

**Assessment Methodology for the
U.S. Virgin Islands
Integrated Water Quality Monitoring and Assessment Report**

This document was prepared pursuant to Section 303(d) of the federal Clean Water Act

Contents

1.0 Background.....	4
2.0 Comprehensive Assessment	4
2.1 Identification of Waterbody Type	4
2.2 Identification of Waterbody Classification and Designated Use.....	4
2.3 Monitored Waters	8
2.4 Unmonitored Waters.....	8
3.0 Use and Interpretation of Data.....	10
3.1 Inventory of Physical, Chemical and Microbiological Data	10
3.1.1 Evaluation of Internal Data	10
3.1.2 DPNR Monitoring Sites in Areas that contain coral reef ecosystems	10
3.1.3 Evaluation of External Data	11
3.2 Habitat Assessment Data Inventory	12
3.3 Visual Data Sources.....	12
3.4 Identify Exceedances of Water Quality Standards	12
3.5 Data Gaps and Error Control	14
3.6 Natural Disasters.....	14
3.7 Quality Assurance/Quality Control	14
3.8 Listing Rules.....	16
3.8.1 Minimum Number of Samples.....	16
3.8.2 Listing Removal	16
4.0 Designated Use Attainment	16
4.1 Parameters for Designated Use Assessments	18
4.2 Aquatic Life Use.....	18
4.2.1 Conventional Assessment	18
4.2.2 Toxicant Assessment (Aquatic Life) (Human Health)/Toxicity Assessment	19

4.2.3	Habitat Assessment	20
4.2.4	Biological Assessment	20
4.3	Primary Contact Recreation.....	21
4.3.1	Microbiological Assessment	21
4.3.2	Beach Closing Assessment.....	22
4.3.3	Other Parameters	22
4.4	Listing Categories	23
4.5	Groundwater Monitoring Program	24
Appendix A: Summary of Criterion Levels of Virgin Islands Water Quality Standards.....		25

1.0 Background

The Clean Water Act requires each state to conduct water quality surveys to determine if its waters are healthy, meet its designated uses and attain water quality standards. A report on this water quality assessment is submitted on even numbered years to the U.S. Environmental Protection Agency's Region 2 office. The U.S. EPA encourages states to adopt the integrated reporting format which blends elements of the 305(b) Water Quality Assessment Report and the 303(d) Impaired Waterbody List. The U.S. Virgin Islands Department of Planning and Natural Resources uses this format to assess the U.S. Virgin Islands' waterbodies.

States are required to submit, for U.S. EPA and public review, the methods used to collect, analyze and interpret data to determine conformity with applicable water quality standards and assess support of the applicable designated uses. This method document serves that function by providing an objective and scientifically sound assessment methodology.

2.0 Comprehensive Assessment

2.1 Identification of Waterbody Type

All waters of the U.S. Virgin Islands shall meet generally accepted aesthetic qualifications and shall be capable of supporting diversified aquatic life. The waters within the territory's jurisdiction include: all harbors, bays, streams, lakes, ponds, impounding reservoirs, marshes, water-courses, water-ways, wells, springs, irrigation systems, drainage systems and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, situated wholly or partly within or bordering upon the U.S. Virgin Islands, including the territorial seas, contiguous zones and oceans. Assessments of these waters shall be included in the U.S. Virgin Islands 2022 integrated report, with emphasis given to the waterbodies near-shore and off-shore from the three major islands making up the U.S. Virgin Islands: St. Croix, St. Thomas and St. John.

2.2 Identification of Waterbody Classification and Designated Use

According to the current U.S. Virgin Islands water quality standards, the waters of the U.S. Virgin Islands exist in one of four classes: I, A, B and C. The geographical extent of the four waterbody classes, and the applicable water quality standards are found at the following website:

<http://dpr.vi.gov/environmental-protection/water-quality-management/>

Or, via navigation from <https://dpr.vi.gov>

Class "I" Waters

Waters included in this class can be either inland surface waters or inland groundwaters (Subclass IG waters). Inland surface waters can be fresh (Subclass IF Waters), or, saline or brackish (Subclass IBS Waters).

Subclass Inland Fresh Waters (IF Waters) and Inland Brackish or Saline Waters (IBS Waters):

Designated Uses: Maintenance and propagation of desirable species of wildlife and aquatic life (including threatened, endangered species listed pursuant to section 4 of the federal Endangered Species

Act and threatened, endangered and indigenous species listed pursuant to Title 12, Chapter 2 of the Virgin Islands Code), and primary contact recreation.

Subclass of Inland Groundwaters (IG Waters):

Designated Uses: For use as a potable water source.

Class I geographical delineation: Designated aquatic-influenced environments located within land boundaries.

Class “A” Waters

Designated Uses: Maintenance and propagation of desirable species of aquatic life (including threatened, endangered and indigenous species) and primary contact recreation. Primary contact recreation is defined as activities where the human body may come in direct contact with raw water to the point of complete body submergence. Primary contact recreation includes, but is not limited to, swimming, diving, water skiing, skin diving and surfing. Preservation of the unique characteristics of the waters designated as Outstanding Natural Resource Waters, waters of exceptional recreational, environmental or ecological significance. The quality of these waters cannot be altered except towards natural conditions. No new or increased dischargers shall be permitted.

Class A geographical delineation

Class A Waters (Outstanding Natural Resource Waters):

- (1) Within 0.5 miles of the boundaries of Buck Island’s Natural Barrier Reef, St. Croix.
- (2) Trunk Bay, St. John.

Class “B” Waters

Designated Uses: For maintenance and propagation of desirable species of aquatic life (including threatened, endangered and indigenous species) and for primary contact recreation (swimming, water skiing, etc.). This class allows minimal changes in structure of the biotic community and minimal changes in ecosystem function. Virtually all native taxa are maintained with some changes in biomass and/or abundance; ecosystem functions are fully maintained within the range of natural variability.

Class B geographical delineation

- (1) All other waters within the jurisdiction of the U.S. Virgin Islands not classified as Class “A” or Class “C”.
 - (A) Those Class “B” waters not covered by color and turbidity criteria in section 186-4 (b)(2)(B)(i)(j)(3) of the Virgin Islands water quality standards regulations include:
 - (i) St. Thomas waters-Mandahl Bay (Marina), Vessup Bay, Water Bay, Benner Bay, and the Mangrove Lagoon.
 - (ii) St. Croix waters-Carlton Beach, Good Hope Beach, Salt River Lagoon (Marina), Salt River Lagoon (Sugar Bay), Estate Anguilla Beach, Buccaneer Beach, Tamarind Reef Lagoon, Green Cay Beach and Enfield Green Beach.

- (iii) All non-marine waters defined as all Virgin Islands waters shoreward of the mean high-tide line.

This caveat applies to the above waters which may have characteristics naturally outside of the limits prescribed by the Virgin Islands water quality standards regulations, and thus any exceedances would not represent a violation of standards.

- (B) All other Class “B” waters are covered by the color and turbidity criteria in section 186-4 (b)(2)(B)(ii)(j)(3) of the Virgin Islands water quality standards regulations.

Class “C” Waters

Designated Uses: For maintenance and propagation of desirable species of aquatic life (including threatened and endangered species listed pursuant to section 4 of the federal Endangered Species Act and threatened, endangered and indigenous species listed pursuant Title 12, Chapter 2 of the Virgin Islands Code) and for primary contact recreation (swimming, water skiing, etc.). This class allows for evident changes in structure of the biotic community and minimal changes in ecosystem function. Evident changes in structure due to loss of some rare native taxa; shifts in relative abundance of taxa (community structure) are allowed but sensitive-ubiquitous taxa remain common and abundant; ecosystem functions are fully maintained through redundant attributes of the system.

Class C geographical delineation

- (1) St. Thomas:
 - (A) St. Thomas Harbor beginning at Rupert Rock and extending to Haulover Cut.
 - (B) Crown Bay enclosed by a line from Hassel Island at Haulover Cut to Regis Point at West Gregerie Channel.
 - (C) Krum Bay.
- (2) St. Croix:
 - (A) Christiansted Harbor from Fort Louise Augusta to Golden Rock, along the waterfront and seaward to include the navigational channels and mooring areas.
 - (B) Frederiksted Harbor from La Grange to Fisher Street and seaward to the end of the Frederiksted Pier.
 - (C) Hess Oil Virgin Islands Harbor (alternatively named HOVENSA Harbor).
 - (D) Martin-Marietta Alumina Harbor (alternatively named Port Alucroix or St. Croix Renaissance Group Harbor).
- (3) St. John:
 - (A) Enighed Pond Bay

Figures 1 and 2 show the delineations for the assessment units for St. Croix, St. John and St. Thomas. The figures also show the applicable class for each assessment unit.



Figure 1: St. Croix Assessment Units

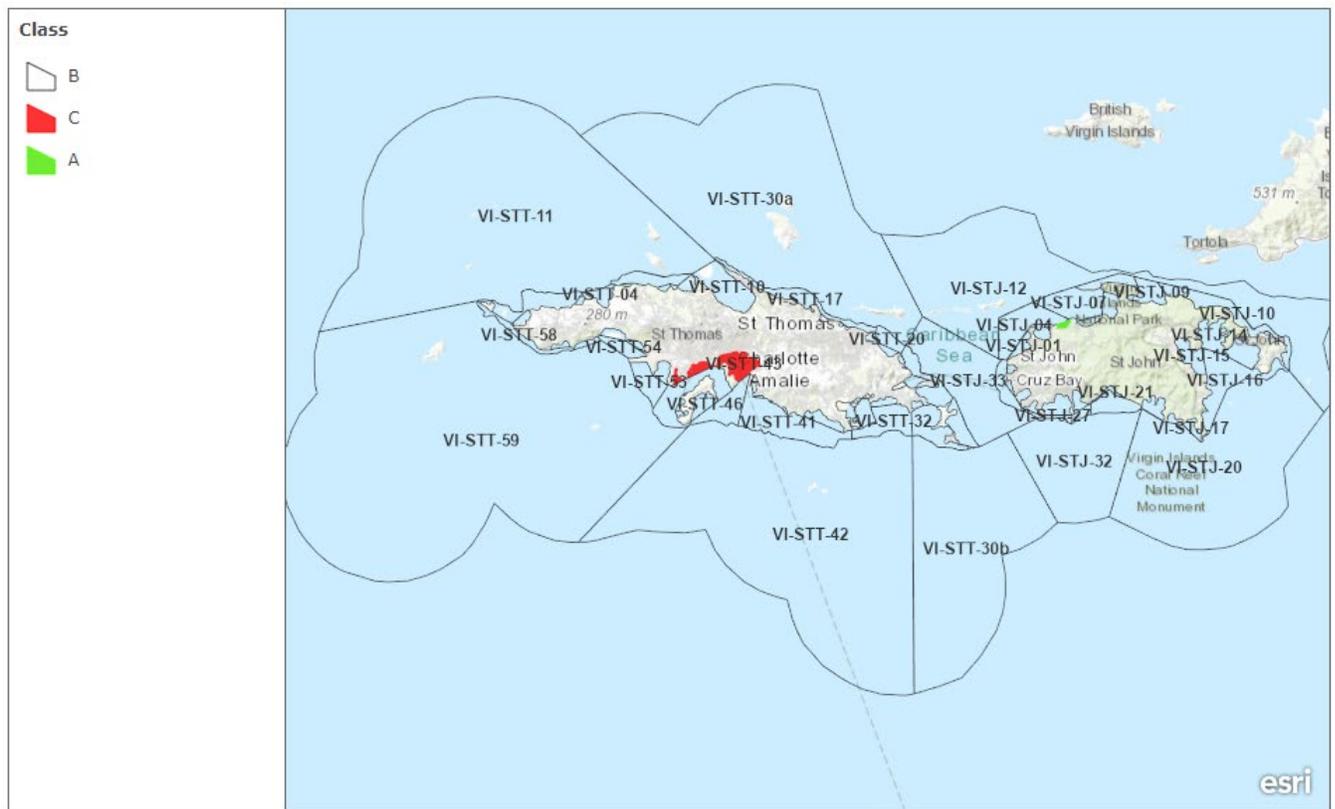


Figure 2: St. John and St. Thomas Assessment Units

2.3 Monitored Waters

Table 1: Overview of monitored waters and assessment units within the U.S. Virgin Islands

Island	# of Assessment Units	Assessment Units Monitored	# of Assessment Units each Class of Water falls under			% of Total
			Class A	Class B	Class C	
	Total					
St. Croix	84	38	1	31	6	45%
St. Thomas	60	41	NA	38	3	68%
St. John	33	17	1	16	NA	52%

* Assessment units not monitored were either missed during monitoring events or currently do not have monitoring locations within the geographic boundary.

2.4 Unmonitored Waters

It is the goal to assess and characterize the condition of all waters in the U.S. Virgin Islands. The following waters have not been assessed since there are no monitoring stations located within these assessment units:

Table 2: Unmonitored Waters

Assessment Unit	Name	Class
VI-STC-01	Frederiksted, south	B
VI-STC-03	Lagrange subwatershed, offshore	B
VI-STC-05	Prosperity subwatershed, offshore	B
VI-STC-07	Creque Dam/Butler Bay	B
VI-STC-08	Hams Bay	B
VI-STC-09	Davis Bay	B
VI-STC-10	Hams Bluff	B
VI-STC-11	Northwest St. Croix HUC14, offshore	B
VI-STC-14	Belvedere	B
VI-STC-15	Northside subwatershed	B
VI-STC-17	Salt River Lagoon, Sugar Bay	B
VI-STC-19	Judith Fancy	B
VI-STC-20	Salt River Bay subwatershed, west	B
VI-STC-21	Salt River Bay subwatershed, east	B
VI-STC-22	Northcentral St. Croix HUC14, offshore	B
VI-STC-28	Altona Lagoon	B
VI-STC-32	Altona Lagoon subwatershed, offshore	B
VI-STC-37	Southgate subwatershed, offshore	B
VI-STC-38	Solitude Backreef	B
VI-STC-42	Buck Island Forereef	A
VI-STC-43	Solitude and Teague Bay subwatersheds, offshore	B
VI-STC-44	Northeast St. Croix HUC14, offshore.	B
VI-STC-45	Isaac Bay	B
VI-STC-48	Turner Hole subwatershed, offshore	B
VI-STC-50	Madam Carty, offshore	B

Assessment Unit	Name	Class
VI-STC-51	Great Pond	B
VI-STC-53	Great Pond Bay subwatershed, offshore	B
VI-STC-54	Leprey Valley Backreef	B
VI-STC-55	Leprey Valley subwatershed, offshore	B
VI-STC-57	Bugby Hole subwatershed, offshore	B
VI-STC-58	Southeast St. Croix HUC14, offshore	B
VI-STC-60	Canegarden Bay, offshore	B
VI-STC-67	Southports St. Croix HUC14, offshore	B
VI-STC-68	Bethlehem subwatershed, inshore	B
VI-STC-69	Bethlehem subwatershed, offshore	B
VI-STC-70	Airport, nearshore	B
VI-STC-71	Airport, offshore	B
VI-STC-72	Airport St. Croix HUC14, offshore	B
VI-STC-73	Diamond, nearshore	B
VI-STC-74	Enfield Green Beach/VIRIL Outfall	B
VI-STC-76	Carlton Beach	B
VI-STC-78	Long Point Bay subwatershed, offshore	B
VI-STC-80	Sandy Point, nearshore south	B
VI-STC-81	Sandy Point, offshore south	B
VI-STC-83	Sandy Point, offshore west	B
VI-STC-84	Southwest St. Croix HUC14, offshore	B
VI-STJ-01	Caneel Bay	B
VI-STJ-04	Hawksnest Bay subwatershed, offshore	B
VI-STJ-07	Maho Bay subwatershed, offshore	B
VI-STJ-08	Mary Point	B
VI-STJ-09	Leinster Bay	B
VI-STJ-10	Minnebeck Bay	B
VI-STJ-11	Newfound Bay	B
VI-STJ-12	North St. John HUC14, offshore	B
VI-STJ-14	Hurricane Hole	B
VI-STJ-18	Grootman Bay	B
VI-STJ-20	Southeast St. John HUC14, offshore	B
VI-STJ-22	Genti Bay, offshore	B
VI-STJ-24	Fish Bay subwatershed, offshore	B
VI-STJ-27	Rendezvous Bay subwatershed, offshore	B
VI-STJ-32	Southwest St. John HUC14, offshore	B
VI-STJ-33	Pillsbury Sound	B
VI-STT-03	Botany Bay subwatershed, offshore	B
VI-STT-06	Neltjeberg Bay	B
VI-STT-09	Dorothea Bay subwatershed, offshore	B
VI-STT-11	Northwest St. Thomas HUC14, offshore	B
VI-STT-12	Lovenlund Bay	B
VI-STT-14	Tutu Bay	B
VI-STT-20	Smith Bay subwatershed, offshore	B

Assessment Unit	Name	Class
VI-STT-26	Red Hook Bay, offshore	B
VI-STT-27	St. James Islands, offshore	B
VI-STT-29	St. James Bay	B
VI-STT-30A	Northeast St. Thomas HUC14, offshore north	B
VI-STT-30B	Northeast St. Thomas HUC14, offshore south	B
VI-STT-32	Jersey Bay, offshore	B
VI-STT-33	Benner Bay	B
VI-STT-42	Southeast St. Thomas HUC14, offshore	B
VI-STT-44	St. Thomas Harbor, outer	B
VI-STT-48	Water Isle Hotel, Beach	B
VI-STT-58	Fortuna Bay subwatershed, offshore	B
VI-STT-59	Northwest St. Thomas HUC14, offshore	B

3.0 Use and Interpretation of Data

3.1 Inventory of Physical, Chemical and Microbiological Data

The inventory of physical, chemical and microbiological data used to develop the 2022 integrated report and make water quality assessments will consist of a search of monitoring results from samples taken between October 1, 2019 and September 30, 2021 downloaded from the water quality portal located at <https://www.waterqualitydata.us/portal/> on October 4, 2021. The portal includes data from the ambient and beach water quality monitoring programs. The parameters used to perform the assessments are: clarity, dissolved oxygen, enterococcus, total nitrogen, pH, total phosphorus, temperature and turbidity.

3.1.1 Evaluation of Internal Data

The U.S. Virgin Islands Division of Environmental Protection’s Coastal Water Quality (ambient) Monitoring Program is managed by the Water Quality Management Program. Through the Coastal Water Quality Monitoring Program, ambient water quality is monitored on a quarterly basis. Through an in-kind assistance agreement, a U.S. EPA contractor is responsible for conducting quarterly ambient monitoring.

The water quality management program also monitors designated recreational beaches on a weekly basis through the beach water quality monitoring program. The beach water quality monitoring program collects samples at up to 43 designated beaches throughout the territory and analyzes the samples for enterococcus. The data is uploaded to the EPA’s water quality portal through the water quality exchange.

3.1.2 DPNR Monitoring Sites in Areas that contain coral reef ecosystems

Any water quality data obtained from coral reef ecosystem areas is assessed with more restrictive conventional numeric criteria as reflected in U.S. Virgin Islands’ 2019 Water Quality Standards. Areas that contain coral reef ecosystems are determined based on benthic habitat atlas of Puerto Rico and the U.S. Virgin Islands. For the purposes of this assessment, a coral reef ecosystem is categorized as coral habitats classified by the National Oceanic and Atmospheric Administration as linear reef, patch reef or spur and groove formations. Reference: Kendall et al, Methods Used to Map the Benthic Habitats of Puerto Rico and the U.S. Virgin Islands, 2001. The coral habitats are described as:

- **Linear Reef:** Linear coral formations that are oriented parallel to shore or the shelf edge. These features follow the contours of the shore/shelf edge. This category is used for such commonly used terms as fore reef, fringing reef and shelf edge reef.
- **Patch Reef(s):** Coral formations that are isolated from other coral reef formations by sand, seagrass or other habitats and that have no organized structural axis relative to the contours of the shore or shelf edge. A surrounding halo of sand is often a distinguishing feature of this habitat type when it occurs adjacent to submerged vegetation.
- **Spur and Groove:** Habitat having alternating sand and coral formations that are oriented perpendicular to the shore or bank/shelf escarpment. The coral formations (spurs) of this feature typically have a high vertical relief compared to pavement with sand channels and are separated from each other by 1-5 meters of sand or bare hardbottom (grooves), although the height and width of these elements may vary considerably. This habitat type typically occurs in the fore reef or bank/shelf escarpment zone.

When compared against global positioning system locations of the above monitoring locations, only two monitoring stations are currently located in coral reef ecosystems:

- Monitoring point STT-14 (linear reef) which is in assessment unit VI-STT-08 and
- Monitoring point STJ-57 (also linear reef) which is in assessment unit VI-STJ-13.

Note that the U.S. Virgin Islands uses a similar system to name its monitoring locations and assessment units. The assessment units are distinguished by the addition of “VI” before the name. For instance, STT-14 is a monitoring point while VI-STT-14 is an assessment unit.

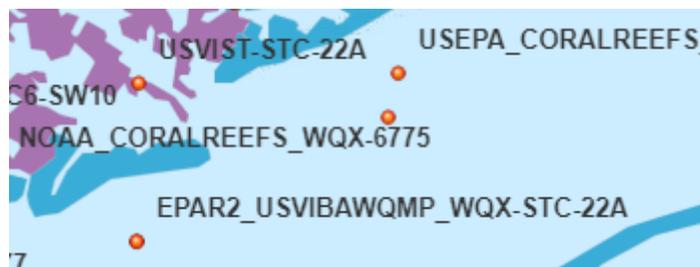


Figure 3: Location of Monitoring location STC-22A

Previous assessments have included points STT-12, STC-7 and STT-22A as coral habitat areas. For point STT-12, the latitude and longitude are in an area classified as scattered coral and point STC-7 is in an area classified as colonized pavement. For this assessment, points STT-12, STC-7 and STT-22A are not located in coral reef ecosystems. For point STC-22A, there is a discrepancy. The U.S. Virgin Islands lists the latitude and longitude for the point as 17.67865, -64.7728 (which does intersect with patch reef). See Figure 3, point labeled USVIST-STC-22A. The label for the point is above and to the right of the orange point that represents the latitude and longitude. In Figure 3, patch reef is represented by purple. The latitude and longitude for point STC-22A from the water quality portal, labeled as EPAR2_USVIBADPNRP_WQX-STC-22A, is 17.67218, -64.77294. Point EPAR2_USVIBADPNRP_WQX-STC-22A does not intersect with a reef. It is possible that the point was moved so as not to disturb the coral when using the monitoring equipment in the field.

3.1.3 Evaluation of External Data

The DPNR considers data received during its data solicitation period for the submission of the draft 303(d) list. All data received is reviewed for credibility and if determined to be of high quality and of great significance it may be added as an appendix. Other data sources refer to any data that was collected outside of the U.S. Virgin Islands DPNR.

When data from other sources is received, the quality assurance project plan, often referred to as a QAPP, and data is evaluated to determine if the DPNR’s data quality objectives are met. If the data is determined to be acceptable then the data is used in the reporting cycle’s assessments. A rationale for any decision to not use any existing and readily available data and information is included in the integrated report.

The Water Quality Portal is a cooperative service sponsored by the U.S. Geological Survey, the U.S. Environmental Protection Agency and the National Water Quality Monitoring Council that integrates publicly available water quality data from the USGS National Water Information System, the EPA STorage and RETrieval Data Warehouse, also known as STORET, and the USDA Sustaining the Earth’s Watersheds - Agricultural Research Database System. The data can be accessed at: <https://www.waterqualitydata.us/portal/>.

3.2 Habitat Assessment Data Inventory

The U.S. Virgin Islands Division of Fish and Wildlife has been identified as a possible data source for habitat assessments. The DPNR has not developed metrics to evaluate habitat data available at this time. When metrics are available to compare against collected data in the future it will be included in future water quality assessment reports.

3.3 Visual Data Sources

The DPNR keeps a log of all incidents of oil spills, fish kills and other events that had a negative impact on the water quality in the U.S. Virgin Islands. Visual data sources reported may be included in the assessment.

3.4 Identify Exceedances of Water Quality Standards

The U.S. Virgin Islands water quality standards set numeric limits for various criteria. All readily available data that meet quality assurance/quality control requirements is compared to the numeric limits set by the U.S. Virgin Islands water quality standards to determine which waterbodies exceed these limits.

Table 3: Water quality and assessment criteria

Parameter	Source Data Type	Assessment Method
Enterococcus	Ambient	The monthly geometric mean for enterococcus shall not exceed 30 colony-forming units/100 mL
	Beach	
Turbidity	Ambient	A maximum nephelometric turbidity unit reading of three (3) shall be permissible. *For areas where coral reef ecosystems are located, a maximum nephelometric turbidity unit reading of one (1) shall be permissible.
	Beach	

Parameter	Source Data Type	Assessment Method
Clarity	Ambient	A minimum secchi disk reading of one meter. *For areas where coral reef ecosystems are located, the bottom must be visible.
Total Phosphorus	Ambient	Shall not exceed 50 µg/l
Total Nitrogen	Ambient	The statistical 90 th percentile shall not exceed 207 µg/l
pH	Ambient	Class A, B: Range shall not be outside 7.0 to 8.3 standard units Class C: Range shall not be outside 6.7 to 8.5 standard units
Dissolved Oxygen	Ambient	Class A, B: Shall be no less than 5.5 mg/L Class C: Shall be no less than 5.0 mg/L
Temperature	Ambient	Shall not exceed 32 degrees Celsius at any time
		*For areas where coral reef ecosystems are located, shall not exceed 29°C at any time.

*Areas that contain coral reef ecosystems are determined based on Benthic Habitat Atlas of Puerto Rico and the U.S. Virgin Islands (2002)

Although the standards for dissolved oxygen, pH, temperature and turbidity are currently defined as measured one meter below the surface and one meter above the sea floor, most of the samples are taken at levels that are not one meter below the surface or one meter above the sea floor. For assessment purposes, where multiple samples are taken (at different depths) on the same day and time, the worst-case result will be used. For example, the minimum dissolved oxygen reading or the maximum temperature reading.

For nitrogen, the standard is written as “shall not exceed 207 µg/L in more than 10 percent of samples over a three-year period.” Since the monitoring period is only two years, the 90th percentile is used as a statistical surrogate.

Application of Natural Conditions: §186-11 states that, “Natural waters may have characteristics outside of the limits prescribed by these regulations. The criteria contained herein do not relate to violations of standards resulting from natural forces.” Table 4 lists the Class B waters, based on §186-11, that are not covered by the Class B turbidity criteria.

Table 4: Application of Turbidity Exemption

Name	Associated Monitoring Stations	Assessment Unit
Benner Bay	None	VI-STT-33
Benner Bay Lagoon Marina	STT-27D, STT-27E	VI-STT-34
Buccaneer Beach	STC-3	VI-STC-31
Carlton Beach	None	VI-STC-76
Enfield Green Beach/VIRIL Outfall	None	VI-STC-74
Good Hope Beach	STC-26	VI-STC-79
Mandahl Bay (Marina)	STT-16B	VI-STT-13
Mangrove Lagoon	STT-27A, STT-27B, STT-27C	VI-STT-35
Manning Bay/Estate Anguilla Beach	STC-23	VI-STC-64
Salt River Bay	STC-33A, STC-33B, STX-17, STX-18	VI-STC-18

Name	Associated Monitoring Stations	Assessment Unit
Salt River Lagoon, Marina	STC-33	VI-STC-16
Southgate subwatershed, offshore	None	VI-STC-37
Tamarind Reef Lagoon (Southgate Lagoon)	STC-5	VI-STC-35
Vessup Bay	STT-22B	VI-STT-23
Water Bay	STT-19, STT-28	VI-STT-18

3.5 Data Gaps and Error Control

Data gaps are not limited to existing data sets, but it can also refer to the lack of certain types of data. The U.S. Virgin Islands will make every effort to control errors that may have been reported in the data. Data determined to be erroneous or flawed based on the program’s data quality objectives established in the coastal water quality monitoring (ambient) and beach water quality monitoring programs quality assurance project plans is discarded.

Table 4 lists potential data gaps that the DPNR intends to work on in the future. The DPNR plans on developing a data document in collaboration with EPA Region 2 to resolve identified data issues. Any data gaps that are identified will be included in the multi-year monitoring strategy for resolution.

Table 4: Potential data gaps and future assessment methodologies

Future Assessment Methodologies to be Included
Toxicity and toxicant data
Wetland assessment data
Intermittent streams data
“Natural” levels relative to the dissolved oxygen and temperature standards
Narrative criteria, as listed in Section 186-1(c) of the Virgin Islands water quality standards regulation
Radioactivity data

3.6 Natural Disasters

Hurricane season in the U.S. Virgin Islands lasts from June through November each year. The DPNR considers whether or not sampling during the reporting cycle related to natural disasters should be used for the water quality assessment. The following storm event occurred in the 2020 hurricane season:

- Hurricane Laura formed on August 21 near the Leeward Islands and brought heavy rain and flooding to islands in the Caribbean, including the Virgin Islands before heading into the Gulf of Mexico. In the Virgin Islands, a peak wind gust of 41 mph (65 km/h) was reported in Sandy Point, Saint Croix. It caused some power outages and flash flooding across the Virgin Islands. No samples were taken in late August or early September.

3.7 Quality Assurance/Quality Control

The DPNR evaluates all internal monitoring data to determine if the Data Quality Objectives outlined in the U.S. Virgin Islands Ambient Water Quality Monitoring Program Quality Assurance Project Plan are

met (i.e. compliance with the relative percent difference of 30 or less between laboratory duplicate bacterial samples). Once the data is determined to meet the required objectives, the data is used to conduct the assessments for the reporting cycle. The elements evaluated are as follows:

Precision and accuracy

The precision and accuracy of data is determined by actions of the analytical laboratory and field staff, which are outlined in the program's respective standard operating procedures and quality assurance project plans.

Representativeness

The representativeness of the data is mainly dependent on the sampling locations and the sampling procedures adequately representing the true condition of the sample site. Sampling station locations and the use of only approved/documented analytical methods determine that the measurement data represents the conditions at the site. Where possible and applicable, sampling schedules are designed with respect to frequency, location and methodology in order to maximize representativeness.

Laboratory representativeness is achieved by following analytical procedure and standard operating procedures, meeting holding times, and assessment and comparison of field duplicate samples. Duplicate samples are not used for assessment in order not to skew the data. Results reported below the detection limit are calculated using the detection limit. For enterococcus, to calculate geometric means, a value of one is substituted for values of zero. Data that is qualified or estimated is removed from the dataset before any calculations or determining the minimum number of samples available for assessment. For instance, if a result from the water quality portal includes the lab qualifier "J" (used when estimating a concentration or when there is an associated quality control problem) the datapoint is not used.

For nitrogen, the laboratory is achieving a detection quantitation limit of 0.245 mg/l – above the nitrogen criterion of 0.207 mg/l. Since data below the standard cannot be used (which would bias the assessment because the standard is based on the percentile exceeding 0.207 mg/l) any data with a detection limit greater than the criterion will be excluded from the assessment.

Comparability

The comparability of data produced by and for the DPNR is predetermined by the commitment of its staff and analytical laboratories to use standardized methods, where possible, including the EPA approved analytical methods, or documented modifications thereof which provide equal or better results. These methods have specified units in which the results are to be reported.

Completeness

The completeness of data is a relationship of how much of the data is available for use compared to the total potential data before any conclusion is reached. Ideally, 100% of the data should be available. However, the possibility of data becoming unavailable due to laboratory error, insufficient sample volume, or samples broken in shipping must be expected. Also, unexpected situations may arise where field conditions do not allow for 100% data completeness. Failure to achieve 100% data completeness usually will result from the field crew's inability to sample at stations because of logistical barriers, such as insufficient depth or adverse weather conditions. In the limited number of instances where these may be encountered, efforts will be made to relocate the station in an adjacent area or re-sample the station.

In addition, established protocols for tracking samples during shipment and laboratory processing must be followed to minimize data loss following successful sample collection. The DPNR has various completeness goals: 100% for data collection and data usage, which directly correlates to a 100% goal for data used to make assessments.

It is the responsibility of the program manager to verify that the data is representative and complete. The laboratory supervisor is responsible for ensuring the data's precision, accuracy and comparability.

3.8 Listing Rules

3.8.1 *Minimum Number of Samples*

Unless described differently for a specific parameter, the minimum data set consists of eight samples in an assessment unit. The DPNR believes that two years of data collected quarterly by the Coastal Water Quality Monitoring Program and the data collected during the weekly Beach Water Quality Monitoring Program are adequate and represents the minimum dataset necessary for an adequate assessment. Where there is more than one point in an assessment unit, the points are evaluated independently and where any point meets the listing criteria, the assessment unit will be listed for the parameter. These recommendations are intended to ensure that existing water quality conditions are accurately portrayed by the data and that the results do not reflect transitional conditions. The DPNR will consider a data set which does not meet this minimum requirement on a case-by-case basis to determine if the data adequately characterizes the water quality conditions. Summer-only sampling for nutrients, pathogenic quality, and temperature may be acceptable since summer generally represents the critical condition for these parameters. ***If the DPNR determines that the data set adequately represents water quality conditions and there are at least two exceedances of the surface water quality standards, this limited data set is used to determine that a use is not attained.*** The justification for two exceedances is that the first exceedance could have the potential to be an outlier and not adequately represent water quality conditions, but the second exceedance confirms that the water quality standard is not attained. Where there are at least two exceedances at a given monitoring point, no minimum number of samples is required to determine that a use is not attained, as additional sampling would still result in two exceedances.

3.8.2 *Listing Removal*

If a water quality standard is no longer applicable, the DPNR can delist a waterbody only for the parameter(s) affected. This stipulation is intended to include instances where a parameter is removed from the Virgin Islands water quality standards. While it is not anticipated that this circumstance is frequent or numerous, this provision is considered necessary to ensure that no parameter will stay on the 303(d) list of impaired waterbodies in perpetuity, without the opportunity for delisting. Any such changes that result in a delisting due to this stipulation will meet Antidegradation Implementation Procedures detailed in the Virgin Islands water quality standards. If a previously listed parameter fully complies with the applicable water quality standard during the 2020 (October 1, 2017 to September 30, 2019) and 2022 (October 1, 2019 to September 30, 2021) cycles and there are a minimum of 16 sample days, that specific parameter will be delisted from 303(d) list.

4.0 Designated Use Attainment

The U.S. Virgin Islands water quality standards identify specific designated uses for the waters of the territory according to its waterbody classifications. Designated uses include:

- maintenance and propagation of desirable species of aquatic life (including threatened, endangered species listed pursuant to section 4 of the federal Endangered Species Act and threatened, endangered and indigenous species listed pursuant Title 12, Chapter 2 of the Virgin Islands Code)
- primary contact recreation (swimming, water skiing, etc.).

The DPNR uses both numeric and narrative criteria to protect designated uses. Numeric criteria are estimates of constituent concentrations that are protective of the designated uses. Narrative criteria are non-numeric descriptions of conditions to be attained/maintained or avoided.

Waterbody delineations, or assessment units, used for determining use support are derived from geographic information system coverages. Use attainability for each assessment unit is determined using the most current version of the U.S. Virgin Islands water quality standards. The current standards were promulgated on January 7, 2020.

As part of the assessment process, each assessment is rated as being supporting, not supporting or insufficient information (usually the result of a data gap). Assessment units that are placed into Category 5 (not supporting) must have a total maximum daily load, known as TMDL, established and the assessment unit is placed on the 2022 303(d) List. See section 4.4 for a full description of all categories.

Those assessment units determined to have insufficient information are placed into Category 3, under one of the four bullets detailed in Section 4.4. The assessment unit is placed in Category 3 if insufficient or no data is available to determine if water quality standards are attained and any designated use is supported. **The Virgin Islands considers insufficient data as anything less than eight points of monitoring data.** Waters with less than eight points of monitoring data may be reviewed on a case-by-case basis if the limited data strongly suggests that water quality standards are exceeded, and the designated uses are impaired. Such waters may be eligible for inclusion on the 303(d) list. See 3.8.1.

To assess an assessment unit, data must be available for at least one applicable parameter associated with the attainment of the given designated use. Impairment of any single indicator will result in the waterbody being listed as impaired (for that parameter), even if the other indicators do not exceed the standards.

The coastal waters of the U.S. Virgin Islands are evaluated for the following uses: primary contact recreation and aquatic life use. All existing and readily available data and information from the water quality portal is assembled and used in the assessment. Currently the fresh waters of the U.S. Virgin Islands are not monitored, so no assessment is done at this time for these water classes.

4.1 Parameters for Designated Use Assessments

Table 5: Parameters considered when assessing designated use

Designated Use	Minimum Parameters Used for Assessments	Source Data Type
• Primary Contact Recreation	Enterococcus	Ambient, Beach
• Maintenance and propagation of desirable species of aquatic life	Clarity/Transparency	Ambient
	Dissolved Oxygen	Ambient
	Nitrogen	Ambient
	pH	Ambient
	Phosphorus	Ambient
	Temperature	Ambient
	Turbidity	Ambient, Beach

4.2 Aquatic Life Use

4.2.1 Conventional Assessment

Conventional parameters are evaluated using the number of exceedances of water quality standards. A waterbody is determined to be impaired if there is an exceedance of a specific parameter two (2) or more times within the chosen dataset.

The conventional parameters are:

- Clarity (All Classes: shall not have a secchi disk reading of minimum of 1 meter; **In areas where coral reef ecosystems are located****: the bottom must be visible);
- Dissolved Oxygen (not less than 5.5 mg/l from other than natural conditions in Class A & B, not less than 5.0 mg/l from other than natural conditions in Class C) *;
- pH (Class A, B: Range shall not be outside 7.0 to 8.3 standard units; Class C: Range shall not be outside 6.7 to 8.5 standard units)
- Temperature (not to exceed 32°C at any time, nor as a result of waste discharge to be greater than 1.0°C above natural conditions; **in areas where coral reef ecosystems are located****, not to exceed 25-29°C at any time, nor as a result of waste discharge to be greater than 1.0°C above natural conditions) *;
- Total Nitrogen (All Classes: shall not exceed 207 µg/L in more than 10% of samples in a three year period);
- Total Phosphorus (All Classes: shall not exceed 50 µg/L in marine and coastal waters); and

- Turbidity (All Classes: shall not exceed 3 nephelometric turbidity unit; **In areas where coral reef ecosystems are located****: shall not exceed 1 nephelometric turbidity unit.

*The term “natural condition” for dissolved oxygen and temperature will be addressed through work in collaboration with the EPA for Class B and C waters during a future triennial review of the water quality standards. During that process, the DPNR will outline how it will define reference sites and establish reference conditions. Once developed, the criteria will be incorporated into this assessment methodology.

**Areas that contain coral reef ecosystems are determined based on Benthic Habitat Atlas of Puerto Rico and the U.S. Virgin Islands (2002).

Reference: Office of Water document EPA 820-F-12-058 Recreational Water Quality Criteria, 2012 (<https://www.epa.gov/wqc/2012-recreational-water-quality-criteria-documents>)

For making water quality attainment determinations, a state or territory that adopts water quality standards consistent with the 2012 recreational water quality criteria would evaluate all readily available data and information to determine whether a waterbody meets the water quality standard (i.e., whether the waterbody is in attainment). Both the geometric mean and the statistical threshold value would be part of the water quality standard and therefore both targets would be used to determine whether a waterbody meets the water quality standard for primary contact recreation. The waterbody condition would need to be evaluated based on all existing and readily available data and information for the specified duration. The EPA’s regulation defines “all existing and readily available water quality related data and information” at 40 CFR 130.7(b)(5). The EPA expects that water quality attainment determinations would include water quality monitoring data collected as part of a beach notification program, as well as information regarding beach closures and advisories.

The conditions for use support for the conventional parameters are as follows:

1. Fully Supporting: For any one pollutant or stressor, criteria exceeded in no more than one of the measurements.
2. Not Supporting: For any one pollutant, criteria exceeded in any of the measurements two or more times within the chosen dataset.

4.2.2 Toxicant Assessment (*Aquatic Life*) (*Human Health*)/Toxicity Assessment

The applicable numeric water quality standards for toxic pollutants to protect the designated uses of waters of the U.S. Virgin Islands shall be the EPA’s national recommended Clean Water Act section 304(a) water quality criteria. Those parameters can be found at www.epa.gov/wqc.

The conditions for use support are as follows:

1. Fully Supporting: No toxicants or toxicity noted in either acute or chronic tests compared to controls or reference conditions.
2. Partially Supporting: No toxicants or toxicity noted in acute tests but may be present in chronic tests in either slight amounts and/or infrequently within an annual cycle.
3. Not Supporting: Toxicants or toxicity noted in many tests and occurs frequently.

Currently, the DPNR does not collect any toxicity data, and none was received during the data solicitation period. Therefore, no assessments were made based on toxicants or toxicity during this reporting period. The DPNR will continue to review its criteria for these assessments and will work to improve upon the current criteria to ensure they are relevant to the assessment of human health. Additionally, as the DPNR works to expand the Virgin Islands water quality standards this section will continue to be amended.

4.2.3 *Habitat Assessment*

Determination of aquatic life use support will consider habitat assessment data (based on availability) in relation to propagation of desired species of marine life and the biological integrity of the benthic communities living within waters. These communities shall be assessed by comparison to reference conditions(s) with similar abiotic and biotic environmental settings that represent the optimal or least disturbed condition for that system. Such reference conditions shall be those observed to support the greatest community diversity, and abundance of aquatic life as is expected to be or has been historically found in natural settings essentially undisturbed or minimally disturbed by human impacts, development, or discharges.

Habitat assessment data is considered as follows:

1. Fully Supporting: Reliable data indicate natural channel morphology, substrate composition, bank/riparian structure, and flow regime of region. Riparian vegetation of natural types and of relatively full standing crop biomass (i.e., minimal grazing or disruptive pressure).
2. Partially Supporting: Modification of habitat slight to moderate usually due to road crossings, limited riparian zones because of encroaching land use patterns, and some watershed erosion. Channel modification slight to moderate.
3. Not Supporting: Moderate to severe habitat alteration by channelization and dredging activities, removal of riparian vegetation, bank failure, heavy watershed erosion or alteration of flow regime and inclusion of exotic or aquatic nuisance species

The DPNR does not have habitat assessment data for the current reporting cycle. As the DPNR continues its ongoing efforts to improve the U.S. Virgin Islands water quality standards, criteria will be set for reference conditions/sites which will assist in completing habitat assessments for various waterbody classes.

4.2.4 *Biological Assessment*

When available, the DPNR may use data collected/received from biological monitoring projects. Upon identifying a source of data to apply towards a biological assessment, the conditions for use support, which will be evaluated in accordance with the narrative biocriteria outlined in the Virgin Islands water quality standards, as follows:

1. Fully Supporting: Reliable data indicate functioning, sustainable biological assemblages (e.g., fish, macroinvertebrates, or algae) none of which has been modified significantly beyond the natural range of the reference condition.

2. Partially Supporting: At least one assemblage (e.g., fish, macroinvertebrates, or algae) indicates moderate modification of the biological community compared to the reference condition.
3. Not Supporting: At least one assemblage indicates nonsupport. Data clearly indicates severe modification of the biological community compared to the reference condition.

Currently, the DPNR is in the process of using the EPA's biological condition gradient to inform development of an index to convert the narrative biocriteria water quality standard into a numeric index for assessment. At this time, the index needs more data for development; therefore, biological assessment will not be used for the 2022 cycle.

4.3 Primary Contact Recreation

4.3.1 *Microbiological Assessment*

Fecal indicator bacteria can be enumerated using various analytical methods including those in which the organisms are grown (cultured) and those in which their deoxyribonucleic acid is extracted from an environmental sample, amplified, and quantified (using quantitative polymerase chain reaction). These different enumeration methods result in method-specific units and values. One culture-based method, membrane filtration, results in the number of colonies that arise from bacteria captured on the membrane filter per volume of water filtered. One colony can be produced from one or several cells (clumped cells in the environmental sample). Another culture-based method, the defined substrate method, produces a most probable number per volume. Most probable number analyses estimate the number of organisms in a sample using statistical probability tables, hence the term "most probable number." Bacterial densities most probable number are based on the combination of positive and negative test tube results that can be read from a most probable number table (U.S. EPA, 1978). Culture-based approaches for the enumeration of fecal indicator bacteria, such as most probable number and membrane filtration, generate results following the culturing of a particular microbe for 18–24 hours, and in the case of most probable number do not result in a direct count or concentration density of the bacteria being enumerated but rather rely on probabilities.

The use support is based on a review of quarterly ambient and weekly beach data for the geometric mean of enterococcus bacteria, beach closing data and reported oil spills. Allowable limits are the same for all classes of waters: a geometric mean of 30 colony-forming unit per 100 mL, or a statistical threshold value exceedance of 110 colony-forming unit/100 mL in more than 10 percent of the samples collected in the same 30 days. The percent of total violations is evaluated as follows:

1. Fully Supporting: No more than one geometric mean of 30 colony-forming unit/100 ml in all class waters, where the geometric mean is applied to all samples collected in a calendar month; and no more than 10 percent of all samples exceed 110 colony-forming unit/100 mL.
2. Not supporting: Two or more geometric means exceed 30 colony-forming unit/100 ml in any class waters, where the geometric mean is applied to all samples collected in a calendar month; or more than 10 percent of all samples exceed 110 colony-forming unit/100 mL.

The statistical threshold value of 110 colony-forming unit/100 mL is based on the EPA's 2012 recreational water quality criteria. The statistical threshold value approximates the 90th percentile of the

water quality distribution and is intended to be a value that should not be exceeded by more than 10 percent of samples taken. To apply the statistical threshold value on a monthly basis is not appropriate and is not justified by the science and statistics used to derive the value, especially for situations where there is only one sample available in a 30-day period. Instead, as has been the practice in the past, the 10 percent exceedance for the threshold value is applied to the entire two-year dataset.

4.3.2 *Beach Closing Assessment*

In addition to pathogens, beach-closing data will be used to determine primary contact recreation use support. The matrix of allowable violations is as follows:

1. Supporting: No bathing area closures or restrictions in effect during reporting period.
2. Not Supporting: On average, one bathing area closure per year of greater than 1 week's duration, or more than one bathing area closure per year.

Closure as stated above refers to the Virgin Islands Department of Health or Virgin Islands Waste Management Authority closing beaches due to immediate health risks or threats. While, restrictions refer to advisories which may recommend that the public avoid certain areas/beaches.

The Department of Planning and Natural Resources only issues administrative advisories and cannot restrict beach access. Beach closures would only be enforced by government enforcement officials for very serious threats to human health; these closures can only be implemented by the Virgin Islands Department of Health or the Virgin Islands Waste Management Authority. These serious threats are usually related to bypasses or overflows of the municipal sewer system, which may result in raw sewage flowing onto beaches and into the nearshore/bathing areas.

The DPNR has implemented a Beaches Environmental Assessment and Coastal Health (BEACH) Monitoring Program that takes samples for Enterococcus at select sites on a weekly basis. If the sample is found to have more than 70 colonies per 100 ml, the beach is considered to be unsafe for swimming. As a practical matter, as the analysis from section 4.3.1 includes the beach data, the results of the microbiological assessment capture the same exceedances as the beach data. The beach data is used in conjunction with data collected from the Ambient Monitoring Program.

4.3.3 *Other Parameters*

Throughout the course of collecting data for this report, data that do not fit within the auspices of the other assessment categories of primary contact recreation or aquatic life use (e.g. aesthetics, algae, odor, etc.) will be considered under other parameters. The following guidelines apply where appropriate:

1. Fully Supporting: For any one pollutant or stressor, criteria exceeded in no more than one of the measurements.
2. Not Supporting: For any one pollutant, criteria exceeded in two or more measurements.

The DPNR intends to continue to work towards developing expanded criteria for making assessments within this category. There were no assessments made for this category during this reporting cycle.

4.4 Listing Categories

Category 1

The assessment unit is placed in this category if it meets the water quality standards for the parameters that define support for both primary contact recreation & aquatic life use.

Category 2

The assessment unit is placed in this category if it attains water quality standards for the parameters that define support for either primary contact recreation or aquatic life use but not all uses have sufficient data to determine if the designated use is supported. For instance, if there is sufficient data to determine that an assessment unit fully supports the primary contact recreation use based on enterococcus, but there is not sufficient data to determine whether or not the aquatic life use is met based on data for clarity, dissolved oxygen, nitrogen, pH, phosphorus, temperature and turbidity, the assessment unit is placed in category 2.

Category 3

The assessment unit is placed under category 3 if insufficient or no data is available to determine if water quality standards are attained and any designated use is supported. *Note: The Virgin Islands considers insufficient data as anything less than eight points of monitoring data. Waters with less than eight points of monitoring data may be reviewed on a case-by-case basis if the limited data strongly suggests that water quality standards are exceeded, and the designated uses are impaired. Such waters may be eligible for inclusion on the 303(d) List.*

This category includes:

- No data is available from any of the identified data sources for the assessment unit in question.
- Insufficient data is available from any of the identified data sources for the assessment unit in question. Insufficient data is defined as less than eight points of monitoring data.
- Inconclusive data are available from any of the identified data sources for the assessment unit in question. This might include information from studies that do not directly provide information related to water quality standards.
- Unreliable or low-quality data is available from any of the identified data sources for the assessment unit in question. Unreliable or low-quality data is defined as data sets that have significant gaps, obvious anomalies, etc.

Category 4

Assessment units that are found to be partially or not supporting for one or both designated uses are placed in category 4 under the appropriate subcategory (4A, 4B, 4C), but does not require the development of a TMDL.

This category contains three distinct subcategories:

Category 4A

The assessment unit is placed in this category if it was previously listed on the 303(d) list and a TMDL has been established and approved by EPA.

Category 4B

The assessment unit is placed into this category only if other pollution control requirements are expected to address all water-pollutant combinations and attain all water quality standards within a reasonable period. The Virgin Islands considers a reasonable period as being the time between reporting cycles. If the impairment is the result of a point source discharge, it is expected that the Territorial Pollution Discharge Elimination System program will take appropriate measures to control point source pollution. If the impairment is the result of non-point source pollution, the DPNR will provide evidence that a pollution control measure is in place.

Category 4C

The assessment unit is placed into this category if the impairment was not caused by a pollutant, but instead is caused by pollution. Assessment Units placed in Category 4C do not require the development of a TMDL. Pollution, as defined by the CWA is “the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water” (section 502(19)). In some cases, the pollution is caused by the presence of a pollutant and a TMDL is required. In other cases, pollution does not result from a pollutant and a TMDL is not required. These assessment units should be scheduled for monitoring to confirm that there continues to be no pollutant associated with the failure to meet the water quality standard and to support water quality management actions necessary to address the cause(s) of the impairment

Category 5

The assessment unit is placed into this category if water quality standards are exceeded and a TMDL must be established. Assessment units that are placed into Category 5 are placed on the 2022 303(d) List.

Delisting

Using the abovementioned data restrictions and drawing from the dataset detailed in Section 3.8.2 above, the DPNR shall determine if any Assessment Units can be delisted for the 2022 reporting cycle. Furthermore, where refinements have been made to the methodology (for example, the treatment of samples from the same date/time), if a waterbody/parameter combination during the 2020 cycle should not have been listed because it was counted as two exceedances even though the samples were from the same date (e.g., at different depths), the waterbody/parameter combination will be delisted so long as there is not more than one exceedance from the 2022 cycle.

4.5 Groundwater Monitoring Program

The Water Quality Management Program of the DPNR is not tasked with monitoring the groundwaters of the U.S. Virgin Islands. The Water Quality Management Program of the DPNR has been informed by the DPNR’s Groundwater Program that the only groundwaters that are monitored throughout the territory are those that are potable water sources. The monitoring is required through the DPNR’s Public Water Systems Supervision Program.

Appendix A: Summary of Criterion Levels of Virgin Islands Water Quality Standards

Class A Quality criteria: Existing natural conditions shall not be changed. The biological condition shall be similar or equivalent to reference condition for biological integrity. In no case shall Class B water quality standards be exceeded.

	A	B	corals	C
Clarity (meters)	≥ 1	≥ 1	≥ 15*	≥ 1
Dissolved Oxygen (mg/l)	> 5.5	> 5.5	> 5.5	> 5
Enterococcus (colony-forming unit/100 ml; geometric mean)	30	30	30	30
Nitrogen (ug/l as 90 th percentile)	207	207	207	207
pH (standard units)	7 - 8.3	7 - 8.3	7 - 8.3	6.7 - 8.5
Phosphorus (ug/l)	50	50	50	50
Temperature (degrees Celsius)	<32	< 32	25 - 29	<32
Turbidity (nephelometric turbidity unit)	≤ 3	≤ 3	≤ 1	≤ 3

*The clarity standard of 15 meters cannot be applied to points STJ-57 (Round Bay) and STT-14 (Hull Bay) because the depth of the sampling locations are less than 15 meters. Instead, the bottom must be visible. Bottom visibility is achieved when the depth measurement and secchi disk reading are equal.