \times 1$$
$$q_o = 0.08\ cfs$$

4. Calculate the estimated basin storage volume:

$$s = 3630 \times PA[1 - (q_o/q_i)]$$
$$s = 3630 \times 1 \times 1 \times [1 - (0.08/0.38)]$$
$$s = 2{,}866\ cubic\ feet$$

5. Select initial values for the detention basin total width ($w_t$), total length ($l_t$), depth (d), interior side slopes (z) and required freeboard (f):

$$w_t = 38\ feet$$
$$l_t = 53\ feet$$
$$d = 3.5\ feet$$
$$z = 3$$
$$f = 1.0\ foot$$

Calculate the basin bottom width and length:

$$w_b = w_t - 2z(d + f)$$
$$w_b = 38 - 2 \times 3(3.5 + 1)$$
$$w_b = 11\ feet$$

$$l_b = l_t - 2z(d + f)$$
$$l_b = 53 - 2 \times 3(3.5 + 1)$$
$$l_b = 26\ feet$$

6. Calculate the resulting storage volume using the prismoidal formula for trapezoidal basins:

$$\boldsymbol{V = w_b l_b d + (w_b + l_b) z d^2 + 4z^2 d^3/3}$$

$$\boldsymbol{V = 11 \times 26 \times 3.5 + (11 + 26) \times 3 \times 3.5^2 + 4 \times 3^2 \times 3.5^3/3}$$

$$\boldsymbol{V = 2,875\ cubic\ feet}$$

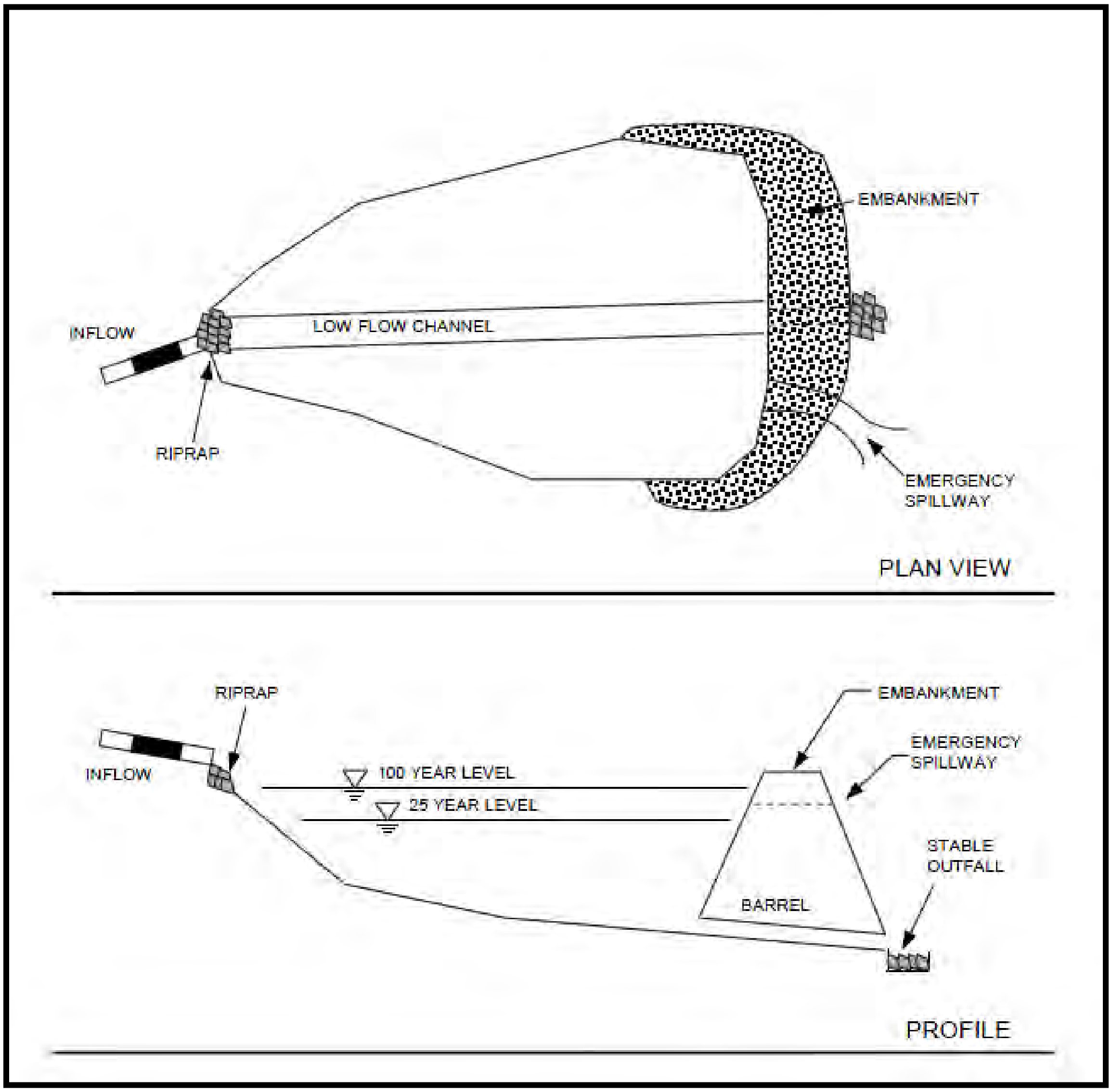
The calculated volume is greater than the required volume, so the preliminary design is ok.

### *Other Design Considerations*

- Credit for infiltration may be given if the soils beneath the detention basin invert have a measured infiltration rate of at least 0.5 inches per hour and none of the infeasibility criteria for infiltration basins are applicable. However, low flow channels should not be included if infiltration is expected.
- If a temporarily-filled pond creates a potential public safety issue, perimeter fencing may be considered. Warning signs should be used wherever appropriate
- In order to meet designs storm requirements, detention basins should have a multistage outlet structure. Three elements are typically included in this design:
  1. A low-flow outlet that controls the extended detention and functions to slowly release the water quality design storm.
  2. A primary outlet that functions to attenuate the peak of larger design storms.
  3. An emergency overflow outlet/spillway

  Design methodology options are provided in manuals included in the References, including the Georgia Stormwater Management Manual, the Urban Storm Drainage Criteria Manual, and the EPA Stormwater Best Management Practice Design Guide.

**Figure 16: Schematic of a Detention Basin**




Georgia Stormwater Management Manual. 2001.

## MANUFACTURED TREATMENT DEVICE

### *Description*

Sometimes referred to as hydrodynamic or vortex separators, a manufactured treatment device is a proprietary water quality structure utilizing settling, filtration, adsorptive/absorptive materials, vortex separation, vegetative components, or other appropriate technology to remove pollutants from storm water runoff.

| BMP Category | |
|---|---|
| Retention | ○ |
| Biofiltration | ○ |
| Other | ● |

| Expected Pollutant Removals | |
|---|---|
| Nutrients | Low |
| Sediment | Med/High |
| Trash | High |
| Pathogens | Low |
| Pesticides | Low |
| Oil & Grease | Med/High |
| Metals | Low |
| Organic Compounds | Low |

???

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Minimum TSS Removal | % | 80 |
| | | |
| | | |
| | | |

### *Feasibility Criteria*

Manufactured treatment devices are considered infeasible for any of the following conditions:

- Bottom of BMP is below seasonally high groundwater table
- Unable to operate off-line and unable to operate in-line w/ safe overflow mechanism
- Excavation would disturb iwi kupuna or other archaeological resources

### *Sizing Procedure*

Follow the manufacturer's guidelines for appropriate sizing calculations and selection of appropriate device/model.

### *Pretreatment Considerations*
No pretreatment is required.

### *Area Requirements*
The footprint requirements for proprietary manufactured treatment devices vary by manufacturer.

### *Sizing Example*
No example is provided as sizing procedures vary by manufacturer, and presenting any specific product might be interpreted as an endorsement.

### *Other Design Considerations*
- The device must provide a TSS removal rate of 80%, verified by a Technology Acceptance and Reciprocity Partnership (TARP) state or by other third party testing organizations, provided that such verification is conducted in accordance with the protocol "Stormwater Best Management Practices Demonstration Tier II Protocol for Interstate Reciprocity".
- All manufactured treatment devices must be able to safely overflow or bypass flows in excess of the storm water quality design storm to downstream drainage systems.

## SAND FILTER

### *Description*

A sand filter is an open chambered structure that captures, temporarily stores, and treats storm water runoff by passing it through an engineered media (e.g., sand).

| BMP Category | |
|---|---|
| Retention | ○ |
| Biofiltration | ○ |
| Other | ● |


Portland Stormwater Management Manual. 2004.

| Expected Pollutant Removals | |
|---|---|
| Nutrients | Low/Med |
| Sediment | High |
| Trash | High |
| Pathogens | Med |
| Pesticides | Unknown |
| Oil & Grease | High |
| Metals | Med/High |
| Organic Compounds | Med/High |

### *Minimum Design Criteria*

| Design Parameter | Units | Value |
|---|---|---|
| Sand Coefficient of Permeability | feet/day | 3.5 |
| Filter media depth | inches | 18 |
| Drawdown (drain) Time | hours | 48 |
| Maximum Interior Side Slope if earthen (length per unit height) | | 3:1 |
| Minimum Underdrain Diameter | inches | 6 |

### *Feasibility Criteria*

Sand filters are considered infeasible for any of the following conditions:

- Bottom of BMP is below seasonally high groundwater table
- Unable to operate off-line and unable to operate in-line w/ safe overflow mechanism
- Excavation would disturb iwi kupuna or other archaeological resources
- Site lacks sufficient hydraulic head to support BMP operation by gravity

### *Sizing Procedure*

1. Use the procedure presented previously to compute the Volumetric Runoff Coefficient and Water Quality Volume.

2. Select values for the filter media depth ($l_m$) and maximum ponding depth ($d_p$).

3. Use Darcy's Law to calculate the required Filter Bed Surface Area:

$$\boldsymbol{A_{fb} = \frac{WQV \times l_m}{k(l_m + d_p/24)(t/24)}}$$

| Where: | | | |
|---|---|---|---|
| | $A_{fb}$ | = | Filter bed surface area (sq-ft) |
| | WQV | = | Water Quality Volume from Step 1 (cu-ft) |
| | $l_m$ | = | Filter media depth from step 2 (ft) |
| | k | = | Filter media permeability coefficient (ft/day) |
| | $d_p$ | = | Maximum ponding depth, from Step 2 (in) |
| | t | = | Filter bed drain time (hr) |

4. Calculate the total area occupied by the BMP ($A_{BMP}$) using the embankment side slopes and assuming a square basin:

$$\boldsymbol{A_{BMP} = \left[\sqrt{A_{fb}} + 2z(d_p/12 + f)\right]^2}$$

| Where: | | | |
|---|---|---|---|
| | $A_{BMP}$ | = | Area occupied by BMP (sq-ft) |
| | $Af_b$ | = | Filter bed surface area from Step 3 (sq-ft) |
| | z | = | Filter bed interior side slope (length per unit height) |
| | $d_p$ | = | Maximum ponding depth from Step 2 (in) |
| | f | = | Freeboard (ft) |

If the calculated area does not fit in the available space, either reduce the drainage area, increase the ponding depth, and/or increase the interior side slope (if it's not already set to the maximum) and repeat the calculations.

### *Pretreatment Considerations*

Pretreatment is required for sand filters in order to reduce the sediment load entering the sand bed, prevent premature clogging, and ensure filter longevity. The pretreatment device must be sized for at least 25% of the WQV, and may be achieved with vegetated swales, vegetated filter strips, sedimentation basins or forebays, sedimentation manholes, and manufactured treatment devices. The typical method is a sedimentation basin that has a length to width ratio of 2:1, and is sized using the Camp-Hazen equation.

### *Area Requirements*

A sand filter requires a footprint equivalent to 1.5% - 3% of its contributing impervious drainage area, excluding pretreatment. The lower value reflects minimum filter media and ponding depths, while the upper value reflects higher filter media and ponding depths.

### *Sizing Example*

Calculate the size of a sand filter serving a 1-acre residential development. Assume the following design parameters:

| Design Parameter | Units | Value |
|---|---|---|
| Percent Impervious Cover, I | % | 70 |
| Design Storm Depth, P | inches | 1.0 |
| Sand Coefficient of Permeability, k | feet/day | 3.5 |
| Interior Side Slope (length per unit height) | | 3:1 |
| Freeboard | ft | 0.5 |
| Drawdown (drain) Time, t | hours | 48 |

1. Calculate the volumetric runoff coefficient and Water Quality Volume (WQV):

$$\boldsymbol{C = 0.05 + 0.009I}$$
$$\boldsymbol{C = 0.05 + 0.0039 \times 70}$$
$$\boldsymbol{C = 0.68}$$

$$\boldsymbol{WQV = PCA \times 3630}$$
$$\boldsymbol{WQV = 1 \times 0.68 \times 1 \times 3630}$$
$$\boldsymbol{WQV = 2{,}468\ cubic\ feet}$$

2. Select a filter media depth ($l_m$) and maximum ponding depth ($d_p$):

$$\boldsymbol{l_m = 1.5\ ft}$$
$$\boldsymbol{d_p = 24\ in}$$

3. Calculate the Filter Bed Surface Area ($A_{fb}$):

$$\boldsymbol{A_{fb} = WQV \times l_m / \left[k\left(l_m + \left(d_p/24\right)\right)(t/24)\right]}$$
$$\boldsymbol{A_{BMP} = 2{,}468 \times 1.5/\left[3.5\left(1.5 + (24/24)\right)(48/24)\right]}$$
$$\boldsymbol{A_{BMP} = 212\ square\ feet}$$

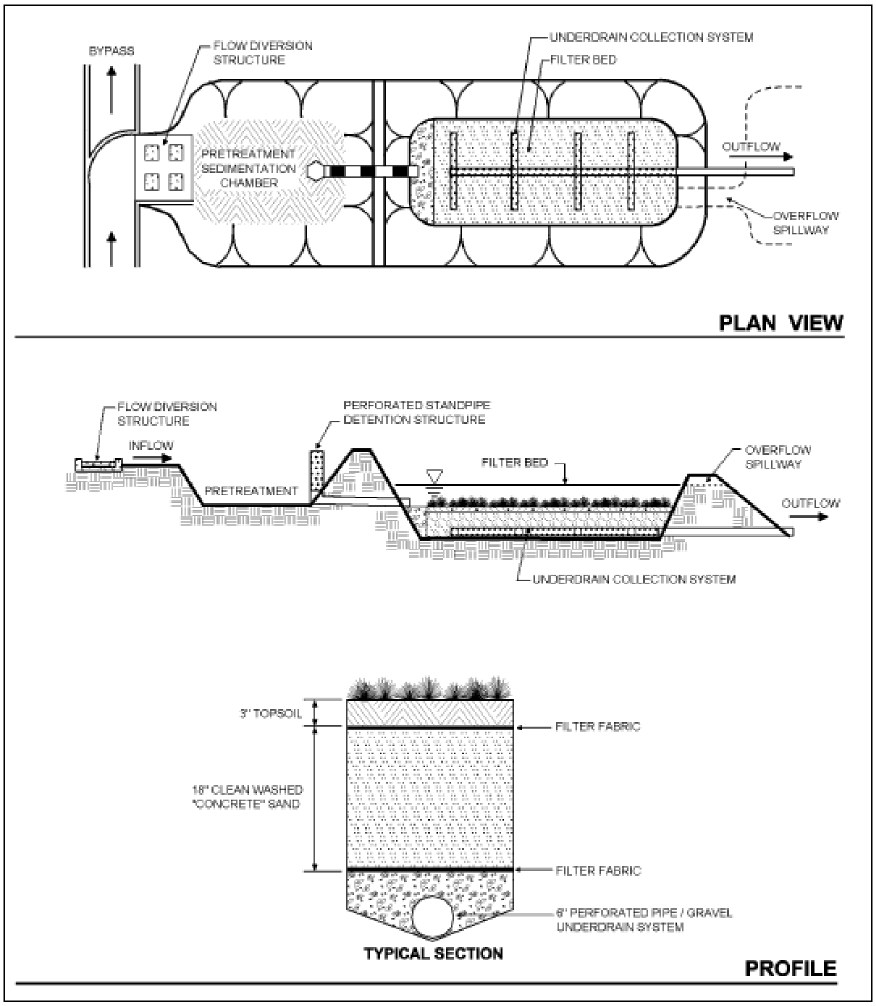
4. Calculate the total area occupied by the BMP ($A_{BMP}$):

$$\boldsymbol{A_{BMP} = \left[\sqrt{A_{fb}} + 2z\left(d_p/12 + f\right)\right]^2}$$
$$\boldsymbol{A_{BMP} = \left[\sqrt{212} + 2 \times 3(24/12 + 0.5)\right]^2}$$
$$\boldsymbol{A_{BMP} = 873\ square\ feet}$$

### *Other Design Considerations*

- A flow spreader should be installed at the inlet along one side of the filter to evenly distribute incoming runoff across the filter and to prevent erosion of the filter device
- A cleanout pipe should be tied into the end of all underdrain pipe runs

**Figure 17: Schematic of a Sand Filter**

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# Appendix D

# CCH Rules Relating to Storm Drainage Standards

# RULES RELATING TO STORM DRAINAGE STANDARDS

**JANUARY 2000**

**Department of Planning and Permitting**
**City and County of Honolulu**
**Honolulu, Hawaii**

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Department of Planning and Permitting
City and County of Honolulu

# RULES RELATING TO

# STORM DRAINAGE STANDARDS

Adopted October 4, 1999
Effective January 1, 2000

Amended Section 1-4 and
Plates 1, 2, and 6
November 27, 2010
Effective May 1, 2011

Amended Page ii,
Sections 1-1, 1-2, 1-3 and
Section 1-5
December 12, 2012
Effective June 1, 2013

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**DEPARTMENT OF PLANNING AND PERMITTING**
**CITY AND COUNTY OF HONOLULU**

**RULES RELATING TO STORM DRAINAGE STANDARDS**

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# RULES OF THE DEPARTMENT OF PLANNING AND PERMITTING RELATING TO STORM DRAINAGE STANDARDS

## §1-1 PURPOSE

These Rules address requirements for both storm runoff quantities for flood control as well as storm runoff quality and reflect the [most] recent changes to Federal, State, and County requirements related to the quality of storm water discharges. By establishing criteria to address water quality, the City and County of Honolulu continues its efforts in complying with Federal Regulatory requirements to control the discharge of pollutants in storm water as specified in the Clean Water Act as amended by the Water Quality Act of 1987.

These standards are not intended to limit the initiative and resourcefulness [of the engineer] in developing drainage plans, or be viewed as maximum limits in design criteria. More stringent criteria should be used where reasonable.

*[Eff: June 1, 2013]* (*Auth: Sec 14-12.31, ROH*) *(Imp: Sec14-12.31, ROH)*

## §1-2 MODIFICATIONS

A. The Director may modify provisions of these rules whenever:

   1. Full conformance to these rules is not achievable because of the size and shape, location or geological or topographical conditions, or land uses.

   2. The project provides for adequate storm water controls to mitigate adverse downstream impacts related to runoff flows and water quality; complies with Subdivision Rules and Regulations and the Land Use Ordinance; and covenants or other legal provisions are provided as needed, to ensure continued conformity to and achievement of mitigation measures; and

   3. The modification is reasonably necessary and not contrary to the intent and purpose of these rules.

B. Modification requests must be in writing and substantiated by facts presented with the request.

C. Before granting any modification, the Director may consult with the Departments of Design and Construction, Environmental Services, Facilities Maintenance, Parks and Recreation, Transportation Services, Board of Water Supply or any other appropriate agency for review and recommendation.

*[Eff: June 1, 2013] (Auth: Sec 14-12.31, ROH) (Imp: Sec14-12.31, ROH)*

## §1-3 DEFINITIONS

As used in these Rules, the following definitions shall apply unless the context indicates otherwise:

"Best Management Practices" or "BMPs" means pollution control measures, applied to nonpoint sources, on-site or off-site, to control erosion and the transport of sediments and other pollutants, which have an adverse impact on waters of the state. BMPs may include a schedule of activities, the prohibition of practices, maintenance procedures, treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, or drainage from raw material storage.

"Biofiltration" means the simultaneous process of filtration, adsorption and biological uptake of pollutants in stormwater that takes place when shallow-depth runoff flows slowly over and through vegetated areas.

"City" means the City and County of Honolulu.

"Department" means the Department of Planning and Permitting, City and County of Honolulu.

"Department of Health" or "DOH" means the Clean Water Branch, Department of Health, State of Hawaii, the water pollution regulatory agency of the state.

"Design Engineer" means a licensed civil engineer in the State of Hawaii.

"Development" means land which is being developed or developed lands.

"Director" means the Director of the Department of Planning and Permitting.

"Disturbed Area" means the area of the project that is expected to undergo any disturbance, including, but not limited to excavation, grading, clearing, demolition, uprooting of vegetation, equipment staging, and storage areas. Areas which are cleared, graded, and/or excavated for the sole purpose of landscape renovation or growing crops are not included in the disturbed area quantity. This exemption does not extend to the construction of buildings and roads of agriculture-related operations that disturb one (1) acre or more.

"Engineering Control Facility" means any drainage device such as a basin, well, pond, ditch, dam, or excavation used for the temporary or permanent storage of storm water by means of detention, retention, divergence, or infiltration for the purpose of reducing storm water volume and/or peak storm discharge flows, and which may provide gravity settling of particulate pollutants. It includes, but is not limited to, detention ponds, retention ponds, infiltration wells or ditches, holding tanks, diversion ditches or swales, drainpipes, check dams, and debris basins.

"EPA" means United States Environmental Protection Agency.

"Evapotranspiration" means the combined loss of water into the atmosphere by evaporation (water changing from a liquid to a vapor from soil, water, or plant surfaces) and transpiration (water that is taken up by plant roots and transpired through plant tissue and leaves).

"Flood" or "flooding" means the inundation to a depth of three inches or more of any property not ordinarily covered by water. The terms do not apply to inundation caused by tsunami wave action.

"Impervious Surface" means a surface covering or pavement of a developed parcel of land that prevents the land's natural ability to absorb and infiltrate rainfall/storm water.

"Infiltration" means the downward migration of surface water (i.e., runoff) through the planting soil (if present) and into the surrounding *in situ* soils and ultimately into groundwater.

"Low Impact Development, or LID" means a storm water management strategy that seeks to maintain or restore the natural hydrologic character of the site, reduce off-site runoff, improve water quality, provide groundwater recharge, and mitigate the impacts of increased runoff and storm water pollution. LID comprises a set of site design approaches and integrated management techniques that promote the use of natural systems for infiltration, evapotranspiration, treatment, and use of rainwater.

"Maximum Extent Practicable" or "MEP" means economically achievable measures for the control of the addition of pollutants from existing and new categories of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint source pollution control practices, technologies, processes, siting criteria, operating methods or other alternatives.

"National Pollutant Discharge Elimination System permit" or "NPDES permit" means the permit issued to the City pursuant to *Title 40, Code of Federal Regulations, Part 122,* Subpart B, Section 122.26(a) (1) (iii), for storm water discharge from the City's separate storm sewer systems; or the permit issued to a person or property owner for a storm water discharge associated with industrial activity pursuant to *Title 40, Code of Federal Regulations, Part 122*, Subpart B, Section 122.26(a) (1) (ii), or other applicable section of Part 122; or the permit issued to a person or property owner for the discharge of any pollutant from a point source into the state waters through the City's separate storm sewer system pursuant to *Hawaii Administrative Rules*, Chapter 11-55, "Water Pollution Control".

"New Development" means land disturbing activities; structural development, including construction or installation of a building or structure, the creation of impervious surfaces; and land subdivision.

"Redevelopment" means development that would create or add impervious surface area on an already developed site.

"Site Design Strategies" means LID design techniques that are intended to maintain or restore the site's hydrologic and hydraulic functions with the intent of minimizing runoff volume and preserving existing flow paths.

"Source Control BMPs" means low-technology practices designed to prevent pollutants from contacting storm water runoff or to prevent discharge of contaminated runoff to the storm drainage system.

"Storm water" means storm water runoff, surface runoff, street wash, or drainage and may include discharges from fire fighting activities.

"Treatment Control BMPs" means engineered technologies designed to remove pollutants from storm water runoff prior to discharge to the storm drain system or receiving waters.

*[Eff: June 1, 2013] (Auth: Sec 14-12.31, ROH) (Imp: Sec14-12.31, ROH)*

## §1-4 SECTION I - STANDARDS FOR FLOOD CONTROL

Standards and regulations for flood control are adopted to protect life and property during intense storms. Small storms that occur frequently usually do not cause significant property damages or loss of life, therefore, peak runoff from large storms are regulated for flood control.

The data from *85* U.S. Geological Survey (USGS) *stream flow gauges on the Island of Oahu* form the basis for Plate 6, "Design Curves for Peak Discharge vs. Drainage Area". The rainfall data on Plates 1 and 2 are from the *National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Silver Spring, Maryland, 2009.* Rainfall data on Plates 1, 2 and 6 will be updated periodically and such updates will automatically be incorporated into these rules when the updates are adopted by the Department. *[Eff: ] (Auth: Sec 14-12.31,ROH) (Imp: Sec 14-12.31.ROH)*

APR 0 8 2011

### §1-4.1 PART I - HYDROLOGIC CRITERIA

A. RECURRENCE INTERVAL

1. For drainage areas of 100 acres or less, Tm (recurrence interval) = 10 years, unless otherwise specified.

2. For drainage areas of 100 acres or less with sump, or tailwater effect and for the design of roadway culverts and bridges, Tm (recurrence interval) = 50 years.

3. For drainage areas greater than 100 acres and all streams, design curves based upon the U.S. Geological Survey data on flood magnitude and frequency, Tm (recurrence interval) = 100 years.

4. Interim measures for areas where downstream facilities are inadequate shall be reviewed on a case-by-case basis.

B. RUNOFF QUANTITY

1. For drainage areas of 100 acres or less, the rational method shall be used.

2. For drainage areas greater than 100 acres:

   a. Plate 6 titled, "Design Curves for Peak Discharge vs. Drainage Area" should be used to determine the 100-year peak discharge.

   b. *Modifications from the Plate 6 peak discharge values may be used if the Design Engineer can justify more acceptable values and it is approved by the Director.*

   *[Eff:* APR 0 8 2011 *] (Auth: Sec 14-12.31,ROH) (Imp: Sec 14-12.31.ROH)*

3. For drainage areas where downstream capacities are inadequate to accommodate runoff quantity identified above, runoff shall be limited to pre-development conditions or as specified in the General Conditions.

## C. RATIONAL METHOD

The formula Q = CIA shall be used to determine quantities of flow rate, in which

Q = flow rate in cubic feet per second;
C = runoff coefficient;
I = rainfall intensity in inches per hour for a duration equal to the time of concentration; and
A = drainage area in acres.

### 1. RUNOFF COEFFICIENT

The runoff coefficient shall be determined from Table 1 for agricultural and open areas and from Table 2 for built-up areas. It shall be based on the ultimate use of the project drainage area. For distinctive composite drainage areas, a weighted value of runoff coefficient shall be used.

For interim drainage measures, existing upstream land use conditions may be used to size interim measures as long as ultimate drainage requirements can be met when downstream restrictions are removed.

### 2. TIME OF CONCENTRATION

a. Determine overland flow time from Plate 3 generally for paved, bare soil and grassed areas.

b. Determine flow time over small agricultural areas with well-defined divides and drainage channels from Plate 5.

1) Use upper curve for well-forested areas, representing

$$Tc = 0.0136\ K^{0.77}$$

2) Use lower curve for areas with little or no cover, representing

$$Tc = 0.0078\ K^{0.77}$$

c. In case of uncertainty, check the time of concentration by dividing the estimated longest route of runoff by the appropriate runoff velocity from Table 3.

### 3. RAINFALL INTENSITY

The design rainfall intensity of a drainage area shall be determined by the following procedure:

a. Select the appropriate 1-hour rainfall value from Plate 1 or Plate 2 for the design recurrence interval.

b. Enter Plate 4 with the rainfall intensity duration equal to the required time of concentration, select the corresponding correction factor, and multiply the 1-hour rainfall value by the factor to obtain the design rainfall intensity.

## D. HYDROLOGIC STUDIES

Since 1959, the City and County of Honolulu and the U.S. Geological Survey have participated in a cooperative program for the collection of special stream flow data. This program included the installation of additional stream gaging stations and crest-stage gages. With the additional hydrologic data supplementing the data from the existing gaging stations, it was anticipated that more would be known of the effects of exposure, altitude, basin slope, basin shape and degree of urbanization on stream runoff on Oahu.

The U.S. Geological Survey developed flood-frequency curves for 74 gaging stations on Oahu by using the log Pearson Type III distribution (U.S. Water Resources Council, 1977, Bulletin 17A). The length of record for the individual stations ranged from 10 to 60 years. In order to furnish data at ungaged sites, they attempted to regionalize the available data by the use of multiple-regression techniques. In the study, a regional analysis was made by using these techniques to relate floodflows to basin and climatic characteristics. The results are contained in the *U.S. Geological Survey Water-Resources Investigations 80-45 Report, An Analysis of the Magnitude and Frequency of Floods on Oahu, Hawaii,* dated June 1980. The results were subsequently updated.

The U.S. Geological Survey and City have further extended the data to facilitate the determination of peak discharge values for the design of drainage facilities by developing Plate 6, Design Curves for Peak Discharge vs. Drainage Area. The curves are based upon the 100-year recurrence interval data. For clarification, the boundaries between the groups shown on Plate 6 are as follows:

| **Group Boundary** | **Location** |
|---|---|
| A and B | Between Oio Stream and Malaekahana Stream and along Koolau Range Ridge. |
| B and C | Between Honouliuli Stream and Waikele Stream, along Waianae Range Ridge, and between Makaleha Stream and Kaukonahua Stream. |

The rainfall data shown on Plates 1 and 2 have been updated from the *Rainfall Frequency Study for Oahu*, Department of Land and Natural Resources, Division of Water and Land Development, State of Hawaii, dated 1984.

## §1-4.2 PART II - DESIGN STANDARDS

### A. GENERAL CONDITIONS

The design and capacity of a drainage system shall be predicated on the following conditions:

1. On the basis of the runoff resulting from the selected design storm, the system shall dispose of surface runoff and subsurface water without damage to street facilities, structures or ground and cause no serious interruption of normal vehicular traffic.

2. Runoff exceeding the design storm must be disposed of with the least amount of interruption to normal traffic and minimum amount of damage to surrounding property.

3. System must have maximum reliability of operation with minimum maintenance and upkeep requirements.

4. System must be adaptable to future expansion, if necessary, with minimum additional cost.

5. Where sump conditions exist, a safety measure such as an overflow swale shall be provided to prevent flooding of adjacent lots in the event the design capacity of the closed conduit is exceeded. Floor levels of homes adjoining sumps shall be a minimum of 3 feet above the low point on roadway.

6. Lots abutting streams and open channels may be graded to drain towards the waterway.

7. In general, natural gullies, waterways, streams and tributaries shall not be replaced with a closed system except at roadway crossings.

8. Roadway culverts and bridges shall be designed to pass the design flow under open channel hydraulic analysis with a minimum freeboard as specified in the attached freeboard chart. Multiple span road crossings shall have minimum clear spans of 30 feet, unless otherwise permitted by the Director. Where possible, the roadway shall be designed to form a sag vertical curve with a low point at the waterway crossing with minimum grades to confine and control overflow at the crossing. Whenever the difference in elevations of the roadway and water surface is such that there could be a deep fill, the roadway culvert or bridge shall be designed to include available headroom up to five feet from the water surface to the soffit of the culvert or bridge. After this headroom requirement is fulfilled, fill material may be used to meet roadway elevations.

9. Outlets for enclosed drains emptying into open channels shall be designed to point downstream at an angle of 45 degrees.

10. Where groundwater is encountered, or may be present during wet weather, subsurface drains shall be installed wherever recommended by the Design Engineer, or the Director.

11. New developments shall provide adequate drainage capacity to accommodate the offsite design storm entering the development site.

12. When downstream drainage systems cannot accommodate peak runoff rates from design storms, runoff rates discharged downstream from new developments will be limited to predevelopment values unless improvements to the downstream system are made.

13. Runoff volume from the design storm shall be limited to predevelopment values unless it can be shown that the runoff can be safely conveyed through existing or planned conveyances, the increased volume would not have adverse impacts downstream, and provided further that the final receiving waters are open coastal waters.

B. DESIGN COMPUTATIONS

The following data shall be submitted to the Director by the Design Engineer.

1. HYDRAULIC DESIGN DATA

a. Computations for runoff, conduit and channel sizes, slopes, losses, hydraulic gradient and other hydraulic characteristics and information pertinent to the system. Computations shall be properly arranged and presented in such a manner that they may be readily checked.

b. The following data shall be shown on the construction plans.

1) Design flow (Q), watershed area (A), roughness coefficient (n), and velocity (v), for all conduits and channels.

2) Hydraulic grade lines, including water surface elevation at each manhole and catch basin.

3) Building setback lines, where required.

4) Floodway/flood fringe boundary, as applicable.

c. When interim drainage measures are required due to restrictions in the downstream drainage systems, the following additional data shall also be provided:

1) Runoff rate using the design storm for existing upstream land use conditions.

2) Runoff volume using the design storm for existing upstream land use conditions.

3) Detention volume and discharge rate.

4) If necessary, capacity of downstream drainage systems.

2. STRUCTURAL DESIGN DATA

a. Structural design computations for all drainage structures other than pipes used within the limits of current loading tables and structures shown in the *"Standard Details for Public Works Construction"* for the City and County of Honolulu.

b. Information pertinent to the design, such as boring data, soils report, etc.

c. Upon the completion of construction of major structures, submit pertinent data such as pile driving logs, pile tip elevations, etc.

C. CLOSED CONDUITS

1. SIZES AND GRADIENTS

a. The size and gradient will be determined by the Manning Formula:

$$Q = A \frac{1.486}{n} R^{2/3} S^{1/2}$$

Q = flow, in cfs
A = area, in sq. ft.
R = hydraulic radius in ft.
S = slope, in ft./ft.
n = roughness coefficient (Manning)

Charts enabling direct solution of Manning formula are found on Plates 8 to 16.

b. The following limitations apply -

1) Minimum size pipe: 18 inches inside diameter

2) Minimum velocity: 2-1/2 feet per second

3). Pipe sizes should not decrease in the direction of the flow.

2. MATERIALS AND "n" VALUES

The following pipes are acceptable for storm drain construction together with the roughness coefficient to be used in the solution of the Manning Formula.

| Materials | n |
|---|---|
| Concrete | 0.013 |
| Cast Iron | 0.013 |
| Corrugated metal pipe (CMP) * | |
| Unpaved | 0.024 |
| 25% paved invert | 0.021 |
| Lower 50% paved | 0.018 |
| 100% paved | 0.013 |
| High Density Polyethylene (HDPE) * | 0.015 |

*Use of CMP or HDPE shall be permitted only when specifically approved for an installation by the Director in writing.

3. LOADING

a. Reinforced Concrete Pipes: Reinforced concrete pipes shall be constructed to American Society for Testing and Materials (ASTM) Specifications.

1) Minimum pipe cover in roadways, driveways and other areas with vehicular traffic shall be two feet.

Should there be a need for a pipe cover of less than 2 feet or should the design or construction method deviate from the Standards of the Department of Planning and Permitting, City and County of Honolulu, the Design Engineer shall submit a structural design for review and approval. The decision to allow such design will be made by the Director.

2) Minimum pipe cover in easement areas without vehicular traffic shall be 1'- 0".

3) Maximum permissible pipe cover will be determined from current loading tables in pipe handbooks for the respective pipes, using 120 lbs. per cu. ft. as the weight of earth.

4) All pipes shall be installed using a first class bedding trench condition. Proper foundations shall be provided for pipes. Pipes on unstable ground or fresh fill shall be supported by a method acceptable to the Director.

5) Drain pipes installed along the longitudinal axis of the roadway shall be located in the pavement area between curbs.

b. Other Closed Conduits. There shall be no minimum cover or maximum permissible depth requirements for closed conduits other than pipes except that such structures, shall be designed to support all loads that it shall be subjected to.

4. MANHOLES AND INLETS

a. Manholes:

1) Location. Manholes shall be located at all changes in pipe size and changes in alignment or grade and at all junction points.

2) Spacing. Maximum manhole spacing shall be 250 feet for pipes 36 inches or less in diameter, or box drains with the smallest dimension less than 36 inches. Maximum manhole spacing for larger pipes and box drains shall be 500 feet.

3) Special Details. Bottoms of manholes and inlets serving as manholes shall be shaped to channelize flow and sloped with slope of pipe as shown in the "Standard Details" of the Department of Planning and Permitting, City and County of Honolulu.

b. Inlets (Catch Basins):

1) Location. Inlets shall be located at the upstream side of intersections, in sumps and where required by quantity of flow.

2) Spacing. Maximum spacing shall be 500 feet.

3) Types. For gutter grades up to 4 percent, standard 10-foot curb inlets with a depressed gutter shall be used. For grades 4 percent and greater, 10-foot long deflector inlets shall be used.

4) Capacity. Inlet capacities as follows, are acceptable:

| | Type | Gutter Grade | cfs |
|---|---|---|---|
| a. | Std. depressed gutter inlet | 0.4% | 6 |
| | | 4.0% | 4 |
| | | sump | 10 |
| b. | Deflector inlet | 4.0% | 4.5 |
| | | 12.0% | 5.5 |
| | Greater than | 12.0% | 6 max |

5) Gutter Flow. The gutter flow shall not exceed a width of 8 feet.

5. PIPE SYSTEM ANALYSIS

Generally speaking, the pipe system shall be analyzed by sections, that is, outlet-to-manhole, manhole-to-manhole or manhole-to-inlet. The analysis shall start at the lowest point of flow and continued upstream. The design flow shall be used in determining whether the pipe will flow full or partially full. Full consideration of the tailwater, entrance and critical flow conditions shall be made.

a. Pipe Flowing Full. If the conditions show that the pipe section will flow full, the principles of flow of water in closed conduits shall be used. The water surface elevation of the upstream manhole is determined by adding the pipe friction and manhole losses to the water surface elevation of the downstream manhole or the beginning elevation as previously stated.

b. Pipe Flowing Partially Full. If the conditions show that the pipe section will flow partially full, the principles of flow water in open channels shall be used. The pipe partially full condition may be determined from the *Pipe Flow Charts* on Plates 8 to 16. The tailwater condition must also be considered in this determination.

c. Manhole Losses.

1. For junction conditions such as drop manholes, or where the outflow line deflects more than 10 degrees with any inflow line, the hydraulic grade shall be determined by applying the “Entrance Control loss” and “C & D losses” (where applicable), or “A, B, C & D losses”, whichever is greater.

2. For junction conditions where the outflow line deflects 10 degrees or less with the inflow line, the hydraulic grade shall be determined by applying the “A, B, C & D losses”.

6. HYDRAULIC GRADIENT COMPUTATIONS

The hydraulic gradient is: (1) a line connecting points to which water will rise in manholes and inlets throughout the system during the design flow; or (2) the level of flowing water at any point along an open channel.

It shall be determined starting at the downstream end of the proposed drainage system and proceeding upstream by adding the friction losses and manhole losses of the system.

The hydraulic gradient for the design flow shall be at least 1 foot below the top of the manhole cover, or 1 foot below the invert of catch basin inlet opening.

a. Beginning Elevation. The elevation of the hydraulic gradient at the downstream end shall be selected according to the following conditions:

1) Connection to existing drainage system - determined from the hydraulic gradient computations of the existing drain;

2) Discharge into a stream - determined from the flow conditions of the stream;

3) Submerged tailwater condition - begin at the tailwater elevation; and

4) Freefall condition (conduit) - begin at the crown of the proposed drain.

b. Friction Loss.

$h_f = S_f(L)$, where:

$h_f$ = head loss due to friction

$S_f$ = friction slope from Manning Formula

$$= \frac{(nv)^2}{2.208\ R^{4/3}},$$

$L$ = length of pipe or channel

The friction loss shall be calculated for the condition of the design flow, that is, pipe flowing full or partially full.

c. Manhole Losses.

Manhole losses shall be as shown on the charts, *Head Losses in Manholes* (Plates 17 and 18). The losses shall be evaluated with pipes flowing full in the vicinity of the manholes; and therefore the velocity shall be for the pipe flowing full. The curves on the charts show the various losses:

1) A curve - loss due to entrance and exit

2) B curve - velocity head

a. Where the downstream velocity exceeds the upstream velocity, the head loss shall be difference in velocity heads.

b. Where the downstream velocity is less than the upstream velocity, the velocity head loss shall be zero.

3) C curve - loss due to change in direction, taking the worst case for branches at a manhole.

4) D curve - loss due to incoming volume.

7. SPECIAL DETAILS

The following structures shall be installed where required:

a. Headwalls, aprons and cut-off walls at drain inlets and outlets.

b. Energy dissipators at outlets.

c. Debris and boulder control structures.

d. Guard rails or fences on channel walls, headwalls and inlets, where they present a hazard to vehicular traffic or pedestrians.

D. OPEN CHANNELS

1. CHANNEL SIZE

Use the Manning Formula to determine the required waterway areas where uniform flow can be assumed.

$$Q = AV \text{ and } V = \frac{1.486\, R^{2/3}\, S^{1/2}}{n}$$

A= area of flow, in square feet
V= velocity, in feet per second
n = roughness coefficient (Manning)
R= hydraulic radius, in feet
S= slope of the energy gradient, in feet per feet

The channel depth shall include design water depth and minimum freeboard allowances. Design water depth shall include rise in water surface caused by curves and junctions.

2. CHANNEL RIGHT-OF-WAY

The channel width shall be sufficient to provide the required waterway area for the design storm as determined by these standards. The total right-of-way shall include a 15-foot wide maintenance road along both banks where the top width of channel exceeds 50 feet, and along one bank where the top width is 50 feet or less. The maintenance road along the channel shall be topped with 6 inches of Asphalt Treated Basecourse (ATB) or Asphalt Concrete (AC). In lieu of a maintenance road, for normally dry channels, access ramps or other suitable alternative measures to facilitate maintenance may be provided.

3. PERMISSIBLE VELOCITIES AND "n" VALUES

Following is a list of "n" values for open channels and maximum permissible velocities. Maximum velocities shall be based upon design flow quantities.

| Unlined Channel | Manning "n" | Maximum Velocity (fps) |
|---|---|---|
| Rock | 0.030 | 10 |
| Ledge coral or limestone | 0.025 | 10 |
| Earth with vegetation (grassed) | 0.035 | 5 |
| **Lined Channels** | | |
| Conc. (trowel finish) | 0.013 | No limitation |
| Conc. (smooth wood forms) | 0.015 | No limitation |
| Gunite | 0.020 | 20 |
| Grouted Rip-rap & CRM (Cement Rubble Masonry) | 0.025 | 20 |
| Asphaltic Concrete | 0.015 | 20 |
| Corrugated Metal Flumes (Part-circle Sections) | 0.021 | 25 |

Note: Use of CMP shall be permitted only when specifically approved for an installation by the Director in writing.

a. Maximum design velocity for channels cut in earth shall not exceed 5 feet per second. The velocity shall be determined by using the natural existing slope of the waterway without utilizing grade transition structures to control the maximum slope for a given unlined channel cross-section and design flow.

b. Velocities between 5 feet per second and 10 feet per second will be permitted in materials, such as cemented gravel, hard pan, or mud rock, depending upon its hardness and resistance to scouring. Borings and samples shall be submitted for evaluation before velocities exceeding 5 feet per second will be permitted.

4. CHANNEL LINING

a. Earth channel shall be fully lined when velocities exceed 5 feet per second, unless otherwise permitted as previously noted above in Section D.3.b of §1-4.2 Part II - Design Standards.

b. All fill sections shall be lined. This lining shall be a complete lining including side slopes and invert with appropriate cut-off walls. If the invert of the channel is in a cut section, the invert slab may be omitted and appropriate cut-off walls provided at the toe of the side slope lining.

c. Where linings are required or used, the linings, shall be continuous. Lining of fill sections without continuing the lining out through cut sections in a channel will not be allowed unless adequate provisions are made to reduce the velocity from the lined section to meet the allowable velocity for the unlined section.

d. Total depth of channel lining will include design water depth and freeboard.

e. Attention shall be given to construction details of linings, such as thickness, reinforcement, expansion and construction joints, cut-off walls, watertight joints, and placement of reinforcement, etc. Where the channel discharges into streams or other channels outside of the limits of a development, velocity reducing and transition structures shall be constructed to minimize erosion and overtopping of banks and subsequent flooding of downstream areas.

f. Where velocities are supercritical, rectangular channels shall be used, unless otherwise permitted by the Director.

g. Earth channels shall be planted with vegetation, such as grass of a species not susceptible to rank growth.

5. FREEBOARD

In designing open channels, freeboard must be provided to allow for surface roughness, wave action, air bulking, and splash and spray. These phenomena depend on the energy content of flow. For water flowing at velocity **v** and depth **d,** the energy per foot of width per second is equal to $\mathbf{(wvd)\,(v^2/2g) = wdv^3/2g}$, where **w** is the unit weight of water.

Thus, this kinetic energy can be converted to potential energy to lift the water surface when flow is stopped or changing direction as a function of depth and velocity of flow. The U.S. Bureau of Reclamation has developed an empirical expression to express a reasonable indication of desirable freeboard in terms of depth and velocity as follows:

$$\text{Freeboard in feet} = 2.0 + 0.025\, v\, (d)^{1/3}$$

where **v** is the velocity in feet per second and **d** is the depth of flow in feet. The velocity of flow can be computed by dividing the design discharge by the cross-sectional area of flow. For convenience of application, the above expression is shown graphically in Plate 7.

6. JUNCTIONS

Junctions shall be designed to channel both flows as nearly parallel as possible to reduce velocity and momentum components, deposition of debris and erosion of banks.

7. BENDS AND SUPERELEVATIONS

Changes in the direction of flow shall be made with smoothly curved channel walls allowing for superelevation in water surface. Curves will nearly always require additional depth. Trapezoidal channels for supercritical velocities are not permitted. Curve radii should be sufficiently great to limit superelevation of the water surface to one foot above computed depth of flow or 10 percent of water surface width, whichever is the least. The amount of superelevation for simple curves may be determined as follows:

**a. Trapezoidal Channels:**

Subcritical velocity:

$$e = \frac{V^2(b + 2zd)}{(gR - 2zV^2)}$$

**b. Rectangular Channel:**

Subcritical velocity:

$$e = \frac{V^2 b}{gR}$$

Supercritical velocity:

$$e = \frac{2V^2 b}{gR}$$

Supercritical velocity - compound curve:

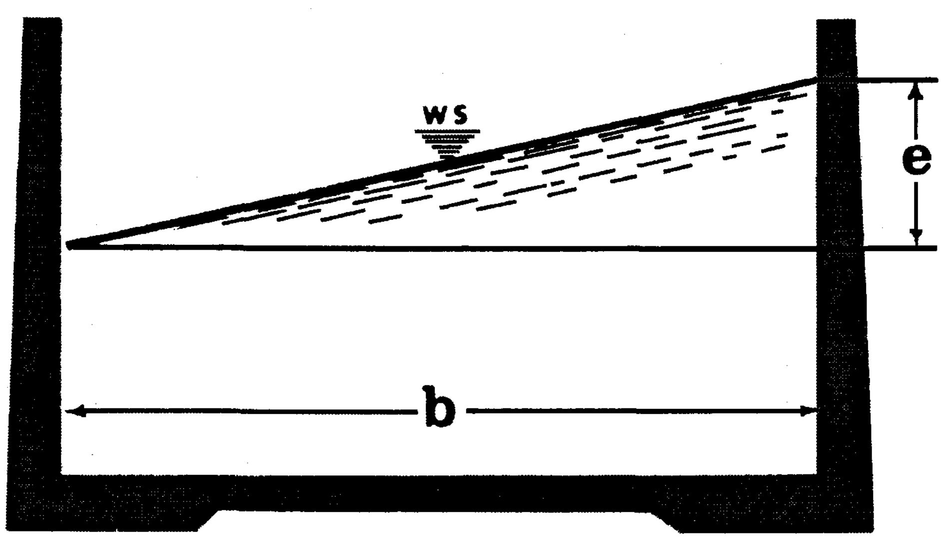
$$e = \frac{V^2 b}{gR}$$

The compound curve is a simple curve of radius R preceded and followed by a section of simple curve with radius of 2R and length of

$$\frac{b}{\tan \beta}, \text{ where } \sin \beta = \frac{(g d_m)^{1/2}}{V}$$

Where,

| | | |
|---|---|---|
| b | = | channel bottom width (ft) |
| d | = | normal depth (ft) |
| $d_m$ | = | mean depth (ft) |
| e | = | maximum difference in elevation of water surface between channel sides (ft) |
| g | = | acceleration due to gravity ($fps^2$) |
| R | = | radius of curve to centerline (ft) |
| V | = | normal velocity (fps) |
| z | = | co-tangent of bank slopes |




**Water Surface Superelevation Showing, "e"**

8. TRANSITIONS

a. The maximum angle between channel centerline and transition walls should be 12.5 degrees.

b. Sharp angles in alignment of transition structures should be avoided.

9. DEBRIS BARRIERS

Debris barriers should be provided upstream of the intake to prevent clogging.

10. DEBRIS BASINS

Where required by the Director, debris basins shall be provided upstream of the debris barrier. Debris basins shall also be provided at the intake of a drainage system when the upstream drainage area is undeveloped.

The volume of debris to be impounded shall be estimated based on the existing upstream land uses.

The basin design shall include an access ramp to the bottom of the basin for maintenance purposes.

11. ENERGY DISSIPATORS

Energy dissipators shall be used to dissipate energy where necessary, and to transition the flow from a lined channel to a normal flow in an unlined channel.

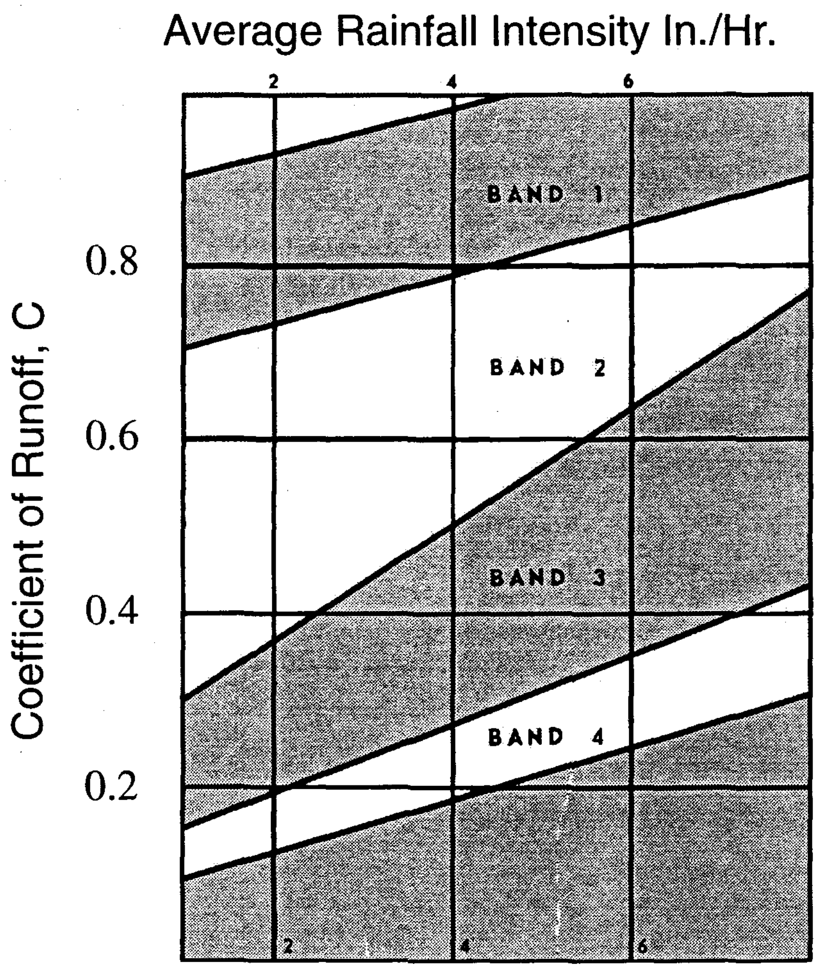
Energy dissipators may be any of the following types, such as the SAF basin, baffled chute, dentated sills, buckets, impact, hydraulic jump, or other approved designs.

*[Eff: JAN 01 2000] (Auth: Sec 14-12.31, ROH) (Imp: Sec14-12.31, ROH)*

§1-4.3 DESIGN CHARTS

**Table 1**

**RUNOFF COEFFICIENT FOR AGRICULTRUAL AND OPEN AREAS**




| | |
|---|---|
| Band 1 | Steep, barren, impervious surfaces |
| Band 2 | Rolling barren in upper band values, flat barren in lower part of band, steep forested and steep grass meadows |
| Band 3 | Timber lands of moderate to steep slopes, mountainous, farming |
| Band 4 | Flat pervious surface, flat farmlands, wooded areas and meadows |

## Table 2

### MINIMUM RUNOFF COEFFICIENTS FOR BUILT-UP AREAS

| | | |
|---|---|---|
| RESIDENTIAL AREAS: | C | = 0.55 to 0.70 |
| HOTEL-APARTMENT AREAS: | C | = 0.70 to 0.90 |
| BUSINESS AREAS: | C | = 0.80 to 0.90 |
| INDUSTRIAL AREAS: | C | = 0.80 to 0.90 |

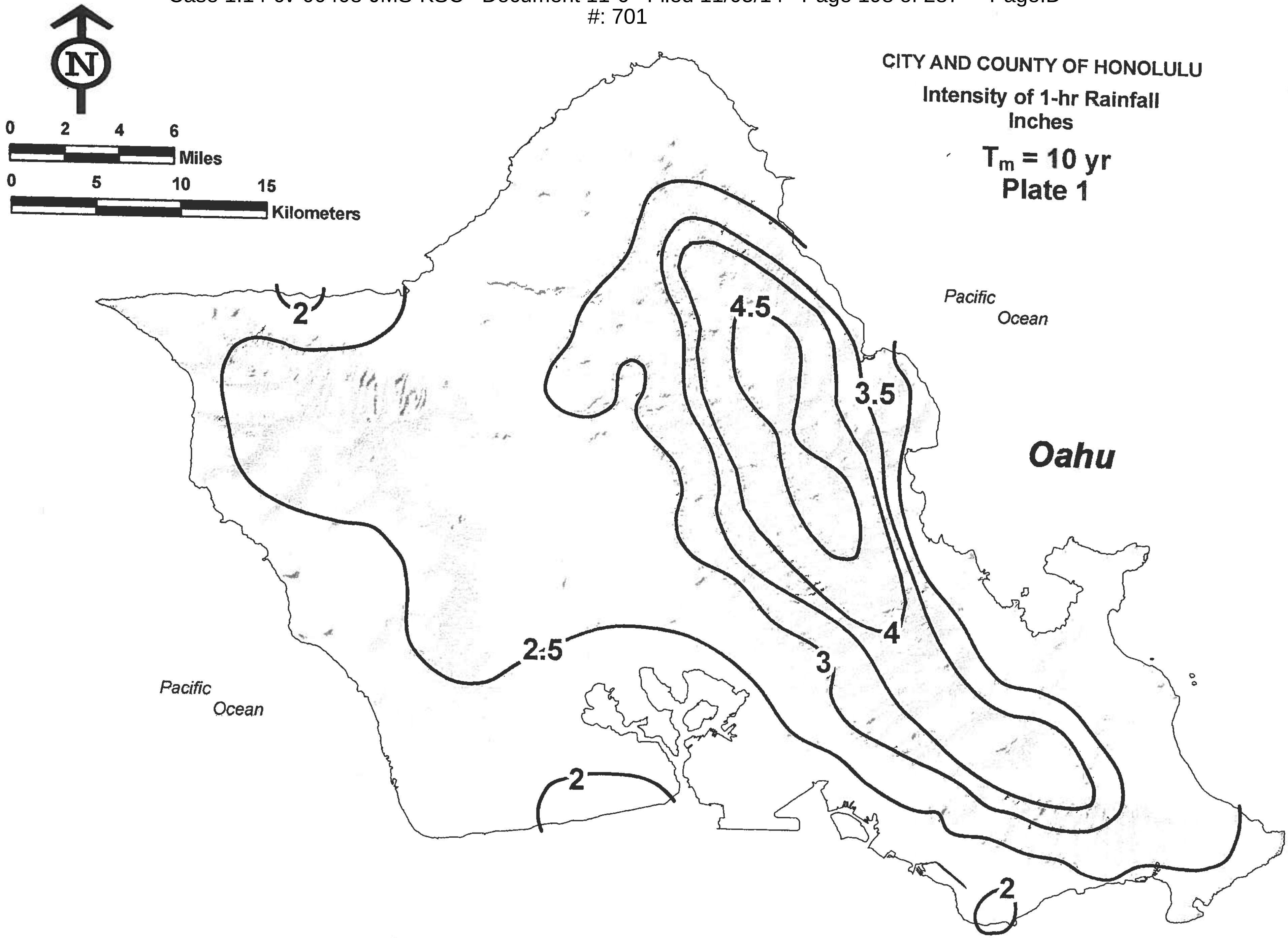
*The type of soil, the type of open space, and ground cover and the slope of the ground shall be considered in arriving at reasonable and acceptable runoff coefficients.*

## Table 3

### APPROXIMATE AVERAGE VELOCITIES OF RUNOFF FOR CALCULATING TIME OF CONCENTRATION

| TYPE OF FLOW | VELOCITY IN fps FOR SLOPES (in percent) INDICATED | | | |
|---|---|---|---|---|
| OVERLAND FLOW: | 0-3% | 4-7% | 8-11% | 12-15% |
| Woodlands | 1.0 | 2.0 | 3.0 | 3.5 |
| Pastures | 1.5 | 3.0 | 4.0 | 4.5 |
| Cultivated | 2.0 | 4.0 | 5.0 | 6.0 |
| Pavements | 5.0 | 12.0 | 15.0 | 18.0 |
| OPEN CHANNEL FLOW: | | | | |
| Improved Channels | Determine Velocity by Manning Formula | | | |
| Natural Channel* (not well defined) | 1.0 | 3.0 | 5.0 | 8.0 |

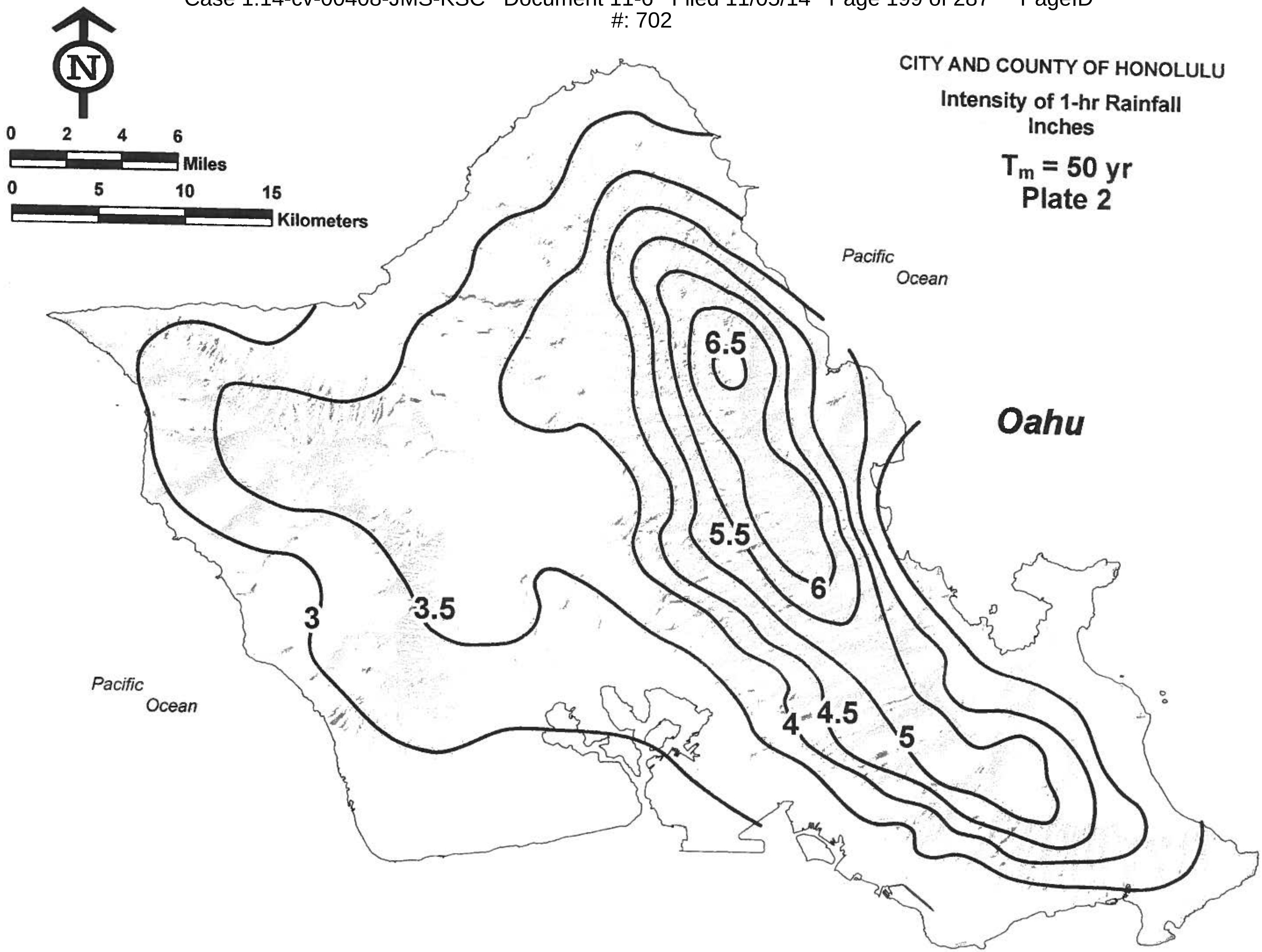
* *These values vary with the channel size and other conditions so that the ones given are averages of a wide range. Wherever possible, more accurate determinations should be made for particular conditions by Manning Formula or from Plate 5.*




23

[Eff: APR 08 2011] (Auth: Sec 14-12.31, ROH) (Imp: Sec 14-12.31, ROH)

Source: National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Silver Spring, Maryland, 2009



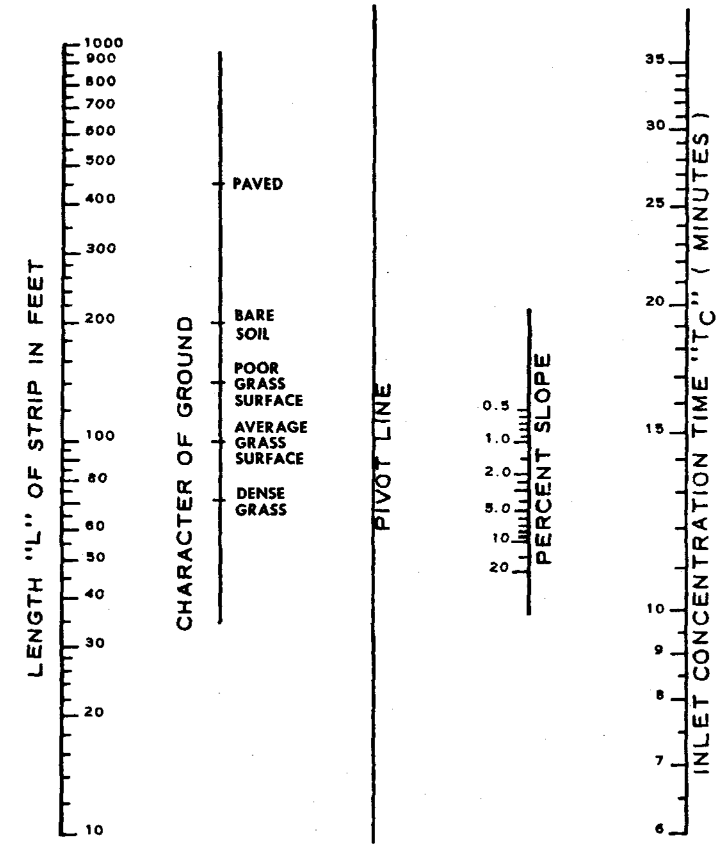

24

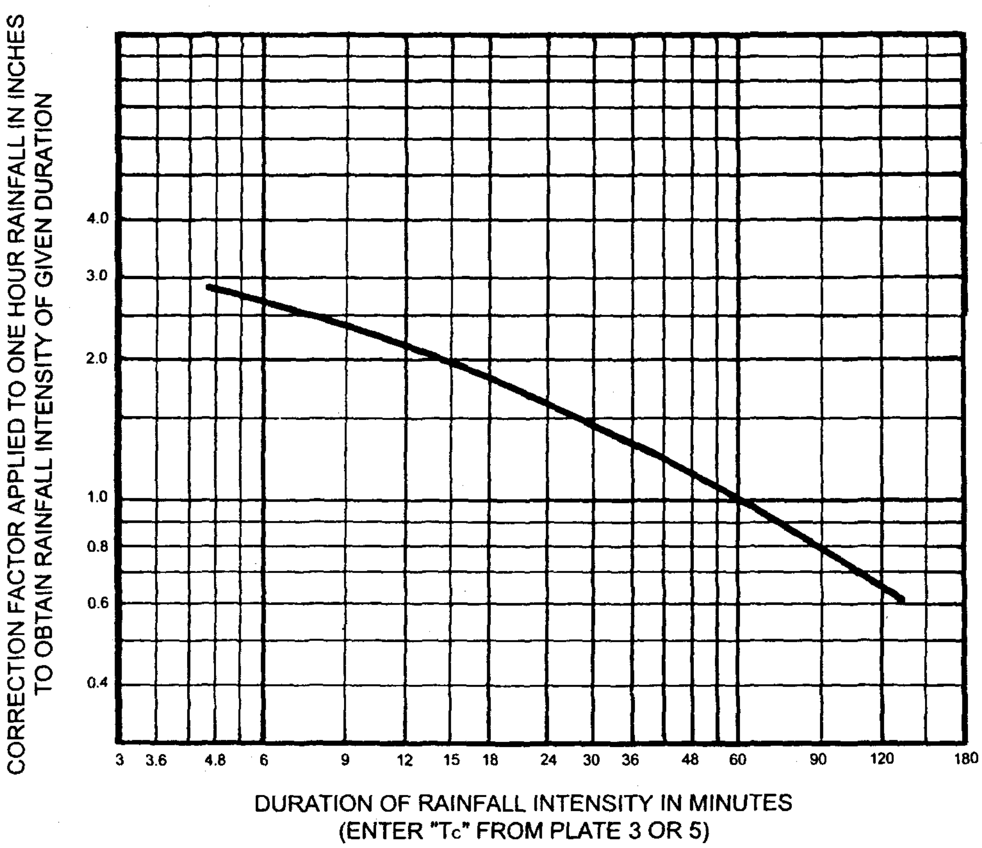
[Eff: APR 0 8 2011] (Auth: Sec 14-12.31, ROH) (Imp: Sec 14-12.31, ROH)

Source: National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Silver Spring, Maryland, 2009

# Plate 3

## Overland Flow Chart



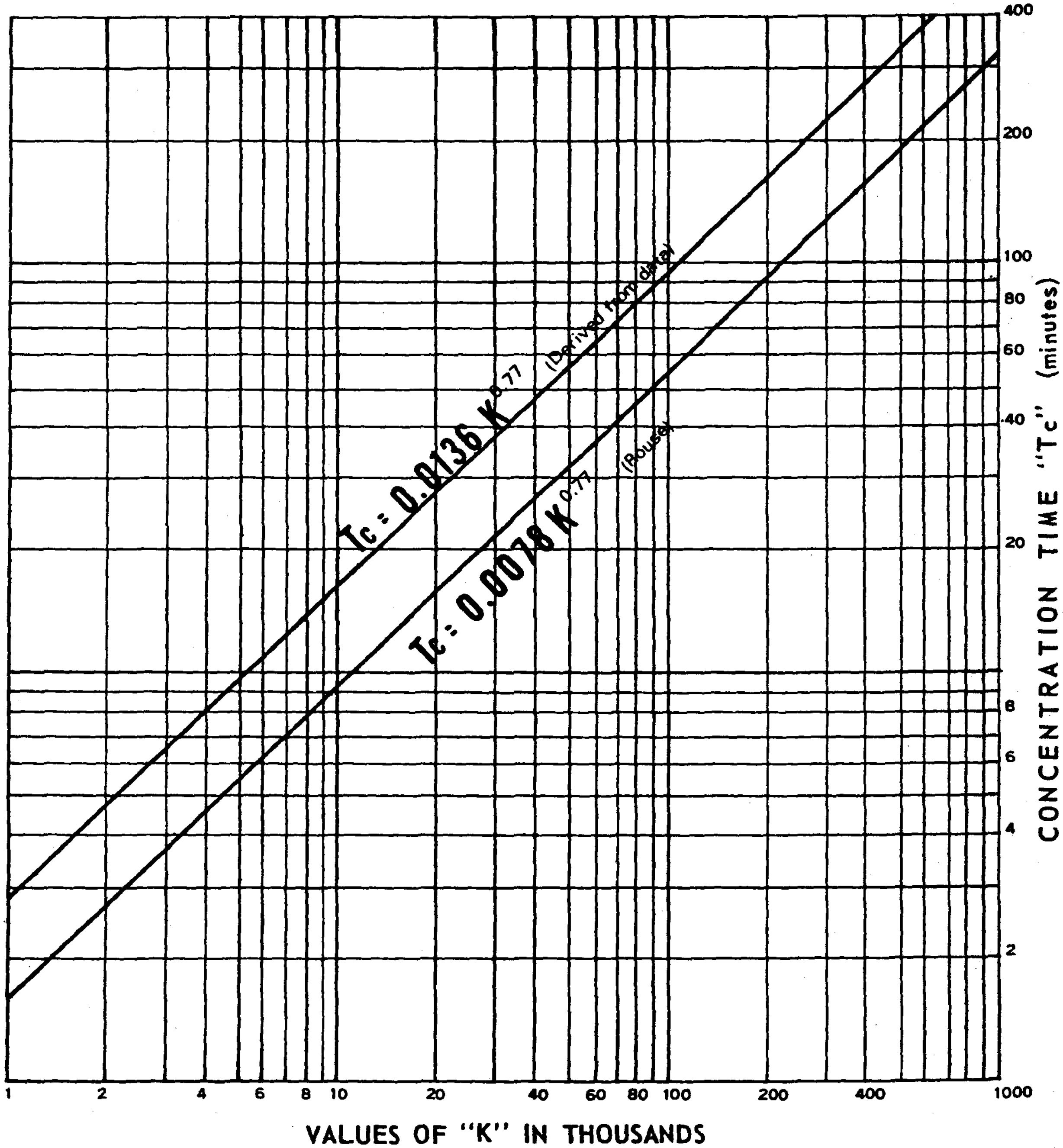

# Plate 4

**CORRECTION FACTOR**

FOR CONVERTING 1 HR. RAINFALL TO RAINFALL INTENSITY OF VARIOUS DURATIONS

TO BE USED FOR AREA LESS THAN 100 ACRES

(See Plate 6 for area more than 100 acres)




L = Maximum length of travel in feet

H = Difference in elevation between most remote point and outlet in feet.

S = Slope H/L

$$K = \frac{L}{\sqrt{S}} = \sqrt{\frac{L^3}{H}}$$

Use upper curve for well forested areas

Use lower curve for areas with little or no cover.

SOURCE: CITY PLANNING COMMISSION
graph from Hunter Rouse "Engineering Hydraulics."

NOTE: Use 5 minutes if Tc is 5 minutes or less.

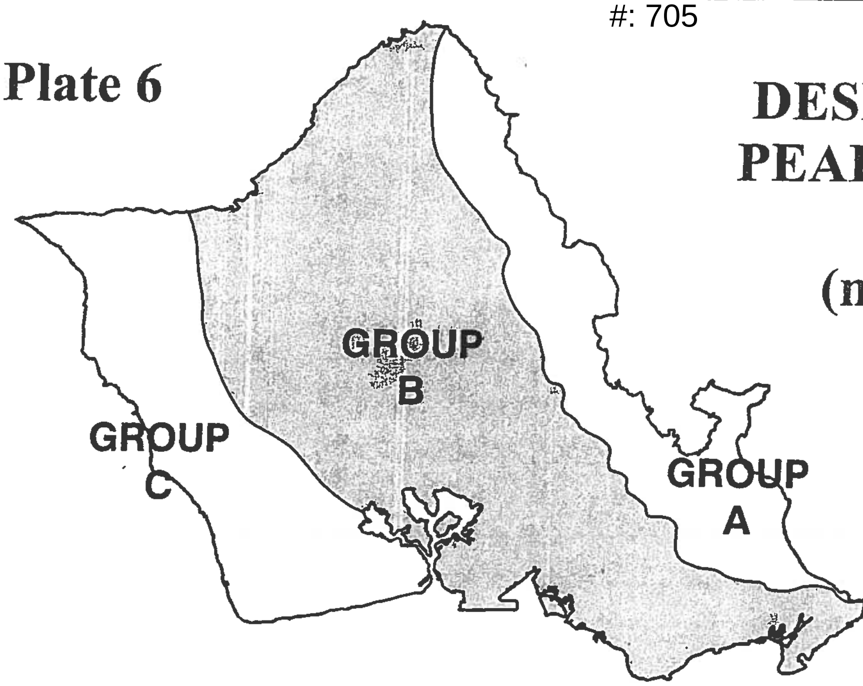
# Plate 5

# Time of Concentration

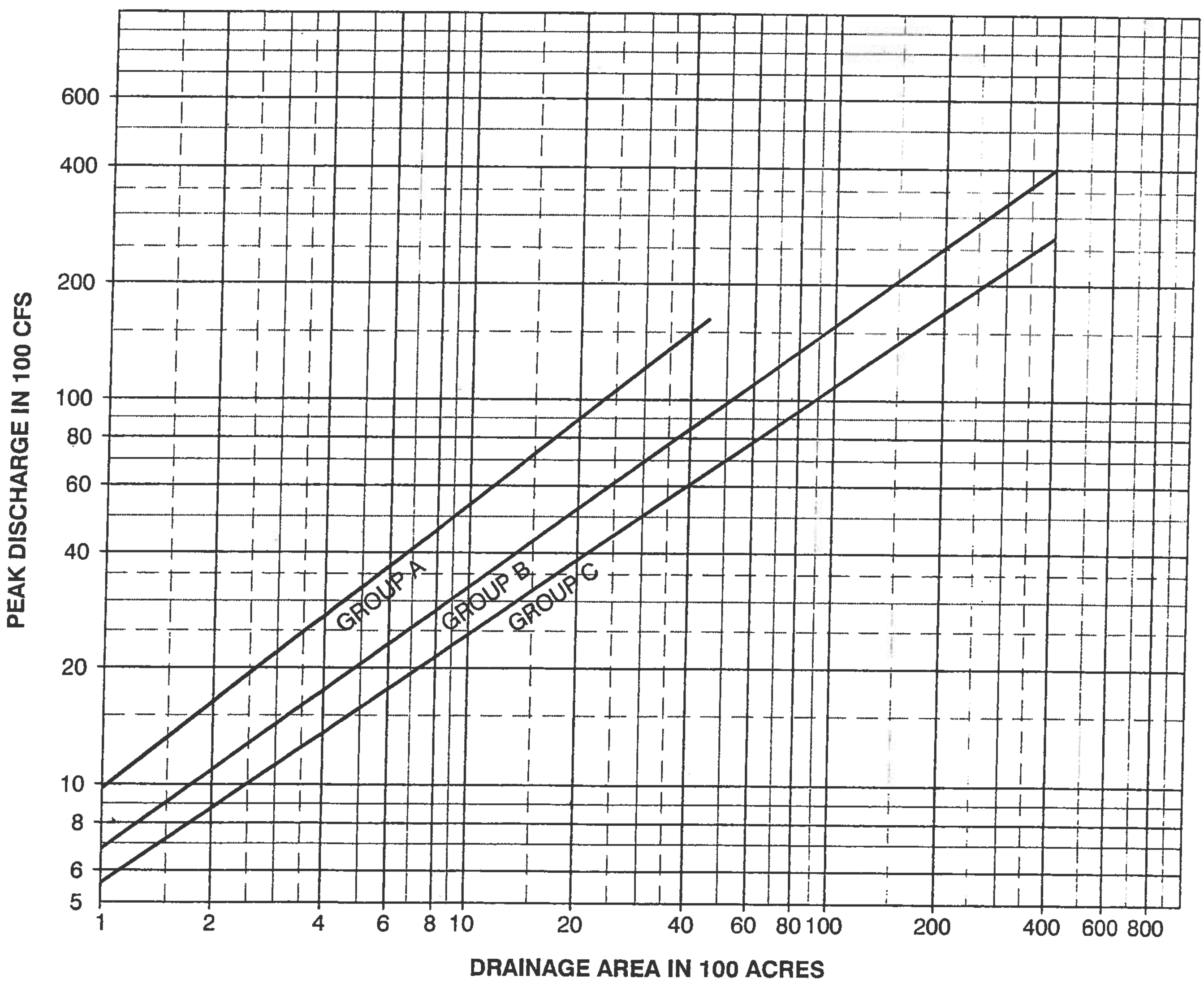
( OF SMALL AGRICULTURAL DRAINAGE BASIN )

**Plate 6**

# DESIGN CURVES FOR PEAK DISCHARGE VS. DRAINAGE AREA (more than 100 acres)




● CURVES ARE FOR STREAM CHANNELS AND DRAINAGE STRUCTURES.




SOURCE: DATA FROM U.S. GEOLOGICAL SURVEY
REV. FEB 2003.

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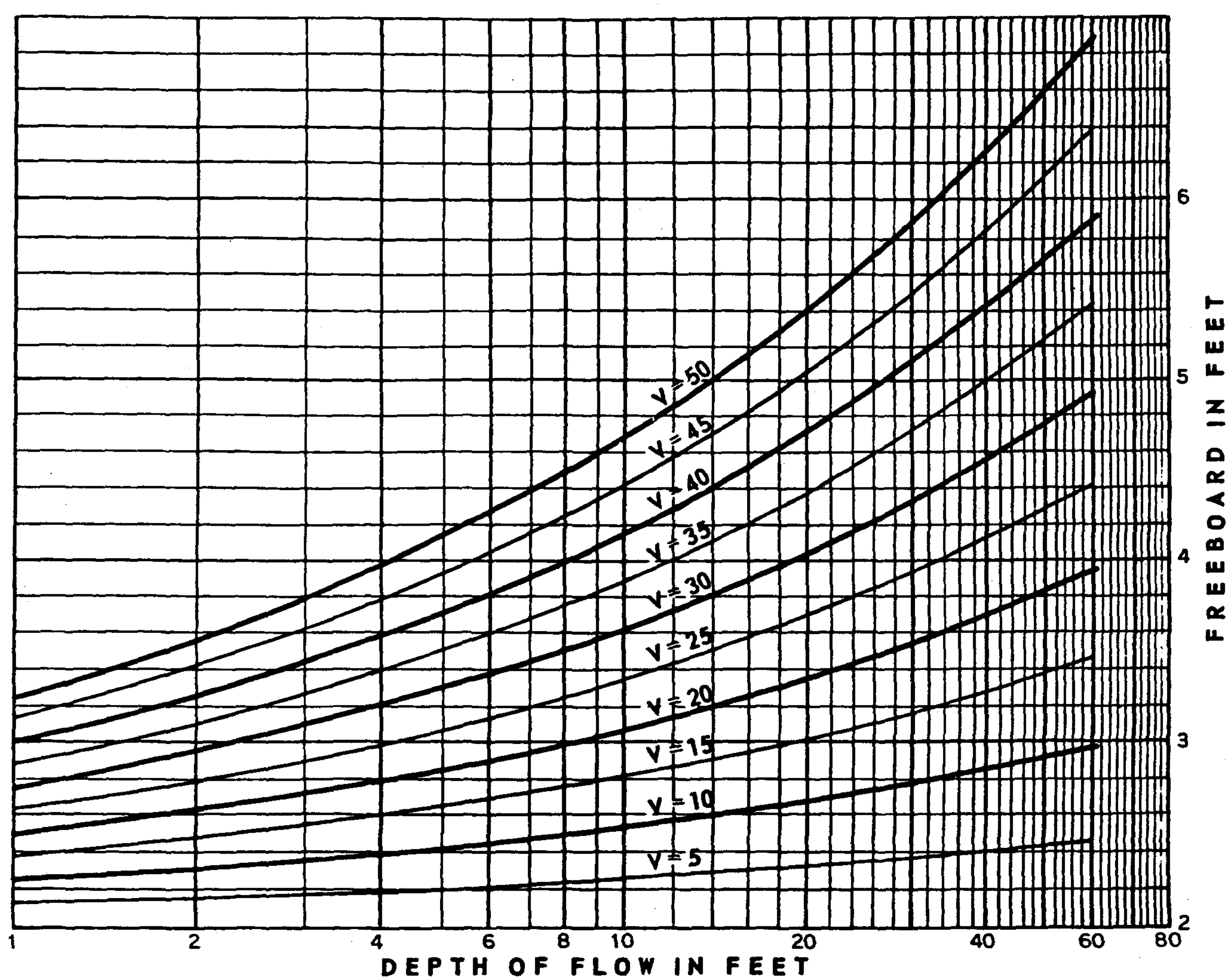
[Eff: APR 0 8 2011 ] (Auth: Sec 14-12.31, ROH) (Imp: Sec 14-12.31, ROH)

# FREEBOARD ALLOWANCES Plate 7

**FREEBOARD IN FEET:**

$$2.0 + 0.025\,V\sqrt[3]{d}$$

**Where V = Velocity, in feet per second**
**d = Depth of flow, in feet**



# Pipe Flow Charts

The following pipe flow charts have been derived by the *U.S. Public Roads Administration, Division Two, Washington, D.C.* These charts are designed to enable direct solution of the Manning formula for circular pipes flowing full and for uniform part-full flow in circular pipes. The "n" scales of 0.013 and 0.024 have been inserted to facilitate the use of these charts for storm drainage systems in Honolulu. The following examples help explain the use of the pipe flow charts.

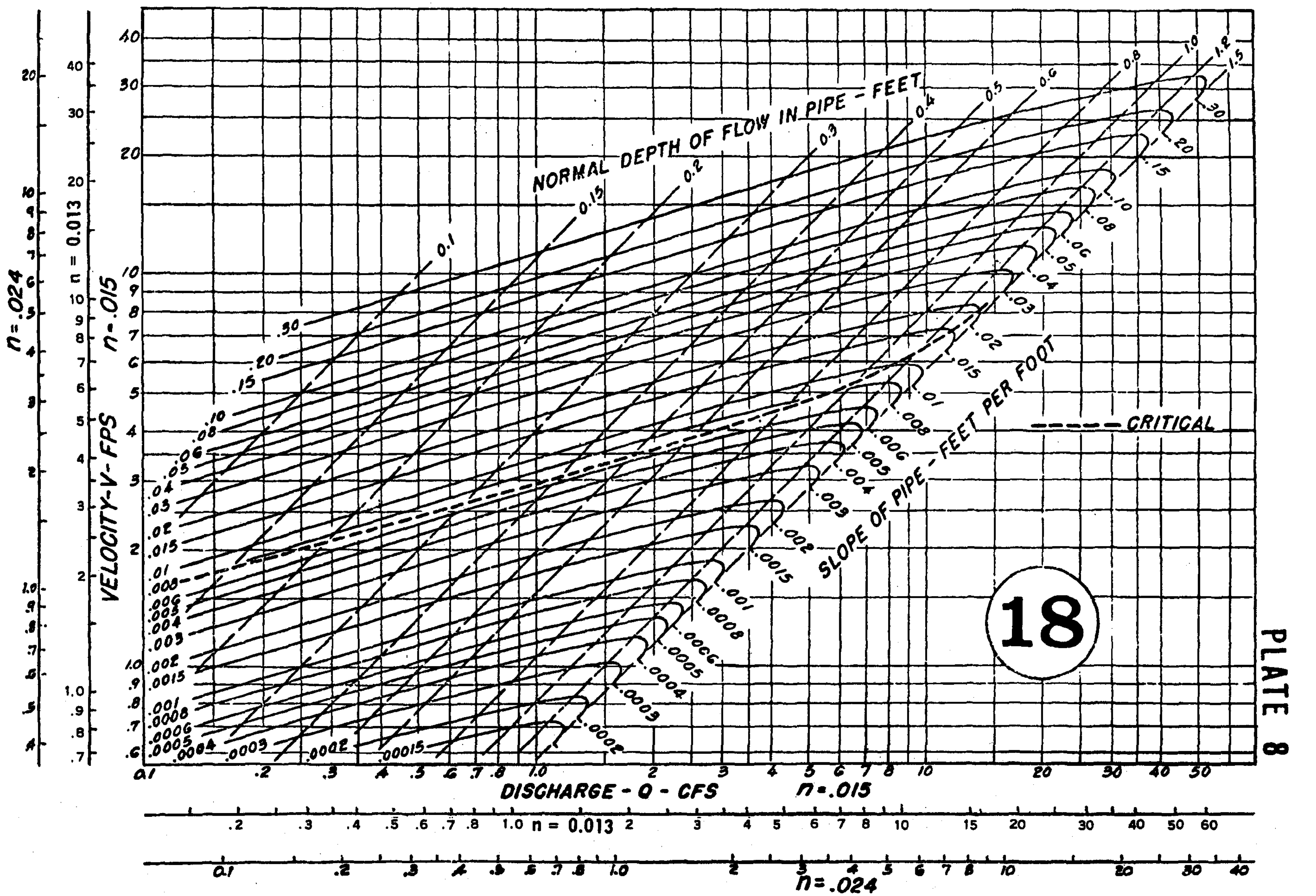
## EXAMPLES

**A.** Determine the depth and velocity of flow in a long 30-inch pipe, n = 0.013, on a 0.5 percent slope ($S_o = 0.005$) discharging 25 cfs. Enter the 30-inch diameter chart at Q = 25 on n = 0.013 scale, follow up to intersection with the line for slope $S_o = 0.005$, and read normal depth $d_n = 1.8$ feet and normal velocity V = 6.7 fps.

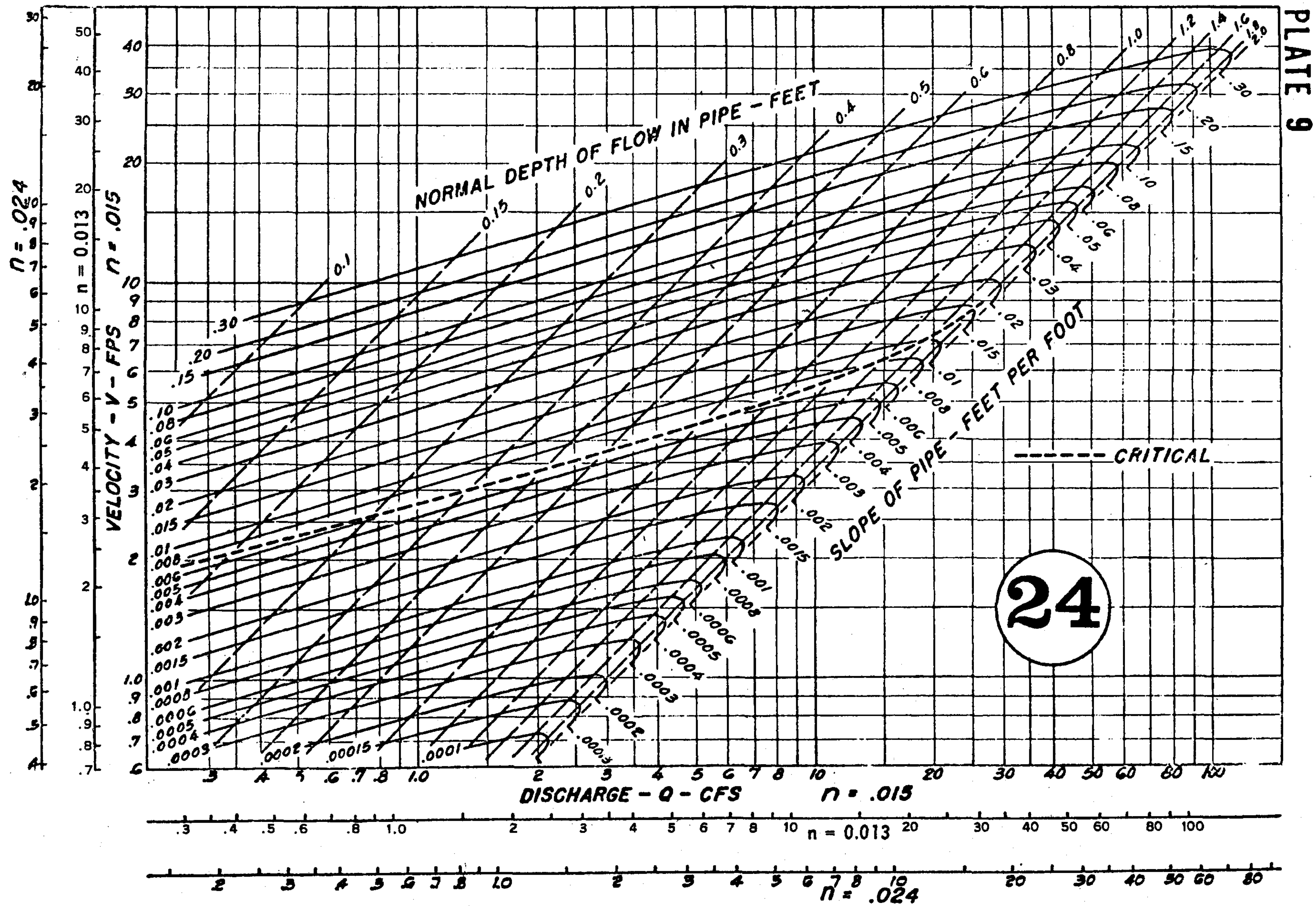
To find critical depth, enter chart Q = 25 and n = 0.015 scale , and read critical depth $d_c = 1.7$ feet at intersection with dotted critical curve. Also critical velocity $V_c = 7.0$ fps. (Note: Critical depth and velocity would be the same, regardless of pipe roughness).

**B.** Determine friction slope for a 30-inch corrugated metal pipe, n = 0.024, on a slope $S_o = 0.008$ ft/ft with a discharge Q = 25 cfs. Enter the 30-inch diameter chart at Q = 25 on n = 0.024 scale. Note that this ordinate falls to the right of the 0.008 slope line, therefore, the pipe will flow full. Read friction slope $S_f = 0.012$ at the line for depth equal to pipe diameter.

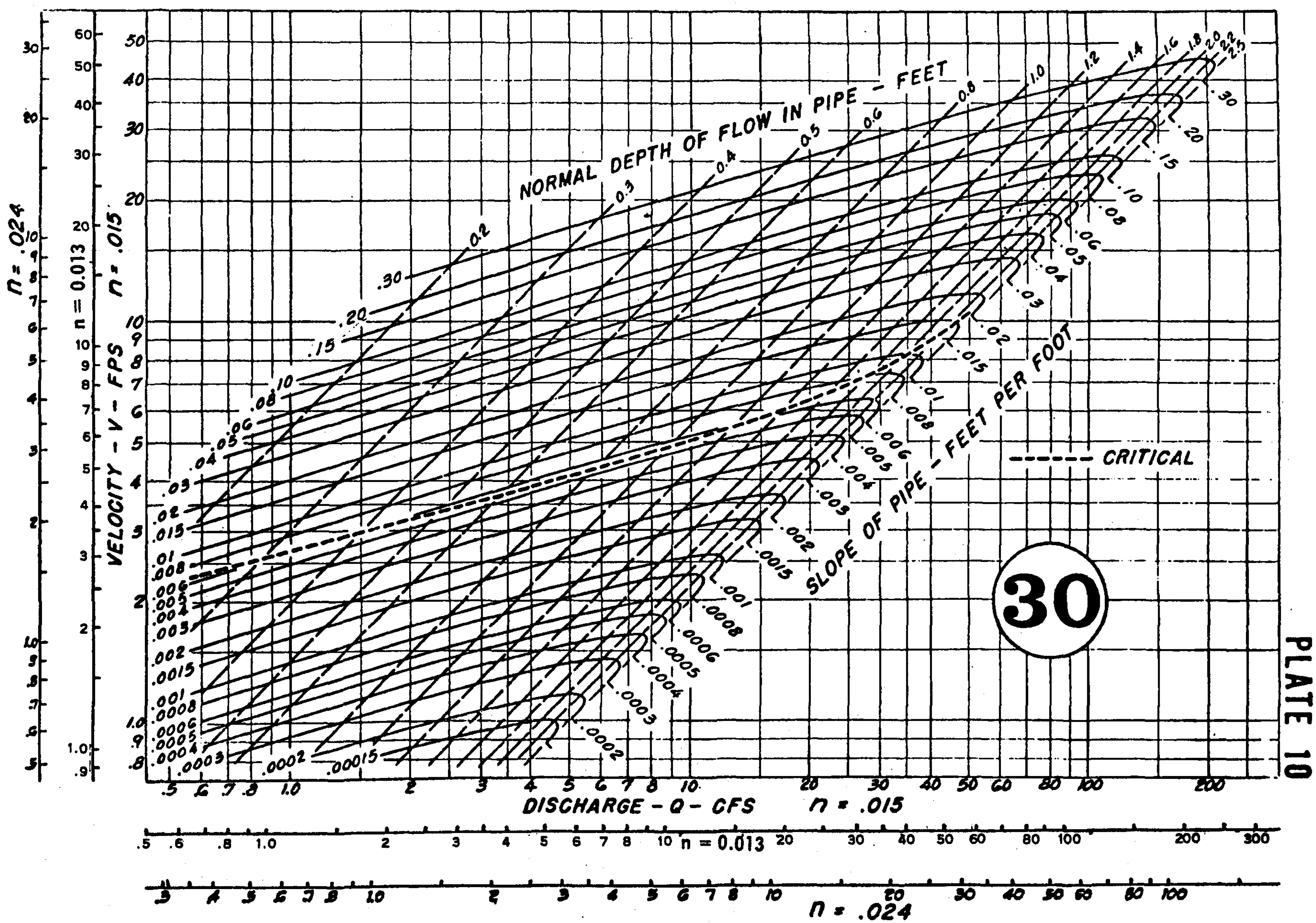
Note $Q = 25 \times \frac{0.024}{0.015} = 40$ cfs on the Q-scale for n = 0.015)



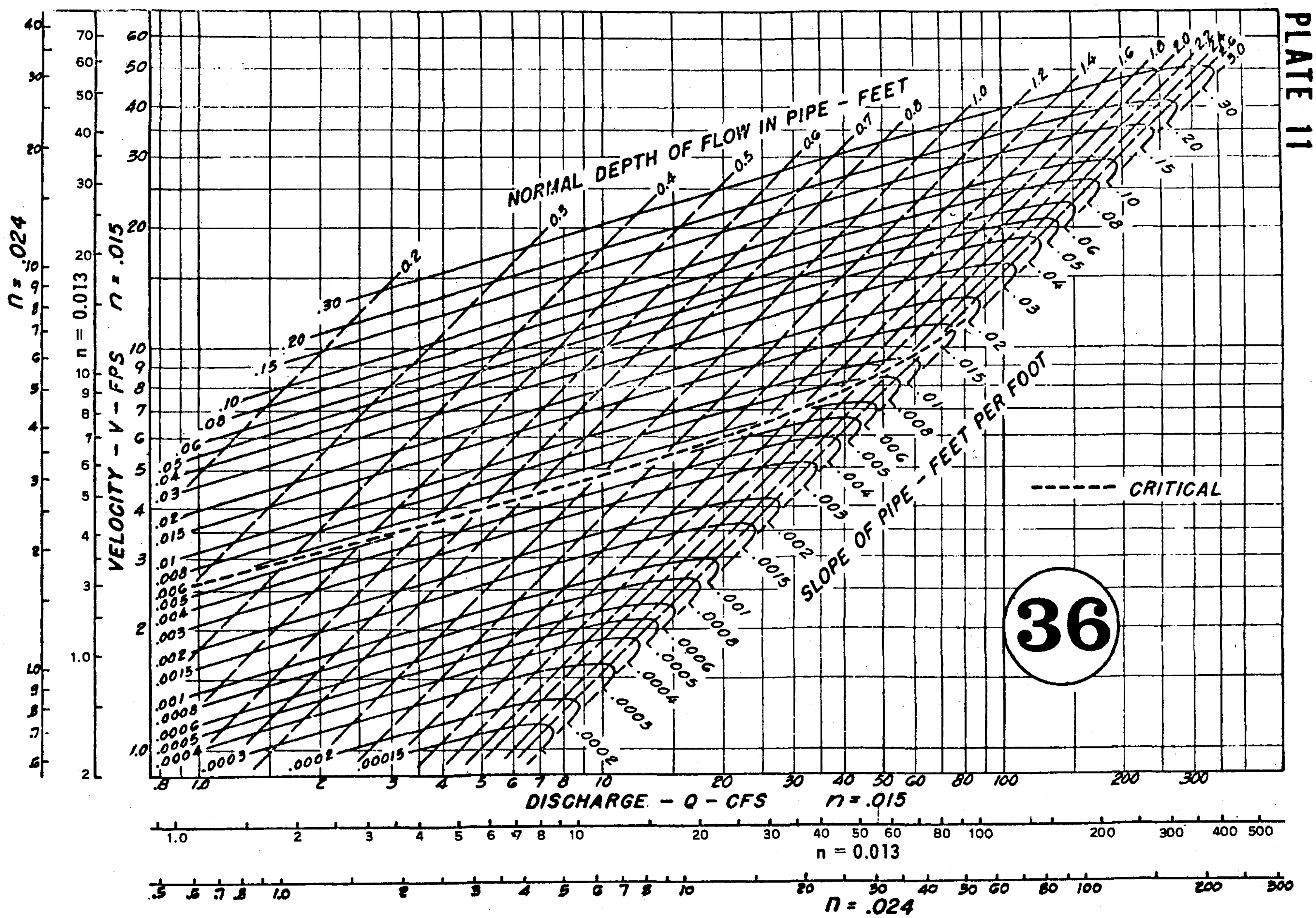

# Pipe Flow Chart 18 inch Diameter




Pipe Flow Chart **24** inch Diameter




# Pipe Flow Chart 30 inch Diameter




# Pipe Flow Chart 36 inch Diameter

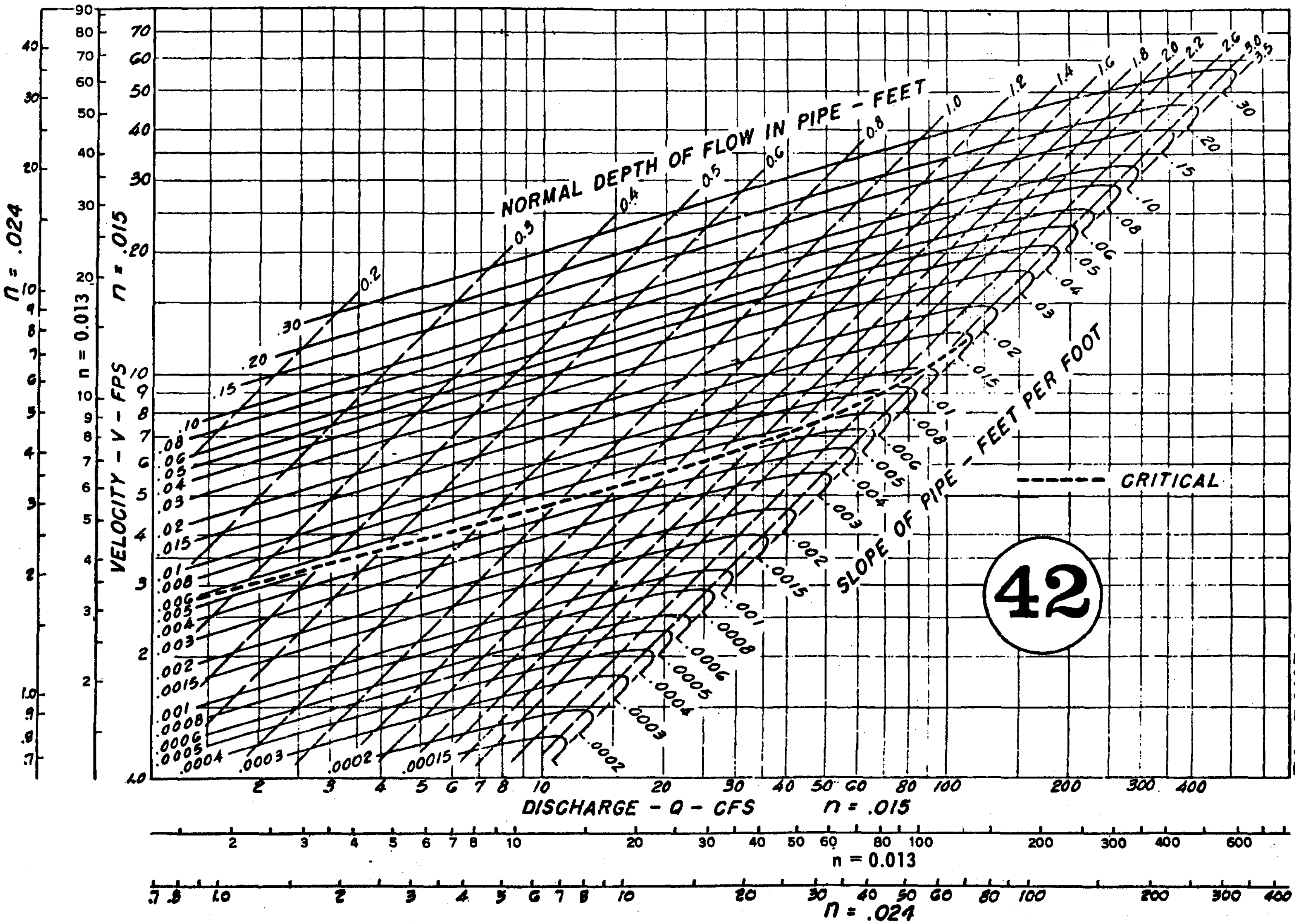
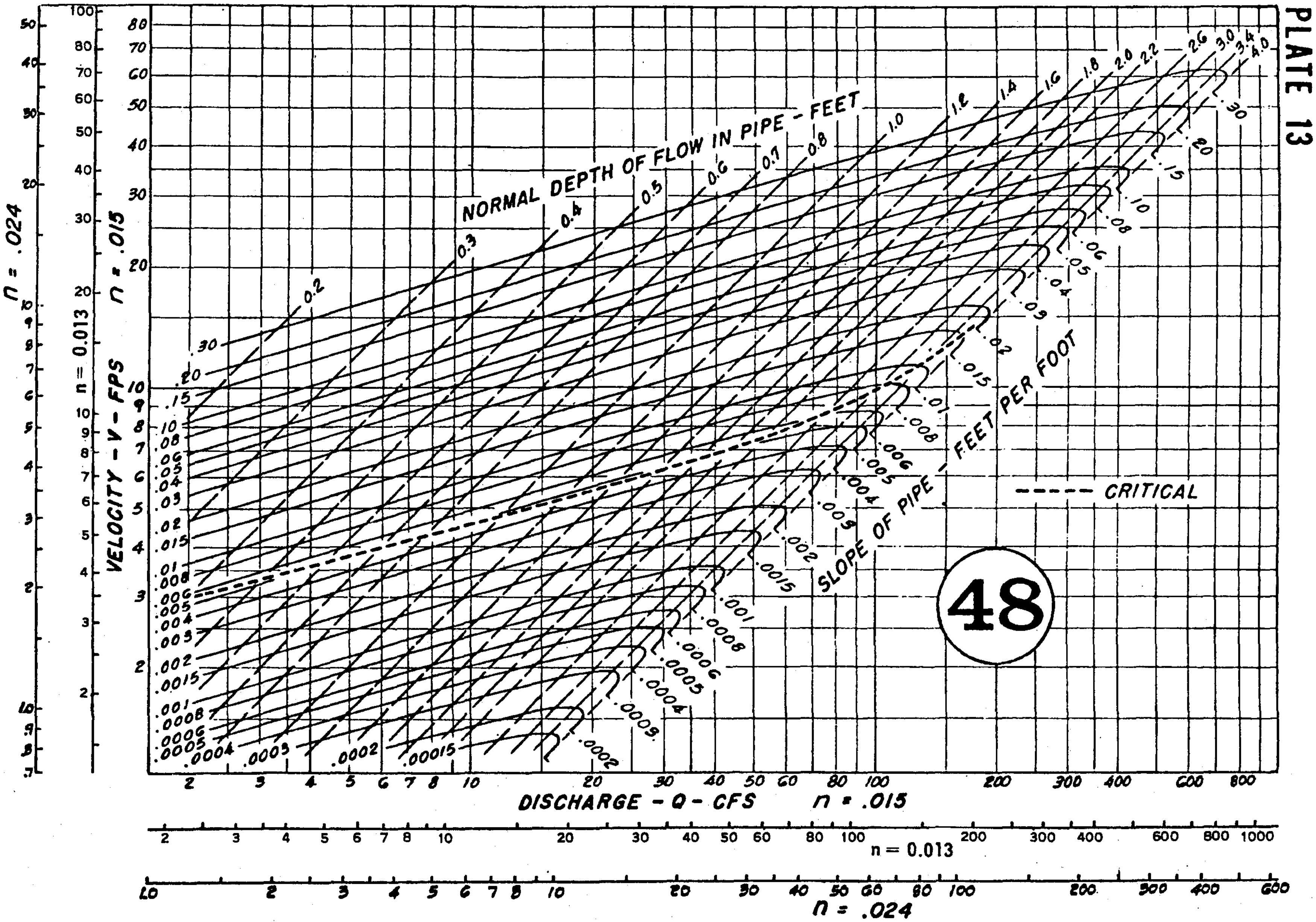


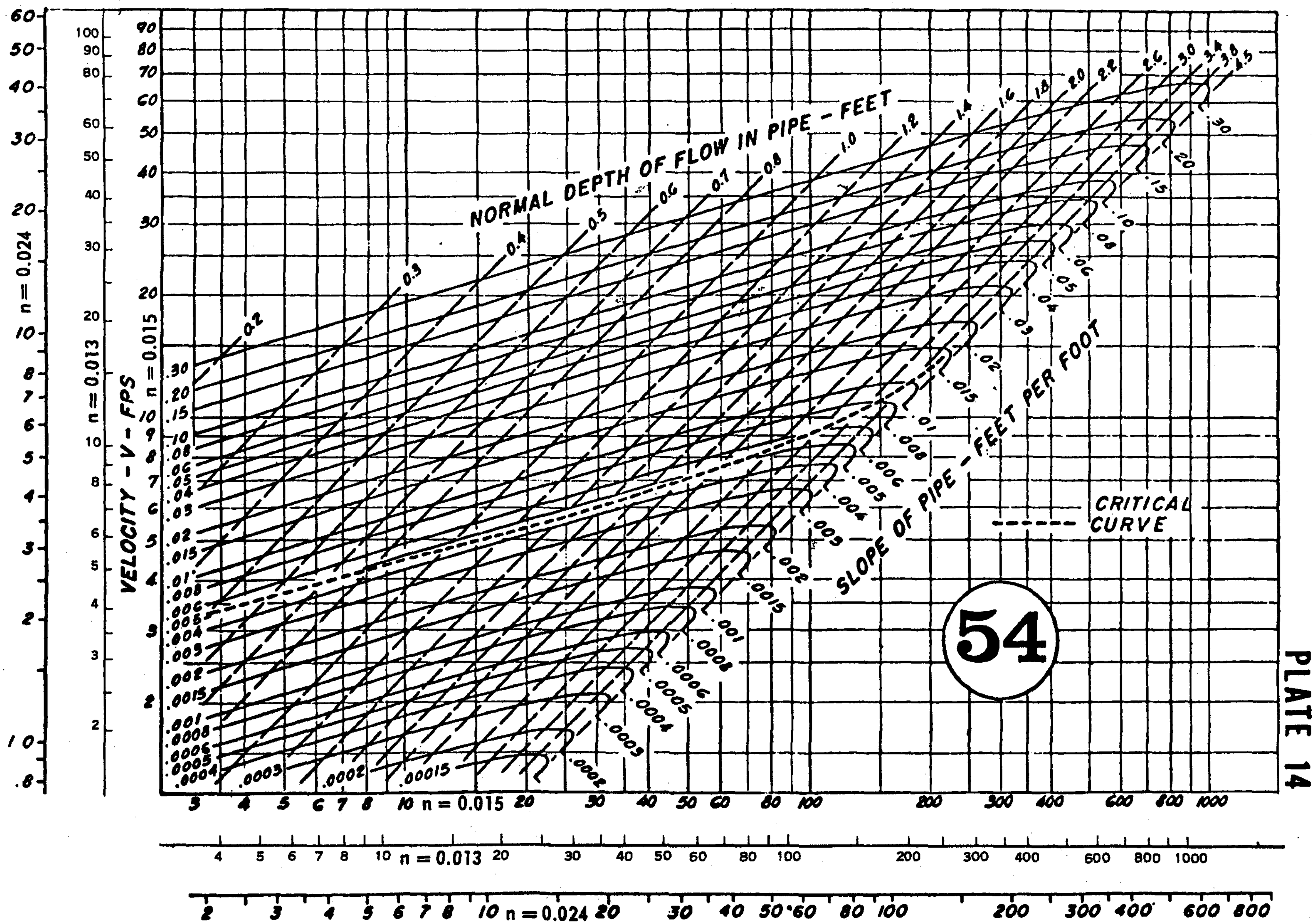

PLATE 12

# Pipe Flow Chart 42 inch Diameter

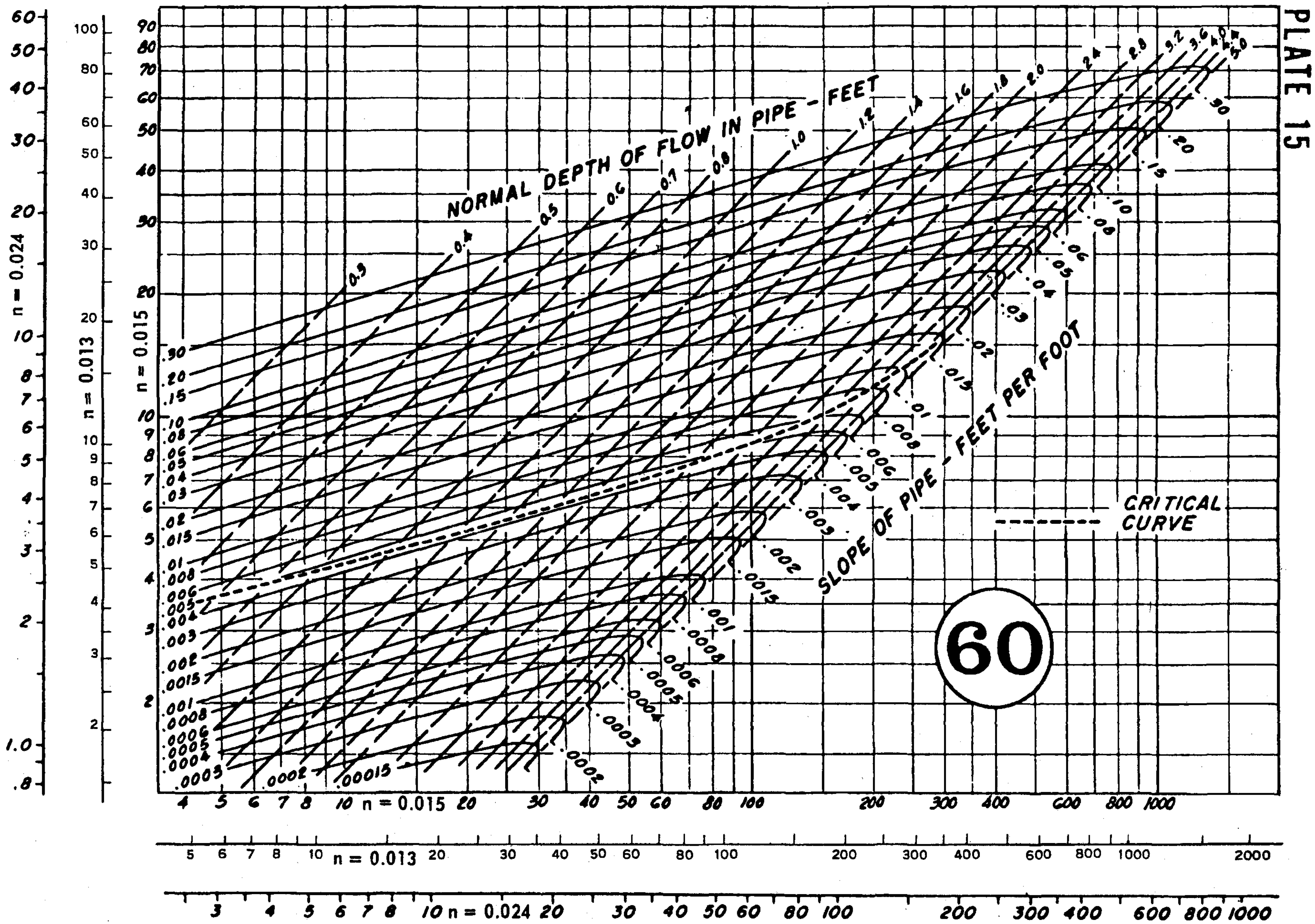



# Pipe Flow Chart 48 inch Diameter

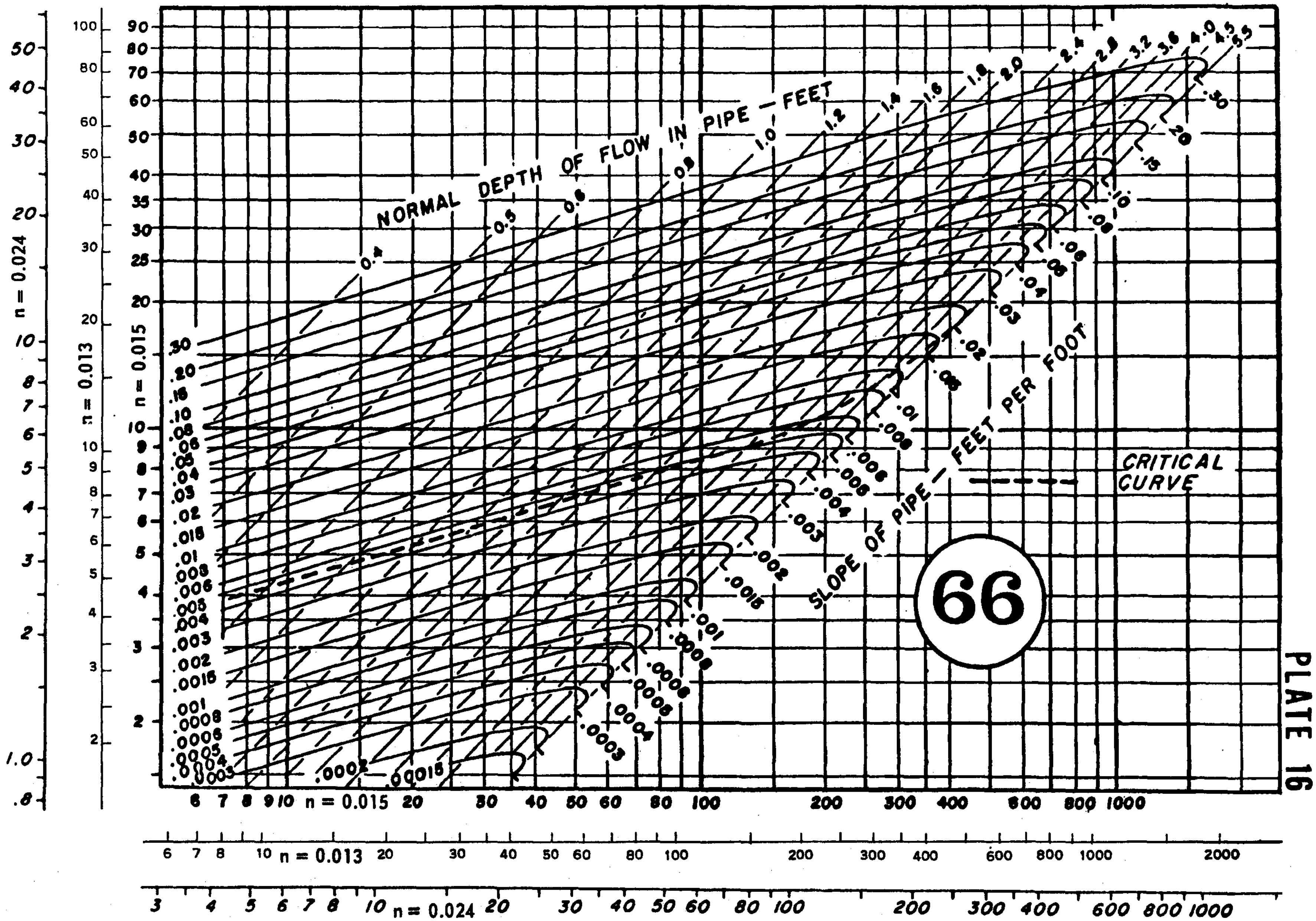
36



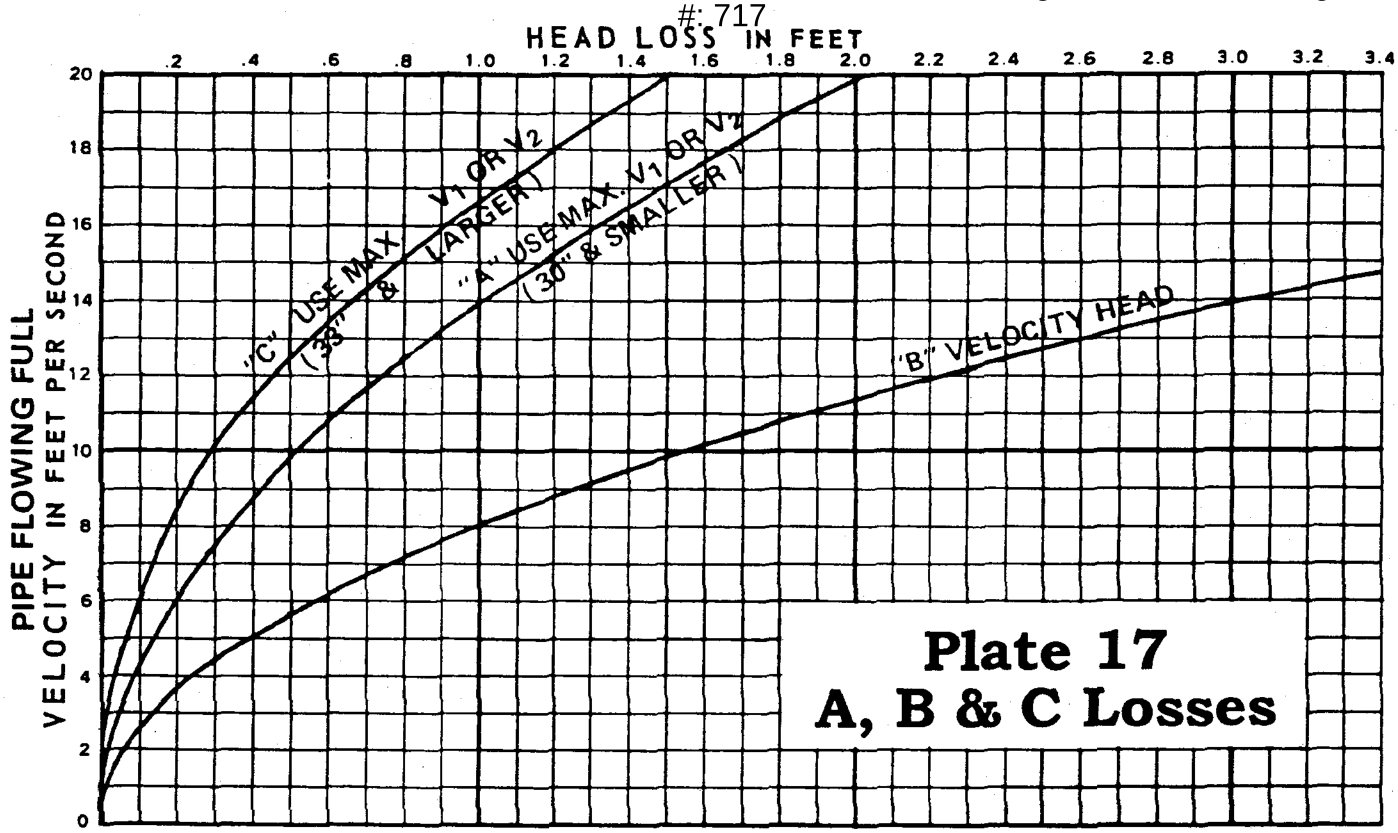

# Pipe Flow Chart 54 inch Diameter



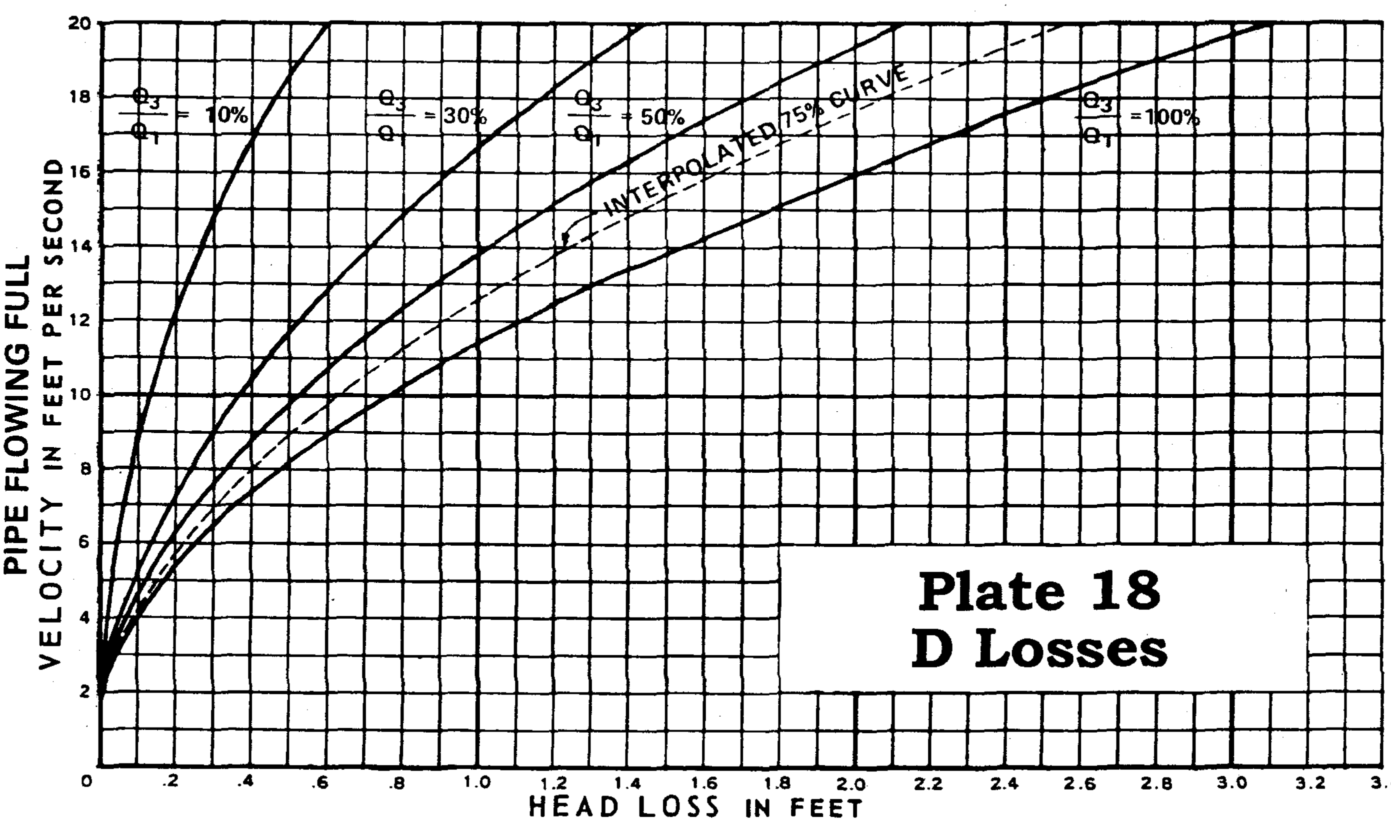

# Pipe Flow Chart 60 inch Diameter




# Pipe Flow Chart 66 inch Diameter



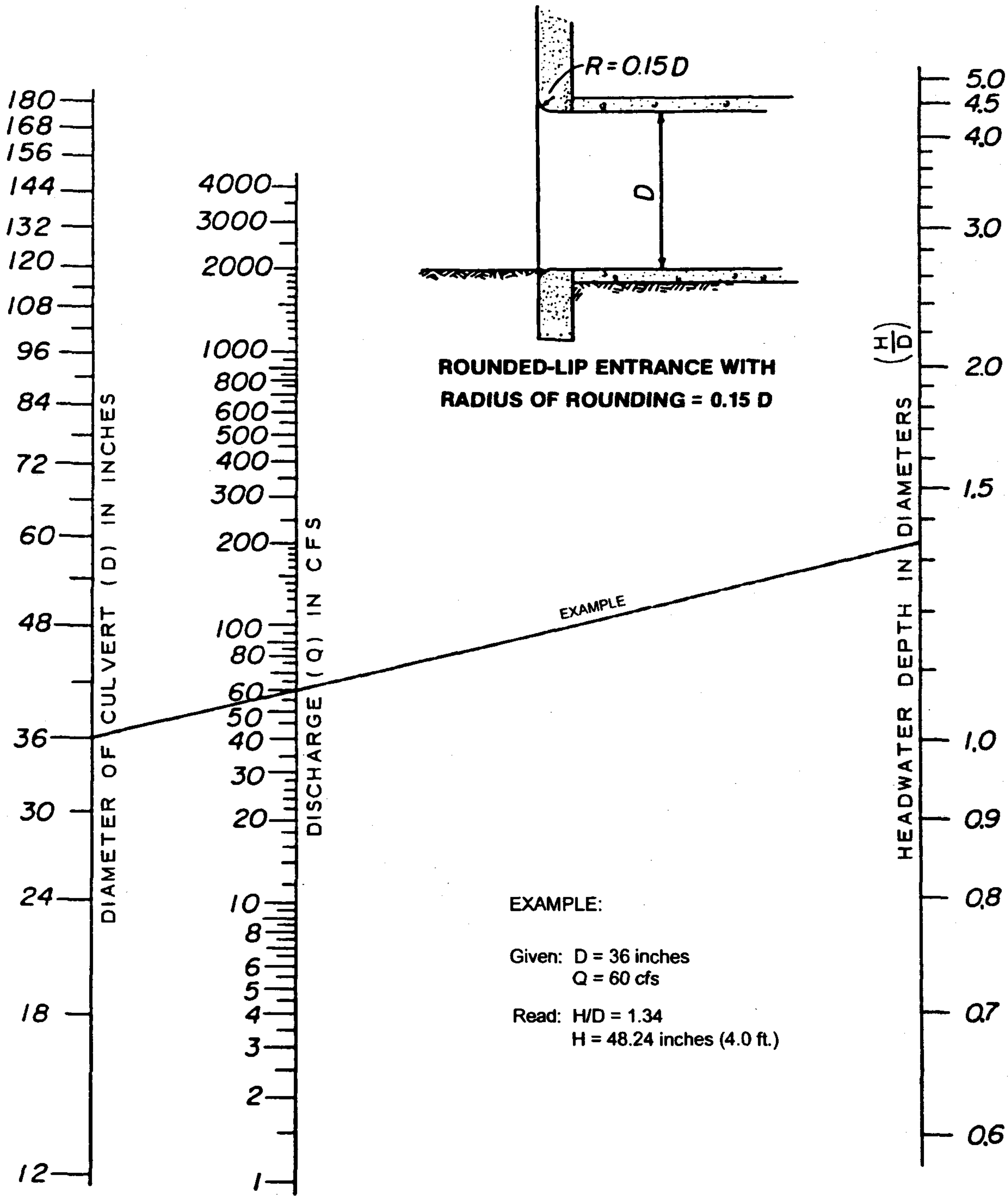

# Head Losses in Manholes




SOURCE: BALTIMORE COUNTY DEPARTMENT OF PUBLIC WORKS

# NOMOGRAPH FOR PIPE CULVERTS WITH ENTRANCE CONTROL

## Plate 19




EXAMPLE:

Given: D = 36 inches
Q = 60 cfs

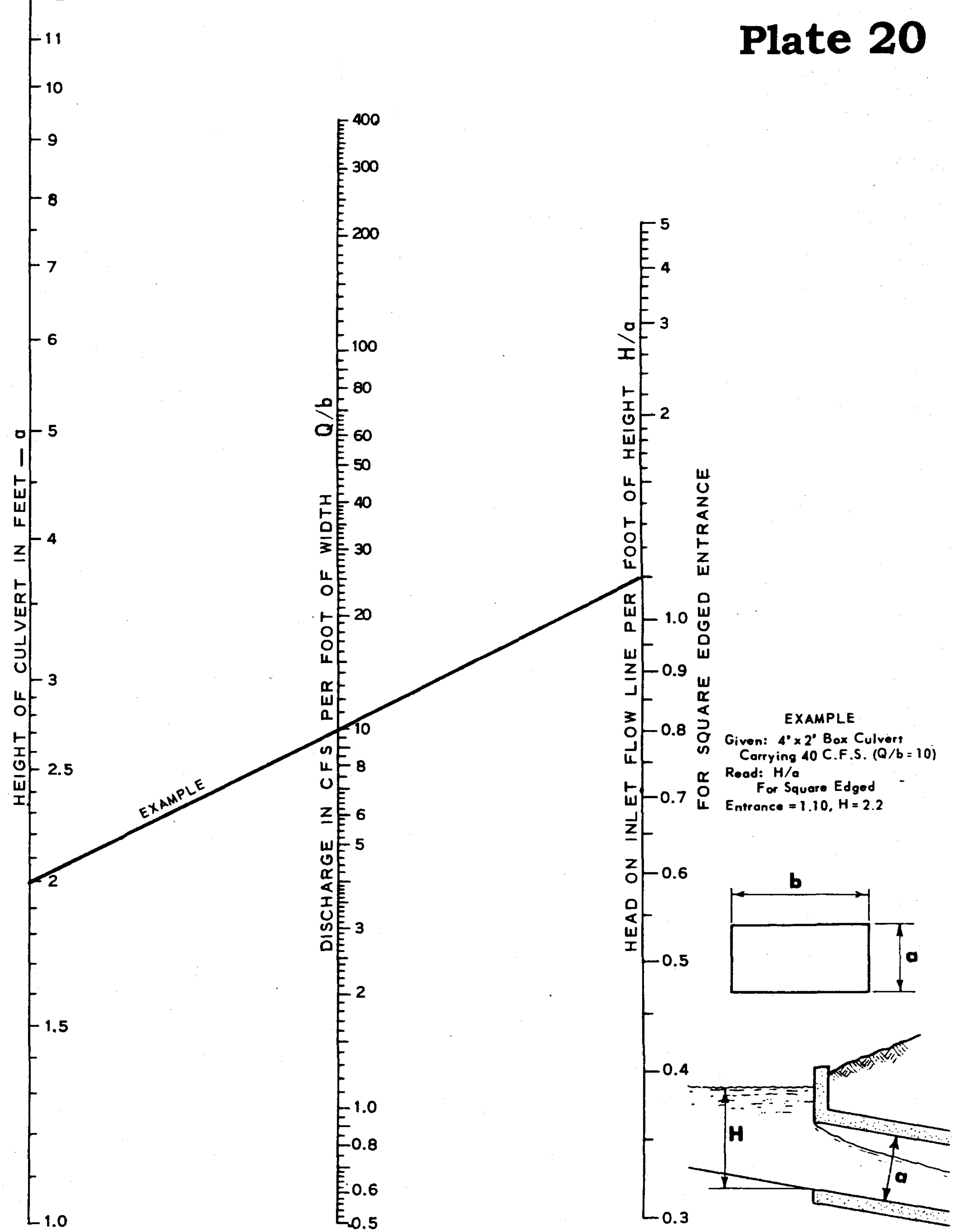
Read: H/D = 1.34
H = 48.24 inches (4.0 ft.)



SOURCE: HANDBOOK OF CONCRETE CULVERT PIPE HYDRAULICS

# NOMOGRAPH FOR BOX CULVERTS WITH ENTRANCE CONTROL

## Plate 20



# §1-5 SECTION II – STANDARDS FOR STORM WATER QUALITY

In response to the requirements of the City's NPDES permit, the City Council passed Ordinance 96-34 addressing the need to regulate storm runoff design criteria for flood control and water quality. This includes establishing controls on the timing and rate of discharge of storm water runoff to reduce storm water runoff pollution to the maximum extent practicable through the implementation of best management practices and engineering control facilities designed to reduce the generation of pollutants.

Long-term water quality is impacted by the volume and frequency of discharged pollutants.

Water quality is also impacted by the modification of a stream's hydrograph caused by increases in flows and durations that result when land is developed (e.g., made more impervious). This phenomenon known as hydromodification, effectively reduces stream base-flow (groundwater flow into streams) and increases overland or storm-flow which causes reduced groundwater recharge and increased peak discharge rates into streams. Hydromodification may result in stream channel instability, streambank or shoreline erosion, loss of habitat, increased sediment transport and deposition, and increased flooding. Consequently, water quality measures for a development should also be designed to include LID BMPs to manage and control hydromodification.

## §1-5.1 PART I - WATER QUALITY CRITERIA

A. OBJECTIVES OF WATER QUALITY CRITERIA

The purpose of the water quality criteria is to reduce the pollution associated with storm water runoff from new development and redevelopment. By establishing these criteria, the City and County of Honolulu is satisfying Federal regulatory requirements to control the discharge of pollutants in storm water as specified in the Clean Water Act Amendments of 1987 and its NPDES permit for discharges from the Municipally Owned and Operated Separate Storm Sewer System issued by the Hawaii Department of Health (DOH) under the authority by the United States Environmental Protection Agency (EPA). Under the NPDES program, the City is required to reduce the discharge of pollutants to receiving waters to the "maximum extent practicable" (MEP).

B. REQUIREMENT APPLICABILITY

1. DEVELOPMENT AND REDEVELOPMENT INCLUDED

Applicable new development and redevelopment projects as defined in B.2a of §1-5.1 Part I Water Quality Criteria must address storm water quality to the MEP through the use of Low Impact Development (LID) Site Design Strategies, Source Control Best Management Practices (BMPs), LID Post-Construction Treatment Control BMPs, and Other Post-Construction Treatment Control BMPs.

For redevelopment projects, the requirements presented in B.6 of §1-5.1 Part I Water Quality Criteria apply only to the addition, and not to the entire development. Redevelopment includes, but is not limited to expansion of a building footprint; addition to or replacement of a structure; replacement of an impervious surface that is not part of a routine maintenance activity; land disturbing activities related to structural or impervious surfaces. Redevelopment does not include routine maintenance activities that are conducted to maintain original hydraulic capacity, original purpose of facility or emergency redevelopment activity required to protect public health and safety. Impervious surface replacement, such as the reconstruction of parking lots and roadways which does not disturb additional area is considered a routine maintenance activity. Redevelopment does not include the repaving of existing roads.

Projects cannot be subdivided or phased to avoid complying with these requirements. Development and redevelopment of the same or adjacent property (ies) permitted within 5 years may be considered together for purposes of assessing the above criteria. The sizing of water quality facilities and drainageways shall be based upon the ultimate use of the drainage area, unless the water quality feature will be re-built/sized during subsequent phases of construction.

2. REGULATED PROJECTS

For purposes of meeting the objectives presented in A of §1-5.1 Part I Water Quality Criteria, projects shall be regulated as follows[1]:

a. Priority A Projects. New development and redevelopment projects that disturb at least 1 acre of land and that are not required to obtain a separate industrial NPDES storm water permit from DOH for long term storm water discharges. Projects at least 5 acres in size are classified as A1, and all others are classified as A2.

b. Priority B Projects. New development and redevelopment projects that do not meet the criteria of a Priority A project but meet any of the following criteria:

   1) Retail Gasoline Outlet with at least 10,000 square feet of total impervious surface area;

   2) Automotive Repair Shop with at least 10,000 square feet of total impervious surface area;

   3) Restaurant with at least 10,000 square feet of total impervious surface area;

   4) Parking lot with at least 10,000 square feet of total impervious surface area

   Impervious surfaces include, but are not limited to, rooftops; walkways; patios; driveways; parking lots; storage areas; impervious concrete and asphalt; and any other continuous watertight pavement or covering. Landscaped soil and pervious pavement, underlain with pervious soil or pervious storage material, are not impervious surfaces.

3. PROJECT APPLICABILITY

These rules shall be effective as of June 1, 2013. The Director may exempt projects from the application of these rules if projects are determined to have submitted

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[1] **Criteria for Regulated Projects may be revised as necessary by the Department (as described in B.7 of §1-5.1 Part I Water Quality Criteria)**

completed construction drawings and completed site-specific drainage reports prior to June 1, 2013.

4. OFF-SITE RUNOFF APPLICABILITY

These criteria are required to be applied to runoff arising from a site and not from off-site runoff, unless the off-site runoff is entering the site as overland flow, and/or will not be separated from on-site runoff. If off-site runoff is to be conveyed through a water quality facility, then the facility must be designed to meet the requirements as described below for the combined on-site and off-site runoff volumes and/or rates.

5. JURISDICTIONAL APPLICABILITY

These requirements apply to projects that drain to City and County drainage facilities and all natural drainage ways that the City and County has ownership and/or responsibility for. Developments that are located in areas that do not drain to the above facilities may be required to meet other DOH requirements.

6. MANAGEMENT PRACTICES TO MEET CRITERIA

a. Priority A1 Projects

The criteria shall be met for Priority A1 projects as follows:

i. Incorporate appropriate LID Site Design Strategies to the MEP.

ii. Incorporate appropriate Source Control BMPs to the MEP.

iii. Unless determined to be infeasible, retain on-site by infiltration or evapotranspiration, the Water Quality Volume or "WQV" with appropriate LID Retention Post-Construction Treatment Control BMPs. The WQV is defined in A of §1-5.2 Part II, Water Quality Design Standards.

iv. Unless determined to be infeasible, biofilter any portion of the Water Quality Volume that is not retained on-site with appropriate LID Biofiltration Post-Construction Treatment Control BMPs.

"Infeasible" means conditions at the site make the implementation of a specific Low Impact Development Best Management Practice technically infeasible. Infeasibility criteria are defined in E of §1-5.2 Part II, Water Quality Design Standards. If it is demonstrated to be infeasible to retain and/or biofilter the Water Quality Volume, one of the following alternative compliance measures is required:

- Either harvest/reuse, or treat (by detention, filtration, settling, or vortex separation) and discharge with appropriate Other Post-Construction Treatment Control BMPs, any portion of the Water Quality Volume that is not retained on-site or biofiltered.
- Retain or biofilter at an offsite location, the volume of runoff equivalent to the difference between the project's WQV and the amount retained on-site or biofiltered. Offsite mitigation projects must be submitted for City approval.

b. Priority A2 Projects

The criteria shall be met for Priority A2 projects as follows:

i. Incorporate appropriate LID Site Design Strategies to the MEP.

ii. Incorporate appropriate Source Control BMPs to the MEP.

iii. Unless determined to be infeasible, either retain on-site by infiltration or evapotranspiration, the Water Quality Volume with appropriate LID Retention Post-Construction Treatment Control BMPs, or biofilter the Water Quality Volume with appropriate LID Biofiltration Post-Construction Treatment Control BMPs, or a combination of the two.

Infeasibility criteria are defined in E of §1-5.2 Part II, Water Quality Design Standards. If it is demonstrated to be infeasible to retain and/or biofilter the Water Quality Volume, one of the following alternative compliance measures is required:

- Either harvest/reuse, or treat (by detention, filtration, settling, or vortex separation) and discharge with appropriate Other Post-Construction Treatment Control BMPs, any portion of the Water Quality Volume that is not retained on-site or biofiltered.
- Retain or biofilter at an offsite location, the volume of runoff equivalent to the difference between the project's WQV and the amount retained on-site or biofiltered. Offsite mitigation projects must be submitted for City approval.

c. Priority B Projects

The criteria shall be met for Priority B projects as follows:

i. Consider appropriate LID Site Design Strategies.

ii. Incorporate appropriate Source Control BMPs to the MEP.

Documents providing details and recommendations on LID Site Design Strategies, Source Control BMPs, and Treatment Control BMPs may be found on the City's website.

7. ADDITIONAL REQUIREMENTS

The criteria identified in B.6 of §1-5.1 Part I, Water Quality Criteria are minimum requirements. If the department determines that additional controls and/or lower thresholds for developments are required to meet the specific water quality needs in watersheds that drain to sensitive receiving waters (as defined by the Hawaii State Department of Health Water Quality Limited Segments [WQLS], or Class 1 Inland Waters, or Class AA Marine Waters), additional requirements may be imposed. These may include design requirements that result in larger facilities as well as additional types of structural or non-structural controls. The design solution will be contingent upon the pollutants that are found to be impacting such water bodies and the regulatory status of the water body.

8. DEDICATION OF FACILITIES TO CITY AND COUNTY

Water Quality facilities may be dedicated to the City. Application for dedication to the City must be approved prior to preparing subdivision maps and construction plans.

9. WATER QUALITY FACILITIES WITHIN PARKS

Parks may be utilized to satisfy water quality facility requirements, with concurrence of the appropriate City agencies, if such parks meet the intent and requirements of the park dedication ordinance and rules.

10. STORM WATER QUALITY FACILITIES REVIEW

The incorporation of storm water quality considerations is encouraged early in the development process as early design considerations will likely lead to more cost-effective projects. Storm water quality management strategies for Priority A1 projects shall be documented in a Storm Water Quality Report (SWQR). Storm water quality management strategies for Priority A2 and Priority B projects shall be documented in a Storm Water Quality Checklist (SWQC). A Storm Water Quality Report Preparation Manual, Storm Water Quality Checklist Preparation Manual, Storm Water Quality Report Template, and Storm Water Quality Checklist Templates may be found on the City's website to assist with and facilitate the preparation of SWQRs and SWQCs.

a. Submittal Requirements

Storm Water Quality Reports or Storm Water Quality Checklists shall be submitted for City review as follows:

1) For Priority A1 and Priority A2 projects, the project's Storm Water Quality Report or Storm Water Quality Checklist shall accompany construction plan approvals.

2) For Priority B projects, the project's Storm Water Quality Checklist shall accompany applications for applicable building and grading permits.

A narrative explaining the project's water quality management strategy must be included in the project's Master Plan, discretionary land use permit, or Environmental Assessment/Environmental Impact Statement.

Storm Water Quality Reports and Storm Water Quality Checklists shall be signed by the owner/developer certifying that the management practices will be implemented and maintained, and signed and stamped by a Professional Engineer licensed and registered to practice in the state of Hawaii, stating that the management practices are in accordance with these Rules and are consistent with the information presented in the construction plans.

11. MAINTENANCE

All storm water quality facilities, including those constructed offsite per B.6 of §1-5.1 Part I, will require regular maintenance by the owner/developer or authorized representative to ensure they operate as designed and to prevent resuspension of previously captured particles. Necessary information, such as inspection/maintenance frequencies, activities, and responsible individuals shall be documented in the Storm Water Quality Report or Storm Water Quality Checklist as applicable. In addition to regular maintenance, annual inspections must be performed for all Post-Construction BMPs by the owner/developer or authorized representative, including inspection and performance of any required maintenance in the late summer/early fall, prior to the start of the rainy season. A log of inspection and maintenance activities must be kept for a minimum of 5 (five) years and be made available to the City upon request.

For facilities that will be dedicated to the City, the City reserves the right to alter the maintenance plan to conform to its practices.

## §1-5.2 PART II - WATER QUALITY DESIGN STANDARDS

A. VOLUME BASED STORM WATER QUALITY CONTROL FACILITIES

Volume based storm water quality facilities include Infiltration Basins, Infiltration Trenches, Subsurface Infiltration Systems, Dry Wells, Bioretention Basins, Permeable Pavement, Green Roofs, Vegetated Bio-Filters, Enhanced Swales, Detention Basins, and Sand Filters.

Volume based storm water quality facilities shall be sized as determined in B.6 of §1-5.1 Part I, Water Quality Criteria. The WQV is calculated as follows:

$$\boldsymbol{WQV = PCA \times 3630}$$

| | | | |
|---|---|---|---|
| Where: | WQV | = | water quality volume (cubic feet) |
| | P | = | design storm runoff depth (inches) |
| | C | = | volumetric runoff coefficient |
| | A | = | total drainage area (acres) |

A design storm runoff depth of 1 inch shall be used. The volumetric runoff coefficient shall be calculated using the following equation as developed by EPA for smaller storms in urban areas:

$$\boldsymbol{C = 0.05 + 0.009I}$$

| | | | |
|---|---|---|---|
| Where: | C | = | volumetric runoff coefficient |
| | I | = | percent of impervious cover, expressed as a percentage |

Infiltration Basin. An infiltration basin is a shallow impoundment with no outlet, where storm water runoff is stored and infiltrates through the basin invert and into the soil matrix. Infiltration Basins shall have a flat invert, interior side slopes (length per unit height) no steeper than 3:1 unless approved by a licensed professional engineer with geotechnical expertise, and at least 3 feet from the basin invert to the seasonally high groundwater table. The soil infiltration rate below the basin invert shall be at least 0.5 inches per hour, and drain completely in 48 hours.

Infiltration Trench. An infiltration trench is a rock-filled trench with no outlet, where storm water runoff is stored in the void space between the rocks and infiltrates through the bottom and into the soil matrix. Infiltration Trenches shall have no more than 6 inches of a top backfill layer, no more than 12 inches of a bottom sand layer, and 1.5-3.0 inch diameter trench rock. The soil infiltration rate below the trench invert shall be at least 0.5 inches per hour, the depth from the trench invert to the seasonally high groundwater table shall be at least 3 feet, and the trench shall completely drain in 48 hours. The depth of the infiltration trench shall not exceed the greater of the trench width and trench length to avoid classification as a Class V injection well.

Subsurface Infiltration System. A subsurface infiltration system is a rock (or alternative pre-manufactured material) storage bed below other surfaces such as parking lots, lawns and playfields for temporary storage and infiltration of runoff. In addition to applicable manufacturer's guidelines, the soil infiltration rate below the system invert shall be at least 0.5 inches per hour, the depth from the system invert to the seasonally high groundwater table shall be at least 3 feet, and the system shall completely drain in 48 hours. The depth of the subsurface infiltration system storage bed shall not exceed the greater of the storage bed's width and storage bed's length to avoid classification as a Class V injection well.

Dry Well. A dry well is a subsurface aggregate-filled or prefabricated perforated storage facility, where roof runoff is stored and infiltrates into the soil matrix. The soil infiltration rate below the dry well invert shall be at least 0.5 inches per hour, the depth from the dry well invert to the seasonally high groundwater table shall be at least 3 feet, and the dry well shall completely drain in 48 hours. If the dry well is aggregate-filled, 1.0-3.0 inch aggregate shall be used unless an alternative is approved by a licensed professional engineer with geotechnical expertise. The depth of the dry well shall not exceed the diameter to avoid classification as a Class V injection well.

Bioretention Basin. Sometimes referred to as a Rain Garden, a Bioretention Basin is an engineered shallow depression that collects and filters storm water runoff using conditioned planting soil beds and vegetation. The filtered runoff infiltrates through the basin invert and into the soil matrix. Bioretention Basins shall have a flat invert, interior side slopes (length per unit height) no steeper than 1:1 for single family residential installations and no steeper than 3:1 for all other installations unless approved by a licensed professional engineer with geotechnical expertise, and at least 3 feet from the basin invert to the seasonally high groundwater table. The ponding depth shall be no greater than 12 inches, the mulch thickness shall be 2-4 inches, and the planting soil depth shall be 2-4 feet. The soil infiltration rate below the basin invert shall be at least 0.5 inches per hour, and the basin shall drain completely in 48 hours.

Permeable Pavement. Sometimes referred to as pervious pavement or porous pavement, permeable pavement refers to any porous, load-bearing surface that allows for temporary rainwater storage in an underlying aggregate layer until it infiltrates into the soil matrix. It includes pervious concrete, porous asphalt, interlocking paver blocks, and reinforced turf and gravel filled grids. Permeable pavement shall have a reservoir layer no thicker than 3 feet and have at least 3 feet from the reservoir invert to the seasonally high groundwater table. The soil beneath the reservoir layer invert shall have an infiltration rate of at least 0.5 inches per hour, and the reservoir layer shall drain completely in 48 hours.

Green Roof. Sometimes referred to as a Vegetated Roof or Eco-roof, a green roof is a roof that is entirely or partially covered with vegetation and soils for the purpose of filtering, absorbing, evapotranspirating, and retaining/ detaining the rain that falls upon it. Green roofs shall have a slope no greater than 20 percent, at least 2 inches of soil media, and at least 2 inches of drainage layer.

Vegetated Bio-Filter. Sometimes referred to as a Bioretention Filter, Stormwater Curb Extension, or Planter Box, a Vegetated Bio-Filter is an engineered shallow depression that collects and filters storm water runoff using conditioned planting soil beds and vegetation. The filtered runoff discharges through an underdrain system. Vegetated Bio-Filters shall have a relatively flat invert, the ponding depth shall be no greater than 12 inches, the mulch thickness shall be 2-4 inches, and the planting soil depth shall be 2-4 feet. The planting soil shall have a coefficient of permeability equal to at least 1.0 foot per day, and the WQV shall drain completely in 48 hours.

Enhanced Swale. Sometimes referred to as a Bioretention Swale or Dry Swale, an Enhanced Swale is a shallow linear channel with a planting bed and covered with turf or other surface material (other than mulch or plants). Runoff filters through a planting bed, is collected in an underdrain system, and discharged at the downstream end of the swale. Enhanced Swales shall have interior side slopes (length per unit height) no steeper than 3:1 unless approved by a licensed professional engineer with geotechnical expertise, a bottom width between 2-8 feet, and a longitudinal slope no greater than 2 percent without check dams or 5 percent with check dams. If used, check dams shall be no higher than 12 inches. The maximum ponding depth is 18 inches and the minimum media depth is 18 inches.

Detention Basin. Sometimes referred to as a Dry Extended Detention Basin, a detention basin is a shallow man-made impoundment intended to provide for the temporary storage of storm water runoff to allow particles to settle. It does not have a permanent pool and is designed to drain between storm events. Detention Basins shall have an invert sloped between 1-2 percent, interior side slopes (length per unit height) no steeper than 3:1 unless approved by a licensed professional engineer with geotechnical expertise, a minimum length to width ratio of 2 to 1, and a maximum depth of 8 feet. With outlets no smaller than 4 inches in diameter, the basin shall drain completely in 48 hours when full and 24-36 hours when half full.

Sand Filter. A sand filter is an open chambered structure that captures, temporarily stores, and treats storm water runoff by passing it through an engineered media (e.g., sand). Sand filter beds shall have at least 18 inches of sand with a coefficient of permeability of at least 3.5 feet per day, and shall drain completely in 48 hours.

## B. FLOW BASED STORM WATER QUALITY CONTROL FACILITIES

Flow-through based storm water quality facilities include Vegetated Swales, Vegetated Filter Strips, and Manufactured Treatment Devices.

Flow-through based storm water quality facilities shall be sized for the Water Quality Flow Rate (WQF), which is calculated using the Rational Formula as follows:

$$\boldsymbol{WQF = CiA}$$

Where:

| | | | |
|---|---|---|---|
| | WQF | = | water quality flow rate (cubic feet per second) |
| | C | = | runoff coefficient |
| | i | = | peak rainfall intensity (inches per hour) |
| | A | = | total drainage area (acres) |

A peak rainfall intensity of 0.4 inches per hour shall be used. The runoff coefficient shall be determined from Table 4. The runoff coefficient shall be, at a minimum, the midpoint of the given range of values. The higher value shall be used if soil conditions indicate that pervious areas will have little infiltration/interception potential.

For drainage areas containing multiple land uses the following formula may be used to compute a composite weighted runoff coefficient:

$$\boldsymbol{C_c = \left(\sum_{i=1}^{n} C_i A_i\right) \Big/ A_t}$$

Where:

| | | | |
|---|---|---|---|
| | $C_c$ | = | composite weighted runoff coefficient |
| | $C_{1,2,\ldots n}$ | = | runoff coefficient for each land use cover type |
| | $A_{1,2,\ldots n}$ | = | drainage area of each land use cover type (acres) |
| | $A_t$ | = | total drainage area (acres) |

The calculated WQF for Vegetated Swales and Vegetated Filter Strips may be reduced by 25% if the soil beneath the BMP is classified as Hydrologic Soils Group (HSG) "A" or "B", as reported by the USDA Natural Resources Conservation Service (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm), or if the soil beneath the BMP is amended by incorporating 6 inches of compost/amendments and tilled up to 8 inches.

Vegetated Swale. Sometimes referred to as a Grass Swale, Grass Channel, or Biofiltration Swale, a vegetated swale is a broad shallow earthen channel vegetated with erosion resistant and flood tolerant grasses. Runoff typically enters the swale at one end and exits at the other end. Vegetated Swales shall have interior side slopes (length per unit height) no steeper than 3:1 unless approved by a licensed professional engineer with geotechnical expertise, a bottom width no greater than 10 feet, and a water depth no greater than 4 inches. The velocity in the swale shall not exceed 1 foot per second, and the hydraulic residence time shall be at least 7 minutes.

Vegetated Buffer Strip. Sometimes referred to as a Vegetated Filter Strip or Biofiltration Strip, a vegetated buffer strip is a grassy slope vegetated with turf grass that is designed to accommodate sheet flow. They may remove pollutants by vegetative filtration. Vegetated Buffer Strips shall have a length (in the direction of flow) no less than 15 feet, the depth of flow shall not exceed 1 inch, and the velocity shall not exceed 1 foot per second. The flow length of the tributary area discharging onto the strip shall not exceed 75 feet.

Manufactured Treatment Device. Sometimes referred to as hydrodynamic or vortex separators, a manufactured treatment device is a proprietary water quality structure utilizing settling, filtration, adsorptive/absorptive materials, vortex separation, vegetative components, or other appropriate technology to remove pollutants from storm water runoff. These devices must provide a TSS removal rate of 80%, verified by a Technology Acceptance and Reciprocity Partnership (TARP) state or other third party testing organization, provided that such verification is conducted in accordance with the protocol "Stormwater Best Management Practices Demonstration Tier II Protocol for Interstate Reciprocity" (which may be found at http://www.dep.state.pa.us/dep/deputate/pollprev/techservices/tarp/).

C. AREA BASED STORM WATER QUALITY CONTROL FACILITIES

Area based storm water quality facilities include Downspout Disconnection.

Downspout Disconnection. Sometimes referred to as Rooftop Disconnection or Downspout Dispersion, is the redirection of roof runoff to a vegetated area in a dispersed manner. Downspout disconnection facilities shall be sized such that the size of the vegetated area receiving the roof runoff is at least 10% of the size of the roof area that drains to the downspout, or the flow path of the vegetated area receiving the roof runoff is at least as long as the flow path of the roof area that drains to the downspout.

D. DEMAND BASED STORM WATER QUALITY CONTROL FACILITIES

Demand based storm water quality facilities include Harvesting / Reuse.

Harvesting/Reuse. Sometimes referred to as Capture/Reuse or Rainwater Harvesting, is the collection and temporary storage of roof runoff in rain barrels or cisterns for subsequent non-potable outdoor use (landscape irrigation, vehicle washing). Harvesting / Reuse facilities shall be sized such that at least 80% of the total annual runoff is captured, and at least 80% of the total annual reuse demand is met.

E. INFEASIBILITY CRITERIA

Table 5 lists exemption criteria for Low Impact Development (LID).

*[Eff: June 1, 2013] (Auth: Sec 14-12.31, ROH) (Imp: Sec14-12.31, ROH)*

# TABLE 4: RUNOFF COEFFICIENTS FOR WATER QUALITY FLOW CALCULATIONS

| Type of Drainage Area | Runoff Coefficient |
|---|---|
| Business | |
| Downtown areas | 0.70 – 0.95 |
| Neighborhood areas | 0.50 – 0.70 |
| Residential | |
| Single-family areas | 0.30 – 0.50 |
| Multi-units, detached | 0.40 – 0.60 |
| Multi-units, attached | 0.60 – 0.75 |
| Suburban | 0.25 – 0.40 |
| Apartment dwelling areas | 0.50 – 0.70 |
| Industrial | |
| Light areas | 0.50 – 0.80 |
| Heavy areas | 0.60 – 0.90 |
| Parks, cemeteries | 0.10 – 0.25 |
| Playgrounds | 0.20 – 0.40 |
| Railroad yards | 0.20 – 0.35 |
| Unimproved areas | 0.10 – 0.30 |
| Lawns | |
| Sandy soil, flat, ≤ 2% | 0.05 – 0.10 |
| Sandy soil, average 2-7% | 0.10 – 0.15 |
| Sandy soil, steep ≥ 7% | 0.15 – 0.20 |
| Heavy soil, flat, ≤ 2% | 0.13 – 0.17 |
| Heavy soil, average 2-7% | 0.18 – 0.22 |
| Heavy soil, steep ≥ 7% | 0.25 – 0.35 |
| Streets | |
| Asphaltic | 0.70 – 0.95 |
| Concrete | 0.70 – 0.95 |
| Brick | 0.75 – 0.85 |
| Drives and walks | 0.75 – 0.95 |
| Roofs | 0.75 – 0.95 |

## TABLE 5: EXEMPTION CRITERIA FOR LOW IMPACT DEVELOPMENT

| Exemption Criteria | Infiltration Basin | Infiltration Trench | Subsurface Infiltration | Dry Well | Bioretention Basin | Permeable Pavement |
|---|---|---|---|---|---|---|
| Soils beneath basin invert have measured infiltration rates less than 0.5 in/hr | ● | ● | ● | ● | ● | ● |
| Unable to maintain a distance of at least 3 ft from BMP invert to seasonally high groundwater table | ● | ● | ● | ● | ● | ● |
| Site has known man-made plumes or contaminated soils | ● | ● | ● | ● | ● | ● |
| Site has high potential for concentrated pollutant/chemical spills | ● | ● | ● | ● | ● | ● |
| Site is up-gradient of ephemeral streams (i.e. habitat type change downstream) | ● | ● | ● | ● | ● | ● |
| Site is up-gradient of known shallow landslide-prone area | ● | ● | ● | ● | ● | ● |
| Unable to maintain a distance of at least 50 ft to the nearest groundwater well used for drinking water | ● | ● | ● | ● | ● | ● |
| Unable to maintain a distance of at least 35 ft to the nearest septic system | ● | ● | ● | ● | ● | ● |
| Unable to maintain a distance of at least 20 ft to the nearest building foundation | ● | ● | ● | | ● | |
| Unable to maintain a distance of at least 10 ft to the nearest building foundation | | | | ● | | |
| Unable to maintain a distance of at least 100 ft to the nearest down-gradient building foundation | ● | ● | ● | ● | ● | |
| Unable to maintain a distance of at least 10 ft to the nearest property line | ● | ● | ● | ● | ● | |
| Unable to divert flows in excess of WQDS around BMP, and unable to create safe overflow mechanism for flows in excess of WQDS | ● | ● | ● | | ● | |
| Excavation would disturb iwi kupuna or other archaeological resources | ● | ● | ● | | ● | |
| Site has high potential for oil and/or grease spills | | | | | | ● |
| Site has high potential to receive sand and/or sediment loads | | | | | | ● |
| Unable to maintain a pavement slope no greater than 5% | | | | | | ● |
| Pavement would be above a utility vault | | | | | | ● |
| Pavement is expected to receive more than 1,000 average daily trips | | | | | | ● |
| Other justification for an exemption proposed by the developer/agent and is acceptable to the City | ● | ● | ● | ● | ● | ● |

**TABLE 5: EXEMPTION CRITERIA FOR LOW IMPACT DEVELOPMENT (continued)**

| **Exemption Criteria** | **Vegetated Bio-Filter** | **Green Roof** | **Enhanced Swale** | **Downspout Disconnect** | **Vegetated Swale** | **Vegetated Filter Strip** | **Tree Box Filter** |
|---|---|---|---|---|---|---|---|
| Unable to divert flows in excess of WQDS around BMP, and unable to create safe overflow mechanism for flows in excess of WQDS | ● | | ● | | ● | ● | |
| Excavation would disturb iwi kupuna or other archaeological resources | ● | | ● | | ● | ● | ● |
| Invert of underdrain layer is below seasonally high groundwater table | ● | | ● | | | | |
| Site does not receive enough sunlight to support vegetation | ● | | | | ● | ● | |
| Site lacks sufficient hydraulic head to support BMP operation by gravity | ● | | ● | | | | ● |
| Roof is for a single family residential dwelling | | ● | | | | | |
| Space is unavailable due to renewable energy, electrical, and mechanical systems | | ● | | | | | |
| Slope on roof exceeds 20% (11 degrees) | | ● | | | | | |
| Slope of receiving vegetated area exceeds 5% | | | | ● | | | |
| Diverted runoff drains within 10 feet of a retaining wall | | | | ● | | | |
| Diverted runoff drains within 10 feet of property line | | | | ● | | | |
| Concentrated flow cannot be established naturally | | | | | ● | | |
| Sheet flow cannot be established naturally | | | | | | ● | |
| Entrance at surface not possible | | | | | | | ● |
| Residential and no planting strip | | | | | | | ● |
| No curb and gutter | | | | | | | ● |
| Other justification for an exemption proposed by the developer/agent and is acceptable to the City | ● | ● | ● | ● | ● | ● | ● |

● denotes that the BMP is considered infeasible if the exemption criteria is applicable

*[Eff: June 1, 2013] (Auth: Sec 14-12.31, ROH) (Imp: Sec14-12.31, ROH)*

**§1-6 REPEAL**

The City and County of Honolulu's Storm Drainage Standards, revised printing dated May 1988, is repealed in its entirety.

*[Eff:* JAN 01 2000 *] (Auth: Sec 14-12.31, ROH) (Imp: Sec14-12.31, ROH)*

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU

These rules were adopted on October 4, 1999, following public hearing held on July 23, 1999, after public notice was given on June 21, 1999, in the Hawaii State and County Public Notices, Honolulu City and County.

These rules shall take effect on January 1, 2000.

JAN NAOE SULLIVAN
Director
Department of Planning and Permitting

APPROVED:

JEREMY HARRIS ACTING MAYOR
Mayor
City and County of Honolulu

Dated: October 18, 1999

APPROVED AS TO FORM
AND LEGALITY:

Deputy Corporation Counsel

FILED:

Given unto my hand and affixed with the Seal of the City and County of Honolulu this 19th day of October, 1999.

GENEVIEVE G. WONG, City Clerk

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU

These amendments to the rules were adopted on November 27, 2010, following a public hearing held on November 17, 2010, after public notice was given on October 14, 2010, in the Hawaii State and County Public Notices, Honolulu City and County.

These amendments to the rules shall take effect on May 1, 2011.

DAVID K. TANOUE
Director
Department of Planning and Permitting

APPROVED:

PETER B. CARLISLE
Mayor
City and County of Honolulu

Dated: MAR 16 2011

APPROVED AS TO FORM
AND LEGALITY:

Corporation Counsel

FILED

Given unto my hand and affixed with the Seal of the City and County of Honolulu this 29 day of March, 2011.

BERNICE K. N. MAU, City Clerk

These amendments to the rules were adopted on December 12, 2012, following a public hearing held on November 27, 2012, after public notice was given on October 26, 2012, in the Hawaii State and County Public Notices, Honolulu City and County.

These amendments to the rules shall take effect on June 1, 2013.

JIRO A. SUMADA
Acting Director
Department of Planning and Permitting

APPROVED:

Peter B. Carlisle

PETER B. CARLISLE
Mayor
City and County of Honolulu

Dated: 12/28/12

APPROVED AS TO FORM
AND LEGALITY:

Deputy Corporation Counsel

FILED:

Given unto my hand and affixed with the Seal of the City and County of Honolulu this 02 day of January, 2013.

Bernice K.N. Mau

BERNICE K.N. MAU, City Clerk

# Examples Illustrating Applications of Rules Relating to Storm Drainage Standards

**FINAL**

**December 2012**

**By:**
**City and County of Honolulu**
**Department of Planning and Permitting**

E Mālama I Ka Wai Ola
Protect our waters…
FOR LIFE

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# TABLE OF CONTENTS

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## A. Introduction

This booklet contains examples, which are intended to illustrate some of the more important aspects of the application of the "Rules Relating to Storm Drainage Standards" of the Department of Planning and Permitting, City and County of Honolulu. They are not intended to be complete examples of what must be submitted to the City and County of Honolulu. All designs must be completed per City and County requirements.

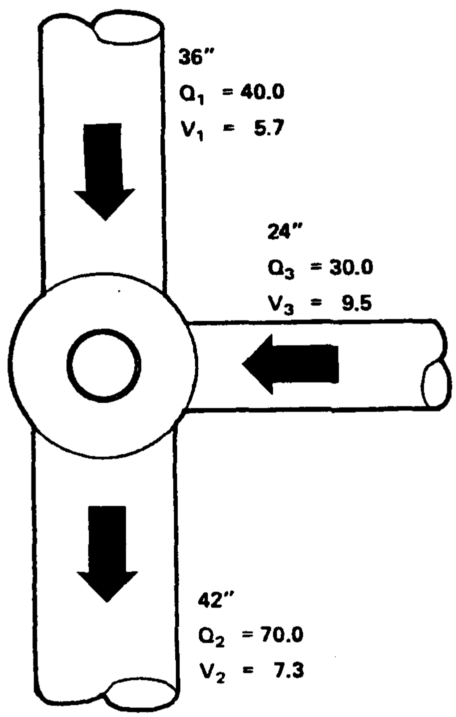
The information is brief and subject to change. The user is encouraged and invited to consult with the appropriate staff of the Department of Planning and Permitting for discussions on site-specific best management practices ("BMPs") and to consult with design guidance that has been developed by other agencies on the design of BMPs. For a list of other design guidance manuals, please consult the City and County of Honolulu, Department of Planning and Permitting.

## B. Flood Control Design

### Example #1: Analysis & Solution for Manhole Losses

NOTE: in lieu of the following analysis, an analysis based upon the Bernoulli's Energy Theorem, such as the pressure-momentum method, will be acceptable.

GIVEN: Pipe size, Q, pipe flowing full, velocity and direction of flow.




LEGEND

**$Q_1$ = Upstream Volume, cfs**
**$Q_2$ = Downstream Volume, cfs**
**$Q_3$ = Incoming Volume, cfs**
**$V_1$ = Upstream Velocity, fps**
**$V_2$ = Downstream Velocity, fps**
**$V_3$ = Upstream Branch Velocity, fps**
**h = Head Loss, in ft.**

## SOLUTION

**"A" LOSS (ENTRANCE & EXIT LOSS)**

1. Determine higher velocity between $\mathbf{V_1}$ and $\mathbf{V_2}$
2. Use Curve **"A"** or **"C"** depending on pipe size and determine $\mathbf{h_A}$ (Ex. Prob. $\mathbf{h_A}$ = 0.15)

**"B" LOSS (VELOCITY HEAD LOSS)**

1. Use Curve **"B"** and determine $h_V$ for $V_1$ and $V_2$

   a. If $V_2$ is lower than $V_1$, then $h_B$ shall be **0**
   b. If $V_2$ is higher than $V_1$, then $h_B$ shall be $h_{B_2} - h_{B_1}$

   Ex. Prob. $h_{B_2} = 0.83$ and $h_{B_1} = 0.50$
   $h_B = 0.83 - 0.50 = 0.33$

**"C" LOSS (DIRECTIONAL CHANGE LOSS)**

1. Use worst case and determine degree of bend.
2. With higher $V_1$ or $V_2$, use Curve **"C"** and determine head loss (**h**).

   a. For **0°** to **22½°** bends, $h_C$ shall be **0.67** times **h.**
   b. For **22½°** to **45°** bends, $h_C$ shall be **1.00** times **h.**
   c. For **45°** to **90°** bends, $h_C$ shall be **2.00** times **h.**

   Ex. Prob. $h = 0.15$
   $h_C = 2 \times 0.15 = 0.30$

**"D" LOSS (LOSS DUE TO INCOMING VOLUME)**

1. Add total branch volume and determine ratio of branch volume to upstream volume.
2. Use appropriate curve and determine $h_D$ with higher $V_1$ or $V_3$.

   Ex. Prob. $Q_3/Q_1 = 30/40 = 75\%$,
   $h_D = 0.56$

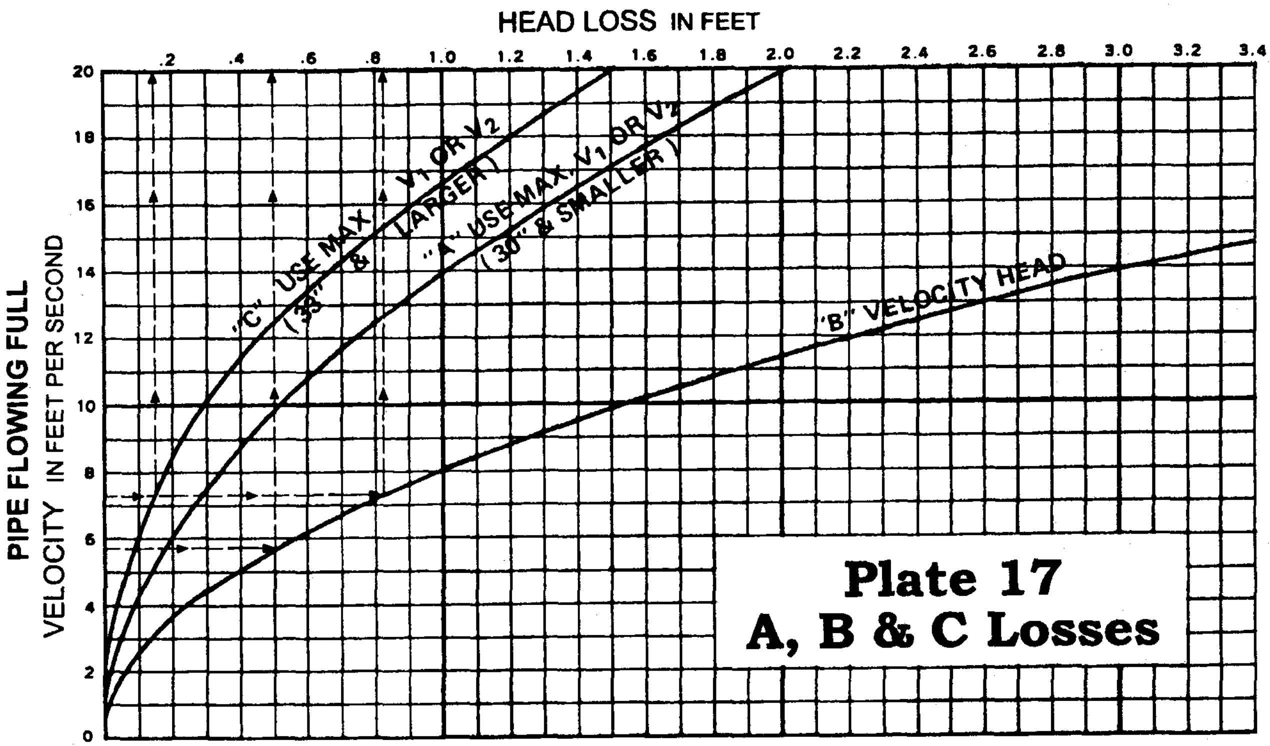
**TOTAL LOSS:**

1. Add $h_A$, $h_B$, $h_C$, and $h_D$

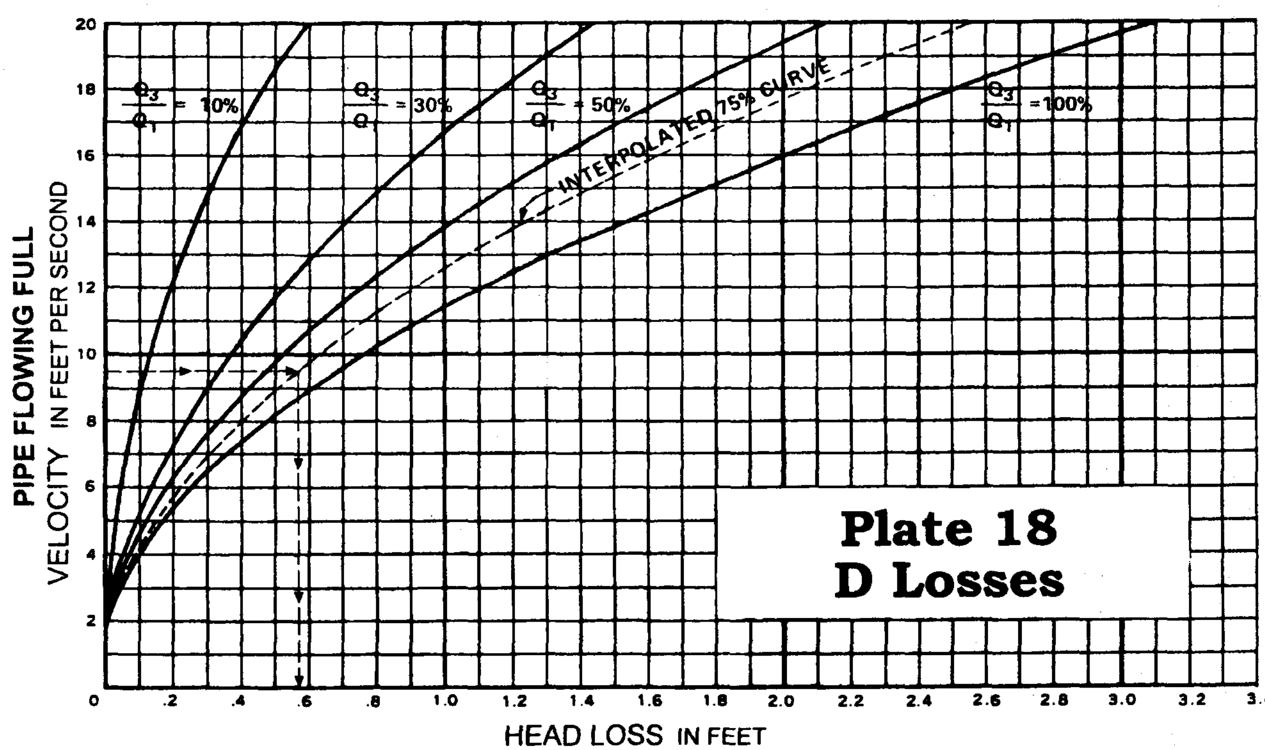
   Ex. Prob. $h_T = 0.15 + 0.33 + 0.30 + 0.56$
   $h_T = 1.34$

## Losses

| | | |
|---|---|---|
| **A** | | = **0.15** |
| **B** | **0.83 – 0.50** | = **0.33** |
| **C** | **2(0.15)** | = **0.30** |
| **D** | | = **0.56** |
| **Total Loss** | | = **1.34 ft.** |




# Head Losses in Manholes



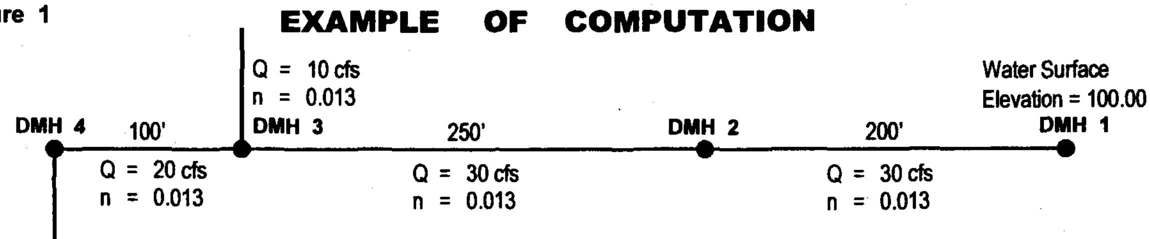



SOURCE: BALTIMORE COUNTY DEPARTMENT OF PUBLIC WORKS

# C. Flood Control Design

**Example #2: Pipe System Analysis**

**Figure 1**




**Given:** Runoff quantities, **n**, manholes and outlet condition as shown in Figure 1.

**Determine:** Pipe sizes and hydraulic gradient.

**SOLUTION**

**USE PLATES 8 TO 20 AS AID TO ANALYSIS.**

Make preliminary determination of pipe sizes for the data given using pipe flow charts. This is shown in Figure 2.

Using the pipe sizes and slopes of pipes as determined above, compute hydraulic gradient for the system. This is shown in Figure 3.

1. Controlling grade at DMH1 is 100.00 as shown in Figure 3.

   Study conditions of flow between manholes or inlets to determine if entrance control or losses govern hydraulic gradient.

2. With the selected pipe size between DMH 1 and DMH 2, 24" diameter pipe at S = 0.010, compute the head loss in the pipe by the formula $h = SL$ or $h_f = S_f L$, whichever controls.

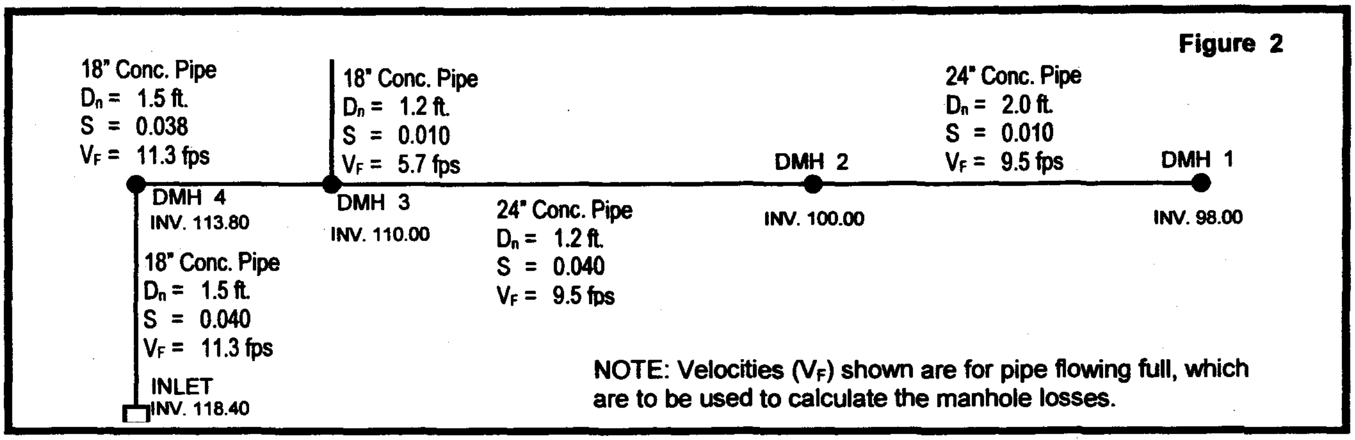
   **$h$ = elevation head loss**
   **$h_f$ = friction head loss**
   **$S$ = slope of pipe**
   **$S_f$ = friction slope (used when pipe flowing full)**
   **$L$ = length of the pipe or channel**

   Since the pipe is flowing full, as determined by the pipe flow chart using 24" diameter, the friction slope 0.018 must be used. The head loss in the pipe is:

   $h_f = S_f L$
   $h_f = (0.018)(200) = 3.60$ **feet**

The downstream hydraulic gradient at DMH 2 is equal to the controlling grade at DMH 1 plus the head loss or

**100.00 + 3.60 = 103.60**

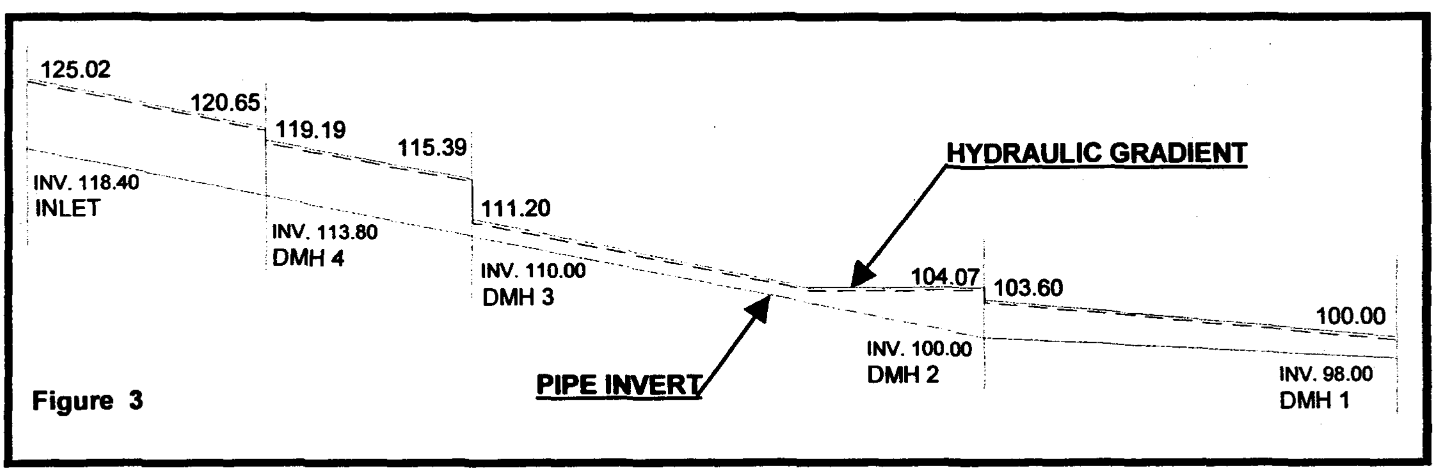



3. Since the pipe is flowing full, and there are no bends or drops, compute the upstream hydraulic gradient at DMH 2 by adding the manhole losses to the downstream hydraulic gradient at DMH 2. These values are obtained from charts on manhole losses. From the charts:

**A = 0.47**
**B = 0.00 (since the velocities are equal)**
**C = 0.00**
**D = 0.00**
**0.47 ft. (Total DMH losses)**

The upstream hydraulic gradient at DMH 2 is:

**103.60 + 0.47 = 104.07**



4. With the selected pipe size between DMH 2 and DMH 3, 24" diameter pipe at S = 0.040, compute the head loss elevation in the pipe:

$$h = SL$$
$$h = (0.040)(250) = 10.00 \text{ feet}$$

Since the pipe is not flowing full as determined by the pipe flow chart, the elevation head loss and the normal depth must be added to the invert of DMH 2. Therefore, the downstream hydraulic gradient at DMH 3 is

$$100.00 + 10.00 + 1.20 = 111.20$$

5. Compute the upstream hydraulic gradient at DMH 3 by adding to the invert elevation the manhole losses and entrance control losses for open channel flow. Only manhole losses "C" and "D" need be considered.

From the charts:

$$\begin{array}{ll} C = 2(0.40) & = 0.80 \quad (90^\circ \text{ Bend}) \\ D & = \underline{0.69} \\ & \;\; 1.49 \text{ ft.} \quad (\text{Total DMH losses}) \end{array}$$

Entrance control loss for Q = 30 cfs, D = 24" is:

$$H/D = 1.95, \text{ From Plate 19}$$
$$H = 3.90 \text{ feet}$$

The upstream hydraulic gradient at DMH 3 is:

$$110.00 + 1.49 + 3.90 = 115.39$$

6. With selected pipe size between DMH 3 and DMH 4, 18" diameter pipe at S = 0.038, compute the head loss in the pipe:

$$h_f = S_f L$$
$$h_f = (0.038)(100) = 3.80 \text{ feet}$$

The downstream hydraulic gradient at DMH 4 is:

$$115.39 + 3.80 = 119.19$$

since the tailwater condition of the pipe is submerged.

7. Since there is a bend greater than $10^{\circ}$ at DMH 4, compare losses and use the higher HGL.

| | |
|---|---|
| **A = 0.66** | **C = 0.80** |
| **B = 0.00** | **D = 0.00** |
| **C = 0.80 (0.40 x 2)** | **0.80** |
| **D = 0.00** | |
| **1.46** | |

Entrance control loss for Q = 20 cfs, D = 18" is:

**H/D = 3.0 From Plate 19**
**H = 4.50**
**119.19 + 1.46 = 120.65 > 113.80 + 4.50 + 0.80 = 119.10**

The upstream hydraulic gradient at DMH 4 is 120.65.

8. Since the pipe is flowing full, the downstream hydraulic gradient at the inlet is determined by friction loss in the length of pipe.

$h_f = S_f L$
$h_f = (0.038)(115) = 4.37$ feet
**120.65 + 4.37 = 125.02**

Entrance control loss at the inlet for Q = 20 cfs, D = 18" is:

**H/D = 3.0 From Plate 19**
**H = 4.50**
**118.40 + 4.50 = 122.90**

Since the hydraulic gradient is higher, the top of headwall must be at least 125.02 + 1 foot = 126.02.

Adjust pipe sizes if warranted by the hydraulic gradient as computed above.

PROJECT: XYZ Subdivision
DRAIN LINE A

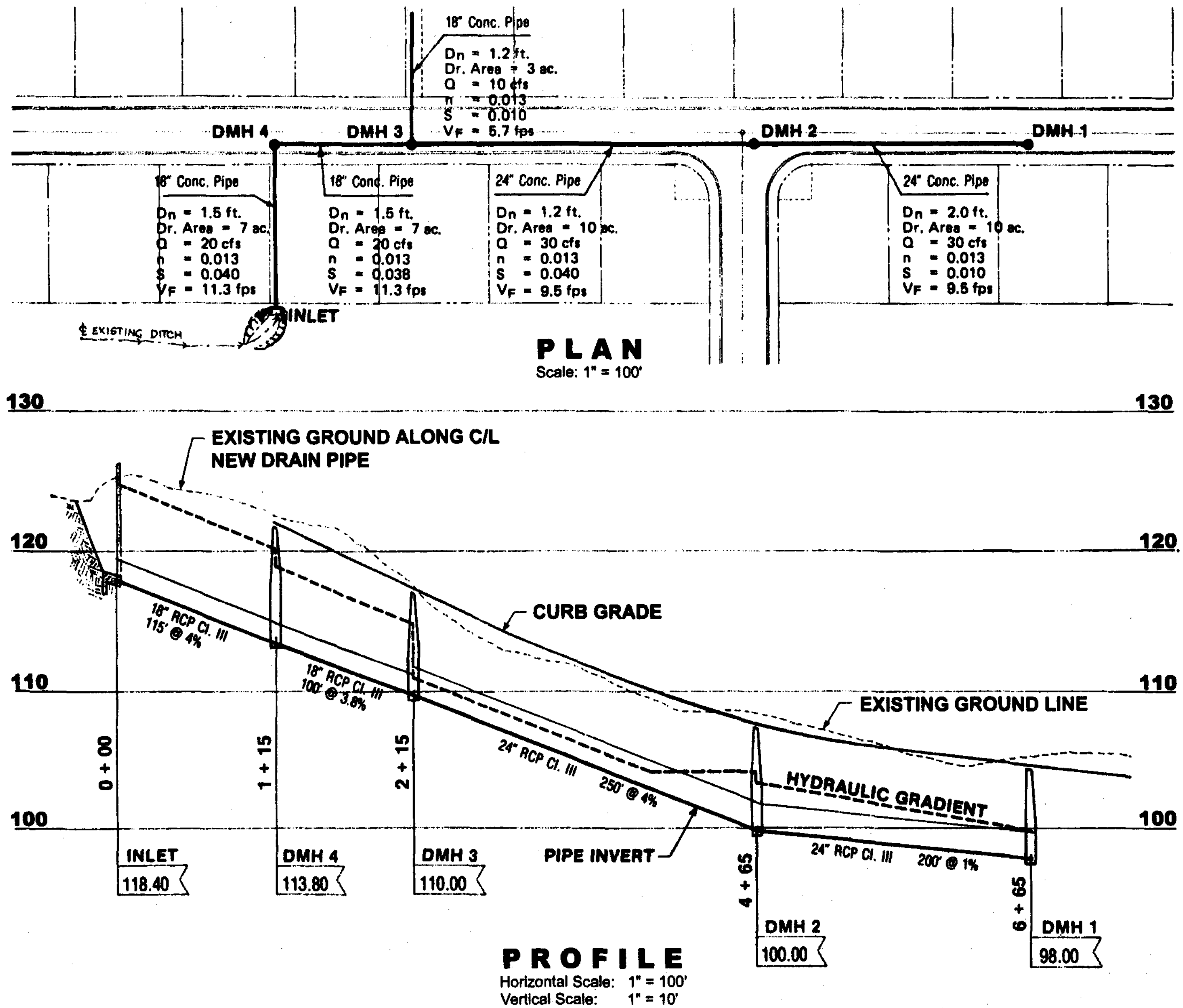
# DRAINAGE DESIGN DATA

DATE: 10/28/85
COMPUTED BY: TM
CHECKED BY: LW

| Inlet | $T_c$ | C | I / i | Drain Area | Q Runoff / Accum. Q | $d_n$ | $V_F$ | Size of Pipe | Length of Seg. | $S_f$ | S | Invert Elevation | $H_f$ | Manhole Losses A | B | C | D | Ent. Cont. | Hydraulic Grade Elev. Down | Up | Finished Grade Elevation | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DMH 1 | | | | | | | | | | | | 98.00 | | | | | | | | 100.00 | | |
| | | | | 10 | 30 | 2.0 | 9.5 | 24 | 200 | .018 | .010 | | 3.60 | | | | | | 103.60 | | | |
| DMH2 | | | | | | | | | | | | 100.00 | | .47 | 0 | 0 | 0 | 3.80 | | 104.07 | | |
| | | | | 10 | 30 | 1.2 | 9.5 | 24 | 250 | .018 | .040 | | 4.50 | | | | | | 111.20 | | | |
| DMH3 | | | | | | | | | | | | 110.00 | | .66 | 0 | .80 | .69 | 3.90 | | 115.39 | | |
| | | | | 7 | 20 | 1.5 | 11.3 | 18 | 100 | .038 | .038 | | 3.80 | | | | | | 119.19 | | | |
| DMH 4 | | | | | | | | | | | | 113.80 | | .66 | 0 | .80 | 0 | 4.35 | | 120.65 | | |
| | | | | 7 | 20 | 1.5 | 11.3 | 18 | 115 | .038 | .040 | | 4.37 | | | | | | 125.02 | | | |
| INLET | | | | | | | | | | | | 118.40 | | | | | | | | | | |

6

**Suggested layout of tabulated computation form for DRAINAGE DESIGN DATA to be submitted for approval**




Drainage Plan Showing Design Data to be Submitted on Drawing

# EXAMPLE 1, 6.22 ACRE RESIDENTIAL DEVELOPMENT

A 6.22-acre site will be developed for the future construction of 22 single family residential houses. The site is divided into two drainage areas, as shown in Figure 1.

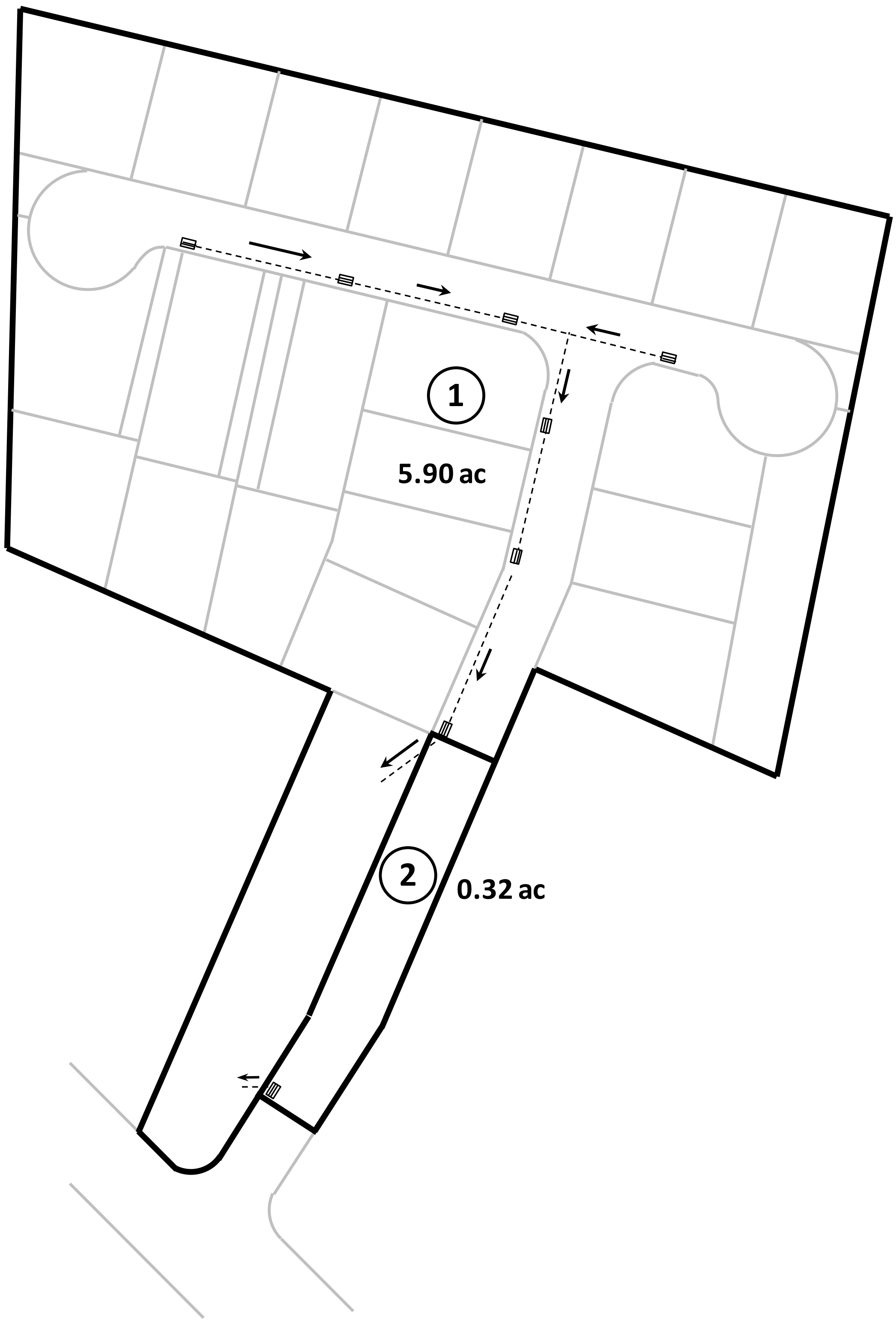



FIGURE1: EXAMPLE 1 DEVELOPMENT PLAN

Based on the size, the project meets the criteria of a Priority A1 new development project and requires preparation of a storm water quality report (SWQR). As specified in Section B.6 of §1-5.1 Part I, water quality criteria shall be achieved with LID Site Design, Source Control, LID Retention, LID Biofiltration (if LID Retention is infeasible), and Alternative Compliance (if LID Retention and LID Biofiltration are infeasible). Implementation of each of these five elements for this example is presented below.

## A. LID SITE DESIGN

The *City and County of Honolulu Storm Water BMP Guide* (*BMP Guide*) identifies 5 LID Site Design Strategies for new development and redevelopment projects. Those that are applicable to this project will be implemented.

## B. SOURCE CONTROL

The *BMP Guide* identifies 12 Source Control BMPs for new development and redevelopment projects. Those that are applicable to this project will be implemented.

## C. LID RETENTION

Assume for purposes of this example that retention is feasible. Although many, if not all, of the 7 LID Retention BMPs identified in the *BMP Guide* may be implemented, details for an Infiltration Basin are presented below.

Assume that a single Infiltration Basin will be used for both drainage areas (see Figure 2). The sizing of the Infiltration Basin is accomplished using the City's BMP sizing worksheet, which is consistent with the Step-by-Step Sizing Procedure provided in the *BMP Guide*. The sizing worksheet is presented in Figure 3, and the calculations are summarized as follows:

1. Water Quality Volume (WQV). For purposes of this example, assume 70% impervious cover. Using a 1-inch design storm depth, the WQV for 6.22 acres is calculated to be 15,353 cubic feet.
2. Maximum allowable storage depth. For purposes of this example, assume a soil infiltration rate of 1.5 in/hr and an infiltration rate safety factor of 2. Using a drawdown time of 48 hours, the maximum allowable storage depth is calculated to be 3.0 feet.
3. Design storage depth. The ponding depth is set to 3 feet, which is equal to or less than the maximum allowable storage depth.
4. Basin invert footprint. Using a basin fill time of 2 hours (industry accepted practice), the required invert surface area is calculated to be 4,913 square feet.
5. BMP area requirements. The invert width is set to 25 feet, and the invert length is calculated to be 196.5 feet. Using a side slope of 3:1 and a freeboard depth of 1 foot (actual free board requirements must be determined for flood design storm), the top width and top length are calculated to be 49 feet and 220.5 feet, respectively. The total area, excluding pretreatment, is calculated to be 10,806 square feet.

The BMP layout and BMP details are presented in Figures 2 and 4, respectively. The Infiltration Basin will have two inlet points; one at the eastern end capturing 5.90 acres of roadway and residential lot runoff, and one at the western end capturing 0.32 acres of roadway runoff.

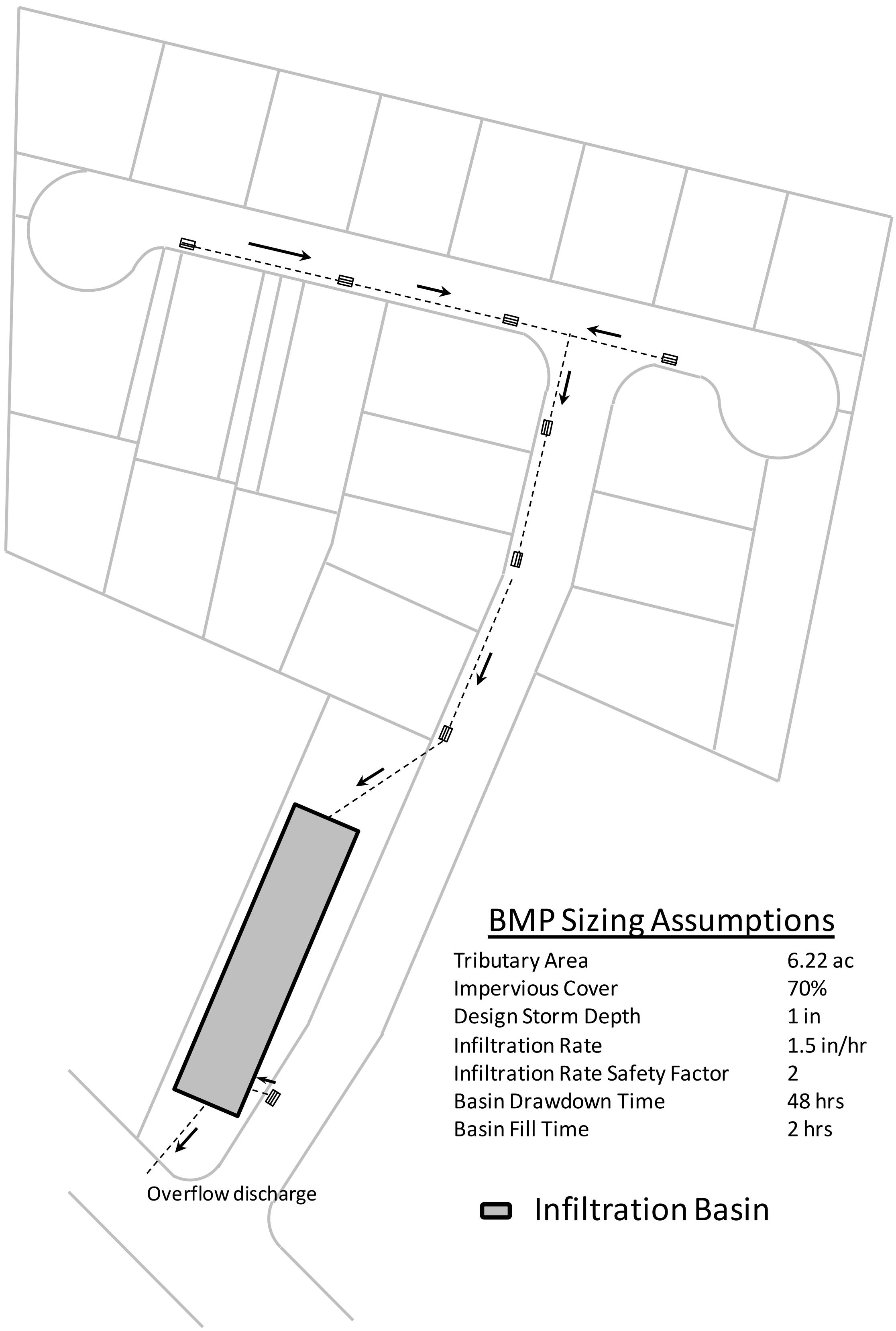



FIGURE 2: BMP LAYOUT, RETENTION

# BMP Sizing Worksheet: Infiltration Basin

**Project:** 6.22 ac Residential Development **Date:** July 2012

| | | |
|---|---|---|
| **1. Water Quality Volume** | | |
| a. BMP Tributary Drainage Area, **A** | 6.22 | ac |
| b. % Impervious Area, **I** | 70 | % |
| c. Water Quality Design Storm Depth, **P** | 1.0 | in |
| d. Volumetric Runoff Coefficient, **C** | 0.68 | |
| e. Water Quality Volume, **WQV** | 15,353 | cu-ft |
| **2. Maximum Storage Depth** | | |
| a. Soil Infiltration Rate, **k** (0.5 min) | 1.5 | in/hr |
| b. Infiltration Rate Safety Factor (2 - 5), $\mathbf{F_s}$ | 2 | |
| c. Drawdown Time, **t** | 48 | hrs |
| d. Max. Storage Depth, $\mathbf{d_{max}}$ | 3.0 | ft |
| **3. Design Storage Depth** | | |
| a. Ponding Depth, $\mathbf{d_p}$ | 3.00 | ft |
| **4. Basin Invert Footprint** | | |
| b. Reservoir Fill Time, **T** | 2 | hrs |
| c. Min. Bottom Surface Area, $\mathbf{A_b}$ | 4,913 | sq-ft |
| **5. BMP Area Requirements** | | |
| a. Side Slopes (length per unit height), **z** (3.0 min) | 3 | |
| b. Freeboard, **f** (1.0 min) | 1 | ft |
| c. Invert Width, $\mathbf{w_b}$ | 25.0 | ft |
| d. Invert Length, $\mathbf{l_b}$ | 196.5 | ft |
| e. Top Width, $\mathbf{w_t}$ | 49.0 | ft |
| f. Top Length, $\mathbf{l_t}$ | 220.5 | ft |
| g. Min. Top Surface Area excluding pretreatment, $\mathbf{A_{BMP}}$ | 10,806 | sq-ft |

**FIGURE 3: INFILTRATION BASIN SIZING WORKSHEET**

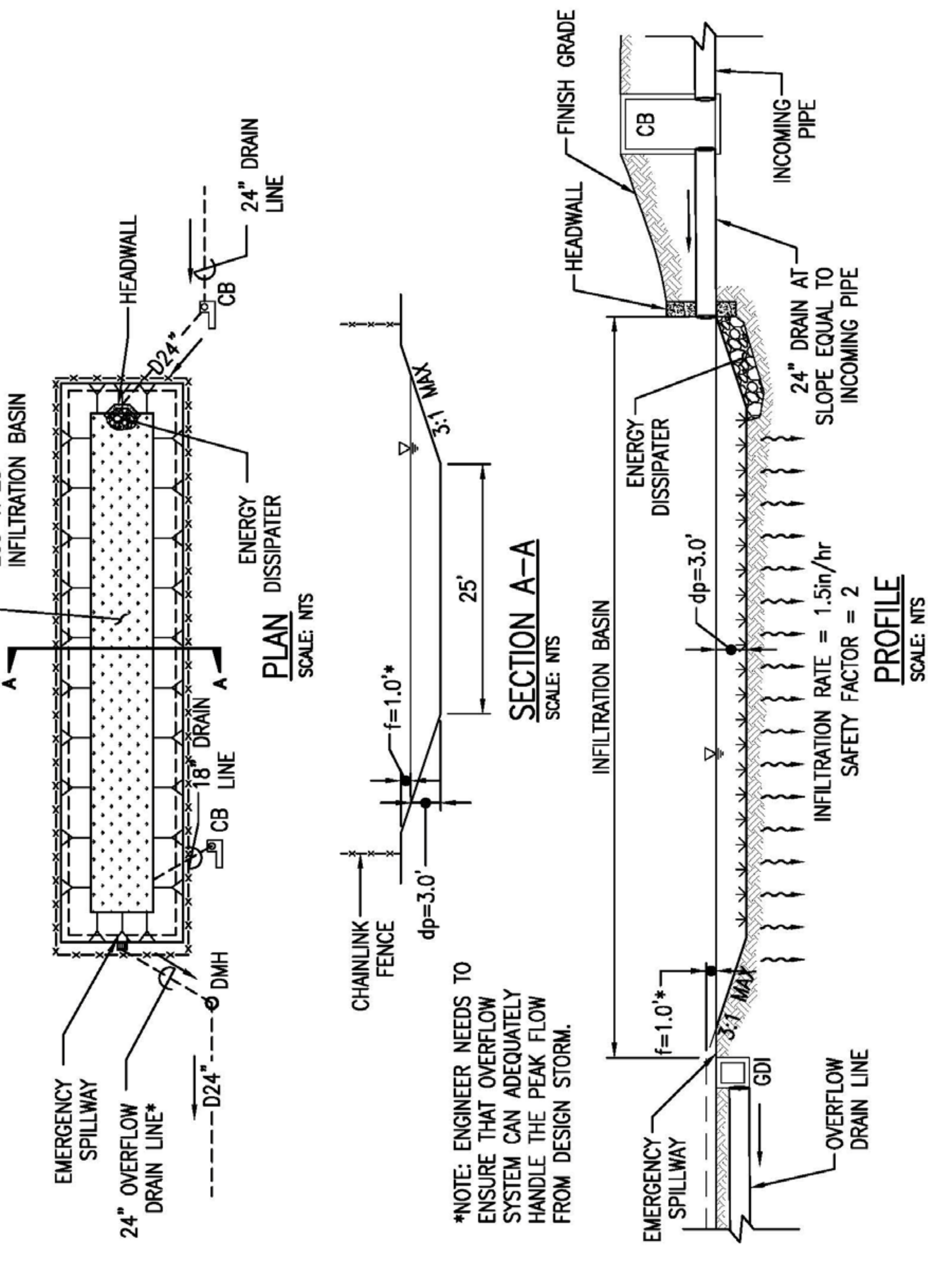



FIGURE 4: BMP DETAILS, RETENTION

## D. LID BIOFILTRATION

For purposes of this example, assume that retention is determined to be infeasible, but biofiltration is feasible. Of the 7 LID Biofiltration BMPs identified in the *BMP Guide*, the water quality criteria may be met by biofiltering the runoff from both drainage areas with a Vegetated Swale. See Figure 5 for the proposed layout.

The sizing of the Vegetated Swale is accomplished using the City's BMP sizing worksheet, which is consistent with the Step-by-Step Sizing Procedure provided in the *BMP Guide*. The sizing worksheet is presented in Figure 6, and the calculations are summarized as follows:

1. Water Quality Flow Rate (WQF). For purposes of this example, assume a weighted runoff coefficient of 0.7. Using a rainfall intensity of 0.4 in/hr, the WQF for 6.22 acres is calculated to be 1.74 cfs.
2. Swale geometry. The bottom width, depth of flow, side slope, longitudinal slope, and Manning's roughness coefficient are set to 7 feet, 4 inches, 3, 4%, and 0.20, respectively.
3. Swale hydraulic capacity. Using the dimensions from step 2, the cross sectional area, wetted perimeter, and hydraulic radius are calculated to be 2.67 sq-ft, 9.11 ft, and 0.29 ft. The design flow rate is calculated to be 1.75 cfs, which is equal to or greater than the WQF.
4. Design flow velocity. The design flow velocity is calculated to be 0.66 feet per second, which is less than the minimum allowed velocity of 1 foot per second.
5. Swale length. Using a hydraulic residence time of 7 minutes, the swale length is calculated to be 276 feet.
6. BMP area requirements. Using 6 inches of freeboard, the required total surface area is calculated to be 3,310 sq-ft. At 276 feet long, this equates to a top width of 12 feet.

The vegetated swale does not require pretreatment, as specified in the *BMP Guide*. The BMP details for the vegetated swale are presented in Figure 7.

## E. ALTERNATIVE COMPLIANCE

If LID Retention and LID Biofiltration are determined to be infeasible, alternative compliance would be required. Options include treating the runoff with Other Treatment Control BMPs identified in the BMP Guide (detention basin, manufactured treatment device, sand filter, etc.).

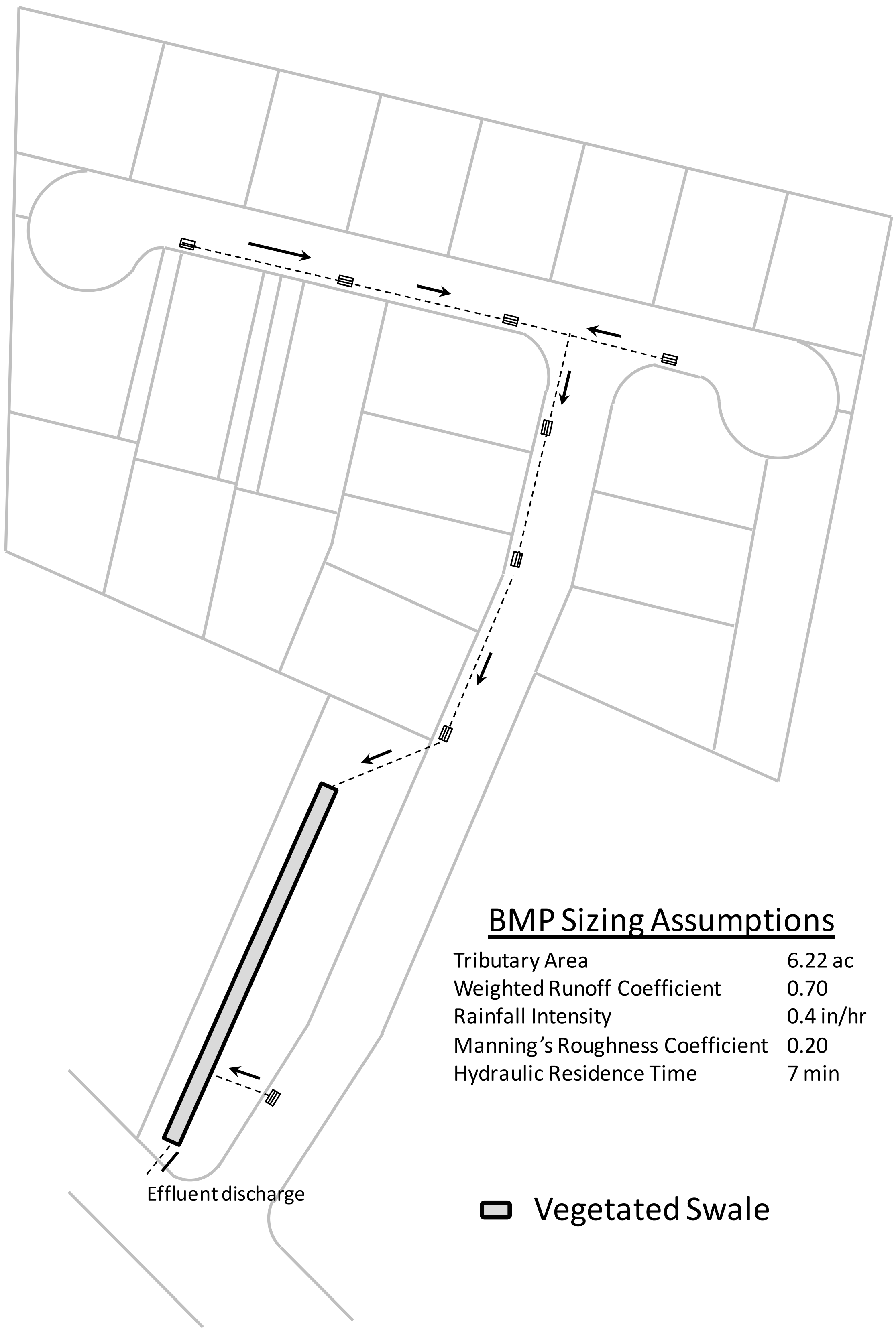



FIGURE 5: BMP LAYOUT, BIOFILTRATION

# BMP Sizing Worksheet: Vegetated Swale

**Project:** 6.22 ac Residential Development **Date:** July 2012

| | | |
|---|---|---|
| **1. Water Quality Flow Rate** | | |
| a. BMP Tributary Drainage Area, **A** | 6.22 | ac |
| b. Weighted Runoff Coefficient, **C** | 0.7 | |
| c. Rainfall Intensity, **i** | 0.4 | in/hr |
| d. Water Quality Flow Rate, **WQF** | 1.74 | cfs |
| **2. Swale Geometry** | | |
| a. Bottom Width, **b** (10.0 ft max) | 7.00 | ft |
| b. Flow Depth, **y** (4.0 in max) | 4.0 | in |
| c. Side Slopes (length per unit height), **z** (3.0 max) | 3 | ft/ft |
| d. Longitudinal Slope, **s** | 4.0 | % |
| e. Manning's Roughness Coefficient, **n** | 0.20 | |
| **3. Swale Hydraulic Capacity** | | |
| a. Cross-sectional Area @ Flow Depth, **A** | 2.67 | sq-ft |
| b. Wetted Perimeter, **WP** | 9.11 | ft |
| c. Hydraulic Radius, **R** | 0.29 | ft |
| d. Calculated Flow Rate, **Q** | 1.75 | cfs |
| **4. Design Flow Velocity** | | |
| a. Design Flow Velocity, **V** (1.0 fps max) | 0.66 | fps |
| **5. Swale Length** | | |
| a. Hydraulic Residence Time, **T** (7.0 min) | 7 | min |
| b. Minimum Length, **L** | 276 | ft |
| **6. BMP Area Requirements** | | |
| a. Freeboard, **f** (6 min) | 6 | in |
| b. Embankment Top Surface Area, $\mathbf{A_{BMP}}$ | 3,310 | sq-ft |

**FIGURE 6: VEGETATED SWALE SIZING WORKSHEET**

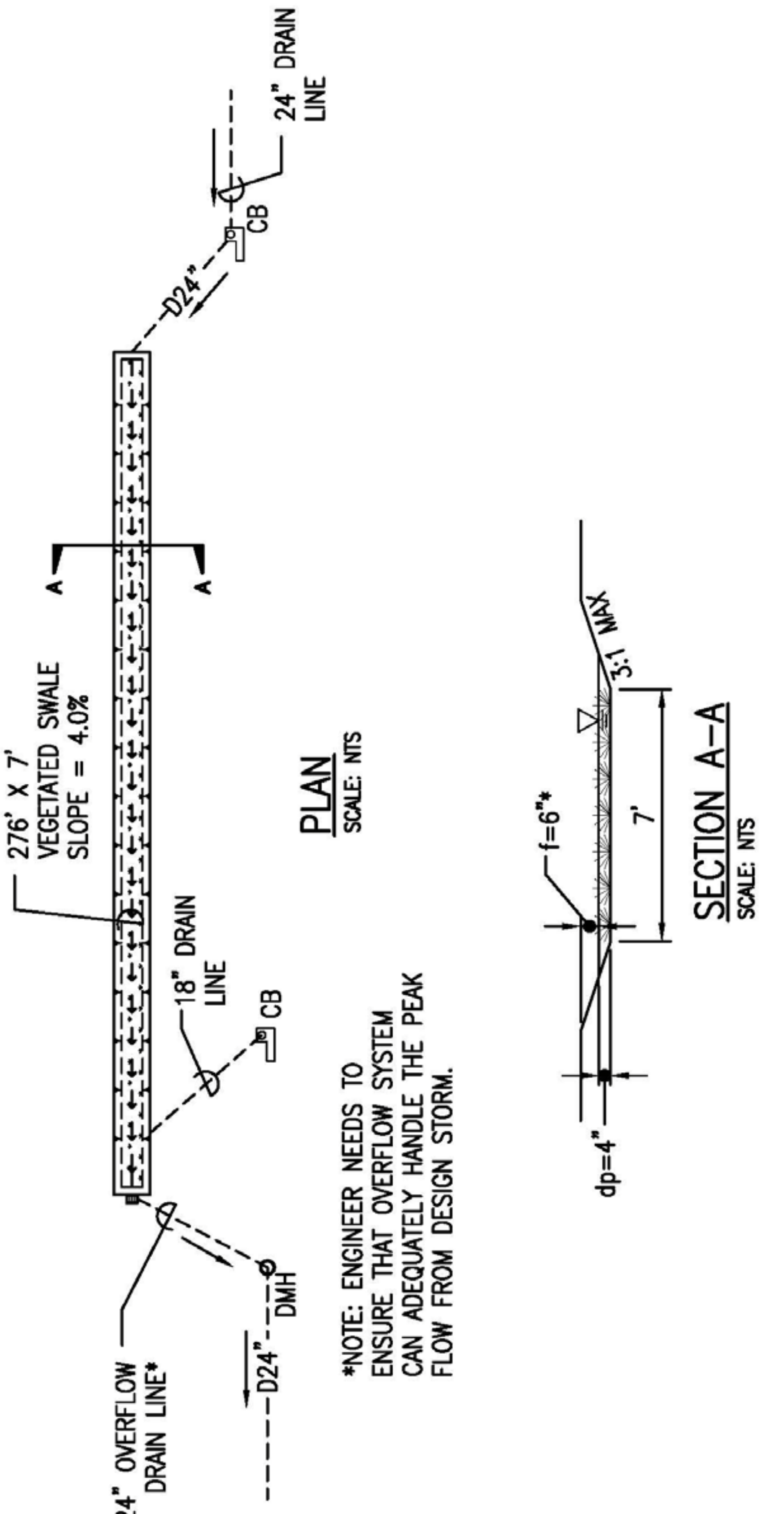



FIGURE 7: BMP DETAILS, BIOFILTRATION

# EXAMPLE 2, 3.44 ACRE COMMERCIAL DEVELOPMENT

A 3.44-acre site will be developed for the construction of a commercial development of 4 retail establishments. The site is divided into 7 drainage areas, as shown in Figure 1.

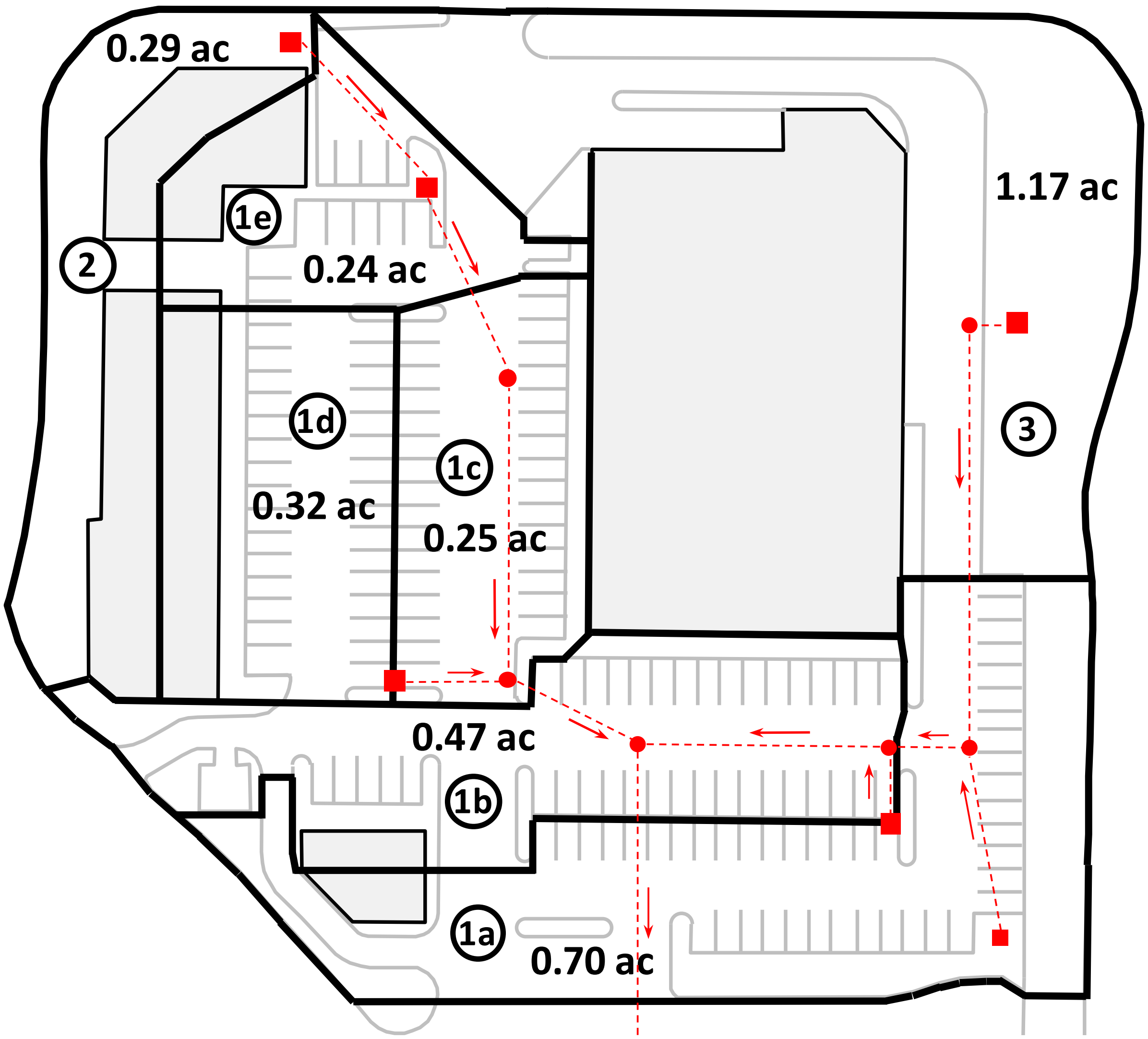



FIGURE 1: EXAMPLE 2 DEVELOPMENT PLAN

Based on the size, the project meets the criteria of a Priority A2 new development project and requires preparation of a storm water quality checklist (SWQC). As specified in Section B.6 of §1-5.1 Part I, water quality criteria shall be achieved with LID Site Design, Source Control, LID Retention or LID Biofiltration, and Alternative Compliance (if necessary). Implementation of each of these four elements for this example is presented below. References to specific proprietary products should not be interpreted as an endorsement of those products.

## A. LID SITE DESIGN

The *City and County of Honolulu Storm Water BMP Guide* (*BMP Guide*) identifies 5 LID Site Design Strategies for new development and redevelopment projects. Those that are applicable to this project will be implemented.

## B. SOURCE CONTROL

The *BMP Guide* identifies 12 Source Control BMPs for new development and redevelopment projects. Those that are applicable to this project will be implemented.

## C. LID RETENTION OR BIOFILTRATION

Retention or biofiltration requirements are presented for each drainage area individually, as each drainage area has its own characteristics and options.

### C.1 Drainage Area 1

Drainage Area 1 is composed of 5 subareas as shown in Figure 1. The runoff from each subarea may be retained with permeable pavement if retention is feasible (see Figure 2), or biofiltered with a vegetated bio-filter (see Figure 3). The sizing of both BMPs is accomplished using the City's BMP sizing worksheets, which are consistent with the Step-by-Step Sizing Procedures provided in the *BMP Guide*.

Permeable Pavement. The BMP sizing worksheet for Drainage Area 1a is presented in Figure 4, and the calculations are summarized as follows:

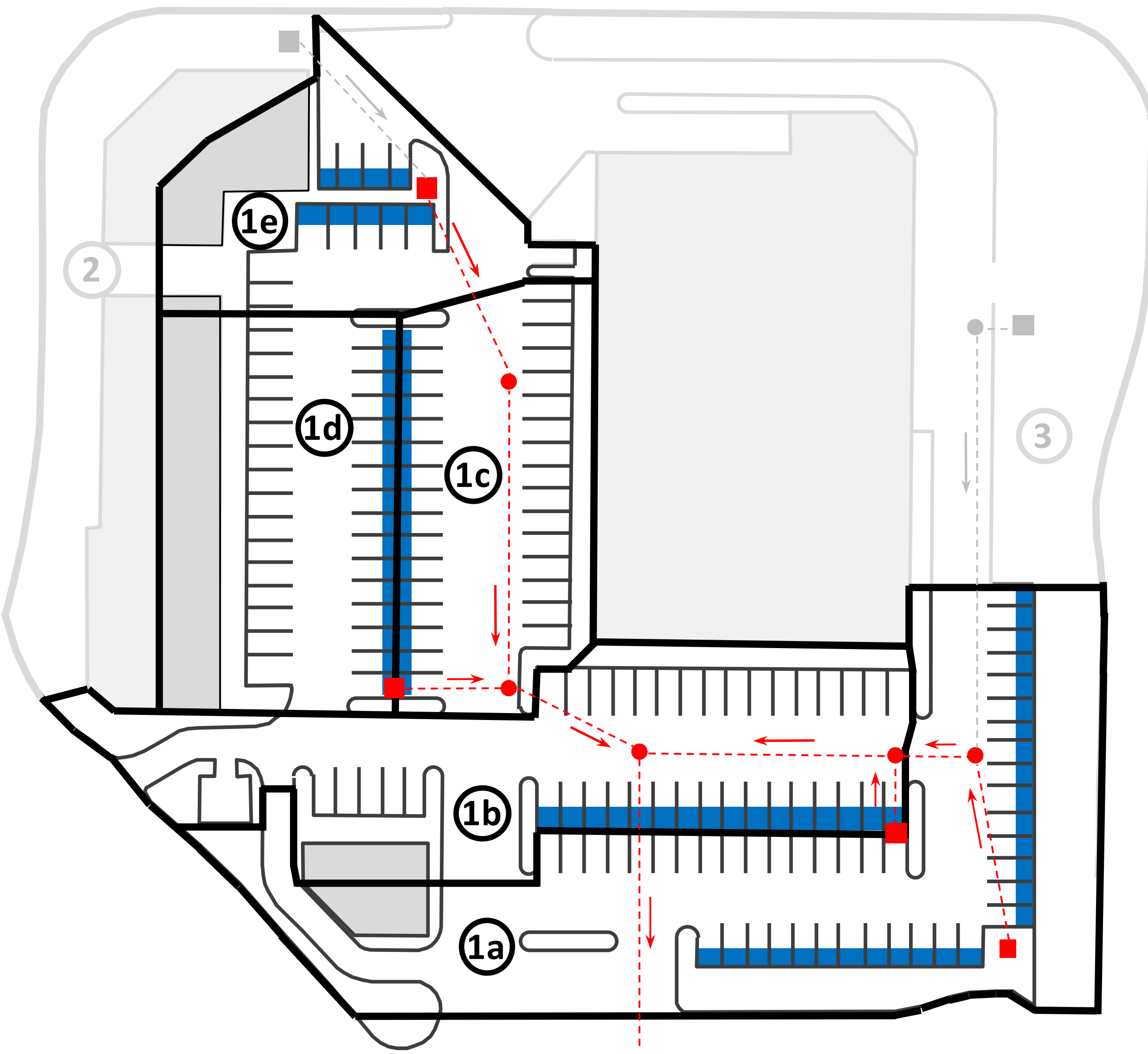
1. Water Quality Volume (WQV). Assuming 70% impervious cover, and using a 1-inch design storm depth, the WQV is calculated to be 1,957 cubic feet.
2. Maximum allowable storage depth. For illustration purposes, assume a soil infiltration rate of 1.5 in/hr and an infiltration rate factor of safety of 2. Using a drawdown time of 48 hours, the maximum allowable storage depth is calculated to be 3.0 feet.
3. Design depths. The pavement course and reservoir course are set to 7 inches and 36 inches, respectively. Using a pavement course porosity of 0.15 and a reservoir course porosity of 0.35, the total effective water storage depth is calculated to be 1.14 feet, which is equal to or less than the maximum allowable storage depth.
4. Pavement surface area. Using a fill time of 2 hours, the required surface area is calculated to be 1,550 square feet.

The length of the permeable pavement is set to the length of the corresponding parking area, and the width is then calculated using the required surface area. This results in a width of 6.48 feet. The necessary length will achieved with two sections, one for each parking area.

The calculations for the other 4 subareas follow the same steps using the same design parameters for constructability and consistency. A summary is as follows:

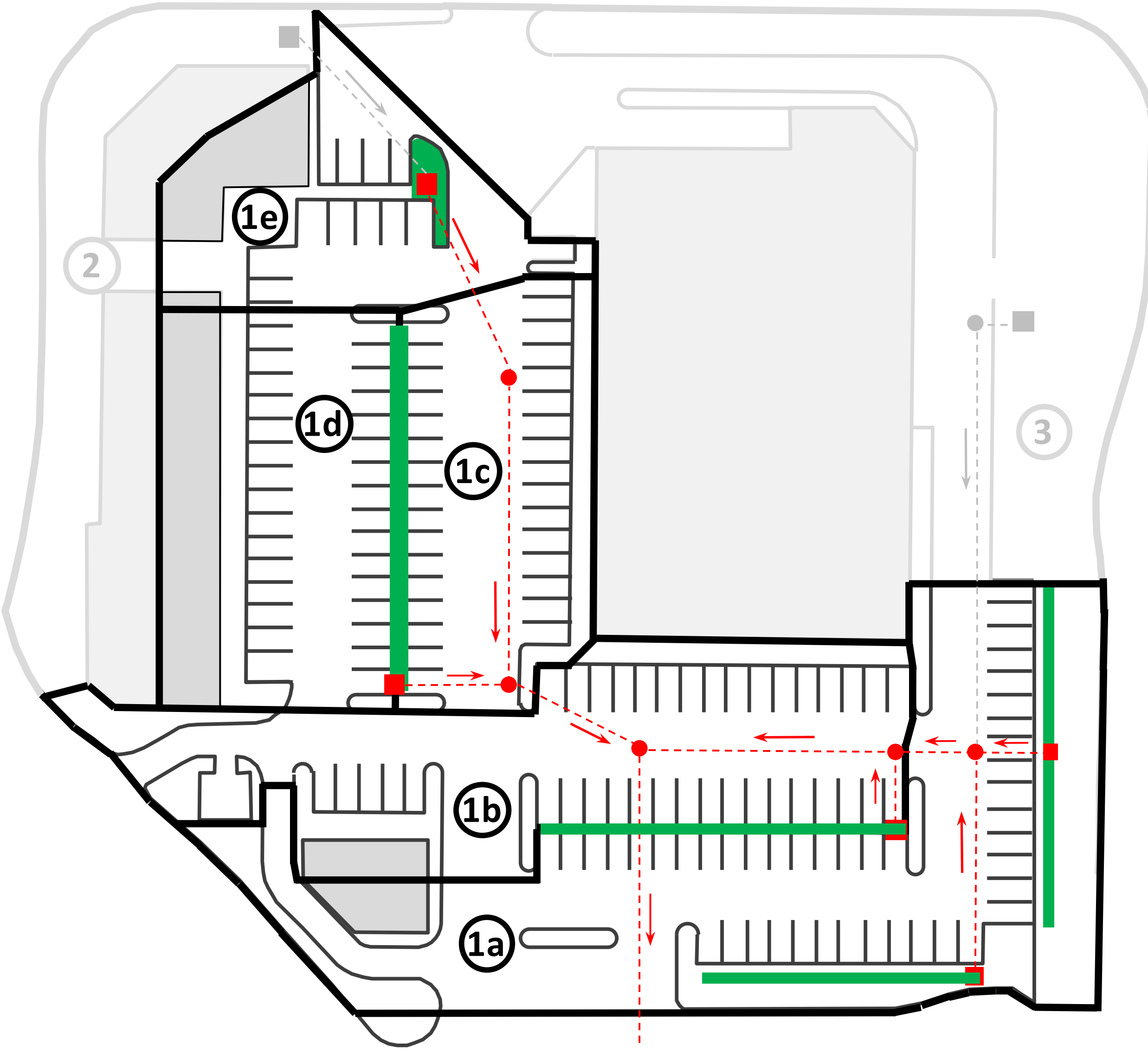
| Subarea ID | Drainage Area (ac) | % Impervious Cover | WQV (cu-ft) | Surface Area (sq-ft) | Length (ft) | Width (ft) |
|---|---|---|---|---|---|---|
| 1a | 0.70 | 70% | 1,957 | 1,550 | 239 | 6.48 |
| 1b | 0.47 | 95% | 1,544 | 1,223 | 140 | 8.74 |
| 1c | 0.25 | 95% | 821 | 651 | 140 | 4.65 |
| 1d | 0.32 | 95% | 1,051 | 833 | 140 | 5.95 |
| 1e | 0.24 | 90% | 749 | 593 | 87 | 6.82 |

BMP Details are presented in Figure 5.




| **Permeable Pavement Design Parameters** | |
|---|---|
| Design Storm Depth | 1 in |
| Infiltration Rate | 1.5 in/hr |
| Infiltration Rate Safety Factor | 2 |
| Drawdown Time | 48 hrs |
| Pavement Course Thickness | 7 in |
| Reservoir Course Thickness | 36 in |

FIGURE 2: BMP LAYOUT 1, DRAINAGE AREA 1




**Vegetated Bio-Filter Design Parameters**

| | |
|---|---|
| Design Storm Depth | 1 in |
| Planting Media Thickness | 2 ft |
| Maximum Ponding Depth | 4 in |
| Filter Bed Drain Time | 48 hrs |

FIGURE 3: BMP LAYOUT 2, DRAINAGE AREA 1

| | | |
|---|---|---|
| **1. Water Quality Volume** | | |
| a. BMP Tributary Drainage Area, **A** | 0.70 | ac |
| b. % Impervious Area, **I** | 80 | % |
| c. Water Quality Design Storm Depth, **P** | 1.0 | in |
| d. Volumetric Runoff Coefficient, **C** | 0.77 | |
| e. Water Quality Volume, **WQV** | 1,957 | cu-ft |
| **2. Maximum Storage Depth** | | |
| a. Soil Infiltration Rate, **k** (0.5 min) | 1.5 | in/hr |
| b. Infiltration Rate Safety Factor (2 - 5), $\mathbf{F_s}$ | 2 | |
| c. Drawdown Time, **t** | 48 | hrs |
| d. Max. Storage Depth, $\mathbf{d_{max}}$ | 3.0 | ft |
| **3. Design Storage Depths** | | |
| a. Pavement Course Thickness, $\mathbf{l_p}$ | 7.0 | in |
| b. Reservoir Course Thickness, $\mathbf{l_r}$ | 36.0 | in |
| c. Pavement Course Porosity, $\mathbf{n_p}$ | 0.15 | |
| d. Reservoir Course Porosity, $\mathbf{n_r}$ | 0.35 | |
| e. Total Effective Storage Depth, $\mathbf{d_t}$ | 1.14 | ft |
| **4. BMP Area Requirements** | | |
| a. Fill Time, **T** | 2 | hrs |
| b. Min. Surface Area, $\mathbf{A_{BMP}}$ | 1,550 | sq-ft |

**FIGURE 4: PERMEABLE PAVEMENT SIZING WORKSHEET (DA 1A)**

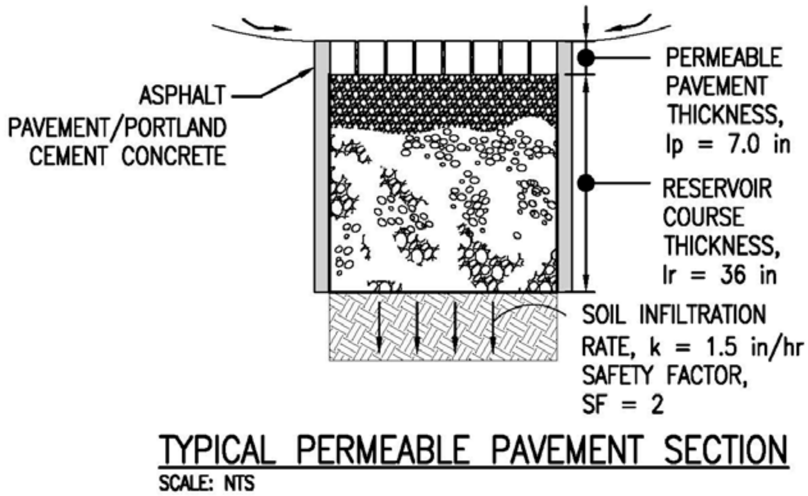



**FIGURE 5: PERMEABLE PAVEMENT DETAILS**

Vegetated Bio-Filter. The BMP sizing worksheet for Drainage Area 1a is presented in Figure 6, and the calculations are summarized as follows:

1. Water Quality Volume (WQV). The WQV is the same as that given above for the permeable pavement option.
2. Design depths. The planting media depth and maximum ponding depth are set to 2 feet and 4 inches, respectively.
3. Filter bed surface area. Using a planting media permeability coefficient of 1 ft/day and a filter bed drain time of 48 hours, the required filter bed surface area, excluding pretreatment, is calculated to be 903 square feet.
4. Filter bed dimensions. The width of the filter bed is set such that the resulting length occupies the length of the respective parking areas. Using this approach, the filter bed width is set to 3.75 feet.
5. Total Area. Using an embankment side slope of 0 and 3 inches of freeboard, the total BMP areas are the same as the filter bed surface area. Similarly to the retention option, the Vegetated Bio-Filter will be divided into two sections.

The calculations for the other 4 subareas follow the same steps using the same design parameters for constructability and consistency. A summary of all 5 subareas is as follows:

| Subarea ID | Drainage Area (ac) | % Impervious Cover | WQV (cu-ft) | Surface Area (sq-ft) | Length (ft) | Width (ft) |
|---|---|---|---|---|---|---|
| 1a | 0.70 | 70% | 1,957 | 903 | 239 | 3.78 |
| 1b | 0.47 | 95% | 1,544 | 713 | 140 | 5.09 |
| 1c | 0.25 | 95% | 821 | 379 | 140 | 2.71 |
| 1d | 0.32 | 95% | 1,051 | 485 | 140 | 3.47 |
| 1e | 0.24 | 90% | 749 | 346 | 37 | 13 |

Not that for Drainage Area 1e, the length and width given above represent maximum values since the BMP area is an irregular shape (i.e., not rectangular). For this reason, the length times the width does not equal the required surface area. BMP details are presented in Figure 7.

| | | |
|---|---|---|
| **1. Water Quality Volume** | | |
| a. BMP Tributary Drainage Area, **A** | 0.70 | ac |
| b. % Impervious Area, **I** | 80 | % |
| c. Water Quality Design Storm Depth, **P** | 1.0 | in |
| d. Volumetric Runoff Coefficient, **C** | 0.77 | |
| e. Water Quality Volume, **WQV** | 1,957 | cu-ft |
| **2. Filter Bed Surface Area** | | |
| a. Planting Media Depth, $\mathbf{l_m}$ (2.0 - 5.0 ft) | 2.0 | ft |
| b. Maximum Ponding Depth, $\mathbf{d_p}$ (12 in) | 4.0 | in |
| c. Planting Media Coefficient of Permeability, **k** | 1 | ft/day |
| d. Filter Bed Drain Time, **t** | 48 | hrs |
| e. Filter Bed Surface Area, $\mathbf{A_{BMP}}$ | 903 | sq-ft |
| **3. BMP Area** | | |
| a. Side Slopes (length per unit height), **z** | 0 | |
| b. Freeboard, **f** | 0.25 | ft |
| c. Filter Bed Width, $\mathbf{w_b}$ | 3.78 | ft |
| d. Filter Bed Length, $\mathbf{l_b}$ | 239 | ft |
| e. Top Width, $\mathbf{w_t}$ | 3.78 | ft |
| f. Top Length, $\mathbf{l_t}$ | 239 | ft |
| g. Min. Top Surface Area excluding pretreatment, $\mathbf{A_{BMP}}$ | 903 | sq-ft |

**FIGURE 6: VEGETATED BIO-FILTER SIZING WORKSHEET (DA 1A)**

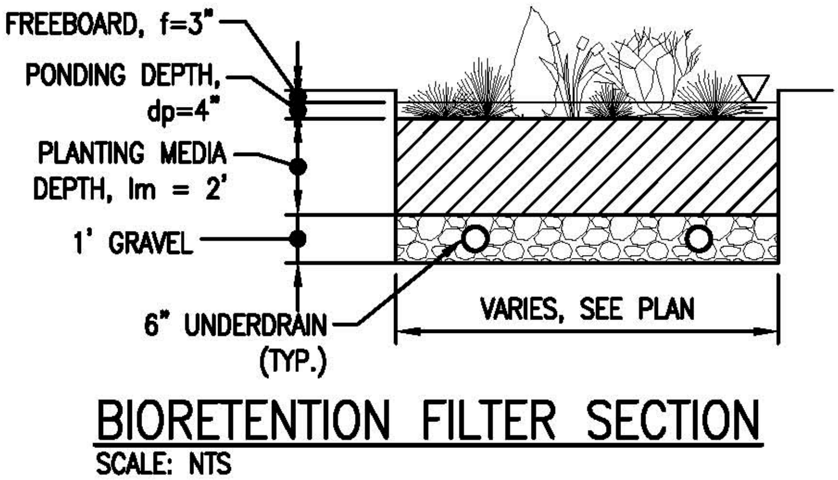



**FIGURE 7: VEGETATED BIO-FILTER DETAILS**

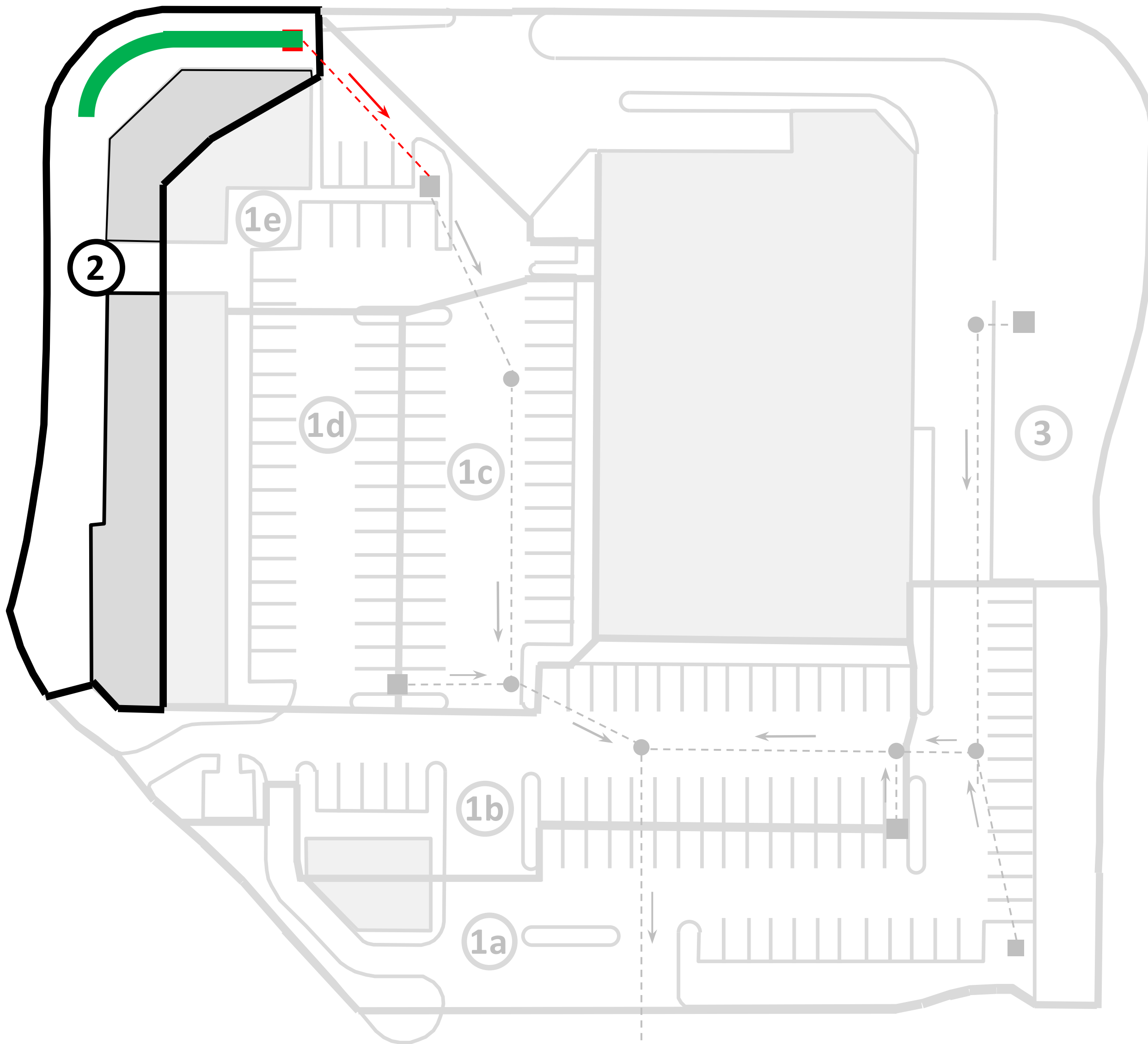
C.2 Drainage Area 2

The 0.29 acres of runoff from Drainage Area 2 may not be retained because there is not enough space to meet the building setback criterion (20 feet). It may be biofiltered with either a vegetated swale (see Figure 8) or vegetated bio-filter (see Figure 9). The sizing of the BMPs is accomplished using the City's BMP sizing worksheets, which are consistent with the Step-by-Step Sizing Procedure provided in the *BMP Guide*.

Vegetated Swale. The BMP sizing worksheet is presented in Figure 10, and the calculations are summarized as follows:

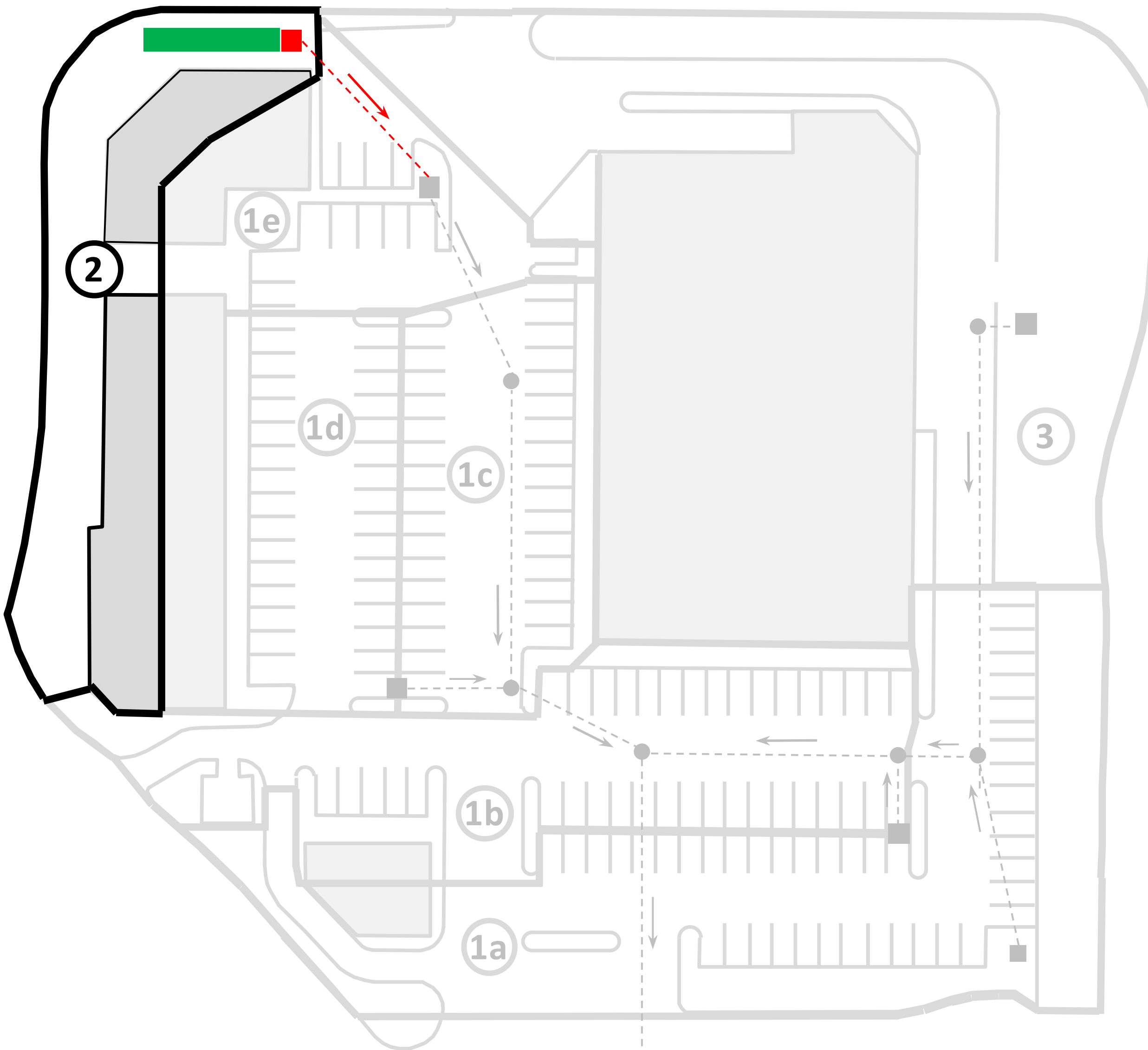
1. Water Quality Flow Rate (WQF). Assuming a weighted runoff coefficient of 0.50, and using a rainfall intensity of 0.4 in/hr, the WQF is calculated to be 0.058 cfs.
2. Swale geometry. The bottom width, depth of flow, side slope, longitudinal slope, and Manning's roughness coefficient are set to 3 feet (to minimize the length), 1.25 inches, 3:1, 2%, and 0.20, respectively.
3. Swale hydraulic capacity. The cross sectional area, wetted perimeter, and hydraulic radius are calculated to be 0.35 sq-ft, 3.66 ft, and 0.09 ft, respectively. The design flow rate is calculated to be 0.075 cfs, which is equal to or greater than the WQF.
4. Design flow velocity. The design flow velocity is calculated to be 0.22 feet per second, which is less than the maximum allowed velocity of 1 foot per second.
5. Swale length. Using a hydraulic residence time of 7 minutes, the swale length is calculated to be 92 feet.
6. BMP area requirements. Using 6 inches of freeboard, the required total surface area is calculated to be 607 sq-ft. At 92 feet long, this equates to a top width of 6.6 feet.

BMP details are presented in Figure 11.




| **Vegetated Swale Design Parameters** | |
|---|---|
| Weighted Runoff Coefficient | 50% |
| Rainfall Intensity | 0.4 in/hr |
| Manning's Roughness Coeff. | 0.20 |
| Hydraulic Residence Time | 7 min |

FIGURE 8: BMP LAYOUT 1, DRAINAGE AREA 2




**Vegetated Bio-Filter Design Parameters**

| | |
|---|---|
| Design Storm Depth | 1 in |
| Planting Media Thickness | 2 ft |
| Maximum Ponding Depth | 4 in |
| Filter Bed Drain Time | 48 hrs |

FIGURE 9: BMP LAYOUT 2, DRAINAGE AREA 2

| | | |
|---|---|---|
| **1. Water Quality Flow Rate** | | |
| a. BMP Tributary Drainage Area, **A** | 0.29 | ac |
| b. Weighted Runoff Coefficient, **C** | 0.5 | |
| c. Rainfall Intensity, **i** | 0.4 | in/hr |
| d. Water Quality Flow Rate, **WQF** | 0.058 | cfs |
| **2. Swale Geometry** | | |
| a. Bottom Width, **b** (10.0 ft max) | 3.00 | ft |
| b. Flow Depth, **y** (4.0 in max) | 1.25 | in |
| c. Side Slopes (length per unit height), **z** (3.0 max) | 3 | ft/ft |
| d. Longitudinal Slope, **s** | 2.0 | % |
| e. Manning's Roughness Coefficient, **n** | 0.20 | |
| **3. Swale Hydraulic Capacity** | | |
| a. Cross-sectional Area @ Flow Depth, **A** | 0.35 | sq-ft |
| b. Wetted Perimeter, **WP** | 3.66 | ft |
| c. Hydraulic Radius, **R** | 0.09 | ft |
| d. Calculated Flow Rate, **Q** | 0.075 | cfs |
| **4. Design Flow Velocity** | | |
| a. Design Flow Velocity, **V** (1.0 fps max) | 0.22 | fps |
| **5. Swale Length** | | |
| a. Hydraulic Residence Time, **T** (7.0 min) | 7 | min |
| b. Minimum Length, **L** | 92 | ft |
| **6. BMP Area Requirements** | | |
| a. Freeboard, **f** (6 min) | 6 | in |
| b. Embankment Top Surface Area, $\mathbf{A_{BMP}}$ | 607 | sq-ft |

**FIGURE 10: VEGETATED SWALE SIZING WORKSHEET (DA 2)**

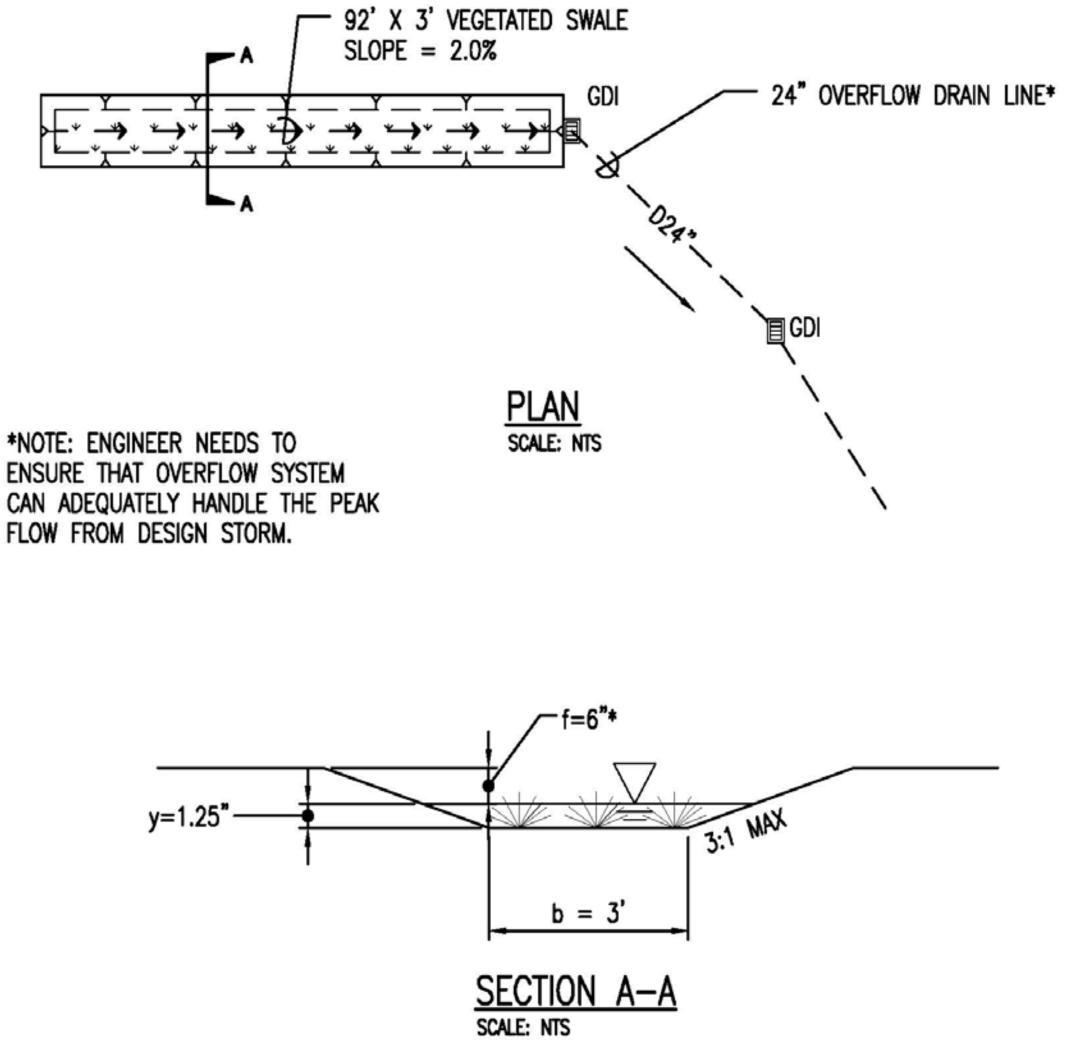



FIGURE 11: VEGETATED SWALE DETAILS

Vegetated Bio-Filter. The BMP sizing worksheet is presented in Figure 12, and the calculations are summarized as follows:

1. Water Quality Volume (WQV). Assuming 50% impervious cover, and using a 1-inch design storm depth, the WQV is calculated to be 526 cubic feet.
2. Design depths. For constructability and consistency, the planting media depth and maximum ponding depth used for Drainage Area 1 are used here.
3. Filter bed surface area. Using the same parameters as those presented for Drainage Area 1, the required filter bed surface area is calculated to be 243 square feet.
4. Filter bed dimensions. The width and length of the filter bed are set to 5 feet and 49 feet, respectively, which are based on available space and drainage area characteristics.

5. Total Area. Using an embankment side slope of 3:1 and 3 inches of freeboard, the top width, top length, and total BMP area are calculated to be 8.5 feet, 52.1 feet, and 443 square feet, respectively.

BMP details are presented in Figure 7.

| | | |
|---|---|---|
| **1. Water Quality Volume** | | |
| a. BMP Tributary Drainage Area, **A** | 0.29 | ac |
| b. % Impervious Area, **I** | 50 | % |
| c. Water Quality Design Storm Depth, **P** | 1.0 | in |
| d. Volumetric Runoff Coefficient, **C** | 0.5 | |
| e. Water Quality Volume, **WQV** | 526 | cu-ft |
| **2. Filter Bed Surface Area** | | |
| a. Planting Media Depth, $l_m$ (2.0 - 5.0 ft) | 2.0 | ft |
| b. Maximum Ponding Depth, $d_p$ (12 in) | 4.0 | in |
| c. Planting Media Coefficient of Permeability, **k** | 1 | ft/day |
| d. Filter Bed Drain Time, **t** | 48 | hrs |
| e. Filter Bed Surface Area, $A_{BMP}$ | 243 | sq-ft |
| **3. BMP Area** | | |
| a. Side Slopes (length per unit height), **z** | 3 | |
| b. Freeboard, **f** | 0.25 | ft |
| c. Filter Bed Width, $w_b$ | 5.0 | ft |
| d. Filter Bed Length, $l_b$ | 49 | ft |
| e. Top Width, $w_t$ | 8.5 | ft |
| f. Top Length, $l_t$ | 52.1 | ft |
| g. Min. Top Surface Area excluding pretreatment, $A_{BMP}$ | 443 | sq-ft |

**FIGURE 12: VEGETATED BIO-FILTER SIZING WORKSHEET (DA 2)**

### C.3 Drainage Area 3

The 1.17 acres of runoff from Drainage Area 3 may be retained with an infiltration basin if retention is feasible (See Figure 13), or biofiltered with a vegetated bio-filter (see Figure 14). The sizing of both BMPs is accomplished using the City's BMP sizing worksheets, which are consistent with the Step-by-Step Sizing Procedure provided in the *BMP Guide*.

Infiltration Basin. The BMP sizing worksheet is presented in Figure 15, and the calculations are summarized as follows:

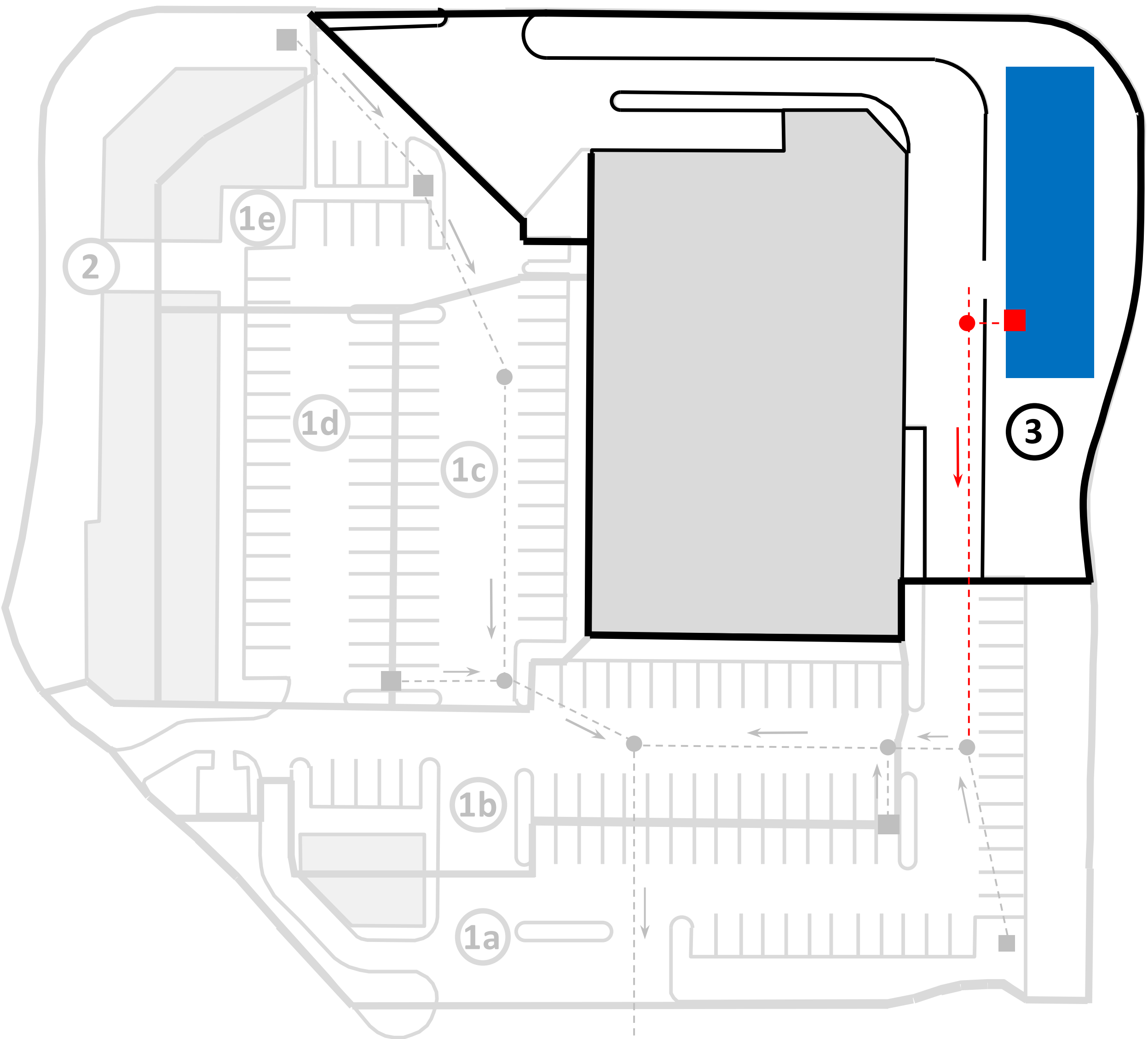
1. Water Quality Volume (WQV). Assuming 75% impervious cover, and using a 1-inch design storm depth, the WQV is calculated to be 3,079 cubic feet.
2. Maximum allowable storage depth. Using the same parameters as those presented for Drainage Area 1, the maximum allowable storage depth is calculated to be 3.0 feet.
3. Design storage depth. The ponding depth is set to 3 feet, which is equal to or less than the maximum allowable storage depth.
4. Basin invert footprint. Using a basin fill time of 2 hours (industry accepted practice), the required invert surface area is calculated to be 985 square feet.
5. BMP area requirements. Based on available space, the invert width is set to 10 feet, and the invert length is calculated to be 98.5 feet. Using a side slope of 3:1 and a freeboard depth of 1 foot (actual free board requirements must be determined for flood design storm), the top width and top length are calculated to be 34 feet and 122.53 feet, respectively. The total footprint is calculated to be 4,166 square feet.

BMP details are presented in Figure 16.

Vegetated Bio-Filter. The BMP sizing worksheet is presented in Figure 17, and the calculations are summarized as follows:

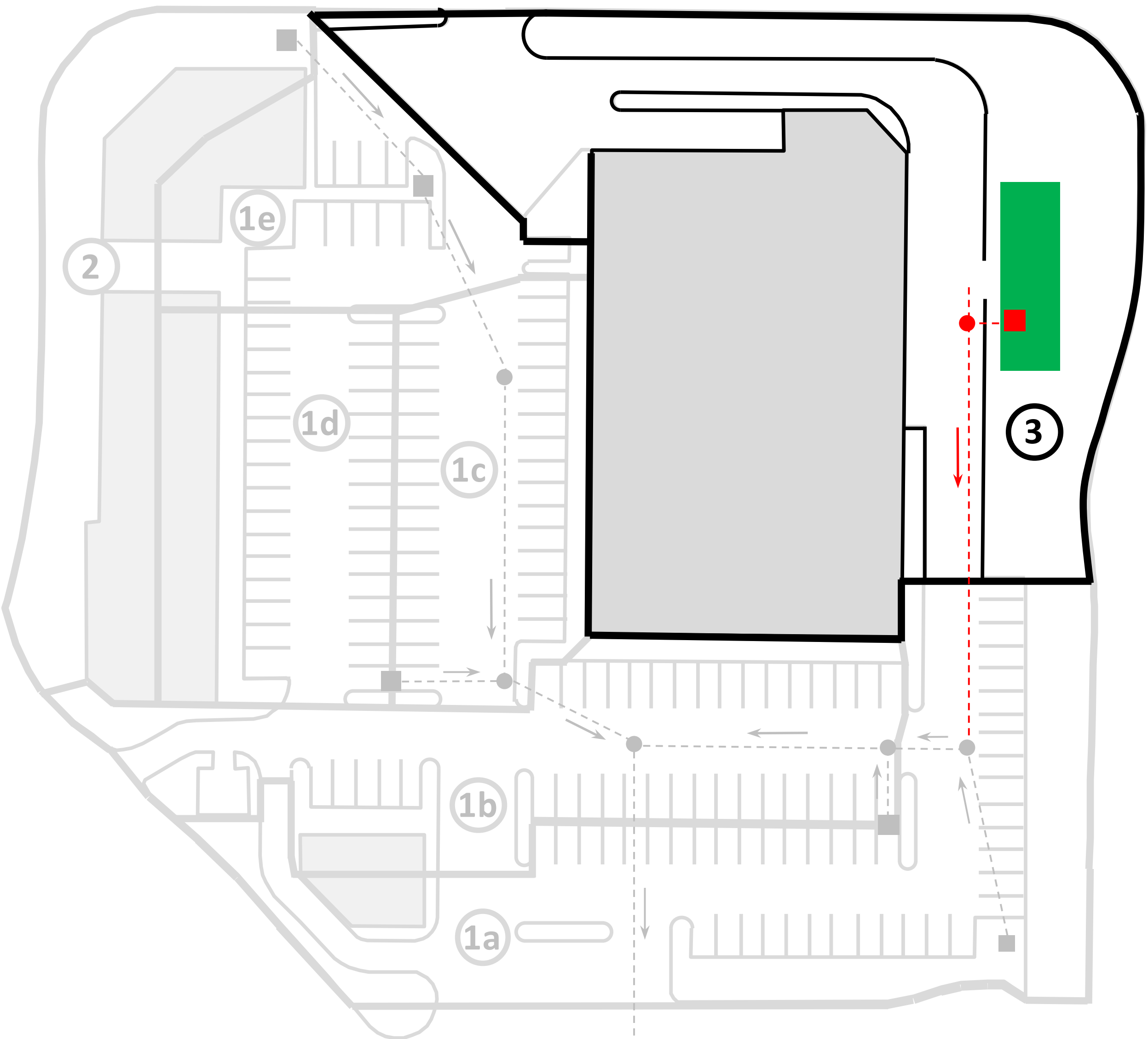
1. Water Quality Volume (WQV). The WQV is the same as that given above for the infiltration basin (3,079 cubic feet).
2. Design depths. For constructability and consistency, the planting media depth and maximum ponding depth used for Drainage Area 1 are used here.
3. Filter bed surface area. Using the same parameters as those presented for Drainage Area 1, the required filter bed surface area is calculated to be 1,421 square feet.
4. Filter bed dimensions. Based on available space, the invert width is set to 20 feet, and the invert length is calculated to be 71 feet.
5. Total Area. Using an embankment side slope of 3:1 and 3 inches of freeboard, the top dimensions are calculated to be 24 feet by 75 feet, and the total BMP area is calculated to be 1,752 square feet.

BMP details are presented in Figure 7.




| **Infiltration Basin Design Parameters** | |
|---|---|
| Design Storm Depth | 1 in |
| Infiltration Rate | 1.5 in/hr |
| Infiltration Rate Safety Factor | 2 |
| Drawdown Time | 48 hrs |
| Basin Fill Time | 2 hrs |

FIGURE 13: BMP LAYOUT 1, DRAINAGE AREA 3




**Vegetated Bio-Filter Design Parameters**

| | |
|---|---|
| Design Storm Depth | 1 in |
| Planting Media Thickness | 2 ft |
| Maximum Ponding Depth | 4 in |
| Filter Bed Drain Time | 48 hrs |

FIGURE 14: BMP LAYOUT 2, DRAINAGE AREA 3

| | | |
|---|---|---|
| **1. Water Quality Volume** | | |
| a. BMP Tributary Drainage Area, **A** | 1.17 | ac |
| b. % Impervious Area, **I** | 75 | % |
| c. Water Quality Design Storm Depth, **P** | 1.0 | in |
| d. Volumetric Runoff Coefficient, **C** | 0.725 | |
| e. Water Quality Volume, **WQV** | 3,079 | cu-ft |
| **2. Maximum Storage Depth** | | |
| a. Soil Infiltration Rate, **k** (0.5 min) | 1.5 | in/hr |
| b. Infiltration Rate Safety Factor (2 - 5), $\mathbf{F_s}$ | 2 | |
| c. Drawdown Time, **t** | 48 | hrs |
| d. Max. Storage Depth, $\mathbf{d_{max}}$ | 3.0 | ft |
| **3. Design Storage Depth** | | |
| a. Ponding Depth, $\mathbf{d_p}$ | 3.00 | ft |
| **4. Basin Invert Footprint** | | |
| b. Reservoir Fill Time, **T** | 2 | hrs |
| c. Min. Bottom Surface Area, $\mathbf{A_b}$ | 985 | sq-ft |
| **5. BMP Area Requirements** | | |
| a. Side Slopes (length per unit height), **z** (3.0 min) | 3 | |
| b. Freeboard, **f** (1.0 min) | 1 | ft |
| c. Invert Width, $\mathbf{w_b}$ | 10.0 | ft |
| d. Invert Length, $\mathbf{l_b}$ | 98.5 | ft |
| e. Top Width, $\mathbf{w_t}$ | 34.00 | ft |
| f. Top Length, $\mathbf{l_t}$ | 122.53 | ft |
| g. Min. Top Surface Area excluding pretreatment, $\mathbf{A_{BMP}}$ | 4,166 | sq-ft |

**FIGURE 15: INFILTRATION BASIN SIZING WORKSHEET (DA 3)**

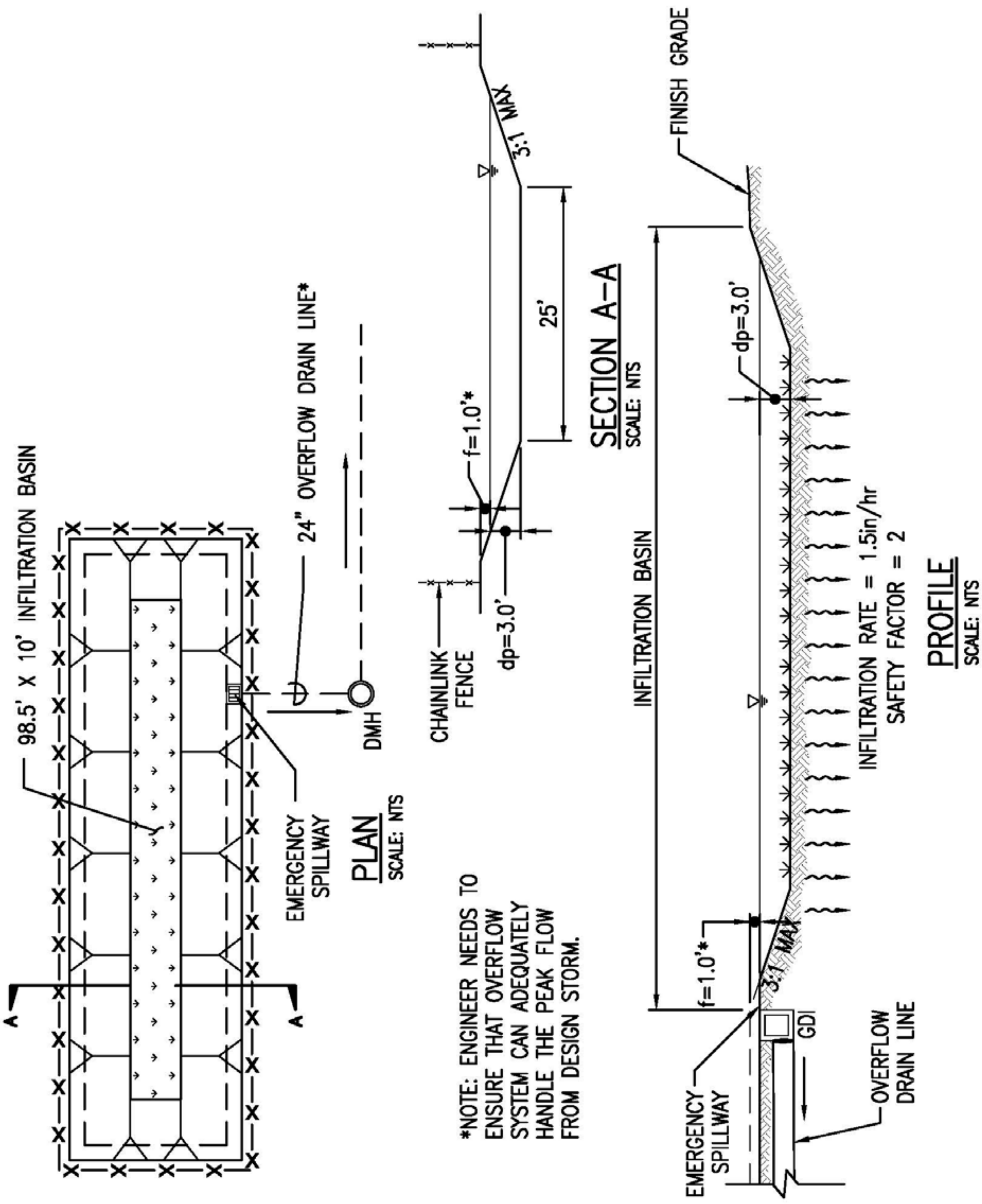



FIGURE 16: INFILTRATION BASIN DETAILS

| | | |
|---|---|---|
| **1. Water Quality Volume** | | |
| a. BMP Tributary Drainage Area, **A** | 1.17 | ac |
| b. % Impervious Area, **I** | 75 | % |
| c. Water Quality Design Storm Depth, **P** | 1.0 | in |
| d. Volumetric Runoff Coefficient, **C** | 0.725 | |
| e. Water Quality Volume, **WQV** | 3,079 | cu-ft |
| **2. Filter Bed Surface Area** | | |
| a. Planting Media Depth, $\mathbf{l_m}$ (2.0 - 5.0 ft) | 2.0 | ft |
| b. Maximum Ponding Depth, $\mathbf{d_p}$ (12 in) | 4.0 | in |
| c. Planting Media Coefficient of Permeability, **k** | 1 | ft/day |
| d. Filter Bed Drain Time, **t** | 48 | hrs |
| e. Filter Bed Surface Area, $\mathbf{A_{BMP}}$ | 1,421 | sq-ft |
| **3. BMP Area** | | |
| a. Side Slopes (length per unit height), **z** | 3 | |
| b. Freeboard, **f** | 0.25 | ft |
| c. Filter Bed Width, $\mathbf{w_b}$ | 20 | ft |
| d. Filter Bed Length, $\mathbf{l_b}$ | 71.06 | ft |
| e. Top Width, $\mathbf{w_t}$ | 23.50 | ft |
| f. Top Length, $\mathbf{l_t}$ | 74.56 | ft |
| g. Min. Top Surface Area excluding pretreatment, $\mathbf{A_{BMP}}$ | 1,752 | sq-ft |

**FIGURE 17: VEGETATED BIO-FILTER SIZING WORKSHEET (DA 3)**

## D. ALTERNATIVE COMPLIANCE

If LID Retention and LID Biofiltration are determined to be infeasible, alternative compliance would be required. Options include treating the runoff with Other Treatment Control BMPs identified in the BMP Guide (detention basin, manufactured treatment device, sand filter, etc.).

# EXAMPLE 3, 0.74 ACRE COMMERCIAL DEVELOPMENT

A restaurant is being constructed on a 0.74-acre site. The layout is presented in Figure 1, and includes more than 10,000 square feet of impervious surface.

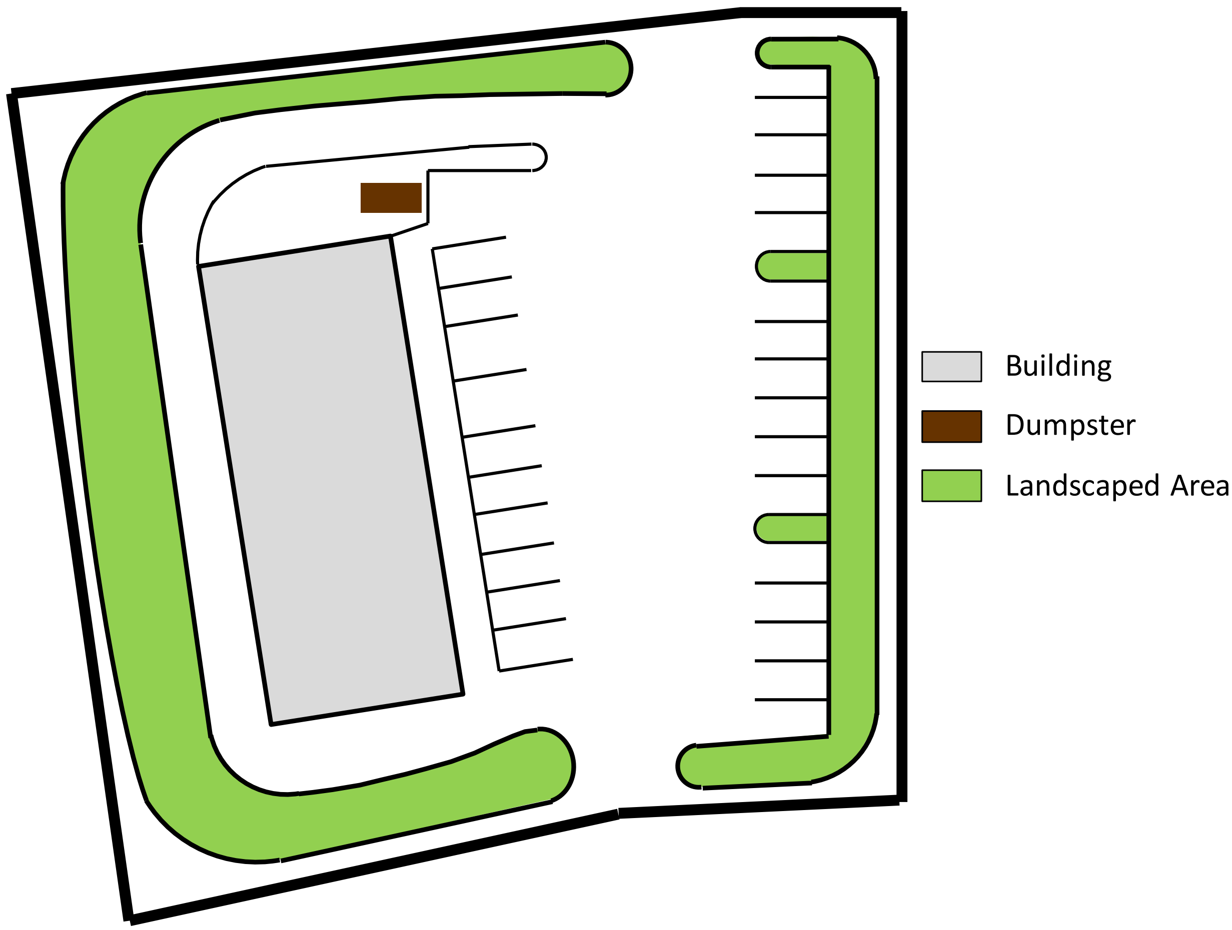



FIGURE1: EXAMPLE 3 DEVELOPMENT PLAN

The project meets the criteria of a Priority B new development project and requires the preparation of a Storm Water Quality Checklist (SWQC). As specified in Section B.6 of §1-5.1 Part I, water quality criteria shall be achieved by considering LID Site Design and implementing appropriate Source Control. Each of these elements is presented below.

## A. LID SITE DESIGN

All 5 LID Site Design Strategies specified in the *City and County of Honolulu Storm Water BMP Guide* (*BMP Guide*) were considered. The strategy "Direct Runoff to Landscaped Areas" will be implemented by directing all pavement runoff to the surrounding landscaped areas, and directing roof runoff to the adjacent landscaped area using roof drains. Details are shown in Figure 2.

## B. SOURCE CONTROL

The *BMP Guide* identifies 12 Source Control BMPs for new development and redevelopment projects. The following ones will be implemented:

- Automatic Irrigation Systems
    - Irrigation system will be designed to each landscape area's specific water requirements.
    - Irrigation system will be designed to minimize the runoff of excess irrigation water into the storm water drainage system.
    - Plants with similar water requirements will be grouped together in order to reduce excess irrigation runoff and promote surface filtration.
- Storm Drain Inlets
    - All storm drain inlets and catch basins within the project area will be stenciled with appropriate signage.
- Outdoor Trash Storage
    - Dumpster area will be graded towards vegetated/landscaped area.
    - Drip pans will be placed underneath dumpster to reduce/prevent leaking of liquid wastes.
    - Dumpster with attached lids will be used to prevent rainfall from entering container.
    - Dumpster area will be paved with an impervious surface to mitigate spills.
    - Signs will be posted indicating that hazardous material are not to be disposed of therein.
- Parking Areas
    - Pavement runoff will be directed towards vegetated/landscaped areas.

Details are shown in Figure 2.

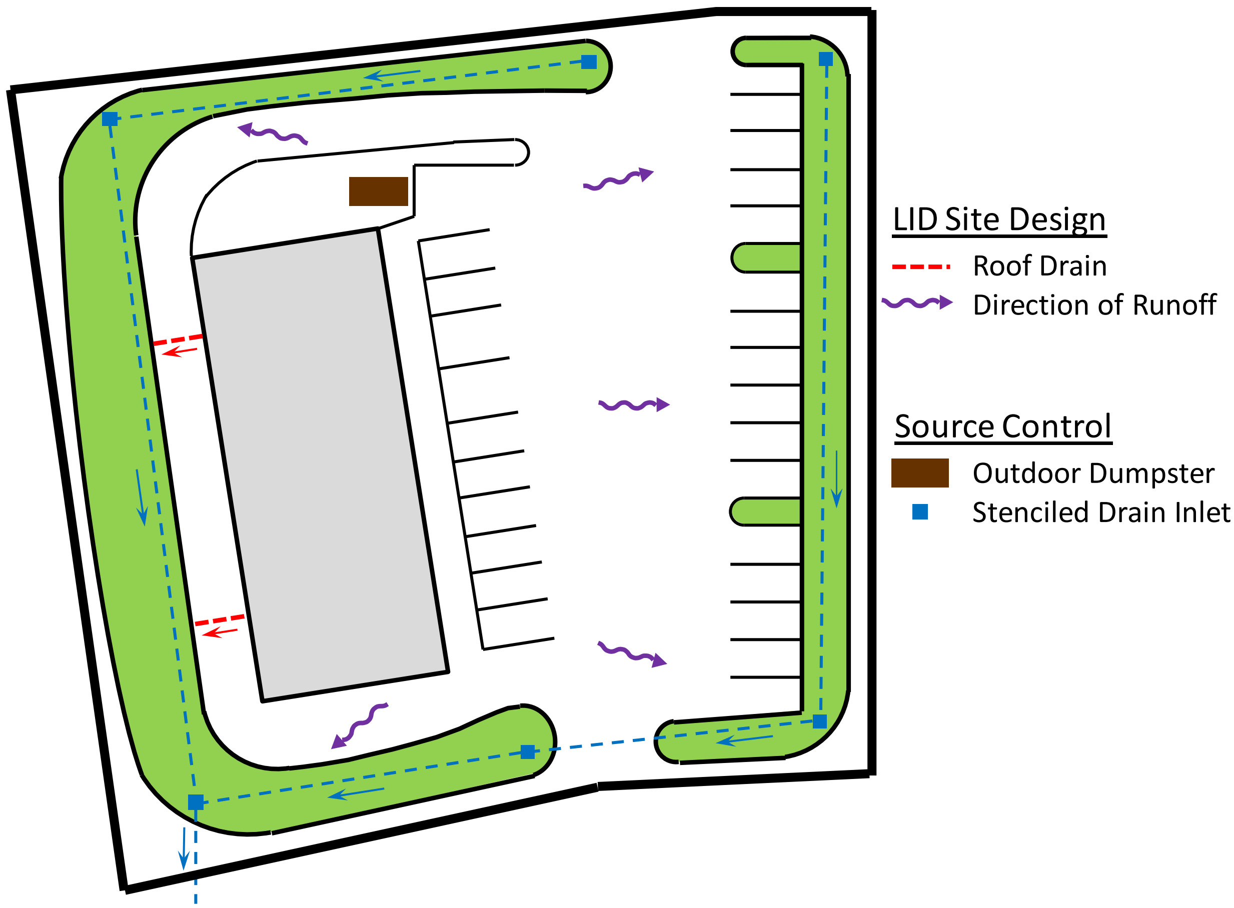



FIGURE2: LID SITE DESIGN AND SOURCE CONTROL PLAN

# Appendix E

# A Sample of CDS Unit Operation and Maintenance Guideline

# OPERATIONS AND MAINTENANCE GUIDELINES

## CDS Stormwater Treatment Unit

### INTRODUCTION

The CDS unit is an important and effective component of your storm water management program and proper operation and maintenance of the unit are essential to demonstrate your compliance with local, state and federal water pollution control requirements.

The CDS technology features a patented non-blocking, indirect screening technique developed in Australia to treat water runoff. The unit is highly effective in the capture of suspended solids, fine sands and larger particles. Because of its non-blocking screening capacity, the CDS unit is un-matched in its ability to capture and retain gross pollutants such as trash and debris. In short, CDS units capture a very wide range of organic and in-organic solids and pollutants that typically result in tons of captured solids each year such as: Total suspended solids ( TSS) and other sedimentitious materials, oil and greases, trash, and other debris (including floatables, neutrally buoyant, and negatively buoyant debris). These pollutants will be captured even under very high flow rate conditions.

CDS units are equipped with conventional oil baffles to capture and retain oil and grease. Laboratory evaluations show that the CDS units are capable of capturing up to 70% of the free oil and grease from storm water. CDS units can also accommodate the addition of oil sorbents within their separation chambers. The addition of the oil sorbents can ensure the permanent removal of 80% to 90% of the free oil and grease from the storm water runoff.

### OPERATIONS

The CDS unit is a non-mechanical self-operating system and will function any time there is flow in the storm drainage system. The unit will continue to effectively capture pollutants in flows up to the design capacity even during extreme rainfall events when the design capacity may be exceeded. Pollutants captured in the CDS unit's separation chamber and sump will be retained even when the units design capacity is exceeded.

### CDS UNIT INSPECTION

Access to the CDS unit is typically achieved through two manhole access covers – one allows inspection (and clean out) of the separation chamber (screen/cylinder) & sump and another allows inspection (and cleanout) of sediment captured and retained behind the screen.

The unit should be periodically inspected to determine the amount of accumulated pollutants and to ensure that the cleanout frequency is adequate to handle the predicted pollutant load being processed by the CDS unit. The unit should be periodically inspected for indications of vector infestation, as well. The recommended cleanout of solids within the CDS unit's sump should occur at 75% to 85% of the sump capacity. However, the sump may be completely full with no impact to the CDS unit's performance.

CONTECH Stormwater Solutions (previously CDS Technologies) recommends the following inspection guidelines: For new initial operation, check the condition of the unit after every runoff event for the first 30 days. For ongoing operations, the unit should be inspected after the first six inches of rainfall at the beginning of the rainfall season and at approximately 30-day intervals. The visual inspection should ascertain that the unit is functioning properly (no blockages or obstructions to inlet and/or separation screen), evidence of vector infestation, and to measure the amount of solid materials that have accumulated in the sump, fine sediment accumulated behind the screen, and floating trash and debris in the separation chamber. This can be done with a calibrated dipstick, tape measure or other measuring instrument so that the depth of deposition in the sump can be tracked.

**CDS UNIT CLEANOUT**

The frequency of cleaning the CDS unit will depend upon the generation of trash and debris and sediments in your application. Cleanout and preventive maintenance schedules will be determined based on operating experience unless precise pollutant loadings have been determined.

Access to the CDS unit is typically achieved through two manhole access covers – one allows cleanout of the separation chamber (screen/cylinder) & sump and another allows cleanout of sediment captured and retained behind the screen. For units possessing a sizable depth below grade (depth to pipe), a single manhole access point would allow both sump cleanout and access behind the screen.

CONTECH Stormwater Solutions Recommends The Following:

> <u>NEW INSTALLATIONS</u>: Check the condition of the unit after every runoff event for the first 30 days. The visual inspection should ascertain that the unit is functioning properly (no blockages or obstructions to inlet and/or separation screen), measuring the amount of solid materials that have accumulated in the sump, the amount of fine sediment accumulated behind the screen, and determining the amount of floating trash and debris in the separation chamber. This can be done with a calibrated "dip stick" so that the depth of deposition can be tracked. Refer to the "Cleanout Schematic" **(Appendix B) f**or allowable deposition depths and critical distances. Schedules for inspections and cleanout should be based on storm events and pollutant accumulation.
>
> <u>ONGOING OPERATION:</u> During the rainfall season, the unit should be inspected at least once every 30 days. The floatables should be removed and the sump cleaned when the sump is 75-85% full. If floatables accumulate more rapidly than the settleable solids, the floatables should be removed using a vactor truck or dip net before the layer thickness exceeds approximately one foot.
>
> Cleanout of the CDS unit at the end of a rainfall season is recommended because of the nature of pollutants collected and the potential for odor generation

from the decomposition of material collected and retained. This end of season cleanout will assist in preventing the discharge of pore water from the CDS ® unit during summer months.

**USE OF SORBENTS** –The addition of sorbents is **not a requirement** for CDS units to effectively control oil and grease from storm water. The conventional oil baffle within a unit assures satisfactory oil and grease removal. However, the addition of sorbents is a unique enhancement capability unique to CDS units, enabling increased oil and grease capture efficiencies beyond that obtainable by conventional oil baffle systems.

Under normal operations, CDS units will provide effluent concentrations of oil and grease that are less than 15 parts per million (ppm) for all dry weather spills where the volume is less than or equal to the spill capture volume of the CDS unit. During wet weather flows, the oil baffle system can be expected to remove between 40 and 70% of the free oil and grease from the storm water runoff.

CONTECH Stormwater Solutions only recommends the addition of sorbents to the separation chamber if there are specific land use activities in the catchment watershed that could produce exceptionally large concentrations of oil and grease in the runoff, concentration levels well above typical amounts. If site evaluations merit an increased control of free oil and grease then oil sorbents can be added to the CDS unit to thoroughly address these particular pollutants of concern.

***Recommended Oil Sorbents***

Rubberizer® Particulate 8-4 mesh or OARS ™ Particulate for Filtration, HPT4100 or equal. Rubberizer is supplied by Haz-Mat Response Technologies, Inc. 4626 Santa Fe Street, San Diego, CA 92109 (800) 542-3036. OARS is supplied by AbTech Industries, 4110 N. Scottsdale Road, Suite 235, Scottsdale, AZ 85251 (800) 545-8999.

The amount of sorbent to be added to the CDS separation chamber can be determined if sufficient information is known about the concentration of oil and grease in the runoff. Frequently the actual concentrations of oil and grease are too variable and the amount to be added and frequency of cleaning will be determined by periodic observation of the sorbent. As an initial application, CDS recommends that approximately 4 to 8 pounds of sorbent material be added to the separation chamber of the CDS units per acre of parking lot or road surface per year. Typically this amount of sorbent results in a ½ inch to one (1”) inch depth of sorbent material on the liquid surface of the separation chamber. The oil and grease loading of the sorbent material should be observed after major storm events. Oil Sorbent material may also be furnished in pillow or boom configurations.

The sorbent material should be replaced when it is fully discolored by skimming the sorbent from the surface. The sorbent may require disposal as a special or hazardous waste, but will depend on local and state regulatory requirements.

## CLEANOUT AND DISPOSAL

A vactor truck is recommended for cleanout of the CDS unit and can be easily accomplished in less than 30-40 minutes for most installations. Standard vactor operations should be employed in the cleanout of the CDS unit. Disposal of material from the CDS unit should be in accordance with the local municipality's requirements. Disposal of the decant material to a POTW is recommended. Field decanting to the storm drainage system is not recommended. Solids can be disposed of in a similar fashion as those materials collected from street sweeping operations and catch-basin cleanouts.

## MAINTENANCE

The CDS unit should be pumped down at least once a year and a thorough inspection of the separation chamber (inlet/cylinder and separation screen) and oil baffle performed. The unit's internal components should not show any signs of damage or any loosening of the bolts used to fasten the various components to the manhole structure and to each other. Ideally, the screen should be power washed for the inspection. If any of the internal components is damaged or if any fasteners appear to be damaged or missing, please contact CONTECH at 800.338.2211 to make arrangements to have the damaged items repaired or replaced.

The screen assembly is fabricated from Type 316 stainless steel and fastened with Type 316 stainless steel fasteners that are easily removed and/or replaced with conventional hand tools. The damaged screen assembly should be replaced with the new screen assembly placed in the same orientation as the one that was removed.

## CONFINED SPACE

The CDS unit is a confined space environment and only properly trained personnel possessing the necessary safety equipment should enter the unit to perform particular maintenance and/or inspection activities beyond normal procedure. Inspections of the internal components can, in most cases, be accomplished by observations from the ground surface.

## VECTOR CONTROL

Most CDS units do not readily facilitate vector infestation. However, for CDS units that may experience extended periods of non-operation (stagnant flow conditions for more than approximately one week) there may be the potential for vector infestation. In the event that these conditions exist, the CDS unit may be designed to minimize potential vector habitation through the use of physical barriers (such as seals, plugs and/or netting) to seal out potential vectors. The CDS unit may also be configured to allow drain-down under favorable soil conditions where infiltration of storm water runoff is permissible. For standard CDS units that show evidence of mosquito infestation, the application of larvicide is one control strategy that is recommended. Typical larvicide applications are as follows:

> SOLID B.t.i. LARVICIDE: ½ to 1 briquet (typically treats 50-100 sq. ft.) one time per month (30-days) or as directed by manufacturer.
>
> SOLID METHOPRENE LARVICIDE (not recommended for some locations): ½ to 1 briquet (typically treats 50-100 sq. ft.) one time per month (30-days) to once every 4-½ to 5-months (150-days) or as directed by manufacturer.

**RECORDS OF OPERATION AND MAINTENANCE**

CONTECH Stormwater Solutions recommends that the owner maintain annual records of the operation and maintenance of the CDS unit to document the effective maintenance of this important component of your storm water management program. The attached **Annual Record of Operations and Maintenance** form (see **Appendix A**) is suggested and should be retained for a minimum period of three years.

# APPENDIX A

## ANNUAL RECORDS OF OPERATIONS & MAINTENANCE AND INSPECTION CHECKLISTS

# ANNUAL RECORD OF OPERATION AND MAINTENANCE

**OWNER** ____________________
**ADDRESS** ____________________
**OWNER REPRESENTATIVE** ____________________ **PHONE** ____________________

**INSTALLATION:**
MODEL DESIGNATION ____________ DATE ____________
SITE LOCATION ____________________

**INSPECTIONS:**

| DATE/ INSPECTOR | SCREEN/INLET INTEGRITY | FLOATABLES DEPTH | DEPTH TO SEDIMENT (inches) | SEDIMENT VOLUME* (CUYDS) | SORBENT DISCOLORATION |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

DEPTH FROM COVER TO BOTTOM OF SUMP (SUMP INVERT) ____________

DEPTH FROM COVER TO SUMP @ 75% FULL ____________

VOLUME OF SUMP @ 75% FULL = _______ CUYD

VOLUME/INCH DEPTH ____________ CUFT/IN OF SUMP

VOLUME/FOOT DEPTH ____________ CUYD/FT OF SUMP

***Calculate Sediment Volume = (Depth to Sump Invert – Depth to Sediment)*(Volume/inch)**
OBSERVATIONS OF FUNCTION: ____________________
____________________
____________________

**CLEANOUT:**

| DATE | VOLUME FLOATABLES | VOLUME SEDIMENTS | METHOD OF DISPOSAL OF FLOATABLES, SEDIMENTS, DECANT AND SORBENTS |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

OBSERVATIONS:
____________________
____________________
____________________
____________________

**SCREEN MAINTENANCE:**
DATE OF POWER WASHING, INSPECTION AND OBSERVATIONS:
____________________
____________________

**CERTIFICATION:** ____________ **TITLE:** ____________ **DATE:** ____________

## INSPECTION CHECKLIST

1. During the rainfall season, inspect and check condition of unit at east once every 30 days ☐
2. Ascertain that the unit is funcioning properly (no blockages or obstructions to inlet and/or separation screen) ☐
3. Measure amount of solid material s that have accumulated in the sump (Unit should be cleaned when the sump is 75-85% full) ☐
4. Measure amount of fine sediment accumulated behind the screen ☐
5. Measure amount of floating trash and debris in the separation chamber ☐

## MAINTENANCE CHECKLIST

1. Cleanout unit at the end and beginning of the rainfall season ☐
2. Pump down unit (at least once a year) and thoroughly inspect separation chamber, separation screen and oil baffle ☐
3. No visible signs of damage or loosening of bolts to internal components observed * ☐

*** If there is any damage to the internal components or any fasteners are damaged or missing please contact CONTECH (800.338.1122).**

# CD Deliverable

12.0006

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, HONOLULU DISTRICT
TECHNICAL INTEGRATION BRANCH
BLDG. 230, ROOM 209
FORT SHAFTER, HI 96858

# State of Hawaii DOT Harbors
# Planning Assistance to States
# REVISED SCOPE OF WORK

31 May 2011

**I. PROJECT NAME:** Development of Geographic Information System (GIS) Layers for State of Hawaii, Department of Transportation, Harbors Division.

**II. PROJECT AUTHORITY:** Planning Assistance to States (PAS), Section 22, Water Resources Development Act (WRDA) of 1974.

**III. PURPOSE:** The Harbors Division desires to develop a comprehensive broad spectrum of GIS layers that it has deemed essential for the implementation of an effective GIS to help Harbors in the development, utilization, and management of the port resources in Hawaii. The work to be accomplished under this amendment will build off the Pilot GIS work (Phase I) that was undertaken in the initial PAS agreement between the U.S. Army Corps of Engineers (USACE) and the State of Hawaii, Department of Transportation, Harbors Division on 18 May 2009. The work to be accomplished in Phase II and Phase III includes the development of the GIS layers which were identified in Phase I and prioritized by the Harbors Division in the order in which they are presented in Table 1 below and described in greater detail in Section IV.D. of this Amendment-1, respectively. Order of magnitude cost estimates associated with the development of each respective GIS layer is also presented in the aforementioned table. The total cost to develop the entire spectrum of GIS layers on Oahu is $513,690. The total cost will be shared 50% Federal and 50% non-Federal. The project will focus on completing the layers for Oahu. The remaining work on neighbor islands will be pursued at a later time as Federal and non-Federal funding become available.

This broad spectrum of GIS layers represent myriad types of data that the Harbors Division deemed essential for sharing within its organization, as well as with other government agencies in a uniform, consistent, and efficient manner via its GIS. Such data would be utilized to plan for and/or address various issues it faces daily which include, but are not limited to, environmental compliance, operations, property management, and engineering. Despite the shortfall in funding to realize the entire spectrum of GIS layers, it desires to enter into this Amendment 1 to begin the development of the highest priority GIS layer, "(U02) Storm Drain System", first with the intent to develop the next higher priority GIS layer as funding becomes available under a subsequent amendment.

**IV. DEVELOPMENT OF GIS LAYERS**

A. It is recognized that Harbors Division's priorities may change as the project develops. At the time of scope development, Oahu harbors took precedent over Neighbor Island harbors.

B. The following table shows the list of highest priority layers identified by Harbors Division. The storm drain system (pipes, open channels, inlets, outlets, junctions) around Honolulu Harbor has been built and modified by many projects and has resulted in a complex system which will take up the bulk of the time. The priorities identified by Harbors Division are listed in the table below along with the cost associated to fully develop each GIS layer.

**Table 1**

| Data Layers Description | Oahu | Phase |
|---|---|---|
| Storm drain system | 200,000 | Phase II |
| Executive orders | 43,720 | Phase III |
| Aerial photos | 0 | Phase III |
| Foot markers | 31,816 | Phase III |
| Pier Footprints | 3,616 | Phase III |
| Permits | 58,937 | Phase III |
| Leases, subleases, and easements | 100,869 | Phase III |
| Bollards, cleats, capstans | 40,337 | Phase III |
| H.C. numbers (CIP/Maintenance) | 0 | Phase III |
| Bid tabulations | 2,687 | Phase III |
| Entrance channels & turning basins | 19250 | Phase III |
| Berthing areas | 3,475 | Phase III |
| HRS 343 documents | 8,983 | Phase III |
| Total | 513,691 | |

C. The layers with the greatest ease to develop will be converted first. This is dependent upon the level of support and input provided by the various Harbors offices. Geospatial data development requires Harbors staff to help with input and data availability. The USACE will strive to provide data in each layer and strive to complete all layers if possible within the funding and time constraints. The Phase II will focus on completion of the data layers for the storm drain system on Oahu. The storm drain data layers on the neighbor islands will be covered in future phases.

D. DESCRIPTION OF HIGH PRIORITY LAYERS:

1. Storm Drain System (IPD U02)
   a. Map and identify the components (eg. outlets, inlets, manholes, pipes, open channels) of the storm drain system.
   b. Provide naming/numbering scheme for each feature.
   c. Gather attribute information for each feature (eg. material, sizes, applicable asbuilt drawings, etc.)
   d. Photo document outlets, inlets, manholes

2. Executive Orders (IPD LU06)
   a. Layer should provide clear boundary lines and maps for Harbors' properties.
   b. Map for each harbor should clearly show the EO's and subunits.
   c. Should be able to query the layer by attributes or through maps.
   d. This activity was started for Oahu under the Pilot Project and will be completed in Phase III.

3. Aerial Photos (IPD DU07)
   a. As part of the pilot project aerial photos for both Honolulu Harbor and KBPH were obtained from Harbors, COE, USGS, USDA, and University of Hawaii. These images were processed and input into the GIS. This activity was started for Oahu under the Pilot Project.
   b. Aerial photography collections for the neighbor island harbors need to be converted, consolidated, and documented similar to the Oahu harbors. All remaining hardcopy photos from Harbors Division should be located, scanned, georeferenced and metadata authored. Imagery from other agencies will be added as available.

4. Foot Markers (IPD TM05)
   a. Identify and GPS beginning and endpoints of each marker.
   b. Extrapolate markers at intervals to match ground markers
   c. Create GIS points and attributes
   d. Create GeoPDF maps over aerial imagery for use by Harbors staff.

5. Pier Footprints (IPD LU13)
   Split each harbor geographically by piers or other designations to provide a name for each area. The purpose is to establish a name for each area of the harbor so everyone can use the same language. Honolulu Harbor was completed as part of the pilot program but KBPH and the neighbor islands needs to be analyzed and completed.

6. Permits (IPD LU01)
   a. Tie an export file of the Property Management database (Comprehensive information Database System (CIDS)) to maps
   b. Identify areas that are already permitted or encumbered by permits
   c. Search database geographically to identify Property Management data
   d. This activity was started for Oahu under the Pilot Project and will be completed in Phase III.

7. Leases, Subleases, and Easements (IPD LU02 and IPD LU03)
   a. Tie an export file of the Property Management database (Comprehensive Information Database System (CIDS)) to maps
   b. Identify areas that are already leased or available to be leased.
   c. Identify easements
   d. Search database geographically to identify Property Management data
   e. Identify tenants

f. This activity was started for Oahu under the Pilot Project and will be completed in Phase III.

8. Bollards, Cleats, Capstans (IPD LU13)
   a. While digitizing storm drain features, digitize all anchor points. Also digitize from HAR-EM *Bollard Capacities Survey* (Jan 22, 1999)
   b. GPS each anchor point during field inspection of storm drain features
   c. Add attributes to match survey (type, capacity (only if available from survey and type matches field verification), bent location.)

9. H.C. Numbers (IPD DU08)
   a. Create a polygon for each project with an H.C. Number. Add attributes to allow queries by funding source, zone or area (eg. Commercial Fishing Village), piers, or funding source (CIP vs Maintenance)
   b. Use the H.C. number to hyperlink studies, reports, contract documents, and all types of documents.
   c. Develop a network folder system to provide a home for sharing and archiving documents.
   d. This activity was started for Oahu under the Pilot Project and will be completed in Phase III.

10. Bid Tabulations (IPD DU04)
    a. Using the footprints developed by the H.C. numbers, bid tabulations will be hyperlinked geographically or through its attributes.
    b. This activity was started for Oahu under the Pilot Project and will be completed under Phase III.

11. Entrance Channels (IPD TM02) and Turning Basins (IPD TM03)
    a. The entrance channels for KBPH and the main channel at Honolulu have been mapped. Need to find the asbuilt drawings for Kalihi Channel and input into the GIS.
    b. Turning basins for KBPH and Honolulu Harbor have been input during the Pilot Project (Phase I).
    c. This activity was started for Oahu under the Pilot Project and will be completed under Phase III.

12. Berthing Areas (IPD TM04)
    a. Berthing areas are required to be maintained (dredged) by Harbors Division. This is the area between the Federal Project Line (turning basin) and the piers.
    b. Need to verify the extents of the berthing areas and determine if there are areas maintained by tenants.

13. HRS 343 Documents (Neg Decs/EA/EIS/exemptions) (IPD DU06)
    a. Obtain all available HRS 343 documents on or within 1000 feet from Harbors' boundaries. Scan hard copies if necessary.

b. Utilize polygons from H.C. Numbers or develop polygon footprints as necessary for each document.
c. Fill out attributes (title, proponent, year, Harbor, H.C. number(s), Encumbrance number(s) etc. to allow logical search)
d. Hyperlink to document.
e. This activity was started for Oahu under the Pilot Project and will be completed under Phase III.

IV. **RESPONSIBILITIES AND EXPECTATIONS:**

A. U.S. Army Corps of Engineers (COE):

1. The COE will assign an experienced staff member in developing and checking the GIS data.
2. Where practicable and not detrimental to the project schedule, the COE will assist Harbors Division in GIS related matters such as data exchanges among external agencies, and review of GIS related contracts.
3. As needed, the COE will provide training in using the GIS.
4. The COE will conduct presentations and attend meetings as requested by the Harbors Coordinator.
5. All geospatial data created for this project will have Federal Geographic Data Committee (FGDC) compliant metadata authored in conformity with Executive Order 12906.
6. All geospatial data produced will be delivered to Harbors at the completion of the project.

B. Hawaii DOT, Harbors Division:

1. To complete the implementation plan, each of the product descriptions must have a technical POC. Harbors Division will assign a technical person for each product description which identifies the GIS layers to be created. The COE will not perform any further work on that layer until a POC is assigned. This is to ensure that the work is being carried out for someone who intends to use the data and that someone in Harbors Division will understand why the data was created and how it is supposed to be used.
2. Harbors Division will appoint a Coordinator to be responsible for interfacing with the COE and making decisions with authority from Harbors Division.
3. Where possible, the Coordinator will obtain the Harbors data that will be assessed for utilization in the conversion stage of this project.
4. If data or information is required of specific Harbors offices, the Coordinator will obtain the information if the COE is unable to obtain the information or commitment directly from the office.
5. The Coordinator will provide access to field or technical staff when Harbors expertise or assistance is required. The coordinator will also arrange for COE access to Harbors facilities as required.
6. Harbors Division will arrange access to Harbors facilities as required by the COE.

C. Storm Drain System (IPD U02)

1. Engineering Branch to provide a POC responsible for working with the Corps and provide the data and information needed to create the layers. This will include scans of the as-built drawings, shop submittals, specifications, reports, etc.
2. As soon as possible, the storm drain system needs to be discussed among the COE and Harbors users to ensure that the correct features and attributes are collected for the different uses of this data. The Coordinator will be responsible for setting up the meeting and inviting all of the potential Harbors users to make sure their needs are met.
3. The Harbors POC needs to be capable of making decisions relating to this system such as identifying the necessary attributes and development of the naming/numbering schemes.
4. The Corps will not perform any on water or under pier surveys.

E. Executive Orders (IPD LU06)

1. Other than what has been provided during the Pilot Project, the quantity of Executive Orders which have to be scanned or will be available is unknown.
2. The Property Management Section is expected to provide input, guidance and data to develop these layers.
3. Some of the documents have bad or no control points and have to be placed based on professional judgment. These will be called out in the attributes.

F. Aerial Photos (IPD DU07)

1. It is unknown how many remaining aerial photos require conversion.
2. It is assumed that the Harbors Coordinator will check with all Harbors staff to ensure that all available aerial photos are collected.
3. If numbers are small, COE will scan hardcopy photos.
4. Commercial or copyrighted imagery will not be shared outside of the COE and Harbors without written consent by the owning party.

G. Foot Markers (IPD TM05)

1. Presume that access will be provided to GPS the beginning and end points of the foot markers. To avoid unnecessary fieldwork, these features could be collected while collecting features for storm drainage system on Oahu.
2. Travel costs to the neighbor islands should be combined with the bollards and any other features that need collecting.

D. Pier Footprints (IPD LU13)

It is assumed that the harbor agent, and operations personnel will be available to agree on the geographical breakdown of the piers at each harbor. For neighbor islands, this task will be done from Oahu, unless other IPD's are funded that would allow an on island meeting with the harbor agent and staff. Coordination with the neighbor islands would be through phone calls and email.

H. Permits (IPD LU01), Leases (IPD LU02), Easements (IPD LU03)

1. It is unlikely that access will be provided to connect to the Comprehensive Information Database System (CIDS). If access is not possible, then periodic exports and conversions will be required to keep the system up to date.

2. Other than what has been provided during the Pilot Project, the quantity of encumbrances which have to be scanned or will be provided for conversion is unknown.
3. The Property Management Section is expected to provide input, guidance and data to develop these layers.
4. Some of the documents have bad or no control points (permits) and have to be placed based on professional judgment. These will be called out in the attributes and/or the metadata.

I. Bollards, Cleats, Capstans (IPD LU13)
1. Presume that access will be provided to GPS the beginning and end points of the foot markers. To avoid unnecessary fieldwork, these features will be collected while collecting features for storm drainage system.
2. Structural analysis will not be performed.
3. For anchor points collected outside of the existing bollard survey, the bent numbers will not be input into the attributes.
4. Need a Harbors POC to agree on the type classification when attributing the features.
5. Travel costs to the neighbor islands should be combined with the foot markers and any other features that need collecting.

J. H.C. Numbers (IPD DU08)
Per telephone conversations with Arnold Liu, no asbuilt drawings have been scanned for the neighbor islands so this IPD will not be populated at this time.

K. Bid Tabulations (IPD DU04)
Using the footprints developed by the H.C. numbers, bid tabulations will be hyperlinked geographically or through its attributes.

L. Entrance Channels (IPD TM02) Turning Basins (IPD TM03)
Need to find the asbuilt drawings for Neighbor island features and input into the GIS.

M. HRS 343 Documents (Neg Decs/EA/EIS/exemptions) (IPD DU06)
1. Other than what has been provided during the Pilot Project, the quantity of HRS343 documents which have to be scanned or will be available is unknown
2. Need to do a comprehensive search and download on the OEQC website to identify neighbors. Quantity is unknown.

**V. DELIVERABLES:**

GIS layers and attachments (eg. Photos, reports, reference data, all GIS data)
Data dictionary (documents purpose, structure, attributes)
Metadata (describes the GIS layers and how they were created)

The Corps will deliver an ESRI geodatabase that is compatible with Harbors Division's existing GIS software. The geodatabase shall contain all the GIS data developed for this project. Photos, maps, reports and other documents referenced in the GIS development shall also be delivered. All data shall be accompanied by metadata which will document each GIS layer. A data

**dictionary shall also be provided which should document the project purposes, database structure and attributes.**

**VII. SCHEDULE: The project is anticipated to take 36 months beginning with the receipt of funding. The timeline below shows the intermediate checkpoints based on the start date of Phase II. Phase III will commence upon completion of Phase II and receipt of funding.**

**Phase II**

| | |
|---|---|
| Harbors to provide names and contact info for Coordinator and Technical POC's | 2 wks |
| Kickoff meeting (if required) | 1 mo |
| Input on current features, attributes, limitations | |
| Discuss attributes, features, limitations | |
| COE begins digitizing as-built drawings | 1 mo |
| Interviews with technical POC's for specific layers | 2 mo |
| 1st submittal of draft layers for Harbors feedback | 3 mo |
| Revise data structure based on Harbors input | 4 mo |
| 2nd submittal of draft storm drain layers for Harbors feedback | 10 mo |
| Final review of storm drainage layers | 12 mo |
| Prepare maps for storm drain system (if required) | 13 mo |
| 3 rd submittal of draft layers (non storm drainage) | 14 mo |
| Final review of layers | 15 mo |
| Delivery of Storm Drain layers to Harbors | 16 mo |

**Phase III**

| | |
|---|---|
| Kickoff meeting (if required) | 16 mo |
| Input on current features, attributes, limitations | |
| Discuss attributes, features, limitations | |
| COE begins digitizing as-built drawings | 16 mo |
| Interviews with technical POC's for specific layers | 18 mo |
| 1st submittal of draft layers for Harbors feedback | 21 mo |
| Revise data structure based on Harbors input | 24 mo |
| 2nd submittal of draft layers for Harbors feedback | 28 mo |
| Final review of layers | 30 mo |
| Prepare maps for layers (if required) | 32 mo |
| 3rd submittal of draft layers (non storm drainage) | 34 mo |
| Final review of layers | 35 mo |
| Project Closeout | 36 mo |

**VIII. COST ESTIMATE: $513,690**

**The estimated total cost of the study is $513,690. The cost of the PAS study will be cost shared at 50% Federal and 50% non-Federal.**

**IX. PROJECT DELIVERY TEAM (PDT):**

**Arnold Liu, Harbors Division, Planning Section**
**Deborah Solis, Project Manager, USACE, Civil and Public Works Branch**
**Benton Ching, P.E., Hydraulic Engineer, USACE, Technical Integration Branch**

**GIS ROCKS!**