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STORM WATER MONITORING PLAN

Storm Water Management Plan for Department of the Navy

Navy Region Hawaii, Oahu, Hawaii

Note: Portions of this Plan have been redacted due to National Security concerns

NPDES Permit No. HI S000257

Prepared by:

Navy Region Hawaii

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Table of Contents

12 Monitoring Plan 12-1
12.1 Introduction 12-1
12.2 Sampling Locations and Rationale 12-2
12.2.1 Annual Monitoring Sites 12-2
12.2.2 Secondary Monitoring Locations 12-3
12.3 Priority Based Monitoring Schedule 12-3
12.4 Permit Compliance 12-8
12.5 Management Measures Effectiveness 12-8
12.6 Storm Event Selection Criteria 12-8
12.7 Storm Water Sampling and Analysis 12-8
12.7.1 Sample Collection and Transport 12-8
12.7.2 Analytical Requirements 12-12
12.8 Quality Assurance/Quality Control 12-21
12.8.1 Field Sample Procedures 12-21
12.8.2 Chain-of-Custody Procedures 12-21
12.8.3 Laboratory Procedures 12-22
12.8.4 Data Reduction, Validation, and Reporting 12-22
12.8.5 Reporting Requirements 12-24
12.9 Analytical Requirements, Map and Sampling Information by Monitoring Location 12-24
12.10 Other Permit-identified Sites 12-24

Tables

Table 12-1 Annual Monitoring Sites for JBPHH 12-3
Table 12-2 Secondary Monitoring Points to be Monitored over a 5 Year Period 12-4
Table 12-3 Priority Based Monitoring Schedule 12-6
Table 12-4 NPDES Permit S000257 Limitations and Monitoring Requirements for Storm Water Associated with Industrial Sites 12-10
Table 12-5 NPDES Permit S000257 Sample Container Requirements 12-13
Table 12-6 Analytical Parameters, Methodologies and Detection Levels 12-15
Table 12-7 Organic Analytical Parameters Associated with Potential Pollutants 12-17
Table 12-8 Inorganic and General Analytical Parameters Associated with Potential Pollutants 12-19

Exhibit

Exhibit 12-1 Sample Chain of Custody Form 12-23

Appendices

Appendix 12-1 Sampling Locations and Rationale
Appendix 12-2 Other Permit-identified Sites

12 Monitoring Plan

12.1 Introduction

This Monitoring Plan provides the technical and management procedures that will be implemented to meet the monitoring requirements of the NPDES Permit HI S000257 (herein referred to as the "Permit"). All monitoring described in this plan are required by the Permit and/or state and federal storm water regulations. The Permit requires the Department of the Navy, Navy Region Hawaii to monitor their storm water discharges associated with industrial activities. The State of Hawaii Department of Health (DOH) also requires each effluent flow or pollutant (as specified in the Permit) to be monitored according to the prioritized schedule to yield data that reasonably characterizes the nature of the discharge.

The Permit also requires monitoring for compliance with Total Maximum Daily Loads (TMDLs). Currently Navy Region Hawaii only has one TMDL waste load allocation (WLA), which is for the North Fork of Kaukonahua Stream. Monitoring for compliance with this TMDL WLA is detailed under a separate monitoring plan (*2016 TMDL Storm Water Monitoring at North Fork of Upper Kaukonahua Stream*, Navy Region Hawaii, December 2015).

The Permit describes the requirements for the Monitoring Plan as follows:

Monitoring Plan (Part F.1):

1) 1. Monitoring Plan

a. The Permittee shall submit the Monitoring Plan to the Director within one (1) year after the effective date of this permit for review and acceptance. Any revisions to the Monitoring Plan shall be submitted by January 31st of each year. All revisions to the Monitoring Plan shall be implemented over the coming calendar year.

The monitoring program must be designed and implemented to meet the following objectives:

(i) Assess compliance with this permit (including TMDL I&M Plans and demonstrating consistency with WLAs);

(ii) Determine whether the Permittee's industrial facilities (as specified in Part E) comply with water quality requirements set forth in Part F.2 of this permit;

(iii) Measure the effectiveness of each element/control measure of the Permittee's storm water management program;

(iv) Assess the overall health based on the chemical, physical, and biological impacts to receiving waters resulting from storm water discharges and an evaluation of the long term trends;

(v) Characterize storm water discharges from the Small MS4;

(vi) Identify sources of specific pollutants;

(vii) Detect and eliminate illicit discharges and illegal connections to the Small MS4; and

(viii) Assess the water quality issues in watershed resulting from storm water discharges to receiving waters.

b. The plan shall, at a minimum, include the following items:

(i) Written narrative of the proposed monitoring plan's objectives, including but not limited to the objectives identified in Part F.1.a., and description of activities;

(ii) The monitoring locations on a sampling location map with an explanation of why the location was selected and the identification of the pollutants of concern for each of the sampling locations.

(iii) The Permittee shall develop a priority based monitoring schedule for each type of industrial area or facility identified pursuant to Part E.1.a. of this permit. The monitoring schedule will prioritize facilities or areas with the greatest potential of pollutant discharge. The facilities or areas ranked first within each type shall be monitored annually. Industrial areas or facilities not ranked first shall be monitored on a rotational basis (at least two (2) areas or facilities monitored per year per type). The Plan shall provide the rationale for the priority rankings, identify the types of industry within each of the priority areas or facilities, and provide a monitoring schedule for the rotational monitoring of industrial areas or facilities. Areas or facilities which exceed any of the limitations are required to be monitored during the next representative storm event for all parameters until none of the limitations are exceeded.

(iv) For each activity, a description of how the results will be used to determine compliance with this permit.

(v) Identification of management measures proven to be effective and/or ineffective at reducing pollutants and flow.

(vi) Written documentation of the following:

(a) Characteristics (timing, duration, intensity, total rainfall) of the storm event(s);

(b) Parameters for measured pollutant loads; and

(c) Range of discharge volumes to be monitored, as well as the timing, frequency, and duration at which they are identified;

(vii) Written documentation of the analytical methods to be used;

(viii) Written documentation of the Quality Assurance/Quality Control procedures to be used; and

(ix) Estimated budget to be implemented over the coming calendar year.

12.2 Sampling Locations and Rationale

Monitoring locations were designated using a priority based ranking system per industrial type. Element Environmental, LLC (E2) reviewed documentation from previous SWPCP performed by HDR and reported in "Prefinal Draft Storm Water Program Plan Commander, Navy Region Hawaii Joint Base Pearl Harbor-Hickam" Appendix G5 and G7, 29 June 2012, and visited the industrial sites identified in the permit from November through December 2015, in order to determine site ranking and sampling priority. The following facilities or areas with the greatest potential of pollutant discharge for their standard industrial code type will be monitored annually. The remaining sites will be monitored on a rotational basis with at least two locations (where more than one per industrial type exists) monitored per year. Details for each location, including a sampling location map, justification for the sample location and a list of pollutants of concern are listed in Appendix 12-1.

12.2.1 Annual Monitoring Sites

Sampling locations identified as a priority within an industrial type are provided in Table 12-1. These sites will be monitored once per year throughout the five (5) year period of this permit.

Table 12-1 Annual Monitoring Sites for JBPHH

Building	Industrial Activity	Major SIC Code
217, 217a	Descriptions redacted due to national security concerns	44
B-23, B-24, B-25, B-26		37/44
1770		37
439		24
35		41
BWPU		49
553, 229		42
1715		50
2010		51
2130		28
2131		76
2036		15
2177, 2178, 2183, 2184, 2185, 2186		73
2072, 2073		55/75
1219, 1220		35

12.2.2 Secondary Monitoring Locations

Sampling locations not identified as the highest priority when grouped by industrial type are listed in Table 12-2. These locations will be monitored once over the five (5) year permit period as per the schedule provided in Table 12-3.

12.3 Priority Based Monitoring Schedule

The monitoring schedule in Table 12-3 was established by prioritizing industrial sites by industrial classification and then by rank of potential of pollutant discharge. Appendix 12-1 lists the individual sites and rationale that was used to create the schedule.

Table 12-2 Secondary Monitoring Points to be Monitored over a 5 Year Period

Building	Industrial Activity	Major SIC Code
19	Descriptions redacted due to national security concerns	44
A2, A3, A4, A5		44
3		44
S-375, S-376		44
454		44
1631, 1725		37
M-1, M-2, M-3, M-4		37/44
683		37
1320		37
1588		37
1766		37
Wharves S-1, S-8, to S- 21		37
Hotel Piers 1 to 4		37
FORFAC		37
449		42
1757, 1758		37
K-3, K-4 to K-11		44
415		55
4		41
3		41
57/462		24
W-1/W-2/W-3		44
W-4/W-5		44
X-24, X-31, 77, 78		50
1526		42
IWTC		42
S-169		55
Bldg. 159 (In process of being moved to Bldg. 1656)		50
Area 3		37
60		37
YRDH-6, YC-1638		37
1037		55
1055		37
YFN-1222, YC-1637, YR-83		37

Building	Industrial Activity	Major SIC Code
1070, 1072	Descriptions redacted due to national security concerns	42
1073, 2001		55
2002		41
2006		41
75065, 1720		50
2025		28
2030		41
2125		51
2157, 2152		51
3002		51
3004		51
3020		51
3200		75
3400, 3408		55
3407		28
3424		55
3455, 3460		44
11666		35
1055, 2030, 2125		75
12604		51
12605		51
3386		35
4002		41
2184		55

Table 12-3 Priority Based Monitoring Schedule

Sampling Location		Year				
		2016	2017	2018	2019	2020
Bishop Point	19			X		
	A2, A3, A4, A5			X		
Ford Island	217, 217a	X	X	X	X	X
	3				X	
	S-375, S-376				X	
	454		X			
Merry Point	1725, 1631		X			
	M-1, M-2, M-3, M-4		X			
Bravo Wharves	B-23, B-24, B-25, B-26	X				
Subbase	1770	X	X	X	X	X
	683				X	
	1320				X	
	1588			X		
	1766			X		
	Wharves S-1, S-8, to S- 21		X			
NAVSUP Fleet Logistics	Hotel Piers 1 to 4	X				
	FORFAC	X				
	449			X		
	1757, 1758		X			
	K-3, K-4 to K-11		X			
Lualualei	415					X
	4					X
	439	X	X	X	X	X
Westloch	3					X
	57/462		X			
	W-1/W-2/W-3					X
	W-4/W-5					X
	18 & G NAVFAC HI #60					X
Wahiawa NCTAMS	S238 NAVFAC HI #65					X
NAVFAC HI Main	X-24, X-31, 77, 78	X	X	X	X	X
Marine Barracks	35	X	X	X	X	X
PH Shipyard	1526				X	
	BWPU	X	X	X	X	X
	IWTC					X
	S-169	X				
	Bldg. 159 (In process of being moved to Bldg. 1656)		X			
Makalapa Gate	553, 229	X	X	X	X	X

Sampling Location		Year				
		2016	2017	2018	2019	2020
Waipio Peninsula	Area 3					X
	60					X
	YFN-1222, YC-1637, YR-83					X
	YRDH-6, YC-1638					X
Hickam	1037		X			
	1055			X		
	1070, 1072		X			
	1073, 2001		X			
	1715	X	X	X	X	X
	2002	X				
	2006			X		
	2010	X	X	X	X	X
	75065			X		
	1720, 2025			X		
	2030		X			
	2130	X	X	X	X	X
	2131	X	X	X	X	X
	2036	X	X	X	X	X
	2125			X		
	2157, 2152				X	
	2177, 2178, 2183, 2184, 2185, 2186	X	X	X	X	X
	3002				X	
	1055, 2030, 2125		X			
	12604		X			
	12605		X			
	2072, 2073	X	X	X	X	X
	1219, 1220	X	X	X	X	X
	4002		X			
	2184				X	
	3455, 3460	X				
	3004			X		
HIANG	3020	X				
	3200			X		
	3400, 3408			X		
	3407		X			
	3424			X		
	11666			X		
	3386		X			

12.4 Permit Compliance

A description of how results from each activity are used to ensure permit compliance are provided in this section. Results from sample analysis and physical observations of storm water discharges will be evaluated against acceptable runoff effluent limitations as provided in Table 1 of the Permit and HAR, Chapter 11-54. Data will be evaluated to measure the effectiveness of control measures of the management program and to assess the overall health of impacts to receiving waters. Monitoring locations where sample results fail to meet the limitations will be investigated for potential sources of pollutants including natural sources. The site will also be inspected to determine if illicit discharges or illegal connections are present. Based on the findings, BMPs will be evaluated for potential improvements.

12.5 Management Measures Effectiveness

Both visual observations during storm water monitoring and storm water sample analysis results will be used to help determine whether management measures are effective at reducing pollutants and flow. Visual observations of management measures will be recorded on field sampling sheets when possible during storm water sampling. Examples may include storm water breaching an absorbent sock or a sock that is effectively preventing a sheen from entering a storm drain inlet. Data from storm water analysis will be evaluated to determine whether management measures used to reduce a pollutant are effective or not by comparing numerical values to past exceedances.

12.6 Storm Event Selection Criteria

The Permit requires that the permittee collect samples for analysis from a representative storm. A representative storm is defined as a storm which accumulates a minimum of 0.1 inch of rain throughout the storm and occurs at least 72 hours after the previous qualifying rainfall event. Sampling shall start within the first 15 minutes of storm water discharge.

12.7 Storm Water Sampling and Analysis

This section provides information for storm water sampling and analysis. Sample collection and transport are discussed in Section 12.7.1. Analytical parameters, holding times and container requirements are discussed in Section 12.7.2. Locations where parameters fail to meet the limitations of the permit, must be resampled until parameters return to compliance through the use of improved management practices.

12.7.1 Sample Collection and Transport

Samples are to be collected within the first 15 minutes of discharge at the sampling location. A sample collected within the first 15 minutes is considered a “Grab” sample. Subsequent samples collected beyond 15 minutes are to be combined and are considered a composite sample. A composite sample shall be taken every 15 minutes up to 1 hour after the start of discharge. Composite samples are to be flow proportional as described below. Sampling may cease if the discharge flows for more than one (1) hour.

If the duration of a discharge event is less than 30 minutes, the sample collected during the first 15 minutes fulfills the requirement of a composite sample and shall be analyzed for all parameters. Enough sample should be collected as a grab sample to perform all analysis. If the duration of the discharge event lasts longer than a half hour, each 15 minute sample shall be combined proportional to the flow

occurring at the time each sample was taken, including the initial grab sample, into one composite sample. Flow proportions can be established by adjusting the timing of sampling, to increase during periods of greater flow or by volume, collecting more sample for greater flow at the given intervals.

For discharge events greater than 30 minutes in duration, labile analytes are to be tested from the grab sample and all others from the composite as described in Table 12-4.

12.7.1.1 Manual Sampling

Samples may be collected manually or with automated sampling equipment such as an ISCO Avalanche or Global WS750. Manual sample collection may include the use of a sheet flow sampler such as a surface bailer type device, direct grabs using a glass jar such as the 1.8 liter ISCO container or through a peristaltic pump with tubing run down through a storm drain inlet. Care must be taken to use sampling equipment with inert surfaces to avoid interactions with target analysis such as Oil and Grease. Equipment should be Teflon lined, glass or stainless steel. If low level analysis of metals associated with steel, such as chromium are required, contact with metal surfaces should also be avoided. Monitoring locations were designated based on collecting discharge from an industrial site. Each site poses different challenges in obtaining a representative sample. Appendix 12-1 addresses sampling challenges and suggested sampling approaches for each monitoring location.

12.7.1.2 Automated Sampling

Automated sampling improves the efficiency of sampling and is useful in collecting samples from discharge events that occur outside of typical business hours. Deployment of automated samplers require a site visit prior to a qualifying storm event. Automated samplers utilize a peristaltic pump which delivers sample to jars within the unit. A mechanism moves the sample stream between jars according to user defined programmed events. This allows the sampler to take composite and grab samples. Teflon lined sample tubing is secured to a sampling intake screen which is typically mounted within a storm drain inlet upstream of a weir. A fluid sensor is secured just above the sample intake to initiate sampling once discharge is detected. A pressure transducer and Doppler velocity unit may also be secured beside the sample inlet to measure flow. The tubing and wiring is then routed to the auto-sampler. A rain gauge may be attached to the sampler to record rainfall, used to determine compliance with a qualifying event or to help establish flow. The ISCO Avalanche auto-sampler is equipped with a pH flow cell and thermometer for recording field parameters real time and a refrigerated sample storage compartment. Data obtained while samples are collected by the ISCO include pH, rainfall, temperature and flow. Samples are stored cool until retrieved. The Global WS750 sampler is triggered by flow but does not record the additional information.

Automated samplers require routine maintenance once deployed until samples are successfully obtained. It is recommended that samplers are visited on a weekly basis. Batteries need to be checked and replaced as needed, pH probes require calibration checks, sample inlets should be cleared of debris and sediment and tubing connections should be checked and replaced when faulty. Discharge events may trigger an auto-sampler that fail to meet the 0.1 inch qualifying event requirement. In this case, samples need to be removed, bottles cleaned and replaced and batteries recharged or replaced. Once a sampler has successfully obtained a qualifying sample, it should be removed from the sampling location, maintained and either deployed at another site or placed in storage.

Table 12-4 NPDES Permit S000257 Limitations and Monitoring Requirements for Storm Water Associated with Industrial Sites

Effluent Parameter (units)	Effluent Limitation {1}	Type of Sample {2}
Flow (gallons)	{4}	Calculated or Estimated
Biochemical Oxygen Demand (5-Day) (mg/l)	{4}	Composite {3}
Chemical Oxygen Demand (mg/l)	{4}	Composite {3}
Total Suspended Solids (mg/l)	{4}	Composite {3}
Total Phosphorus (mg/l)	{4}	Composite {3}
Total Nitrogen (mg/l) {5}	{4}	Composite {3}
Nitrate + Nitrite Nitrogen (mg/l)	{4}	Composite {3}
Oil and Grease (mg/l)	15	Grab {6}
pH Range (Standard Units)	{7}	Grab {9}
Ammonia Nitrogen (mg/l)	{4}	Composite
Turbidity (0.1 NTU)	{4}	Grab
Dissolved Oxygen (0.1 mg/l)	{4}	Grab
Oxygen Saturation (1%)	{4}	Grab
Temperature (0.1 ºC)	{4}	Grab
Copper (µg/l)	6+ (freshwater) 2.9 (saltwater)	Composite {3}
Zinc (µg/l)	22+ (freshwater) 95 (saltwater)	Composite {3}
Additional Toxic Pollutants {10}	{11}	{12}

mg/l = milligrams per liter = 1000 micrograms per liter (µg/l)

+ = The value listed as the minimum standard. Depending upon the receiving water $CaCO_3$ hardness, higher standards may be calculated using the respective formula in the U.S. Environmental Protection Agency publication Quality Criteria for Water (EPA 440/5-86-001, Revised May 1, 1987).

NOTES:

{1} Pollutant concentration levels shall not exceed the storm water discharge limits or be outside the ranges indicated in the table. Actual or measured levels which exceed those storm water discharge limits or are outside those ranges shall be reported to the CWB required in HAR, Chapter 11-55, Appendix B, Section 10(c) of December 6, 2013.

{2} The Permittee shall collect samples for analysis from a discharge resulting from a representative storm. A representative storm means a rainfall that accumulates more than 0.1 inch of rain and occurs at least 72 hours after the previous measurable (greater than 0.1 inch) rainfall event.

"Grab sample" means a sample collected during the first 15 minutes of the discharge.

"Composite sample" means a combination of at least two (2) sample aliquots, collected at periodic intervals. The composite shall be flow proportional; either the time interval between each aliquot or the volume of each aliquot must be proportional to the total flow

of storm water discharge flow since the collection of the previous aliquot. The Permittee may collect aliquots manually or automatically.

Samples for analysis shall be collected during the first 15 minutes of the discharge and at 15-minute intervals thereafter for the duration of the discharge, as applicable. If the discharge lasts for over an hour, sample collection may cease.

{3} If the duration of the discharge event is less than 30 minutes, the sample collected during the first 15 minutes of the discharge shall be analyzed as a grab sample and reported toward the fulfillment of this composite sample specification. If the duration of the discharge event is greater than 30 minutes, the Permittee shall analyze two (2) or more sample aliquots as a composite sample.

{4} Monitor and Report. The value shall not exceed the applicable limit as specified in Chapter 11-54 for the applicable classification of the receiving state waters. If no limitation is specified in Chapter 11-54, then the Permittee shall monitor and report the analytical result. DOH may include discharge limitations specified in Section 11-55-19 and discharge limitations based on Federal Register, Vol. 73, No. 189, Pages 56572–56578, dated September 29, 2008.

{5} The Total Nitrogen parameter is a measure of all nitrogen compounds in the sample (nitrate, nitrite, ammonia, dissolved organic nitrogen, and organic matter present as particulates).

{6} The Permittee shall measure Oil and Grease using EPA Method 1664, Revision A.

{7} The following pH limitations applies to discharge into state waters classified as inland streams:

(a) For streams, pH shall not deviate more than 0.5 units from ambient conditions and shall not be lower than 5.5 nor higher than 8.0.

(b) For the Pearl Harbor Estuary, pH shall not deviate more than 0.5 units from ambient conditions and shall not be lower than 6.8 nor higher than 8.8.

{8} The pH limitation for discharge into state waters classified as marine open coastal waters and embayments shall not deviate more than 0.5 units from a value of 8.1, except at coastal locations where and when freshwater from stream, storm drain or groundwater discharge may depress the pH to a minimum level of 7.0.

{9} The Permittee shall measure pH within 15 minutes of obtaining the grab sample.

{10} Toxic pollutants, as identified in Appendix D of 40 CFR Part 122 (for JBPHH facilities whose storm water discharges are associated with industrial activity as listed in 40 CFR 122.26(b)(14)) or in HAR, Chapter 11-54, Section 11-54-4, need only be analyzed if they are identified by the Permittee as potential pollutants requiring monitoring in the SWPCP. The Permittee shall test for the total recoverable portion of all metals. If any toxic pollutant is detected equal to or greater than the discharge limitation, the Permittee shall revise the SWPCP, as necessary, to reduce the presence of the pollutant in the discharge of storm water to below the discharge limitation.

{11} Effluent limitations are the acute water quality standards established in HAR, Section 11-54-4. For pollutants which do not have established acute water quality standards, monitoring results shall be reported.

{12} Cyanide and the volatile fraction of the toxic organic compounds shall be sampled by grab sample. All other pollutants, as identified in Appendix D of the 40 CFR Part 122 or in HAR Section 11-54-4 shall be sampled by composite sample.

12.7.1.3 Sample Transport

Once samples have been obtained, either manually or through automation, samples may need to be analyzed for pH, dissolved oxygen, oxygen saturation, temperature and turbidity using field equipment if the parameters were not measured by automated equipment or if they cannot be transported to the laboratory within the method holding times. Samples must then be transferred to appropriate laboratory provided bottles, placed in a cooler with ice and transported to an analytical laboratory. A chain of custody (see Section 12.8.2) must be filled out and accompany the samples. Sample containers, holding times and preservative requirements can be found in Table 12-5.

12.7.2 Analytical Requirements

The Permit requires that all sites be analyzed for the parameters listed in Table 12-4. In addition to the tests listed in the table, Additional Toxic Pollutants are required. These pollutants are determined during site visits as identified during the SWPCP process. Tables 12-7 and 12-8 describe chemical pollutants associated with significant materials from 40 CFR 122.26(b)(14) defined industrial activities that were encountered during site visits and documented in the SWPCP. Table 12-6 lists the cumulative potential toxic pollutants from sampling locations listed in Tables 12-1 and 12-2. Individual pollutant lists by sampling location are provided in Appendix 12-1.

Table 12-5 NPDES Permit S000257 Sample Container Requirements

Parameter Name[1]	Units	Methodology	Maximum Holding Time	Preservation	Container Type/ Size
TFH	mg/L	GC/FID	7 days (extract) 40 days (analysis)	4ºC, pH<2, HCl	1x1 liter amber
TPH(D)	µg/L	GC/FID	7 days (extract) 40 days (analysis)	4ºC, pH<2, HCl	1x4 oz amber
TPH(G)	µg/L	GC/FID	14 days (analysis)	4ºC, pH<2, HCl	3x40 mL VOA
O&G	mg/L	gravimetric	7 days (extract)	4ºC, pH<2, H2SO4	1x1 liter amber
VOCs	µg/L	GC/MS	14 days	4ºC	3x40 mL VOA
BTEX	ug/L	GC/PID	14 days	4ºC	3x40 mL VOA
PAHs	µg/L	GC/MS	7 days (extract) 40 days (analysis)	4ºC, Na2S2O3 day K	1x1 liter amber
MBAS	mg/L	Colorimetric	48 hours	4ºC	1x25 mL
Carb	µg/L	HPLC	7 days (extract) 40 days (analysis)	4ºC	1x1 liter amber
Herb	µg/L	GC/ECD	7 days (extract) 40 days (analysis)	4ºC	1x1 liter amber
GEs	mg/L	GC/MS	14 days	4ºC	3x40 mL VOA
Alcs	mg/L	GC/MS	14 days	4ºC	3x40 mL VOA
metals	µg/L	ICP	6 months	pH<2, HNO3	500 mL plastic
BOD5	mg/L	Electrode	48 hours	4ºC	1000 mL plastic
COD	mg/L	Photo Spectroscopy	28 days	4ºC, pH<2, H2SO4	50 mL plastic
TKN	mg/L	IC	28 days	4ºC, pH<2, H2SO4	500 mL plastic
NH4+	mg/L	Colorimetric	14 days	4ºC, pH<2, H2SO4	500 mL plastic
Nitrate & Nitrite	mg/L	Colorimetric	28 days	4ºC	500 mL plastic
Total P	mg/L	ICP	28 days	4ºC, pH<2, H2SO4	500 mL plastic
TSS	mg/L	Gravimetric	7 days	4ºC	100 mL plastic

Notes.

1.

Alcs	- Alcohols
BOD5	- Five-Day Biochemical Oxygen Demand
BTEX	- Benzene, Toluene, Ethylbenzene, Xylene
Carb	- Carbamates
COD	- Chemical Oxygen Demand
Dup RPD	- Duplicate Relative Percent Difference
ECD	- Electron Capture Detection
EDTA	- Ethylenediaminetetraacetic acid
FID	- Flame ionization detection
GC	- Gas chromatography
GEs	- Glycol esters
Herb	- Chlorinated Herbicides
ICP	- Inductively coupled plasma atomic emission spectroscopy
MBAS	- Methylene blue active substances
mg/L	- Milligrams per Liter
MS	- Mass spectrometry
MS RPD	- Matrix spike relative percent difference
NH4+	- Ammonium
O&G	- Oil and Grease
P	- Phosphorous
Ten Metals	- Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Zn) analysis by inductively coupled plasma atomic emission spectroscopy method and atomic absorption spectroscopy method
TFH	- Total fuel hydrocarbons
TKN	- Total Kjeldahl Nitrogen
TPH(D)	- Total petroleum hydrocarbons (as diesel)
TPH(G)	- Total petroleum hydrocarbons (as gasoline)
TSS	- Total Suspended Solids
TDS	- Total Dissolved Solids
ug/L	- Micrograms per Liter
VOCs	- Volatile Organic Compounds

Table 12-6 Analytical Parameters, Methodologies and Detection Levels

Parameter	Method	Detection Level (mg/L)
Basewide Requirements		
BOD5	SM5210B	2.0
COD	410.2	10
TSS (Total Suspended Solids)	SM 2540D	2.0
Total Phosphorous	365.2, 365.1, 365.3	0.02
Total Nitrogen = TKN + Nitrate/Nitrite	Summation	N/A
TKN	351.2	0.1
Nitrate & Nitrite	353.2	0.0015
Oil and Grease	1664 A	2.0
pH	150.1, 4500-H^+ B FM	N/A
Ammonia	350.1	0.001
Turbidity	180.1	0.1 (NTU)
Dissolved Oxygen	SM4500-O FM	0.1
Oxygen Saturation	Calc FM	(1%)
Temperature	SM 2550B FM	1 ^{o}C
Cu (Copper)	200.8 low level	0.002
Zn (Zinc)	200.8 low level	0.09
Toxic Pollutants as determined by SWPCP		
TPH		
TFH - TPH(D) + TPH(G)	Summation	N/A
TPH (Diesel)	8015	0.1
TPH (Gas)	8015	0.1
BTEX		
Benzene	624	0.001
Toluene	624	0.001
Ethylbenzene	624	0.001
Total Xylenes	624	0.001
MBAS	425.1, SM 18th 5540 C	0.1
Carbamates		
Carbaryl (Sevin)	TLC, 632	0.005
Carbofuran (Furadan)	632	0.005
Methiocarb (Mesurol)	TLC, 632	0.005
Methomyl (Lannate)	632	0.005
Oxamyl (Vydate)	632	0.005
Propoxur (Baygon)	TLC, 632	0.005
Chlorinated Herbicides:		
2,4-D	8151A	0.0002
Dalapon	8151A	0.0002
Dinoseb	8151A	0.0002

Parameter	Method	Detection Level (mg/L)
Alcohols and Esters		
Glycol Esters: Ethylene Glycol	8015B, 8260M	25
Alcohols: Isopropyl Alcohol	8015B, 8260M	5
Reactive Parameters		
Cyanide, Total mg/kg	335.3	0.1
Sulfide	SM4500-S2	0.1
Other Metals		
Titanium	200.8 low level	0.25
Iron	200.8 low level	0.1
Aluminum	200.8 low level	0.7
Magnesium	200.8 low level	0.1
Ten Metals		
As (Arsenic)	200.8 low level	0.06
Cd (Cadmium)	200.8 low level	0.04
Cr (Chromium)	200.8 low level	1
Pb (Lead)	200.8 low level	0.1
Hg (Mercury)	245.1	0.002
Ni (Nickel)	200.8 low level	0.09
Se (Selenium)	200.8 low level	0.25
Ag (Silver)	200.8 low level	0.002
PAHs		
Acenaphthene	625	0.01
Benzo (a)pyrene	625	0.01
Fluoranthene	625	0.01
Naphthalene	625	0.01
Solvents		
Halogenated Volatile Organic Compounds	624	0.001
Semivolatiles	625	0.001

Table 12-7 Organic Analytical Parameters Associated with Potential Pollutants

Potential Pollutant	Analytical Parameter																
	TFH	TPH(D)	TPH(G)	TPH(IR)	O&G	PCBs	VOCs	BTEX	MBAS	Carb	Herb	GEs	Alcs	Expls	PAHs	Fec. Col.	Fec. Str.
Adhesives/Resins/ Glue							X								X		
Alcohols													X				
Algicides											X						
Antifreeze/Coolant												X					
Caustics															X		
Detergents/ Surfactants									X								
Dielectric/ Electrolytes						X											
Diesel Fuel		X													X		
Explosives														X			
Firefighting Foam									X			X					
Freon					X												
Gasoline			X					X							X		
Hydraulic/ Calibration Fluid	X																
Jet Fuel		X															
Kerosene	X																
Lubricants					X												
Metal Cleaners	X																
Oil & Grease					X										X		

Potential Pollutant	Analytical Parameter																
	TFH	TPH(D)	TPH(G)	TPH(IR)	O&G	PCBs	VOCs	BTEX	MBAS	Carb	Herb	GEs	Alcs	Expls	PAHs	Fec. Col.	Fec. Str.
Paint Thinner	X																
Paint/Varnish															X		
Pesticides/ Herbicides										X	X						
Photographic Chemicals							X										
Sanitary Waste																X	X
Solvents	X																
Tar				X													
Transformer Oil						X											
Used Oil					X												
Wash Water					X				X								

Notes:

Alcs	- Alcohols	GEs	- Glycol esters	TFH	- Total fuel hydrocarbons
BTEX	- Benzene, toluene, ethylbenzene, total xylenes	Herb	- Chlorinated herbicides	TPH(D)	- Total petroleum hydrocarbons (as diesel)
Carb	- Carbamates	MBAS	- Methylene blue active substances	TPH(G)	- Total petroleum hydrocarbons (as gasoline)
Expls	- Explosives (nitroaromatics & nitroamines)	O&G	- Oil and Grease	TPH(IR)	- Total petroleum hydrocarbons (as infrared spectroscopy)
Fec. Col.	- Fecal Coliform	PAHs	- Poly Aromatic Hydrocarbons	VOCs	- Volatile organic compounds
Fec. Str.	- Fecal Streptoccocci	PCBs	- Polychlorinated biphenyls		

Table 12-8 Inorganic and General Analytical Parameters Associated with Potential Pollutants

Potential Pollutant	Analytical Parameter																		
	Cu	Cr	Hg	Ag	Ti	Pb	Cd	Ten Metals	pH	NH_4^+	Nitrate & Nitrite	Total P	Sulfate & Sulfite	Anions & Cations	Resid. Cl_2	Asb.	SC	TSS	TDS
Acids								X	X										
Algicides	X																		
Anti-Freeze/Coolant	X																		
Asbestos																X			
Caustics									X					X					
Chlorine/Sodium Hypochlorite															X				
Chromate		X							X										
Detergents/Surfactants									X										
Dielectric/Electrolytes								X											
Fertilizers										X	X	X	X						
Gypsum													X	X					
Lead						X													
Lubricants								X											
Metal Cleaners								X	X										
Oxidizers								X	X										
Paint Chips	X					X												X	
Paint/Varnish	X				X														
Photographic Chemicals			X	X							X								
Salts									X					X			X		X
Sandblasting Waste Solids								X										X	X
Sanitary Waste										X									
Sediment																		X	X
Tar								X											

Potential Pollutant	Analytical Parameter																		
	Cu	Cr	Hg	Ag	Ti	Pb	Cd	Ten Metals	pH	NH_4^+	Nitrate & Nitrite	Total P	Sulfate & Sulfite	Anions & Cations	Resid. Cl_2	Asb.	SC	TSS	TDS
Ten Metals								X											
Transformer Oil								X											
Used Oil								X											

Notes:

Ag	Silver
Anions & Cations	HCO3-, CO3-2, Cl-, SO4-2, NO3-, F-, OH-, Na+, K+, Ca+2, Mg+2
Asb.	Asbestos
Cr	Chromium (total)
Cu	Copper
Hg	Mercury
NH4+	Ammonium
P	Phosphorus
Resid Cl2	Residual Chlorine
SC	Specific Conductance
Ten Metals	Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Zn) analysis by inductively coupled plasma atomic emission spectroscopy method and atomic absorption spectroscopy method.
Ti	Titanium
TSS	Total Suspended Solids
TDS	Total Dissolved Solids

12.8 Quality Assurance/Quality Control

A thorough Quality Assurance/Quality Control (QA/QC) plan is an essential component of a monitoring program, involving extensive field sampling and laboratory analyses. Because of the inherent variability in storm water samples, it is important to minimize additional uncertainties that may be introduced by sample handling and analytical techniques. This section describes the major elements of the QA/QC plan as related to sampling procedures and to methods of chemical analyses performed in the monitoring program. The plan fulfills the QA/QC requirements of the Permit.

The objectives of the QA/QC plan are to assure that: (1) all elements of the monitoring program are conducted, and (2) all monitoring is conducted by trained personnel. Implementation of a sound QA/QC plan ensures that the data collected are of high quality and defensible in court. QA/QC procedures will be followed in all phases of the monitoring program including sampling, laboratory analysis, and data reporting/validation. This plan includes elements to address both sampling and analytical concerns including sample contamination, variability, accuracy, and precision.

12.8.1 Field Sample Procedures

Adherence to proper sampling preparation, sample handling, and laboratory procedures is essential to maintaining data quality and integrity. This section details the required standard operating procedures for sampling and sample handling as set forth by the EPA.

12.8.1.1 Reconnaissance and Preparation

Representative sampling sites have been selected in accordance with feasibility, accessibility, and safety constraints. Communication with laboratories will be established and a Sampling Field Notebook will be prepared, as described in Section 12.8.1.2 noted below. Field teams will be trained by experienced personnel. Supervisors will be responsible for coordination of sampling efforts and for preparedness of teams.

12.8.1.2 Sampling Field Notebook

A specific Sampling Field Notebook will be prepared and kept on file. The Sampling Field Notebook will contain the following items and procedures:

- List of equipment
- Location (map and description) of sampling point(s)
- Field Data Sheets
- Field sampling instructions
- Sample packing, transfer, and tracking (chain-of-custody) instructions and forms

These procedures will be followed by the field personnel in all phases of the field monitoring program. Personnel with field experience in storm water sampling will be responsible for training field sampling personnel.

12.8.2 Chain-of-Custody Procedures

All sample custody and transfer procedures will follow EPA-recommended procedures and emphasize careful documentation of sample collection and handling processes, including transfer of sample and chain-of-custody details such as sample date and time, number of sample containers and sampling method required. Field teams will adhere to proper chain-of-custody and documentation procedures for all sampling operations. Preformatted sample and chain-of-custody forms will be used to document the

relevant information for each sample bottle and the transfer of bottles to the laboratory. An example of a completed chain-of-custody form is shown in Exhibit 12-1.

12.8.3 Laboratory Procedures

Analysis for the routine parameters will be performed by a qualified laboratory. A qualified laboratory shall meet ISO17025 requirements. The laboratory must make every effort to meet target detection limits, holding times, and sample preservation techniques. The laboratory shall provide a written QA/QC report addressing any deviations from the QA/QC requirements.

12.8.3.1 Accuracy

Laboratory accuracy can be assessed through performance and evaluation programs, and/or a certification of performance. As an alternative, the use of “blind” standard reference samples supplied by Environmental Resource Associates (ERA) and through the analysis of laboratory-prepared matrix spike samples, or “internal standards”, can be used. Blind ERA reference samples would be analyzed once every quarter in which samples are analyzed. A goal of five percent of the samples shall be analyzed as matrix spike duplicates. For the matrix spike duplicate, a known standard analyte concentration is first spiked, or added, to an original sample and then duplicated. The accuracy of the analytical methods is evaluated from the results of the analytical recoveries of the first, or matrix spike, and second, or matrix spike duplicate spikes.

12.8.3.2 Precision

Laboratory precision must be assessed through the analysis of laboratory duplicates, for example analysis of two portions derived from the same sample, at the frequency of 10 percent of the samples. In addition, five percent of the samples will be analyzed for matrix spike duplicates as described above.

12.8.3.3 Laboratory Blanks

Sample contamination resulting from laboratory analysis procedures or sample storage methods will be assessed through the use and analysis of laboratory blanks and equipment blanks. Laboratory blanks, including reagent and/or method, shall be reported for each day samples are analyzed.

12.8.3.4 Completeness

All reported analyses will be evaluated against the requested analyses to assess the completeness of the analytical characterization of the water samples. Any missing data will be accounted for by the laboratory or field programs, with an overall goal of 95 percent completeness.

12.8.4 Data Reduction, Validation, and Reporting

Overall data quality will be assessed by laboratory personnel responsible for QA/QC based on sampling and analytical conditions, adherence to internal QC procedures, and results of accuracy and precision checks. Actual detection limits will be reported in the final analytical report summary along with the results of the external QA samples, field duplicates, laboratory duplicates, matrix spike duplicates, and equipment and reagent blanks. Corrective action will be identified if necessary.

Exhibit 12-1 Sample Chain of Custody Form

TestAmerica Honolulu
99-193 Aiea Heights Drive
Suite 121
Aiea, HI 96701
phone 808.486.5227 fax

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☑ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Matt Neal	Site Contact: Matt Neal	Date: 12/22/14	COC No:
Element Environmental llc	Tel/Fax:	Lab Contact:	Carrier:	____ of ____ COCs
98-030 Hekaha St. Unit 9	Analysis Turnaround Time			Sampler:
Aiea, HI 96701	☐ CALENDAR DAYS ☑ WORKING DAYS			For Lab Use Only:
(808) 488-1200 Phone	TAT if different from Below _____			Walk-in Client:
(808) 488-1300 FAX	☑ 2 weeks			Lab Sampling:
Project Name: Navy Stormwater	☐ 1 week			
Site: PWC1-2014	☐ 2 days			Job / SDG No.:
P.O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Total Suspended Solids EPA 160.	Total Dissolved Solids EPA 160.1	TKN EPA 351.4 Total N calc	Nitrate-Nitrite as N 353.2	Total Phos 365.1	Oil and Grease 1664	BTEX by EPA 624	GRO 8015	DRO / RRO 8015	As,Cd,Cr,Cu,Pb,Ni,Se,Ag,Zn,Tl 200.7	Mercury by 245.1	4 Hawaii PAHs by 625						Sample Specific Notes:
PWC-1	12/22/2014	8:56	G	SW	13	N																			

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☐ Disposal by Lab ☐ Archive for_____ Months

Special Instructions/QC Requirements & Comments: 4 Hawaii PAHs include Acenapthene, Benzo(a)pyrene, Flouranthene, Napthalene

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

12.8.5 Reporting Requirements

An Annual Report, which will include a Monitoring Report, shall be submitted to DOH by January 31st of each year of the permit. Monitoring reporting will be completed in accordance with the Permit. Storm water monitoring results shall be submitted on a DOH discharge monitoring report. Monitoring results exceeding the effluent limitations shall be reported to the Director of DOH CWB as soon as the results become available, but in no case later than 60 days after the samples were taken.

12.9 Analytical Requirements, Map and Sampling Information by Monitoring Location

Appendix 12-1 provides detailed information for field personnel to identify the appropriate analysis to perform for each sample location, identify sampling locations in relationship to permitted facilities with map oriented photos of each location and relevant information to successfully sample each location. Individual site descriptions are provided and justification is presented for sites listed on the permit that are no longer viable.

12.10 Other Permit-identified Sites

Based on the 2016 site visits, NAVFAC Hawaii is recommending the removal of eight (8) sites from the monitoring requirements. A brief discussion about the conditions and activities at these sites are provided in Appendix 12-2.

DRAFT FINAL (REDACTED), PREDECISIONAL FOR DISCUSSION PURPOSES ONLY, DO NOT CITE OR QUOTE

APPENDIX 12-1

Sampling Locations and Rationale

Appendix 12-1 redacted due to national security concerns

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APPENDIX 12-2

Other Permit-identified Sites

Appendix 12-2 redacted due to national security concerns