Draft State of Delaware 305(b) Assessment Methodology

General Provisions

Data Considered:

Readily available data and information for the period of January 1, 2016 through December 31, 2020 will be considered for the assessment of most designated uses. Given that adequate water quality data may not be available in all cases, determinations of use attainment will be made with an abundance of caution.

Data Quality and Quantity

Data from the Department of Natural Resources and Environmental Control's (DNREC's) Environmental Laboratory Section (ELS) will be considered for use if it is collected and analyzed in accordance with the DNREC ELS Quality Assurance Project Plan. For data from sources other than the DNREC ELS, the Department will consider the quality controls used in collection and analysis to determine if it will be appropriate for use in this assessment. The Department routinely currently collects water quality samples at more than 130 stations throughout the State. That data makes up the bulk of the data available for use in 305(b) assessments. The Department considers data from the most recent five-year period, thus, at each station, there are usually data from 20 sampling dates or more. Some stations are in place for a more limited period and have smaller data sets. Other readily available data and reports will be requested in advance of each assessment from parties outside of the Department and used if they are made available. In addition to electronic mail requests from specific organizations, a notice will be published in the Delaware State News and the News Journal.
For the 2022 assessment, the Department will consider data and information received before November 1, 2021 from the following sources:

- Reports of ambient water quality data including State ambient water quality monitoring programs, citizen volunteer monitoring programs, complaint investigations, and other readily available data sources (e.g., EPA's Storage and Retrieval System (STORET), the United States Geological Survey, and research reports), and data and information provided by the public;
- Reports prepared to satisfy Clean Water Act (CWA) Sections 305(b), 303(d) and 314 and any updates;
- Fish and shellfish advisories
- Restrictions on water sports or recreational contact

Coordination with Delaware River Basin Commission (DRBC) and Chesapeake Bay Program Assessments

The DRBC prepares 305(b) assessment reports every two years for the Delaware River and Delaware Bay. Delaware will incorporate the most recent use attainment determinations made by DRBC for the shared waters of the Delaware River and Delaware Bay into its 2022 303(d) list. Delaware expects to work cooperatively with the

DRBC, member states and stakeholders to develop and implement TMDLs in waters of the Delaware River and Bay that the DRBC determines to be impaired.

The Chesapeake Bay Program (CBP) is doing assessments for waters in the Chesapeake Bay and nearby waters that drain into the bay in co-operation with Maryland, Virginia, Washington D.C. and Delaware. Delaware incorporates the most recent use attainment determinations for waters of the state that use criteria developed by the CBP for waters that drain to the Chesapeake Bay.

Use of Environmental Protection Agency Integrated Assessment Guidance

US EPA has guidance online for preparation of Integrated Reports at the following URL: https://www.epa.gov/tmdl/integrated-reporting-guidance

The core recommendation of the guidance is to categorize all waters of the state according to the following five categories:

Category 1: All designated uses are met;

Category 2: Some of the designated uses are met but there is insufficient data to determine if remaining designated uses are met;

Category 3: Insufficient data to determine whether any designated uses are met. Either no data is available or some data is available, but it is insufficient to make a determination

Category 4: Water is impaired or threatened but a TMDL is not needed;

- 4A: All TMDLs for this segment have been completed and EPA approved. Class 4A waters have all necessary TMDLs approved, but one or more impairments exist, despite the approved TMDLs.
- 4B: Other required control measures are expected to result in the attainment of WQSs in a reasonable period of time
- 4C: The impairment or threat is not caused by a pollutant

Category 5: Water is impaired or threatened and a TMDL is needed for at least one pollutant or stressor

The Department has created a sub-category of Category 5 waters based on recommendations in a March 2018 report prepared by the Department titled “An Evaluation of Clean Water Act Section 303(d) listings of Delaware Waters Affected by Fish Consumption Advisories”. That evaluation recommends that for some waters where trends indicate a downward slope in fish tissue contaminant concentrations that should be below fish tissue target levels within five to ten years without implementing a TMDL a subcategory of impaired waters be created. That subcategory is 5(MNR) in which MNR stands for “Monitored Natural Recovery”. As implied by the name, the Department plans to continue monitoring fish tissue in those waterbodies in accordance with the Fish Tissue Advisory program protocols until such time as the contaminants in the fish are no longer above levels of concern and beyond. When the data supports

removing the fish tissue advisories, the Department will consider that information for delisting decisions with stakeholder input. The Department also plans to pursue remediation efforts in affected watersheds in accordance with the WATAR program and process as discussed in other sections of this report and online at https://dnrec.alpha.delaware.gov/waste-hazardous/remediation/watar/. Waters in Category 5(MNR) remain in EPA Category 5 and as such will require a TMDL at a future date if expected decreases do not actually occur. If trends analyses at later dates show that trends in 5(MNR) waters are not in fact trending downward, or reaching their target levels, the Department will reclassify those waters as Category 5 and TMDLs for those pollutants will be developed.

The Department has worked with US EPA to move Delaware's 303(d) listing information into EPA's Assessment, Total Maximum Daily Load (TMDL) Tracking and Implementation System (ATTAINS) database which allows EPA and stakeholders to track the conditions of the Nation's surface waters. As part of that effort, the Department has converted the list of impaired waters into a format more compatible with the ATTAINS database and geographical information systems (GIS). The new format is significantly longer than the older format, but much easier to use in those environments. Future Integrated Reports are expected to be compiled largely within the ATTAINS system and reports for stakeholders will be prepared as needed for the public comment period.

The Department assesses data for a number of parameters in each segment that sufficient data is readily available for, and then assigns them the codes listed above for each parameter and segment combination. This gives the Department more information about specific parameters of concern and allows more detailed tracking of those concerns over time. Each of Delaware's monitored waterbody segments will be assigned to the appropriate category for each designated use and then 'rolled up' into a final categorization for the segment.

Dissolved Oxygen (DO) Aquatic Life Use Support (ALUS)

The following types of DO data are typically available for analysis:

- Field measurements taken by personnel using handheld DO probes; and
- Continuous monitoring data collected using multiparameter monitoring systems that are typically deployed for several days, weeks, or months.To get a more accurate picture of dissolved oxygen dynamics and other water quality parameters, the Department continues to increase its use of continuous monitoring systems.

To determine ALUS with regard to Dissolved Oxygen (DO), the following methodology will be used to compare measured DO concentrations to two different standards, the minimum at all times and daily average concentrations. Average DO concentrations will be considered to be met if the 10^{th} percentile of available data is above the applicable criteria of 5.0 mg/l for marine waters and 5.5 mg/l for fresh waters. The statewide minimum DO concentration for surface waters is 4.0 mg/l at any time. Stations are

judged to be in compliance with this criterion if the minimum is not violated by more than 1% of continuous monitoring data and no more than two field samples are below the minimum. Dissolved oxygen criteria in the Murderkill River are different from the Statewide averages for the period of May 16 to September 30th and the data from that period will be considered in the same way as the rest of the State against the lower criteria.

Assessments of Average DO Criteria Attainment:

If sampling events occurred on at least ten different days during the assessment period for each station, attainment of the DO average criteria will be assessed using the method that follows. Stations where monitoring has been discontinued that have data from fewer than 10 days will not be considered for further evaluation of average DO attainment.

For purposes of DO compliance with the daily average criteria in a segment, continuous monitoring data, if available, will be averaged on a daily basis for each station. If no continuous data is available, then the field measurements (as available) will be considered to be representative of the daily average for that day. Any type of sample (continuous or field measurement) will be considered to be representative for that station at the time of collection. Once the daily average for each station (station daily average, SDA) has been determined, the SDAs for each station will be pooled and the upper confidence limit (UCL) of the nonparametric 10th percentile confidence interval will be determined using methods described in Section 3.7 of Helsel and Hirsch . That UCL will be compared to the applicable standard. If the UCL will be above the applicable average criteria for all stations in a segment, the segment will be considered to be fully supporting (Category 1) for the DO average portion of ALUS. If the UCL from any station in a segment is below the applicable average, the segment will be considered not fully supportive of the aquatic life use (Category 5)

Formally stated, the following hypotheses will be tested:

H_0: at the 90% Confidence level, $X_{10} \geq$ Standard

H_1: at the 90% Confidence level, $X_{10} <$ Standard

Where X_{10}= Non parametric estimate of the 10th percentile of available data.

Assessments of Minimum DO Criteria Attainment:

Attainment of the minimum DO criteria will be assessed based on all available data (note that ten samples in 5 years are not needed for the comparison to the minimum). For stations for which no continuous DO monitoring data are available, two or more SDAs in five years below the applicable minimum will be sufficient evidence to show that the aquatic life use was not supported (Category 5).

Nutrient Enrichment Assessment

For tidal portions of the Indian River, Rehoboth Bay and Little Assawoman Bay watersheds, the water quality criterion for dissolved inorganic nitrogen is a seasonal average of 0.14 mg/l as N, and for dissolved inorganic phosphorus a seasonal average of 0.01 mg/l. For those stations where sampling events occurred on at least ten different days during the assessment period, the available data for the months of March to October from each station will be averaged and confidence intervals on the averages determined. The lower confidence limit on the averages will be compared to the above values to assess attainment of desired nutrient levels in these waters. Segments with one or more stations whose lower confidence limit on their seasonal average are above the criteria will be considered to be not fully supporting the aquatic life use (Category 5).

For the remaining waters of the State, the Department has been developing and implementing nutrient and dissolved oxygen TMDLs using target values for total nitrogen of 2-3 mg/l and total phosphorus levels of 0.1 to 0.2 mg/l. These target values were developed in order to implement the narrative provisions in the Surface Water Quality Standards. For those stations with sampling events on at least ten different days during the five-year assessment period the data will be averaged and lower confidence limits on the averages calculated and compared to the maximum values above.
Segments with one or more stations whose lower confidence limit on their average nutrient concentrations are above the target values will considered to be not fully supporting the aquatic life use (Category 5).

The following conditions will also result in segments being listed in Category 5.

1. There were documented cases of nuisance algal blooms or excessive macrophyte growth. These cases violate Section 4.1.1.3 of Delaware's Standards which require waters of the State to be free from substances that may result in a dominance of nuisance species;
2. Detailed, site-specific monitoring studies indicated a strong linkage between nutrient levels and indicators of eutrophication such as high chlorophyll-a concentrations, extreme daily variation in dissolved oxygen levels, and high sediment oxygen demand; or

3. For ERES waters, a long-term trend analysis indicates a statistically significant increase in nutrient levels over time. Such increases are inconsistent with the short-term goal of "holding the line" on water quality in ERES waters. Such increases are also inconsistent with the long-term goal of restoring those waters, to the extent feasible, to their natural state.

Assessments of Total Suspended Solids in the Tidal Inland Bays Watershed

For tidal portions of the Indian River, Rehoboth Bay and Little Assawoman Bay watersheds, the water quality criterion for total suspended solids (TSS) is a seasonal average of 20mg/l from March 1 to October 31. For those stations where sampling events occurred on at least ten different days during the assessment period, the available data for the months of March to October from each station will be averaged and confidence intervals on the averages determined. The lower confidence limit on the

averages will be compared to the above values to assess attainment of desired TSS levels in these waters. Segments with one or more stations whose lower confidence limit on their seasonal average were above the criteria were considered to be not fully supporting the aquatic life use (Category 5).

Primary Contact Recreation Use Assessments

Generally, total enterococcus bacteria water quality samples are collected several times each year at each monitoring station. In addition, for all guarded beaches and many unguarded beaches, samples are collected much more frequently from mid-May through mid-September as part of beach monitoring activities pursuant to the Beaches Environmental Assessment and Coastal Health (BEACH) Act. Assessment of the above two situations for primary contact recreation use support will be as follows.

For segments with no beach monitoring, if sampling events occurred on at least ten different days during the assessment period, the geometric mean of the available enterococcus (colonies/100 ml) data for each station will be compared to the geometric mean values shown in the table below. For segments with no beach monitoring, one or more station geometric means above the values in the table will be considered to not be in support of the Primary Contact Recreation designated use (Category 5).

Water Type	Geometric Mean (Enterococcus colonies/100 ml) Criteria for Primary Contact Use
Fresh	100
Marine	35

Temperature Assessments

Delaware surface water quality criteria indicate that, in freshwaters, no human induced increase of the daily maximum temperature above 86ºF (30.0 ºC) shall be allowed and in marine waters the maximum human induced temperature is 87 ºF (30.6 ºC). Stations for which two or more sampling events are above the criteria and whose segments receive thermal discharges would be deemed not in support of the aquatic life use. There are no Delaware waters receiving thermal discharges currently.

Assessment of Harvestable Shellfish Waters Use Support

Delaware is a member of the Interstate Shellfish Sanitation Conference (ISSC), the administrative body of the National Shellfish Sanitation Program (NSSP). Delaware's Shellfish Sanitation Regulations are administered as per ISSC / NSSP standards and practices. Section 3.2.1.3 of said Regulations specifies data collection / closure criteria for Delaware shellfish waters, which include parameters constituting administrative closure of shellfish waters. Parameters that would trigger administrative closures in compliance with ISSC/NSSP standards may include theoretical pollution loading, sanitary shoreline survey information, and numerical total coliform data. All Delaware shellfish waters designated as other-than-Approved, which may include Prohibited,

Seasonally Approved, Conditionally Approved, or restricted, are so designated on the basis of administrative decisions. Specifically, these criteria include: 1) theoretical pollution loading, which is determined to be the potential for intermittent pollution discharges, making detection of said theoretical releases non-detectable via conventional sampling methodology; 2) sanitary shoreline survey findings which indicate potential for theoretical pollution loading, also non-detectable via conventional sampling methodology; and 3) may include dilution of theoretical virus discharges from point sources; however, not corresponding to increases in total coliform levels. In order to comply with ISSC / NSSP requirements, Delaware samples all shellfish waters not administratively closed for other reasons for total coliform bacteria. Delaware's Shellfish Program is assessed under the auspices of the U.S. Food and Drug Administration, as per ISSC/NSSP standards and practices, and submits bacteriological water quality data to the U.S. Food and Drug Administration to demonstrate compliance.

To assess the harvestable shellfish designated use, the Department will consider the data and reports to FDA for waters that are not administratively closed. Waters that were administratively closed for shellfish harvesting as a result of total coliform exceedances during the assessment period will be assessed as Category 5.

Listing Criteria for Waters with Fish Consumption Advisories

For purposes of developing Delaware's Integrated 305(b) Report and 303(d) List, the issuance of a "no consumption" or "limited consumption" fish advisory will be interpreted as a violation of Section 4.5.9.2.3 and Section 4.1.1.3 of Delaware's Surface Water Quality Standards. Those two narrative provisions provide, respectively, that:

1) waters of the State shall be maintained to prevent adverse toxic effects on human health resulting from ingestion of chemically contaminated aquatic organisms; and
2) waters of the State shall be free from pollutants that may endanger public health.

Any segment for which fish consumption advisories are in place as of the publishing of the Integrated Report will be placed in Category 5 for each of the chemicals of concern included in each advisory. If fish consumption advisories were lifted, or any chemical of concern has been removed from an advisory, any requirements to develop a TMDL for that chemical in that segment will be removed if the fish tissue data was originally the sole cause for placement of the segment on the 303(d) list. In waters impaired by toxic pollutants, with both fish consumption advisories and water column data, both fish tissue and water column data will be assessed independently against the applicable criteria.

For the 2022 assessments, the Department will incorporate the latest Fish Tissue Advisories issued by the Delaware Departments of Health and the Department of Natural Resources and Environmental Control.

Ammonia assessments

In fresh waters, ammonia's toxicity is known to be controlled by both the temperature and pH of the water. Delaware's ammonia criteria are based on the presence or absence of early life stages of fish and specify that the criterion should not be exceeded more than one time in a three-year period. The applicable criterion is calculated for each sampling event.

For stations whose average salinity during the assessment period is below 5 ppt, total ammonia as nitrogen, temperature and pH data will be used to compare the total

ammonia data to the criterion calculated according to the following formulas:

When fish early life stages are present:

$$\text{Criterion} = \frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{pH-7.688}} * \text{MIN}\,(2.85, 1.45 * 100.028^{*(25-T)})$$

When fish early life stages are absent:

$$\text{Criterion} = \frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{pH-7.688}} * [1.45\ 10^{0.028*(25-\text{MAX}\,(T,7))}]$$

If two or more sampling events from the same station resulted in exceedances of the calculated criteria within three years, the station will be deemed not supported for aquatic life use support based on ammonia toxicity.

Assessments of Aquatic Life Use Support Using Site-Specific Data That Results from Environmental Assessments and Other Programs

In the normal course of business, the Department requests, receives and evaluates water quality data for various environmental programs. Similar data may also come from other parties (e.g., State, Federal, or local agencies). The Department will use those site-specific studies to compare water quality data to the applicable water quality standard(s) and make assessment and listing decisions for the affected segments. If the data show no water quality criteria are exceeded and no uses are impaired, no further listing action will be taken. If the data are ambiguous or inconclusive, the segment will be listed in Category 3. If water quality criteria are exceeded or uses are impaired as a result of a contaminated site, and the owners of the site are making substantial progress (as determined by the Department) toward correcting the pollution problem, the segment will be listed in Category 4 if an enforceable regulatory mechanism has been identified and implemented. If it appears that there is a water quality problem related to a contaminated site, and that substantial progress is not likely in the near future, the segment will be listed in Category 5.

Assessments of Biology and Habitat

The Department has been working with the EPA to address prior listings for Biology and Habitat. As new stressor analyses and other data and information become available, appropriate measures will be taken to address these listings. Where no specific pollutant can be determined, the Department will delist those segments (move to category 4b or 4c as needed) and address water quality issues through restoration and other efforts as funding is available. If specific pollutants can be determined, TMDLs or other actions will be taken to address those pollutants.

Setting Priorities for Water Quality Limited Segments Still Needing TMDLs

The Department will set priorities for upcoming TMDLs in waters that remain in Category 5 or 5(MNR) according to the following protocol. Waters where TMDL

development is not expected for five or more years will be assigned to the "Low" priority group. For 2022 that includes waters listed for Habitat or Biology TMDL development. It also includes waters in Category 5(MNR) where waters are expected to be attaining for toxics in fish tissues within five to ten years as discussed above. As discussed above, the Department will change the priority of 5(MNR) waters if data shows that attainment of the use is not expected in a short period of time. The Department is working with EPA Region 3 to develop stressor analysis tools to try to resolve longstanding listings for Habit or Biology. Finally, there are some Delaware waters that are part of the DRBC waters and for which the DRBC and EPA will be taking the lead for TMDL development. Those will also be listed as Low priority.

For waters the Department expects to develop TMDLs in more than 2 years, but less than 5 or more, the Department will show them as "Medium" priority. In those waters, plans are underway to collect data and other information to develop appropriate TMDLs.

If the Department expects to develop TMDLs in the next two years or less, those waters will be shown as "High" priority.

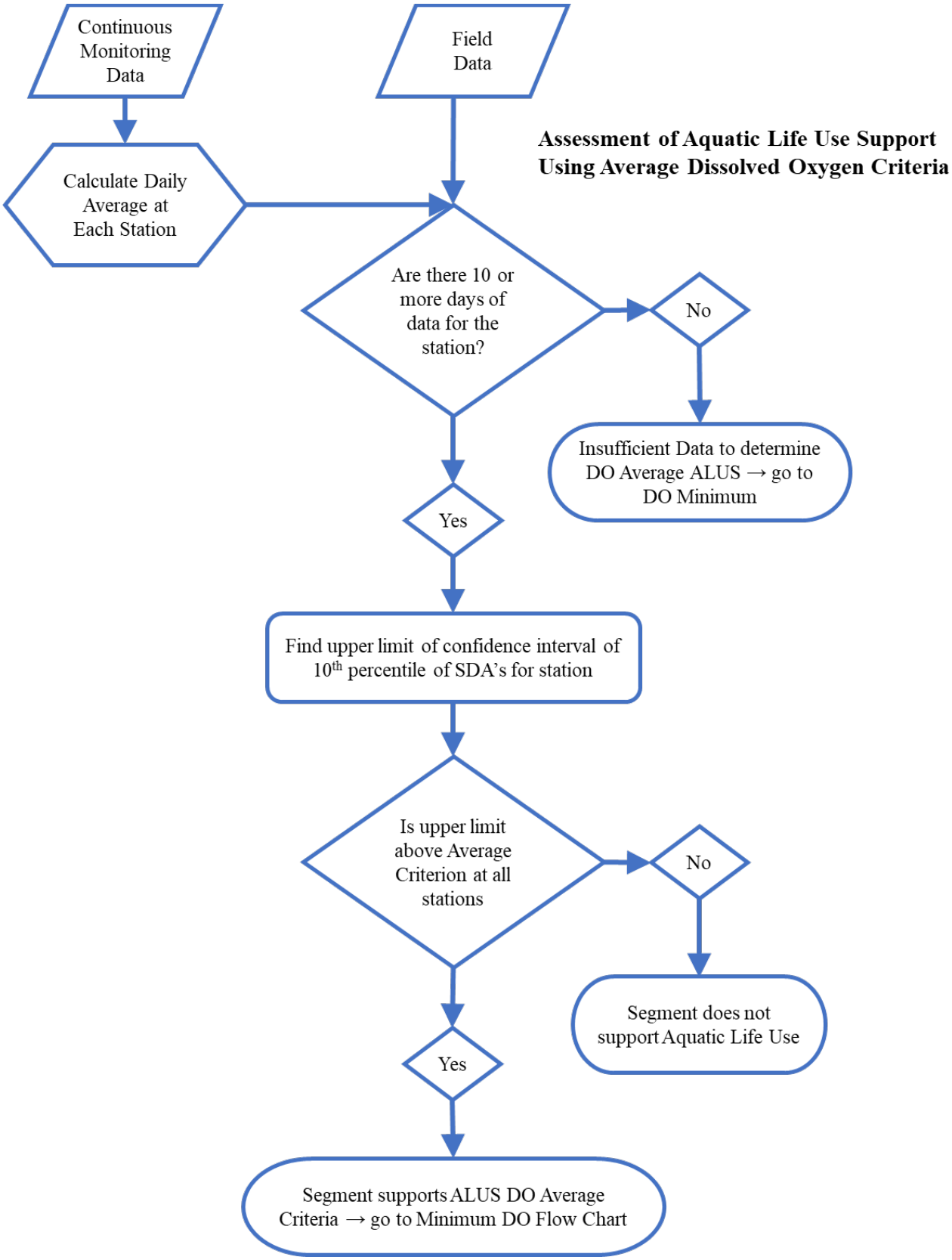
Rationale Used to Designate a Lower Category for Segments Previously Designated for TMDL Development

The Department may move segments from prior 303(d) Lists (equivalent to Category 5) to another category based on any of the following factors and will document the reasons for doing so on a case-by-case basis. Once a TMDL has been promulgated and approved by the EPA, it is in place until it has been rescinded by the Department following applicable Departmental procedures.

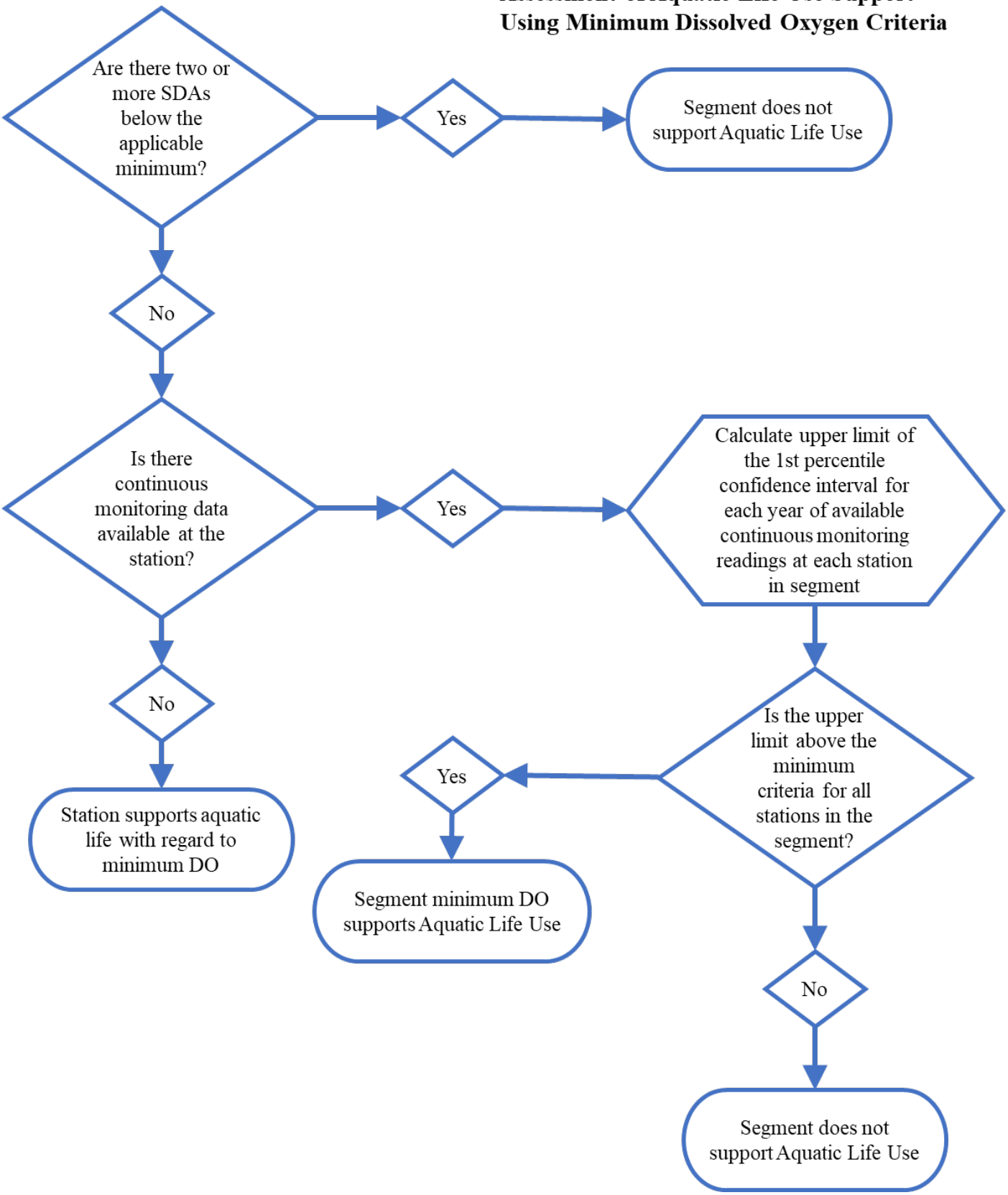
- The assessment and interpretation of more recent or more accurate data demonstrate that the applicable WQS(s) is being met. (Move to category 1)
- The results of more sophisticated water quality modeling demonstrate that the applicable WQS(s) is being met. (Move to category 1)
- Demonstration that flaws in the original analysis of data and information led to the water being incorrectly listed. (Move to category 1)
- The development of a new listing methodology, consistent with State WQSs and federal listing requirements, and a reassessment of the data that led to the prior listing, concluding that WQSs are now attained. (Move to appropriate category)
- A demonstration pursuant to 40 CFR 130.7(b)(1)(ii) that there are effluent limitations required by State or local authorities that are more stringent than technology-based effluent limitations required by the CWA and that these more stringent effluent limitations will result in the attainment of WQSs for the pollutant causing the impairment. (Move to category 4A or 4B until data and analysis support move to Category 1)
- A demonstration pursuant to 40 CFR 130.7(b)(1)(iii) that there are other pollution control requirements required by State, local, or federal authority that will result in attainment of WQSs for a specific pollutant(s) within a reasonable time. (Move to category 4A or 4B until data and analysis support move to Category 1)
- Documentation that the State included on a previous Section 303(d) List an impaired water that was not required to be listed by EPA regulations; e.g., waters where there is no pollutant associated with the impairment. (Move to category 1 or 4C as appropriate)
- Approval or establishment by EPA of a TMDL since the last Section 303(d) List. (Move to category 4A or 4B until data and analysis support move to Category 1)

Other factors may also be used to change categories on a case by case basis, subject to EPA approval and appropriate stakeholder involvement.

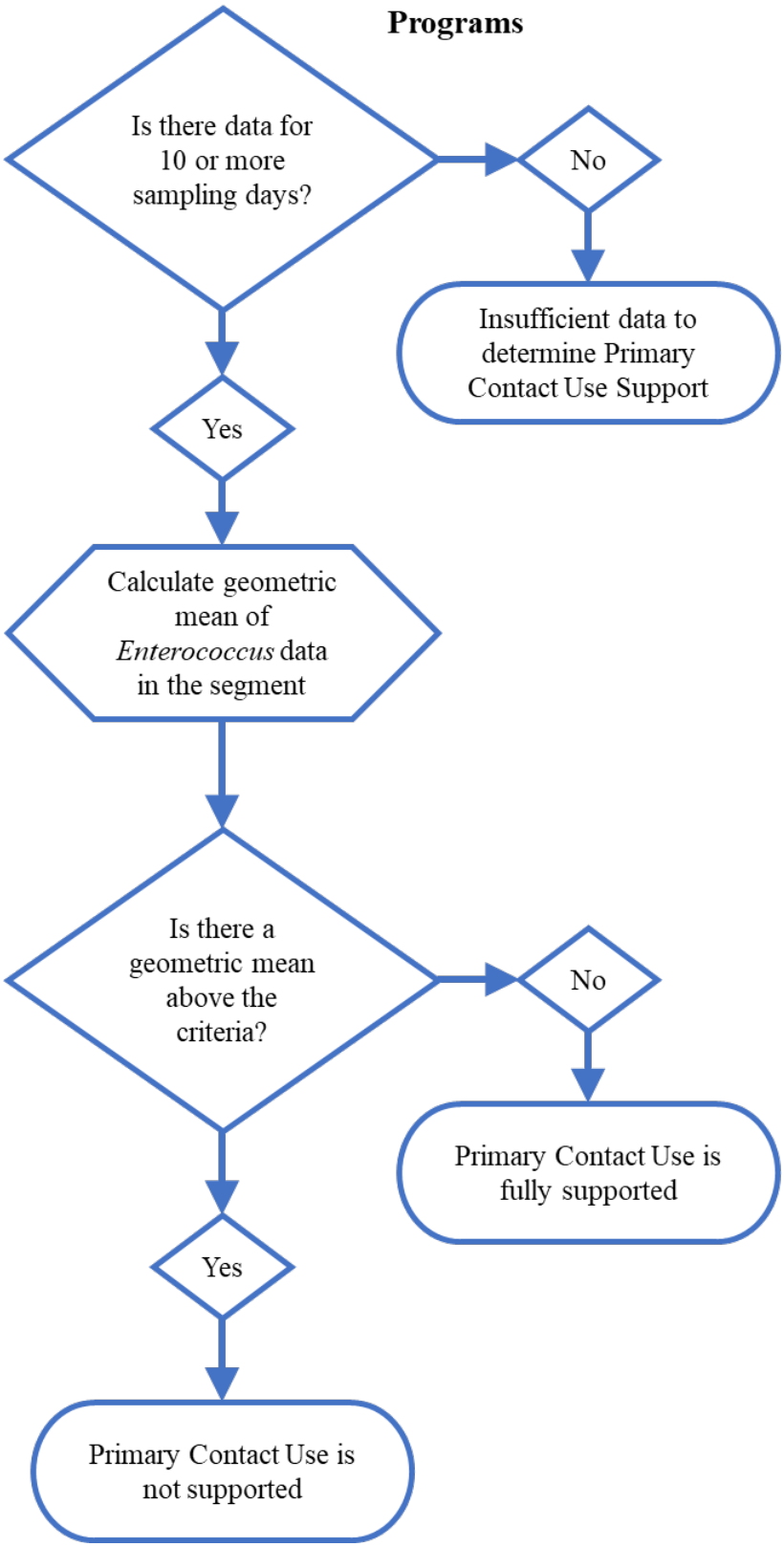
Flow Charts for Designated Use Attainment


Continuous Monitoring Data
Field Data
Assessment of Aquatic Life Use Support Using Average Dissolved Oxygen Criteria
Calculate Daily Average at Each Station
Are there 10 or more days of data for the station?
No
Insufficient Data to determine DO Average ALUS → go to DO Minimum
Yes
Find upper limit of confidence interval of 10th percentile of SDA's for station
Is upper limit above Average Criterion at all stations
No
Segment does not support Aquatic Life Use
Yes
Segment supports ALUS DO Average Criteria → go to Minimum DO Flow Chart

Assessment of Aquatic Life Use Support
Using Minimum Dissolved Oxygen Criteria



Assessment of Primary Contact Use Support in Segments that do not have Beach Monitoring Programs



Assessment of Primary Contact Use Support in Segments with Beach Monitoring Programs