

Quality Assurance Program Plan for the California Coastal Beach Safety Monitoring Program

California State Water Resources Control Board

November 9, 2023

Version 2

Preface

This Quality Assurance Program Plan (Program Plan) establishes quality assurance (QA) and quality control (QC) policies and procedures for California's Coastal Beach Safety Monitoring Program (Beach Program). The content of this Program Plan is in conformance with the State Water Resources Control Board's (State Water Board) Quality Management Plan (QMP) and fulfills the United States Environmental Protection Agency's (U.S. EPA) requirement as set in 40 C.F.R. § 31.45, for programs receiving federal grant monies for water quality monitoring under the Federal Beaches Environmental Assessment and Coastal Health Act (BEACH Act) grant.

Contents

Signature Page	1
Approval.....	1
Preface	2
Contents.....	3
Abbreviations and Acronyms	5
Distribution List	7
Executive Summary	11
1. Program Management	11
1.1 Program Roles and Responsibilities	11
1.2 Program Description	20
1.3 Program Data Quality Objectives.....	27
1.4 SWAMP Comparability	29
1.5 Data Quality Indicators	30
1.6 Measurement Quality Objectives	33
1.7 Special Training and Certification	35
1.8 Program Documentation and Records.....	35
1.9 Data Management	38
2. Data Generation and Acquisition	41
2.1 Sampling Design.....	41
2.2 Sampling Methods	43
2.3 Sample Handling and Custody	44
2.4 Constraints.....	46
2.5 Analytical Methods.....	48
2.6 Quality Control and Performance Criteria	49
3. Data Verification, Validation, Completeness and Assessment.....	55
3.1 Data Verification	56
3.2 Data Validation	58
3.3 Corrective Action	59
3.5 Assessment	61

Appendix A. Related Regulations to the Management of the Beach Program	63
Table 1. Assembly and Senate Bills	63
Table 2. Health and Safety Code	63
Table 3. CCR Title 17	64
Appendix B. Designated Beaches, Stations, & Locations within each County/City associated with the Beach Program.....	66
Appendix C. Data Quality Assurance Goals.....	96
1. Introduction	98
2. Data Quality Assurance Goals	99
3. Quality Assurance Program Plan Approach	100
4. Quality Assurance Project Plan Approach	101
5. Annual Review	102
Appendix D. Beach Program Business Rules	103
Qualifier Lookup List	109
QACode Lookup List.....	110
Appendix E. Beach Program Chain-of-Custody Form.....	112
Appendix F. Beach Program Corrective Action Report Template	114
Works Cited (U.S. EPA, 2006)	116

Abbreviations and Acronyms

Abbreviation/Acronym	Meaning
AB	Assembly Bill
ANOVA	Analysis of Variance
ATP	Alternative Test Procedure
BEACH Act	Beaches Environmental Assessment and Coastal Health Act
Beach Program	California's Coastal Beach Safety Monitoring Program
BEACON	Beach Advisory and Closing Online Notification
Cal. Code of Regs.	California Code of Regulation
CDX	Central Data Exchange
CEDEN	California Environmental Data Exchange Network
CEJST	Climate and Environmental Justice Screening Tool
C.F.R.	Code of Federal Regulations
cfu	Colony Forming Units
CWA	Clean Water Act
DAS	Division of Administrative Services
ddPCR	Digital Droplet Polymerase Chain Reaction
DFA	Division of Financial Assistance
DIT	Division of Information Technology
DWQ	Division of Water Quality
E. coli	Escherichia coli
East Bay	East Bay Regional Park District
ELAP	Environmental Laboratory Accreditation Program
F	Variance Ratio
Humboldt	Humboldt County Department of Health and Human Services, Public Health
L ₁ /L ₂	Logarithm
Long Beach	Long Beach Health and Human Services
Los Angeles	Los Angeles County Department of Public Health
Marin	County of Marin Environmental Health Services Division
MDL	Method Detection Limit
Mendocino	County of Mendocino Public Health Division of Environmental Health
mL	Milliliters
Monitoring Council	California Water Quality Monitoring Council
Monterey	Monterey County Health Department

MPN	Most Probable Number
MQO	Measurement Quality Objective
Ocean Plan	Water Quality Control Plan for Ocean Waters of California
Orange	Orange County Health Care Agency
PD	Project Director
PM	Project Manager
PRAWN	Program Tracking, Beach Advisory, Water Quality Standard, Nutrient
Program Plan	Quality Assurance Program Plan
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QMP	Quality Management Plan
RL	Reporting Limit
R _{log}	Range of Logarithm
RPD	Relative Percent Difference
San Diego	San Diego County Department of Environmental Health and Quality
San Francisco	San Francisco Department of Public Health
San Luis Obispo	County of San Luis Obispo Health Agency
San Mateo	San Mateo County Environmental Health Services
Santa Barbara	Santa Barbara County Public Health
Santa Cruz	County of Santa Cruz Health Services Agency, Environmental Health
Sonoma	Sonoma County Health Services
SOP	Standard Operating Procedures
State Water Board	State Water Resources Control Board
SWAMP	Surface Water Ambient Monitoring Program
U.S. EPA	United States Environmental Protection Agency
Ventura	County of Ventura Environmental Health Division
WQX	Water Quality Exchange

Executive Summary

The Beach Program is a comprehensive, statewide bacteriological water quality monitoring and public notification program established to inform the public of water quality conditions at coastal beaches in California for the protection of public health while recreating. The Beach Program is administered by the State Water Board and functions as a collaboration with the local environmental health departments or agencies (local agencies) that conduct bacteriological water quality monitoring at public coastal beaches of California and provide public notifications and signage when bacteria thresholds are exceeded and may cause illness with exposure. Successful implementation of the Beach Program requires coordination between implementing agencies to standardize the collection, storage, accessibility, and interpretation of beach monitoring data.

This Program Plan establishes QA and QC policies and procedures for the Beach Program. In order to effectively address and successfully implement QA, QC, and data management activities for the Beach Program, the State Water Board is developing this Program Plan in multiple phases, as described below:

- Phase 1: By December 30, 2022, the State Water Board will document existing quality assurance, quality control, and data management procedures; and establish initial acceptance criteria for the Beach Program.
- Phase 2: By December 29, 2023, the State Water Board plans to refine acceptance criteria if needed, establish quality control procedures, and establish initial data verification and validation procedures.
- Phase 3: By December 31, 2024, the State Water Board plans to refine quality control activities and data verification and validation procedures if needed; and evaluate the data management strategy.

This is the second version of the Program Plan, which includes components of Phase 2 described above.

1. Program Management

1.1 Program Roles and Responsibilities

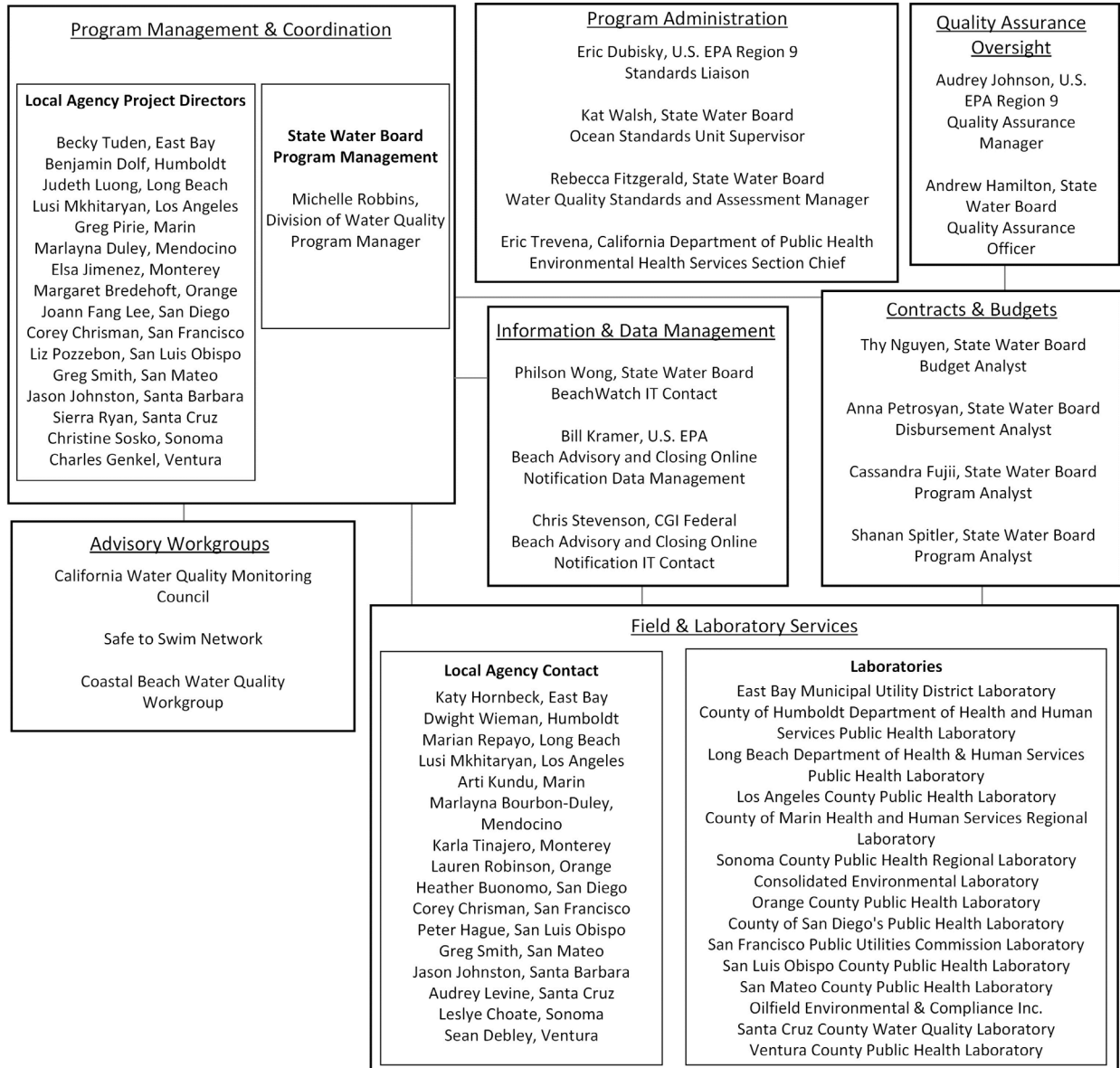
The Beach Program is organized into four major programmatic units:

1. Program Administration
2. Program Management and Coordination
3. Field and Laboratory Services
4. Information and Data Management

The programmatic units are visualized in Figure 1, below. Work carried out and completed under each of the programmatic units is a collaborative effort between the

State Water Board and local agencies. The following sections describe the programmatic units and the roles and responsibilities of the associated individuals in each programmatic unit. The [Distribution List](#) includes the list of individuals that the Program Plan is distributed to.

Figure 1. Beach Program Organization



1.1.1 Program Administration

Name	Agency	Title
Eric Dubinsky	U.S. EPA, Region 9	Standards Liaison
Kat Walsh	State Water Board, Division of Water Quality (DWQ)	Ocean Standards Unit Supervisor
Rebecca Fitzgerald	State Water Board, DWQ	Environmental Program Manager, Standards and Assessment Section
Eric Trevena	California Department of Public Health (CDPH)	Environmental Health Services Section Chief

In coordination with the U.S. EPA Region 9, the State Water Board's DWQ is tasked with the management and administration of the Beach Program. Responsibilities at this level include:

- Directing program implementation;
- Approving changes to monitoring protocols, site locations, monitoring frequencies, data management strategies, program-wide QA policies and protocols;
- Facilitating coordination efforts within the State Water Board, other state, and federal agencies;
- Reporting out to the U.S. EPA; and
- Approving funding allocations for program management and oversight and sub-awards to local agencies.

The California Department of Public Health (CDPH) is responsible for establishing and revising the bacteria standards used by the Beach Program, as per [Senate Bill 482](#). The State Water Board's DWQ coordinates with CDPH on the administration of this program.

1.1.2 Quality Assurance Oversight

Name	Agency	Title
Audrey Johnson	U.S. EPA, Region 9	Quality Assurance Manager
Andrew Hamilton	State Water Board, Office of Information Management and Analysis	Quality Assurance Officer

Oversight of program QA activities includes reviewing and approving the Beach Program's Program Plan to ensure conformance to requirements prescribed under

Directive No. [CIO 2105-P-01-0](#) for programs receiving federal and state grant monies for water quality monitoring under the Clean Water Act (CWA), as per the requirements set out in [40 C.F.R. § 31.45](#).

The State Water Board Quality Assurance Officer is responsible for ensuring the program follows the QA policies and principles outlined in the [QMP](#), as well as reviewing and approving Quality Assurance Project Plans (QAPPs) for the Beach Program projects. The Quality Assurance Officer also works with DWQ to design and implement the Beach Program's QA standards to ensure that all activities and planning documents are consistent.

1.1.3 Program Management and Coordination

Beach Program management is responsible for the overall direction of the program. Duties include:

- Directing and overseeing programmatic strategic planning;
- Overseeing the review and revision of mission planning documents;
- Ensuring programmatic compliance with state and federal regulations alongside the Program Directors (refer to [Project Directors](#));
- Implementing and managing operational plans;
- Proposing and approving the budget and budget change proposals alongside the Budget Analyst and Program Analyst (refer to [Contracts and Budgets Staff](#)); and
- Reporting to U.S. EPA and State Water Board.

Program Manager & Technical Contact

Name	Agency	Title
Michelle Robbins	State Water Board, DWQ	Program Manager (PM)

The PM and Technical Contact are responsible for the oversight and coordination of the Beach Program, such as managing the grant agreements with local agencies, as well as the technical aspects of the Beach Program, such as establishing QA requirements. The Technical Contact assists the PM in their responsibilities as needed. Additionally, they are the primary contacts for the local agencies.

Duties also include:

- Providing technical oversight to ensure the project meets the requirements of the appropriate program guidelines and is implemented in accordance with the grant agreement with local agencies;

- Approving invoice packages, project costs, and progress reports submitted by local agencies;
- Reviewing invoice backup documentation (i.e., travel expenses, laboratory invoice documents, and personnel costs) for accuracy and eligibility;
- Approving program expenditures to ensure costs align with program scope and budget;
- Maintaining technical and grant files to produce an accurate and auditable record of program activities;
- Directing and organizing programmatic workgroups;
- Reporting to DWQ management and the U.S. EPA liaison;
- Reviewing QA planning documents, and reports submitted by local agencies;
- Maintaining and curating information available on the State Water Board's Beach Program webpages;
- Assuring ongoing compliance with the elements within this Program Plan;
- Working with Division of Information Technology (DIT) to maintain BeachWatch functionality; and
- Verifying data manually within Beach Advisory and Closing Online Notification (BEACON) with BEACON Data Management at the U.S. EPA.

Alongside the State Water Board Quality Assurance Officer (refer to [Quality Assurance Oversight](#)), the PM will develop and implement QA standards, which involves:

- Reviewing Standard Operating Procedures (SOPs);
- Overseeing verification, validation, and completeness checks of programmatic data;
- Reviewing programmatic audit reports and performance measures;
- Evaluating the adequacy of QA policies and procedures for program; and
- Documenting internal audits and other QA activities.

Project Directors

Name	Agency
Becky Tuden	East Bay Regional Park District
Benjamin Dolf	Humboldt County Department of Health and Human Services, Public Health
Judeth Luong	Long Beach Health and Human Services
Lusi Mkhitarian	Los Angeles County Department of Public Health
Greg Pirie	County of Marin Environmental Health Services Division

Marlayna Duley	County of Mendocino Public Health Division of Environmental Health
Elsa Jimenez	Monterey County Health Department
Margaret Bredehoft	Orange County Health Care Agency
Joann Fang Lee	San Diego County Department of Environmental Health and Quality
Corey Chrisman	San Francisco Department of Public Health
Liz Pozzebon	County of San Luis Obispo Health Agency
Greg Smith	San Mateo County Environmental Health Services
Jason Johnston	Santa Barbara County Public Health
Sierra Ryan	County of Santa Cruz Health Services Agency, Environmental Health
Christine Sosko	Sonoma County Health Services
Charles Genkel	County of Ventura Environmental Health Division

The Project Director (PD) is a designated employee of the local agency responsible for the overall management of the administrative and technical aspects of the local agency's executed grant agreement.

PD duties include:

- Adhering to the terms and conditions of the local agency's grant agreement, keeping the project on track, and ensuring compliance with all applicable state or federal regulations;
- Ensuring that work is performed within the timelines and scope of work described in the local agency's grant agreement by coordinating with field and laboratory personnel;
- Keeping the project on task and submitting deliverables per negotiated timelines;
- Initiating and submitting requests for time extensions, deviations, or budget line-item adjustments;
- Submitting progress reports and invoices to the PM;
- Maintaining an accurate and auditable record file for the time-period specified by the local agency's grant agreement;
- Certifying invoice submissions and progress reports are accurate and reflect work performed within the specified billing period; and
- Ensuring the public is notified of any bacteriological standard exceedances through the local agency's hotline or webpage.

Contracts and Budgets Staff

Name	Agency	Title
Thy Nguyen	State Water Board, Division of Administrative Services (DAS)	Budget Analyst
Anna Petrosyan	State Water Board, Division of Financial Assistance (DFA)	Disbursement Analyst
Cassie Fujii	State Water Board, DFA	Program Analyst
Shanan Spitler	State Water Board, DFA	Program Analyst

Contracts and budget staff are responsible for the management of both federal and state funding for the Beach Program, applying for grant funding, and assisting with developing and executing grant agreements with local agencies. DFA administers the implementation of State Water Board financial assistance programs. DAS administers routine service contracts with both public and private entities in support of State Water Board activities. The Program Analyst is a person designated by the DFA responsible for the overall administration of the local agency grant agreements by reviewing grant agreement documents prior to execution and completing budget line-item adjustments. The Disbursement Analyst is a person designated by DFA responsible for funding management of the grant agreements with local agencies by tracking expenditures for grant funds. The Budget Analyst is a person designated by DAS responsible for assisting with the preparation and administration of the grant application for BEACH Act grant funding and aiding the PM for budget planning.

1.1.4 Information and Data Management

Name	Agency	Title
Philson Wong	State Water Board, DIT	BeachWatch IT Contact
Bill Kramer	U.S. EPA, Office of Science and Technology	BEACON Data Management
Chris Stevenson	CGI Federal	BEACON IT Contact

Beach Program data are uploaded to the State Water Board managed database, BeachWatch. This data is then synchronized with the California Environmental Data Exchange Network (CEDEN), and then transferred to the Program Tracking, Beach Advisory, Water Quality Standard, Nutrient Notification Data Access Database (PRAWN) and BEACON, which are managed by the U.S. EPA. For more information on these databases, refer to [Data Management](#).

The BeachWatch IT Contact is the database administrator, who submits all data to PRAWN and BEACON. The BeachWatch IT Contact also develops and modifies data management infrastructure within BeachWatch to expedite data uploads and reporting.

BEACON is maintained by the BEACON Data Management contact at U.S. EPA and the BEACON IT Contact through CGI Federal. The BEACON Data Management contact will ensure data submissions have been completed and verified by the set deadline. The BEACON Data Management contact and BEACON IT Contact will work together to develop and modify data infrastructure (i.e., create new beach IDs or revise historical status). The BEACON IT Contact develops and modifies data management infrastructure and aids with data uploading or reporting issues in BEACON.

1.1.5 Field and Laboratory Services

Contact Name	Agency	Laboratory
Katy Hornbeck	East Bay	East Bay Municipal Utility District Laboratory
Dwight Wieman	Humboldt	Humboldt Public Health Laboratory
Juan Garcia	Long Beach	Long Beach Public Health Laboratory
Ziad Askar	Los Angeles	Los Angeles Public Health Laboratory
Arti Kundu	Marin	Marin Health and Human Services Regional Laboratory
Marlayna Duley	Mendocino	Sonoma Public Health Regional Laboratory
Karla Tinajero	Monterey	Consolidated Environmental Laboratory
Emmeline Gu	Orange	Orange Public Health Laboratory
Joann Fang Lee	San Diego	San Diego Public Health Laboratory
Diane O'Donohue	San Francisco	San Francisco Public Utilities Commission Laboratory
Liz Pozzebon	San Luis Obispo	San Luis Obispo Public Health Laboratory
Allison Fang	San Mateo	San Mateo Public Health Laboratory
Stacy Covarrubias	Santa Barbara	Oilfield Environmental & Compliance Inc.
Audrey Levine	Santa Cruz	Santa Cruz Water Quality Laboratory
Leslye Choate	Sonoma	Sonoma Public Health Laboratory
Sean Debley	Ventura	Ventura Public Health Laboratory

Field services are provided by personnel at the local agencies. Laboratory services are provided by in-house or contract laboratories. Field services collect microbiological samples consistent with the procedures outlined in the local agency's QAPP. Local laboratories provide microbiological analysis of samples using methodology approved

for use in the Beach Program (refer to [Sampling Methods](#)). The local agencies are responsible for verifying and validating field and laboratory data, uploading verified data to BeachWatch for public availability, and posting notification signage at beaches that exceed bacteriological standards.

The primary contacts for the field and laboratory services of each local agency are provided above and are responsible for coordinating and communicating with the PD and PM regarding the local Beach Program projects and ensuring the collection and analysis of samples comply with the requirements of this Program Plan.

1.1.7 Advisory Workgroups

Coordination is one of the key elements of the Beach Program strategy to support the State Water Board's mission. Coordination efforts associated with the Beach Program takes place both internally and externally. External coordination includes statewide multi-agency efforts, such as the California Water Quality Monitoring Council (Monitoring Council), to small workgroups addressing key developments in emerging areas of monitoring methods, such as the Coastal Beach Water Quality Workgroups. Workgroups may be ongoing or limited term depending on the time it will take to address the topic of concern. Individuals associated with the Beach Program are active participants in the Monitoring Council, Safe to Swim Network, and Coastal Beach Water Quality Workgroups as detailed below. The program administrators and PM of the Beach Program also collaborate with partners through the local agency monitoring programs and other avenues.

California Water Quality Monitoring Council

The [Monitoring Council](#) is co-chaired by the California Environmental Protection Agency and the California Natural Resources Agency, and is comprised of stakeholders from state regulatory, public health, and natural resource agencies; the regulated community; non-governmental organizations; and academia. The mission of the Monitoring Council is to develop, maintain, and coordinate the implementation of a comprehensive monitoring program strategy to improve the efficiency and effectiveness of California's system of water quality and associated ecosystem monitoring and assessment programs, and to ensure that the resulting data and information are made available to decision makers and the public via the internet. To achieve this mission, the Monitoring Council targets significant coordination through interagency theme-specific workgroups and support workgroups that are staffed by issue experts representing key stakeholders.

Safe to Swim Network

The Safe to Swim Network is a workgroup of the Monitoring Council intended to coordinate monitoring and assessment of swimming safety statewide, expanding the focus to include both coastal and inland freshwater swimming, as well as other risks to recreation (e.g., harmful algal blooms). The Safe to Swim Network also responsible for managing and enhancing the My Water Quality web portal, [“Is It Safe to Swim in Our Waters?”](#)

Coastal Beach Water Quality Workgroups

The Northern and Southern [Coastal Beach Water Quality Workgroups](#) are organized by the PM and Technical Contact and are comprised of key stakeholders from various sectors including state and federal regulatory agencies, local agencies conducting monitoring and using Beach Program data, non-governmental organizations, scientists, and the general public. The goal of these workgroups is to coordinate and improve water quality monitoring, pollution abatement, public education, and public notification efforts for the protection of public health while recreating at coastal beaches. To achieve this goal, the workgroups gather to discuss local beach monitoring programs, water quality monitoring regulations, new technologies and methodologies, and current research efforts. Additionally, the Coastal Beach Water Quality Workgroups provide a forum to raise challenges associated with the Beach Program and discuss solutions. The meetings are typically held bi-annually in May and November, either jointly or with a region-specific focus.

1.2 Program Description

1.2.1 Background

The Beach Program was established in accordance with law passed by the California Legislature in 1997 through [Assembly Bill 411 \(AB 411\)](#), which amended [Health and Safety Code Section 115880-115915](#). This required that CDPH establish and maintain minimum standards for the sanitation and protection of public health at high use public beaches along the coast. Under Cal. Code of Regs., tit. 17, § 7952-7962, CDPH was required to establish minimum protective standards for total coliform, fecal coliform, and enterococci bacteria, and require testing of waters adjacent to beaches that are visited by over 50,000 people annually and are adjacent to a storm drain that flows during dry weather from April 1st through October 31st (locations available in [Appendix B](#)). In 2012, in accordance with [Senate Bill 482](#), the State Water Board assumed the responsibility of directing monitoring and providing funding to the local agencies. However, CDPH still retains responsibility for establishing, maintaining, and amending minimum protective standards for public health. For details on related regulations pertaining to the Beach Program, refer to [Appendix A](#).

Local agencies submit samples to accredited laboratories for analysis of enterococcus, total coliform, and fecal coliform, and compare the results with the bacteria thresholds listed in Cal. Code of Regs., tit. 17, § 7958. Following Cal. Code of Regs., tit. 17, § 7958, when a public beach fails to meet the bacteria standards, the local agency should post or close a beach, or portion thereof, until the standards are met. When a threshold is exceeded, local agencies issue an advisory because there is a potential elevated health risk to recreational users. The local agency may consider other factors, including the results of prior rainfall and other environmental conditions in making public health decisions. If there is a known health risk to the public, such as from a sewage spill, local agencies may close the beach, or a portion thereof. Local agencies provide public-facing information regarding heightened bacteria levels, and beach notices that allow individuals to make well-informed decisions about engaging in water recreation.

The data collected by the Beach Program are used to investigate and assess water quality, risks to public health, and promote scientific advancement and understanding of California’s coastal waters. The information collected under the Beach Program is also used to inform and make regulatory decisions to protect the environment, public health, and beneficial uses such as identifying and listing impaired waterbodies. The principal data users and decision makers include the U.S. EPA; State Water Board; other state, federal, county, and city agencies; members of the scientific, regulated, and tribal communities; and the public.

1.2.2 Grant Funding and Requirements

The Beach Program is federally-funded with BEACH Act grants under [CWA § 406](#) and state-funded with the Waste Discharge Permit Fund. The State Water Board provides grants to the 16 local agencies that conduct bacteriological water quality monitoring at coastal public beaches. Fourteen of the agencies receive state funds and use a three-year grant agreement term. The remaining two agencies receive both state and federal funds. Because federal grants are provided on an annual basis, the agencies receiving federal grant funds receive grants with a one-year agreement term.

State and federal funding are available based on the fiscal years they occur in. The state’s fiscal year occurs July 1st to June 30th, while the federal fiscal year occurs October 1st to September 30th. Table 1 depicts the fiscal years described. All grant agreements with local agencies are required to conduct the same work between April 1st to October 31st, regardless of the funding received.

Table 1. State and Federal Funding through Fiscal Years

YEAR 1												YEAR 2											
J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D

					State Fiscal Year										
								Federal Fiscal Year							

The agreement defines the terms of the grant requirements and consists of four main components: Scope of Work and Schedule, Funding Terms, General Terms and Conditions, and Special Conditions.

The Scope of Work describes the responsibility of the local agency to meet programmatic requirements. Responsibilities include project management, preparation, and submittal of a QAPP, obtaining necessary permits, beach sampling and analytical testing, uploading data, and meeting posting and beach closure requirements. The Scope of Work also describes deliverables such as quarterly and annual progress report submittals, a final project summary, and provides a schedule with deadlines for each document. For more information about QAPP requirements, refer to [Program Documentation](#).

The Funding Terms outline the annual funding allocation per fiscal year that the agency can receive. Funding is provided annually through the Waste Discharge Permit Fund and BEACH Act grant. Project funds may only be reimbursed after the agency has paid project costs, and reimbursements must be claimed for the fiscal year the costs took place. Budget details can also be found in the Funding Terms portion of the local agency's grant agreement. These include a breakdown of costs between different categories, including personnel services, indirect costs, operating expenses, and laboratory costs. Any unused funds are reverted to the granting agency, either the state or U.S. EPA.

The General Terms and Conditions and Special Conditions sections of the local agency's grant agreement include provisions to address events of default, insurance requirements, audits, and other conditions. Local agencies must comply with these terms and conditions to be reimbursed.

1.2.3 Program Schedules

Grant Schedule

Each grant agreement with the local agencies establishes important quarterly and annual deadlines. The grant schedule follows the state fiscal year (July 1st-June 30th) (refer to [Background](#) for more information on the funding schedule). Reimbursement requests (i.e., invoices) are due from the local agency grantee to the State Water Board 20 days after the end of the quarter. Similarly, final reimbursement requests are due 20 days after the end of the fiscal year. A Final Project Summary is due before the end of the Annual Work Completion Date for each year of the agreement. Both state and federal grant deadlines are listed in Table 2, below.

Table 2. State and Federal Grant Schedule Deadlines

Task	State Deadlines	Federal Deadlines
Annual Eligible Start Date	July 1 st	July 1 st
Quarterly Reimbursement Request	January 20 th , April 20 th , July 20 th , October 20 th	July 20 th
Annual Work Completion Date	August 15 th	August 15 th
Final Project Summary	August 15 th	August 15 th
Annual Reimbursement Request	September 1 st	July 31 st

Beach Program Sampling Schedule

Bacteria sampling occurs weekly from April 1st through October 31st, at beaches with over 50,000 annual visitors and located adjacent to a storm drain that flows during dry weather per Cal. Code of Regs., tit. 17, § 7952-7962. Local agencies submit data to BeachWatch within 5 days of receipt from the laboratory. Local agencies also submit beach notices and closures in BeachWatch. All information uploaded to BeachWatch is publicly available through the State Water Board's website.

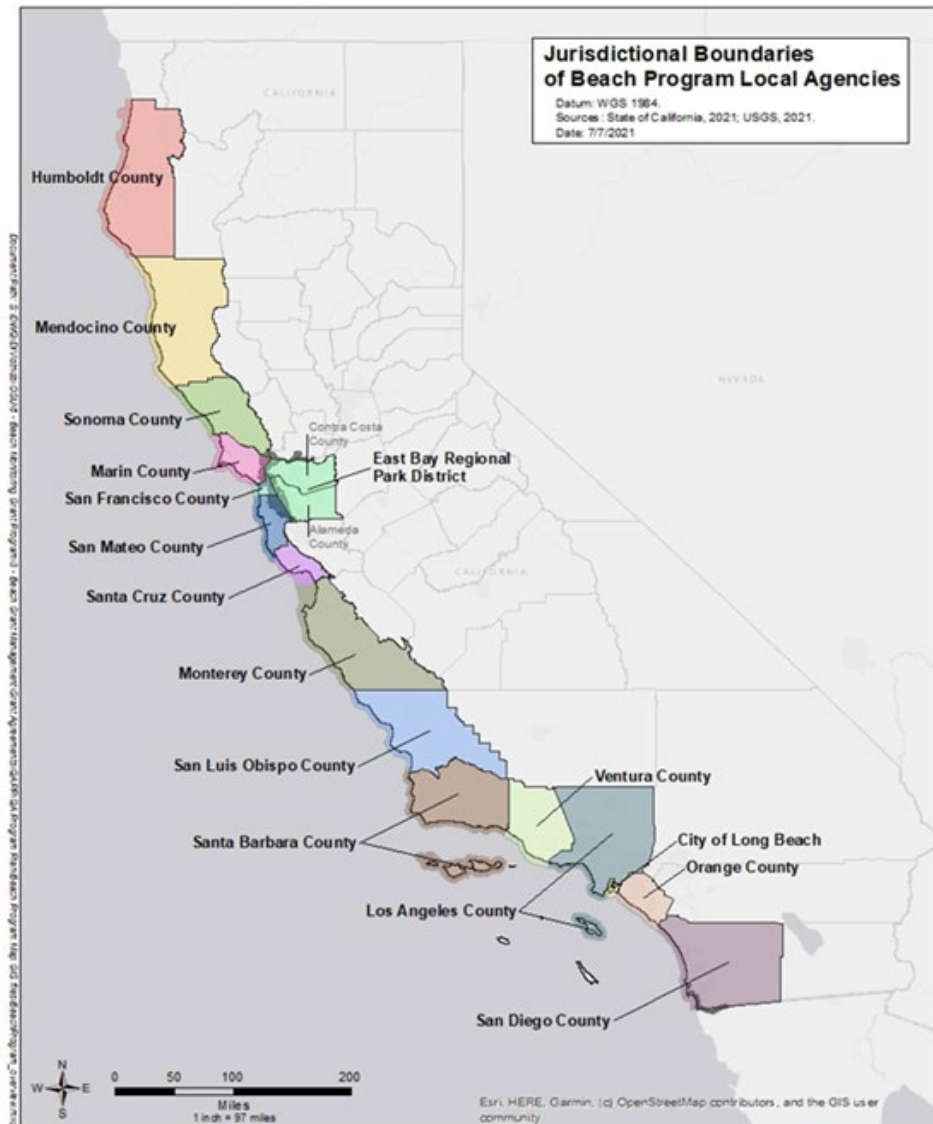
1.2.4 Monitoring Projects

Each monitoring project is individually planned and executed by each of the 16 local agencies and are representative of the jurisdictional boundaries of each local agency. The jurisdictional boundaries of each of the local agencies can be seen in Figure 2, below. The jurisdictions are:

- East Bay
- Humboldt
- Long Beach
- Los Angeles
- Marin
- Mendocino
- Monterey
- Orange
- San Diego
- San Francisco
- San Luis Obispo
- San Mateo
- Santa Barbara
- Santa Cruz

- Sonoma
- Ventura

Figure 2. Jurisdictional Boundaries of Beach Program Local Agencies



1.2.6 Monitoring and Bacteria Standards

As stated above, Health and Safety Code § 115880 requires weekly testing from April 1st through October 31st of beaches visited by more than 50,000 people annually and located adjacent to a storm drain that flows in the dry weather for total coliform, fecal coliform, and enterococci bacteria. The California Department of Public Health established statewide standards for the sanitation of public beaches to protect recreational users from the effects of pathogens in California coastal water bodies. These standards were set in the Health and Safety Code in 1985 and are based on sampling for total coliform, fecal coliform, and enterococcus. As per Cal. Code of Regs., tit. 17, § 7958, the minimum bacteriological standards are:

- Single sample
 - 1,000 total coliform bacteria per 100 mL, if the ratio of fecal/total coliform bacteria exceeds 0.1; or
 - 10,000 total coliform bacteria per 100 mL; or
 - 400 fecal coliform bacteria per 100 mL; or
 - 104 enterococcus bacteria per 100 mL
- Mean of the logarithms (i.e., geometric mean) of the results of at least five weekly samples during any 30-day sampling period
 - 1,000 total coliform bacteria per 100 mL; or
 - 200 fecal coliform bacteria per 100 mL; or
 - 35 enterococcus bacteria per 100 mL

Furthermore, Health and Safety Code § 115880.d allows local agencies to conduct studies and develop a body of evidence which justifies using a more rapid test method for specific locations. For example, digital droplet Polymerase Chain Reaction (ddPCR) is approved for use in San Diego (refer to [Pilot Study in San Diego](#)).

Water Quality Control Plan for Ocean Waters of California

The bacteria standards established by the California Department of Public Health for the Beach Program are different from, but may work in tandem with, the bacteria water quality objectives established by the State Water Board for the [Water Quality Control Plan for Ocean Waters of California](#) (Ocean Plan).

The bacteria water quality objectives within the Ocean Plan are set to ensure the reasonable protection of the water contact beneficial use. Ocean waters are defined as the territorial marine waters of the state as defined by California law to the extent these waters are outside of enclosed bays, estuaries, and coastal lagoons. These water quality objectives pertain to water from the shoreline to 1,000 feet from the shoreline or the 30-foot depth contour, which is furthest from the shoreline, and in areas outside this zone for water contact sports as determined by the Regional Water Board. The objectives also pertain to all kelp beds. The jurisdictional boundaries of territorial marine waters of the state extend three nautical miles from shore and include the state islands. If a discharge outside the territorial waters of the state could affect the quality of the waters of the state, the discharge may be regulated to assure no violation of the Ocean Plan will occur in ocean waters.

As per Chapter II.B.1.a.(1) of the Ocean Plan, bacteria water quality objectives are listed in Table 3 and 4, below.

Table 3. Fecal Coliform Water Quality Objective

Indicator	30-day geometric mean ¹	Single sample maximum
Fecal coliform density	200 per 100 mL	400 per 100 mL

¹ A 30-day geometric mean is calculated based on [no fewer than] the five most recent samples from each site.

Table 4. Enterococci Water Quality Objective

Indicator	Six-week rolling geometric mean	Statistical threshold value ¹
Enterococci	30 cfu ² per 100 mL	110 cfu ² per 100 mL

¹The statistical threshold value is not to be exceeded by more than 10 percent of samples collected in a calendar month, calculated in a static manner.

²cfu = colony forming units; considered equivalent to most probable number (MPN) for the purposes of program acceptance criteria.

These water quality objectives are used in multiple ways, including in permits issued by the State and Regional Water Boards. Some local agencies leverage efforts to address monitoring requirements for both the Beach Program and monitoring requirements in permits. Health and Safety Code § 115881.a allows for overlap between requirements.

1.3 Program Data Quality Objectives

Data quality objectives are developed as part of a systematic planning process designed to assist investigators in the development of a sound and defensible project. Data quality objectives are the qualitative and quantitative statements that clarify the program's objectives, define the appropriate type, quantity, and sensitivity of data to collect, and specify the tolerable levels of potential error that will be used to establish the level of quality needed to support decisions.

In accordance with BEACH Act performance criteria, data quality objectives for the Beach Program are established with a focus in four main categories:

1. Beach identification
2. Monitoring design and implementation plans
3. Data collection and laboratory analysis methods and procedures
4. Data verification and validation

1.3.1 Beach Identification

According to the BEACH Act, coastal recreation waters are defined as the Great Lakes and marine coastal waters (including coastal estuaries) designated under CWA § 303 by a state for use for swimming, bathing, surfing, or similar water contact activities. Coastal recreation waters do not include either inland waters or waters upstream of the mouth of a river or stream that has an unimpaired natural connection with the open sea.

The definition of a public beach can be found in [Health and Safety Code § 115875](#). In California, coastal beaches include those in the coastal zone along the Pacific Ocean or those within the jurisdiction of the San Francisco Bay Conservation and Development

Commission. Factors such as geography, geology, the type of recreational use, and the type of access will be considered in the definition of beaches. Maps and lists of beaches located within each local agency's jurisdiction are included within their respective QAPPs. The extent of the beach as well as the actual beach mileage along all the coastal waters is calculated and represented in BEACON using latitude and longitude coordinates. Once all beaches have been identified, the local agencies, with help from the PM, will geo-locate and develop maps of each participating beach, indicating points of access and potential contamination sources.

1.3.2 Monitoring Design and Implementation Plan

The local agency describes the monitoring design at the agency scale in the QAPP, including:

- When required sampling will be conducted
- When additional sampling will be conducted
- Where samples will be collected

The local agency also identifies the parameters that are monitored in their QAPP. At a minimum, local agencies will conduct monitoring on a weekly basis from April 1st to October 31st. Once the laboratories analyze the samples, the PD will upload data to BeachWatch within five days and will use the data to make the appropriate public health decisions. Refer to [Sampling Design](#) for more details.

1.3.3 Data Collection and Laboratory Analysis Methods and Procedures

The local agency identifies methods and procedures used for sample collection and laboratory analysis, which must meet the following minimum requirements.

Sample Collection Techniques

Strict adherence to specific procedures for sampling is critical to a successful monitoring program. For more information on proper sample collection techniques, refer to [Sampling Methods](#). Each local agency has established sample collection techniques in their respective QAPPs. For more information on current sample handling requirements, refer to [Sample Handling and Custody](#). Field sampling SOPs and QA practices are outlined in the local agency's respective QAPPs.

Laboratory Analyses

All laboratories contracted to run samples associated with the Beach Program must be accredited through the Environmental Laboratory Accreditation Program (ELAP) for appropriate microbiological methods. ELAP is a program that assesses and evaluates laboratories to a laboratory accreditation standard. ELAP offers accreditation to environmental testing laboratories that have policies and procedures that conform to the ELAP's accreditation standard and can demonstrate competency in the analytical

methods used for regulatory purposes. Laboratories must undergo proficiency testing once a year and obtain an acceptable score for each field of accreditation the laboratory is applying or accredited for.

Laboratories should have the capability to analyze the quantity of samples requested within the required time period, the instrumentation and technique expertise to perform the required analyses within the required time period, and the qualified individuals to perform the analyses. Strict adherence to standardized procedures for laboratory analysis is also critical to a successful monitoring program. Each local agency has identified laboratory techniques and methods in their respective QAPPs. Any SOP used for the Beach Program shall be included in the local agency's respective QAPP. Copies of all laboratory operation SOPs will be kept on file and will be made available to the State Water Board upon request. For more information on current laboratory analysis requirements and methods approved for use in the Beach Program, refer to [Analytical Methods](#).

As a part of Phase 3 of the development of the Program Plan and as described in the Data Quality Assurance Goals ([Appendix C](#)), the State Water Board will further refine additional QC measures to be implemented by local agencies for laboratory analyses and data verification and validation procedures.

1.3.4 Data Verification and Validation

The Beach Program aims to generate and provide data that are well planned and documented, valid and defensible, and supportive of making decisions. Data types collected by the program include field data and fecal indicator levels. Data collected under the Beach Program are used to make environmental, regulatory, and public health decisions as well as promote scientific advancement and understanding of California's ocean waters. The decisions and information provided by the program can have significant health, economic, and political effects. Therefore, it is important that the data collected by the Beach Program should be of the appropriate type, quality, and quantity needed to support the intended data use.

1.4 SWAMP Comparability

The Surface Water Ambient Monitoring Program (SWAMP) is the State Water Board's flagship surface water monitoring program because of its comprehensive quality management system with well-established QA policies and procedures to manage data quality. SWAMP's efforts focus on quality management of the project lifecycle based on the principles of planning, documentation, implementation, review, and reporting. Permits, grants, waivers, and other State Water Board monitoring efforts often require monitoring projects to be "SWAMP Comparable" to meet the State Water Board's quality and data system requirements (refer to the "SWAMP Comparable" Section of the [SWAMP Program Plan](#)). To be "SWAMP Comparable," monitoring projects should conform to policies and procedures for project management, data review, and reporting

as detailed in the SWAMP Program Plan. The Beach Program aims to be SWAMP Comparable by adopting and implementing requirements, policies, and procedures that are consistent with SWAMP measurement quality objectives (MQOs), sampling methods, handling and custody practices, data management business rules, and corrective action processes.

1.5 Data Quality Indicators

Data are never free of error and always have some level of uncertainty. Uncertainty is most easily defined as the sum of all errors introduced in a measurement and is often communicated to data users using error bars on graphs, or confidence intervals in text (U.S. EPA, 2008). In water quality sampling, error is introduced as early as the sampling design phase and continues to be added at each stage of monitoring: from sample collection, preservation, and handling to analytical measurement and data entry in the database. Thus, it is important to have set limits of allowable error to ensure data are useable and supportive of the Beach Program's Data Quality Objectives.

Data quality indicators are the quantitative statistics and qualitative descriptors used to interpret the degree of acceptability or utility of data to the user (U.S. EPA, 2002). The principal data quality indicators used for the Beach Program are precision, accuracy (bias), sensitivity, comparability, representativeness, and completeness. Beach Program definitions for each data quality indicator are provided below. Data quality indicators are used to define the MQOs for the Beach Program, which, if achieved, will provide an indication that the resulting data are expected to meet the project data quality objectives. This provides a method to set an acceptable amount of uncertainty for each data point to assess performance and confidence in the results.

1.5.1 Precision

The precision of a measurement system describes how close the agreement is between multiple measurements. If the values are close together, then the measurement is said to have a high degree of precision. A MQO can then be set to allow for a reasonable level of error to occur within the limits of the technology and expertise available and set an objective of precision to be achieved for a measurement to reduce decision error when the data are used. Beach Program precision is monitored using laboratory duplicates. When duplicates are analyzed, precision of the test will be expressed in terms of ability to detect the target bacteria.

1.5.2 Accuracy (Bias)

Accuracy is the assessment of the closeness of agreement between a measured or determined value and the true value (U.S. EPA, 1992). According to the U.S. EPA (1992), bias is defined as a systematic error inherent in a method or caused by some feature of the measurement system. The term "accuracy" is often used to describe both the precision and bias of an analysis. For the purposes of the Beach Program, the term will be used to describe bias alone to distinguish between the two measures. Like

precision, a MQO can be set to limit the amount of bias; to allow for a reasonable level of error to occur within the limits of the technology available; and to set an objective of accuracy to be achieved for a measurement to reduce decision error.

The Beach Program will use laboratory blanks and sterility checks, to provide information about contamination (bias) that may be introduced during analytical activities. When contamination is introduced into the analytical system, the blank sample result provides information about the degree of bias that has been introduced. A sterility check confirms if antimicrobial steps performed during testing processes were successful and confirms that containers, glassware, media, and reagents used to complete the analysis are not a source of contamination.

A common test to measure accuracy (bias) is to analyze a laboratory control sample containing a certified reference material with known concentration of analytes of interest and compare the values that are measured in these samples to the known values. The Beach Program relies on participating laboratory's performance on proficiency testing (also referred to as performance evaluation) samples to evaluate laboratory's accuracy. Proficiency testing samples are a type of certified reference material provided by independent, accredited proficiency testing providers to evaluate a laboratory's performance in a specific analysis. The Beach Program does not collect this data directly but requires the use of laboratories that hold ELAP accreditation for the methods performed for the Beach Program. A requirement of ELAP accreditation is for laboratories to achieve an acceptable result on the proficiency testing samples on an annual basis for each analysis on their certificate of accreditation.

5.3 Sensitivity and Resolution

Analytical sensitivity is most commonly defined as the lowest value an instrument or method can measure with reasonable statistical certainty. Resolution refers to the capability of a method or instrument to recognize small differences between values. These two terms are often used to assess if an instrument or method is appropriate for a study. For water quality measurements, it is important to understand the capability of an instrument or testing method to provide a measurement that allows for a decision or assessment to be made. A list of standard methods that use detection techniques with known analytical sensitivity (capabilities) are approved for use in the Beach Program to ensure that data reported will meet the needs of the program. For more information on the methods approved for use in the Beach Program, refer to [Detection Limit](#).

1.5.4 Representativeness

Representativeness is the degree to which measurements correctly represent the environmental condition, target organism population, and/or watershed to be studied (U.S. EPA, 1992). Representativeness touches on how well the site and sample collection represent the study area and analyte of interest, and whether the sample represents the conditions in the field at the time of analysis. Careful study design,

adherence to SOPs, use of appropriate sampling equipment, and maintaining proper sampling, handling, and storage conditions can strengthen a project's representativeness. Assuring that the data are representative of the program objectives is addressed primarily by selecting appropriate locations, methods, times, and frequencies of sampling and by maintaining the integrity of the sample after collection. Each local agency has established monitoring design in their respective QAPPs. For the Beach Program, samples are taken at locations adjacent to a storm drain that flows in dry weather to adequately protect recreational users from the effects of pathogens such as enterococcus, total coliform, and fecal coliform.

1.5.5 Comparability

Comparability expresses the measure of confidence that one dataset can be compared to and combined with another (U.S. EPA, 1992). The data from multiple projects can be combined for decision-making purposes when projects use similar methodology and data reporting and units, have similar expectations for the level of quality needed, and document and provide similar amounts of metadata and QA information. All projects contributing to the Beach Program shall maintain comparability by following the provisions outlined in the relevant regulations (refer to [Appendix A](#)), respective sampling and analytical methodologies, the QMP, and this Program Plan.

The Beach Program is designed to be SWAMP comparable by following similar QA practices. The data collected from diverse monitoring projects and programs support a wide variety of monitoring objectives, organizations, methods, and data types. Therefore, diverse data can be combined to support a decision by the State Water Board, if it is deemed "comparable."

1.5.6 Completeness

Completeness refers to the comparison between the amount of valid data originally planned to be collected, and the actual quantity collected. Completeness is commonly expressed as a percentage of the number of reported measurements that meet data quality objectives, compared with the number of projected quality measurements. Completeness checks can be carried out to ensure complete data reporting, evaluate project logistics and performance, and provide feedback to project teams and management, as well as confirm work task completion for contract invoices. The State Water Board aims for 100 percent because local agencies are contractually obligated to sample weekly from April 1st to October 31st. However, the completeness objective for the Beach Program is established at 90 percent to account for potential sampling limitations such as unsafe sampling conditions or unforeseen events (e.g., COVID-19 pandemic) that would prevent sampling or laboratory analyses. This allowance for 90 percent completeness will not affect the assessment of data quality. However, any missed samples must be reported to the PM, as per the local agency's grant agreement.

1.6 Measurement Quality Objectives

MQOs are specific goals or acceptance criteria defined by data users that clearly describe the data quality that is sought for the project. The MQOs are established for each of the data quality indicators described above. The Beach Program MQOs (Table 5) provide a consistent rubric to evaluate data quality and usability and are consistent with the MQOs established for bacteriological analyses performed for SWAMP. This ensures that data for the Beach Program will be comparable to the data collected for SWAMP programs and projects. The MQOs for the Beach Program supersede the QC acceptance criteria for any method used in the Beach Program unless the method QC acceptance criteria are more stringent. Refer to the [Quality Control and Performance Criteria](#) section of this document for minimum QC requirements.

Refer to the [Corrective Action](#) section of this document for corrective action guidelines to follow if MQOs identified in this section are not met. As a part of Phase 3 of the development of the Program Plan and as described in the Data Quality Assurance Goals ([Appendix C](#)), the State Water Board will further refine program MQOs and establish a MQO framework to ensure data submitted for the Beach Program are robust, complete, and scientifically defensible.

Table 5. Quality Control¹: Indicator Bacteria in Fresh Water

Laboratory Quality Control	Data Quality Indicator	Frequency of Analysis	Measurement Quality Objective
Sterility Check	Bias	Per new lot of dehydrated culture media as instructed in SM 9020B.4.i.5 ² and SM 9222D.1.a	No growth
Sterility Check	Bias	For non-sterile filters and pads per lot as instructed in SM 9020B.4.h.1.1	No growth
Sterility Check	<u>Bias</u>	<u>Membrane Filter:</u> Media, filters, buffered dilution water, rinse water, and all equipment per series of samples as instructed in SM 9020B.8.a.5 ²	No growth
Sterility Check	<u>Bias</u>	<u>Multiple Tube:</u> Media, dilution water, and glassware as instructed in SM 9020B.8.a.5 ²	No growth
Laboratory Positive Control	Precision, Bias	Per new lot of dehydrated culture media for the following methods: Colilert,	Positive response

		Colilert-18, Enterolert, or other chromogenic/fluorogenic methods. Per new lot of commercially-prepared culture media ampules for U.S. EPA-approved fecal coliform membrane filter methods (e.g., SM 9222). Per batch for laboratory-prepared culture media for U.S. EPA-approved fecal coliform membrane filter methods (e.g., SM 9222).	
Laboratory Negative Control	Precision, Bias	Per new lot of dehydrated culture media for the following methods: Colilert, Colilert-18, Enterolert, or other chromogenic/fluorogenic methods. Per new lot of commercially-prepared culture media ampules for U.S. EPA-approved fecal coliform membrane filter methods (e.g., SM 9222). Per batch for laboratory-prepared culture media for U.S. EPA-approved fecal coliform membrane filter methods (e.g., SM 9222).	Negative response
Laboratory Duplicate	Precision	Per 10 samples or per analytical batch, whichever is more frequent	Dependent on calculation (refer to Determining Precision)
Laboratory Blank	Bias	Per 10 samples or per analytical batch, whichever is more frequent	No growth

¹ Unless method specifies more stringent requirements.

² Cited from Standard Methods for the Examination of Water and Wastewater.

1.7 Special Training and Certification

Local agencies shall train field sampling personnel to ensure that all field personnel are knowledgeable and competent in the field sampling SOPs and QA practices outlined in the approved QAPP for the local agency prior to performing any field activities for the Beach Program (refer to [Method Assessment and Procedures](#)). Local agencies must retain all training records, which must be made available to the State Water Board upon request.

The laboratories that participate in the Beach Program must have QA Manuals that describe the specific training procedures for individuals performing analyses for the program. All training procedures must be consistent with the training requirements outlined in the ELAP regulations.

1.8 Program Documentation and Records

Maintenance of program documentation and records of programmatic activities is essential to the functionality and success of the Beach Program. These documents also ensure compliance with state and federal regulations associated with the Beach Program. Program documentation includes the deliverables required by the local agency grant agreements (e.g., progress reports), QA planning documents (e.g., chain-of-custody forms), and reports.

Multiple types of records are important to program functionality. Records include field and laboratory data records, permits, and entitlements. Accuracy and accessibility of records support different purposes, including the program's development over time. Records are also important for data checks and ensuring program deliverables are correct. Additionally, records allow for internal tracking of funding needs, developments in improved beach monitoring methods, and programmatic successes or gaps that need to be addressed. The types of documents and records for the Beach Program are described in the following sections.

1.8.1 Program Documents

Grant Agreements

The State Water Board provides financial assistance to the local agencies that perform work required for the Beach Program through state grants. These grant agreements stipulate the terms and conditions the local agencies must comply with to receive funding for program related activities, such as the submittal and approval of QAPPs, quarterly progress reports, and final project summaries.

Quality Assurance Project Plans (QAPPs)

Each local agency implementing monitoring projects for the Beach Program must have a State Water Board approved QAPP prior to implementation of the project. The QAPP must describe the systematic planning process involved with the acquisition and management of project data including a description of the quality objectives for the project, as well as the technical procedures, quality assurance practices, and quality control activities implemented to meet the quality objectives. The QAPP shall conform to the technical and quality assurance policies and procedures of this Program Plan. Local agencies must submit their QAPP to the State Water Board within 30 days after execution of the local agency's grant agreement.

Grantees shall develop the QAPP in accordance with the EPA Guidance for Project Plans (EPA QA/G-5). In accordance with the Water Board QMP, an approved QAPP can remain effective for up to three years if no substantive changes are made to the project. QAPPs must be reviewed at least annually by the local agencies to determine if changes or amendments are needed to the QAPP. Non-substantive changes to a QAPP, such as changes in personnel can be addressed through a QAPP amendment process.

Quarterly Progress Reports

The quarterly progress reports provide a summary of the work performed within the three-month period, including:

- The number and location of sampling stations monitored
- The number of samples collected
- Any samples not collected due to unsafe conditions
- The number of beaches posted and/or closed
- The laboratory costs per sample
- Any applicable public notification expenses
- The web address, telephone number, and other methods of public communication
- The accomplishments and milestones achieved during that quarter
- The monitoring results
- Any problems encountered in conducting the work
- Corrective Action Report

Each local agency must submit quarterly progress reports to the PM by the twentieth of the month following the end of the calendar quarter (April, July, October, and January).

Final Project Summary

The final project summary provides a summary of work conducted within the state fiscal year, including:

- All information contained in the quarterly progress reports;
- All estimated and actual costs of the project, including a description and amount of any funds from sources other than this agreement necessary to complete the project;
- Any appropriate photos or graphics, such as sampling locations, field sampling equipment, or laboratories; and
- Any additional information requested by the PD or PM.

Each local agency must submit a final project summary to the PM by the annual completion date designated within the local agency's grant agreement.

1.8.2 Program Records

Field Data Records

Field data consists of field observations (i.e., collection time and date, latitude and longitude coordinates) reported by agencies to the BeachWatch database. All field and laboratory data uploaded by local agencies to BeachWatch are transferred to the CEDEN and BEACON databases on an annual basis.

Laboratory Records

Laboratory data consists of beach water quality monitoring data reported by agencies to the BeachWatch database. Supporting documentation, such as laboratory reports, training records, equipment QC records, analysis logs, and ELAP certificate of accreditation, should also be kept on file by the local agencies. Local agencies must be able to generate laboratory reports that contain specific minimal information (i.e., sample results with associated QC data). These laboratory reports must be made available to the State Water Board upon request.

Other Records

Local agencies are required to obtain all public agency approvals, entitlements, or permits required for project implementation before field work begins. If the project is carried out on lands not owned by the local agency, the local agency must obtain adequate rights of way for the life of the project. Local agencies must submit a list and signed copies of such approvals, entitlements or permits to the PM, if applicable. These documents should be retained and stored by the local agency and State Water Board. The maintenance of this documentation protects the legality of the Beach Program.

Records Retention

Each local agency shall retain all Beach Program-related records for seven years from the work completion date in accordance with their grant agreement. This includes electronic and physical copies of records. Records shall be made available to the State Water Board upon request.

1.9 Data Management

Field data and sample collection information are recorded on field sheets and chain-of-custody forms. Primary verification is performed by field staff against hardcopy field sheets and entered into data templates or directly into the database. Laboratory staff will perform analyses and verify data generated from the laboratory meets Beach Program MQOs and provide the respective local agency with the data. Local agencies will submit their data to the Beach Program database, BeachWatch. BeachWatch stores all pertinent microbiological data about each participating beach and contains minimum data elements that are compatible with CEDEN.

The PM and Technical Contact review data submitted to BeachWatch to verify data follows the correct formatting, standard vocabulary, and business rules, as well as verify the data meet Beach Program MQOs. Data are made available to the PM and local agencies for review through the BeachWatch user interface. The data are also stored in an accessible form usable to the local decision-makers through a public interface. Data are transferred to CEDEN on a routine basis, then transferred to Water Quality Exchange (WQX). BeachWatch data are also submitted to BEACON on an annual basis.

The flow of data pertinent to the Beach Program is described in the following subsections. All data processes are carried out using standard procedures as detailed in [Data Verification, Validation, Completeness, and Assessment](#).

1.9.1 Field Data

Prior to visiting a site, field personnel may pre-fill core information about the planned sampling event into standardized [chain-of-custody](#) forms. This information may include the project, station, and agency codes and information, along with the sample container types and number to be filled.

All data and observations taken in the field shall be collected and stored appropriately and shall be made available to the State Water Board upon request. Field personnel are responsible for primary verification of the data to ensure accurate and complete data collected in the field. As a part of Phase 3 of the development of the Program Plan and as described in the Data Quality Assurance Goals ([Appendix C](#)), the State Water Board will work with local agencies to refine field data requirements.

1.9.2 Laboratory Data

Laboratories must verify data generated from the laboratory meets the acceptance criteria (MQOs) established for this program and appropriately qualify data that exceeds acceptance criteria using the data qualifying criteria established in SWAMP Data Management guidelines and discussed in further detail in [Data Verification, Validation,](#)

[Completeness and Assessment](#). Laboratories shall maintain and store all hardcopy or electronic documents per the time frames established within [Records Retention](#).

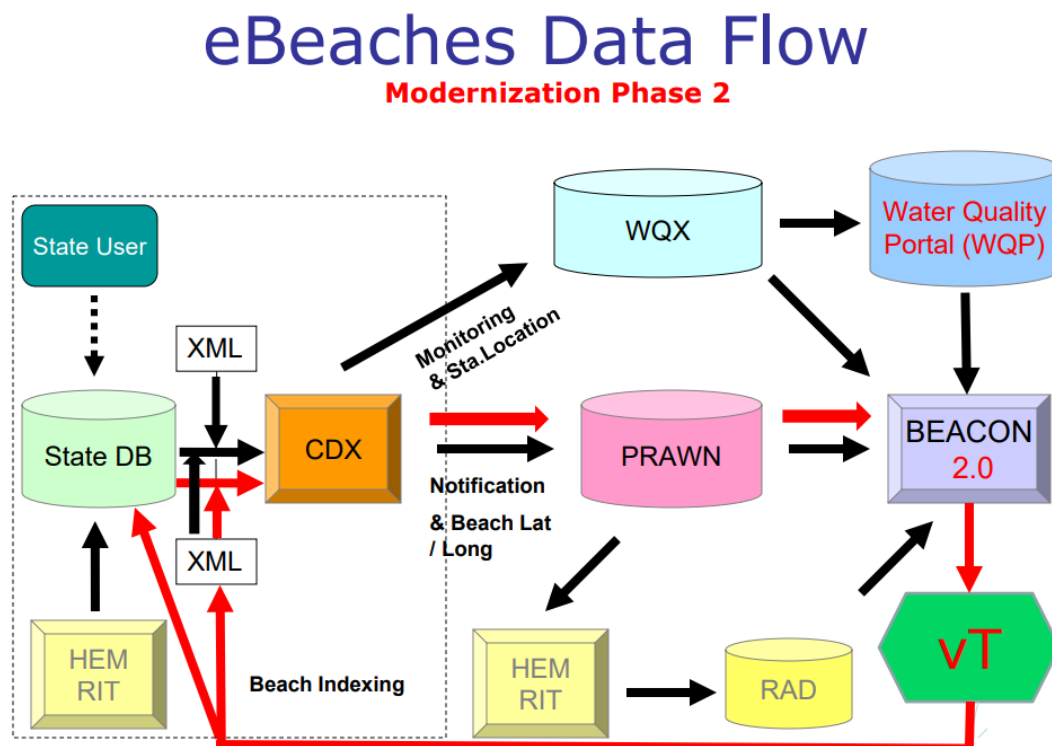
Local agencies shall submit their data to the State Water Board managed database, BeachWatch, within five days of receiving the sampling results. Data can be submitted as a single sample upload or bulk upload. The local agencies must follow the applicable business rules for submission of data to the BeachWatch database (refer to [Business Rules](#)). The business rules describe the columns and formats of the BeachWatch bulk data upload template, the minimum data elements required for Beach Program data reporting, as well as how each of the sample types and results are to be reported.

1.9.3 Data Transfer

The Beach Program's BeachWatch database is maintained by the PM, Technical Contact, and BeachWatch IT Contact at the State Water Board. The purpose of BeachWatch is to store water quality data acquired for the program and synchronize that data with CEDEN, as well as transfer the data to BEACON. BeachWatch contains structure, minimum data elements, and standardized vocabulary that are compatible with the State Water Board's CEDEN data system and U.S. EPA's BEACON database. As a part of Phase 3 of the development of the Program Plan and as described in the Data Quality Assurance Goals ([Appendix C](#)), the State Water Board will evaluate the data management strategies. This may include updates to BeachWatch, such as adding additional fields for metadata (e.g., laboratory QC data) and data entry warnings (e.g., out of range sample date, negative results).

BeachWatch data are formatted through a State Node and then submitted at least annually online to the Central Data Exchange (CDX) by the BeachWatch IT Contact by January 31st of the following year. The CDX is the U.S. EPA's electronic reporting site. From CDX, locational data (beach locations and station coordinates) are sent to PRAWN and monitoring data (advisories, sample results) are sent to WQX. PRAWN stores beach administrative, advisory, and closing data. The WQX is the primary framework for sharing data at the national level and compiling data into the Water Quality Portal. It allows various partners, including the State Water Board, to share ambient water quality data with the U.S. EPA. From WQX, the data are sent to the Water Quality Portal and BEACON (refer to Figure 3 for a visual of the flow of Beach Program data).

Figure 3. Flow of Beach Program Data



BEACON

The U.S. EPA created BEACON to meet the BEACH Act requirement that U.S. EPA establish and maintain a publicly available database of pollution occurrences for coastal recreation waters. [BEACON](#) is a publicly available website that provides access to mapped locational data (beaches and monitoring stations); monitoring results (pathogen indicators, algae, salinity, etc.); and notification data (advisories and closures). All coastal beach water quality information gathered by U.S. states, territories, and tribes is submitted and stored in this database.

To assure that the data provided to U.S. EPA are stored and displayed correctly in BEACON, the PM conducts a verification that data are input correctly, makes any changes to the data as necessary, and informs the BEACON Data Manager of any system issues (refer to [BEACON Verification](#)). The U.S. EPA's [Manual Data Verification Guide](#) provides a list of checks that must be completed. Verification must be completed by March 31st of the following year.

The State Water Board also maintains data systems and tools for internal programmatic functions such as contract management, budget planning, invoicing, and project documentation. These data systems are for internal use by the State Water Board.

CEDEN

CEDEN is the State Water Board's data system for surface water quality in California. It is publicly available [online](#) to find and share information about California's water bodies, including streams, lakes, rivers, and the coastal ocean. CEDEN consolidates California's data in a central location, where it can be easily accessed and used for statewide management efforts.

All monitoring data within BeachWatch are synchronized with CEDEN on a weekly basis. The flat files with information pertaining to postings and closures are not transferred to CEDEN as they are not compatible but are submitted to BEACON separately. CEDEN sends a portion of the monitoring data within its system to EPA's WQX weekly.

Future BeachWatch Updates

The State Water Board is working to make BeachWatch compliant with CEDEN's minimum data requirements.

As part of Phase 2, the BeachWatch data upload template was updated to include: Sample Agency Code, Lab Agency Code, Lab Batch, Analysis Date, Detected Above MDL, and QA Code. Descriptions of and requirements for each new column can be found in the Business Rules document (refer to [Appendix D](#)).

During Phase 3 of the development of the Program Plan and as described in the Data Quality Assurance Goals ([Appendix C](#)), the State Water Board will update BeachWatch and the data upload template to refine QC, data verification, and validation processes.

2. Data Generation and Acquisition

2.1 Sampling Design

2.1.1 Site Selection

Health and Safety Code § 115880-115915 and Cal. Code of Regs., tit. 17, § 7958-7962 establish sampling requirements for the Beach Program which provide a basic guide for sampling design. Health and Safety Code § 115880 requires sampling at public beaches which are adjacent to a storm drain that flows during dry weather and have over 50,000 annual visitors. Bacteriological sampling for total coliform, fecal coliform, and enterococci must take place at least once per week from April 1st through October 31st, unless sampling would be unsafe.

As required in the local agency's grant agreements, each local agency shall develop a QAPP which meets sample design requirements, such as the inclusion of sample locations with latitude and longitude, sample collection techniques, a sampling schedule, parameters sampled, and testing methods used. The PD is responsible for coordinating and overseeing the sampling process.

Justice40 Initiative

The Justice40 Initiative was established by the federal government to allocate 40 percent of certain federal investments to disadvantaged communities that are marginalized, underserved, and overburdened by pollution. Disadvantaged communities are identified using the Climate and Environmental Justice Screening Tool (CEJST) which decides by analyzing several criteria for a given census tract. CEJST screens census tracts for multiple factors within the following categories:

- Climate change
- Clean energy and energy efficiency
- Clean transit
- Affordable and sustainable housing
- Health burdens
- Training and workforce development
- Remediation and reduction of legacy pollution
- Development of critical clean water and wastewater infrastructure

For the purposes of the Beach Program, Justice40 includes a five-mile radius around coastal census tracts. This ensures that beaches within close proximity to a disadvantaged community are considered for inclusion in the Beach Program. Local agencies may also provide input about which beaches should be included under the Justice40 Initiative. Once a determination is made to include a beach in the program, it must meet requirements similar to Health and Safety Code § 115880-115915 and Title 17 CCR Sections 7958-7962, including water quality monitoring for bacteria, and a notification system that the public can access via phoneline and internet.

2.1.2 Sampling Location

Point Zero

Point zero is defined within the Ocean Plan ([Appendix III – Standard Monitoring Procedures for Storm Water Point Sources](#)) as the surf zone immediately where runoff from an outfall meets the ocean water. The Ocean Plan requires storm water agencies with outfalls greater than 36 inches monitor at zero-point at the following frequencies:

- During wet weather with a minimum of three storms per year, and
- When non-storm water discharges occur (i.e., flowing during dry weather), and if located at a beach that meets AB 411 requirements, at least weekly.

The State Water Board developed a collaborative approach to integrate the Beach Program monitoring requirements with required stormwater bacteria monitoring directed by Regional Water Board permits. The local agency's grant agreements require a list of sampling locations, denoting which stations are point zero locations.

2.1.3 Sampling Design Description

As required in the Beach Monitoring Grant Agreement, each local agency shall develop a QAPP which meets sample design requirements, such as the inclusion of sample locations with latitude and longitude, sample collection techniques, a sampling schedule, parameters sampled, and testing methods used. The PD is responsible for coordinating and overseeing the sampling process.

Sampling design descriptions for Beach Program projects are detailed in QAPPs. The sampling design is developed and documented by the PD as part of the QAPP process. The PD must review the sampling design annually, in tandem with the QAPP requirements and provide information regarding changes, or lack thereof, in the required memo to be submitted to the State Water Board's QA Officer and PM (refer to the [Program Documents](#) section for more information regarding QAPP requirements).

2.2 Sampling Methods

2.2.1 Sampling Method Program Policy

Adherence to sampling, preservation, and handling procedures is critical to the production of valid data.

For routine monitoring, Beach Program projects must collect samples using established sampling methods for routine monitoring efforts that fit the needs of the project. The term "established sampling methods" is defined as protocols developed and published by government agencies (e.g., U.S. EPA or USGS) or other voluntary consensus standard bodies (e.g., American Society for Testing and Materials).

2.2.2 Sampling Method Description

All samples must be collected according to the requirements within Cal. Code of Regs., tit. 17, § 7961 ([Appendix A, Table 3](#)). The protocol(s) that will be employed by a project must be identified within the approved QAPP for each local agency, as stated in the Executed Agreement. The QAPP must include descriptions of sample collection techniques, the sampling schedule, parameters sampled, testing methods used, units the results are reported in, and other information as appropriate.

2.2.3 Sampling Method Regulatory Requirements

Cal. Code of Regs., tit. 17, § 7961 ([Appendix A, Table 3](#)) provides minimum requirements for on-site sampling procedures that are specific to the program objective for the Beach Program. During the sampling process, a local agency staff member or contractor must conduct bacteriological sampling by visiting the designated beach location and collecting water in ankle- to knee-deep water, approximately 4 to 24 inches below the water surface. In the event of a release of untreated sewage, the affected area must be sampled again and closed or restricted by the PD. These procedures

must be incorporated into the established sampling methods within the local agency's QAPP selected by the local agency.

2.2.4 Sample Collection Requirements

Sampling requirements will be described in each local agency's QAPP. However, sampling shall follow these minimum requirements:

- Samples will be collected in sterilized containers;
- Samples are to be taken with the technician wearing gloves or using a sampling stick;
- Extreme care must be taken to avoid contaminating the sample and sample container;
- Do not remove bottle covering and closure until just prior to obtaining each sample;
- Do not touch the inside of the sample container;
- Do not rinse the sample container;
- Do not put caps on the ground while sampling; and
- Do not transport the samples with other environmental samples.

2.3 Sample Handling and Custody

2.3.1 Sample Handling and Custody Program Policy

All samples collected for Beach Program projects must follow Beach Program QA program-defined requirements for sampling containers, holding time, and sample custody. Recommendations for sample containers, sample preservative, and holding time are detailed in the following subsections and were drawn from sample handling requirements in 40 C.F.R. § 136.

2.3.2 Sample Handling and Custody Deviations

Any sample handling and custody information that deviates from the Beach Program Sample Handling requirements shall be approved by the State Water Board QA Officer and PM. Upon approval, the deviation shall be described within the local agency's QAPP.

2.3.3 Sample Handling and Custody Requirements

Sample Labelling and Handling

All sample containers must be clearly labeled with the sampling location, collection date and time, and name of collector. All labels should be made in indelible ink and coincide with sample information on the field form and chain-of-custody form (refer to [Chain-of-Custody](#)). Within 15 minutes after collection, sample containers will be checked for integrity (e.g., lids are tightened, no leakage is occurring). All samples must be sealed and transported from the sample point to the laboratory for analysis after sampling.

Field personnel shall place samples into coolers with wet ice to maintain a temperature of <10°C for transport to laboratory. Insulated containers, such as plastic or Styrofoam coolers, are preferable to ensure proper maintenance of storage temperature. Samples shall be stored in a manner in which the caps are not exposed directly to or submerged in water. To keep sample containers dry, place containers in a waterproof storage bag and then place in cooler.

Samples shall be submitted to the appropriate laboratories under chain-of-custody within the required holding time and sampling handling conditions (refer to Table 6 below). Upon delivery of samples to the laboratory, the temperature and integrity of the samples must be checked. Laboratories shall store and process samples within the appropriate holding time, handling, and methodology requirements. If a sample is contaminated in any way, this information shall be noted on the chain-of-custody form and the sample must not be analyzed.

Table 6. Sampling Handling: Indicator Bacteria for Fresh Water

Recommended Container	Recommended Preservation	Required Holding Time¹
125-mL sterile plastic (high density polyethylene, polystyrene, or polypropylene) container	Cool to ≤10°C	8 hours

¹ “Required Holding Time” assumes that the “Recommended Preservation” (or a method-mandated alternative) has been employed.

Sampling Containers

Recommendations on the type and size of sample containers are provided in Table 6 above. Factory-sealed, pre-sterilized, disposable whirlpak bags are not recommended but an allowable container for the Beach Program. If a local agency chooses to use these bags, the PM and State Water Board QA Officer shall be notified. Local agencies may use the recommended list of sample containers or choose a container that is equivalent to those listed. Any plastic container that is made of a sterilizable material (i.e., polypropylene or other autoclavable plastic) may be used. Sampling containers must be clean and sterilized prior to use to avoid contamination. Records of conformance for sterile sample containers should be maintained on a timeline consistent with the records retention policy or until data are verified by the State Water Board in case the data are investigated for possible sources of contamination.

At no time shall field or sampling personnel use a non-standard or inappropriate sampling container. If a laboratory receives a sample in an inappropriate container, the sample must not be analyzed.

Holding Times

Required holding times are drawn from information published in 40 C.F.R. § 136.3; Table II to promote comparability with other federal and state monitoring activities. Holding times are detailed in Table 6 above. Sample analysis should begin as soon as possible after receipt, with a holding time of no more than eight hours for compliance monitoring. Required holding times for sample analysis begin at the time of sample collection and conclude when sample analysis is initiated.

Field, sampling, and laboratory staff should not hold samples longer than the determined time limit between collection and initiation of analysis. If that holding time is exceeded, the laboratory must not analyze the samples. All samples not analyzed within the 8-hour compliance holding time shall be noted on the chain-of-custody form.

Chain-of-Custody

Documentation of the chain-of-custody is required for all samples collected for the Beach Program. The chain-of-custody begins at the sample collection site and ends when the sample is disposed. The chain-of-custody form will travel with the samples from the field to the laboratory. Field and sampling staff will have exclusive custody of any sample from the time of collection until the sample is deposited with the laboratory.

The minimum requirements for a chain-of-custody form are set by the U.S. EPA's [National Beach Guidance and Required Performance Criteria for Grants](#). These include the sampling location, time of collection, date of collection, collector's name and signature, agency, laboratory to which the samples were delivered or sent, and other notes or comments. The chain-of-custody form required for the Beach Program can be found in [Appendix E](#).

The laboratory will assume custody of each sample it receives and is responsible for forwarding all sample analysis results to the PD within 24 to 48 hours of completion of analyses. If the laboratory receives samples without proper chain-of-custody documentation, samples must not be analyzed.

2.4 Constraints

Variability should be considered when developing a monitoring program. This section provides information on the types of variability that can affect Beach Program implementation projects, and recommended and corrective actions as discussed in [U.S. EPA's National Beach Guidance and Required Performance for Grants](#).

2.4.1 Natural Variability

Bacteria densities in water samples are highly variable across time and location. Variations with time scales on the order of minutes are important because such considerations influence the number of samples needed to accurately characterize

microbial water quality and the confidence with which to ascribe the results. Variations with time scales on the order of tens of minutes are important because they have the same time scale as that of typical recreational use episodes. Variations with time scales on the order of a day are important because knowledge of them allows comparison between samples taken at different times of the day or between samples taken on successive days. Temporal variability can also be caused by both environmental and meteorological parameters such as sunlight intensity and temperature (U.S. EPA, 2010).

Low tides are associated in most cases with higher bacteria densities at coastal sites. The association is typically a result of increased freshwater input to estuarine and coastal locations during low tide, given the direction of water flow. Approaches for accounting for low tide should include sampling with regard to tidal cycles and sampling at low tide or the portion of the tidal cycle during which bacteria density is highest.

Variation in bacteria densities is one of the main challenges when designing effective monitoring programs and interpreting sampling results. The local agency's monitoring projects should address these challenges within their respective QAPP when establishing the monitoring design and collection procedures, including sampling time, location, and sample depth.

2.4.2 Rain Advisories

Bacteria density can increase by several orders of magnitude during a single rainfall event and continue for a period up to three days. Bacteria loading varies significantly during rain events and is related to rainfall intensity and duration, total rainfall amount, and antecedent rainfall patterns. Rain advisories can be used as pre-emptive warnings that people should avoid swimming in ocean waters during a rain event and for three days after rainfall ceases. Rain advisories can be issued via county hotlines, newspapers, and radio. The U.S. EPA recommends the development of a protocol for a variety of rain events, considering local circumstances and evaluate whether additional monitoring or a formal protocol for preemptive advisories without confirmatory sampling results is appropriate. The local agencies shall identify ways to address rain advisories within their respective QAPP.

If conditions are unsafe for sampling due to a heavy rain event, local agencies report the lack of sampling that occurred to the PM and report it in the Quarterly Progress Report, as required in the local agency's grant agreement.

2.4.3 Accessibility

Although the Beach Program requires weekly seasonal monitoring, if sampling conditions are unsafe, a local agency can forgo sampling. If this occurs during the required monitoring season, the PD must provide details about missed samples through the grant reporting process. Further details can be found within the Executed

Agreement, under the Beach Monitoring and Analytical Testing section, which requires the local agencies to collect samples on a weekly basis between April 1 and October 31 unless sampling would be unsafe.

2.5 Analytical Methods

2.5.1 Analytical Methods Program Policy

Any methodology used for the Beach Program must support the intended use of the data. The analytical methods used for the Beach Program must be approved under CWA § 304(h) and published in [40 C.F.R. § 136.3 \(Table IH\)](#) for analysis of enterococcus, fecal coliform, and total coliform in ambient waters.

2.5.2 Analytical Methods Selection

All analytical methods employed by a project must be identified within the local agency's QAPP.

2.5.3 Analytical Method Regulatory Requirements

ELAP Requirements

All analyses shall be performed by laboratories holding ELAP accreditation for the analyses performed for the Beach Program. As per [Cal. Code of Regs., tit. 22, § 64802.05](#), the laboratories must comply with quality system requirements and develop and implement a QA program in order to receive accreditation. Refer to [Laboratory Analyses](#) for more information regarding ELAP accreditation.

Method Modifications

Any modification of an approved method must be identified as an allowable modification as described in 40 C.F.R. § 136.6. A laboratory using an allowable modification must demonstrate and document method performance that meets or exceeds performance of the approved method in the matrix to which it will be applied.

If a laboratory modifies a method in a manner that is not allowable in 40 C.F.R. § 136.6, then the laboratory must receive approval from the U.S. EPA through the CWA Alternative Test Procedure (ATP) program. The ATP program and requirements are described in 40 C.F.R. § 136.4. Through the ATP program, a laboratory can apply for the review of a method modification or a new method.

Nationwide Use of Alternative Methods

In accordance with 40 C.F.R. § 136.4, a local agency may submit a written application to the U.S. EPA to use an ATP for nationwide use. The application must identify the pollutant(s) or parameter(s) the ATP is being requested for, provide a detailed description of the proposed ATP and references confirming the general applicability,

and compare data for the performance of the proposed ATP compared to the performance of the reference method.

If accepted by the U.S. EPA, the National ATP Coordinator will notify the Regional ATP Coordinators that they may consider approval of the ATP for limited use in their regions based on the information and data provided in the application until the alternate test procedure is approved by publication in a final rule in the Federal Register. If not recommended for approval, the National ATP Coordinator may specify what additional information might lead to a reconsideration of the application and notify the Regional ATP Coordinators of the disapproval recommendation.

Limited Use of Alternative Methods

In accordance with 40 C.F.R. § 136.5, a local agency may apply to use an ATP in the region. The Regional ATP Coordinator may approve the ATP restricted to use only with respect to a specific discharge or facility, or to all dischargers or facilities specified in the approval for the Region.

The State Water Board QA Officer is designated as the State ATP Coordinator for California. All applications for a limited use ATP must be submitted to the State Water Board QA Officer prior to contact with the Regional ATP Coordinator. If the State Water Board QA Officer deems the application necessary for State Water Board needs, then the application will be forwarded to the Regional ATP Coordinator for review.

If the application is not approved by the Regional ATP Coordinator, the Regional ATP Coordinator shall specify what additional information might lead to reconsideration of the application.

Pilot Study in San Diego County

The U.S. EPA Region 9 approved the use of the digital droplet Polymerase Chain Reaction (ddPCR) method for beach water quality monitoring under the U.S. EPA's BEACH Program in San Diego County as a pilot program for California. The ddPCR method is used by San Diego County to provide same-day notice of elevated bacteria at beaches in lieu of using the IDEXX Enterolert method. Consistent with the requirements in Health and Safety Code § 115880(d), San Diego County demonstrated that ddPCR can be used to reliably determine levels of enterococci bacteria as an indication of overall microbiological fecal contamination conditions for coastal beaches in San Diego County. This method cannot be used for regional or state use unless it goes through the ATP process, as described above.

2.6 Quality Control and Performance Criteria

All data submitted for the Beach Program must contain defined QC data that address the defined data quality indicators (precision, accuracy, sensitivity and resolution,

representativeness, comparability, and completeness) to assess the usability of the data for their intended purpose.

2.6.1 Minimum QC Requirements

The laboratory must follow the QC acceptance criteria outlined in the [Measurement Quality Objectives](#) section unless the method specifies more stringent requirements.

Local agencies may develop custom QC requirements and performance criteria where no other programmatic requirements are available, or where more stringent QC is required for the intended data use. These requirements must be documented within the local agency's approved QAPP.

All laboratory personnel will adhere to current and generally accepted practices for safe handling, testing of samples, and chain-of-custody measures. Information on the proper use of the required equipment, decontamination, and calibration is contained in vendor and instrumentation protocols. Field and laboratory personnel are responsible for responding to failures in sampling and measurement systems. If monitoring equipment fails, failing equipment shall be replaced or repaired prior to subsequent sampling events. If analytical equipment fails or quality check samples fall outside of acceptability limits, personnel are to record the problem according to their documentation protocols and take necessary corrective actions to correct and resolve the issue. Refer to for more information.

Sterility Check

Sterility checks are performed to evaluate if viable microorganisms are present and can grow on equipment or sample containers that were used for the analysis, which would indicate a source of contamination (bias) for the analysis. The specific type and number of sterility checks are method-dependent. For example, membrane filter tests require the testing of filters for sterility, while multiple-tube procedures do not. For all methodologies, there should be no growth associated with the sterility check conducted. Refer to Table 5 under [Measurement Quality Objectives](#) for information regarding the frequency of analysis by procedure.

Laboratory Controls

A laboratory control sample is used to assess precision and bias, ensure proper performance, and establish the baseline of growth to compare test results. Each approved methodology provides suggested control cultures for microbiological tests.

The laboratory control sample shall be analyzed using the same preparation, reagents, and analytical methods employed for field samples. The frequency of analysis is method-dependent (refer to Table 5 under [Measurement Quality Objectives](#)). For positive controls, there should be a positive response while, for negative controls, there should be a negative response. Deviations from the applicable MQOs shall be reported

and flagged, as applicable. Corrective actions shall be employed, where applicable (refer to [Corrective Action](#)).

Positive Control

A positive control is a sample spiked with known presence of a target analyte, used to determine a laboratory can detect analytes when they are present. Refer to Table 5 under [Measurement Quality Objectives](#) for information regarding the frequency of analysis.

Negative Control

A negative control is a sample using the same preparation, reagents, and analytical methods employed for field samples without the target analyte to determine if a laboratory detects the target analyte when it is not present. Refer to Table 5 under [Measurement Quality Objectives](#) for information regarding the frequency of analysis.

Laboratory Duplicate

A laboratory duplicate is an analysis or measurement of the target analyte(s) performed identically on two sub-samples of the same sample, usually taken from the same container. The results from laboratory duplicate analyses are used to evaluate analytical or measurement precision, and include variability associated with sub-sampling and the matrix (not the precision of field sampling, preservation, or storage internal to the laboratory). Refer to Table 5 under [Measurement Quality Objectives](#) for information regarding the frequency of analysis.

Any laboratory duplicate, such as an un-spiked environmental laboratory duplicate or a laboratory control spike duplicate, may function as a laboratory duplicate in any batch. The method for determining precision is method-dependent. A laboratory duplicate shall be analyzed once per 10 samples or once per analytical batch, whichever is more frequent.

Determining Precision

Colony Forming Unit

In order to determine laboratory precision for bacterial analysis for analytical methods quantifying Colony Forming Units (CFUs), the following procedure (adapted from Standard Methods 9020 Section 8.b) will be used.

The results from the preceding 15 positive samples are used to calculate a running mean. The results used to calculate the running mean must all correspond to the same QC parameter, in this instance laboratory duplicates (as opposed to field duplicates). The results of different QC parameters such as laboratory and field duplicates must not both be used to calculate a single running mean. Note: Field duplicates are not a current Beach Program requirement and not recommended for microbiological analyses (refer to Table 6).

Step 1

Record the results from duplicate analyses (these results are here designated as D_1 and D_2).

Step 2

Calculate the logarithm (here designated as L_1 and L_2) of each duplicate result. Note: if either of the values D_1 or D_2 are less than 1, add 1 to both values before calculating the logarithms.

$$L_1 = \log D_1$$

$$L_2 = \log D_2$$

Step 3

Calculate the range of logarithms ($R_{\log}$) for each pair of duplicates. $R_{\log}$ is equal to the absolute value of the difference between the two numbers.

$$R_{\log} = |L_1 - L_2|$$

Step 4

Calculate the mean of $R_{\log}$ for the duplicates analyzed.

$$\sum \frac{R_{\log}}{n}$$

Where,

$\sum \frac{R_{\log}}{n}$ = the sum of the ranges of logarithms calculated for each pair of duplicates
 n = the number of pairs of duplicates (in this case, $n = 15$)

Step 5

Assess the precision of the duplicate analyses. In order for the laboratory to demonstrate an acceptable level of precision, the range of logarithms for a particular duplicate must be less than the mean of the range of logarithms multiplied by 3.27.

Most Probable Number

The maximum level of precision for the Most Probable Number (MPN) is limited to that which is achievable through the combination of tubes and dilution ratios employed. In order to determine laboratory precision for bacterial analysis using analytical methods quantifying the MPN, the laboratory will calculate the relative percent difference (RPD).

$$RPD = \left(\frac{C_{sample} - C_{duplicate}}{mean} \right) * 100$$

Where,

C_{sample} = the concentration of the original sample
 $C_{duplicate}$ = the concentration of the duplicate sample
 $mean$ = the mean concentration of both samples

Laboratory Blank

A laboratory blank is free from the target analyte(s) and is used to represent the environmental sample matrix as closely as possible. Contamination that may be introduced during sample handling, preparation, or analysis can be monitored and bias can be determined with the use of laboratory blanks.

Analysis and reporting of laboratory blanks are required only when samples are diluted prior to analysis. If samples are not diluted in the sample batch, laboratory blanks are not required for that specific sample batch. At least one blank per analytical batch must be used and there should be no growth or positive detection. A laboratory blank shall be analyzed once per 10 samples or once per analytical batch, whichever is more frequent.

2.6.1 Minimum Detection Limit

The detection limits (i.e. sensitivity) of the analytical methods used to produce data for the Beach Program are important to understand and control, to ensure the sensitivity of the analyses meet program needs. To conform with the data management standards of the State Water Board, data submitted to BeachWatch are required to include the Minimum Detection Limit (MDL) of the analytical method used to produce each sampling result. However, the MDL procedure is not applicable to methods that do not produce results with a continuous distribution, such as microbiological methods that involve counting colony forming units (CFU) or determining most probable number (MPN), which are the most widely used methods that are approved for use in the Beach Program. Therefore, the MDL field in BeachWatch shall be populated with the sensitivity limitation of the CFU or MPN technique used for the analysis. For example, the sensitivity limitations for the IDEXX Quanti-Tray for total coliform is 1.0 MPN, therefore the MDL would be populated with 1.0.

Methods that use polymerase chain reaction (PCR)-based technologies can determine a detection limit (or limit of detection) using a dilution of a reference material and measuring recovery of the replicates of each dilution. This detection limit shall be populated in the MDL field.

2.6.2 Reporting Limit

For most microbiological methods, the quantification capabilities (reporting limit) and the detection capabilities (detection limit) of the analytical method are not distinguishable and do not represent separate performance thresholds of the analysis. However, in BeachWatch, a reporting limit (RL) for the analytical method used to produce data is required for each sample result. For data produced from CFU and MPN methodologies, the RL and the MDL shall be populated with the same value. For example, the sensitivity limitations for the IDEXX Quanti-Tray for total coliform is 1.0 MPN, therefore the RL would be populated with 1.0.

For PCR-based methods, the quantification capabilities and the detection capabilities of the analytical method do represent different performance thresholds for the analysis. The limit of qualification for these analyses shall be populated in the RL field.

2.6.3 Laboratory Instrument/Equipment Inspection and Maintenance

Information regarding the maintenance of analytical instruments and equipment, including maintenance schedules and documentation procedures used by laboratories, shall be detailed in the laboratory's QA manual. Information about the instrument and equipment maintenance shall be provided to the State Water Board Quality Assurance Officer upon request.

2.6.4 Laboratory Instrument Calibration and Frequency

For certain analytical techniques used by the laboratory, calibration of the instrument used is necessary. Calibration frequency needed to maintain data quality may vary by instrument and/or manufacturer. Factory-recommended calibration procedures and schedules shall be followed. All calibration schedules shall be detailed in the laboratory's QA manual. Information about the calibration results and frequency shall be provided to the State Water Board upon request.

2.6.5 Inspection/Acceptance of Supplies and Consumables

Information about acceptance criteria for supplies and consumables is contained within the laboratory's QA program. Laboratories and field personnel will determine that all supplies and consumables used for sample collection, preparation, and analysis comply with acceptance criteria outlined in their QA manuals or SOPs prior to conducting analyses or collecting samples.

All materials must be visually inspected upon receipt to assure that they are undamaged, in clean condition, and conform to what is listed on the packing invoice. The materials and equipment are also compared to the type and model listed on the purchase order. Sample containers provided by a laboratory will be analyte-free or demonstrated not to contain contaminants for the analytes being monitored.

Certificates of conformance identifying that sample containers have been properly sterilized must be maintained for all sample containers used for this program.

2.6.6 Data Management

All data and observations taken in the field shall be entered or transferred into the applicable standardized data template or database maintained by the local agencies. Local agencies are responsible for primary verification of the data to ensure accurate and complete data collected in the field. Local agencies shall maintain and store all hardcopy and electronic field sheets and calibration logs per the time frames within the applicable contract to which the sample was collected. Electronic scans or photocopies of those records shall be made available to the State Water Board Quality Assurance Officer and PM upon request.

Laboratories shall receive samples under chain-of-custody, and store and process samples within the appropriate holding time, handling, and methodology requirements. Laboratories shall maintain and store all hardcopy and electronic laboratory reports, bench sheets, calibration logs, and chain-of-custody forms per the time frames within the applicable contract to which the sample was received (refer to [Program Records](#)). Electronic scans or photocopies of those records shall be made available to the State Water Board upon request.

All data will be reported electronically to the Beach Program through the program's database, BeachWatch, which stores pertinent information about each participating beach and is maintained by State Water Board staff within DWQ and DIT. BeachWatch contains structures, minimum data elements, and standardized vocabulary that are compatible with the State Water Board's CEDEN and U.S. EPA's BEACON data system. Appropriate user instructions and system documentation are available to all individuals with BeachWatch credentials upon logging in. A system of QC checks will be performed to assure that all data are accurately entered into any data storage system (e.g., negative results or zeros).

3. Data Verification, Validation, Completeness and Assessment

All Beach Program data are required to undergo review and evaluation to ensure that the data conform to the Beach Program and project-specific criteria within the Program Plan or QAPP, as applicable. Additionally, data must be assessed to determine usability and support for the intended uses of the data. Review of data consists of four discrete processes: verification, validation, completeness, and assessment.

At present, the Beach Program has inadequate verification, validation, completeness, or assessment processes to ensure the quality of data produced for the program. This problem was identified in a management review of the Beach Program and will be further addressed during Phase 3 of the development of the Program Plan and as described in the Data Quality Assurance Goals ([Appendix C](#)). The following sections

include the current verification, validation, completeness, and assessment processes, as well as those that will be implemented in Phase 3.

3.1 Data Verification

Data verification is the process of evaluating the correctness, consistency, conformance, and completeness of a specific data set against the original records, methods or procedures, format requirements, and contractual requirements. The data will be reviewed to ensure that all data collected have been reported and done so accurately. Verification applies to all aspects of the data generation, from site visitation to analytical results submission (U.S. EPA, 2002). Verification in the Beach Program will take place at two levels: by the original data producers and at a secondary level by the PM or Technical Contact.

3.1.1 Primary Data Verification

Verification is part of the routine processes of field, sampling, laboratory, and local agency staff. Field sheets, chain-of-custody forms, laboratory logs, and information systems shall be checked on a daily basis to ensure accurate and complete information throughout a sample's collection, transport, and processing. Local agencies are responsible for ensuring that all data are entered accurately and completely into BeachWatch.

Field and Laboratory

Sample information and requested analyses are entered into chain-of-custody forms by the field staff. Field personnel shall ensure that the information entered on field sheets is accurate and complete prior to transferring custody of the samples to the laboratory.

Laboratory personnel must review the field data entry records against the original field sheets to detect and correct typographical errors. Additionally, the laboratory personnel must verify that the correct result qualifier and QA codes are applied to the results, where applicable (refer to [Appendix D](#)). Additionally, field and laboratory personnel are responsible for ensuring that sampling holding time requirements are followed or labeled with the appropriate QA code if hold times are exceeded or samples are received in an improperly stored or preserved state.

Laboratory personnel are responsible for determining acceptance criteria for reviewing laboratory reports regarding sample management, integrity, and preservation, as well as reported measurements or values, dilutions, and units. Each laboratory will perform checks of all records at a frequency that the laboratory determined in their laboratory quality manual.

Local Agency

Local agencies are responsible for checking all data are entered accurately and completely into the BeachWatch data entry template and entered into BeachWatch. Data are entered using the Business Rules ([Appendix D](#)) for data reporting and formatting. At a minimum, the data verification procedures shall include:

- Verifying results against original sample collection records
- Verifying laboratory reports against analysis results
- Verifying sample processing and analysis information against the requirements outlined in this Program Plan
- Verifying environmental and QC sample results against the MQOs outlined in this Program Plan
- Verifying no duplicated data exist in the dataset
- Verifying all required fields are completed
- Verifying appropriate QA codes are applied

QA Codes

QA codes pertain to improper sample handling, collection, and analysis. A list of QA codes and their descriptions can be found in the Business Rules ([Appendix D](#)) for the Beach Program as well as a list of acceptable QA code combinations.

3.1.2 Secondary Data Verification

The PM and Technical Contact perform secondary verification of all data submitted to BeachWatch on a quarterly basis during invoice review to determine completeness of data. This includes checking for negative results and weekly results for all bacteria indicators uploaded. However, the State Water Board will establish procedures or an automated process to verify data submitted to BeachWatch by local agencies.

Potential data issues discovered during secondary verification may be communicated back to the local agency for additional follow-up or Corrective Action Report (refer to [Corrective Action](#)).

BeachWatch Verification

Manual Verification

The PM and Technical Contact will review all of the electronic data against the MQOs, assure proper business rules were followed, and highlight outlier and/or nonsensical data values in an excel-exported document of the data for additional verification by the local agencies. The data set is verified for completeness, meeting program MQOs, and adhering to sample holding time requirements of the Beach Program.

Automatic Verification

Within the data upload template local agencies will use to submit data to BeachWatch, controlled vocabulary lists will be used to verify appropriate values are being entered into BeachWatch. Filters and logic rules will be used within BeachWatch to ensure accurate data entry. Upon submission of the data upload template to BeachWatch, data shall be checked through an automatic system for duplicate entries, blank entries, and population of the required fields such as analytical method and unit combinations, as well as verifying qualifier, and station code.

System controls are in place to ensure future dates (upon the user logging into BeachWatch) will not be accepted into BeachWatch. Additionally, a system control will ensure the analysis date is on or after the sample date.

During Phase 3 of the development of the Program Plan, BeachWatch will be updated to automatically add appropriate QA codes to results if they were not applied by the local agency.

BEACON Verification

Using the Manual Data Verification Guide for data in BEACON, the PM and Technical Contact verify:

- Beach attributes are correct (i.e., beach length, tier, and reporting frequency)
- Pollution sources are entered for each exceedance by the local agency
- Advisories and closures are included and there are no duplicates
- Monitoring data is correct

3.1.3 Data Completeness Review

The data completeness review is the process by which Beach Program data are reviewed by the local agencies, as well as the PM and Technical Contact, to ensure that all data that were expected to be collected are present within the data system. Completeness evaluations ensure program requirements for data generation and reporting are met by contributing projects. This can be achieved by querying the project data and conducting a large-scale review using the MQOs and requirements within the local agency's grant agreement.

If gaps in data completeness are identified by the local agencies, PM, or Technical Contact, the local agencies must document information regarding missing data and submit it to the State Water Board.

3.2 Data Validation

Validation applies to all activities in the field as well as in the analytical laboratory (U.S. EPA, 2002). Data validation is the process by which the environmental data are assessed for potential bias and flagged accordingly to alert the data user to potential

issues that will affect usability. The PM and Technical Contact will review all submitted Corrective Action Reports (refer to [Corrective Action](#)). Currently, BeachWatch will not allow any unacceptable values, including those discussed in the previous subsections.

As part of Phase 3 of the development of the Program Plan and as described in the Data Quality Assurance Goals ([Appendix C](#)), the State Water Board will further refine the data verification and validation procedures. This will include further establishing automatic evaluation of data at the result level in reference to the project data quality indicators, MQOs, and the associated QC metadata check to determine the appropriate data and batch qualifiers. This will require database infrastructure changes to include capabilities to check and qualify data that exceed program acceptance criteria. The qualifiers will follow the data management principles of the State Water Board and will be consistent with the Beach Program data management business rules. For example, BeachWatch will flag data values that are outside of the quantification ranges of the methods (e.g., exceedances in enterococci levels). When errors or questionable results are detected, BeachWatch will provide a prompt, which will require the local agency submitting data to address the error and take the appropriate corrective action before the data may be uploaded.

3.3 Corrective Action

Corrective action(s) describe steps that must be taken when results do not meet acceptance criteria (U.S. EPA, 2003). Unacceptable results often highlight an issue that warrants an investigation and corrective actions must be taken prior to reporting results. The corrective actions are divided into categories based on the type of work performed (e.g., testing laboratory activities, field activities) and the involved QC sample type (e.g., field blanks, laboratory blanks). A list of potential corrective actions can be found in Table 7, below.

Table 7. Corrective Action: Indicator Bacteria in Fresh Water

Laboratory Quality Control	Corrective Action
Sterility Check	Identify the contamination source and take appropriate action; discard membrane filter/pad or prepared media lot; discard sample results if positive sterility checks occurred during analysis
Laboratory Positive Control	Identify the cause and take appropriate action; discard prepared media and remake from start or purchase new lot
Laboratory Negative Control	Identify the cause or contamination source and take appropriate action; discard prepared media and remake from start or purchase new lot

Dilution Control	Identify the cause or contamination source and take appropriate action; qualify data as needed
Laboratory Duplicate	Verify the results; qualify data as needed
Laboratory Blank	Identify contamination source and take appropriate action; qualify data as needed

Local agencies are required to submit a Corrective Action Report identifying the corrective action(s) taken as a component of their quarterly progress reports to the State Water Board (refer to [Appendix F](#) for the Beach Program Corrective Action Report template). A Corrective Action Report is a report developed in response to an incident of non-conformance at any stage of data collection, from site visitation to sample analysis. These reports are to be filled out by field and laboratory personnel when a deviation from standard or required protocol has occurred. Corrective actions include investigation, action, review, and further action if so required. Information required within a Corrective Action Report include:

- Deficiency Identification
- Problem Type
- Problem Description
- Proposed Corrective Action
- Corrective Action Information
- Resolution Date
- Corrective Action Outcome(s)
- Compliance Review and Approval

3.3.1 Field Corrective Action

The field personnel are responsible for responding to failures in sampling and field management systems. If monitoring equipment fails, personnel are to record the problem according to their documentation protocols and go through the necessary root-cause investigation and take the appropriate corrective actions to resolve the issue. Failing equipment shall be replaced or repaired prior to subsequent sampling events. It is the combined responsibility of all members of the field personnel to determine if the performance requirements of the specific sampling method have been met, and to collect additional samples if necessary. Associated data are entered into a Corrective Action Report and submitted to the State Water Board.

3.3.2 Laboratory Corrective Action

The laboratory is responsible for responding to failures in their measurement systems. If analytical equipment fails or quality check samples fall outside of acceptability limits,

personnel are to record the problem according to the documentation protocols in the Quality Manual and go through the necessary root-cause investigation and take the appropriate corrective actions to resolve the issue. Data should be qualified accordingly, if the data are not within the acceptance criteria or deviates from the analytical procedures it will result in data quality concerns. Associated data are entered into a Corrective Action Report and submitted to the State Water Board.

3.5 Assessment

Data quality assessment is used to determine the usability of the generated data by evaluating all aspects of data generation (U.S. EPA, 2012). It is the scientific and statistical evaluation of environmental data to determine if they meet the MQOs, and thus are the right type, quality, and quantity to support their intended use. It uses the results of the verification and validation steps in conjunction with verification that the measurement systems were performed in accordance with the criteria specified in this Program Plan to determine overall data usability. Then the statistical component of data quality assessment completes the data life cycle by providing the evaluation needed to determine if the performance and acceptance criteria in the MQOs were achieved. The data quality assessment involves five steps:

- Reviewing MQOs and sampling design
- Conducting preliminary data review
- Selecting the statistical method
- Verifying assumptions of the method
- Drawing conclusions from the data

The five steps are described in detail in the U.S. EPA's [Guidance for Data Quality Assessment: Practical Methods for Data Analysis](#) and [Data Quality Assessment: A Reviewer's Guide](#). As a part of Phase 3 of the development of the Program Plan and as described in the Data Quality Assurance Goals ([Appendix C](#)), the assessment steps described above will be further established for the Beach Program.

The State Water Board alongside local agencies, advisory groups, and the U.S. EPA, will conduct an annual review of planning documentation. They will also conduct a preliminary data review to identify patterns, relationships, and potential anomalies. If there are problems with data quality or the program design collects insufficient data, this Program Plan and local agency QAPPs will be updated to address these problems.

3.5.1 Program

The program is periodically assessed to ensure that local agencies can continue work within the constraints of the grant agreement, grant allotment, and regulatory requirements. In 2022, two surveys were conducted to gather information about each local agency's programmatic structure, reporting practices, and the funding necessary to achieve the objectives of the program. In May of 2022, funding survey responses

were received and provided information about each agency's expenses for personnel, travel, supplies, laboratory analysis, and other activities. Subsequently, a survey in June 2022 provided more information about how agencies report data in BeachWatch, providing a basis of understanding for the development of quality assurance practices. Survey responses and programmatic information are saved for future use to improve the functionality of the program and advocate for additional funding to support new and improved methods for water quality monitoring.

Appendix A. Related Regulations to the Management of the Beach Program

Table 1. Assembly and Senate Bills

Regulations	Year	Description
<u>AB411</u>	1997	Amended Sections 115880, 115885, and 115915 of the Health and Safety Code, relating to public beaches
<u>AB1946</u>	2000	Revised the survey requirements to instead require each local health officer to submit to the board, on or before the 15th day of each month, a survey including certain information and documenting all beach postings and closures resulting from failure of a beach to meet the bacteriological standards specified above
<u>AB1876</u>	2004	- Added public beaches located in the San Francisco Bay area - Weekly testing for bacteriological contamination must occur at beaches visited by 15,000 people annually and location in an area adjacent to a creek-mouth, stream-mouth, or storm drain outfall - Allows reduction of monitoring frequency if testing, over two years, shows microbiological contaminant levels did not exceed minimum - Requires multilingual signs warning of contamination in multilingual areas and must be posted at storm water outflows where they empty onto beach
<u>AB2701</u>	2005	Repealed the revisions from AB1946
<u>SB482</u>	2012	Revised the Title 17 CCR Section 7962 requirement and transferred responsibility from California Department of Public Health to the State Water Board

Table 2. Health and Safety Code

Section	Description
115880	- Requires weekly testing April through October of beaches visited by more than 50,000 people annually and located adjacent to a storm drain that flows in the dry weather for total coliform, fecal coliform, and enterococci bacteria - Establishes protective minimum standards for bacteria indicators
115881	States the State Water Board is responsible for establishing and reviewing monitoring protocols, site locations, and monitoring frequencies, identifying options for funding, and any duty imposed upon a local public officer or agency pursuant to Section 115880

	and 115881 shall be mandatory only during a fiscal year in which the California Legislature has appropriated sufficient funds
115885	Local agencies are required to comply with established standards, investigate any complaint of a violation, establish a telephone hotline to inform the public, and report any violation. They may also restrict the use of, or close, the public beach or portion where the violation occurred until the standard is met
115890	Requires a notice of violation to be provided to the owner, or person or agency in charge of the affected beach
115895	A violation by a private person is considered a misdemeanor
115910	- Requires health officers submit a survey documenting all beach postings and closures - Information on beach closures and suspected sources of contamination that caused the closure will be made available to the public by the State Water Board - The State Water Board must keep an updated site of beach postings and closures data provided by the local agencies
115915	- Whenever a public beach fails to meet bacteriological standards, post the public beach with conspicuous warning signs to inform the public of the nature of the problem and possibility of risk to public health - Warning signs must be visible from each primary access point, identified in Section 30531 of the Public Resources Code, and any additional access point identified by the local agency

Table 3. CCR Title 17

Section	Description
7958	- The minimum bacteriological standards for single samples are: 1,000 total coliform bacteria per 100 mL, if the ratio of fecal/total coliform bacteria exceeds 0.1 10,000 total coliform bacteria per 100 mL 104 fecal coliform bacteria per 100 mL - The minimum bacteriological standards for mean of the logarithms of the results of at least five weekly samples during any 30-day sampling period: 1,000 total coliform bacteria per 100 mL 200 fecal coliform bacteria per 100 mL 35 enterococcus bacteria per 100 mL - Bacteriological analysis must be done by a laboratory certified by the Environmental Laboratory Accreditation Program to perform testing for the purposes of environmental monitoring in California

7959	• Sampling stations designated by a Regional Water Quality Control Board must collect samples at frequencies specified by waste discharge requirements • Local health officers are responsible for proper collection and analysis of water samples and can determine sampling stations outside the designated by the Regional Water Quality Control Board
7960	• Requires corrective action if set standards are not met • Requires local health officer or agency may close, post with warning signs, or restrict use of the public beach until corrective action has been taken and the standard is met
7961	• Requires weekly testing from April 1 to October 31 of beaches visited by more than 50,000 people annually and located adjacent to a storm drain that flows in the dry weather • Samples must be taken in ankle- to knee-deep water, approximately 4 to 24 inches below the water surface • If testing reveals waters adjacent to a public beach fail to meet standards, the local health officer must post the beach and use the standards to determine if use restrictions or closure is necessary • In the event of a known release of untreated sewage into waters adjacent to a public beach, the local health officer must: ○ Immediately post and close the beach until the source of sewage release is eliminated ○ Sample affected waters ○ Continue closure or restriction of the beach until standards are met
7962	• All duties of the local health officer or agency are mandatory “only during a fiscal year in which the Legislature has appropriated sufficient funds, as determined by the State Director of Health Services, in the annual Budget Act or otherwise for local agencies to cover the costs to those agencies associated with performance of these duties.”

Appendix B. Designated Beaches, Stations, & Locations within each County/City associated with the Beach Program

County/City	Beach Name	Station Name	Latitude	Longitude
East Bay	Crown Beach (Alameda Co)	Crown 2001 Shoreline Dr.	37.757306	-122.259216
East Bay	Crown Beach (Alameda Co)	Crown Bath House	37.765825	-122.27506
East Bay	Crown Beach (Alameda Co)	Crown Bird Sanctuary	37.754289	-122.251743
East Bay	Crown Beach (Alameda Co)	Crown Crab Cove	37.76827	-122.278283
East Bay	Crown Beach (Alameda Co)	Crown Sunset Rd.	37.759396	-122.265284
East Bay	Crown Beach (Alameda Co)	Crown Windsurfer Corner	37.762876	-122.27274
East Bay	Keller Beach (Contra Costa Co)	Keller North Beach	37.92105	-122.386938
East Bay	Keller Beach (Contra Costa Co)	Keller South Beach	37.920659	-122.386572
Humboldt	Clam Beach Co. Park	Clam Beach Co. Park	40.98775	-124.12064
Humboldt	Luffenholtz Beach	Luffenholtz Creek	41.0423	-124.12084
Humboldt	Trinidad State Beach	Mill Creek/Trinidad	41.06164	-124.14884
Humboldt	Moonstone Beach	Moonstone Beach	41.03007	-124.1157
Humboldt	Mad River Beach Co. Park	North Mad River Mouth	40.95382	-124.12768
Long Beach	Long Beach	B-10	33.75012	-118.1299286
Long Beach	Long Beach	B-11	33.74454	-118.1191635
Long Beach	Alamitos Bay Beach	B-14	33.75447	-118.1320419
Long Beach	Alamitos Bay Beach	B-22	33.75965	-118.1191635
Long Beach	Colorado Lagoon	B-24	33.77062	-118.13475

Long Beach	Colorado Lagoon	B-25	33.7712	-118.13435
Long Beach	Alamitos Bay Beach	B-31	33.75119	-118.1264496
Long Beach	Long Beach	B-5	33.76393	-118.1784286
Long Beach	Long Beach	B-56	33.76345	-118.1736221
Long Beach	Long Beach	B-60	33.76135	-118.1624527
Long Beach	Long Beach	B-64	33.755	-118.1403809
Long Beach	Alamitos Bay Beach	B-67	33.75806	-118.1302185
Long Beach	Long Beach	B-69	33.7563	-118.1312167
Long Beach	Long Beach	B-7	33.75956	-118.1549377
Long Beach	Long Beach	B-8	33.75786	-118.1485214
Long Beach	Long Beach	B-9	33.75641	-118.1441803
Los Angeles	Inner Cabrillo Beach	CB-01	33.71333	-118.283
Los Angeles	Inner Cabrillo Beach	CB-02	33.71138	-118.2831
Los Angeles	Malibu Beach	DPH 001	34.0367	-118.61012
Los Angeles	Surfrider Beach	DPH 002	34.03757	-118.67631
Los Angeles	Dockweiler State Beach	DPH 002B	34.0368898	-118.676899
Los Angeles	Malibu Lagoon State Beach	DPH 003	34.03143	-118.68204
Los Angeles	Puerco Beach	DPH 004	34.03329	-118.73389
Los Angeles	Puerco Beach	DPH 004B	34.03312	-118.73374
Los Angeles	Dan Blocker County Beach	DPH 005	34.02908	-118.75366
Los Angeles	Dan Blocker County Beach	DPH 005B	34.02896	-118.7532222
Los Angeles	Paradise Cove	DPH 006	34.02071	-118.78616
Los Angeles	Zuma Beach	DPH 007	34.01393	-118.81942
Los Angeles	Point Dume County Beach	DPH 007B	34.01317	-118.82099
Los Angeles	Zuma Beach	DPH 008	34.0296	-118.84182
Los Angeles	Zuma Beach	DPH 008B	34.02859	-118.84194

Los Angeles	Nicholas Canyon County Beach	DPH 009	34.04241	-118.91559
Los Angeles	Nicholas Canyon County Beach	DPH 009B	34.04234	-118.91619
Los Angeles	Leo Carillo State Beach	DPH 010	34.04558	-118.93336
Los Angeles	Leo Carillo State Beach	DPH 010B	34.04477	-118.93326
Los Angeles	Will Rogers State Beach	DPH 101	34.03934	-118.55052
Los Angeles	Will Rogers State Beach	DPH 102	34.03833	-118.54393
Los Angeles	Will Rogers State Beach	DPH 102B	34.03846	-118.54452
Los Angeles	Will Rogers State Beach	DPH 103	34.03477	-118.53611
Los Angeles	Will Rogers State Beach	DPH 103B	34.0343	-118.53569
Los Angeles	Santa Monica State Beach	DPH 104	34.02	-118.51038
Los Angeles	Santa Monica State Beach	DPH 104B	34.01931	-118.51008
Los Angeles	Santa Monica State Beach	DPH 105	34.01475	-118.50405
Los Angeles	Santa Monica State Beach	DPH 105B	34.0144	-118.5039
Los Angeles	Santa Monica State Beach	DPH 106	34.00199	-118.48979
Los Angeles	Venice City Beach	DPH 107	33.98933	-118.47857
Los Angeles	Venice City Beach	DPH 107B	33.98857	-118.47822
Los Angeles	Venice City Beach	DPH 108	33.97826	-118.46714
Los Angeles	Venice City Beach	DPH 109	33.96768	-118.45994
Los Angeles	Dockweiler State Beach	DPH 110	33.94064	-118.44226
Los Angeles	Dockweiler State Beach	DPH 111	33.92331	-118.43326

Los Angeles	El Segundo Beach	DPH 112	33.91592	-118.42926
Los Angeles	El Segundo Beach	DPH 112B	33.91534	-118.42954
Los Angeles	Manhattan Beach	DPH 113	33.89441	-118.41868
Los Angeles	Manhattan Beach	DPH 113B	33.89401	-118.41849
Los Angeles	Hermosa Beach	DPH 114	33.87146	-118.40663
Los Angeles	Hermosa Beach	DPH 115	33.85203	-118.39971
Los Angeles	Hermosa Beach	DPH 115B	33.85232	-118.39977
Los Angeles	Redondo Beach	DPH 116	33.83207	-118.39071
Los Angeles	Avalon Beach	DPH 117	33.34297	-118.324
Los Angeles	Avalon Beach	DPH 118	33.34327	-118.325
Los Angeles	Avalon Beach	DPH 119	33.34381	-118.326
Los Angeles	Avalon Beach	DPH 120	33.34422	-118.326
Los Angeles	Avalon Beach	DPH 121	33.34503	-118.327
Los Angeles	Dockweiler State Beach	DPH 122	33.9611547	-118.4562179
Los Angeles	Avalon Beach	DPH 123	33.35074	-118.3284295
Los Angeles	Avalon Beach	DPH 124	33.3512183	-118.3286159
Los Angeles	Seaside Lagoon	DPH 125	33.8194442	-118.8442
Los Angeles	Seaside Lagoon	DPH 126	33.8441	-118.3939
Los Angeles	Marina Del Rey Beach - Mothers Beach	MDRH-1	33.979889	-118.4577173
Los Angeles	Marina Del Rey Beach - Mothers Beach	MDRH-2	33.98084	-118.45802
Los Angeles	Marina Del Rey Beach - Mothers Beach	MDRH-3	33.9819795	-118.4569488

Los Angeles	El Pescador State Beach	SMB-1-02	34.039	-118.8929
Los Angeles	Dan Blocker County Beach	SMB-1-10	34.0329	-118.741
Los Angeles	Puerco Beach	SMB-1-12	34.0306	-118.7111
Los Angeles	Carbon Beach	SMB-1-13	34.0383	-118.6731
Los Angeles	La Costa Beach	SMB-1-14	34.0362	-118.6364
Los Angeles	Las Tunas County Beach	SMB-1-16	34.0253392	-118.5977
Los Angeles	Las Tunas County Beach	SMB-1-17	34.02530393	-118.5962
Los Angeles	Topanga State Beach	SMB-1-18	34.0385	-118.58196
Los Angeles	El Matador State Beach	SMB-1-3	34.0378	-118.8747
Los Angeles	Paradise Cove	SMB-1-6	34.0171	-118.7897
Los Angeles	Escondido Beach	SMB-1-8	34.0253	-118.7656
Los Angeles	Will Rogers State Beach	SMB-2-1	34.02530412	-118.566
Los Angeles	Dockweiler State Beach	SMB-2-10	33.95702	-118.45196
Los Angeles	Dockweiler State Beach	SMB-2-11	33.9444	-118.4442
Los Angeles	Dockweiler State Beach	SMB-2-13	33.93071	-118.43711
Los Angeles	Will Rogers State Beach	SMB-2-2	34.0379	-118.5557
Los Angeles	Will Rogers State Beach	SMB-2-4	34.03744	-118.54191
Los Angeles	Will Rogers State Beach	SMB-2-7	34.02645	-118.51955
Los Angeles	Santa Monica State Beach	SMB-3-3	34.00806	-118.49657
Los Angeles	Santa Monica State Beach	SMB-3-4	34.00497	-118.49296
Los Angeles	Santa Monica State Beach	SMB-3-5	33.99662	-118.48488
Los Angeles	Venice City Beach	SMB-3-6	33.9935842	-118.4824055

Los Angeles	Venice City Beach	SMB-3-8	33.98625	-118.47635
Los Angeles	Redondo Beach	SMB-6-03	33.8337	-118.3906
Los Angeles	Redondo Beach	SMB-6-2	33.8386475	-118.3911549
Los Angeles	Torrance Beach	SMB-6-6	33.8044	-118.39424
Los Angeles	Malaga Cove	SMB-7-1	33.8033	-118.39589
Los Angeles	Bluff Cove	SMB-7-2	33.79362	-118.40684
Los Angeles	Long Point	SMB-7-3	33.73872	-118.39394
Los Angeles	Abalone Cove	SMB-7-4	33.7418	-118.379
Los Angeles	Portuguese Bend	SMB-7-5	33.7363	-118.36
Los Angeles	Royal Palms State Beach	SMB-7-6	33.71773	-118.32182
Los Angeles	Point Fermin Park	SMB-7-8	33.7101	-118.29901
Los Angeles	Outer Cabrillo Beach	SMB-7-9	33.70936	-118.28302
Los Angeles	Malibu Lagoon State Beach	SMB-MC-2	34.0351	-118.67853
Los Angeles	Point Dume County Beach	SMB-O-01	34.0138	-118.7918
Los Angeles	Point Dume County Beach	SMB-O-02	34.0319	-118.7242
Marin	Fort Baker Horseshoe Cove	BAKER NE	37.83352	-122.4747
Marin	Fort Baker Horseshoe Cove	BAKER NW	37.83317	-122.4778
Marin	Fort Baker Horseshoe Cove	BAKER SW	37.83212	-122.4774167
Marin	Bolinas Beach	BOLINAS	37.90515	-122.6829833
Marin	Chicken Ranch	CHICKEN RANCH	38.109741	-122.8646
Marin	Chicken Ranch	CHICKEN RANCH DITCH	38.11018	-122.8653833
Marin	China Camp	CHINA CAMP	38.00042	-122.4610167

Marin	Dillon Beach	DILLON	38.249	-122.968
Marin	Drake's Beach	DRAKES BEACH	38.02728	-122.9614833
Marin	DRAKES ESTERO	DRAKES ESTERO	38.08278	-122.9327833
Marin	Heart's Desire	HEARTS DESIRE	38.1326	-122.8934167
Marin	Lawson's Landing	LAWSONS LANDING	38.23172	-122.9678532
Marin	McNears Beach	MCNEARS BEACH	37.992531	-122.452442
Marin	Miller Park	MILLER PARK	38.19956	-122.9219
Marin	Millerton Point	MILLERTON POINT	38.105935	-122.849419
Marin	Muir Beach	MUIR BEACH - CENTRAL	37.85932	-122.5763167
Marin	Muir Beach	MUIR BEACH - NORTH	37.85972	-122.577885
Marin	Muir Beach	MUIR BEACH - SOUTH	37.85807	-122.5749667
Marin	Paradise Cove	PARADISE COVE	37.8941	-122.4575
Marin	Rodeo Beach	RODEO BEACH - CENTRAL	37.830135	-122.536869
Marin	Rodeo Beach	RODEO BEACH - NORTH	37.831681	-122.5393037
Marin	Rodeo Beach	RODEO BEACH - SOUTH	37.828947	-122.535709
Marin	Schoonmaker Beach	SCHOONMAKER BEACH	37.8640924	-122.489744
Marin	Shell Beach	SHELL BEACH	38.1166	-122.873228
Marin	Stinson Beach	STINSON BEACH - CENTRAL	37.896007	-122.640577
Marin	Stinson Beach	STINSON BEACH - NORTH	37.89717	-122.64295
Marin	Stinson Beach	STINSON BEACH - SOUTH	37.891805	-122.63576
Marin	Whitehouse Pool	Whitehouse Pool	38.063107	-122.817782
Mendocino	Big River-Mendocino Bay Headlands SP	Big River	39.30246	-123.7937715

Mendocino	Caspar Headlands SB	Caspar Headlands	39.36057	-123.8180592
Mendocino	Hare Creek	Hare Creek	39.417	-123.8129096
Mendocino	Pudding Creek Beach	Pudding Creek	39.4592	-123.808963
Mendocino	Van Damme SP	Van Damme	39.27321	-123.7912334
Mendocino	Virgin Creek	Virgin Creek	39.47224	-123.8047192
Monterey	Carmel Beach	CBOA	36.5545	-121.93053
Monterey	Del Monte Beach	DMB	36.60104	-121.88727
Monterey	Lover's Point	LOP	36.62542	-121.91656
Monterey	Monterey Beach Hotel	MBH	36.61187	-121.85772
Monterey	Maccabee Beach	MCA	36.616246	-121.899599
Monterey	San Carlos Beach	SCB	36.60963	-121.89537
Monterey	Asilomar State Beach	SDA	36.61901	-121.94136
Monterey	Spanish Bay Beach	SPB	36.6104	-121.94788
Monterey	Stillwater Cove	STCO	36.56601	-121.94146
Monterey	Zmudowski State Beach	ZMB	36.842	-121.807
Orange	Huntington State Beach	0	33.62929	-117.95968
Orange	Huntington City Beach	12N	33.646706	-117.989356
Orange	Huntington City Beach	15N	33.652132	-117.997507
Orange	Newport Beach	15S	33.6563	-117.92425
Orange	Huntington City Beach	21N	33.66385	-118.01322
Orange	Newport Beach	21S	33.6009	-117.90283
Orange	Huntington City Beach	27N	33.67565	-118.02853

Orange	Newport Beach	27S	33.59426	-117.88161
Orange	Newport Beach	29S	33.59315	-117.87556
Orange	Bolsa Chica State Beach	33N	33.68818	-118.042
Orange	Bolsa Chica State Beach	39N	33.70208	-118.05494
Orange	Crystal Cove State Park	39S	33.5784	-117.84916
Orange	Huntington State Beach	3N	33.63311	-117.96602
Orange	Newport Beach	3S	33.6265	-117.95384
Orange	Huntington State Beach	6N	33.63838	-117.97541
Orange	Newport Beach	6S	33.62222	-117.94431
Orange	Huntington State Beach	9N	33.6417	-117.98126
Orange	Newport Beach	9S	33.61665	-117.93684
Orange	Aliso County Beach	ACM1D	33.51045	-117.75281
Orange	Aliso County Beach	ACM1U	33.51045	-117.75281
Orange	Aliso County Beach	ACM1Z	33.51045	-117.75281
Orange	Dana Point Harbor	BDP07	33.4595	-117.6905
Orange	Dana Point Harbor	BDP08	33.46133	-117.7055
Orange	Dana Point Harbor	BDP12	33.46216	-117.705
Orange	Dana Point Harbor	BDP13	33.46233	-117.7043333
Orange	Dana Point Harbor	BDP14	33.4625	-117.7043333
Orange	Dana Point Harbor	BDP15	33.46233	-117.7045
Orange	Dana Point Harbor	BDP16	33.46166	-117.7058333

Orange	Dana Point Harbor	BDP17	33.462	-117.7036667
Orange	Newport Beach	BGCD	33.59	-117.86833
Orange	Newport Beach	BGCU	33.59	-117.86833
Orange	Huntington Harbour	BHH04	33.71716	-118.0691667
Orange	Huntington Harbour	BHH05	33.71183	-118.0816667
Orange	Huntington Harbour	BHH06	33.72483	-118.0561667
Orange	Huntington Harbour	BHH09	33.72883	-118.0646667
Orange	Huntington Harbour	BHH11	33.72083	-118.0711667
Orange	Huntington Harbour	BHH12	33.72616	-118.0658333
Orange	Huntington Harbour	BHH13	33.71966	-118.0648333
Orange	Huntington Harbour	BHH15	33.72633	-118.0716667
Orange	Huntington Harbour	BHH16	33.71622	-118.0644461
Orange	Laguna Beach	BLUBRDD	33.52965	-117.77347
Orange	Laguna Beach	BLUBRDU	33.52965	-117.77347
Orange	Laguna Beach	BLUBRDZ	33.52965	-117.77347
Orange	Laguna Beach	BLULGND	33.51672	-117.6124
Orange	Laguna Beach	BLULGNU	33.51672	-117.6124
Orange	Laguna Beach	BLULGNZ	33.51672	-117.6124
Orange	Newport Bay	BNB01	33.60583	-117.8863333
Orange	Newport Bay	BNB02	33.60866	-117.8906667
Orange	Newport Bay	BNB03	33.60833	-117.8945
Orange	Newport Bay	BNB05	33.613	-117.9078333
Orange	Newport Bay	BNB07	33.615	-117.9195
Orange	Newport Bay	BNB09	33.621	-117.9368333
Orange	Newport Bay	BNB10	33.61833	-117.9345
Orange	Newport Bay	BNB11	33.61683	-117.9311667
Orange	Newport Bay	BNB12	33.615	-117.9268333
Orange	Newport Bay	BNB14	33.609	-117.9261667

Orange	Newport Bay	BNB15	33.60866	-117.9206667
Orange	Newport Bay	BNB17	33.6065	-117.9126667
Orange	Newport Bay	BNB18	33.60566	-117.9041667
Orange	Newport Bay	BNB20	33.60416	-117.8933333
Orange	Newport Bay	BNB21	33.60466	-117.888
Orange	Newport Bay	BNB22	33.59866	-117.8833333
Orange	Newport Bay	BNB23	33.5945	-117.8776667
Orange	Newport Bay	BNB24E	33.63266	-117.892
Orange	Newport Bay	BNB24M	33.61483	-117.8938333
Orange	Newport Bay	BNB24N	33.61783	-117.8921667
Orange	Newport Bay	BNB24W	33.61583	-117.8953333
Orange	Newport Bay	BNB28	33.6255	-117.8933333
Orange	Newport Bay	BNB29	33.61316	-117.8991667
Orange	Newport Bay	BNB30	33.61683	-117.904
Orange	Newport Bay	BNB31	33.6065	-117.8993333
Orange	Newport Bay	BNB32	33.60933	-117.9151667
Orange	Newport Bay	BNB33	33.60283	-117.8835
Orange	Newport Bay	BNB34	33.60566	-117.8886667
Orange	Newport Bay	BNB35	33.62	-117.9286667
Orange	Newport Slough	BNS01	33.6299	-117.9511391
Orange	Newport Slough	BNS02	33.62733	-117.947252
Orange	Laguna Beach	CLEOD	33.5371	-117.78056
Orange	Laguna Beach	CLEOU	33.5371	-117.78056
Orange	Laguna Beach	CLEOZ	33.5371	-117.78056
Orange	Doheny State Beach	DSB1Z	33.45619	-117.67056
Orange	Doheny State Beach	DSB4Z	33.4603	-117.67764
Orange	Dana Point Harbor	DSB5D	33.46219	-117.68937
Orange	Dana Point Harbor	DSB5U	33.46219	-117.68937
Orange	Doheny State Beach	DSB5Z	33.4621	-117.68938
Orange	Laguna Beach	DUMONDD	33.51919	-117.76302
Orange	Laguna Beach	DUMONDU	33.51919	-117.76302
Orange	Laguna Beach	DUMONDZ	33.51919	-117.76302

Orange	Crystal Cove State Park	ELMOROD	33.56052	-117.82184
Orange	Crystal Cove State Park	ELMOROZ	33.56023	-117.82205
Orange	San Clemente City Beach	ELPORTALZ	33.42691389	-117.6283333
Orange	Laguna Beach	EMRLDD	33.551	-117.807
Orange	Laguna Beach	EMRLDU	33.55144	-117.80798
Orange	Laguna Beach	EMRLDZ	33.55099	-117.80801
Orange	Laguna Beach	HEISLRD	33.54475	-117.79458
Orange	Laguna Beach	HEISLRU	33.54475	-117.79458
Orange	Laguna Beach	HEISLRZ	33.54475	-117.79458
Orange	San Clemente City Beach	LINDALZ	33.42296	-117.62335
Orange	Laguna Beach	MAINBCD	33.54218	-117.78527
Orange	Laguna Beach	MAINBCU	33.54218	-117.78527
Orange	Laguna Beach	MAINBCZ	33.54244	-117.78659
Orange	San Clemente City Beach	MARIPOZ	33.42433	-117.62533
Orange	Crystal Cove State Park	MDCD	33.56396	-117.82836
Orange	Crystal Cove State Park	MDCU	33.582294	-117.857175
Orange	Dana Point Harbor	MDP10	33.45845	-117.6935518
Orange	Dana Point Harbor	MDP11	33.462	-117.703414
Orange	Dana Point Harbor	MDP18	33.46031	-117.6961325
Orange	Huntington Harbour	MHH01	33.71213	-118.0555441
Orange	Huntington Harbour	MHH07	33.72783	-118.0756667
Orange	Huntington Harbour	MHH10	33.717	-118.0581667
Orange	Huntington Harbour	MHH14	33.72533	-118.0766667
Orange	Laguna Beach	OLB05	33.54716	-117.8016667
Orange	Crystal Cove State Park	ONB39	33.57369	-117.84043

Orange	Seal Beach Surfside	OSB01	33.7265	-118.0843333
Orange	Seal Beach Surfside	OSB02	33.74083	-118.1141667
Orange	Seal Beach Surfside	OSB03	33.739	-118.1141667
Orange	Seal Beach Surfside	OSB04	33.73716	-118.1023333
Orange	Seal Beach Surfside	OSB05	33.73778	-118.1062374
Orange	Monarch Beach	OSL25	33.48183	-117.7251667
Orange	Sunset County Beach	OSUB1	33.71666	-118.0723333
Orange	Laguna Beach	PEARLD	33.52868	-117.77273
Orange	Laguna Beach	PEARLU	33.52868	-117.77273
Orange	Laguna Beach	PEARLZ	33.52868	-117.77273
Orange	San Clemente City Beach	PICOD	33.43147	-117.63287
Orange	San Clemente City Beach	PICOZ	33.43147	-117.63287
Orange	San Clemente City Beach	PIERZ	33.41957	-117.62
Orange	Poche County Beach	POCHED	33.44103	-117.6452
Orange	Poche County Beach	POCHEU	33.44103	-117.6452
Orange	Poche County Beach	POCHEZ	33.44103	-117.6452
Orange	Crystal Cove State Park	PPCD	33.58221	-117.85694
Orange	Crystal Cove State Park	PPCU	33.57601	-117.84062
Orange	San Clemente City Beach	RIVERAZ	33.40814	-117.60979
Orange	Doheny State Beach	S-0	33.4616	-117.68261
Orange	Doheny State Beach	S-1	33.46071	-117.6965
Orange	Capistrano Bay District	S-11	33.4509	-117.6612

Orange	Capistrano Bay District	S-13	33.4476	-117.65509
Orange	Poche County Beach	S-15	33.44125	-117.64636
Orange	San Clemente City Beach	S-17	33.43068	-117.63183
Orange	San Clemente City Beach	S-19	33.42079	-117.62141
Orange	Doheny State Beach	S-2	33.46172	-117.68557
Orange	San Clemente State Beach	S-21	33.4051	-117.6069
Orange	San Clemente State Beach	S-23	33.39577	-117.60024
Orange	Doheny State Beach	S-3	33.45938	-117.6763
Orange	Dana Point	S-6	33.46044	-117.70739
Orange	Capistrano Beach	S-9	33.4545	-117.66827
Orange	Dana Point	S1	33.46959	-117.78216
Orange	Aliso County Beach	S10	33.51162	-117.75463
Orange	Aliso County Beach	S11	33.51326	-117.75723
Orange	Aliso County Beach	S12	33.51452	-117.75993
Orange	Dana Point	S2	33.47926	-117.72423
Orange	Aliso County Beach	S3	33.48908	-117.73584
Orange	Aliso County Beach	S4	33.49756	-117.74138
Orange	South Laguna Beach	S5	33.50051	-117.74504
Orange	Aliso County Beach	S6	33.50339	-117.74719
Orange	Aliso County Beach	S7	33.50499	-117.74845
Orange	Aliso County Beach	S8	33.50499	-117.74845
Orange	Aliso County Beach	S9	33.50692	-117.75237

Orange	Huntington State Beach	SAR-N	33.62986	-117.95975
Orange	Monarch Beach	SCM1D	33.4818	-117.725
Orange	Monarch Beach	SCM1Z	33.48119	-117.7249
Orange	Doheny State Beach	SJC1D	33.46155	-117.683931
Orange	Doheny State Beach	SJC1U	33.46155	-117.6842
Orange	Doheny State Beach	SJC1Z	33.46155	-117.68411
Orange	San Clemente City Beach	SLINDALZ	33.422051	-117.622569
Orange	San Clemente City Beach	TRFCYND	33.41796	-117.61787
Orange	San Clemente City Beach	TRFCYNU	33.41796	-117.61787
Orange	San Clemente City Beach	TRFCYNZ	33.41735	-117.61893
Orange	Laguna Beach	VICTRAD	33.54087	-117.78361
Orange	Laguna Beach	VICTRAU	33.54087	-117.78361
Orange	Laguna Beach	VICTRAZ	33.54087	-117.78361
Orange	Laguna Beach	WESTZ	33.50461	-117.74768
San Diego	Baja California, MEXICO	BC-010	32.4191	-117.0973
San Diego	Baja California, MEXICO	BC-020	32.4987	-117.123
San Diego	Baja California, MEXICO	BC-030	32.5257	-117.124
San Diego	Imperial Beach municipal beach, other	EH-010	32.57266523	-117.133201
San Diego	Imperial Beach pier area	EH-030	32.57875	-117.133186
San Diego	Coronado north beach	EH-060	32.685586	-117.194319

San Diego	San Diego Bay	EH-070	32.69012298	-117.1644037
San Diego	San Diego Bay	EH-080	32.67521446	-117.1681813
San Diego	Torrey Pines State Beach	EH-109-0	32.94242778	-117.262725
San Diego	San Diego Bay	EH-120	32.62880198	-117.1080939
San Diego	San Diego Bay	EH-200	32.71476765	-117.2241597
San Diego	San Diego Bay	EH-211	32.709209	-117.236837
San Diego	Mission Bay, De Anza Cove	EH-227	32.7951	-117.21634
San Diego	Pacific Beach	EH-250	32.7945	-117.2562
San Diego	WindanSea Beach	EH-260	32.8263	-117.2795
San Diego	WindanSea Beach	EH-280	32.8294	-117.2805
San Diego	Marine Street Beach	EH-290	32.8341	-117.2815
San Diego	Whispering Sands Nicholson Pt.	EH-300	32.839387	-117.281998
San Diego	South Casa Beach S.D.	EH-305	32.8467	-117.278863
San Diego	South Casa Beach S.D.	EH-310	32.8475	-117.2782
San Diego	Childrens Pool	EH-311	32.847921	-117.278373
San Diego	La Jolla Shores Beach	EH-320	32.8556	-117.2581
San Diego	La Jolla Shores Beach	EH-330	32.859	-117.256
San Diego	La Jolla Shores Beach	EH-340	32.863	-117.2547
San Diego	San Dieguito River Beach	EH-380	32.9753	-117.2706055
San Diego	Solana Beach City Beaches	EH-395	32.98210361	-117.2731986
San Diego	San Elijo State Beach	EH-400	33.0283	-117.2889

San Diego	Moonlight Beach	EH-420	33.0481	-117.2989
San Diego	Moonlight Beach	EH-420A	33.0485	-117.299
San Diego	Moonlight Beach	EH-420B	33.048	-117.299
San Diego	Leucadia	EH-430	33.0644	-117.305
San Diego	Leucadia	EH-435	33.076405	-117.310332
San Diego	South Carlsbad State Beach	EH-440	33.0866	-117.3134332
San Diego	Carlsbad State Beach	EH-455	33.138	-117.3398
San Diego	Carlsbad State Beach	EH-460	33.1454	-117.3451
San Diego	Carlsbad municipal beach	EH-475	33.1571	-117.35312
San Diego	Carlsbad municipal beach	EH-480	33.1644	-117.3591
San Diego	USMC Camp Pendleton	EH-510	33.3805	-117.5785
San Diego	San Onofre State Beach	EH-520	33.3855	-117.5952
San Diego	South Carlsbad State Beach	EN-010	33.10061	-117.3194
San Diego	South Carlsbad State Beach	EN-020	33.106306	-117.321583
San Diego	South Carlsbad State Beach	EN-030	33.11572	-117.3255
San Diego	South Carlsbad State Beach	EN-040	33.119222	-117.327111
San Diego	South Carlsbad State Beach	EN-050	33.1285	-117.333806
San Diego	Dog Beach, O.B.	FM-010	32.7561	-117.2535762

San Diego	Tourmaline Surfing Park	FM-030	32.805	-117.2628
San Diego	WindanSea Beach	FM-050	32.8299	-117.2807
San Diego	La Jolla Cove	FM-070	32.85045	-117.2727
San Diego	La Jolla Shores Beach	FM-080	32.8548	-117.2598
San Diego	Torrey Pines City Beach	FM-090	32.8778	-117.2514
San Diego	Torrey Pines State Beach	FM-100	32.9345	-117.2619552
San Diego	Border Field State Park	IB-010	32.53595	-117.1243
San Diego	Border Field State Park	IB-020	32.54340957	-117.1252278
San Diego	Tijuana Slough National Wildlife Refuge	IB-030	32.555139	-117.129323
San Diego	Tijuana Slough National Wildlife Refuge	IB-040	32.56286903	-117.1325905
San Diego	Imperial Beach municipal beach, other	IB-045	32.569389	-117.133023
San Diego	Imperial Beach municipal beach, other	IB-050	32.5665773	-117.133205
San Diego	north Imperial Beach	IB-060	32.58567857	-117.1330494
San Diego	Silver Strand State Beach	IB-067	32.588219	-117.13256
San Diego	Silver Strand State Beach	IB-068	32.626401	-117.139424
San Diego	Silver Strand State Beach	IB-069	32.631769	-117.141885
San Diego	Silver Strand State Beach	IB-070	32.6358	-117.14317

San Diego	Coronado City beaches	IB-079	32.674066	-117.1723
San Diego	Coronado City beaches	IB-080	32.6775	-117.17727
San Diego	Mission Bay	MB-015	32.777266	-117.216636
San Diego	Mission Bay	MB-031	32.7713	-117.2098
San Diego	Tecolote Shores	MB-041	32.7732	-117.21
San Diego	Mission Bay, Leisure Lagoon	MB-053	32.784102	-117.209331
San Diego	Mission Bay	MB-058	32.788086	-117.209866
San Diego	Mission Bay, De Anza Cove	MB-070	32.7969	-117.2119
San Diego	Mission Bay, Campland On The Bay	MB-080	32.7949	-117.2213
San Diego	Mission Bay	MB-085	32.78847	-117.217833
San Diego	Mission Bay	MB-086	32.7892	-117.2134
San Diego	Mission Bay	MB-100	32.7823	-117.2325
San Diego	Mission Beach	MB-115	32.75968	-117.254057
San Diego	Mission Bay, Fanuel Park	MB-120	32.7908	-117.2443
San Diego	Mission Bay	MB-125	32.788806	-117.251967
San Diego	Mission Bay, Sail Bay	MB-131	32.7832	-117.251
San Diego	Mission Bay, San Juan Cove	MB-140	32.7797	-117.2508
San Diego	Mission Bay, Bahia Point	MB-160	32.7755	-117.2454
San Diego	Mission Bay, Mariners Basin	MB-170	32.7692	-117.2489
San Diego	Mission Bay, Vacation Isle	MB-203	32.7741	-117.2327
San Diego	Mission Bay, Vacation Isle	MB-205	32.77605	-117.2382
San Diego	Mission Bay, Ventura Cove	MB-223	32.77088	-117.24468

San Diego	Mission Bay, Mariners Basin	MB-225	32.7625	-117.2493
San Diego	Mission Bay	MB-226	32.760746	-117.247827
San Diego	Oceanside municipal beach, other	OC-010	33.165614	-117.359991
San Diego	Oceanside municipal beach, other	OC-020	33.17292851	-117.3660512
San Diego	Buccaneer Beach	OC-022	33.1765	-117.3696
San Diego	Buccaneer Beach	OC-030	33.17781407	-117.3708564
San Diego	Oceanside municipal beach, other	OC-040	33.18238609	-117.3745711
San Diego	Oceanside municipal beach, other	OC-050	33.19032586	-117.3818685
San Diego	Oceanside municipal beach, other	OC-080	33.1937	-117.3843
San Diego	Oceanside municipal beach, other	OC-090	33.1966	-117.3869
San Diego	Harbor Beach	OC-100	33.20155952	-117.3922027
San Diego	Harbor Beach	OC-110	33.2044	-117.3941
San Diego	non-accessible or restricted access shoreline on Pt. Loma	PL-040	32.6653	-117.2432
San Diego	non-accessible or restricted access shoreline on Pt. Loma	PL-050	32.68047562	-117.2488
San Diego	Sunset Cliffs Park	PL-070	32.71932563	-117.2569444
San Diego	Ocean Beach	PL-082	32.739448	-117.254989

San Diego	Ocean Beach	PL-090	32.74673611	-117.2549425
San Diego	Ocean Beach	PL-100	32.7491121	-117.2532714
San Diego	Ocean Beach	PL-110	32.75391191	-117.2530143
San Diego	Mission Beach	PL-120	32.77131486	-117.2535588
San Diego	Solana Beach City Beaches	SE-010	32.991319	-117.274819
San Diego	Solana Beach City Beaches	SE-020	32.996569	-117.276194
San Diego	Cardiff State Beach	SE-030	33.001319	-117.278388
San Diego	Cardiff State Beach	SE-040	33.005833	-117.278472
San Diego	Cardiff State Beach	SE-050	33.0118911	-117.2803
San Diego	Cardiff State Beach	SE-060	33.0157	-117.2819125
San Diego	San Elijo State Beach	SE-070	33.019055	-117.2842
San Diego	La Jolla Shores Beach	SI-010	32.86353	-117.25508
San Diego	La Jolla Shores Beach	SI-020	32.86548	-117.2546
San Diego	La Jolla Shores Beach	SI-030	32.86768	-117.25413
San Francisco	Crissy Field	BAY#202.4_SL	37.8066	-122.4519
San Francisco	Crissy Field	BAY#202.5_SL	37.8069	-122.4683
San Francisco	Aquatic Park	BAY#210.1_SL	37.80899	-122.4212947
San Francisco	Aquatic Park	BAY#211_SL	37.8076	-122.4221
San Francisco	Mission Bay Channel	BAY#220_SL	37.7719	-122.3967
San Francisco	Crane Cove Park	BAY#230_SL	37.763431	-122.386861
San Francisco	Candlestick Point	BAY#300.1_SL	37.7096	-122.3899
San Francisco	Candlestick Point	BAY#301.1_SL	37.70917	-122.3823

San Francisco	Candlestick Point	BAY#301.2_SL	37.711025	-122.380136
San Francisco	Islais Creek Channel	BAY#320_SL	37.74703	-122.38793
San Francisco	Baker Beach	OCEAN#15EAST_SL	37.79258	-122.48465
San Francisco	Baker Beach	OCEAN#15_SL	37.7917	-122.484926
San Francisco	Baker Beach	OCEAN#16_SL	37.78977	-122.48741
San Francisco	China Beach	OCEAN#17_SL	37.78816	-122.49136
San Francisco	Ocean Beach	OCEAN#18_SL	37.77492	-122.51351
San Francisco	Ocean Beach	OCEAN#19_SL	37.7638	-122.511
San Francisco	Ocean Beach	OCEAN#20_SL	37.74891	-122.50996
San Francisco	Ocean Beach	OCEAN#21.1_SL	37.73567	-122.50769
San Francisco	Ocean Beach	OCEAN#21_SL	37.73782	-122.50825
San Francisco	Ocean Beach	OCEAN#22_SL	37.71526	-122.50476
San Luis Obispo	Avila Beach	AB10	35.17916	-120.74048
San Luis Obispo	Avila Beach	AB8	35.17806	-120.7328414
San Luis Obispo	Avila Beach	AB9	35.17846	-120.7357546
San Luis Obispo	Cayucos Beach	CAY13	35.4334	-120.8876812
San Luis Obispo	Cayucos Beach	CAY14	35.44834	-120.9055292
San Luis Obispo	Cayucos Beach	CAY15	35.44884	-120.907087
San Luis Obispo	Cayucos Beach	CAY16	35.44904	-120.90792
San Luis Obispo	Montana De Oro	HAZ10	35.29028	-120.8816936

San Luis Obispo	Hearst Memorial State Beach	HSB23	35.64288	-121.18897
San Luis Obispo	Morro Bay City Beach	MB11	35.37164	-120.8652582
San Luis Obispo	Morro Bay City Beach	MB12	35.37618	-120.8645111
San Luis Obispo	Morro Bay City Beach	MB13	35.37834	-120.8647187
San Luis Obispo	Morro Strand State Beach	MB14	35.3986	-120.868249
San Luis Obispo	Oceano Dunes State Rec Area	OCB11	35.10057	-120.6312982
San Luis Obispo	Oceano Dunes State Rec Area	OCB12	35.10542	-120.6319792
San Luis Obispo	Oceano Dunes State Rec Area	OCB13	35.10834	-120.6324927
San Luis Obispo	Olde Port Beach	OLDE12	35.17767	-120.7489886
San Luis Obispo	Pismo State Beach	PB3	35.1359	-120.6426598
San Luis Obispo	Pismo State Beach	PB4	35.13819	-120.6440774
San Luis Obispo	Pismo State Beach	PB5	35.14104	-120.6456298
San Luis Obispo	San Simeon Beach	PICO23	35.61409	-121.1476715
San Luis Obispo	Sewers	SEW7	35.16669	-120.6936686
San Mateo	Aquatic Park	Aquatic Park	37.56022	-122.2911306
San Mateo	Bean Hollow State Beach	Bean Hollow Creek	37.22621	-122.4094
San Mateo	Bean Hollow State Beach	Bean Hollow State Beach	37.22551	-122.4091799
San Mateo	Rockaway Beach	Calera Creek	37.61092	-122.4971
San Mateo	Coyote Point County Park	Coyote Point County Park	37.5893	-122.3275134

San Mateo	Dunes State Beach	Dunes State Beach	37.4823	-122.453
San Mateo	Foster City Lagoon	Erckenbrack Park	37.563365	-122.260472
San Mateo	Fitzgerald Marine (Moss Beach)	Fitzgerald Marine (Moss Beach)	37.5242	-122.5177731
San Mateo	Francis State Beach	Francis State Beach	37.46721	-122.446792
San Mateo	Fitzgerald Marine (Moss Beach)	Frenchmans Creek	37.4808	-122.4515
San Mateo	Gazos Creek Access	Gazos Creek	37.16455	-122.36263
San Mateo	Gazos Creek Access	Gazos Creek Access	37.16531	-122.3630524
San Mateo	Foster City Lagoon	Gull Park, Foster City	37.56658	-122.26061
San Mateo	Kiteboard Beach	Kiteboard Beach	37.57174444	-122.27877
San Mateo	Lakeshore Park	Lakeshore Park Rec Center	37.54965	-122.28582
San Mateo	Pacifica State Beach	Linda Mar Beach #5	37.59687	-122.5044449
San Mateo	Pacifica State Beach	Linda Mar Beach #7	37.597587	-122.504712
San Mateo	Foster City Lagoon	Marlin Park	37.5992	-122.25438
San Mateo	Montara State Beach	Martini Creek	37.54834	-122.5153
San Mateo	Roosevelt State Beach	North Roosevelt Creek	37.489	-122.4562
San Mateo	Oyster Point Marina	Oyster Point Marina	37.66386	-122.3833907
San Mateo	Pescadero State Beach	Pescadero Creek	37.2659	-122.41133
San Mateo	Pescadero State Beach	Pescadero State Beach	37.26696	-122.4126758
San Mateo	Venice State Beach	Pilarcitos Creek	37.46785	-122.44701
San Mateo	Pillar Point Harbor	Pillar Point #5	37.5037	-122.4857

San Mateo	Pillar Point Harbor	Pillar Point #7	37.50207	-122.492821
San Mateo	Pillar Point Harbor	Pillar Point #8	37.50025	-122.4958231
San Mateo	Pillar Point Harbor	Pillar Point #9	37.5023	-122.4764
San Mateo	Pomponio State Beach	Pomponio Creek	37.29803	-122.4063
San Mateo	Pomponio State Beach	Pomponio State Beach	37.29971	-122.4063376
San Mateo	Rockaway Beach	Rockaway Beach	37.60814	-122.4980502
San Mateo	Roosevelt State Beach	Roosevelt State Beach	37.48842	-122.4562204
San Mateo	San Gregorio State Beach	San Gregorio Creek	37.32098	-122.40321
San Mateo	San Gregorio State Beach	San Gregorio State Beach	37.32243	-122.4040378
San Mateo	Pacifica State Beach	San Pedro Creek	37.596	-122.50543
San Mateo	Montara State Beach	San Vicente Creek	37.52423	-122.51774
San Mateo	Sharp Park Beach	Sharp Park Beach #3	37.62994	-122.4946839
San Mateo	Roosevelt State Beach	South Roosevelt Creek	37.4871916	-122.4550426
San Mateo	Surfers Beach	Surfers Beach	37.499732	-122.468894
San Mateo	Venice State Beach	Venice Beach	37.4804	-122.4518156
Santa Barbara	Hammonds	WP0000004	34.41692	-119.63425
Santa Barbara	Leadbetter	WP0000007	34.40214	-119.6945
Santa Barbara	Coal Oil Point	WP0000012	34.40808	-119.8795278
Santa Barbara	El Capitan State Beach	WP0000013	34.45797	-120.0218611
Santa Barbara	Guadalupe Dunes	WP0000018	34.96631	-120.6509167
Santa Barbara	Butterfly Beach	WP0000023	34.41728	-119.6475556

Santa Barbara	Goleta Beach	WP0000037	34.42475	-119.8286111
Santa Barbara	Hope Ranch Beach	WP0000072	34.4145	-119.7801111
Santa Barbara	Gaviota State Beach	WP0000079	34.47094	-120.2253889
Santa Barbara	Jalama Beach	WP0000080	34.51172	-120.5021389
Santa Barbara	East Beach	WP0000083	34.41636	-119.6836944
Santa Barbara	East Beach	WP0000085	34.41231	-119.6854167
Santa Barbara	Arroyo Burro	WP0000147	34.40231	-119.7421944
Santa Barbara	Carpinteria State	WP0000180	34.38992	-119.5195833
Santa Barbara	Refugio State Beach	WP0000183	34.46286	-120.0693333
Santa Barbara	Dry weatherland Beach	WP0000188	34.4183	-119.595
Santa Cruz	Cowell Beach	Cowell	36.960806	-122.024308
Santa Cruz	Cowell Beach	Cowell-BC	36.96147	-122.023339
Santa Cruz	Cowell Beach	Cowell-C	36.961623	-122.023142
Santa Cruz	Cowell Beach	Cowell-CW	36.961759	-122.022927
Santa Cruz	Main Beach	Main	36.962447	-122.021114
Santa Cruz	Main Beach	Main-A	36.962058	-122.022199
Santa Cruz	Main Beach	Main-B	36.962115	-122.021936
Santa Cruz	Main Beach	Main-C	36.962189	-122.021679
Santa Cruz	Neary Lagoon mouth	N0	36.9623	-122.02355
Santa Cruz	Pajaro Dunes Beach	O010	36.85119	-121.81022
Santa Cruz	Sunset State Beach	O060	36.89547	-121.83907
Santa Cruz	Manresa State Beach	O080	36.93181	-121.86295
Santa Cruz	Hidden Beach	O099	36.95698	-121.88885
Santa Cruz	Rio del Mar Beach	O110	36.96891	-121.90765

Santa Cruz	Seacliff State Beach	O140	36.97167	-121.91395
Santa Cruz	New Brighton State Beach	O170	36.97814	-121.93862
Santa Cruz	Capitola City Beach	O235	36.9717	-121.94977
Santa Cruz	Capitola City Beach	O240	36.97125	-121.95011
Santa Cruz	Pleasure Point Beach	O320	36.95564	-121.9717
Santa Cruz	Moran Lake, County Beach	O340	36.95609	-121.97853
Santa Cruz	Corcoran Lagoon Beach	O370	36.95968	-121.98611
Santa Cruz	Sunny Cove Beach	O380	36.96034	-121.98948
Santa Cruz	Twin Lakes State Beach	O410	36.96162	-121.99801
Santa Cruz	Seabright Beach	O440	36.96306	-122.00858
Santa Cruz	Main Beach	O450	36.96337	-122.01484
Santa Cruz	Main Beach	O460	36.96297	-122.01974
Santa Cruz	Main Beach	O478	36.962081	-122.022131
Santa Cruz	Cowell Beach	O488	36.96195	-122.02317
Santa Cruz	Cowell Beach	O490	36.9614	-122.02386
Santa Cruz	Cowell Beach	O493	36.959846	-122.025329
Santa Cruz	Cowell Beach	O494	36.95776	-122.02566
Santa Cruz	Lighthouse Beach	O510	36.95174	-122.02849
Santa Cruz	Mitchell's Cove Beach	O520	36.95258	-122.04134
Santa Cruz	Natural Bridges State Beach	O530	36.94967	-122.05785
Santa Cruz	San Vicente Beach	O560	37.00909	-122.19368
Santa Cruz	Scott Creek Beach	O580	37.03921	-122.2295
Santa Cruz	Waddell Creek Beach	O590	37.09609	-122.27976
Santa Cruz	Main Beach	Wharf-East	36.961995	-122.022464

Sonoma	Black Point Regional Park Beach	Black Point	38.68346	-123.4324089
Sonoma	Campbell Cove State Beach	Campbell Cove	38.30492	-123.057075
Sonoma	Doran Regional Park Beach	Doran Park	38.3134	-123.043222
Sonoma	Goat Rock State Park Beach	Goat Rock	38.44084	-123.125277
Sonoma	Gualala Regional Park Beach	Gualala	38.76225	-123.5312859
Sonoma	Salmon Creek State Park Beach	Salmon Creek	38.35631	-123.0685373
Sonoma	Still Water Cove Regional Park Beach	Stillwater	38.54697	-123.2976107
Ventura	Rincon Beach	1000	34.373398	-119.476088
Ventura	Solimar Beach	10000	34.310402	-119.35891
Ventura	Rincon Beach	1100	34.37538	-119.4730453
Ventura	Emma Woods State Beach	11000	34.290996	-119.338068
Ventura	Surfers Point at Seaside	13000	34.27301	-119.3050308
Ventura	Promenade Park Beach	14000	34.274409	-119.297644
Ventura	Promenade Park Beach	15000	34.275337	-119.295483
Ventura	Promenade Park Beach	17000	34.275661	-119.293034
Ventura	San Buenaventura State Beach	18000	34.27362	-119.2888336
Ventura	San Buenaventura State Beach	19000	34.272228	-119.285178

Ventura	San Buenaventura State Beach	20000	34.263737	-119.275887
Ventura	San Buenaventura State Beach	21000	34.2569	-119.2715302
Ventura	Marina Park Beach	22000	34.25377	-119.2701111
Ventura	Penninsula Beach	23000	34.24641	-119.2680511
Ventura	La Conchita Beach	2500	34.364201	-119.450103
Ventura	Surfers Knoll Beach	25000	34.23971	-119.2668381
Ventura	Oxnard Beach	29000	34.19789	-119.2486877
Ventura	Oxnard Beach	30000	34.19035	-119.2445755
Ventura	Oxnard Beach Park	32000	34.17873	-119.2384567
Ventura	Oxnard Beach Park	33000	34.17652	-119.2370834
Ventura	Hollywood Beach	34000	34.16859	-119.233078
Ventura	Hollywood Beach	35000	34.16328	-119.2302933
Ventura	Hobie Beach	36000	34.15963	-119.22219
Ventura	Kiddie Beach	37000	34.16167	-119.22215
Ventura	Silverstrand Beach	38000	34.15727	-119.2254257
Ventura	Silverstrand Beach	39000	34.15244	-119.2201004
Ventura	Oil Piers Beach	4000	34.35218	-119.4281006
Ventura	Silverstrand Beach	40000	34.14739	-119.2168274
Ventura	Port Hueneme Beach Park	41000	34.14134	-119.1951523
Ventura	Ormond Beach	42000	34.13899	-119.1892395
Ventura	Ormond Beach	43000	34.13577	-119.1836472
Ventura	Ormond Beach	44000	34.11953	-119.160408

Ventura	Point Mugu Beach	45000	34.0878	-119.0653305
Ventura	Thornhill Broome Beach	46000	34.0752	-119.0237045
Ventura	Sycamore Cove Beach	47000	34.070354	-119.014049
Ventura	County Line Beach	49500	34.051551	-118.959972
Ventura	Hobson County Park Beach	5000	34.33778	-119.4122467
Ventura	Staircase Beach	50000	34.047184	-118.950487
Ventura	Faria County Park Beach	7000	34.31897	-119.3917542
Ventura	Mandos Cove Beach	8100	34.321022	-119.375788

Appendix C. Data Quality Assurance Goals

DATA QUALITY ASSURANCE GOALS FOR THE PUBLIC BEACH SAFETY MONITORING PROGRAM

California State Water Resources Control Board
January 7, 2022

1. Introduction

The Public Beach Safety Monitoring Program (“Beach Program”) is a comprehensive, statewide bacteriological water quality monitoring and reporting program established to provide notifications on water contact safety for the protection of public health at ocean beaches in California. While the Beach Program is currently focused primarily on ocean beaches, bacteriological water quality monitoring is expected to extend to priority freshwater and estuarine water contact recreation sites with recent law passed by California Legislature in 2021 through Assembly Bill 1066.¹

The Beach Program was established in accordance with law passed by California Legislature in 1997 through Assembly Bill 411², which amended Health and Safety Code sections 115880, 115885, and 115915. Local environmental health departments or agencies (“local agencies”) are required to conduct beach water quality monitoring and public notification programs as described in sections 7952 through 7962 of Title 17 of the California Code of Regulations. This includes, at a minimum, monitoring beaches with storm drains that discharge during dry weather and are visited by more than 50,000 people per year at least weekly from April 1 through October 31 for total coliform, fecal coliform, or enterococci. When bacteriological standards for the Beach Program are not met, the local health official is responsible for posting notifications that restrict or prohibit the use of the beach, or a portion thereof.

At the state level, the Beach Program was administered solely by the California Department of Public Health until 2012 when, in accordance with Senate Bill 482³, the State Water Resources Control Board (“State Water Board”) assumed the responsibility for directing monitoring and providing funding to the local agencies. Additionally, the State Water Board assumed responsibility for reviewing monitoring protocols, site locations, and monitoring frequencies. However, the California Department of Public Health retains the responsibility to establish and amend minimum standards for the sanitation of public beaches.

The State Water Board continues to administer the program by providing grant funding to the sixteen local agencies that conduct monitoring for the Beach Program, managing the BeachWatch database and facilitating the transfer of data to the U.S. EPA’s databases annually, hosting Coastal Beach Water Quality Workgroup meetings to discuss science and regulations related to the Beach Program, and assisting with resolving test method and monitoring issues raised by local agencies.

In 2018, the State Water Board began to evaluate and take steps to improve quality assurance procedures for the Beach Program pursuant to 40 C.F.R. 31.45, which includes documenting the systematic process to ensure the quality of data generated is

¹ California Legislature. 2021. [Assembly Bill 1066, Priority Inland Water-Contact Recreation Sites: Water Quality Monitoring](#).

² California Legislature. 1997. [Assembly Bill 411, Beach Sanitation: Postings](#).

³ California Legislature. 2011. [Senate Bill 482, Public Beach Contamination, Standards, Testing, and Closing](#).

known and is appropriate for decision making purposes, and to minimize the loss of data due to out-of-control conditions or malfunctions. To accomplish this, the State Water Board is preparing a Quality Assurance Program Plan for the Beach Program, which will establish program-wide quality assurance policies and procedures for monitoring activities of the program. All local agencies will be required to revise their Quality Assurance Project Plans, which document the monitoring activities within their respective jurisdictions, to conform with the quality assurance policies and procedures in the Quality Assurance Program Plan.

This document identifies data quality assurance goals for the Beach Program, outlines the State Water Board's plan to develop and implement the Beach Program's Quality Assurance Program Plan, outlines the role of Quality Assurance Project Plans, and describes the annual review process.

2. Data Quality Assurance Goals

Local agencies have conducted monitoring for the Beach Program for over twenty years. Current program-wide quality assurance, quality control, and data management activities are primarily based on requirements detailed in laws and regulations, such as those in the Health and Safety Code and Title 17 of the California Code of Regulations; however, additional information and quality assurance measures are needed to fully support the Beach Program. As such, the State Water Board identified four data quality assurance goals for the Beach Program. In addressing these goals, the State Water Board will document existing and establish additional program-critical quality assurance measures to ensure the data generated for the Beach Program is of known quality and is appropriate for decision making. The four data quality assurance goals for the Beach Program are described below:

- Establish Data Acceptance Criteria: Considering the type and quality of data needed to make decisions for the Beach Program, the State Water Board will derive program-wide acceptance criteria that data will need to meet to minimize the possibility of making erroneous conclusions. This includes identifying and documenting the data quality objectives, data quality indicators, and measurement quality objectives for the Beach Program. The State Water Board will establish acceptable levels of uncertainty related to precision, accuracy, and representativeness for the Beach Program, as well as identifying criteria to minimize or control sampling and measurement error.
- Establish Quality Control Measures: Considering the data quality objectives, data quality indicators, and measurement quality objectives, the State Water Board will establish standardized quality control activities for the Beach Program to verify and validate the quality of the data generated. This includes identifying the type and frequency of quality control measures to be implemented by local

agencies for field sampling and laboratories for analysis, such as replicate sampling, field duplicates, and sample holding times.

- Establish Procedures for Data Verification and Validation: To ensure the data collected are appropriate and consistent with the intended use, the State Water Board will develop a systematic process to ascertain the data's completeness, correctness, and consistency with methods and acceptance criteria for the Beach Program. This includes identifying what sampling and analytical information local agencies should be reviewing during the data verification step, as well as establishing procedures for how local agencies shall evaluate analytical data to verify if it meets the acceptance criteria and labeling data that does not. This may also include establishing corrective action procedures local agencies or laboratories must follow if the acceptance criteria are not met.
- Evaluate the Data Management Strategy: Considering the data lifecycle (from generating to final use and storage), the State Water Board will evaluate measures to further monitor, control, and store data generated for the Beach Program. This may include updating the state's database for the Beach Program, BeachWatch, to allow local agencies to submit quality control results along with water quality data and identify, or flag, data that does not meet the acceptance criteria. Furthermore, the State Water Board may establish procedures or an automated process to verify data submitted to BeachWatch by the local agencies.

3. Quality Assurance Program Plan Approach

The Quality Assurance Program Plan will define and document the type and quality of data needed for program level decisions, and will describe the methods for collecting, analyzing, and assessing data to support those decisions. In developing the Quality Assurance Program Plan, the State Water Board will focus on establishing and documenting program-critical quality assurance, quality control, and data management activities.

The State Water Board will develop the Quality Assurance Program Plan in accordance with the U.S. EPA's Region 9 Guidance for Quality Assurance Program Plans⁴ and in conformance with the State Water Board's Quality Management Plan⁵. In order to effectively address and successfully implement quality assurance, quality control, and data management activities for the Beach Program, the State Water Board will develop the Quality Assurance Program Plan in multiple phases, as described below:

⁴ U.S. EPA Region 9. 2012. [Guidance for Quality Assurance Program Plans \(R9QA/03.2\)](#).

⁵ State Water Board. 2017. [Quality Assurance Management Plan Version 2.0](#).

- Phase 1: By December 30, 2022, the State Water Board will document existing quality assurance, quality control, and data management procedures; and establish initial acceptance criteria for the Beach Program.
- Phase 2: By December 29, 2023, the State Water Board plans to refine acceptance criteria if needed, establish quality control procedures, and establish initial data verification and validation procedures.
- Phase 3: By December 31, 2024, the State Water Board plans to refine quality control activities and data verification and validation procedures if needed; and evaluate the data management strategy.

The State Water Board will facilitate opportunities for data users, data producers, and decision makers to be involved in each phase of developing the Quality Assurance Program Plan. This approach will ensure that their needs are defined and adequately addressed. This approach will also provide opportunities to collaborate on improvements to the Beach Program and build consensus around approaches to improve quality assurance, quality control, and data management activities that need to be implemented program wide. To accomplish this, the State Water Board will provide opportunities for information sharing or to engage in discussions with the California Department of Public Health, local agencies, laboratories, Regional Water Quality Control Boards, other regulatory agencies, and other interested parties. This may include holding focused discussions at Coastal Beach Water Quality Workgroup meetings, convening an advisory group with representatives from the local agencies and the California Department of Public Health, providing opportunities to comment on proposed program-wide quality assurance measures, or providing surveys to gather information and suggestions.

The State Water Board will submit the final Quality Assurance Program Plan to the U.S. EPA for review and approval. The State Water Board Quality Assurance Officer will, at a minimum, review the Beach Program Quality Assurance Program Plan every five years. Furthermore, the State Water Board will review and revise Quality Assurance Program Plan as described in Section 5 below.

4. Quality Assurance Project Plan Approach

The Quality Assurance Project Plans identify the local agencies' project-specific considerations, responsible individuals, and technical planning processes for obtaining, assessing, and reporting environmental data. Furthermore, the Quality Assurance Project Plans describe in detail the quality assurance, quality control, and technical activities implemented by local agencies to ensure the results of work performed will satisfy the stated performance criteria.

The sixteen local agencies have each prepared and submitted their Quality Assurance Project Plan to the State Water Board. Once the Quality Assurance Program Plan is approved by the U.S. EPA, the State Water Board will consult with the local agencies to ensure their Quality Assurance Project Plans are revised to align with the Beach Program's Quality Assurance Program Plan and the State Water Board's Quality Management Plan.

5. Annual Review

The State Water Board will conduct an annual review of the Beach Program, including the development and implementation of the Quality Assurance Program Plan in collaboration with the State Water Board's Quality Assurance Officer. In conducting the annual review, the State Water Board will consider the needs of the program and the lessons learned from developing and implementing the Quality Assurance Program Plan, Quality Assurance Project Plans, identify and establish a plan to address challenges, and evaluate opportunities to improve the Beach Program. This may include:

- Evaluating the suitability of analytical methods for the Beach Program and working with the Environmental Laboratory Accreditation Program to ensure laboratories are accredited for appropriate methods;
- Considering opportunities to expand the use of rapid analytical methods, such as the droplet digital polymerase chain reaction analytical method;
- Consulting with the California Department of Public Health to align the indicators and bacteriological standards used for the Beach Program with those identified in the U.S. EPA's 2012 Recreational Water Quality Criteria⁶ and California's Bacteria Water Quality Objectives; and
- Evaluating the success and challenges of implementing quality assurance, quality control, and data management activities program-wide.

In considering this information, the State Water Board may modify its approach to developing and implementing the Quality Assurance Program Plan to ensure program- critical quality assurance needs are being met and are effectively implemented program-wide. The State Water Board will provide the U.S. EPA with information and updates resulting from this annual review in its' closeout report for the Beaches Environmental Assessment and Coastal Health Act Grant.

⁶ U.S. EPA. 2012. [Recreational Water Quality Criteria](#).

Appendix D. Beach Program Business Rules

Standardized formatting promotes consistency and prevents the misinterpretation of data. “Business rules” establish a uniform method of data entry that enables both project staff and end users to easily understand test results. The following information should be used in conjunction with the MQOs and required QC samples for complete compliance with the Beach Program. In general, the Beach Program requires the reporting of accuracy, precision, and blank QC samples. A Microsoft Excel template exists to format the laboratory data in a manner that can be easily loaded into BeachWatch. Each of the fields in the template and how to populate them are described in Table 1, below.

Table 1. Description and Business Rules for Fields within BeachWatch Data Upload Template

Template Field Name	Description	Business Rule
SampleAgencyCode	SampleAgencyCode refers to the organization or agency that collected the sample. This should be listed on the Chain of Custody document that accompanies the samples from the fields.	If an environmental sample is used to perform laboratory QC (e.g., lab duplicate), the SampleAgencyCode still refers to the agency that collected the native sample, not the agency that created the QC sample.
AB411Location	AB411Location refers to the locations that match the criteria established through AB411 (i.e., 50,000 annual visitors, near a storm drain that flows during dry weather, etc.)	AB411Location is indicated by Y or N
StationID	StationID represents a unique sampling site in a sampling design. A single waterbody may have multiple stations.	StationID should represent a geographic location not a geographic location combined with a replicate reference. There cannot be multiple StationIDs with the same target latitude/longitude coordinates.

		The format for the unique alphanumeric description of the station is created by the respective local agency.
SampleDate	SampleDate refers to the date the sample was collected in the field.	The format for date in the template is DD/MM/YYYY.
SampleTime	SampleTime refers to the time when the first sample of a sampling event at a specific station was collected in the field.	If the sampling crew collects multiple containers at a single station, the SampleTime for each would be the time of the first container collected. By doing so, the samples can easily be linked and any holding time issues will be consistent and conservative for laboratory work. The SampleTime format should be expressed as HH:MM in 12-hour time.
SampleType	SampleType refers to the type of sample collected or analyzed.	The SampleType code for the Beach Program shall be listed as "Grab."
LabAgencyCode	LabCode refers to the organization, agency, or laboratory that performed the analysis on the sample.	The format for the unique description is created by the State Water Board based on the organization's, agency's, or laboratory's name.
LabBatch	The LabBatch is a unique code, provided by the laboratory, which represents a group of samples processed together. It groups all environmental samples with their supporting QC samples and will be used to verify completeness based	The LabBatch is assigned to and identifies all samples analyzed together in one batch. All lab batches listed in the data sheet need to be listed one time only in the LabBatch column.

	on the Beach Program QA Program Plan.	
AnalysisDate	AnalysisDate is the date and time the sample was processed on the analytical instrument.	The date and time should be expressed as DD/MM/YYYY HH:MM. The analysis date and time is the time sample analysis is initiated.
ParameterCode	ParameterCode is the name of the parameter for which the analysis is conducted and result is reported.	Parameters within BeachWatch are “coliform, total,” “coliform, fecal,” and “enterococcus.”
AnalysisMethod	AnalysisMethod refers to the analysis method used by the laboratory to analyze the sample.	Methods are expressed with an AnalysisMethod code such as SM 9221E or EPA 1600. Any method for the Beach Program which is not in the current BeachWatch database list must be approved by the PM and State Water Board QA Officer prior to being added to the database.
RL	Reporting Limit (RL) is the minimum value below which data are documented as nonquantifiable. It is the reporting limit for the sample analyzed, as determined by the laboratory.	The RL field shall be populated with the limitation of the CFU or MPN technique used for the analysis as defined by the method. For PCR-based methods, the quantification capabilities and the detection capabilities of the analytical method do represent different performance thresholds for the analysis. The RL and (Method Detection Limit) MDL shall be populated with the same value.

MDL	MDL is the minimum concentration of an analyte that undergoes the entire measurement process and can be reported with a stated level of confidence that the analyte concentration is greater than zero. It is the detection limit associated with the method used to analyze the parameter in the sample. It is the detection limit associated with the method used to analyze the parameter in the sample.	The MDL field shall be populated with the limitation of the CFU or MPN technique used for the analysis as defined by the method. For methods that use PCR-based technologies, the detection limit using a dilution of a reference material and measuring recovery of the replicates of each dilution shall be populated in the MDL field. The RL and MDL shall be populated with the same value.
Dilution	Dilution is the factor by which a sample was diluted and is reported as a whole number.	Default value is 1. A dilution other than 1 is recorded when a sample requires an additional dilution to fit into the standard curve of the instrument. It does not apply to dilutions that are standard in the method being used for analysis. Final reported results, along with the MDL and RL, must be corrected for dilution that was carried out during the process of analysis.
Result	Result is the final numeric result of a given analyte.	The Result is expressed as a real number rather than a calculation. The result should be reported with the appropriate number of significant figures. A result of 3.72669 with 3 significant figures should be reported as 3.73.

		A result of 1.350 with 4 significant figures must display as 1.350 in the Excel file.
Units	Units refers to how the result is measured or expressed.	Each analyte requires that specific Units be used in BeachWatch to ensure comparability across data. Units are indicated by MPN/100mL, CFU/100mL, or Copies/100mL.
Qualifier	The Qualifier qualifies the analytical results of the sample.	Detected qualifiers include: <, >, =, Present (P), or Detected Not Quantifiable (DNQ). Non-detected qualifiers: Not Detected (ND) or Not Analyzed (NA). Refer to Qualifier Lookup List for descriptions of each.
DetectedAboveMDL	The MDL is the detection limit associated with the method used to analyze the parameter in the sample. DetectedAboveMDL indicates if the Result is above the MDL.	DetectedAboveMDL are indicated by Y or N.
QACode	QACode is applied to the result to describe any special conditions, situations, or outliers that occurred during or prior to the analysis to achieve the result.	The default code, indicating no special conditions, is "None." If more than one code should be applied to a record, the convention is to list them in alphabetical order separated by commas and no spaces. If a combination is not listed, contact PM or Technical Contact.

		Refer to QA Code Lookup List for descriptions of each and combinations.
Comments	The Comments field holds any comments related to the lab result or analysis of the sample.	These could be comments needed to clarify any portion of the analysis or a comment that is not accommodated by another field.

Qualifier Lookup List

Qualifier	Description
<	Less than
>	Greater than
=	Equal to
NA	Not analyzed
ND	Not detected
P	Present
DNQ	Detected Not Quantifiable

QA Code Lookup List

QA Code	Description
BCO	Sample received in improper container
BRKA	Sample container broken but analyzed
BX	Sample stored at improper temperature
BY	Sample received at improper temperature
H	A holding time violation has occurred
IZM	Bottle integrity compromised, potential contamination
J	Estimated value – EPA Flag
JA	Analyte positively identified but quantitation is an estimate
LC	Laboratory Contamination
MN	Method procedures not followed
None	None – No QA Qualifier
VH	Holding time violation occurred, flagged by QAO
VJ	Estimated value – EPA Flag, flagged by QAO

QA Code Combinations	Description
BCO,H	BCO,H; see individual descriptions for complete definition
BRKA,H	BRKA,H; see individual descriptions for complete definition
BRKA,H,IZM	BRKA,H,IZM; see individual descriptions for complete definition
BRKA,J	BRKA,J; see individual descriptions for complete definition
BX,H	BX,H; see individual descriptions for complete definition
BX,H,J	BX,H,J; see individual descriptions for complete definition
BY,H	BY,H; see individual descriptions for complete definition
BY,J	BY,J; see individual descriptions for complete definition
H,IZM	H,IZM; see individual descriptions for complete definition
H,J	H,J; see individual descriptions for complete definition
H,JA	H,JA; see individual descriptions for complete definition
J,JA	J,JA; see individual descriptions for complete definition
J,LC	J,LC; see individual descriptions for complete definition
J,MN	J,MN; see individual descriptions for complete definition

J,VH	J,VH; see individual descriptions for complete definition
JA,VH	JA,VH; see individual descriptions for complete definition
LC,VH	LC,VH; see individual descriptions for complete definition
VH,VJ	VH,VJ; see individual descriptions for complete definition

Appendix E. Beach Program Chain-of-Custody Form

Coastal Beach Safety Monitoring Program

State Water Resources Control Board
1001 I Street Sacramento, CA 95814

Chain of Custody Record and Sample Information

Version 1.0

Page _____ of _____

Sample Collection Agency:				Project Name:				Sample Matrix Code (SW=seawater) Sample Type Code (Single) Sample Container Used? (Yes/No) Preservation Code (See below) No. of Containers				Analyses Requested				
Sample Collection Agency Address:				Grant Agreement No.:								Total Coliform	Fecal Coliform	Enterococcus	Other	Notes
Project Director Contact Information				Field Lead Contact Information												
Name:				Name:												
Phone:				Phone:												
Email:				Email:												
Sample ID		Date	Time	Location												
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
Samples Relinquished By:											Samples Received By:					
Name (Print) and Agency		Signature		Date		Time		Name (Print) and Agency		Signature		Date		Time		
1																
2																
3																
4																
Completed by Field Staff				Completed by Laboratory Personnel												
Field Observation(s)				Sample Receipt		Analysis Information		Laboratory Notes				Preservation Codes				
				Total No. of Sample Containers Received		Analysis Date						1. Cooled, ≤10 °C		7. NaOH/2N Acetone		
				Sample(s) Properly Coded (Y=yes; N=no)		Analysis Time						2. HNO3		8. HCl		
				Temperature °C		Turn Around Time						3. HCl		9. Filtered		
				Sample(s) Intact (Y=yes; N=no)		Routine (Y or N)						4. H2SO4		10. Freeze, ≤10 °C		
				Custody Seal(s) Intact (Y=yes; N=no)		Special Instruction		Results Sent To:				5. Na2S2O3		11. None required		
Sample(s) Accepted (Y=yes; N=no)		Expedite? (Y or N)		6. NaOH		12. Other _____										

Appendix F. Beach Program Corrective Action Report Template

Corrective Action Report

Agency Name and Address:		Project Director:	
Deficiency Identification			
Date Identified:		Identified through:	
Reporting Party:		☐ Sampling/field management ☐ Laboratory measurement ☐ Other (specify):	
Involved Party:			
Problem Type			
Problem Description			
Proposed Corrective Action			
Corrective Action Information			
Impact on Data			
Sample Results			
Follow-up Plan			
Corrective Action Outcome(s)			
Resolution Date			
Date:		☐ Proposed ☐ Completed	
Compliance Review/Approval (to be filled out by State Water Board Staff)			
Reviewed by: [Name and Title]		Review date:	
Approved by: [Name and Title]		Approval date:	
Notes:			

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