HAWAII DEPARTMENT OF TRANSPORTATION
OAHU DISTRICT

STORM WATER MANAGEMENT PROGRAM
ANNUAL MONITORING PLAN
2025 – 2026

MS4 NPDES Permit No. HI S000001

Hawaii Department of Transportation
Oahu District
727 Kakoi Street, Honolulu, Hawaii 96819

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LIST OF ACRONYMS AND ABBREVIATIONS

AMP	Annual Monitoring Plan
AMR	Annual Monitoring Report
AMS	Asset Management System
AR	Annual Report
BMP	Best Management Practice
COC	Chain of Custody
CWA	Clean Water Act
DOH	Hawaii Department of Health
HDOT	Hawaii Department of Transportation
EPA	Environmental Protection Agency
I&M	Implementation and Monitoring
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MS4	Municipal Separate Storm Sewer System
NO2	Nitrite
NO3	Nitrate
NPDES	National Pollutant Discharge Elimination System
QA	Quality Assurance
QC	Quality Control
ROW	Rights-of-Way

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

RPD	Relative Percent Difference
SM	Standard Methods
SWMP	Storm Water Management Program
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
WLA	Waste Load Allocation

1. INTRODUCTION
MS4 NPDES Permit Part F.1.

The Hawaii Department of Transportation (HDOT), Oahu District owns and operates a municipal separate storm sewer system (MS4) and has developed and implemented a Storm Water Management Program (SWMP) as required by National Pollutant Discharge Elimination System (NPDES) Permit No. HI S000001 (hereinafter MS4 NPDES Permit), effective September 1, 2020.

The MS4 NPDES Permit requires that the HDOT SWMP reduce, to the maximum extent practicable, the discharge of pollutants to and from the MS4 to protect water quality and to satisfy the appropriate water quality requirements of the Clean Water Act (CWA).

1.1 Annual Monitoring Plan

This Annual Monitoring Plan has been prepared in accordance with the HDOT SWMP, and MS4 NPDES, Part F.1.b. Annual Monitoring Plan requirements (Table 1). The Permit defines the Monitoring Year as July 1 through June 30. This *Annual Monitoring Plan 2025 – 2026* (hereinafter AMP) details HDOT SWMP efforts to be conducted from July 1, 2025, through June 30, 2026. The AMP is to be submitted to the Hawaii Department of Health (DOH) by June 1st of each year in compliance with the MS4 NPDES, Part F.1.a (Table 4). This AMP, in tandem with the Annual Monitoring Report 2024 – 2025 and the Annual Report 2024 – 2025, to be submitted by October 31, 2025, will demonstrate compliance with all AMP components of the MS4 NPDES Permit.

Table 1. MS4 NPDES Permit Requirements for the Annual Monitoring Plan.

OBJECTIVE
Part F.1.b.(1): 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;
Part F.1.b.(2): For each activity, a description of how the results will be used to determine compliance with this permit;
Part F.1.b.(3): Identification of management measures proven to be effective and/or ineffective at reducing pollutants and flow;
Part F.1.b.(4): Written documentation of the following: (i) Characteristics (timing, duration, intensity, total rainfall) of the storm event(s); (ii) Parameters for measured pollutant loads; and (iii) Range of discharge volumes to be monitored, as well as the timing, frequency, and duration at which they are identified;
Part F.1.b.(5): Written documentation of the analytical methods to be used;
Part F.1.b.(6): Written documentation of the Quality Assurance/Quality Control procedures to be used; and
Part F.1.b.(7): Estimated budget to be implemented over the coming fiscal year.

1.2 Purpose and Compliance with MS4 Permit

HDOT conducts water quality monitoring as a part of the SWMP to assess pollutant load contributions from HDOT rights-of-way (ROW) to state waters. The primary purpose of this monitoring is to assess the characteristics of storm water (quality and quantity) and evaluate potential impacts to the watershed and receiving waterbodies so that effective control mechanisms can be developed and implemented. The AMP describes the monitoring activities planned for the upcoming Monitoring Year to assess water quality issues resulting from storm water discharges from HDOT ROWs within select priority watersheds to their receiving waters.

Historic, ongoing, and future efforts of the Monitoring Program focus on a watershed level approach, consisting of prioritizing watersheds with impaired waterbodies per CWA Section 303(d). This approach is to allow HDOT to proactively implement monitoring in anticipation of future Total Maximum Daily Loads (TMDLs) that may be approved during the current permit term. Water quality monitoring activities are conducted in select watersheds listed as High Priority for a TMDL in Appendix C of the State of Hawaii Water Quality Monitoring and Assessment Report (Clean Water Branch 2022). Prioritizing within these watersheds is based on informal communications with DOH regarding TMDL development.

Additionally, HDOT conducts monitoring to meet specific requirements in watersheds where TMDLs have been approved where HDOT is identified as a pollutant source through the assignment of a Waste Load Allocation (WLA) (Table 2). Associated *Implementation and Monitoring Plans* for these TMDL WLA watersheds provide Monitoring Plan details in Chapter 4.

Table 2. Current HDOT approved TMDLs, Sorted by Final Compliance Date.

STREAM WATERSHED	TMDL APPROVAL DATE	EFFECTIVE DATE OF MS4 PERMIT	LATEST I&M PLAN REVISION DATE	FINAL COMPLIANCE DATE
Waimanalo	January 1, 2001	October 28, 2013	April 2015	October 28, 2018
Ala Wai	January 1, 2002	October 28, 2013	April 2015	October 28, 2018
Kawa	September 2, 2005	October 28, 2013	April 2015	October 28, 2020
Kapaa*	July 27, 2007	October 28, 2013	April 2015	October 28, 2025
Kaneohe	February 9, 2010	October 28, 2013	April 2015	October 28, 2026
Waikele	May 9, 2019	May 9, 2020	May 2020	May 8, 2027

*Kapaa is a sub-watershed to Kawainui and is the only stream-based watershed that contains portions of the HDOT MS4

1.2.1 Long-Term Monitoring Approach

HDOT has implemented a watershed-based approach to establish a long-term monitoring strategy. Since 2001, HDOT has sampled and analyzed storm water runoff from various watersheds island-wide to identify potential sources of pollutants and assess its impact on water quality in receiving waters. Appendix A includes the Watershed Prioritization List which weights watersheds on Oahu by their potential for TMDL development as stated in the previous section, proportion of HDOT contributing area, and extent of potential pollutant loads.

Table 3 shows the historical sampling effort and number of samples collected within the corresponding watershed.

Table 3. HDOT Historical Sampling June 2001 – June 2025

WATERSHED	DATA COLLECTION PERIOD	NO. OF STORM WATER SAMPLES
Aiea	2011 – 2014	20
Ala Wai	2006 – 2010, 2018 – 2021	130
Halawa	2001 – 2009	167
Kaelepulu	2007 – 2010, 2021 – 2023	93
Kalihi	2023 - Current	4
Kaneohe	2009 – 2021	219
Kapaa	2007 – 2009	209
Kapakahi	2009 – 2015	98
Kawa	2006 – 2007, 2012 – 2021	334
Kawanui	2008 – 2009	85
Keehi	2023 - Current	6
Moanalua	2021 – Current	32
Waiawa	2009 – 2012	88
Waikele	2010 – 2014	254
Waimalu	2009 – 2012	112
Waimanalo	2007 – 2011	164

1.2.2 Monitoring Program Framework Documents

The MS4 NPDES Permit requires five types of plans and reports to address and report on SWMP monitoring activities. The plans and reports, along with the MS4 NPDES Permit submittal requirements for each, are as follows.

- Storm Water Management Program Plan – Submitted in February 2022.
- Annual Report – To be submitted each year by October 31st reporting on the previous fiscal year.

- TMDL Implementation and Monitoring (I&M) Plans – Five plans submitted October 28, 2014, and one plan submitted May 8, 2020.
- Annual Monitoring Plan – To be submitted each year by June 1st, describing planned monitoring activities for the upcoming fiscal year.
- Annual Monitoring Report – To be submitted each year by October 31st, reporting on all monitoring activities during the previous fiscal year.

These documents comprise the framework by which HDOT monitors, evaluates, and reports the compliance status and effectiveness of the SWMP. Collectively, they detail program activities, standards and milestones, assessment methods, and results of SWMP implementation.

The *2022 Storm Water Management Program Plan*, associated appendices, *TMDL Implementation and Monitoring Plans*, and other program plans are on the HDOT website, www.stormwaterhawaii.com.

2. MONITORING PROGRAM OBJECTIVES
MS4 NPDES Permit Part F.1.b.(1)

Part F.1.b.(1.) 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

MS4 NPDES Permit Part F.1.b.(1), requires that the Monitoring Program provide a written narrative of the proposed monitoring plan's objectives. Table 4 demonstrates the alignment of the plan's narrative chapters with the objectives and requirements of the monitoring program, MS4 NPDES Permit Parts F.1.a.(1) – F.1.a.(7).

Specific objectives for each prioritized watershed and correlating compliance with any associated TMDL I&M Plans are outlined in their relevant *Watershed Specific Monitoring Plan*, included as appendices to this AMP.

Table 4. HDOT NPDES Permit No. HI S000001, Part F.1. Annual Monitoring Program Objectives and Permit Requirements.

OBJECTIVE	CHAPTER REFERENCE
F.1. Annual Monitoring Plan	
F.1.a. Submit the Annual Monitoring Plan by June 1st of each year for review and acceptance. The Annual Monitoring Plan shall be implemented over the coming fiscal year.	
F.1.a.(1) Assess compliance with permit (including TMDL I&M Plans and demonstrating consistency with WLAs)	AMP[1] Chapters 2.0 and 3.0 AMR[2] Chapters 2.0 and 3.0 AR[3]
F.1.a.(2) Measures the effectiveness of Permittee's storm water management program	AMP[1] Chapter 4.0 AR[3]
F.1.a.(3) Assess the overall health of the receiving waters based on the chemical, physical, and biological impacts resulting from the storm water discharges and an evaluation of the long-term trends	AMP[1] Chapter 5.0 AMR[2] Chapter 5.0
F.1.a.(4) Characterize storm water discharges from the MS4	AMP[1] Chapters 3.0 and 7.0 AMR[2] Chapters 3.0 and 7.0 AR[3] Chapter 12.0
F.1.a.(5) Identify sources of specific pollutants	AMP[1] Chapters 3.0 and 5.0 AR[3] Chapters 3.0 and 12.0
F.1.a.(6) Detect and eliminate illicit discharges and illegal connections to the MS4	AMP[1] Chapter 6.0 AR[3] Chapter 3.0
F.1.a.(7) Assess the water quality issues in the watershed resulting from storm water discharges to receiving waters.	AMP[1] Chapter 4.0 AR[3] Chapter 12.0

More information on activities to meet each objective can be found in the Chapters referenced for the:
1. Annual Monitoring Plan 2025– 2026(AMP)
2. Annual Monitoring Report 2024– 2025 (AMR)
3. Annual Report 2024 – 2025 (AR)

3. PERMIT COMPLIANCE ASSESSMENT
MS4 NPDES Permit Part F.1.b.(2)

Part F.1.b.(2.) For each activity, a description of how the results will be used to determine compliance with this permit

The MS4 NPDES Permit Part F.1.a.(1), requires that the Monitoring Program be designed and implemented to assess compliance with the MS4 NPDES Permit, TMDL I&M Plans, and WLAs. Part F.1.b.(2) also requires a description of how results from monitoring activities will determine compliance. The required planning documentation for program compliance regarding the MS4 NPDES Permit, TMDL I&M Plans, and WLAs is fulfilled in the *2022 Storm Water Management Program Plan*. In addition, plans for a Compliance Assessment for each prioritized watershed is included within their *Watershed Specific Monitoring Plan*, appendices to this AMP.

3.1 Illicit Discharge Detection and Elimination | MS4 NPDES Permit Part F.1.a.(5) and F.1.a.(6)

Part F.1.a.(5) Identify sources of specific pollutants

Part F.1.a.(6) Detect and eliminate illicit discharges and illegal connections to the MS4

MS4 NPDES Permit Parts F.1.a.(5) and (6) require that objectives of the HDOT Monitoring Program include measures for identifying sources of specific pollutants and detecting and eliminating illicit discharges and illegal connections to the MS4. HDOT has a process for identifying sources of specific pollutants and detecting and eliminating illicit discharges and illegal connections to the MS4, through implementation of the Industrial Commercial Activities Discharge Management Program and Illicit Discharge Detection and Elimination Program. Details of these plans and programs can be found in the *2022 Storm Water Management Plan*.

3.2 Discharge Characterization | MS4 NPDES Permit Part F.1.a.(4)

Part F.1.a.(4) Characterize storm water discharges from the MS4

The MS4 Permit Part F.1.a(4) requires the Monitoring Program to characterize storm water discharges from HDOT's MS4. HDOT will meet this requirement by preparing and implementing a water quality sampling and analysis plan for selected priority watersheds. Chapters five (5) and six (6) of this AMP specify the data collection protocols, analytical methods, and Quality Assurance/Quality Control (QA/QC) procedures followed by HDOT. The outcomes derived from these sampling efforts will be integrated with supplementary data from other MS4 programs, including debris cleaning records, the TMDL program, and landscape service contracts. This comprehensive approach will be documented and evaluated in the *Annual Monitoring Report*, providing a characterization of stormwater discharges to HDOT's MS4.

3.3 Watershed Assessment | MS4 NPDES Permit Part F.1.a.(5) and F.1.a.(7)

Part F.1.a.(5) Identify sources of specific pollutants

Part F.1.a.(7) Assess the water quality issues in watershed resulting from storm water discharges to receiving waters

The MS4 NPDES Permit Parts F.1.a.(5) and (7), require that the Monitoring Program be designed and implemented to assess the overall health and water quality issues in watersheds based on the chemical, physical, and biological impacts to receiving waters resulting from HDOT storm water discharges, and to evaluate long-term trends. HDOT will

meet this objective by gathering and analyzing historical storm water and stream data. HDOT retains an inventory of water quality sampling data that will be used, together with water quality data from other institutional sources on the island of Oahu, to evaluate trends in overall water quality and impacts to receiving waters due to discharges from the HDOT MS4. HDOT will include completed watershed level health and water quality assessments of select priority watersheds in the *Annual Monitoring Report*.

4. MANAGEMENT MEASURES EVALUATION
MS4 NPDES Permit Part F.1.b.(3)

Part F.1.b.(3.) Identification of management measures proven to be effective and/or ineffective at reducing pollutants and flow

The MS4 NPDES Permit Part F.1.a.(2), requires that the Monitoring Program be designed and implemented to assess effectiveness of the SWMP. In accordance with MS4 Permit Part G.1.d, HDOT submitted a Program Effectiveness Strategy in October 2022. The Program Effectiveness Strategy is provided in the *2022 Storm Water Management Program Plan* as Appendix A.3, and it includes program implementation monitoring information and other performance indicators. HDOT will include completed program effectiveness assessments with identified water quality improvements for selected priority watersheds in the *Annual Report*.

5. DATA COLLECTION PROTOCOL
MS4 NPDES Permit Part F.1.a.(4)

F.1.a.(4) Characterize storm water discharges from the MS4

In the 2024 – 2025 Monitoring Year, HDOT continued conducting water quality monitoring activities in the Moanalua Stream, Keehi Stream, and Kalihi Stream Watersheds. HDOT will continue these monitoring efforts in the 2025 - 2026 Monitoring Year.

Monitoring activity details and details of the storm water quality sampling sites for Moanalua Stream Watershed, Keehi Stream Watershed, and Kalihi Stream Watershed are provided in Appendix B.1, B.2, and B.3 respectively.

5.1 Storm Event Characterization | MS4 NPDES Permit Part F.1.b.(4)(i)

Part F.1.b.(4.) Written documentation of the following: (i) Characteristics (timing, duration, intensity, total rainfall) of the storm event(s)

Precipitation will be monitored using a combination of on-site or web-based rain gauges, and the Molokai radar managed by the National Oceanic and Atmospheric Administration's National Weather Service. This data will be used to delineate storm characteristics (timing, duration, intensity, and relative total rainfall), and the range of discharge volumes that occur during sampling events. Where practicable, rain gauges are installed at locations within or near monitoring sites. Details on locations of rain gauges are included in Section 7.1 of the B Appendices of this Annual Monitoring Plan.

When rainfall is anticipated based on local weather forecasts, online radar imagery will be monitored to determine the projected timing, duration, and intensity of incoming precipitation at the monitoring sites. The rain gauges will also be monitored to evaluate the intensity of rainfall at each location. If the rainfall volume is anticipated to be over one tenth of an inch, the Monitoring Team will mobilize sampling equipment and supplies to collect grab samples or samples from the automated samplers, as applicable. Additional methods for characterizing flow rates at the time of sampling for each designated site may be considered to contribute to more robust analyses and conclusions.

5.2 Field Sampling Methods | MS4 NPDES Permit Part F.1.b.(4)(iii)

Part F.1.b.(4.) Written documentation of the following: (iii) Range of discharge volumes to be monitored, as well as the timing, frequency, and duration at which they are identified

5.2.1 Automated Sample Collection

Automatic samplers may be used to collect samples and provide data control and logging for sensors. Each automatic sampler will be programmed to obtain a timed series of samples throughout a rainfall event. Once the water flow in the drainage structure reaches a predetermined depth, samplers will collect runoff at a prescribed time frequency. The samples are automatically collected by a pumping mechanism that draws water from the main channel of flow through a laboratory-grade vinyl tube and into a clean plastic bottle. Automatic samplers will normally be programmed to collect samples every 2-15 minutes to increase the chances of capturing a runoff event. In the occurrence of larger storms, samples may be collected at less frequent intervals to provide a more accurate representation of runoff from the entire storm. Samples will be collected until runoff slows to a point where there is insufficient water at the intake, there is no flow, and/or the supply of bottles is exhausted. The bottles can be submitted to the laboratory as discrete samples,

or as composite sample(s), which can be obtained from combining multiple containers from different periods of the storm event. Automatic samplers will be serviced immediately following a storm event.

All samples will be placed on ice during transits, refrigerated when held for prolonged periods, and consistently maintained at a temperature equal to or less than 4 degrees Celsius (°C) until they are delivered to the laboratory. Sample containers will be packaged and handled to protect the integrity of the water samples.

5.2.2 Manual Sample Collection

Manual samples may be collected by field personnel during a storm event. Storm events will be monitored by radar so that field personnel can be present in the watershed during active storms to obtain manual samples. Samples may be serially collected manually at 1-minute to 60-minute intervals depending on the anticipated storm duration and intensity. Samples will be deposited into clean, labeled plastic bottles. Where plausible, samples will be collected directly into sampling bottles. If necessary, an extension pole or other apparatus can be used to aid sample collection. Samples may also be collected via single use 1-liter tri-pour beakers attached to an extension pole, rope, or other apparatus and then evenly distributed into the appropriate sample bottles. Where necessary, samples may alternatively be collected via pump through single use tubing directly into the appropriate sample bottles. As needed, the tubing will be weighed down at one end to aid in sample collection in high flow situations. An extension pole, rope, or other apparatus may also be used to aid sample collection with tubing, especially during high flow conditions. Samples collected by any of these methods will be considered a grab sample.

Manual samples will be placed on ice and maintained at a temperature equal to or less than 4°C until they are delivered to the laboratory. Sample containers will be packaged and handled to protect the integrity of the water samples.

5.2.3 Sampling Equipment Decontamination and Calibration

Samples collected using non-disposable or non-dedicated equipment will require decontamination between samples to prevent cross-contamination. Prior to the start of sampling, surfaces of the sampling equipment that come into direct contact with sample water will be decontaminated. After each use, sample collection containers and lids will be decontaminated by a certified laboratory according to standard sampling protocols. If this is not possible, equipment and containers will be washed using a non-phosphate detergent solution and brushed to remove sediment and then be triple rinsed with distilled water and air- dried.

Field monitoring equipment will be calibrated according to the manufacturer's instructions.

5.3 Other Watershed Monitoring

5.3.1 Existing TMDL Monitoring

The U.S. Environmental Protection Agency (EPA) has approved TMDLs for the Ala Wai Canal, Kawa Stream, Waimanalo Stream, Kapaa Stream, Kaneohe Stream, and Waikele Stream Watersheds. During the 2025 – 2026 Monitoring Year, HDOT Monitoring Program will continue monitoring activities in HDOT ROW located in the six TMDL areas as described in the applicable I&M Plans. Monitoring activities in the TMDL Watersheds include tracking and analysis of Best Management Practices (BMP) such as street sweeping and other debris control operations and maintenance activities.

A complete description of the BMPs, monitoring activities, and assessment methods for each TMDL watershed are provided in their corresponding I&M Plan. The six I&M Plans are provided on the HDOT website, www.stormwaterhawaii.com/resources/plans.

5.3.2 Future TMDL Monitoring

In addition to conducting monitoring activities in approved TMDL areas, HDOT also proactively plans and implements monitoring activities in anticipation of future TMDLs. Monitoring is conducted in certain watersheds that are listed as High Priority for a TMDL in Appendix C of the State of Hawaii Water Quality Monitoring and Assessment Report (Clean Water Branch 2022). Prioritizing these watersheds based on informal communications with DOH regarding TMDL development.

Moanalua Stream, Keehi, Kalihi, and Kaelepulu Stream Watersheds are currently prioritized by DOH for the development of future TMDLs. During the 2025 – 2026 Monitoring Year HDOT will continue sampling activities in Moanalua Stream Watershed, Keehi Stream Watershed, and Kalihi Stream Watershed. Other monitoring assessments will be conducted for the Kaelepulu Stream Watershed. Collection of samples that characterize storm water runoff from HDOT ROW in these specific watersheds will provide data for potential WLAs that may be assigned to HDOT, as well as provide data to identify effective operational and structural BMPs.

5.3.3 Other High Priority Waterbodies and Watersheds

Per MS4 NPDES Permit Part F.4, as additional TMDLs are adopted by DOH, which are approved by the EPA and that identify HDOT as a source, HDOT shall develop I&M Plans for a minimum of one additional TMDL waterbody or watershed per year within one year of the approval date.

As part of a proactive watershed-based approach to monitoring, HDOT will continue to periodically review the most recent release of the State of Hawaii Water Quality Monitoring and Assessment Reports, in particular Appendix C, which contains the CWA

Section 303(d) List of Impaired Waters on Oahu. HDOT will also stay up to date with long-term planning efforts made by DOH and EPA towards assessing impaired waterbodies and identifying and developing TMDLs for watersheds.

During the 2025 – 2026 Monitoring Year, HDOT plans to review existing water quality data from Oahu's receiving waters (i.e., surface water such as streams, estuaries, or marine shorelines) for select TMDL or high-priority watersheds. Data collected will be used in conjunction with water quality sample laboratory data collected during storm water discharges to assess impacts to receiving waters and specific water quality issues resulting from storm water discharges from the HDOT MS4, as well as to evaluate the long-term trends.

HDOT will continue to maintain awareness of projects and goals of regulatory agencies such as DOH and EPA and will consider the locations of other agencies' stream monitoring sites while planning and reporting on HDOT storm water monitoring activities. The results of the assessment of HDOT impact to the overall health of the receiving waters, based on the chemical, physical, and biological impacts resulting from storm water discharges, will assist HDOT to identify management measures proven to be effective or ineffective at reducing pollutants and flow, and provide guidance for future planning and design of institutional and post-construction BMPs.

6. ANALYTICAL METHODS AND QA/QC
MS4 NPDES Permit Part F.1.a.(4)

Part F.1.a.(4) Characterize storm water discharges from the MS4

6.1 Pollutant Load Parameters and Analytical Methods | MS4 NPDES Permit Part F.1.b (4)(ii) and F.1.b.(5)

Part F.1.b.(4.) Written documentation of the following: (ii) Parameters for measured pollutant loads

Part F.1.b.(5.) Written documentation of the analytical methods to be used

Storm water samples collected under the Data Collection Protocol, as described in Chapter 5 and in Appendix B.1, B.2, and B.3 of this AMP will be analyzed for Total Nitrogen (TN), Total Kjeldahl Nitrogen (TKN), Total Phosphorous (TP), and Total Suspended Solids (TSS) by a State-approved laboratory. These parameters were selected since they are the most representative of the pollutants of concern for the watersheds of interest and the 303(d) List of Impaired Waters.

Table 5 lists the preferred analytical methods for each parameter and their associated holding times and preservation methods. If the analytical methods in Table 5 are not available, alternative methods may be approved under the guidelines of Code of Federal Regulations, Title 40, Subchapter D, Part 136 Guidelines Establishing Test Procedures for the Analysis of Pollutants.

Table 5. Storm Water Monitoring Parameters.

PARAMETER (MG/L)	ANALYTICAL METHOD	HOLDING TIME (DAYS)	PRESERVATION METHOD
Total Kjeldahl Nitrogen (TKN)	EPA 351.2	28	Cool to ≤4°C pH<2 using sulfuric acid
Nitrate + Nitrite (NO3 + NO2)	EPA 353.2	28	Cool to ≤4°C pH<2 using sulfuric acid
Total Nitrogen (TN)	Calculated by TKN plus Nitrate + Nitrite		
Total Phosphorus (TP)	SM[1] 4500PE	28	Cool to ≤4°C, pH<2 using sulfuric acid
Total Suspended Solids (TSS)	SM[1] 2540D	7	Cool to ≤4°C
Ammonia	EPA 350.1	28	Cool to ≤4°C, H<2 using sulfuric acid

1-Standard Methods (SM)

Holding time is the maximum suggested period between sample collection and laboratory analysis. The laboratory will note in their Analytical Report if samples are received outside of the holding time. Holding times assume proper preservation methods have been followed.

Water quality testing parameters under other SWMP programs may differ from those listed in Table 4. The Monitoring Team will determine the specific parameters for field or laboratory analysis on a case-by-case basis.

6.1.1 Analytical Results

Each set of sample results will be provided in the analytical laboratory's report. This report will contain relevant information about the sample receipt and analysis procedures, including descriptions of problems with the analyses, corrective actions if applicable, deviations from analytical methods, QC results, and a definition list for each qualifier used. The laboratory analysis results reports will be maintained in a dedicated project folder on a secure server.

6.2 Quality Assurance/Quality Control Procedures | MS4 NPDES Permit Part F.1.b.(6)

Part F.1.b.(6.) Written documentation of the Quality Assurance/Quality Control procedures to be used

QA/QC is an important component of an effective sampling program. This section of the chapter provides details of laboratory analytical methods, QA/QC procedures to be used in watershed water quality monitoring, illicit discharge sampling, post- construction BMP effectiveness studies, and other storm water discharge characterization conducted as part of the HDOT SWMP.

6.2.1 Data Management

Precautions will be taken in the storage and analysis of data to prevent errors, loss, or misinterpretation of data. Before data is modified or analyzed, a copy of the original data will be archived.

Information will be hand recorded on standardized Field Logs and Chain of Custody (COC) forms, which are scanned and electronically filed. The COC forms will accompany all samples. A Field Log will be kept for each sampling site with the details of the date, time, personnel, purpose of visit, weather, conditions observed, samples collected, and actions performed. Photographs may be used to document field conditions and samples.

Sample Labeling

All sample bottles are given simple consecutive labels specific to each sample location. Information such as sample date, time, analysis method, preservation method (if any), conditions, and personnel present are recorded in the Field Logs and COC forms and linked to specific sample bottle numbers when appropriate.

Chain of Custody

The COC forms will be used to trace the possession of each sample from the time it is collected until completion of analyses. All samples submitted to the laboratory will be accompanied by a COC form. The COC form details the following information, at minimum, as follows:

- Name and contact information of sampling personnel
- Name and contact information for laboratory
- Sampling contract name
- Sample ID number
- Date and time of sample collection
- Sample matrix

- Sample location
- Number of containers
- Preservation method, if any
- Analytical test parameters
- Analytical method
- Sample temperature
- Name and signature(s) of persons involved in the COC
- Date and method of delivery

HDOT and the laboratory will maintain electronic copies of each COC form. Electronic copies of the completed COC forms will be submitted to DOH as an appendix of the correlating Annual Monitoring Report.

Custody seals will be affixed to sample coolers to ensure that the sample COC has not been compromised during transit to the laboratory.

AMS Maximo

HDOT inventories and monitors SWMP assets and activities through an integrated, multiplatform asset management system (AMS). The foundation of the AMS is a georeferenced inventory of all known MS4 drainage structures and post-construction BMPs hosted on Esri's ArcGIS platform. All assets can be explored alongside reference information including hydrology, infrastructure, and cadastral datasets in an interactive, web-based map application (AMS Viewer).

The spatial inventory is directly linked to a relational database hosted on IBM's Maximo Asset Management platform (AMS Maximo). AMS Maximo connects each individual asset to an attribute dataset and inspection work orders. Inspectors enter data into AMS Maximo either directly through its web interface or through a mobile data collection app, such as ArcGIS Field Maps or Survey123.

Water Quality monitoring activities and documentation are managed within the Water Quality Monitoring Module of AMS Maximo. Sampling events are logged as Site-Inspection Records and organized by Monitoring Site. Within this record, COC forms, site conditions, sampling event details, and laboratory results are stored.

The AMS is the principal management tool used by HDOT for short-term planning and long-term compliance monitoring. The AMS allows program managers to assess compliance with MS4 NPDES Permit requirements, measure effectiveness, and make modifications as necessary, by facilitating the visibility of resources and comprehensive data analysis.

Field Logs

Field Logs are completed during every sampling event to document the details of site visits such as location, date, time, personnel, purpose of visit, weather, conditions observed, samples collected, and actions performed. Data is then transferred to the AMS Maximo Water Quality Monitoring Module for storage and analysis.

Photographs

Photographs may be taken of each sample, by HDOT or the laboratory, to document visual characteristics of the sample contents. Photographs will be stored electronically in a dedicated project folder on a secure server and within the AMS Maximo Water Quality Monitoring Module.

6.2.2 Data Quality Assessment

All generated data will undergo data verification and validation. The items listed below will be evaluated as applicable to the analytical method. Qualifiers will be applied, as necessary.

- Deliverables
- COC/Condition of samples at laboratory receipt
- Holding times
- Calibration (initial and continuing)
- Blanks (method and calibration)
- Laboratory replicates
- Laboratory Control Samples (LCS)/Laboratory Control Sample Duplicates (LCSD)
- Matrix Spikes (MS)/Matrix Spikes Duplicates (MSD)
- Field QC samples
- Compound quantification and reported detection limits
- Overall assessment of data

The data will be reviewed in accordance with appropriate EPA method-specific, and/or laboratory-specific QC guidance documents.

6.2.3 Field Quality Assurance/Quality Control

The field and laboratory QA/QC procedures ensure the reliability and validity of field data gathered as part of the overall program.

Equipment Rinsate Blanks

Equipment rinsate blanks verify the adequacy of the decontamination process and whether the equipment is a source of sample contamination. To confirm that non-

dedicated, non-disposable sampling equipment has been effectively decontaminated, rinsate samples will be collected and submitted to the laboratory for analysis. These samples will be submitted for analysis as normal samples.

The equipment rinsate blank will be collected from the decontaminated equipment prior to or after the completion of sampling. These samples will be obtained by pouring distilled or deionized water through or over decontaminated sampling equipment. The water will be collected in a clean sample container and will be transported to the laboratory for analysis. Equipment rinsate blanks will be collected and analyzed for the same parameters listed in Table 3 as applicable.

Should the rinsate blank contain levels of contaminants within an order of magnitude above the analysis detection limits or within an order of magnitude of associated samples, potential contamination will be documented. No field rinsate blank is required for dedicated equipment (not reused to obtain other samples), or for laboratory supplied and/or cleaned containers. Equipment rinsate blanks will be collected at a frequency of one per twenty normal samples per matrix.

Field Duplicates

As needed, field duplicate may be collected to verify the precision of the laboratory and/or shipping method and serve as an indicator of potential cross-contamination. Field duplicates will be collected at the same location immediately following the parent sample and then composited with the parent sample. Duplicate samples will be assigned to a different sample ID but are labeled in a manner that is not apparent to the laboratory. Duplicate samples will be preserved, packaged, and sealed in the same manner as other samples of the same matrix. The field duplicates will be sent blindly to the laboratory.

Field duplicates will be collected and analyzed for the same parameters listed in Table 3 as applicable.

6.2.4 Laboratory Quality Assurance/Quality Control

The laboratory QA/QC procedures ensure the reliability and validity of field and analytical laboratory data gathered as part of the overall program.

Container Certificate of Analysis

Bottles used for preservation and shipping are provided by the laboratory and are certified according to the container manufacturer's Certificate of Analysis.

Laboratory Quality Control Samples

Laboratory QC samples are analyzed as part of standard laboratory practice. The laboratory monitors the precision and accuracy of the results of analytical procedures through the

analysis of QC samples, including LCS/LCSD samples, method blanks, laboratory replicates, and MS/MSD samples, one per batch per analysis.

A routinely collected water sample contains sufficient mass for both routine sample analysis and additional laboratory QC analyses, apart from MS/MSD samples. These will be analyzed at a frequency of one per sampling event. Precision, accuracy/bias, representativeness, completeness, and comparability are the data quality indicators used to assess the sampling results for usability. Each data quality indicator is described as follows, including a definition of the terminology and the process for calculating the indicator.

Precision

Precision criteria monitor analytical reproducibility and is the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. The QC measures for precision include field duplicates, laboratory duplicates, LCS and LCSD samples, and MS and MSD samples. Precision is expressed as relative percent difference (RPD), which is calculated by dividing the absolute difference of two samples by their mean, as shown in the equation below.

The method performance criteria for precision is RPD ≤ 30%.

$$\textit{Relative Percent Difference} = \frac{(\textit{Result}_{\textit{Parent Sample}} - \textit{Result}_{\textit{Duplicate Sample}})}{\frac{(\textit{Result}_{\textit{Parent Sample}} + \textit{Result}_{\textit{Duplicate Sample}})}{2}}$$

Precision variability may be the result of one or more of the following: field instrument variation, analytical measurement variation, poor sampling technique, sample transport problems, or spatial variation (heterogeneous sample matrices). To identify the cause of imprecision, the field sampling design rationale and sampling techniques will be evaluated, and both field and analytical duplicate sample results will be reviewed. If poor precision is indicated in both the field and analytical duplicates, then the laboratory may be the source of error. If poor precision is limited to the field duplicate results, then the sampling technique, field instrument variation, sample transport, and/or spatial variability may be the source of error.

Accuracy/Bias

Accuracy is the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) that are due to sampling and analytical operations. Examples of QC measures for accuracy include MS, LCS, and equipment rinses (if non-dedicated sampling equipment is used). Accuracy is measured by the percent recovery for spiked samples (LCS/LSCD and MS/MSD). The method performance criteria for accuracy/bias will be

established based upon the specific laboratory's statistically determined internal performance QC limits.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under correct, normal circumstances. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. The method performance criteria for completeness is 90%. Completeness measures the effectiveness in sample collection, analysis, and result reporting of the entire Monitoring Program, and is calculated on a per-analyte basis by the percentage of usable data (usable data divided by the total possible data), as follows.

$$\% \text{ Completeness} = \frac{\text{Number of Valid Results}}{\text{Number of Possible Results}} \times 100$$

'Number of Valid Results' is the number of possible results minus the number of possible results not reported. Results may not be reported in instances in which the sample(s) are not analyzed for any reason (holding time violations in which resampling and analysis were not possible, samples spilled or broken, etc.).

Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. To meet the needs of data users, the samples will be collected using the AMP guidelines, applicable field sampling techniques, and specific analytical methodology. If field QC issues affecting comparability are identified, data will be qualified as estimated.

7. BUDGET AND RESOURCE ALLOCATION

MS4 NPDES Permit Part F.1.b.(7)

Part F.1.b.(7.) Estimated budget to be implemented over the coming fiscal year

This chapter provides an estimated budget for the 2025 – 2026 Monitoring Year. Components that will require funding include the following:

- Sampling site setup and maintenance
- Storm water sampling and analysis
- Data analysis and reporting
- Administration and recordkeeping

Table 6 shows the estimated costs associated with water quality monitoring for the 2025 – 2026 Monitoring Year, as detailed in Chapter 6. The 2023-2024 Annual Report, Appendix L.1, includes program costs that are estimated to continue in the 2025-2026 reporting year, of which a portion of each program element has some monitoring associated tasks.

Table 6. Estimated Costs Associated with Water Quality Within the 2025 – 2026 Monitoring Program.

PROGRAM COMPONENT	ESTIMATED ANNUAL COST
Labor	$120,000
Materials	$20,000
Laboratory Analyses	$20,000
ESTIMATED TOTAL	$160,000

8. CONCLUSION

In conclusion, the AMP for the HDOT serves as a framework for ensuring compliance with the MS4 NPDES Permit. The strategies outlined in this plan reflect HDOT's commitment to meeting regulatory requirements. By evaluating both historical data and ongoing monitoring efforts, HDOT aims to comply with effective management measures to address water quality issues, particularly within priority watersheds. Within the 2025-2026 monitoring year, regulatory required assessments will guide the development of BMPs, in compliance with permit objectives to improve the overall health of receiving waters.

9. REFERENCES

City and County of Honolulu, Department of Environmental Services. 2007. Annual Stream Water Quality Monitoring Report.

State of Hawaii Department of Transportation Highways, Oahu District. 2022. Oahu Storm Water Management Program Plan. URL: https://www.stormwater hawaii.com/hawaii-storm-water-program-plan/.

State of Hawaii Department of Transportation Highways, Oahu District. 2016. Trash Reduction Plan.

State of Hawaii Department of Transportation Highways, Oahu District. 2021. Program Effectiveness Strategy.

State of Hawaii Department of Transportation Highways, Oahu District. 2021. Storm Water Pollution Control Plans. URL: http://www.stormwaterhawaii. com/ resources/plans/.

State of Hawaii Department of Transportation Highways, Oahu District. 2020. Implementation & Monitoring Plans. URL: http://www.stormwaterhawaii.com/ resources/plans/.

State of Hawaii Department of Transportation, Highways, Oahu District. 2020. National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit No. HI S000001, effective September 1, 2020.

State of Hawaii Department of Health, 2001. Total Maximum Daily Loads Estimated for Waimanalo Stream, Island of Oahu, Hawaii.

State of Hawaii Department of Health. 2002. Total Maximum Daily Loads of Total Suspended Solids, Nitrogen and Phosphorus for Kawa Stream, Kaneohe, Hawaii.

State of Hawaii Department of Health. 2002a. Revisions to Total Maximum Daily Loads for the Ala Wai Canal, Island of Oahu, Hawaii, Total Nitrogen and Total Phosphorus.

State of Hawaii Department of Health. 2005. Allocations of Total Maximum Daily Loads of Total Suspended Solids, Nitrogen and Phosphorus for Kawa Stream, Kaneohe, Hawaii.

State of Hawaii Department of Health. 2007. Total Maximum Daily Loads (TMDLs) for Total Suspended Solids, Nitrogen and Phosphorus in Kapaa Stream, Kaneohe, Hawaii.

State of Hawaii Department of Health. 2009. Total Maximum Daily Loads (TMDLs) for Total Suspended Solids, Nitrogen and Phosphorus in Kaneohe Stream, Kaneohe, Hawaii.

State of Hawaii Department of Health. 2014. Water Quality Standards Map of the Island of Oahu. URL: https://health.hawaii.gov/cwb/files/2013/05/WQS_20140708_Oahu.pdf

State of Hawaii Department of Health. 2019. Turbidity, Sediment, and Nutrient Total Maximum Daily Loads for the Waikele Watershed Oahu, Hawaii.

State of Hawaii Department of Health. 2021. Hawaii Administrative Rules, Chapter 11-54.
State of Hawaii Department of Health, Clean Water Branch. 2020. Data Acceptance Criteria.

State of Hawaii Department of Health, Clean Water Branch. 2024. 2024 State of Hawaii Water Quality Monitoring and Assessment Report: Integrated Report to the U.S. Environmental Protection Agency and the U.S. Congress Pursuant to §303(d) and §305(b), Clean Water Act (P.L. 97-117).

United States Environmental Protection Agency. 1990. Clean Water Act (CWA) Section 402(p)(3)(B).

United States Environmental Protection Agency. 2025. How's My Waterway? URL: https://mywaterway.epa.gov/community/2685%20N%20Nimitz%20Hwy,%20Honolulu,%20HI%2096819/overview.

Appendix A.1

Watershed Prioritization Calculations and List

Watershed Prioritization Ranking Calculations

Ranking Category	Weight Factor	Value Calculation
Surface Water Quality	10	303(d) listed as "High Priority" and the Hawaii Department of Health has indicated Total Maximum Daily Load (TMDL) in progress
	5	303(d) listed as "High Priority"
	3	303(d) listed as "Low Priority"
	0	Not included in 303(d) list
Hawaii Department of Transportation (HDOT) Right-of-Way (ROW) Percentage of Watershed	0 – 3	= 3 X (HDOT ROW % / HDOT ROW highest %)
Industrial/ Commercial (IC) Parcel Density	0 – 2	= 2 X (IC parcel area % / IC parcel area highest %)
Annual Average Daily Traffic (AADT)	1	= (AADT sum of max for each route in watershed / AADT highest sum of max for each route)

Watershed Prioritization List

(last updated March 2025)

Watershed	Ranking Category with Weighted Factor				Total
	303(d) TMDL Priority	ROW Percent Area	IC Density	AADT within HDOT ROW	
Kalihi	10	2.4	0.5	0.6	13.5
Moanalua	10	1.4	0.3	0.7	12.4
Keehi	10	1.3	0.1	0.3	11.7
Kaelepulu	10	0.3	0.0	0.1	10.4
Halawa	3	2.9	0.1	1.0	7.0
Kapakahi	3	2.5	0.8	0.6	6.9
Waimalu	3	0.7	2.0	0.7	6.4
Nuuanu	3	1.8	0.7	0.7	6.2
Kapalama	3	1.5	0.8	0.7	6.0
Aiea	3	1.7	0.0	0.9	5.6
Kaupuni	5	0.1	0.1	0.1	5.3
Waiawa	3	0.9	0.1	0.8	4.9
Kalauao	3	0.8	0.3	0.6	4.6
Keaahala	3	1.2	0.2	0.2	4.6
Heeia	3	1.1	0.0	0.2	4.3
Kuliouou	3	0.5	0.0	0.1	3.6
Kahaluu	3	0.4	0.0	0.0	3.5
Kiikii	3	0.2	0.0	0.3	3.5
Wailele	3	0.3	0.0	0.0	3.4
Paukauila	3	0.3	0.0	0.1	3.3
Waianu	3	0.2	0.1	0.0	3.3
Keamanea	3	0.3	0.0	0.0	3.3
Kaaawa	3	0.2	0.0	0.0	3.3
Kaalaea	3	0.2	0.0	0.0	3.2
Makapuu	0	3.0	0.2	0.0	3.2
Waikane	3	0.1	0.1	0.0	3.2
Sand Island	0	1.3	1.8	0.0	3.2
Kahana	3	0.1	0.0	0.0	3.1
Waiahole	3	0.1	0.0	0.0	3.1

Kahawainui	3	0.1	0.0	0.0	3.1
Anahulu	3	0.0	0.0	0.0	3.1
Kaloi	0	1.3	0.2	0.6	2.1
Makaiwa	0	0.5	1.5	0.1	2.1
Halehaa	0	1.2	0.9	0.0	2.1
Puu Hawaiiloa	0	1.6	0.0	0.0	1.7
Manuwai	0	1.3	0.2	0.1	1.6
Oio	0	0.2	1.2	0.0	1.4
Honouliuli	0	0.5	0.0	0.4	0.9
Waialaenui	0	0.3	0.2	0.4	0.9
Kualoa	0	0.9	0.0	0.0	0.9
Koko Crater	0	0.7	0.1	0.0	0.8
Makaua	0	0.6	0.1	0.0	0.7
Wailupe	0	0.5	0.0	0.2	0.7
Loko Ea	0	0.6	0.0	0.0	0.6
Kamiloiki	0	0.3	0.2	0.1	0.6
Papaakoko	0	0.6	0.0	0.0	0.6
Hanauma	0	0.5	0.0	0.0	0.6
Hakipuu	0	0.4	0.1	0.0	0.5
Ulehawa	0	0.4	0.1	0.1	0.5
Niu	0	0.3	0.1	0.1	0.5
Kahawai	0	0.4	0.0	0.0	0.5
Kalunawaikaala	0	0.3	0.2	0.0	0.5
Waipuhi	0	0.4	0.0	0.0	0.4
Keaau	0	0.4	0.0	0.0	0.4
Waipio	0	0.3	0.0	0.1	0.4
Hahaione	0	0.2	0.0	0.1	0.4
Haiamoa	0	0.2	0.0	0.0	0.3
Kawela	0	0.3	0.0	0.0	0.3
Pakulena	0	0.3	0.0	0.0	0.3
Kaipapau	0	0.2	0.1	0.0	0.3
Kamaileunu	0	0.2	0.0	0.0	0.3
Nanakuli	0	0.1	0.1	0.1	0.3
Portlock	0	0.2	0.0	0.1	0.2
Mailiili	0	0.1	0.1	0.1	0.2
Kawaihapai	0	0.2	0.0	0.0	0.2
Makaha	0	0.2	0.0	0.0	0.2

Paumalu	0	0.2	0.0	0.0	0.2
Waialua	0	0.2	0.0	0.0	0.2
Punaluu	0	0.1	0.1	0.0	0.2
Kamilonui	0	0.1	0.1	0.1	0.2
Kaluakauila	0	0.2	0.0	0.0	0.2
Koloa	0	0.1	0.0	0.0	0.2
Pahole	0	0.1	0.0	0.0	0.2
Makua	0	0.1	0.0	0.0	0.1
Malaekahana	0	0.1	0.0	0.0	0.1
Makaleha	0	0.1	0.0	0.0	0.1
Kaluanui	0	0.1	0.0	0.0	0.1
Maakua	0	0.1	0.0	0.0	0.1
Waimea	0	0.0	0.0	0.0	0.1
Diamond Head	0	0.0	0.0	0.0	0.0
Manini	0	0.0	0.0	0.0	0.0
Salt Lake	0	0.0	0.0	0.0	0.0

*Watersheds undergoing monitoring evaluations by HDOT, as detailed in the 2025-2026 Annual Monitoring Plan, Appendix B.

APPENDIX B.1

Moanalua Stream Watershed Specific Monitoring Plan

HAWAII DEPARTMENT OF TRANSPORTATION
OAHU DISTRICT

STORM WATER MANAGEMENT PROGRAM
MOANALUA STREAM WATERSHED
SPECIFIC MONITORING PLAN

MS4 NPDES Permit No. HI S000001

Hawaii Department of Transportation
Oahu District
727 Kakoi Street, Honolulu, Hawaii 96819

Version: Final
June 2025

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LIST OF ACRONYMS AND ABBREVIATIONS

AMR	Annual Monitoring Report
AMP	Annual Monitoring Plan
BMP	Best Management Practices
DOH	Hawaii Department of Health
HDOT	Hawaii Department of Transportation
I&M	Implementation and Monitoring
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
No.	Number
PID	Point Identification Number
ROW	Rights-of-Way
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
WLA	Waste Load Allocation

1. INTRODUCTION

The purpose of this watershed-specific monitoring plan for the Moanalua Stream Watershed is to ensure watershed level compliance with the objectives outlined in the requirements of the municipal separate storm sewer system (MS4) National Pollutant Discharge Elimination System (NPDES) Permit No. HI S000001 effective September 1, 2020 (hereinafter MS4 NPDES Permit), specifically Part F.1.a.

Moanalua Stream Watershed was selected for monitoring based on its ranking in a Watershed Prioritization created by the Hawaii Department of Transportation (HDOT). The priority ranking applies weighted values for designations of surface water quality impairments, percent area of HDOT Right-of-Way (ROW) within the watershed, industrial/commercial parcel density, and annual average daily traffic within the ROW.

Moanalua Stream Watershed is located near the Daniel K. Inouye International Airport, and the neighborhoods of Salt Lake and Kalihi and drains into Keehi Lagoon. Keehi Lagoon is a Class A receiving waterbody, determined to be a high priority for Total Maximum Daily Load (TMDL) development by the Hawaii Department of Health (DOH). The 2022 Clean Water Act Section 303(d) List of Impaired Waters on Oahu states that Keehi Lagoon is impaired for Total Nitrogen (TN), Nitrate + Nitrite, Total Phosphorus (TP), Turbidity, and Total Suspended Solids (TSS). The upper area of the Moanalua Stream Watershed consists of mixed residential and business developments, while the lower portion primarily consists of military, commercial, and industrial facilities. Facilities within the watershed include the Moanalua Golf Club, Walter J. Nagorski Golf Course, Moanalua Medical Center, Tripler Army Medical Center, the Fort Shafter Army Base, and Red Hill Naval Base. The HDOT routes in the watershed include H-1 Freeway, H-201 Freeway, and Nimitz Highway (Route 92).

2. OBJECTIVES FOR WATERSHED

MS4 NPDES Permit Part F.1.b(1)

Part F.1.b(1) 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

This plan provides a comprehensive overview of the applied strategies tailored to the unique characteristics of the watershed, aimed at effectively meeting the permit's objectives. The following sections will detail these strategies, demonstrating HDOT's ongoing regulatory compliance. Table 1 demonstrates the alignment of the plan's narrative

sections with the objectives and requirements of the monitoring program, MS4 NPDES Permit Parts F.1.a.(1) – F.1.a.(7).

Table 1. HDOT NPDES Permit No. HI S000001, Part F.1. Annual Monitoring Program Objectives and Permit Requirements.

OBJECTIVE	SECTION REFERENCE
F.1. Annual Monitoring Plan	
F.1.a. Submit the Annual Monitoring Plan by June 1st of each year for review and acceptance. The Annual Monitoring Plan shall be implemented over the coming fiscal year.	
F.1.a.(1) Assess compliance with permit (including TMDL Industrial and Commercial (I&M) Plans and demonstrating consistency with Waste Load Allocation (WLAs))	Section 3.0
F.1.a.(2) Measures the effectiveness of Permittee's storm water management program	Section 4.0
F.1.a.(3) Assess the overall health of the receiving waters based on the chemical, physical, and biological impacts resulting from the storm water discharges and an evaluation of the long-term trends	Section 5.0
F.1.a.(4) Characterize storm water discharges from the MS4	Sections 3.0 and 7.0
F.1.a.(5) Identify sources of specific pollutants	Sections 3.0 and 5.0
F.1.a.(6) Detect and eliminate illicit discharges and illegal connections to the MS4	Section 6.0
F.1.a.(7) Assess the water quality issues in the watershed resulting from storm water discharges to receiving waters.	Section 4.0

3. COMPLIANCE ASSESSMENT

MS4 NPDES Permit Part F.1.a(1) and F.1.b.(2)

Part F.1.a.(1) Assess compliance with this permit (including TMDL I&M Plans and demonstrating consistency with WLAs

Part F.1.b(2) For each activity, a description of how the results will be used to determine compliance with this permit

A specific compliance assessment strategy for Moanalua Stream Watershed will be performed to meet the required objectives of the MS4 NPDES Permit Part F.1.a(1). This strategy is designed to provide an overview of the current compliance status within the watershed. A comprehensive review of compliance activities within the watershed is conducted to determine the status of compliance for each part of the MS4 Permit.

Scheduled to be completed in 2025-2026, the outcomes of the assessment will be presented in a table outlining permit requirements alongside corresponding indicators of compliance within the correlating Annual Monitoring Report (AMR).

3.1 Sampling Informs Discharge Characterization and Watershed Assessment

To meet the requirements outlined in Part F.1.b.(2) of the permit, the following describes how sampling efforts will support compliance with Discharge Characterization and Watershed Assessment strategies, which are slated for implementation for the Moanalua Stream Watershed in subsequent years. Comprehensive water quality sampling and analysis throughout the watershed will enable HDOT to effectively characterize stormwater discharges from the MS4. This process will involve identifying the presence and concentrations of specific pollutants, analyzing their discharge patterns in relation to rainfall and flow rates, and evaluating spatial variations among sampling locations. The findings will be instrumental in assessing the water quality challenges within the watershed, particularly in relation to stormwater discharges impacting Keehi Lagoon and the contributions from HDOT's MS4.

4. EFFECTIVENESS ASSESSMENT

MS4 NPDES Permit Part F.1.a(2)

Part. F.1.a.(2) Measure the effectiveness of the Permittee's storm water management program

A specific effectiveness assessment strategy for Moanalua Stream Watershed will be performed to meet the required objectives of the MS4 NPDES Permit Part F.1.a(2). This strategy is analogous to the Annual Report subsection, "Best Management Practice (BMP) Assessment Metrics", and will provide a three-year average of operational BMP outcomes within the watershed. Scheduled to be completed in 2025-2026, the outcomes will be presented in the correlating AMR in a tabular format with corresponding permit requirements, program section, assigned outcome levels, and outcomes as watershed limited assessment parameters.

5. RECEIVING WATER ASSESSMENT

MS4 NPDES Permit Part F.1.a(3)

Part F.1.a.(3) Assess the overall health of the receiving waters based on the chemical, physical, and biological impacts resulting from storm water discharges and an evaluation of the long-term trends

A receiving water assessment strategy for the Moanalua Stream Watershed will be implemented to fulfill the objectives outlined in the MS4 NPDES Permit Part F.1.a(3). This strategy aims to evaluate the long-term health of Keehi Lagoon by collecting data from reputable resources, such as the US Environmental Protection Agency, DOH, US Geological Services, and the City and County of Honolulu. Key factors influencing the watershed's impact on receiving water will be examined, such as area size, average discharge calculations, land use types, traffic densities, water quality impairments, and beneficial uses. This analysis will provide insights into water quality trends and beneficial use outcomes for Keehi Lagoon and will be incorporated into the 2025-2026 AMR.

6. MS4 ASSET INVENTORY

MS4 NPDES Permit Part F.1.a(6)

Part F.1.a.(6) Detect and eliminate illicit discharges and illegal connections to the MS4

The HDOT Monitoring Program, as delineated in the current Annual Monitoring Plan (AMP), aims to identify specific pollutant sources, thereby facilitating the elimination of illicit discharges and illegal connections to the MS4, in accordance with the NPDES Permit Part F.1.a.(6) requirements. A crucial aspect of this initiative is the development of an accurate asset inventory related to the MS4. To this end, HDOT is implementing a comprehensive MS4 Asset Inventory strategy focused on the Moanalua Stream Watershed. This strategy will involve field verification of existing HDOT assets, identification of Jurisdiction Transfer Points and illegal connections, as well as corrections to existing data related to pipe attributes and flow directions. The outcomes of these assessments will be documented in the AMRs until a thorough evaluation is completed, ensuring ongoing improvement in MS4 management practices.

7. DISCHARGE SAMPLING AND CHARACTERIZATION ASSESSMENT

MS4 NPDES Permit Part F.1.a(4)

Part F.1.a.(4) Characterize storm water discharges from the MS4

The Discharge Sampling and Assessment strategy for the Moanalua Stream Watershed fulfills the objectives specified in the MS4 NPDES Permit Part F.1.a(4). This strategy encompasses detailed subsections that delineate the protocols for data collection, the analytical methods employed, and quality control and quality assurance procedures tailored for watershed-specific water quality sampling. The outcomes derived from these sampling efforts will be integrated with supplementary data from other MS4 programs, including debris cleaning records, the TMDL program, and landscape service contracts. This comprehensive approach will be documented and evaluated in the AMR, which aims to provide a thorough characterization of stormwater discharges focused on tailored pollutants of concern. This strategic synthesis of data aims to facilitate decision-making and enhance the effectiveness of HDOT's Storm Water Management Program.

7.1 Data Collection Protocol

During the 2021 – 2022 Monitoring Year, HDOT commenced water quality sampling from HDOT ROW into Moanalua Stream to help characterize storm water runoff and assess the potential of implementing enhanced operational or structural BMPs in the watershed. During the 2025 – 2026 Monitoring Year, HDOT will continue to collect storm water quality samples from three monitoring sites in the Moanalua Stream Watershed.

- Site #1 – Water quality monitoring of MS4 network along H-1 Freeway and Ala Napunani Street interchange which discharges to an intermittent portion of Moanalua Stream.
- Site #2 – Water quality monitoring of MS4 network along Puuloa Road, North King Street, and H-1 Freeway interchange which discharges to Moanalua Stream, approximately one mile upstream from Keehi Lagoon.
- Site #3 – Water quality monitoring of MS4 network along H-1 Freeway near the Funston Road interchange which discharges to an intermittent portion of Moanalua Stream (Kahauiki Tributary).

Specific methods that will be used to determine storm events including the monitoring of a rain gauge near Site #1, see location of RG-23 on Figure 2, are in Section 5 of the AMP. Specific methods that will be used when sampling for these sampling locations are also in Section 5 of the AMP. See Figure 1 Moanalua Stream Watershed for a map of all locations.

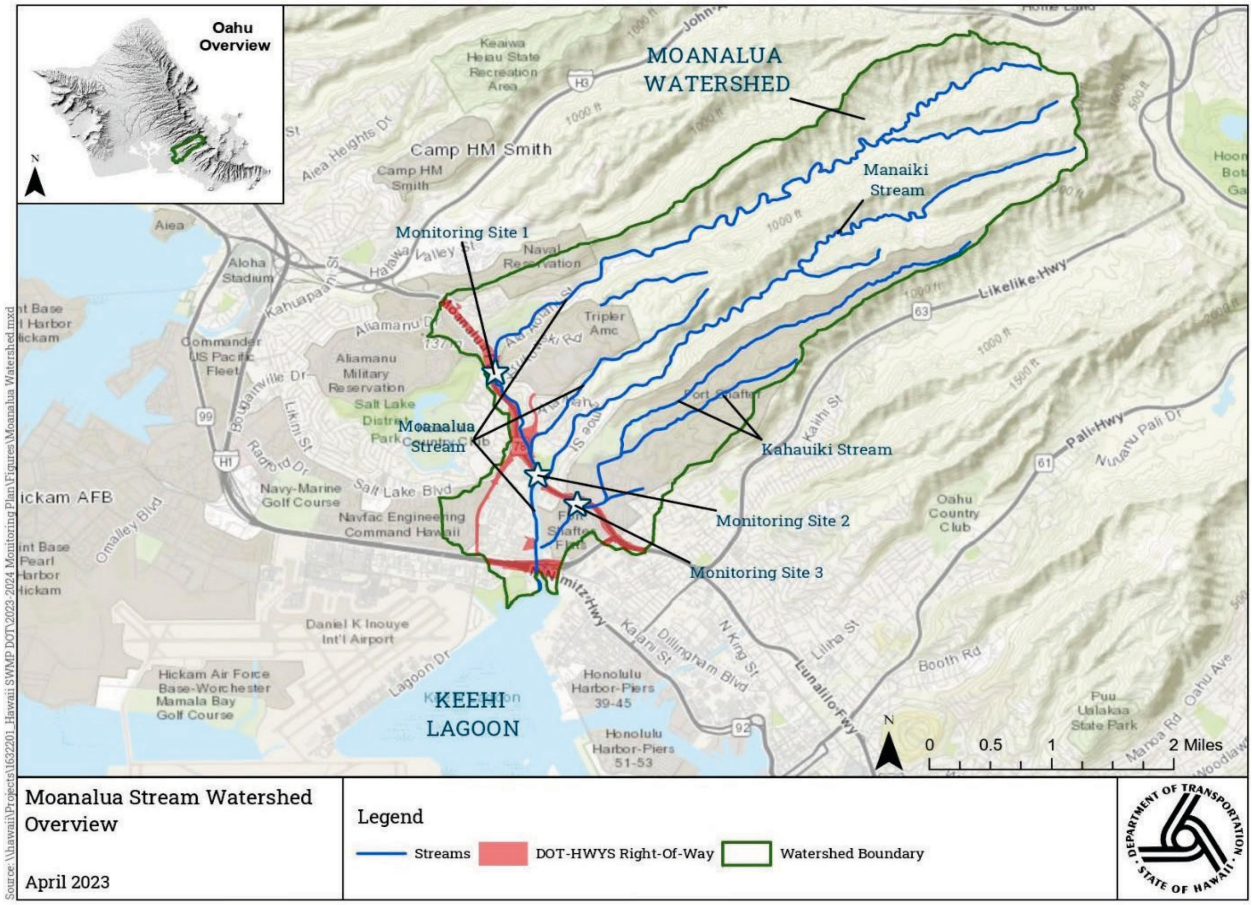

Figure 1. Location of Monitoring Sites in Moanalua Stream Watershed

7.1.1 Moanalua Stream Watershed Monitoring Site #1

HDOT will continue conducting storm water monitoring on a portion of the H-1 Freeway and adjacent roads near the Ala Napunani Street interchange. The drainage area is approximately five acres. Storm water runoff in the area is collected by a network of grated drain inlets in the concrete medians along the freeway, adjacent roads, and ramps. This drainage area discharges to a 60-inch pipe which outfalls at Point Identification Number (PID) 300311 directly into an intermittent portion of Moanalua Stream.

Storm water quality samples will be collected at grated drain inlet PID 110647, which is approximately 325 yards upstream of the outfall to Moanalua Stream. This point of the MS4 network was selected since it does not contain upstream contributions from the non-HDOT sources along Ala Napunani Street.

Storm water quality samples will be collected from this site using automated samplers, grab samples, or a combination of both. See *Figure 2* for the location map of Moanalua Stream Watershed Monitoring Site #1.

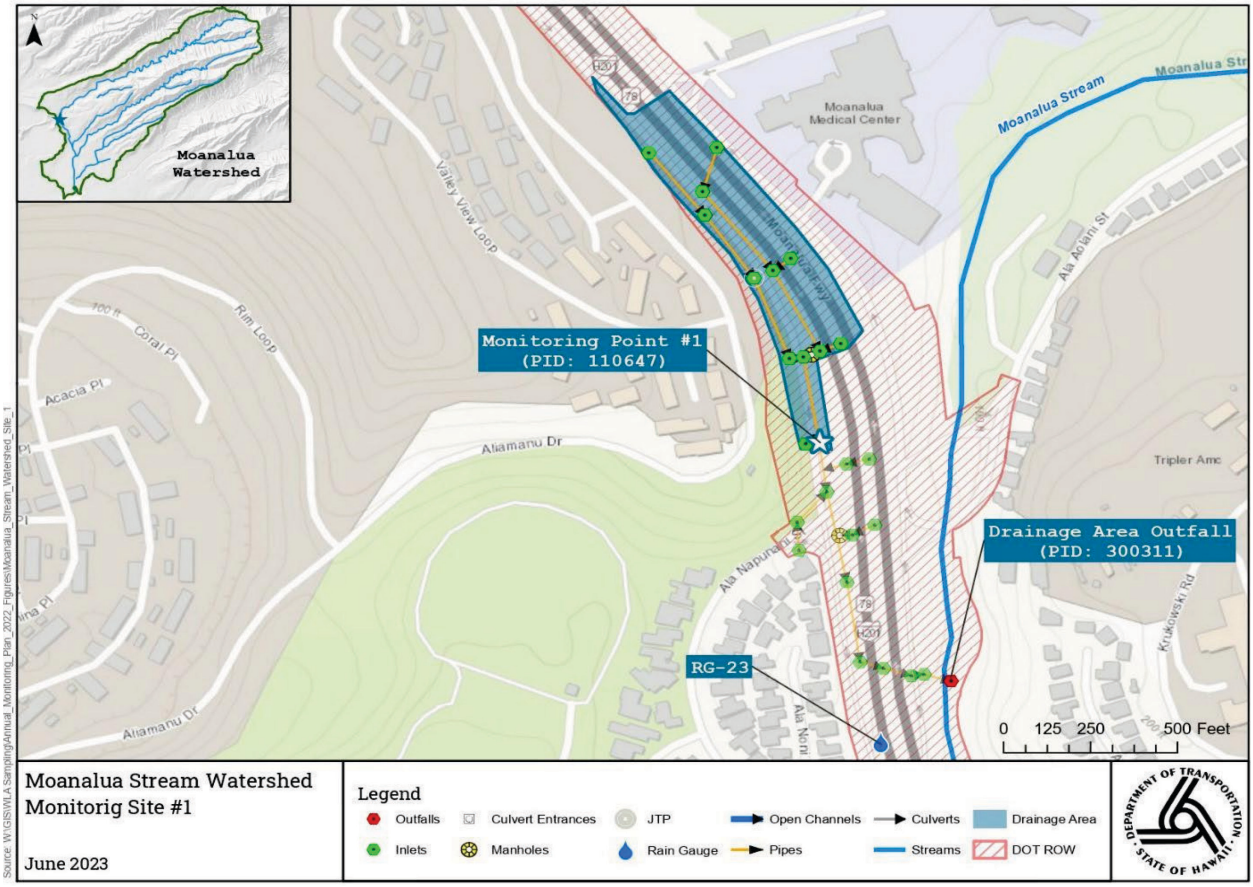

Figure 2. Location Moanalua Stream Monitoring Site #1.

7.1.2 Moanalua Stream Watershed Monitoring Site #2

HDOT will continue conducting storm water monitoring on a portion of Puuloa Road, H-1 Freeway, and North King Street near the Puuloa Road interchange. The drainage area is approximately 12 acres. Storm water runoff from the north end of Puuloa Road, the on-ramp to North King Street, a 0.25-mile length of H-1 Freeway, and the Kaua Street on-ramp, drains into a 54-inch pipe that runs along North King Street. This pipe splits at inlet PID 115335 and discharges directly into Moanalua Stream via two 42-inch outfalls (PID 304426 and PID 303121), approximately one mile upstream of Keehi Lagoon.

Storm water quality samples will be collected at inlet PID 103372. Samples may be collected at the outfalls at a future time, however currently both the outfalls are partially buried in the stream bank and potentially submerged during high tides, and/or during large storm events. The inlet closer to the stream, PID 115335, is also inaccessible for sampling because of tidal influence.

Storm water quality samples will be collected from this site using automated samplers, grab samples, or a combination of both. See *Figure 3* for the location map of Moanalua Stream Watershed Monitoring Site #2.

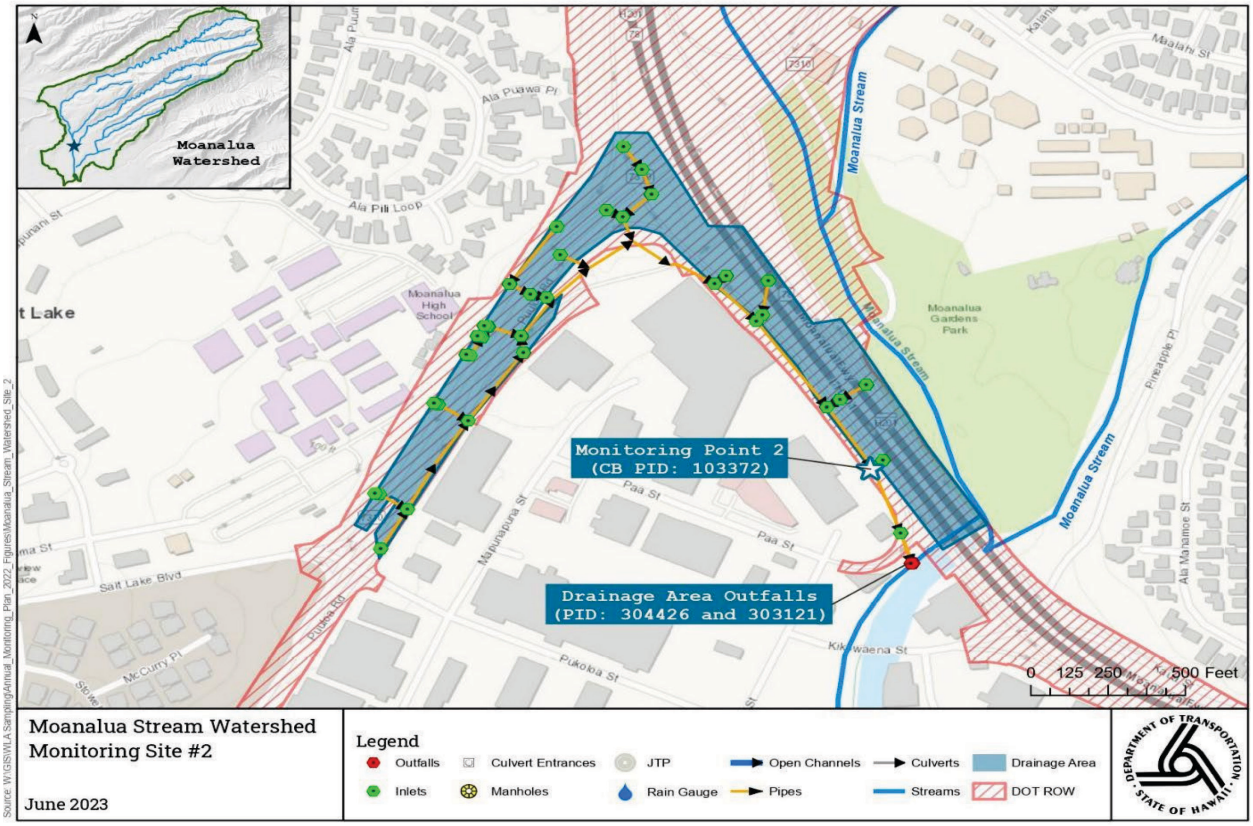

Figure 3. Location of Moanalua Stream Monitoring Site #2.

7.1.3 Moanalua Stream Watershed Monitoring Site #3

HDOT will continue conducting storm water monitoring on a portion of the H-1 Freeway near the Funston Road interchange. The drainage area is approximately two acres. Storm water runoff in the area flows off the highway and is collected by a network of grated drain inlets within concrete medians and shoulders of the road. This drainage area discharges to a 24-inch pipe which outfalls at PID 304595 into a grass area, and eventually into an intermittent portion of Moanalua Stream (Kahauiki Tributary).

PID 304595, situated within a fenced area along Moanalua Stream, is inaccessible for stormwater quality sampling. In monitoring year 2024-2025, the upstream inlet PID 103380 was also rendered inaccessible due to temporary sediment controls related to a nearby construction site. This obstruction is expected to persist through monitoring year 2025-2026 and potentially beyond. During the 2025-2026 monitoring year, HDOT will evaluate

alternative nearby sites for their suitability as new ongoing sampling locations throughout the Moanalua Stream Watershed water quality assessment.

Storm water quality samples may be collected from this site when accessible using automated samplers, grab samples, or a combination of both. See *Figure 4* for the location map of Moanalua Stream Watershed Monitoring Site #3.

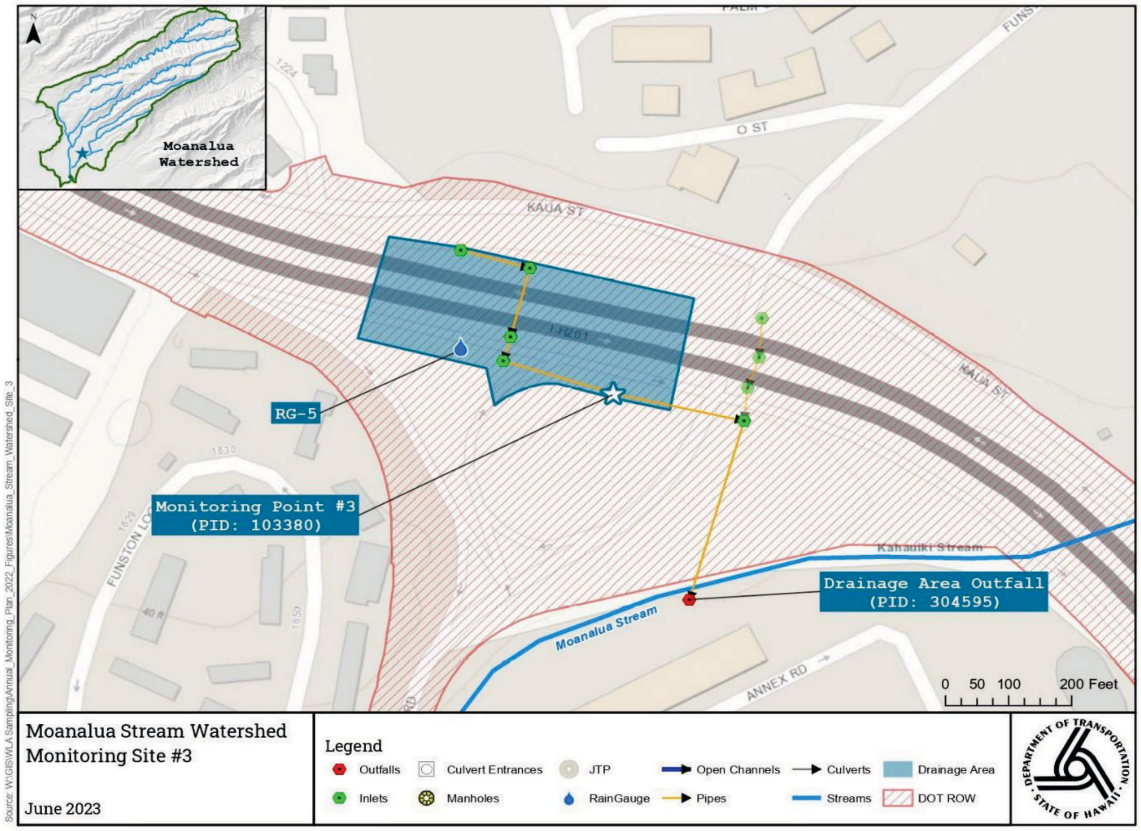

Figure 4. Location of Moanalua Stream Monitoring Site #3.

7.2 Analytical Methods and Quality Assurance and Quality Control | MS4 NPDES Permit Part F.1.b.(5) and F.1.b.(6)

Part F.1.b.(5.) Written documentation of the analytical methods to be used

Part F.1.b.(6.) Written documentation of the Quality Assurance/Quality Control procedures to be used

As detailed in Section 6 of the 2025-2026 AMP, storm water samples collected will be analyzed for TN, Total Kjeldahl Nitrogen, TP and TSS by a State-approved laboratory.

8. WATERSHED ASSESSMENT

MS4 NPDES Permit Part F.1.a(5) and F.1.a.(7)

Part F.1.a.(5) Identify sources of specific pollutants

Part F.1.a.(7) Assess the water quality issues in watershed resulting from storm water discharges to receiving waters

The Watershed Assessment strategy for the Moanalua Stream Watershed will address the objectives outlined in the MS4 NPDES Permit Part F.1.a(5) and Part F.1.a(7). This approach involves an evaluation of HDOT MS4 impacts on water quality by analyzing and synthesizing external reports that detail water quality issues within the Moanalua Stream watershed and Keehi Lagoon. Additionally, the strategy may incorporate modeling of pollutant loading to enhance understanding of the HDOT MS4 contributions to these issues. Key questions include the correlation between pollutants of concern discharging from HDOT's ROW and those responsible for impairments in the waterbody, as well as identification of pollutant sources within and beyond HDOT's jurisdiction. This future analysis will provide insights into water quality trends and beneficial use outcomes for Keehi Lagoon.

9. TACTICS AND METRICS

MS4 NPDES Permit Part F.1.a(2)

F.1.a.(2) Measures the effectiveness of Permittee's storm water management program

In future years, HDOT will adopt a final Tactics and Metrics strategy for the Moanalua Stream Watershed, which aims to mitigate the impacts of the MS4 to Keehi Lagoon. This strategy synthesizes previous findings from the Monitoring Program to delineate the most effective BMPs for reducing specific pollutants and their sources within the watershed. Key BMPs may include enhanced debris control frequencies, revised outfall inspection protocols, targeted public education campaigns, improved erosion control measures, and the integration of retrofitted BMPs. Implementing this comprehensive approach is intended to ensure long-term permit compliance and beneficial use of Keehi Lagoon.

10. CONCLUSION

The watershed-specific monitoring plan for the Moanalua Stream Watershed represents a strategic framework aimed at ensuring compliance with the MS4 NPDES Permit requirements. By systematically addressing the monitoring objectives outlined in the permit, the plan enhances the capacity of HDOT to assess and mitigate the impacts of stormwater discharges on local waterways, particularly Keehi Lagoon. Through sampling and assessment protocols, including the characterization of stormwater discharges and identification of pollutant sources, HDOT aims to facilitate compliance reporting and guide the implementation of effective BMPs tailored to the Moanalua Stream Watershed.

11. REFERENCES

City and County of Honolulu, Department of Environmental Services. 2007. Annual Stream Water Quality Monitoring Report.

State of Hawaii Department of Transportation Highways, Oahu District. 2022. Oahu Storm Water Management Program Plan. URL: https://www.stormwater hawaii.com/hawaii-storm-water-program-plan/.

State of Hawaii Department of Transportation Highways, Oahu District. 2016. Trash Reduction Plan.

State of Hawaii Department of Transportation Highways, Oahu District. 2021. Program Effectiveness Strategy.

State of Hawaii Department of Transportation Highways, Oahu District. 2021. Storm Water Pollution Control Plans. URL: http://www.stormwaterhawaii. com/ resources/plans/.

State of Hawaii Department of Transportation, Highways, Oahu District. 2020. National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit No. HI S000001, effective September 1, 2020.

State of Hawaii Department of Health. 2014. Water Quality Standards Map of the Island of Oahu. URL: https://health.hawaii.gov/cwb/files/2013/05/WQS_20140708_Oahu.pdf

State of Hawaii Department of Health. 2021. Hawaii Administrative Rules, Chapter 11-54.
State of Hawaii Department of Health, Clean Water Branch. 2020. Data Acceptance Criteria.

State of Hawaii Department of Health, Clean Water Branch. 2024. 2024 State of Hawaii Water Quality Monitoring and Assessment Report: Integrated Report to the U.S. Environmental Protection Agency and the U.S. Congress Pursuant to §303(d) and §305(b), Clean Water Act (P.L. 97-117).

United States Environmental Protection Agency. 1990. Clean Water Act (CWA) Section 402(p)(3)(B).

United States Environmental Protection Agency. 2025. How's My Waterway? URL: https://mywaterway.epa.gov/community/2685%20N%20Nimitz%20Hwy,%20Honolulu,%20HI%2096819/overview.

APPENDIX B.2

Keehi Stream Watershed Specific Monitoring Plan

HAWAII DEPARTMENT OF TRANSPORTATION
OAHU DISTRICT

STORM WATER MANAGEMENT PROGRAM
KEEHI STREAM WATERSHED
SPECIFIC MONITORING PLAN

MS4 NPDES Permit No. HI S000001

Hawaii Department of Transportation
Oahu District
727 Kakoi Street, Honolulu, Hawaii 96819

Version: Final
June 2025

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LIST OF ACRONYMS AND ABBREVIATIONS

AMR	Annual Monitoring Report
AMP	Annual Monitoring Plan
BMP	Best Management Practices
DOH	Hawaii Department of Health
HDOT	Hawaii Department of Transportation
I&M	Implementation and Monitoring
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
No.	Number
PID	Point Identification Number
ROW	Rights-of-Way
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
WLA	Waste Load Allocation

1. INTRODUCTION

The purpose of this watershed-specific monitoring plan for the Keehi Stream Watershed is to ensure watershed level compliance with the objectives outlined in the requirements of the municipal separate storm sewer system (MS4) National Pollutant Discharge Elimination System (NPDES) Permit No. HI S000001 effective September 1, 2020 (hereinafter MS4 NPDES Permit), specifically Part F.1.a

Keehi Stream Watershed was selected for monitoring based on its ranking in Watershed Prioritization created by the Hawaii Department of Transportation (HDOT). The priority ranking applies weighted values for designations of surface water quality impairments, percent area of HDOT Right-of-Way (ROW) within the watershed, industrial/commercial (IC) parcel density, and annual average daily traffic within the ROW.

Keehi Watershed is in an area of mixed development between Moanalua Stream Watershed and Manuwai Stream Watershed. There are two HDOT routes within the watershed, the H-1 Freeway and Nimitz Highway (Route 92). Nimitz Highway is located directly beneath the H-1 Freeway. Deck drains along the H-1 Freeway superstructure convey runoff down to Nimitz Highway. Several drainage networks direct storm water runoff south which connects to the City and County of Honolulu (CCH) MS4 which ultimately discharges into Keehi Lagoon via an indirect connection. Keehi Lagoon is a Class A receiving water body that has been deemed a high priority Total Maximum Daily Load (TMDL) development by DOH. The 2022 CWA Section 303(d) List of Impaired Waters on Oahu states Keehi Lagoon is impaired for Total Nitrogen (TN), Nitrate + Nitrite (NO3 + NO2), Total Phosphorus (TP), Turbidity, and Total Suspended Solids (TSS). Within the watershed are industrial, commercial, and residential developments; Salt Lake District Park, Honolulu Country Club, Navy housing, and part of the Salt Lake neighborhood are contained in the northern region of the watershed boundary. The southern region contains the east end of Daniel K. Inouye Airport as well as industrial use buildings.

2. OBJECTIVES FOR WATERSHED

MS4 NPDES Permit Part F.1.b(1)

Part F.1.b(1) 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

This plan provides a comprehensive overview of the applied strategies tailored to the unique characteristics of the watershed, aimed at effectively meeting the permit's objectives. The following sections will detail these strategies, demonstrating HDOT's ongoing regulatory compliance. Table 1 demonstrates the alignment of the plan's narrative sections with the objectives and requirements of the monitoring program, MS4 NPDES Permit Parts F.1.a.(1) – F.1.a.(7).

Table 1. HDOT NPDES Permit No. HI S000001, Part F.1. Annual Monitoring Program Objectives and Permit Requirements.

OBJECTIVE	SECTION REFERENCE
F.1. Annual Monitoring Plan	
F.1.a. Submit the Annual Monitoring Plan by June 1st of each year for review and acceptance. The Annual Monitoring Plan shall be implemented over the coming fiscal year.	
F.1.a.(1) Assess compliance with permit (including TMDL Industrial and Commercial (I&M) Plans and demonstrating consistency with Waste Load Allocation (WLAs))	Section 3.0
F.1.a.(2) Measures the effectiveness of Permittee's storm water management program	Section 4.0
F.1.a.(3) Assess the overall health of the receiving waters based on the chemical, physical, and biological impacts resulting from the storm water discharges and an evaluation of the long-term trends	Section 5.0
F.1.a.(4) Characterize storm water discharges from the MS4	Sections 3.0 and 7.0
F.1.a.(5) Identify sources of specific pollutants	Sections 3.0 and 5.0
F.1.a.(6) Detect and eliminate illicit discharges and illegal connections to the MS4	Section 6.0
F.1.a.(7) Assess the water quality issues in the watershed resulting from storm water discharges to receiving waters.	Section 4.0

3. COMPLIANCE ASSESSMENT

MS4 NPDES Permit Part F.1.a(1) and F.1.b.(2)

Part F.1.a.(1) Assess compliance with this permit (including TMDL I&M Plans and demonstrating consistency with WLAs)

Part F.1.b(2) For each activity, a description of how the results will be used to determine compliance with this permit

A specific compliance assessment strategy for Keehi Stream Watershed will be performed to meet the required objectives of the MS4 NPDES Permit Part F.1.a(1). This strategy is designed to provide an overview of the current compliance status within the watershed. A comprehensive review of compliance activities within the watershed is conducted to determine the status of compliance for each part of the MS4 Permit. Tentatively scheduled to be completed in 2027-2028, the outcomes of the assessment are planned to be presented in a table outlining permit requirements alongside corresponding indicators of compliance within the correlating Annual Monitoring Report (AMR).

3.1 Sampling Informs Discharge Characterization and Watershed Assessment

To meet the requirements outlined in Part F.1.b.(2) of the permit, the following describes how sampling efforts will support compliance with Discharge Characterization and Watershed Assessment strategies, which are slated for implementation for the Keehi Stream Watershed in subsequent years. Comprehensive water quality sampling and analysis throughout the watershed will enable HDOT to effectively characterize stormwater discharges from the MS4. This process will involve identifying the presence and concentrations of specific pollutants, analyzing their discharge patterns in relation to rainfall and flow rates, and evaluating spatial variations among sampling locations. The findings will be instrumental in assessing the water quality challenges within the watershed, particularly in relation to stormwater discharges impacting Keehi Lagoon and the contributions from HDOT's MS4.

4. EFFECTIVENESS ASSESSMENT

MS4 NPDES Permit Part F.1.a(2)

Part. F.1.a.(2) Measure the effectiveness of the Permittee's storm water management program

A specific effectiveness assessment strategy for Keehi Stream Watershed will be performed to meet the required objectives of the MS4 NPDES Permit Part F.1.a(2). This strategy is analogous to the Annual Report subsection X.2.1, "Best Management Practice (BMP) Assessment Metrics", and will provide a three-year average of operational BMP outcomes within the watershed. Tentatively scheduled to be completed in 2027-2028, the outcomes are planned to be presented in the correlating AMR in a tabular format with corresponding permit requirements, program section, assigned outcome levels, and outcomes as watershed limited assessment parameters.

5. RECEIVING WATER ASSESSMENT

MS4 NPDES Permit Part F.1.a(3)

Part F.1.a.(3) Assess the overall health of the receiving waters based on the chemical, physical, and biological impacts resulting from storm water discharges and an evaluation of the long-term trends

A receiving water assessment strategy for the Keehi Stream Watershed will be implemented to fulfill the objectives outlined in the MS4 NPDES Permit Part F.1.a(3). This strategy aims to evaluate the long-term health of Keehi Lagoon by collecting data from reputable resources, such as the US Environmental Protection Agency, DOH, US Geological Services, and the City and County of Honolulu. Key factors influencing the watershed's impact on receiving water will be examined, such as area size, average discharge calculations, land use types, traffic densities, water quality impairments, and beneficial uses. This analysis will provide insights into water quality trends and beneficial use outcomes for Keehi Lagoon and tentatively will be incorporated into the 2027 – 2028 AMR.

6. MS4 ASSET INVENTORY

MS4 NPDES Permit Part F.1.a(6)

Part F.1.a.(6) Detect and eliminate illicit discharges and illegal connections to the MS4

The HDOT Monitoring Program, as delineated in the current Annual Monitoring Plan (AMP), aims to identify specific pollutant sources, thereby facilitating the elimination of illicit discharges and illegal connections to the MS4, in accordance with the NPDES Permit Part F.1.a.(6) requirements. A crucial aspect of this initiative is the development of an accurate asset inventory related to the MS4. To this end, HDOT will be implementing a comprehensive MS4 Asset Inventory strategy focused on the Keehi Stream Watershed in 2027-2028. This strategy will involve field verification of existing HDOT assets, identification of Jurisdiction Transfer Points and illegal connections, as well as corrections to existing data related to pipe attributes and flow directions. The outcomes of these assessments will be documented in the AMRs until a thorough evaluation is completed, ensuring ongoing improvement in MS4 management practices.

7. DISCHARGE SAMPLING AND CHARACTERIZATION ASSESSMENT

MS4 NPDES Permit Part F.1.a(4)

Part F.1.a.(4) Characterize storm water discharges from the MS4

The Discharge Sampling and Assessment strategy for the Keehi Stream Watershed fulfills the objectives specified in the MS4 NPDES Permit Part F.1.a(4). This strategy encompasses detailed subsections that delineate the protocols for data collection, the analytical methods employed, and quality control and quality assurance procedures tailored for watershed-specific water quality sampling. The outcomes derived from these sampling efforts will be integrated with supplementary data from other MS4 programs, including debris cleaning records, the TMDL program, and landscape service contracts. This comprehensive approach will be documented and evaluated in the AMR, which aims to provide a thorough characterization of stormwater discharges focused on tailored pollutants of concern. This strategic synthesis of data aims to facilitate decision-making and enhance the effectiveness of HDOT's SWMP.

7.1 Data Collection Protocol

During the 2023-2024 Monitoring Year, HDOT commenced water quality sampling from HDOT ROW into Keehi Watershed to help characterize storm water runoff and assess the potential of implementing enhanced operational or structural BMPs in the watersheds (or other watersheds which drain to the impaired waters of Keehi Lagoon). During the 2025 – 2026 Monitoring Year, HDOT will continue to collect storm water quality samples within Keehi Watershed.

- Site #1 – Water quality monitoring of MS4 network along the H-1 Freeway viaduct, accessible along North Nimitz Highway near Ohohia St, which discharges to Keehi Lagoon. Samples from this location will also be used to represent the lower Kalihi Watershed since the same H-1 Freeway viaduct traverses that watershed, and storm water runoff is anticipated to be substantially similar.

During the Monitoring Year, additional sampling locations and methods within Keehi Watershed to increase the drainage area evaluated will be assessed. Updates to the sampling locations, details, and associated analytical results will be provided in the Annual Monitoring Report 2025 – 2026, as applicable. Specific methods that will be used to determine storm events and field sampling for these sampling locations are in Section 5 of the AMP.

See *Figure 1 Keehi Watershed* for a watershed location map.

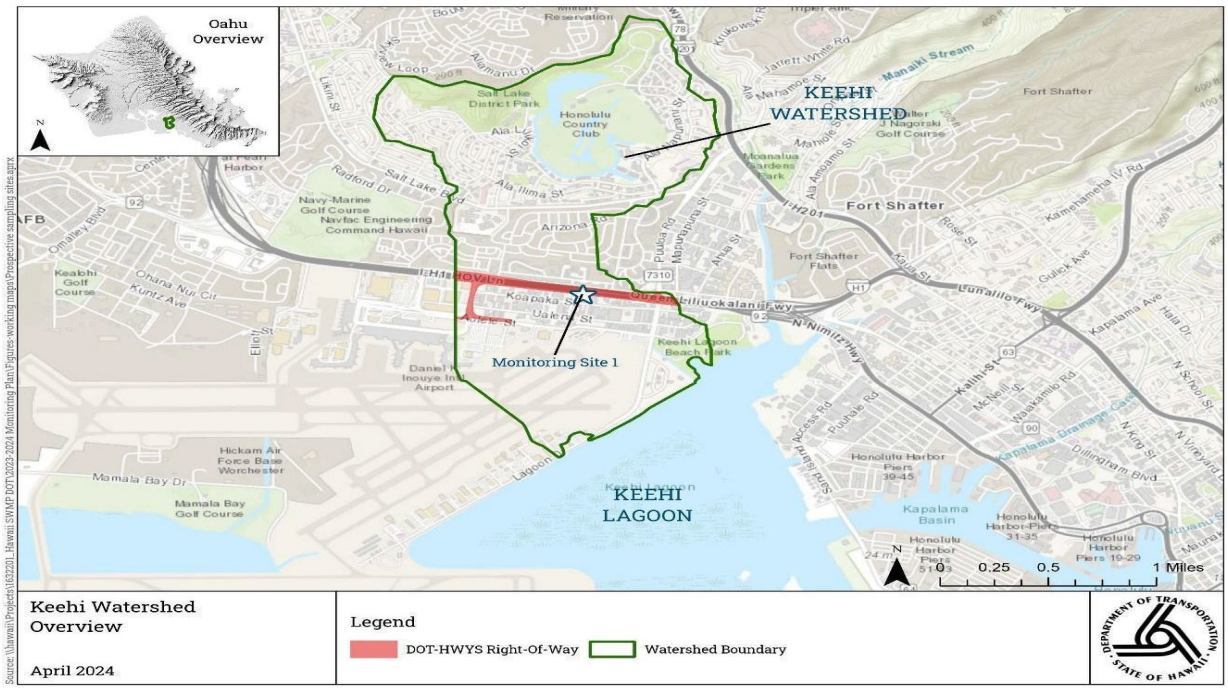

Figure 1. Location of Monitoring Site in Keehi Watershed.

7.1.1 Keehi Watershed Monitoring Site #1

HDOT will continue conducting storm water monitoring under a portion of the H-1 Freeway Viaduct along the North Nimitz Highway near Ohohia St, west of the Keehi interchange. Storm water runoff in the area is collected by grated drop inlets, before entering downspouts daylighting at the ground level and entering the drainage network along N Nimitz Highway. This drainage area discharges to CCH owned box culvert at PID J00522 on Ohohia St before discharging into Keehi Lagoon.

Storm water quality samples will be collected at a downspout, which outlets to an adjacent catch basin with PID 101708.

Storm water quality samples will be collected from this site using automated samplers, grab samples, or a combination of both.

See *Figure 2* for the location map of Keehi Watershed Monitoring Site #1, which is also Kalihi Watershed Monitoring Site #2.

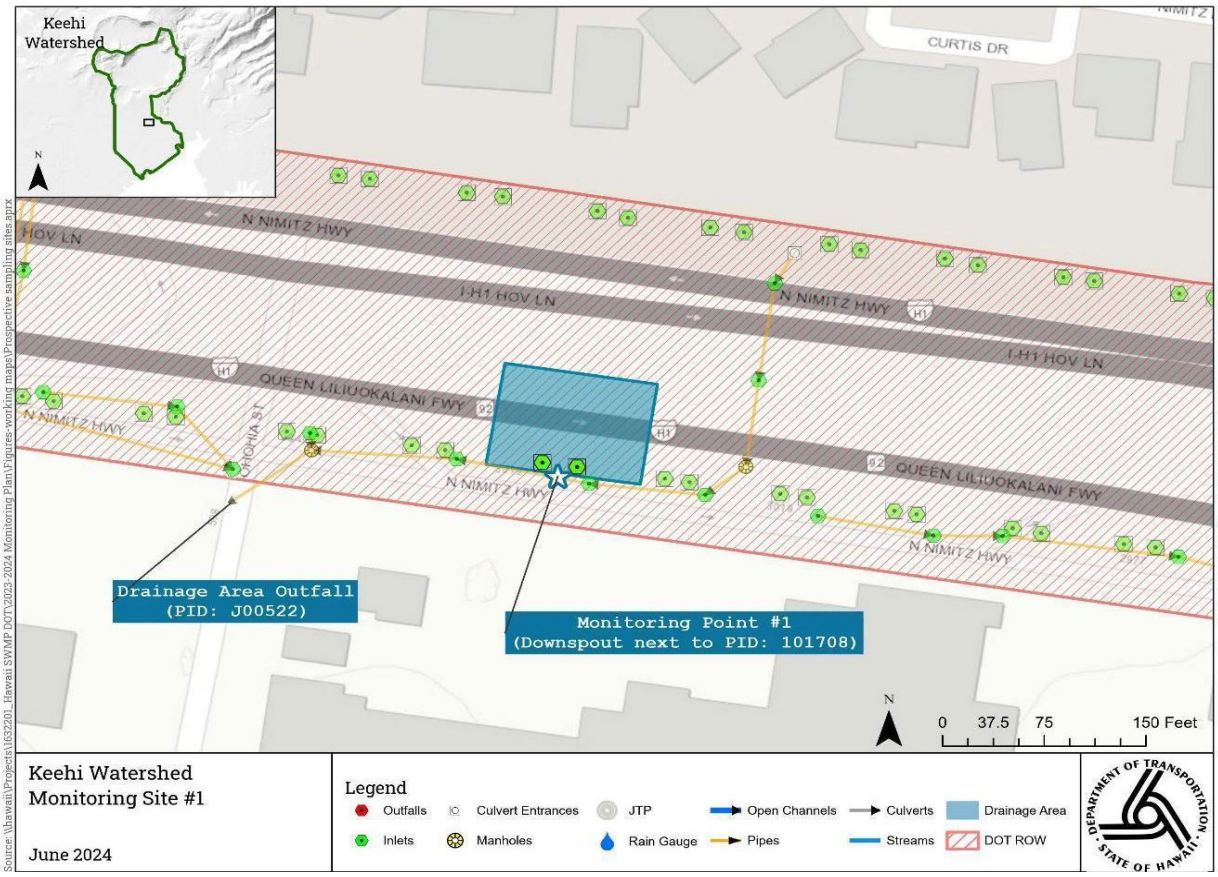

Figure 2. Location of Keehi Watershed Monitoring Site #1.

7.2 Analytical Methods and Quality Assurance and Quality Control| MS4 NPDES Permit Part F.1.b.(5) and F.1.b.(6)

Part F.1.b.(5.) Written documentation of the analytical methods to be used

Part F.1.b.(6.) Written documentation of the Quality Assurance/Quality Control procedures to be used

As detailed in Section 6 of the 2025-2026 AMP, storm water samples collected will be analyzed for TN, TKN, TP, TSS, and Ammonia by a State-approved laboratory

8. WATERSHED ASSESSMENT

MS4 NPDES Permit Part F.1.a(5) and F.1.a.(7)

Part F.1.a.(5) Identify sources of specific pollutants.

Part F.1.a.(7) Assess the water quality issues in watershed resulting from storm water discharges to receiving waters.

The Watershed Assessment strategy for the Keehi Stream Watershed will address the objectives outlined in the MS4 NPDES Permit Part F.1.a(5) and Part F.1.a(7). This approach involves an evaluation of HDOT MS4 impacts on water quality by analyzing and synthesizing external reports that detail water quality issues within the Keehi Stream watershed and Keehi Lagoon. Additionally, the strategy may incorporate modeling of pollutant loading to enhance understanding of the HDOT MS4 contributions to these issues. Key questions include the correlation between pollutants of concern discharging from HDOT's ROW and those responsible for impairments in the waterbody, as well as identification of pollutant sources within and beyond HDOT's jurisdiction. This future analysis will provide insights into water quality trends and beneficial use outcomes for Keehi Lagoon.

9. TACTICS AND METRICS

MS4 NPDES Permit Part F.1.a(2)

F.1.a.(2) Measures the effectiveness of Permittee's storm water management program

In future years, HDOT will adopt a final Tactics and Metrics strategy for the Keehi Stream Watershed, which aims to mitigate the impacts of the MS4 to Keehi Lagoon. This strategy synthesizes previous findings from the Monitoring Program to delineate the most effective

BMPs for reducing specific pollutants and their sources within the watershed. Key BMPs may include enhanced debris control frequencies, revised outfall inspection protocols, targeted public education campaigns, improved erosion control measures, and the integration of retrofitted BMPs. Implementing this comprehensive approach is intended to ensure long-term permit compliance and beneficial use of Keehi Lagoon.

10. CONCLUSION

The watershed-specific monitoring plan for the Keehi Stream Watershed represents a strategic framework aimed at ensuring compliance with the MS4 NPDES Permit requirements. By addressing the monitoring objectives outlined in the permit, the plan enhances the capacity of HDOT to assess and mitigate the impacts of stormwater discharges on local waterways, particularly Keehi Lagoon. Through sampling and assessment protocols, including the characterization of stormwater discharges and identification of pollutant sources, HDOT aims to facilitate compliance reporting and guide the implementation of effective BMPs tailored to the Keehi Stream Watershed.

11. REFERENCES

City and County of Honolulu, Department of Environmental Services. 2007. Annual Stream Water Quality Monitoring Report.

State of Hawaii Department of Transportation Highways, Oahu District. 2022. Oahu Storm Water Management Program Plan. URL: https://www.stormwater hawaii.com/hawaii-storm-water-program-plan/.

State of Hawaii Department of Transportation Highways, Oahu District. 2016. Trash Reduction Plan.

State of Hawaii Department of Transportation Highways, Oahu District. 2021. Program Effectiveness Strategy.

State of Hawaii Department of Transportation Highways, Oahu District. 2021. Storm Water Pollution Control Plans. URL: http://www.stormwaterhawaii. com/ resources/plans/.

State of Hawaii Department of Transportation, Highways, Oahu District. 2020. National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit No. HI S000001, effective September 1, 2020.

State of Hawaii Department of Health. 2014. Water Quality Standards Map of the Island of Oahu. URL: https://health.hawaii.gov/cwb/files/2013/05/WQS_20140708_Oahu.pdf

State of Hawaii Department of Health. 2021. Hawaii Administrative Rules, Chapter 11-54.
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State of Hawaii Department of Health, Clean Water Branch. 2024. 2024 State of Hawaii Water Quality Monitoring and Assessment Report: Integrated Report to the U.S. Environmental Protection Agency and the U.S. Congress Pursuant to §303(d) and §305(b), Clean Water Act (P.L. 97-117).

United States Environmental Protection Agency. 1990. Clean Water Act (CWA) Section 402(p)(3)(B).

United States Environmental Protection Agency. 2025. How's My Waterway? URL: https://mywaterway.epa.gov/community/2685%20N%20Nimitz%20Hwy,%20Honolulu,%20HI%2096819/overview.

APPENDIX B.3

Kalihi Stream Watershed Specific Monitoring Plan

HAWAII DEPARTMENT OF TRANSPORTATION
OAHU DISTRICT

STORM WATER MANAGEMENT PROGRAM
KALIHI STREAM WATERSHED
SPECIFIC MONITORING PLAN

MS4 NPDES Permit No. HI S000001

Hawaii Department of Transportation
Oahu District
727 Kakoi Street, Honolulu, Hawaii 96819

Version: Final
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AMP	Annual Monitoring Plan
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DOH	Hawaii Department of Health
HDOT	Hawaii Department of Transportation
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MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
No.	Number
PID	Point Identification Number
ROW	Rights-of-Way
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
WLA	Waste Load Allocation

1. INTRODUCTION

The purpose of this watershed-specific monitoring plan for the Kalihi Stream Watershed is to ensure watershed level compliance with the objectives outlined in the requirements of the municipal separate storm sewer system (MS4) National Pollutant Discharge Elimination System (NPDES) Permit No. HI S000001 effective September 1, 2020 (hereinafter MS4 NPDES Permit), specifically Part F.1.a

Kalihi Stream Watershed was selected for monitoring based on its ranking in a Watershed Prioritization created by the Hawaii Department of Transportation (HDOT). The priority ranking applies weighted values for designations of surface water quality impairments, percent area of HDOT Right-of-Way (ROW) within the watershed, industrial/commercial (IC) parcel density, and annual average daily traffic within the ROW.

Kalihi Stream Watershed is in a densely populated and trafficked portion of Honolulu near Honolulu Harbor. It is bordered by Moanalua Stream Watershed to the west and Kapalama Stream Watershed and Nuuanu Stream Watershed to the east. Storm water runoff from Kalihi Stream Watershed discharges to Keehi Lagoon. Keehi Lagoon is a Class A receiving water body that has been deemed a high priority TMDL development by DOH. The 2022 CWA Section 303(d) List of Impaired Waters on Oahu states that Keehi Lagoon is impaired for Total Nitrogen (TN), Nitrate + Nitrite (NO3 + NO2), Total Phosphorus (TP), Turbidity, and Total Suspended Solids (TSS). The northern portion of the watershed is occupied by highway and undeveloped areas, the central region contains residential development, and the southern region contains industrial and commercial development as well as residential areas. There are several HDOT routes in the watershed, the H-1 Freeway, N Nimitz Highway (Route 92), Sand Island Access Road (Route 64), and Likelike Highway (Route 63).

2. OBJECTIVES FOR WATERSHED

MS4 NPDES Permit Part F.1.b(1)

Part F.1.b(1) 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

This plan provides a comprehensive overview of the applied strategies tailored to the unique characteristics of the watershed, aimed at effectively meeting the permit's objectives. The following sections will detail these strategies, demonstrating HDOT's ongoing regulatory compliance. Table 1 demonstrates the alignment of the plan's narrative sections with the objectives and requirements of the monitoring program, MS4 NPDES Permit Parts F.1.a.(1) – F.1.a.(7).

Table 1. HDOT NPDES Permit No. HI S000001, Part F.1. Annual Monitoring Program Objectives and Permit Requirements.

OBJECTIVE	SECTION REFERENCE
F.1. Annual Monitoring Plan	
F.1.a. Submit the Annual Monitoring Plan by June 1st of each year for review and acceptance. The Annual Monitoring Plan shall be implemented over the coming fiscal year.	
F.1.a.(1) Assess compliance with permit (including TMDL Industrial and Commercial (I&M) Plans and demonstrating consistency with Waste Load Allocation (WLAs))	Section 3.0
F.1.a.(2) Measures the effectiveness of Permittee's storm water management program	Section 4.0
F.1.a.(3) Assess the overall health of the receiving waters based on the chemical, physical, and biological impacts resulting from the storm water discharges and an evaluation of the long-term trends	Section 5.0
F.1.a.(4) Characterize storm water discharges from the MS4	Sections 3.0 and 7.0
F.1.a.(5) Identify sources of specific pollutants	Sections 3.0 and 5.0
F.1.a.(6) Detect and eliminate illicit discharges and illegal connections to the MS4	Section 6.0
F.1.a.(7) Assess the water quality issues in the watershed resulting from storm water discharges to receiving waters.	Section 4.0

3. COMPLIANCE ASSESSMENT

MS4 NPDES Permit Part F.1.a(1) and F.1.b.(2)

Part F.1.a.(1) Assess compliance with this permit (including TMDL I&M Plans and demonstrating consistency with WLAs)

Part F.1.b(2) For each activity, a description of how the results will be used to determine compliance with this permit

A specific compliance assessment strategy for Kalihi Stream Watershed will be performed to meet the required objectives of the MS4 NPDES Permit Part F.1.a(1). This strategy is designed to provide an overview of the current compliance status within the watershed. A comprehensive review of compliance activities within the watershed is conducted to determine the status of compliance for each part of the MS4 Permit. Tentatively scheduled to be completed in 2026-2027, the outcomes of the assessment are planned to be presented in a table outlining permit requirements alongside corresponding indicators of compliance within the correlating Annual Monitoring Report (AMR).

3.1 Sampling Informs Discharge Characterization and Watershed Assessment

To meet the requirements outlined in Part F.1.b.(2) of the permit, the following describes how sampling efforts will support compliance with Discharge Characterization and Watershed Assessment strategies, which are slated for implementation for the Kalihi Stream Watershed in subsequent years. Comprehensive water quality sampling and analysis throughout the watershed will enable HDOT to effectively characterize stormwater discharges from the MS4. This process will involve identifying the presence and concentrations of specific pollutants, analyzing their discharge patterns in relation to rainfall and flow rates, and evaluating spatial variations among sampling locations. The findings will be instrumental in assessing the water quality challenges within the watershed, particularly in relation to stormwater discharges impacting Keehi Lagoon and the contributions from HDOT's MS4.

4. EFFECTIVENESS ASSESSMENT

MS4 NPDES Permit Part F.1.a(2)

Part. F.1.a.(2) Measure the effectiveness of the Permittee's storm water management program

A specific effectiveness assessment strategy for Kalihi Stream Watershed will be performed to meet the required objectives of the MS4 NPDES Permit Part F.1.a(2). This strategy is analogous to the Annual Report subsection, "Best Management Practice (BMP) Assessment Metrics", and will provide a three-year average of operational BMP outcomes within the watershed. Tentatively scheduled to be completed in 2026-2027, the outcomes are planned to be presented in the correlating Annual Monitoring Report in a tabular format with corresponding permit requirements, program section, assigned outcome levels, and outcomes as watershed limited assessment parameters.

5. RECEIVING WATER ASSESSMENT

MS4 NPDES Permit Part F.1.a(3)

Part F.1.a.(3) Assess the overall health of the receiving waters based on the chemical, physical, and biological impacts resulting from storm water discharges and an evaluation of the long-term trends

A receiving water assessment strategy for the Kalhi Stream Watershed will be implemented to fulfill the objectives outlined in the MS4 NPDES Permit Part F.1.a(3). This strategy aims to evaluate the long-term health of Keehi Lagoon by collecting data from reputable resources, such as the US Environmental Protection Agency, DOH, US Geological Services, and the City and County of Honolulu. Key factors influencing the watershed's impact on receiving water will be examined, such as area size, average discharge calculations, land use types, traffic densities, water quality impairments, and beneficial uses. This analysis will provide insights into water quality trends and beneficial use outcomes for Keehi Lagoon and will tentatively be incorporated into the 2026-2027 AMR.

6. MS4 ASSET INVENTORY

MS4 NPDES Permit Part F.1.a(6)

Part F.1.a.(6) Detect and eliminate illicit discharges and illegal connections to the MS4

The HDOT Monitoring Program, as delineated in the current Annual Monitoring Plan (AMP), aims to identify specific pollutant sources, thereby facilitating the elimination of illicit discharges and illegal connections to the MS4, in accordance with the NPDES Permit Part F.1.a.(6) requirements. A crucial aspect of this initiative is the development of an accurate asset inventory related to the MS4. To this end, HDOT will be implementing a comprehensive MS4 Asset Inventory strategy focused on the Kalihi Stream Watershed tentatively in 2026-2027. This strategy will involve field verification of existing HDOT assets, identification of Jurisdiction Transfer Points and illegal connections, as well as corrections to existing data related to pipe attributes and flow directions. The outcomes of these assessments will be documented in future AMRs until a thorough evaluation is completed, ensuring ongoing improvement in MS4 management practices.

7. DISCHARGE SAMPLING AND CHARACTERIZATION ASSESSMENT

MS4 NPDES Permit Part F.1.a(4)

Part F.1.a.(4) Characterize storm water discharges from the MS4

The Discharge Sampling and Assessment strategy for the Kalihi Stream Watershed fulfills the objectives specified in the MS4 NPDES Permit Part F.1.a(4). This strategy encompasses detailed subsections that delineate the protocols for data collection, the analytical methods employed, and quality control and quality assurance procedures tailored for watershed-specific water quality sampling. The outcomes derived from these sampling efforts will be integrated with supplementary data from other MS4 programs, including debris cleaning records, the TMDL program, and landscape service contracts. This comprehensive approach will be documented and evaluated in the AMR, which aims to provide a thorough characterization of stormwater discharges focused on tailored pollutants of concern. This strategic synthesis of data aims to facilitate decision-making and enhance the effectiveness of HDOT's SWMP.

7.1 Data Collection Protocol

During the 2023-2024 Monitoring Year, HDOT commenced water quality sampling from HDOT ROW into Kalihi Watershed to help characterize storm water runoff and assess the potential of implementing enhanced operational or structural BMPs in the watersheds (or other watersheds which drain to the impaired waters of Keehi Lagoon). Sampling within the Keehi Stream Watershed was also used to evaluate the water quality of runoff discharged from the H-1 Freeway in Kalihi Stream Watershed because the same H-1 Freeway viaduct traverses that watershed. Traffic patterns of the H-1 Freeway viaduct are generally the same in the two watersheds, and storm water runoff is anticipated to be substantially similar, so the results from the Keehi Watershed Monitoring Site #1 are representative of runoff from the H-1 Freeway from the lower portion of Kalihi Stream Watershed. The Keehi Watershed monitoring point is located 1 mile from Kalihi Stream Watershed. Other potential evaluated sites in the lower portion of the watershed were deemed inaccessible due to infrastructure, construction activities, and safety concerns. During the 2025 – 2026 Monitoring Year, HDOT will continue to collect storm water quality samples from the identified monitoring sites in the Kalihi Watershed and the Keehi Watershed and consider additional sites.

- Site #1 – Water quality monitoring of MS4 network along the Likelike Highway from Holua Way off Valley View Drive which discharges into a City and County of Honolulu (CCH) owned drainage ditch that continues into Kalihi Stream.

- Site #2 – Water quality monitoring of MS4 network along the H-1 Freeway viaduct along the lower portion of Kalihi Stream Watershed that flows into Keehi Stream but then joins with Kalihi Stream within a mile downstream of the discharge point.

Specific methods that will be used to determine storm events and field sampling for these sampling locations are in Section 5 of the AMP.

See *Figure 1 Kalihi Stream Watershed* for a watershed location map.

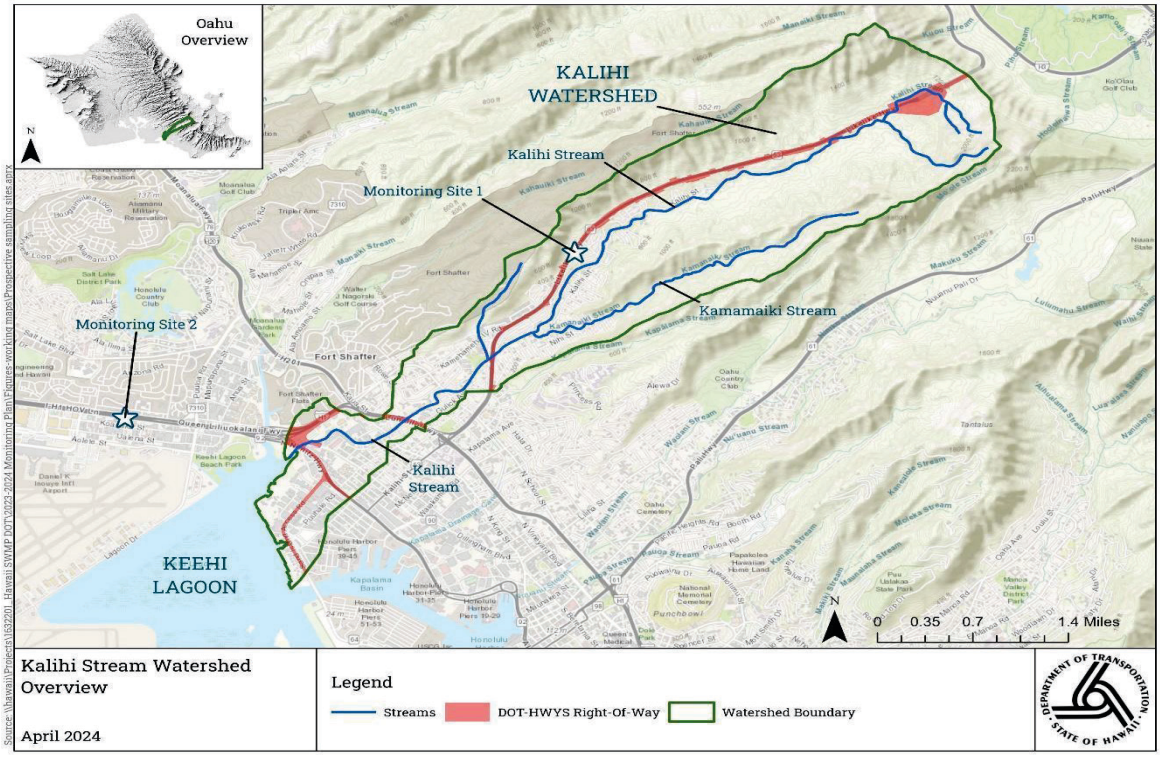

Figure 1. Location of Monitoring Sites in Kalihi Stream Watershed.

7.1.1 Kalihi Stream Watershed Monitoring Site #1

HDOT will continue conducting storm water monitoring along the Likelike from Holua Way off Valley View Dr. Storm water runoff in the area flows off the highway and is collected by a network of grated drain inlets in the shoulders of the road. This drainage area discharges to a 24-inch pipe which outfalls to a CCH owned drainage ditch and continues into Kalihi Stream.

Storm water quality samples will be collected at outfall PID 304465, which is approximately 245 yards upstream of the CCH owned outfall to Kalihi Stream.

Storm water quality samples will be collected from this site using automated samplers, grab samples, or a combination of both.

See *Figure 2* for the location map of Kalihi Stream Watershed Monitoring Site #1.

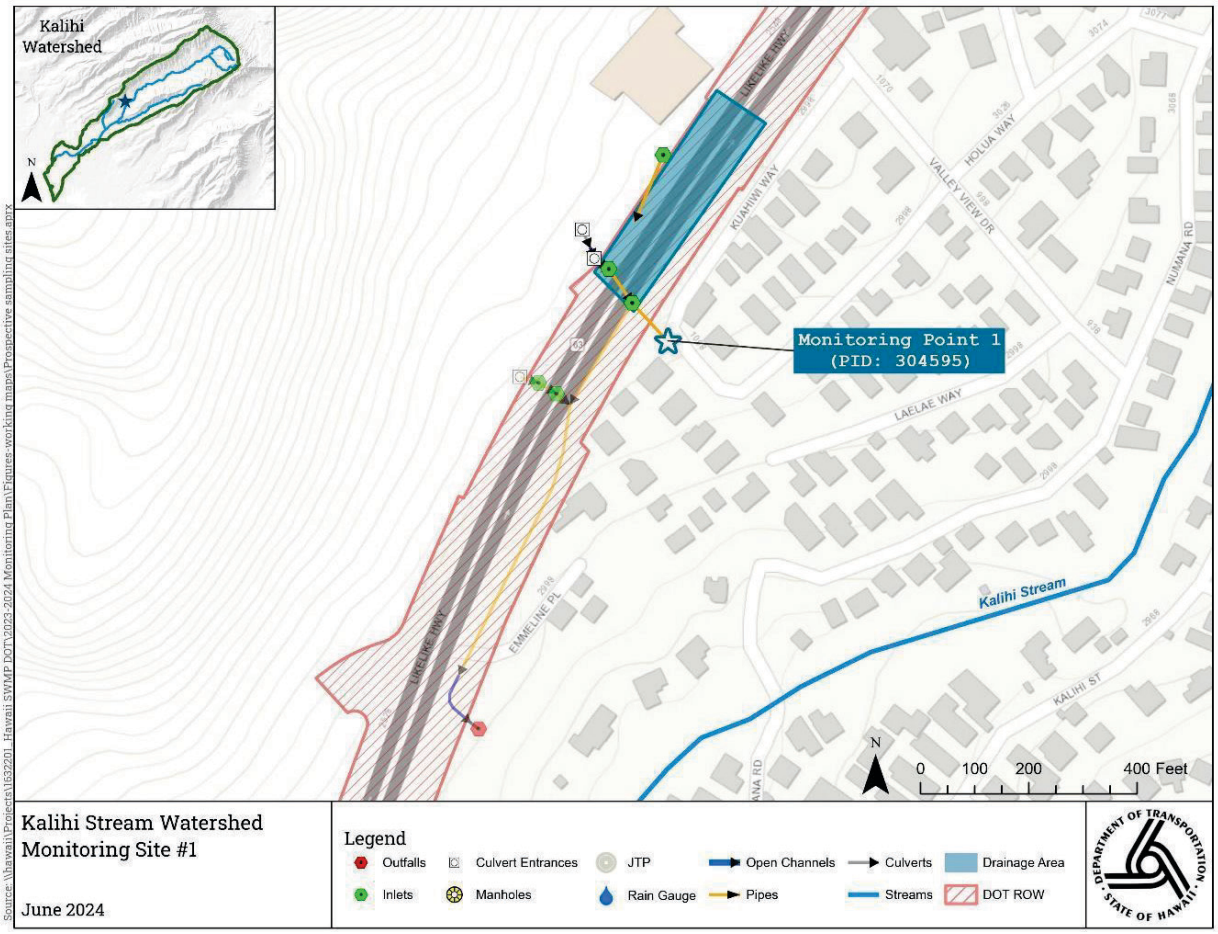

Figure 2. Location of Kalihi Stream Watershed Monitoring Site #1.

7.1.2 Kalihi Stream Watershed Monitoring Site #2

HDOT will continue conducting storm water monitoring along the H-1 Freeway viaduct. Samples collected from the Keehi Watershed Monitoring Site #1, which will be used to evaluate storm water quality for the Kalihi Stream Watershed.

This monitoring site is under a portion of the H-1 Freeway Viaduct along the North Nimitz Highway near Ohohia St, west of the Keehi interchange. Storm water runoff in the area is collected by grated drop inlets, before entering downspouts daylighting at the ground level and entering the drainage network along N Nimitz Highway. This drainage area

discharges to CCH owned box culvert at PID J00522 on Ohohia St before discharging into Keehi Lagoon.

Storm water quality samples will be collected at a downspout, which outlets to an adjacent catch basin with PID 101708.

Storm water quality samples will be collected from this site using automated samplers, grab samples, or a combination of both.

See *Figure 3* for the location map of Kalihi Watershed Monitoring Site #2, which is also Keehi Watershed Monitoring Site #1.

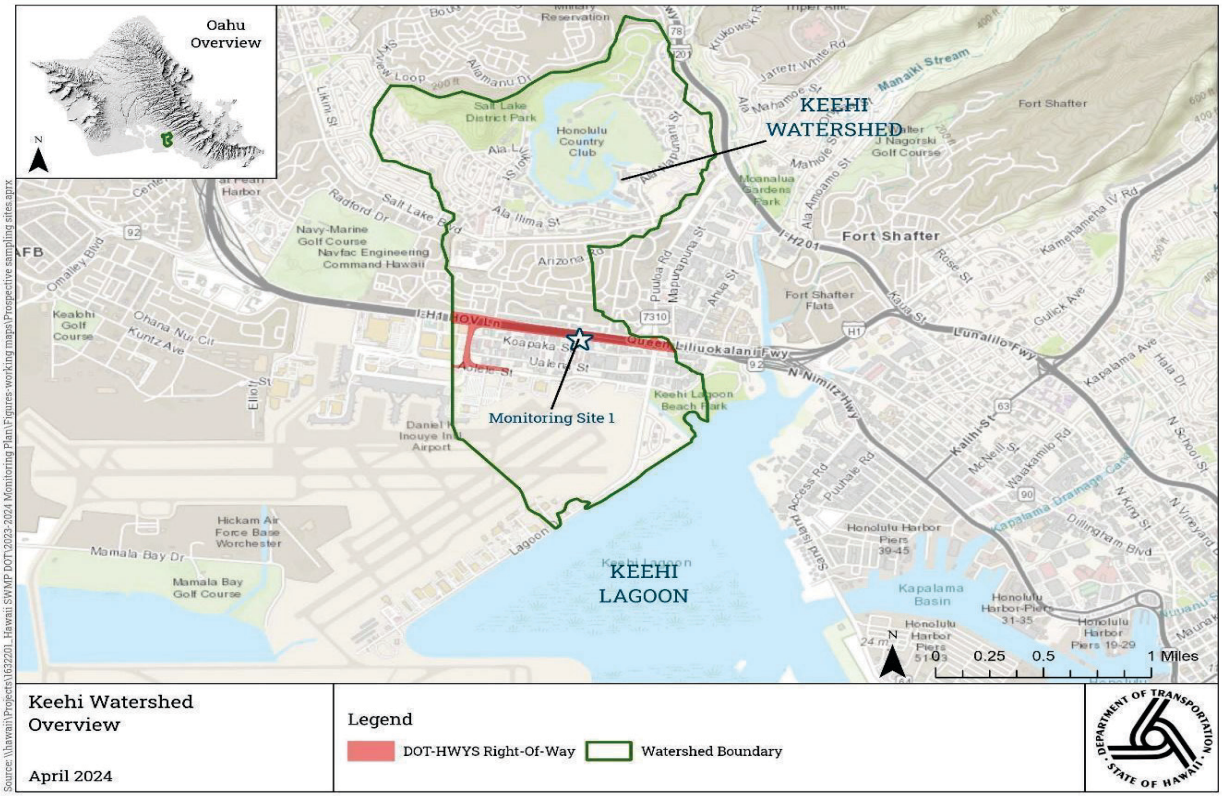

Figure 3. Location of Kalihi Watershed Monitoring Site #2 in Keehi Watershed.

7.2 Analytical Methods and Quality Assurance and Quality Control| MS4 NPDES Permit Part F.1.b.(5) and F.1.b.(6)

Part F.1.b.(5.) Written documentation of the analytical methods to be used

Part F.1.b.(6.) Written documentation of the Quality Assurance/Quality Control procedures to be used

As detailed in Section 6 of the 2025-2026 AMP, storm water samples collected will be analyzed for TN, TKN, TP and TSS by a State-approved laboratory.

8. WATERSHED ASSESSMENT

MS4 NPDES Permit Part F.1.a(5) and F.1.a.(7)

Part F.1.a.(5) Identify sources of specific pollutants

Part F.1.a.(7) Assess the water quality issues in watershed resulting from storm water discharges to receiving waters

The Watershed Assessment strategy for the Kalihi Stream Watershed will address the objectives outlined in the MS4 NPDES Permit Part F.1.a(5) and Part F.1.a(7). This approach involves an evaluation of HDOT MS4 impacts on water quality by analyzing and synthesizing external reports that detail water quality issues within the Kalihi Stream watershed and Keehi Lagoon. Additionally, the strategy may incorporate modeling of pollutant loading to enhance understanding of the HDOT MS4 contributions to these issues. Key questions include the correlation between pollutants of concern discharging from HDOT's ROW and those responsible for impairments in the waterbody, as well as identification of pollutant sources within and beyond HDOT's jurisdiction. This future analysis will provide insights into water quality trends and beneficial use outcomes for Keehi Lagoon.

9. TACTICS AND METRICS

MS4 NPDES Permit Part F.1.a(2)

F.1.a.(2) Measures the effectiveness of Permittee's storm water management program

In future years, HDOT will adopt a final Tactics and Metrics strategy for the Kalihi Stream Watershed, which aims to mitigate the impact of the MS4 on Keehi Lagoon. This strategy synthesizes previous findings from the Monitoring Program to delineate the most effective BMPs for reducing specific pollutants and their sources within the watershed. Key BMPs may include enhanced debris control frequencies, revised outfall inspection protocols, targeted public education campaigns, improved erosion control measures, and the integration of retrofitted BMPs. Implementing this comprehensive approach is intended to ensure long-term permit compliance and beneficial use of Keehi Lagoon.

10. CONCLUSION

The watershed-specific monitoring plan for the Kalihi Stream Watershed represents a strategic framework aimed at ensuring compliance with the MS4 NPDES Permit requirements. By systematically addressing the monitoring objectives outlined in the permit, the plan enhances the capacity of HDOT to assess and mitigate the impacts of stormwater discharges on local waterways, particularly Keehi Lagoon. Through sampling and assessment protocols, including the characterization of stormwater discharges and identification of pollutant sources, HDOT aims to facilitate compliance reporting and guide the implementation of effective BMPs tailored to the Kalihi Stream Watershed.

11. REFERENCES

City and County of Honolulu, Department of Environmental Services. 2007. Annual Stream Water Quality Monitoring Report.

State of Hawaii Department of Transportation Highways, Oahu District. 2022. Oahu Storm Water Management Program Plan. URL: https://www.stormwater hawaii.com/hawaii-storm-water-program-plan/.

State of Hawaii Department of Transportation Highways, Oahu District. 2016. Trash Reduction Plan.

State of Hawaii Department of Transportation Highways, Oahu District. 2021. Program Effectiveness Strategy.

State of Hawaii Department of Transportation Highways, Oahu District. 2021. Storm Water Pollution Control Plans. URL: http://www.stormwaterhawaii. com/ resources/plans/.

State of Hawaii Department of Transportation, Highways, Oahu District. 2020. National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit No. HI S000001, effective September 1, 2020.

State of Hawaii Department of Health. 2014. Water Quality Standards Map of the Island of Oahu. URL: https://health.hawaii.gov/cwb/files/2013/05/WQS_20140708_Oahu.pdf

State of Hawaii Department of Health. 2021. Hawaii Administrative Rules, Chapter 11-54. State of Hawaii Department of Health, Clean Water Branch. 2020. Data Acceptance Criteria.

State of Hawaii Department of Health, Clean Water Branch. 2024. 2024 State of Hawaii Water Quality Monitoring and Assessment Report: Integrated Report to the U.S. Environmental Protection Agency and the U.S. Congress Pursuant to §303(d) and §305(b), Clean Water Act (P.L. 97-117).

United States Environmental Protection Agency. 1990. Clean Water Act (CWA) Section 402(p)(3)(B).

United States Environmental Protection Agency. 2025. How's My Waterway? URL: https://mywaterway.epa.gov/community/2685%20N%20Nimitz%20Hwy,%20Honolulu,%20HI%2096819/overview.

APPENDIX B.4

Kaelepulu Stream Watershed Specific Monitoring Plan

HAWAII DEPARTMENT OF TRANSPORTATION
OAHU DISTRICT

STORM WATER MANAGEMENT PROGRAM
KAELEPULU STREAM WATERSHED SPECIFIC MONITORING PLAN

MS4 NPDES Permit No. HI S000001

Hawaii Department of Transportation
Oahu District
727 Kakoi Street, Honolulu, Hawaii 96819

Version: Final
June 2025

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LIST OF ACRONYMS AND ABBREVIATIONS

AMR	Annual Monitoring Report
AMP	Annual Monitoring Plan
BMP	Best Management Practices
DOH	Hawaii Department of Health
HDOT	Hawaii Department of Transportation
I&M	Implementation and Monitoring
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
No.	Number
PID	Point Identification Number
ROW	Rights-of-Way
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
WLA	Waste Load Allocation

1. INTRODUCTION

The purpose of this watershed-specific monitoring plan for the Kaelepulu Stream Watershed is to ensure watershed level compliance with the objectives outlined in the requirements of the municipal separate storm sewer system (MS4) National Pollutant Discharge Elimination System (NPDES) Permit No. HI S000001 effective September 1, 2020 (hereinafter MS4 NPDES Permit), specifically Part F.1.a.

Kaelepulu Stream Watershed was selected for monitoring based on its ranking in a Watershed Prioritization created by the Hawaii Department of Transportation (HDOT). The priority ranking applies weighted values for designations of surface water quality impairments, percent area of HDOT Right-of-Way (ROW) within the watershed, industrial/commercial (IC) parcel density, and annual average daily traffic within the ROW.

The Kaelepulu Watershed is located on the windward slopes of the Koolau Mountain range and is bordered by the Kawainui Stream Watershed to the west and the Waimanalo Stream Watershed to the east. Predominantly residential with minor areas of small businesses and agricultural land, the watershed is intersected by key transportation routes, namely Kailua Road and Kalanianaole Highway. The latter, running approximately one mile southeast of its junction with Kailua Road, serves as a conduit for stormwater management through its curb and median drainage systems that direct runoff into storm drains, ultimately discharging into Kaelepulu Stream and its associated pond. Historically a freshwater fishpond and marsh, Kaelepulu Pond has sedimentation and pollution stemming from surrounding urban development, which threatens ecosystem health.

The Kaelepulu Stream discharges into Kailua Bay at Kailua Beach and is classified as Class A receiving water under Hawaii Administrative Rules. Notably, it is listed as impaired for several pollutants, including Enterococci, Total Nitrogen (TN), Nitrate-Nitrite, Total Phosphorus (TP), Turbidity, and Chlorophyll A, as per the 2018 Clean Water Act Section 303(d) List of Impaired Waters on Oahu. Monitoring efforts by the City and County of Honolulu (CCH) and the Department of Health (DOH) have focused on this watershed, with historical data from HDOT indicating similar impairments between 2007 and 2010. In 2019, the DOH initiated a comprehensive water quality assessment, collecting samples for various indicators. More recently, HDOT's monitoring in 2021-2023 indicated a minor influence on the contributing factors to these impairments. A comparative analysis of recent HDOT sampling and the CCH study is detailed in Table 1.

Table 1. Water Quality Sample Analysis Results for HDOT and CCH Sampling in Kaelepulu Watershed.

DATA SOURCE	TSS (mg/L)	NITRATE-NITRITE AS N (mg/L)	TP (mg/L)	AMMONIA (mg/L)
HDOT 2021 – 2023 Reporting Period	5.55	0.062	0.023	0.017
CCH 2019 Kaelepulu Modeling Report	31.1	0.195	0.22	0.056

TSS = Total Suspended Solids; TP = Total Phosphorus

2. OBJECTIVES FOR WATERSHED

MS4 NPDES Permit Part F.1.b.(1)

Part F.1.b(1) 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.

This plan provides a comprehensive overview of the applied strategies tailored to the unique characteristics of the watershed, aimed at effectively meeting the permit's objectives. The following sections will detail these strategies, demonstrating HDOT's ongoing regulatory compliance. Table 1 demonstrates the alignment of the plan's narrative sections with the objectives and requirements of the monitoring program, MS4 NPDES Permit Parts F.1.a.(1) – F.1.a.(7).

Table 2. HDOT NPDES Permit No. HI S000001, Part F.1. Annual Monitoring Program Objectives and Permit Requirements.

OBJECTIVE	SECTION REFERENCE
F.1. Annual Monitoring Plan	
F.1.a. Submit the Annual Monitoring Plan by June 1st of each year for review and acceptance. The Annual Monitoring Plan shall be implemented over the coming fiscal year.	
F.1.a.(1) Assess compliance with permit (including TMDL Industrial and Commercial (I&M) Plans and demonstrating consistency with Waste Load Allocation (WLAs))	Section 3.0
F.1.a.(2) Measures the effectiveness of Permittee's storm water management program	Section 4.0
F.1.a.(3) Assess the overall health of the receiving waters based on the chemical, physical, and biological impacts resulting from the storm water discharges and an evaluation of the long-term trends	Section 5.0
F.1.a.(4) Characterize storm water discharges from the MS4	Sections 3.0 and 7.0
F.1.a.(5) Identify sources of specific pollutants	Sections 3.0 and 5.0
F.1.a.(6) Detect and eliminate illicit discharges and illegal connections to the MS4	Section 6.0
F.1.a.(7) Assess the water quality issues in the watershed resulting from storm water discharges to receiving waters.	Section 4.0

3. COMPLIANCE ASSESSMENT

MS4 NPDES Permit Part F.1.a(1) and F.1.b.(2)

Part F.1.a.(1) Assess compliance with this permit (including TMDL I&M Plans and demonstrating consistency with WLAs).

Part F.1.b(2) For each activity, a description of how the results will be used to determine compliance with this permit.

A specific compliance assessment strategy for Kaelepulu Stream Watershed will be performed to meet the required objectives of the MS4 NPDES Permit Part F.1.a(1). This strategy is designed to provide an overview of the current compliance status within the watershed. A comprehensive review of compliance activities within the watershed is conducted to determine the status of compliance for each part of the MS4 Permit. Scheduled to be completed in 2025-2026, the outcomes of the assessment will be presented in a table outlining permit requirements alongside corresponding indicators of compliance within the correlating Annual Monitoring Report (AMR).

3.1 Sampling Informs Discharge Characterization and Watershed Assessment

To meet the requirements outlined in Part F.1.b.(2) of the permit, the following describes how sampling efforts will support compliance with Discharge Characterization and Watershed Assessment strategies for the Kaelepulu Stream Watershed. Comprehensive water quality sampling and analysis throughout the watershed will enable HDOT to effectively characterize stormwater discharges from the MS4. This process will involve identifying the presence and concentrations of specific pollutants, analyzing their discharge patterns in relation to rainfall and flow rates, and evaluating spatial variations among sampling locations. The findings will be instrumental in assessing the water quality challenges within the watershed, particularly in relation to stormwater discharges impacting Kailua Bay and the contributions from HDOT's MS4.

4. EFFECTIVENESS ASSESSMENT

MS4 NPDES Permit Part F.1.a.(2)

Part. F.1.a.(2) Measure the effectiveness of the Permittee's storm water management program.

A specific effectiveness assessment strategy for Kaelepulu Stream Watershed will be performed to meet the required objectives of the MS4 NPDES Permit Part F.1.a(2). This strategy is analogous to the Annual Report subsection, "Best Management Practice (BMP) Assessment Metrics," and will provide a three-year average of operational BMP outcomes within the watershed. Scheduled to be completed in 2025-2026, the outcomes will be presented in the correlating AMR in a tabular format with corresponding permit requirements, program section, assigned outcome levels, and outcomes as watershed limited assessment parameters.

5. RECEIVING WATER ASSESSMENT

MS4 NPDES Permit Part F.1.a.(3)

Part F.1.a.(3) Assess the overall health of the receiving waters based on the chemical, physical, and biological impacts resulting from storm water discharges and an evaluation of the long-term trends.

A receiving water assessment strategy for the Kaelepulu Stream Watershed will be implemented to fulfill the objectives outlined in the MS4 NPDES Permit Part F.1.a(3). This strategy aims to evaluate the long-term health of Kailua Bay by collecting data from reputable resources, such as the US Environmental Protection Agency, DOH, US Geological Services, and the City and County of Honolulu. Key factors influencing the watershed's impact on receiving water will be examined, such as area size, average discharge calculations, land use types, traffic densities, water quality impairments, and beneficial uses. This analysis will provide insights into water quality trends and beneficial use outcomes for Kailua Bay and will be incorporated into the 2025-2026 AMR.

6. MS4 ASSET INVENTORY

MS4 NPDES Permit Part F.1.a(6)

Part F.1.a.(6) Detect and eliminate illicit discharges and illegal connections to the MS4

The HDOT Monitoring Program, as delineated in the current Annual Monitoring Plan (AMP), aims to identify specific pollutant sources, thereby facilitating the elimination of illicit discharges and illegal connections to the MS4, in accordance with the NPDES Permit Part F.1.a.(6) requirements. A crucial aspect of this initiative is the development of an accurate asset inventory related to the MS4. To this end, HDOT completed a comprehensive MS4 Asset Inventory strategy focused on the Kaelepulu Stream Watershed in the 2023-2024 monitoring year. This strategy involved field verification of existing HDOT assets, identification of Jurisdiction Transfer Points and illegal connections, as well as corrections to existing data related to pipe attributes and flow directions. The outcomes of these assessments will be documented in the 2025-2026 AMR.

7. DISCHARGE SAMPLING AND CHARACTERIZATION ASSESSMENT

MS4 NPDES Permit Part F.1.a.(4)

Part F.1.a.(4) Characterize storm water discharges from the MS4

The Discharge Sampling and Assessment strategy for the Kaelepulu Stream Watershed fulfills the objectives specified in the MS4 NPDES Permit Part F.1.a(4). This strategy encompasses detailed subsections that delineate the protocols for data collection, the analytical methods employed, and quality control and quality assurance procedures tailored for watershed-specific water quality sampling. The outcomes derived from these sampling efforts will be integrated with supplementary data from other MS4 programs, including debris cleaning records, the Total Maximum Daily Load program, and landscape service contracts. This comprehensive approach will be documented and evaluated in the AMR, which aims to provide a thorough characterization of stormwater discharges focused on tailored pollutants of concern. This strategic synthesis of data aims to facilitate decision-making and enhance the effectiveness of HDOT's Storm Water Management Program.

7.1 Data Collection Protocol

In 2020, HDOT initiated a dialogue with DOH regarding the Kaelepulu Watershed water quality assessment project, and subsequently shared storm water quality and rainfall data that was collected by HDOT in the watershed. During Monitoring Years 2021-2023, HDOT

resumed water quality sampling in the watershed to help characterize storm water runoff from the HDOT MS4, and assess the potential for implementing enhanced operational or structural BMPs along Kalanianaole Highway. HDOT collected storm water quality samples from two monitoring sites in the Kaelepulu Stream Watershed.

- Site #1 – Water quality monitoring of MS4 network along Kalanianaole Highway which connects to the City and County of Honolulu's (CCH) MS4 and then discharges to Kaelepulu Stream approximately 0.5-mile upstream of Kaelepulu Pond.
- Site #2 – Water quality monitoring of MS4 network along Kalanianaole Highway which discharges to an intermittent portion of Kaelepulu Stream.

See Figure 1 for the location figure of the Kaelepulu Stream Watershed Monitoring Sites.

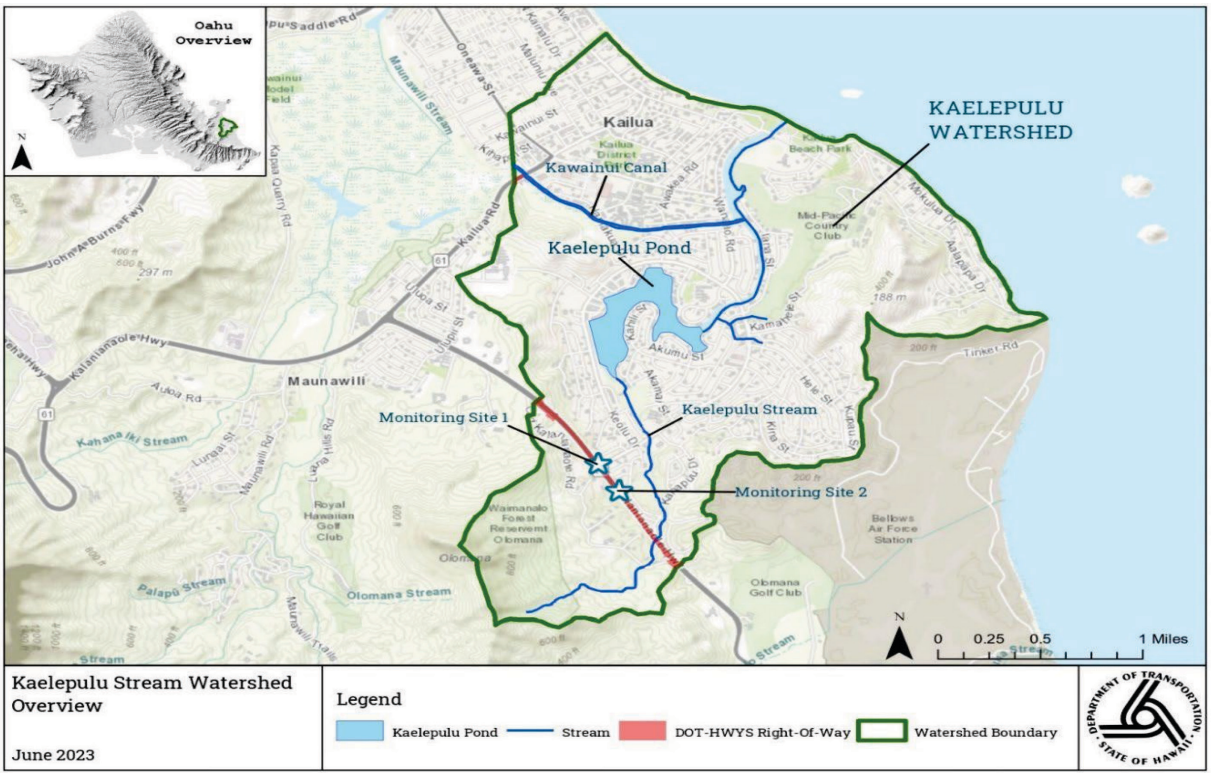

Figure 1. Location of Monitoring Sites in Kaelepulu Watershed.

7.1.1 Kaelepulu Stream Watershed Monitoring Site #1

During the Monitoring Years 2021-2023, HDOT conducted storm water monitoring on a portion of Kalanianaole Highway which lies immediately west of the intersection with Keolu Drive. The drainage alignment is approximately 250 yards long and has an area just under two acres. Storm water runoff in the area flows off the highway and is collected by a network of grated drain inlets in a concrete median and the ocean side shoulder of the

northbound road. This drainage area discharges to a 30-inch pipe which connects to the CCH MS4 at manhole Point Identification Number (PID) 201749. Discharge from the HDOT ROW is then mixed with runoff from the residential neighborhood along Keolu Drive, which flows into a perennial portion of Kaelepulu Stream, approximately 0.5 miles upstream of Kaelepulu Pond.

Storm water quality samples were collected from this site using automated samplers, grab samples, or a combination of both.

See Figure 2 for the location map of the Kaelepulu Stream Watershed Monitoring Site #1.

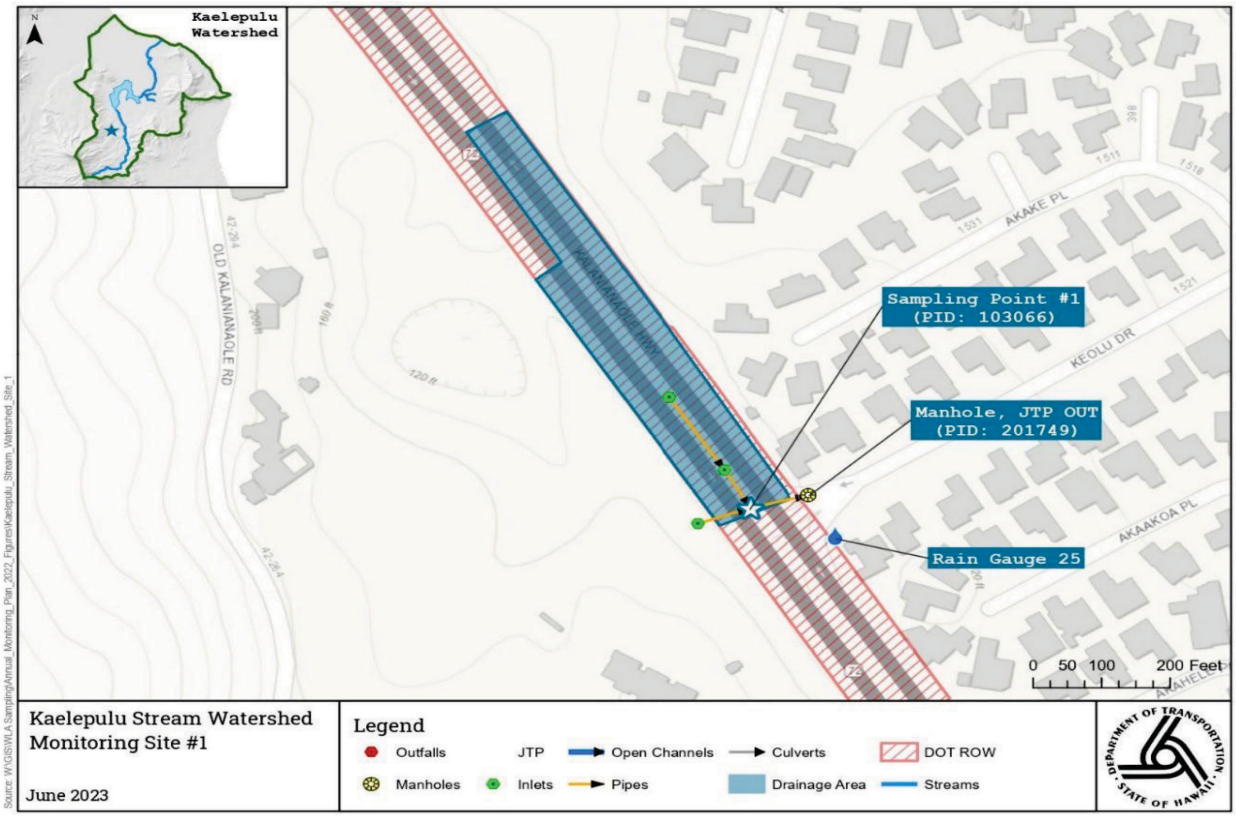

Figure 2. Location of Kaelepulu Stream Monitoring Site 1

7.1.2 Kaelepulu Stream Watershed Monitoring Site #2

During the Monitoring Years 2021-2023, HDOT conducted storm water monitoring on a portion of Kalanianaole Highway which lies south of Keolu Drive. The drainage area is approximately 500 yards long and has an area of approximately one-and-a-half acres. Storm water runoff in the drainage area sheet flows off the highway and is collected by a series of grated drain inlets on the shoulder. This drainage area discharges to a channelized culvert via an open channel at outfall PID 304739. The channelized culvert drains to a grassed area that connects to an intermittent portion of Kaelepulu Stream.

Storm water quality samples were collected from this site using automated samplers, grab samples, or a combination of both.

See Figure 3 for the location map of the Kaelepulu Stream Watershed Monitoring Site #2.

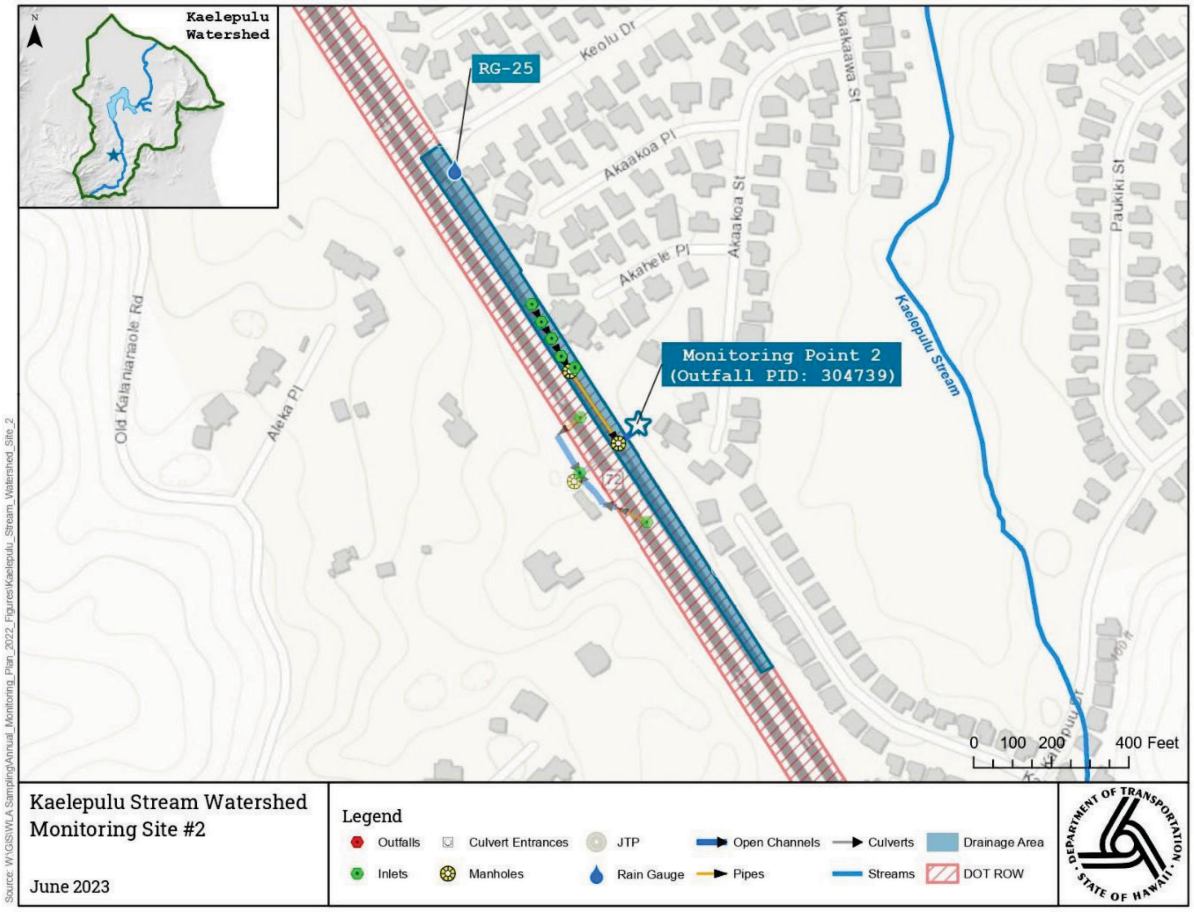

Figure 3. Location of Kaelepulu Stream Monitoring Site 2

7.2 Analytical Methods and Quality Assurance and Quality Control | MS4 NPDES Permit Part F.1.b.(5) and F.1.b.(6)

Part F.1.b.(5.) Written documentation of the analytical methods to be used

Part F.1.b.(6.) Written documentation of the Quality Assurance/Quality Control procedures to be used

As detailed in Section 6 of the 2021-2022 and 2022-2023 AMPs, storm water samples collected were analyzed for TN, Total Kjedhal Nitrogen, TP, Total Suspended Solids (TSS), and Ammonia by a State-approved laboratory.

8. WATERSHED ASSESSMENT

MS4 NPDES Permit Part F.1.a.(5) and F.1.a.(7)

Part F.1.a.(5) Identify sources of specific pollutants

Part F.1.a.(7) Assess the water quality issues in watershed resulting from storm water discharges to receiving waters

The Watershed Assessment strategy for the Kaelepulu Stream Watershed will address the objectives outlined in the MS4 NPDES Permit Part F.1.a(5) and Part F.1.a(7). This approach involves an evaluation of HDOT MS4 impacts on water quality by analyzing and synthesizing external reports that detail water quality issues within the Kaelepulu Stream watershed and Kailua Bay. Additionally, the strategy may incorporate modeling of pollutant loading to enhance understanding of the HDOT MS4 contributions to these issues. Key questions include the correlation between pollutants of concern discharging from HDOT's ROW and those responsible for impairments in the waterbody, as well as identification of pollutant sources within and beyond HDOT's jurisdiction. This analysis will provide insights into water quality trends and beneficial use outcomes for Kailua Bay.

9. TACTICS AND METRICS

MS4 NPDES Permit Part F.1.a.(2)

F.1.a.(2) Measures the effectiveness of Permittee's storm water management program

Tentatively, in 2026-2027, HDOT will adopt a final Tactics and Metrics strategy for the Kaelepulu Stream Watershed, which aims to mitigate the impact of the MS4 to Kailua Bay. This strategy synthesizes previous findings from the Monitoring Program to delineate the most effective BMPs for reducing specific pollutants and their sources within the

watershed. Key BMPs may include enhanced debris control frequencies, revised outfall inspection protocols, targeted public education campaigns, improved erosion control measures, and the integration of retrofitted BMPs. Implementing this comprehensive approach is intended to ensure long-term permit compliance and beneficial use of Kailua Bay.

10. CONCLUSION

The watershed-specific monitoring plan for the Kaelepulu Stream Watershed represents a strategic framework aimed at ensuring compliance with the MS4 NPDES Permit requirements. By addressing the monitoring objectives outlined in the permit, the plan enhances the capacity of HDOT to assess and mitigate the impacts of stormwater discharges on local waterways, particularly Kailua Bay. Through sampling and assessment protocols, including the characterization of stormwater discharges and identification of pollutant sources, HDOT aims to facilitate compliance reporting and guide the implementation of effective BMPs tailored to the Kaelepulu Stream Watershed.

11. REFERENCES

City and County of Honolulu, Department of Environmental Services. 2007. Annual Stream Water Quality Monitoring Report.

State of Hawaii Department of Transportation Highways, Oahu District. 2022. Oahu Storm Water Management Program Plan. URL: https://www.stormwater hawaii.com/hawaii-storm-water-program-plan/.

State of Hawaii Department of Transportation Highways, Oahu District. 2016. Trash Reduction Plan.

State of Hawaii Department of Transportation Highways, Oahu District. 2021. Program Effectiveness Strategy.

State of Hawaii Department of Transportation Highways, Oahu District. 2021. Storm Water Pollution Control Plans. URL: http://www.stormwaterhawaii. com/ resources/plans/.

State of Hawaii Department of Transportation, Highways, Oahu District. 2020. National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit No. HI S000001, effective September 1, 2020.

State of Hawaii Department of Health. 2014. Water Quality Standards Map of the Island of Oahu. URL: https://health.hawaii.gov/cwb/files/2013/05/WQS_20140708_Oahu.pdf

State of Hawaii Department of Health. 2021. Hawaii Administrative Rules, Chapter 11-54. State of Hawaii Department of Health, Clean Water Branch. 2020. Data Acceptance Criteria.

State of Hawaii Department of Health, Clean Water Branch. 2024. 2024 State of Hawaii Water Quality Monitoring and Assessment Report: Integrated Report to the U.S. Environmental Protection Agency and the U.S. Congress Pursuant to §303(d) and §305(b), Clean Water Act (P.L. 97-117).

United States Environmental Protection Agency. 1990. Clean Water Act (CWA) Section 402(p)(3)(B).

United States Environmental Protection Agency. 2025. How's My Waterway? URL: https://mywaterway.epa.gov/community/2685%20N%20Nimitz%20Hwy,%20Honolulu,%20HI%2096819/overview.