

ASSESSMENT DETERMINATION AND DELISTING METHODS

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ASSESSMENT DETERMINATIONS

To meet the objective of creating accurate and precise determinations using the methods detailed above, DEP's assessments are conducted on a segment-by-segment basis of the National Hydrologic Dataset (NHD) flowline layer in a DEP Geographic Information System (GIS) application. Unlike most states that assess whole watersheds probabilistically, DEP conducts a statewide census primarily using targeted monitoring to identify individual stream reaches as attaining or impaired. This results in more detailed and accurate assessments of the waterbody, significantly reduces the need to revisit sites, and allows DEP to focus resources on only those segments of a waterbody that are not meeting applicable WQS.

Using the Methods

Independent Applicability

The assessment methods detailed in Chapters 2–4 constitute the current “decision rules” DEP uses when making assessments. These methods are understood to be independently applicable when making assessment determinations. This is based on USEPA guidance, which mandates that all assessment methods must be evaluated on a stand-alone basis (USEPA 2002). One exception to the independent applicability rule is with discrete and continuous physicochemical sampling methodologies for parameters that can be measured by both methods (e.g., pH, dissolved oxygen). Given that continuous datasets are simply more robust than discrete datasets, continuous datasets can be used to reassess or delist assessment determinations that were based on discrete datasets. Because of the ability to better capture important daily and seasonal variations with a continuous dataset, it is not recommended to use discrete data to reassess or delist a stream that was initially assessed with a continuous dataset. Continuous datasets are preferred for parameters where this technology is available.

Narrative Criteria

The assessment methods detailed in Chapters 2–4 may be used to assess the narrative criteria found in 25 Pa. Code §93.6(a) and (b). For narrative criteria assessments, these methods may be used in a “weight of evidence” approach to come to a final assessment determination.

Outside Data

In addition to the data DEP collects, DEP readily accepts and values all data from outside agencies and the public for use in making assessments. However, different data types and levels of quality assurance determines how those data can be used. DEP's tiered data acceptance strategies follow the same general tiered framework as described by the Chesapeake Bay Monitoring Cooperative's Prioritization Report

(Chesapeake Bay Monitoring Cooperative 2017). Tier 1 data is generally defined as educational or environmental screening data that has known quality and a study plan but does not follow DEP or USEPA quality assurance plans. These data will not be used for assessment determination purposes but can be used by DEP to highlight areas of interest for future monitoring efforts. Tier 2 data have clearly defined quality assurance plans and procedures but may not have followed DEP monitoring protocols described in the Water Quality Monitoring Protocols for Streams and Rivers (Shull and Lookenbill 2018). These data may not be used for assessment determination purposes but can be used for other purposes such as trend or performance analysis. Tier 3 data are assessment level data that have approved quality assurance plans, follow appropriate study designs, and follow DEP monitoring protocols (Shull and Lookenbill 2018). Individuals seeking to provide DEP with Tier 3 data should also be trained and audited by DEP staff before submitting data.

Some interstate surface waters of Pennsylvania have water quality regulation through compact commissions. These waters are comprised of the Ohio River and Delaware River mainstems. The Ohio River Valley Water Sanitation Commission (ORSANCO) and the Delaware River Basin Commission (DRBC) have established methodology, in consultation with DEP and other compact states, to assess the attainment of WQS in compliance with CWA Section 305(b) and provide those results to the states and USEPA. DEP reviews these data and results to make appropriate assessments for both Section 303(d) and 305(b) in the Integrated Report. These assessments apply to the protected uses of the Ohio River from the confluence of the Allegheny and Monongahela Rivers to the PA/WV state line and for the West Branch Delaware River at the PA/NY state line and the mainstem Delaware River from the confluence of the East and West Branches through the Delaware estuary to the PA/DE state line.

Sample Design Considerations

Thoughtful study design and execution are critical to assuring water quality sampling efforts provide the information necessary to make assessment decisions. More information on acceptable sampling design procedures are found in DEP monitoring protocols (Shull and Lookenbill 2018). For assessment determination purposes, DEP utilizes both targeted and probabilistic sampling designs. However, DEP believes the targeted “judgment-based” sampling design is the most suited method to assess WQS and uses. Targeting sampling not only focuses in on sources and causes of potential impairment, it also delimits the spatial effect of the impact. This translates into more accurate assessments. In addition, properly implemented targeted sampling provides information that is necessary if a TMDL is developed. Probabilistic sampling designs can also be useful for assessment determination purposes, especially when waterbodies lack significant environmental stress or are rather homogeneous in land

use. In these cases, probabilistic sampling can provide accurate information without overextending resources. When a probabilistic sampling design is employed, statistical analysis is conducted to determine miles of attaining and impaired stream miles. The results are then translated into assessment units for the Integrated Report. If probabilistic results return a significant mix of assessment decisions, then the watershed may be revisited using a targeted sampling design to obtain more detailed information for assessments.

Requirements for Making Assessments

Assessments will be completed with data that has been collected using appropriate sampling design, see Monitoring Book (Shull and Lookenbill 2018). Sampling sites and locations are positioned to account for changes in water quality due to influences such as major tributaries, point and nonpoint source impacts, land use changes, soil characteristics, and geology. Additional samples are collected at the limits of these changes to effectively “bracket” potential sources of water quality differences. The minimum length of any assessment unit is typically ½ mile. Any assessment unit less than ½ mile may be considered a localized impact and likely will not be reported in the Integrated Report. There is no set maximum assessment unit length; however, the size is limited by the DEP GIS application to efficiently save and return results from the database. Approximately 55 segments of the NHD flowline is recommended as a maximum assessment unit length to avoid GIS application issues.

Decision Framework

DEP will implement the following framework when evaluating monitoring data in the use assessment decision process. The details of this appraisal process may vary from application to application based on the unique characteristics and contexts of each situation. However, DEP will follow this process as often as possible to maintain consistency in the use assessment decision process and so that interested stakeholders can clearly see how DEP evaluates data for assessments. The decision framework aims to document and communicate each step of the decision process in a clear, consistent manner addressing the study designs, data quality, data analysis, assumptions, uncertainties, and consequences associated with each use assessment decision. DEP attempts to be as concise as possible within this framework while not compromising adequate discussion of critical issues influencing the decisions.

- (1) Describe monitoring effort.** Describe the waterbody and the watershed, including basin size, land uses, geologies, and other characteristics. Discuss any germane history and context pertaining to the monitoring effort. To the extent possible, describe the motivations and intentions of the monitoring effort, including the individuals and organizations involved

as well as the intended use of the information collected. Clearly state study goals. Describe and map monitoring locations. Include any photographs.

- (2) **Check data quality.** Evaluate any study plans and objectives, including sampling plan design details such as recordkeeping, data management, training, sampling techniques, and analytical methods. Check data for typos and other anomalies. Document non-detects and censored data.
- (3) **Gather information on likely sources of variation.** At a minimum, this information will typically include characterization – and quantification where possible – of tributary locations, upstream discharges, geologies, and land uses. Potential sources of this information include stream gages, climatological records, and discharge monitoring reports. Include maps, figures, and diagrams as needed. Discuss relevant physical, chemical, and biological processes and other potential sources of variation for the parameter(s) of concern. Address context-specific considerations (e.g., dams).
- (4) **Explore data.** Perform various graphical analyses (e.g., histograms, probability distribution functions, boxplots, time-series plots, scatterplots with likely sources of variation, LOWESS) to visually explore and illustrate data characteristics. Document summary statistics (e.g., minimum, maximum, mean, median, standard deviation).
- (5) **Evaluate data representativeness.** Evaluate how representative samples are of unmonitored conditions, mindful of the sampling plan design (e.g., sample collection frequency, locations, timing, targeting) and the likely sources of variation with special attention to any critical sampling times and locations. Consider if the system is likely to be spatially well-mixed at monitoring location(s) and how quickly conditions are likely to change in time.
- (6) **Describe the relevant standards.** Identify which criteria are being evaluated and the uses to which they apply. Describe how the parameters of concern impact the protected use (i.e., exposure pathways, detrimental effects) being assessed. Review the associated regulatory language including any relevant criterion rationale documentation.

- (7) Apply appropriate analytical procedures.** Select and apply appropriate analytical techniques, mindful of the sampling plan design, monitoring objectives, and the relevant criteria, parameters, and context. State and verify any assumptions associated with each analytical technique. Evaluate decision error rates, if applicable. For hypothesis tests, evaluate null hypothesis choice. Discuss the magnitude, duration, and frequency of relevant criteria digressions, excursions, and/or exceedances.
- (8) Consider other sources of relevant use assessment information.** Additional sources of information may include: previous or concurrent monitoring efforts; data from water supply intakes; biological surveys; and discharge monitoring reports.
- (9) Evaluate all relevant lines of evidence.** Bring together the previous steps into a narrative that addresses contextual data interpretations, possible counter arguments, alternative decision choices, and decision consequences, including evaluation of decision error consequences. Explicitly address any policy ramifications if applicable.
- (10) Decide.** Decide what to do with the dataset and waterbody in question. At a minimum, each decision will include placing the waterbody in one of the Integrated Report categories.

Natural Conditions Exception

Natural quality is defined in 25 Pa. Code § 93.1 as “*The water quality conditions that exist or that would reasonably be expected to exist in the absence of human related activity.*” In accordance with the provisions of Pennsylvania's WQS, waters that have naturally occurring pollutant concentrations, or “natural quality,” that prevent the attainment of an established use will not be assessed as impaired, if it can be demonstrated that anthropogenic sources do not cause or contribute to the non-attainment and the pollutant(s) of concern are generated by natural processes.

Reassessment of Previously Assessed Waters

DEP completed the first statewide ALU assessment of wadeable waters (SSWAP) in 2006 and began reassessment with new methods during 2006 in the eastern regions of the state. The primary focus of reassessment is the attaining waters from the first statewide ALU assessment. The current assessment methodology is more rigorous than the SSWAP method and, as a result, the reassessment of attained waters is to confirm that these waters are attaining ALU. The goal is to reassess all SSWAP ALU attaining waters by 2025. Reassessment of impaired waters is a lower priority unless

conditions have changed as a result of restoration or implementation of a TMDL or it is believed the water may have been listed in error. Reasons to reassess include confirmation of the original source and cause determination and collection of additional data necessary for TMDL development or alternative restoration plans. Following implementation of the TMDL targets and other restoration plans, reassessment should occur after sufficient time has passed to allow for recovery. In general, reassessment following implementation should occur five years after restoration activities have been completed, and if full restoration to WQS has not occurred, reassessment should occur at five-year intervals.

Other use assessments include Fish Consumption, Recreation and Potable Water Supply. Reassessment of these uses should occur within 10 years and identify any changes in status. Assessment of recreation use is ongoing and has only been completed on approximately 40% of the waters of Pennsylvania. The priority for assessment is on assessing the waters that have not yet been assessed as well as reassessing waters that were first assessed prior to 2008.

INTEGRATED REPORT CATEGORY ASSIGNMENT

Chapter 1 introduced and described the Integrated Report Categories. This section describes the assignment of a waterbody segment to one of the Categories based upon the results of the assessment. Categories 1 and 2 are for waters attaining protected uses. Waterbody segments that have been assessed and are attaining all uses are assigned to Category 1. Waterbody segments that have been assessed and are attaining at least one use are assigned to Category 2. Category 3 is reserved for waters that are not assessed for any uses due to insufficient information to complete an assessment.

Impaired waters are assigned to Category 4 or 5. Waters assigned to Category 4 are impaired for one or more uses; however, these waters do not require a TMDL to be developed. Category 4 is comprised of 3 subcategories: 1) Category 4a applies when a TMDL has been completed and approved by USEPA; 2) Category 4b applies when a use impairment caused by a point source pollutant is being addressed by the state through other pollution control requirements and a schedule of compliance. and 3) Category 4c applies when a use is impaired, but the impairment is not caused by a pollutant (i.e., Flow Alterations, Habitat Modification, Water/Flow Variability and Filling and Draining).

Waters assigned to Category 5 are impaired by pollutants for one or more uses and require the development of a TMDL. Category 5 has one subcategory, 5alt, that is

comprised of waters that have been identified for water quality restoration through an alternative approach before a TMDL is completed.

DELISTING AND REMOVAL OF CAUSES FROM IMPAIRED CATEGORIES

Any removal of a pollutant on the 303(d) list (Category 5) is considered a “delisting” and is subject to USEPA review and approval. Delistings must come with reasoning and data to support the change. Removal of a cause of impairment from Category 4 is not strictly considered a “delisting” and is not required to be reviewed and approved by USEPA; however, DEP provides this information within the delisting documentation of each Integrated Report for transparency purposes.

Delisting Reasons

There are multiple reasons to remove a cause of impairment from a waterbody (Table 1). When conditions improve in impaired waters it is possible to remove a cause or causes of impairment from the impaired Categories (Category 4 or 5). In addition, if a cause of impairment is no longer appropriate, it can be removed despite the waterbody remaining impaired for other sources or causes. A delisting reason from Table 1 must be assigned to each cause that is being delisted. The refinement reason should only be used when clarifying the metals cause to a more specific metal, when specifying pH as high or low, and when removing cause unknown.

Table 1. USEPA Delisting Reasons

	Delisted Reason	Description
1	WQS_NEW_DATA	Applicable WQS attained; based on new data
2	WQS_RESTORATION_ACTIVITIES	Applicable WQS attained, due to restoration activities
3	WQS_LISTING_INCORRECT	Applicable WQS attained; original basis for listing was incorrect
4	WQS_STANDARDS_CHANGED	Applicable WQS attained, due to change in WQS
5	REFINEMENT ¹	Clarification of listing cause
6	WQS_NEW_ASMT_METHOD	Applicable WQS attained, according to new assessment method
7	DELISTING_WQS_NOT_APPLICABLE	WQS no longer applicable
8	DELISTING_ORIG_INCORRECT	Data and/or information lacking to determine WQ status; original basis for listing was incorrect

Delisting Requirements

It takes the same or greater level of data rigor to delist a cause as it does to make the impairment determination. This documentation could include one year of Discharge Monitoring Reports (DMRs) with data showing the assessed use is meeting criteria, or data showing there is a different cause for the impairment.

To justify reasons 1-7 in Table 1, an assessment must be conducted to show the waterbody is now meeting its use. The data requirements to demonstrate these improvements are found in Table 2. The applicable data and a detailed map displaying the waterbody must be provided to DEP. Appendix B contains an example map of a stream delisting and details the information that should be depicted on the map. For ALU assessments, the macroinvertebrate station(s) and the new attaining IBI score(s) must be displayed. Recreational use assessments should show the station(s) on the map and display the attaining geometric mean(s). If an assessment is based on chemistry, the data showing attainment must be provided. Any other pertinent information or data to justify the delisting should also be provided.

¹ The refinement reason should only be used when clarifying the metals cause to a more specific metal, when specifying pH as high or low, and when removing cause unknown.

Table 2. Data Requirements for Delisting 303(d) Waters

Assessed Use	Delisting Data Requirements
Aquatic Life - macroinvertebrate	Aquatic macroinvertebrate data, collected using DEP data collection protocols (Shull and Lookenbill 2018), that generates an IBI score above the attainment benchmark set by the sampling protocol. Multiple stations are required to bracket land use changes, nonpoint and point source influences, and any other influences that could affect water quality within the potential delisted waterbody.
Aquatic Life - chemistry	Chemistry results must demonstrate that the applicable criterion is being met as set forth in 25 Pa. Chemistry data used to delist must have been collected more recently than, and have been collected as frequent or more frequently than the data used to list the waterbody.
Recreation	The geometric mean of 5 consecutive samples collected on different days during a 30-day period must be below the criterion: during the swimming season, for <i>Escherichia coli</i> , a maximum 126 cfu/100 ml, and no greater than a 10% digression of 410 cfu/100 ml (for the same samples collected in the same 30-day duration interval); and during the remainder of the year, for fecal coliforms, 2,000 cfu/100 ml, as described in the Bacteriological Assessment Method for recreational use section of this book.
Potable Water Supply	Sampling should target the critical period when criteria digressions or excursions are expected. Samples must be collected at the point of withdrawal prior to the treatment process. Results must demonstrate that the applicable criterion is being met 99% of the time as set forth in 25 Pa. Code Chapters 93 and 96.
Fish Consumption	Fish tissue results showing the improved contamination level and the recommended fish advisory change.

Delisting Clarifications

Category 4b

Moving a pollutant from Category 5 to Category 4b (i.e., delisting) requires additional documentation that must be provided at the time of the assessment determination. According to USEPA's 2006 Integrated Report guidance document, DEP must document that the six following elements are addressed for a 4b delisting to be approved:

1. Identification of segment and statement of problem causing the impairment;
2. Description of pollution controls and how they will achieve water quality standards;
3. An estimate or projection of the time when WQS will be met;
4. Schedule for implementing pollution controls;
5. Monitoring plan to track effectiveness of pollution controls; and
6. Commitment to revise pollution controls, as necessary.

Details on each of the six elements are provided within USEPA's 2006 Integrated Report guidance document. It is important to note that a Consent Order Agreement also meets the six elements and can be used for approval.

To move a waterbody from Category 4b to either Category 1 or 2, documentation must be provided showing the facility is in compliance with their permit conditions and/or their discharge is no longer the cause of impairment.

Cause and Listing Date Refinement

The cause listing date is the year a cause of impairment is first reported on the Integrated Report. Each cause of impairment has its own listing date, or "Date First Listed". This information allows USEPA to track how long it takes TMDLs to be generated after a pollutant is placed on the 303(d) list. It is also useful information for other causes placed on Category 4c.

In most reassessment cases involving the same causes the listing date is carried over; however, if an existing TMDL does not address the new impairment (e.g., a new source enters the watershed), DEP may choose to create a new listing date (Figure 1). For example, if low pH from Acid Mine Discharges was a cause of impairment first listed in 2002, but a new assessment completed in 2021 determines that the existing TMDL (addressing only Acid Mine Discharges on a portion of the watershed) does not address the new source (e.g., Atmospheric Deposition), then the listing date for pH would be 2022. In this example, the new listing date acknowledges that the nature of the cause is now different and an existing TMDL does not cover the new impairment.

Given the previous example, it may be concluded that a cause of impairment can have multiple listing dates because of multiple sources; however, only one listing date can be assigned to a cause. This is due to the way the USEPA tracks listing date information

through the Assessment, Total Maximum Daily Load (TMDL) Tracking and Implementation System (ATTAINS). In cases where a cause may have multiple sources, the oldest listing must be retained regardless of whether a new source (even if it is not covered by a TMDL) is discovered. For example, if Organic Enrichment was first listed in 2002 with a source of "Dam or Impoundment", but a reassessment in 2021 determines a newly discovered source, "Combined Sewer Overflow", is also contributing to the Organic Enrichment impairment, the listing date for Organic Enrichment would remain 2002.

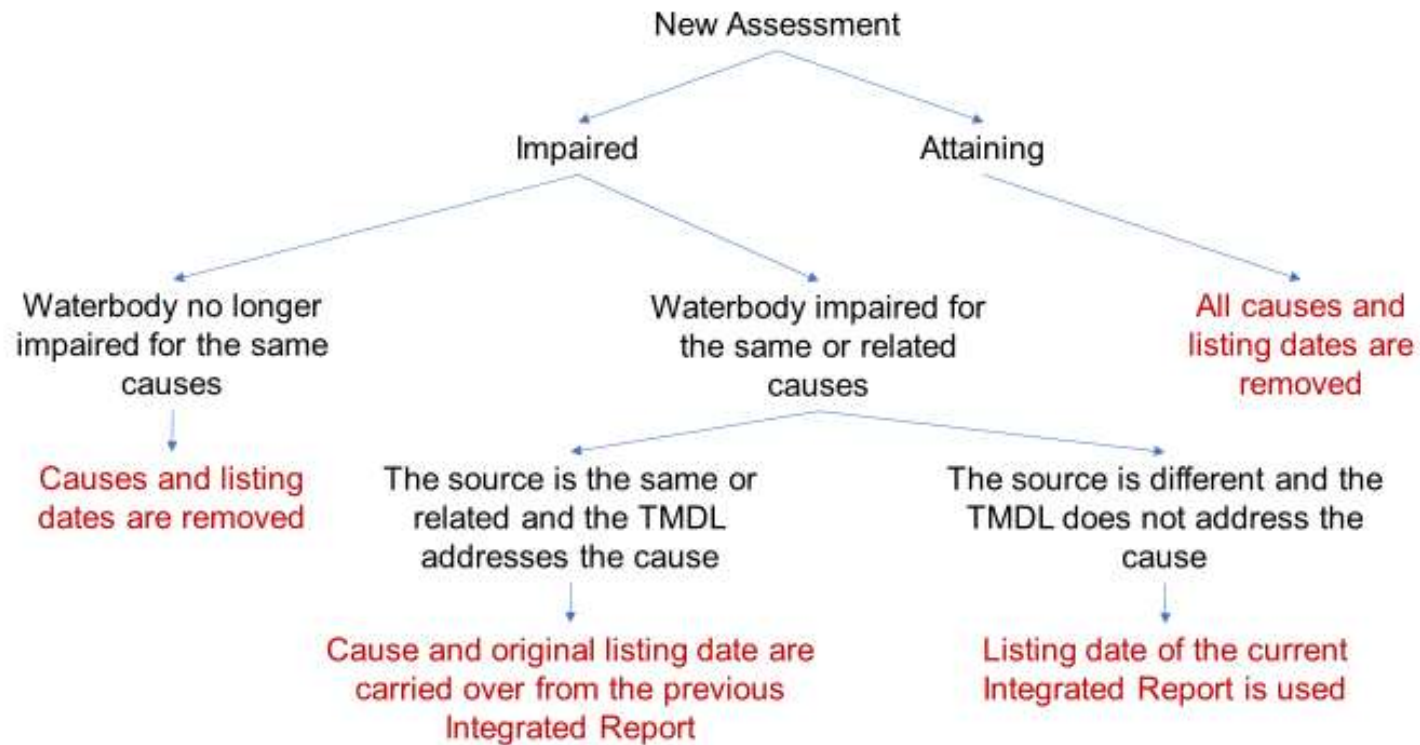


Figure 1. Cause and listing date decision process for reassessments.

LITERATURE CITED

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