COMPREHENSIVE ASSESSMENT AND LISTING METHODOLOGY (CALM):

PROCEDURES FOR ASSESSING WATER QUALITY STANDARDS ATTAINMENT FOR THE STATE OF NEW MEXICO CWA §303(d) /§305(b) INTEGRATED REPORT

NEW MEXICO ENVIRONMENT DEPARTMENT
SURFACE WATER QUALITY BUREAU

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Appendices

LIST OF COMMON ACRONYMS

4Q3	4-Day, 3-Year Low Flow
ATTAINS	EPA's Assessment, TMDL Tracking and Implementation System
AU	Assessment Unit
CALM	Comprehensive Assessment and Listing Methodology
CHL-A	Chlorophyll *a*
CWA	Clean Water Act
DO	Dissolved Oxygen
EPA	United States Environmental Protection Agency
HP	Hydrology Protocol
LM	Listing Methodology
MASS	Monitoring, Assessment, and Standards Section
M-SCI	Mountain Stream Condition Index
MDL	Method Detection Limit
NHD	National Hydrographic Dataset
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMSA	New Mexico Statues Annotated
NPDES	National Pollutant Discharge Elimination System
PAH	Poly Aromatic Hydrocarbon
PCBs	Polychlorinated Biphenyls
PQL	Practical Quantification Limit
QA	Quality Assurance
QAO	Quality Assurance Officer
QC	Quality Control
QAPP	Quality Assurance Project Plan
RBP	Rapid Bioassessment Protocols
ROD	Record of Decision
SDL	Sample Detection Limit
SEV	Severity of Ill Effects
SLD	State Laboratory Division
SOPs	Standard Operating Procedures
SQUID	Surface water QUality Information Database
SSC	Suspended Sediment Concentration
STORET	STOrage and RETrieval System
SWQB	Surface Water Quality Bureau
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
UAA	Use Attainability Analysis
USGS	United States Geological Survey
WQCC	New Mexico Water Quality Control Commission
WET	Whole Effluent Toxicity
WQC	Water Quality Criterion
WQS	Water Quality Standard(s)
WQX	Water Quality Exchange

1.0 ASSESSMENT PROCESS OVERVIEW

Pursuant to Section 106(e)(1) of the federal Water Pollution Control Act (Clean Water Act or CWA), 33 U.S.C. § 1251 *et seq*. [1], the New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) has established appropriate monitoring methods, quality assurance/quality control (QA/QC) procedures, and listing methodologies in order to compile and analyze data on the quality of the surface waters of New Mexico.[2] The SWQB has developed and implemented a water quality monitoring strategy for surface waters of the state in accordance with the New Mexico *Water Quality Act* (NMSA 1978, §§ 74-6-1 to -17)[3]. The monitoring strategy establishes methods of identifying and prioritizing water quality data needs, specifies procedures for acquiring and managing water quality data, and describes how these data are used toward three basic monitoring objectives to: develop water quality-based controls, evaluate the effectiveness of such controls, and conduct water quality assessments (NMED/SWQB 2016a).

From approximately 1998 to present, the SWQB has primarily utilized a rotating basin system approach to water quality monitoring similar to several other states (WERF 2007). Using this approach, a select number of watersheds are monitored for two years with an established return frequency of approximately eight years (NMED/SWQB 2016a). Revisions to the schedule are necessary based on staff and monetary resources that fluctuate on an annual basis. It should also be noted that a watershed is not necessarily ignored during the years in between sampling. The rotating basin strategy is supplemented with other data collection efforts such as data from United States Geological Survey (USGS) water quality monitoring stations and other external sources that meet SWQB's QA/QC requirements. The SWQB has revised their approaches to monitoring and total maximum daily load (TMDL) prioritization in accordance with the Unites States Environmental Protection Agency's (EPA's) "New 303(d) Vision" program (EPA 2013a).

The SWQB maintains current quality assurance and quality control plans that cover all monitoring activities. This document, called the *Quality Assurance Project Plan for Water Quality Management Programs* (QAPP), is revised as substantial technical or programmatic changes occur and approved by the EPA for three-year periods. When an intensive survey is completed, all data are checked against QA/QC measures identified in the QAPP and assessed to determine whether designated uses detailed in the current *State of New Mexico Standards for Interstate and Intrastate Surface Waters* (WQS)[4] are being met. Therefore, these methodologies cover the decision-making process for both listing and de-listing causes of impairment. In New Mexico, surface water data are assessed according to this document and associated appendices – referred to as the comprehensive assessment and listing methodology or "CALM." This document was previously referred to as the "Assessment Protocol." The name was changed to better align with similarly-named EPA guidance documents and other states' titles for their respective listing methodologies. The results of application of New Mexico's listing methodologies are then made available to the public through the *State of New Mexico CWA §303(d) /§305(b) Integrated Report* (Integrated Report). Use attainment decisions are summarized by assessment unit (AU) in New Mexico's Integrated List, which is Appendix A of the Integrated Report and the primary focus of the report. The intent is to prepare the Integrated Report by April 1st of every even-numbered calendar year as required by the CWA. Category 5 water bodies on the Integrated List (see Section 4.0 for category definitions) constitute the *CWA §303(d) List of Impaired Waters*.

Although EPA does not officially approve individual state's listing methodologies, they do provide review and comment and consult the protocols when reviewing New Mexico's draft Integrated List. The CALM is reviewed every odd-numbered calendar year and is generally based on current EPA assessment guidance. For development of the Integrated Report and List, the EPA recommends that states follow the 2006 Integrated Report guidance (EPA 2005), supplemented by biennial memoranda (EPA 2006a, 2009, 2011,

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[1] Full text at https://www.gpo.gov/fdsys/browse/collectionUScode.action?collectionCode=USCODE. Summary at https://www.epa.gov/laws-regulations/summary-clean-water-act.

[2] All available at https://www.env.nm.gov/swqb/.

[3] https://nmonesource.com/nmos/nmsa/en/nav_date.do?page=4.

[4] Available at https://www.env.nm.gov/surface-water-quality/wqs/.

2013b, 2015, and 2017, respectively). The main CALM document and related appendices are opened for 30-day public comment when significant revisions are proposed.

Assessment results are tracked and maintained by water body or AU (WERF 2007). The EPA first suggested the use of the term "assessment unit" (AU) in their 2002 listing guidance (EPA 2001). AUs can represent a single lake or reservoir, length of a stream reach or river, or surface waters within a delineated area such as a watershed. AUs are generally defined by various factors such as hydrologic or watershed boundaries, water quality standards (WQS) found in 20.6.4 New Mexico Administrative Code (NMAC), geology, topography, incoming tributaries, surrounding land use/land management, etc. Assessment units are intended to represent surface waters with assumed homogenous water quality (WERF 2007). With respect to 40 C.F.R. 130.2, New Mexico's use of AU is equivalent to "water quality-limited segment." New Mexico specifically defines the term "segment" within the state WQS at 20.6.4.7.S(2) NMAC. In New Mexico, there are generally many AUs within any particular New Mexico WQS segment (20.6.4.97 through 20.6.4.899 NMAC).

The EPA listing and reporting guidance requires states to organize their respective lists by AUs and electronically report specific assessment information to the EPA's Assessment, TMDL Tracking and Implementation System (ATTAINS). The NMED's Information Technology Bureau merged SWQB's in-house water quality database (NMEDAS) with assessment information previously housed in New Mexico's version of the EPA's Assessment Database (ADB) during the 2014 listing cycle. The merged Oracle-based Surface water Quality Information Database (SQUID) now houses attainment data as well as SWQB-collected chemical, biological, and habitat data used to make attainment decisions. SQUID is also used to generate New Mexico's Integrated List and upload attainment data directly to EPA ATTAINS[5].

ATTAINs was significantly re-designed, with input from states, for the 2018 listing cycle forward. Part of the re-design included nationwide standardization of a variety of database fields, including parameter names/causes of impairment, probable sources, water body types, etc. SQUID was updated accordingly to accommodate these changes. As a result, some of the pre-2018 terminology in the Integrated List has been modified. Notable modifications will be further explained in the preface to the Integrated List.

Assessment of quantitative data creates the basis of designated use attainment decisions. These assessments are based on data that reasonably reflect current surface water quality conditions given sampling limitations. These data are compared with current EPA-approved WQS for the state of New Mexico (20.6.4 NMAC) regardless of what WQS were in effect at the actual time of sampling. Data types may include chemical/physical, biological, habitat, bacteriological, or toxicological data. The vast majority of data used for assessments are collected by the SWQB during rotational water quality surveys. The SWQB will also utilize data collected by other entities (partially listed below), provided the entity's sampling methods and data analysis procedures meet QA/QC requirements as detailed in the most recent QAPP. Appendix A contains data quality and rigor information for aquatic life use determinations.

In general, previously assessed datasets will not be re-assessed and existing assessment conclusions will be carried over onto the new draft list) unless there are 1) more recent available data to add to the assessment dataset, or 2) assessment methodology for a specific parameter has significantly changed. All readily available data that were not assessed for a previous listing cycle will first be collated and assessed (Figure 1.1). Assessment conclusions will be compared to the conclusions of the previous list. If they have not changed for a given water quality parameter within a particular AU, the conclusions of the current assessment will carry over to the current list. If the current assessment indicates a change in attainment status, the new data for that particular water quality parameter at that site will be combined with the most

[5] https://www.epa.gov/waterdata/assessment-and-total-maximum-daily-load-tracking-and-implementation-system-attains

recent five years of data (WERF 2007).

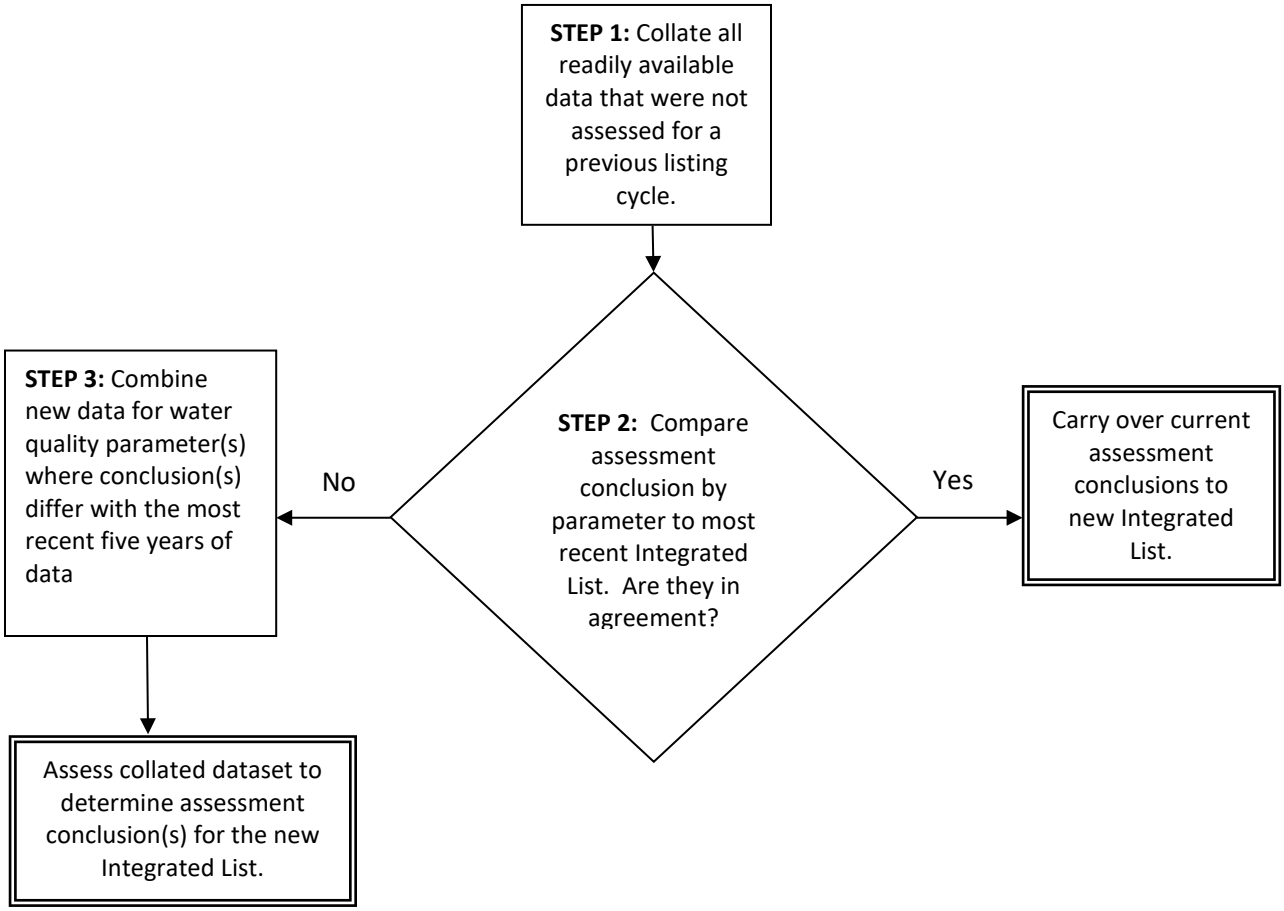


Figure 1.1. Decision process for determining assessment dataset

The specific years of data to use are defined from the date data were collated for the upcoming listing cycle, typically May 1 of the year before the list is due. For example, verified and validated data from May 1, 2014 through May 1, 2019, would be collated for development of the draft 2020 Integrated List. This collated dataset will primarily form the basis of final impairment decision. Data older than five years must meet data requirements and will only be considered on a case by case basis for the following reasons:

- No newer data exists for the waterbody segment/parameter or the existing data does not meet the requirements of this listing methodology;
- The data are part of a larger dataset or long-term monitoring which includes data younger than five years old for the same waterbody/parameter; or
- Information or rationale is provided with the data to show that the data reflects current conditions and adheres to acceptable protocols.

Data older than five years may also be used when necessary to determine historical conditions if the data met QA requirements for assessment purposes at the time of its collection. When decisions must be partially based on historical data, only past data that meet QA requirements for assessment purposes will be used.

The CWA requires that WQS protect designated uses during critical conditions such as years with below average stream flow. This distinction is important because it may not satisfy the intent of the CWA to use data collected in non-drought conditions to draw a conclusion of no impairment when available data collected during low flow conditions indicate impairment. Recent data may take precedence over older data if new data indicate a change in water quality or the older data fail to meet data quality requirements. If there was a temporary disturbance, such as a wildfire, or unintentional spill or discharge, and several consecutive years of data before and after the disturbance are available, the SWQB may also consider data trends when determining attainment status. This is consistent with recommendations in EPA guidance (EPA 2005). If there are only data greater than five years old available for a particular AU, the assessment conclusions based on these older data will be carried over to the next list without being re-assessed until more current data are available to assess.

The Integrated Report and List are opened for a minimum 30-day public comment period. Response to Comments are prepared by SWQB and submitted to the EPA for review. The SWQB also updates and submits an assessment rationale (formerly known as the "record of decision" or ROD). The assessment rationale is an additional, non-required document that SWQB provides to EPA, NMED personnel, and the public that explains when and why a particular cause of impairment was added to or removed from the Integrated List. All the above-mentioned documents developed and maintained by the SWQB are available on the SWQB web page: https://www.env.nm.gov/surface-water-quality/.

Outside sources of available data are specifically solicited via public notice, usually at the same time as significant CALM revisions are public noticed, for a minimum 30-day period before the draft Integrated List of surface waters is prepared (see Section 5.0 below). All data submissions from outside sources will be reviewed by the SWQB Quality Assurance Officer (QAO) to ensure the suitability of the QA/QC procedures under which the data were collected. Specifically, submitted documentation associated with the dataset will be reviewed to determine: (1) if there is documentation of QA/QC procedures that, at a minimum, meet the QA/QC requirements described in the SWQB's most recent QAPP; and (2) if there is reasonable evidence or assurance that these procedures were followed. See https://www.env.nm.gov/surface-water-quality/data-submittals/ for additional information regarding how and what to submit. Although data generally must be received before the end of public notice comment period to be considered for the upcoming listing cycle, data submittals for consideration on planning purposes or future list may be submitted at any time.

Data meeting QA/QC requirements received through this solicitation may be used to confirm a listing of impairment, confirm the absence of impairment, or initiate a new listing of impairment of a particular AU. Data that do not meet these requirements may be used for screening purposes to determine if additional data collection is warranted. Other water quality related data (e.g., habitat conditions, field observations, and fish communities) are also solicited and may be useful for characterizing water quality conditions and for WQS development and refinement. Data packages submitted after the solicitation period and/or related to other watersheds in the state may be considered during development of subsequent Integrated Lists.

Quality data sources could include, but are not limited to, the following. These data would need to meet QA/QC requirements to be used for assessment, as stated above. Provisional data shall not be used to make designated use support determinations:

- Chemical/physical, biological, habitat, and bacteriological data collected by the SWQB during watershed surveys or other recent studies using SWQB's standard operating procedures (SOPs) or otherwise accepted methods;

- Chemical/physical, biological, habitat, and bacteriological data collected by other organizations (including citizen and volunteer groups), contractors, tribes, or individuals during watershed surveys

or other recent studies using SWQB's SOPs or otherwise accepted methods;

- Chemical/physical, biological, habitat, and bacteriological data collected by the USGS;
- Chemical/physical, biological, habitat, and bacteriological data collected by EPA or their contractors as part of National Aquatic Resources Surveys (NARS);
- In-stream (i.e., receiving water) data collected during National Pollutant Discharge Elimination System (NPDES) storm water or effluent permit monitoring efforts;
- In-stream water quality data from other NMED bureaus such as the Drinking Water Bureau (DWB), Ground Water Quality Bureau (GWQB), or the Department of Energy (DOE) Oversight Bureau.

2.0 DATA USABILITY AND QUALITY DETERMINATIONS

2.1 Data Management Rules

2.1.1 Data qualifiers and validation codes

SQUID houses water and fish tissue chemical data, as well as biological and habitat data. These data are available upon request. This database also contains lab data qualifiers and internal validation codes that are added during the data validation process. Validated chemical/physical data collected by the SWQB are uploaded to EPA's Water Quality Exchange (WQX) database. Any data with a qualifier code or data validation code that are used in an assessment should be noted in the assessment documentation. Refer to the current version of the QAPP and SWQB's Data Verification and Validation[6] for the current definition of SWQB data qualifier and data validation codes.

- Lab Qualifier Codes – In the past, sets of qualifier codes have varied between the individual sections at the State Laboratory Division (SLD). The SWQB has encouraged SLD to determine a unified set of codes that will be reported consistently by all SLD sections. Standard lab qualifier codes for SLD and contract labs, as well as the SWQB data validation codes are defined in the most recent QAPP. All data flagged as "rejected" during internal laboratory QA procedures will not be used for assessment purposes. Other flagged results are usable provided the appropriate caveats are documented in the assessment files and uncertainties in the data are discussed.

  Results from samples that are flagged by the laboratory as "below the minimum quantification or reporting limit" (generally referred to as "minimum reporting limit" or MRL in SQUID) may only be used during the assessment process if the MRL is less than the applicable water quality criterion (WQC) or numeric threshold being assessed. For this listing methodology, the following terms related to analytical method sensitivity are considered synonymous and will be evaluated on a case-by-case basis depending on the particular analytical lab because reporting practices can vary: "quantitation limit," "reporting limit," "level of quantitation," and "minimum level." Parameters detected above the method detection limit (MDL) but below the MRL are typically flagged with a J qualifier that indicates any reported quantitative concentration is an estimate. The concentration is estimated because the concentration being detected is below the lowest quantifiable concentration on the calibration curve. There is certainty as to the detection of the chemical but uncertainty as to the exact concentration. These reported values may be used in an assessment when the J flagged data is part of a summed parameter, or if the MRL is less than the applicable WQC. Otherwise, J flagged data will not be assessed. For example, it is common laboratory practice to include J flagged values for individual when summing congeners to determine total PCB concentration using EPA Method 1668A, B, or C congener methods.

  Results from samples that are flagged by the laboratory as "exceeded holding time" will be considered estimates and may be used during the assessment process unless the result is deemed

6 Available at https://www.env.nm.gov/surface-water-quality/sop/

"rejected" based on best professional judgment in accordance with the QAPPs and SOPs. Method holding times are different for each sample parameter. Sample analysis after the allowable holding time for a sample or sample set may be a result of laboratory oversight, delayed sample shipment, need for reanalysis, or poor planning. The data validator will take into account the nature of the analysis, the extent of the noncompliance (e.g., considering the method holding time limit, whether the holding time was exceeded for one day vs. one month, and stability of the parameter in question), the sample matrix, any supporting data, and the purpose and goals of the sampling and analysis program (EPA 2002d). From the EPA's perspective, the time and expense associated with the sample collection and processing is forfeited when data exceeding the holding time are rejected even though the analytical results may in fact be accurate and usable (EPA 2002e). Therefore, data exceeding holding time may be considered for use in assessments, but any listings as a result of these qualified data will be noted as Category 5C – needing more data (see Section 4.0 for details).

SWQB Data Validation Codes (internal) – The SWQB validates all data for a particular water quality survey. Internal data validation procedures are detailed in the most recent QAPP. All data with internal SWQB validation codes will still be used for assessment purposes except data flagged as "rejected" (typically R1, R2, R3, RB1, or Er data validation codes). Also, SWQB bacteria results that are marked Ea due to incubation temperatures between 35.5 and 38 degrees C will be rejected with respect to CWA §303(d)/§305(b) assessment.

2.1.2 Duplicates, compliance monitoring sampling data, and temporal independence

Studies designed to determine ambient conditions in surface waters should consider temporal independence. For the purposes of CWA §303(d)/§305(b) assessment, grab data or water chemistry data collected within a seven-day period are considered duplicate samples except in cases where the data are from distinct hydrologic events. The maximum (or minimum if the criterion is expressed as a minimum) value should be used in the assessment dataset. Examples include when QA/QC duplicates or multiple compliance monitoring samples for human health criteria are taken within a one-hour time frame. Assessing the maximum/minimum value of duplicate samples guarantees that any criterion exceedence is considered, thus avoiding the risk of incorrectly disregarding an exceedence (i.e., Type II error).

2.1.3 Continuous recording equipment (thermographs, data loggers, and sondes)

Periodic instantaneous data do not provide information on maximum or minimum daily parameter values, duration of exceedences, or diurnal fluctuations of water temperature and DO. These aspects of water quality are pertinent to aquatic life use. Because of the limitations of grab data and the increasing availability data loggers and sondes to collect long-term datasets, assessments using data logger and sonde datasets are preferred.

The SWQB has been deploying thermographs in streams and applying the temperature assessment protocol since 1998. Continuously recording temperature data loggers (i.e., thermographs) are relatively inexpensive, readily available, and provide an extensive multiple-day record of hourly temperatures over the period when temperatures are generally highest. Monitoring staff program thermographs to record at least hourly (typically 15-minute data), and deploy them long enough to capture the summer season maximum temperature. The use of continuous data is more technically sound than simply applying percentages to limited instantaneous temperature data and allows consideration of magnitude, frequency and duration into water quality monitoring and listing methods. The use of thermographs eliminates the biases introduced when using instantaneous data to assess water quality parameters with significant diurnal fluctuation. Starting with the 2010 listing cycle, the temperature listing methodology covers all temperature assessment scenarios, including procedures for both instantaneous grab and thermograph data for all types of aquatic life uses in either lotic (e.g., streams or rivers) or lentic (e.g., lake or reservoir) water bodies (see Appendix B).

The SWQB has been deploying multi-parameter sondes at select stations since 2000. In addition, DO and specific conductance data loggers have been deployed in recent years. Monitoring staff program these devices to record, at least hourly, dissolved oxygen (DO), pH, specific conductance, temperature, or turbidity values for a minimum of three days (72 hours). Longer deployments are preferred; the SWQB typically deploys for sondes and single parameter loggers for three to fourteen days, and thermographs for four to six

months. Based on the success of the thermograph-based listing methodology, additional large dataset listing methodologies were developed to address parameters with known diurnal fluxes, namely DO and pH (Appendices E and F, respectively). Starting with the 2012 listing cycle, these protocols cover all assessment scenarios, including procedures for both instantaneous grab and sonde data for all types of aquatic life uses in either lotic (e.g., streams or rivers) or lentic (e.g., lake or reservoir) water bodies.

2.1.4 Limited datasets

As stated above, SWQB also uses thermographs, multi-parameter sondes, and data loggers to generate large datasets for temperature, pH, DO, specific conductance, and turbidity. Regarding chemical data, the SWQB strives for a minimum of four to twelve data points for core parameters such as metals and nutrients during rotating watershed surveys to make designated use determinations. Resource constraints typically limit data collection for radionuclides and organic parameters to four sampling events over a two-year monitoring period. The actual number of data points collected depends upon available resources, specific water quality concerns in the watershed, and the hydrologic characteristics of a given water body during the particular survey year. For example, the SWQB has observed an increasing number of streams with very low to no flow as the survey year progresses from March through October. The EPA does not recommend the use of rigid, across the board, minimum sample size requirements in the assessment process (EPA 2009). Target sample sizes should not be applied in an assessment methodology as absolute exclusionary rules (EPA 2003, 2005). The use of limited datasets is acceptable to the EPA, as limited financial, field, and laboratory resources often dictate the number of samples that can be collected and analyzed (EPA 2002a).

Generally, a minimum of four data points for field and chemical parameters is necessary to apply the procedures in Section 3.0 in order to determine and confirm attainment status for an associated AU parameter pair. The primary purpose of requiring four data points is to protect against the occurrence of false positives and to provide a high probability of detecting endemic impairments. Increased numbers of data points improve the statistical power for detecting lower probabilities of impairment. During the survey year, the SWQB monitoring staff review data as they are received from the laboratory. As needed, staff investigate questionable results by contacting laboratory personnel directly to confirm the results and/or scheduling appropriate modifications to survey sampling plans in order to acquire a minimum of four seasonally-distributed data points for each parameter sampled.

If data from fewer than four sampling events are available ($n \leq 3$) to assess an applicable designated use, there are insufficient data to determine attainment status for that particular designated use. The use will be noted as "Not Assessed" on the list. If there are no data at all, the AU would fall under category 3A (i.e., no data). If data do not exceed any applicable criteria, the AU would fall under Category 3B (i.e., limited data, no exceedences). If data from one or more sampling events exceeds one or more applicable criteria, the AU will be assigned Category 3C (i.e., limited data, exceedences) and the parameter(s) of concern will be noted in the AU Comments field. Additional data will be collected as resources allow in order to determine attainment status. See Section 4.0 for a description of the categories described above.

2.1.5 Application of WQS during low flow conditions

In terms of assessing designated use attainment in ambient surface waters, the WQS apply at all times under all flow conditions unless a flow qualifier is specified in a particular section of the WQS. Therefore, data collected during all flow conditions (except data collected during unstable conditions when assessing for chronic aquatic life use — see section 3.1.2.2 below for additional details), including low flow conditions, will be used to determine designated use attainment status during the assessment process. For a description of critical low flow calculations used to develop point source discharge requirements, see 20.6.4.11.B.

2.1.6 Multiple stations in one AU

As stated in Section 1.0 above, AUs are designed to represent waters with assumed homogenous water quality (WERF 2007). Section 1.0 also describes the relationship between AUs and "segments" as defined in 20.6.4.7.S(2) NMAC. The SWQB typically does not have the resources to establish more than one monitoring station in any particular river or stream AU during rotational watershed surveys, but there are occasions where more than one station with available data (typically chemical/physical data) is either established by the SWQB or some other data collection agency.

When this occurs in rivers or streams, the assessor will first assess data from each station individually to determine impairment(s) (Figure 2.1). Assessment units with homogenous landscape features are likely to have homogenous water quality. However, multiple stations within an AU may indicate otherwise due to point source discharges and/or lack of adequate, or no, best management practices (BMPs) that address non-point source pollution. If conflicts arise and the attainment conclusions for every station in the AU are not in agreement (i.e., either all **Fully Supporting** or all **Not Supporting**), the AU as currently defined may not represent homogeneous water quality. In this case, the AU breaks should be examined and may be split appropriately, including special consideration of NPDES point source discharges, non-point source BMPs, and available water quality and GIS data. The data will then be re-assessed based on the newly-defined AUs. In the rare event that there are two or more stations less than one tenth of a mile (approximately 200 yards) apart, and grab data or chemical data for the same parameter are collected within a seven-day period from these stations, these data are considered replicates for the purpose of assessment and the maximum (or minimum if criterion is expressed as a minimum) value should be used for assessment purposes.

When multiple stations exist on a lake or reservoir (e.g., one "shallow" and one "deep" station), they are usually sampled on the same day or within the same seven-day period. The applicable listing methodology shall be applied to the shallow and deep station datasets separately. If one or both datasets indicate impairment, the impairment conclusion for the AU is **Not Supporting**. If there are conflicting assessment conclusions, it will be noted in the Record of Decisions. The approach in this section is applicable to all impairment determination procedures detailed in this document, as well as all appendices unless otherwise stated.

2.1.7 Blank-correction for constituents measured using ultra low-level procedures

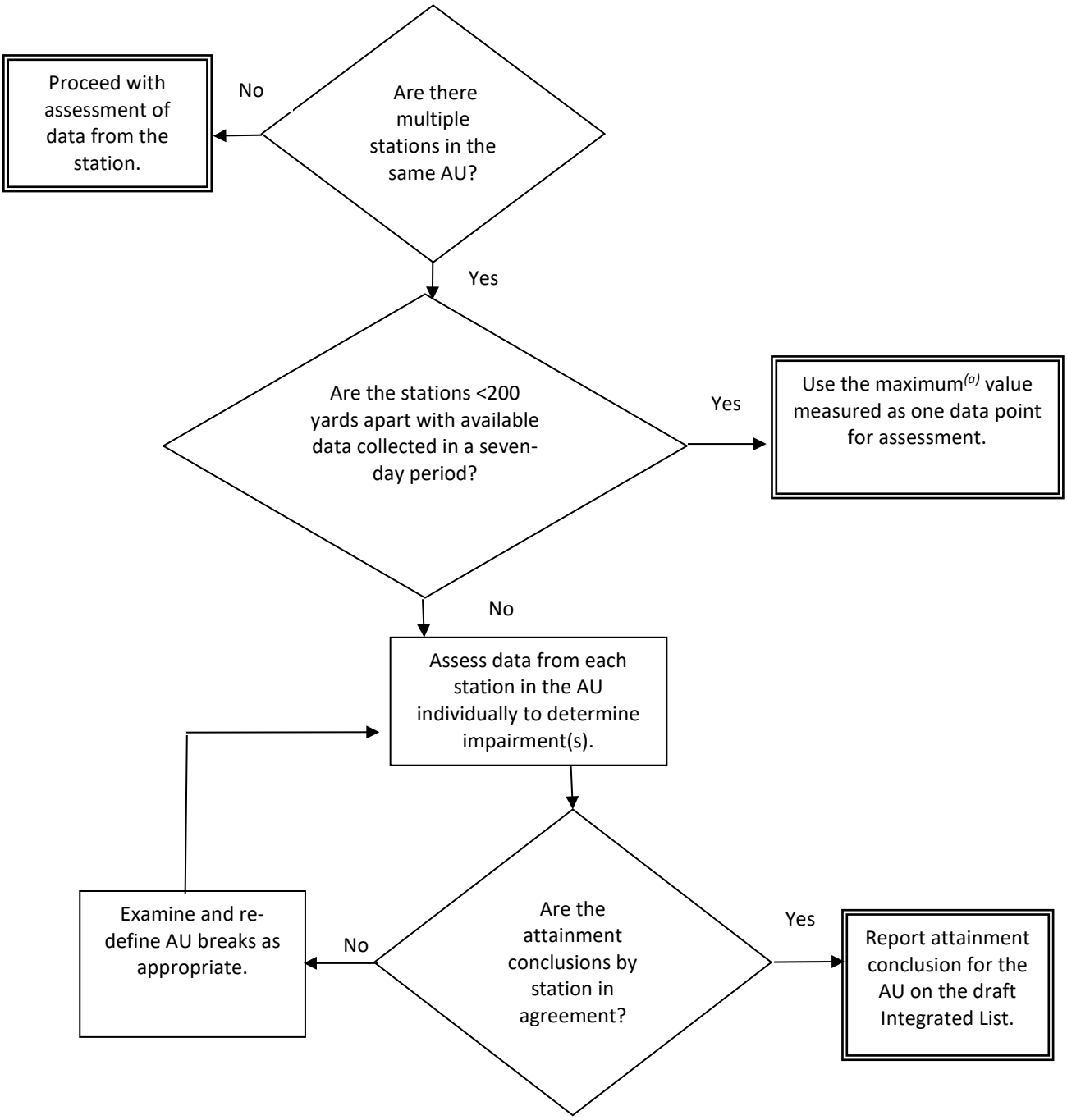
When a constituent concentration is determined using ultra low-level methods which recommend blank-correction (such as EPA Method 1668A, B, or C for analysis of PCBs), the result will first be blank-corrected using the procedures in the method (preferred) assuming adequate data are available to perform the recommended procedure. Other acceptable, documented blank-correction procedures will be considered when the procedures recommended in the method are not used, and the resulting data will be used for assessment if approved by the SWQB QAO. These blank-corrected values will then be compared against New Mexico's WQS to determine impairment.

2.1.8 Non-representative data

Non-representative data include data collected within the mixing zone of a discharge. If available water chemistry data from an existing station appears highly influenced by groundwater from a nearby seep or spring, the data and associated sampling procedures will be reviewed to determine appropriateness for surface water assessment. If the data are from a SWQB sampling station, the station will be relocated when possible to ensure future sampling is representative of the stream water chemistry or the equal-width increment sampling method[7] may be utilized.

In addition, data collected during or immediately after temporary catastrophic events influencing the waterbody that are not representative of normal conditions are typically not used to make CWA §303(d) listing decisions. For example, biological or habitat data collected soon after scouring storm flows which indicate the temporary diminished presence of aquatic life or chemical data collected immediately after accidental spills would not be a basis upon which to list a water body as impaired.

[7] https://pubs.usgs.gov/of/2000/ofr00-213/manual_eng/collect.html#width



NOTES: (a) or minimum if criterion is expressed as a minimum value.

Figure 2.1. Decision process for multiple stations in same assessment unit

For example, wildfires can produce significant water quality changes that may impact fish and other aquatic organisms, drinking water supplies and wastewater treatment systems. These impacts are cumulative as a result of pollutants mobilized by the fire, chemicals used to fight the fire, and the post-fire response of the surrounding environment. Responses include immediate / short-term responses as well as long-term (decade or more) impacts.

The magnitude of the effects of fire on water quality is primarily driven by fire severity (how much of the fuel is consumed) and fire intensity (how hot the fire burned) coupled with subsequent seasonal weather events (e.g., monsoon rainfall). In other words, the more severe the fire, the greater the amount of fuel consumed, the more nutrients released, and the more susceptible the watershed is to erosion of soil and nutrients into the stream, which could negatively impact water quality. In addition, fire intensity affects the formation of hydrophobic soils that repel water and increase the probability of storm water runoff in the watershed. In New Mexico, severe fires most commonly occur on forested lands managed by the U.S. Forest Service (USFS). They have a special taskforce known as the Burned Area Emergency Response (BAER) Team who are responsible for undertaking rapid post-fire assessments. BAER is an emergency program whose purpose is to identify potential threats to life, property and infrastructure, along with potential threats to water quality and recreational resources, wildlife, vegetation, fisheries, and cultural resources.

In New Mexico, wildfires have become more frequent in recent years. In addition, some have occurred mid-way through the SWQB's rotational watershed surveys, making it impossible to continue monitoring impacted AUs that particular survey year due to unsafe conditions, restricted access, or severe flooding. If the planned sampling in a particular AU was less than 50% complete based on the Field Sampling Plan (FSP), this AU will be noted as "Not Assessed" and scheduled for additional data collection as resources, access, and recovery allow. These additional data will be collated with data from the original sampling year and assessed for the subsequent draft Integrated List.

Data collected during or immediately after fires, floods, extreme drought, or other catastrophic events will generally not be used to make attainment decisions if the data are not representative of conditions prior to the event or new stable conditions. When determining if an event is considered substantial enough to impact or alter the conditions that existed prior to the event, the following factors should be considered: severity of event, size of the affected area, distance of sampling sites from the event, hydrology, geomorphic effects that include soil types and slope. In the absence of data that characterize the conditions before an event, the SWQB will work with all available resources to try and determine those conditions.

Catastrophic events may be considered as a basis for listing in instances where nonattainment of standards arises from an irreversible source of pollutants. The decision regarding whether or not data collected during or after an event are representative of normal conditions, as well as a determination of irreversibility, will be evaluated in collaboration with stakeholders and EPA Region 6, on a case by case basis, as each event is unique with varying severity and longevity of impacts.

2.1.9 Temporary water quality standards

During New Mexico's 2013 triennial review, the WQCC adopted a temporary standards provision at Subsection F of 20.6.4.10 NMAC. Per Paragraph (3), designated use attainment as reported in the IR shall be based on the underlying designated use and applicable criterion, not on any temporary variances. This requirement is consistent with federal regulations[8].

[8] https://www.gpo.gov/fdsys/pkg/FR-2015-08-21/pdf/2015-19821.pdf, page 51036.

2.2 Data Quality Levels

As stated in Section 1.0 above, data must, at a minimum, meet the QA/QC requirements described in the SWQB's most recent QAPP to be considered for development of the IR. In some cases, more than one type of data may be used to determine aquatic life use attainment. It is recognized that not all data are of equal quality or rigor. The tables in Appendix A describe defined levels of data quality for biological, chemical/physical, and habitat data types that may be used to determine aquatic life support. These tables contain both elements of data quality as well as quantity. These tables are adapted from the *Consolidated Assessment and Listing Methodology: Towards a Compendium of Best Practices* guidance document (EPA 2002a), as modified with respect to the SWQB's SOPs. It is important to evaluate data quality when an assessment performed with more than one data type results in conflicting use attainment decisions (see Section 3.1.5 for more detail). These tables are included only for aquatic life use determinations because it is the only use for which multiple data types are currently recognized and utilized.

3.0 Individual Designated Use Support Determinations

The WQS are a triad of elements that work in concert to provide water quality protection. These three elements are: designated uses, numeric and narrative criteria, and an antidegradation policy. Designated uses are the defined uses of a particular surface water body. Each water body will have one or more designated uses. For example, Domestic Water Supply is a designated use. Designated use definitions and their assignment to various stream segments in New Mexico can be found in the *Standards for Interstate and Intrastate Surface Waters (*20.6.4 NMAC). The New Mexico Water Quality Control Commission (WQCC) adopted numeric and narrative criteria to protect these designated uses. There are both segment-specific criteria (detailed in 20.6.4.97 through 20.6.4.899 NMAC) and designated use-specific criteria (detailed in 20.6.4.900 NMAC) in New Mexico's WQS. All references to narrative or numeric criteria throughout this document refer to criteria found in 20.6.4 NMAC. The antidegradation policy ensures that existing uses[9] and levels of water quality necessary to protect these uses will be maintained and protected (20.6.4.8 NMAC).

WQS segments described in 20.6.4.97 through 20.6.4.899 NMAC are further divided into AUs for use impairment determination and linked to the National Hydrographic Dataset (NHD) for national electronic reporting requirements. AUs are stream reaches, lakes, or reservoirs defined by various factors such as hydrologic or watershed boundaries, WQS, geology, topography, incoming tributaries, surrounding land use/land management, etc. Assessment units are designed to represent waters with assumed homogenous water quality (WERF 2007). As stated in Section 1.0, data collected at representative stations during the SWQB water quality surveys along with acceptable external data form the basis of use support determinations for each AU. Stream or river AU total length is typically no more than 25 miles, unless there are no tributaries or land use changes to consider along or within the reach or delineated area. Multiple stations in one AU warrant special consideration as detailed in Section 2.1.6 above.

Numerous classified segments in 20.6.4 NMAC include only perennial waters, without specifically identifying which reaches are perennial. For example, the description of 20.6.4.109 NMAC states, "…all other perennial reaches of tributaries to the Rio Puerco…" Therefore, non-perennial reaches of these tributaries do not fall under this WQS segment. If the perennial nature of a stream reach is unclear, the Hydrology Protocol (HP) can be used as described in New Mexico's Water Quality Management Plan (WQCC 2011, update in progress[10]) to determine whether a particular AU is perennial, and therefore included in this classified segment, or non-perennial and therefore subject to the designated uses and criteria in 20.6.4.98 NMAC. Such a determination does not require a use attainability analysis (UAA). If a non-perennial AU is found to

[9] "Existing use" (defined at Subsection Y of 20.6.4.7 NMAC) means "a use actually attained in a surface water of the state on or after November 28, 1975, whether or not it is a designated use." An existing use may be identified by SWQB staff or other sources based on observation, data, and/or documentation.

[10] An update to the entire WQMP is in progress and will include a public comment period.

be ephemeral, then the UAA process must be followed as described in 20.6.4.15.C NMAC to place the AU under 20.6.4.97 NMAC in the Integrated Report.

The following subsections provide guidelines used to interpret available data. These guidelines will be used to make determinations of use support for each designated use in each AU, utilizing the previously described datasets. Some level of flexibility is built into these guidelines to account for uncertainties such as the natural variability of water quality, the lack of extensive data necessary to make more definitive assessments, and the transitory nature of many pollutants. Each designated use has one or more tables with specific requirements for determining use attainment based on the type of data being evaluated. When determining aquatic life use support, each type of data is first evaluated separately. Guidance on how to reconcile two or more data types with differing aquatic life use attainment determinations, as well as guidance on how to handle assessment units where both cause and response variables are determined to be impaired, is found in Section 3.1.6. In addition to the following subsections, several specific listing methodologies for temperature, excessive nutrients, DO, pH, sedimentation/siltation (this habitat variable is also referred to as "stream bottom deposits"), and turbidity to assess specific use attainment have been developed. See Appendices B through H, respectively, for details regarding aquatic life uses and stream types currently covered by these specific assessment protocols.

Integrated listing guidance from EPA recommends the following use attainment categories (EPA 2005 and subsequent biennial guidance): **Fully Supporting, Not Supporting, Insufficient Information,** and **Not Assessed.** For every AU detailed in the Integrated List, an attainment category is assigned to every designated use as stated in the applicable section of 20.6.4 NMAC or identified existing use. New Mexico does not use the **Insufficient Information** category because it is redundant with **Not Assessed**, meaning if there are insufficient data to assess, the AU is not assessed.

A determination of **Fully Supporting** or **Not Supporting** should not be made in the absence of data. It is understood that any assessment may involve some level of best professional judgment (BPJ). However, evaluations based on BPJ, literature statements, or public comments without data to support the decision shall not be the only basis for a listing or de-listing. To those AUs for which there are no available data that meet the QA/QC requirements for any criteria within an applicable designated or existing use, a designation of **Not Assessed** will be assigned that use.

3.1 Assessing Aquatic Life Use (ALU) Support

Use assessment decisions should consider and integrate, whenever possible and appropriate, results of various data types. These include biological, chemical/physical, and toxicological data. Data quality associated with these types can be found in Appendix A.

3.1.1 Biological data

In 2010, the WQCC adopted the following General Criteria (20.6.4.13.M NMAC):

> *Biological integrity: Surface waters of the state shall support and maintain a balanced and integrated community of aquatic organisms with species composition, diversity and functional organization comparable to those of natural or minimally impacted water bodies of a similar type and region.*

Prior to the 2012 listing cycle, benthic macroinvertebrate sampling had been the primary form of biomonitoring utilized by New Mexico. The extensive data set generated through these sampling efforts was a crucial component towards development of numeric translators for both narrative biological and sediment WQS. The SWQB also monitors fish assemblages and algae in an increasing number of water bodies to improve understanding of these biological communities, improve numeric translators for narrative nutrient standards, and better assess potential impairment to aquatic communities.

3.1.1.1 Benthic macroinvertebrate communities

Two biological assessment approaches utilizing benthic macroinvertebrate communities are currently used in New Mexico for determining aquatic life use attainment, namely the reference site approach (i.e., comparing an individual water body to an appropriate individual reference site), and the reference condition approach (i.e., comparing an individual water body to a reference condition for class or group of water bodies to which that water body belongs). Currently, New Mexico has only defined a reference condition for wadeable, perennial streams in the Mountain ecoregions. Wadeable, perennial streams located outside of the Mountain ecoregions continue to be assessed using the reference site approach from the original Rapid Bioassessment Protocol (RBP) (Plafkin et al. 1989) as modified by Jacobi (2009) when a suitable reference site has been identified and sampled as well. The SWQB does not apply either method to large non-wadeable rivers, lakes and reservoirs, or non-perennial streams at this time.

Reference Site Approach

After the study site is selected, a specific reference site must be selected for comparison. The first step in determining a reference site is to identify a pool of best available sites in the same geographic region that have the lowest amount of anthropogenic impacts to the stream's ecosystem. The reference and study sites should share analogous characteristics, to the extent possible, such as elevation, gradient, geology, hydrology, watershed size, in-stream habitat, and riparian vegetation. In particular, characteristics that cannot change over time should be used as primary attributes of similarity between reference and study sites. For this reason, the study site and the reference should at a minimum be in the same ecoregion (Griffin et. al 2006).

Based on identification and enumeration of the benthic macroinvertebrates present in the two samples, biological response indicators (i.e., benthic macroinvertebrate metrics) are calculated and compared between the two sites. Under this approach, the reference site serves as a quantitative control or yardstick to which a site may be compared and evaluated. The eight metrics and scoring criteria New Mexico uses for the reference site approach are recommended in Plafkin et al. (1989) Figure 6.3-4 as modified in Jacobi (2009), excluding the Standing Crop and Community Loss metrics. The ratio between the score for the study site and the reference site provides a percent comparability measure for each study site. The study site is therefore assessed on the basis of its similarity to the reference site and its apparent potential to support an acceptable level of biological health. The resulting score is placed in a condition category based on percent of reference: Non Impaired (>83%), Slightly Impaired (54-79%), Moderately Impaired (21-50%), Severely Impaired (<17%). Sites in any of the impaired condition categories are considered to "Not Supporting" with respect to aquatic life use (see Table 3.3). Plafkin et al. (1989) recommends leaving 4% between each category to account for subjective judgment (e.g., BPJ) as to correct placement. Figure 3.1 provides two examples using the reference site approach.

Reference Condition Approach

The reference condition approach expands on the original RBP methods to acknowledge the reality of a wider range of aquatic conditions that reflect more than minimal impacts, including historic and dominant land and water use activities (Barbour et al. 1999, Stoddard et al. 2006). This broader concept of reference condition allows for the definition of reasonable and attainable targets or goals by class or group in order to assess potential impairment to the aquatic community at a larger number of study sites.

In order to determine reference condition, data from a continuum of reference to stressed sites in the ecoregion(s) of interest must be available. The SWQB has been collecting benthic macroinvertebrate data since 1979. The formal process of developing numeric biological translators began in 2002 with assistance from the EPA and Tetra Tech, Inc. In 2006, the SWQB, in collaboration with Dr. Jacobi and Tetra Tech, Inc., developed a regional Mountain Stream Condition Index (M-SCI) to determine aquatic life use attainment for the Mountain biological region which consists of Ecoregions 21 and 23 (Southern Rockies and AZ/NM Mountains) (Jacobi et al. 2006, Griffith et al. 2006). This approach is similar to the

approach currently utilized in Wyoming and Colorado.

The M-SCI was developed based on reference condition as determined by a number of reference sites. The Jacobi et al. (2006) report describes indices for three classes (bioregions) of streams based on elevation and watershed size. However, the SWQB uses only the High Small (elevation and watershed, respectively) Index applied to the Mountain biological region which consists of Ecoregions 21 and 23 (Southern Rockies and AZ/NM Mountains). The available dataset, stream classification system, and reference site selection process did not sufficiently partition the variability and select an adequate number of sites to define the reference condition and a departure from this condition for the other biological region. Application of the High Small SCI in the report places study reaches in the same condition category for all tested streams in the Mountain region regardless of elevation or watershed size. Therefore, the SWQB applies the "High Small SCI" in the report to determine Aquatic Life Use attainment of all wadeable, perennial streams in the Mountain region, and refers to this as the M-SCI. Any study site within approximately 20 kilometers of the boundary of ecoregions 21 and 23 should be compared to the definitions for the various ecoregions to determine the proper bioregion designation for that site.

	Fish Creek 10 m abv confluence with Trout Creek	Sunshine Creek immed abv USGS gage 0123456	Falls Creek 5m abv conflence with Rock Creek
Metrics	Reference Site	Study Site 1	Study Site 2
Diversity [Shannon Weiner (Log Base 2]	4.42	2.60	3.78
Total No. of Taxa	42	35	39
Total No. of EPT Taxa	7	4	6
Ratio EPT/EPT + Chironomidae	0.445	0.202	0.355
Ratio of Scrapers/Scrapers + Filterers	0.432	0.667	0.520
Ratio of Shredder/Total No. of Ind.	0.043	0.408	0.225
Percent Dominant Taxa	18.7	38.9	20.2
Hilsenhoff Biotic Index	5.7	5.7	5.4
% Comparison to Reference			
Total No. of Taxa	100	83	93
Total No. of EPT Taxa	100	57	86
Ratio EPT/EPT + Chironomidae	100	45	80
Ratio of Scrapers/Scrapers + Filterers	100	154	120
Ratio of Shredder/Total No. of Ind.	100	948	523
Hilsenhoff Biotic Index	100	100	106
Bioassessment Score (based on Plafkin et al 1989 Figure 6.3-4, as modified by Jacobi 2009)			
Diversity [Shannon Weiner (Log Base 2]	6	4	6
Total No. of Taxa	6	6	6
Total No. of EPT Taxa	6	0	4
Ratio EPT/EPT + Chironomidae	6	2	6
Ratio of Scrapers/Scrapers + Filterers	6	6	6
Ratio of Shredder/Total No. of Ind.	6	6	6
Percent Dominant Taxon	6	2	4
Hilsenhoff Biotic Index	6	6	6
Total	48	32	44
Bioscore % Comparison to Reference		**66.7**	**91.7**
ATTAINMENT STATUS ---->		**Non Support**	**Full Support**

NOTES: Ratio EPT/EPT + Chronomidae is calculated as EPT/(EPT+Chironomidae).

Figure 3.1. Examples of reference site approach to determine attainment

The M-SCI is composed of twelve individual metrics from five metric categories, representing community and species attributes such as Taxonomic Composition, Taxonomic Richness, Tolerance, Habit, and Functional Feeding Group. Individual metrics are listed in Table 3.1. For descriptions of these metrics, see Plafkin et al. 1989, Barbour et al. 1999, and Jacobi et al. 2006. % Sensitive EPT is an uncommon metric that was defined during the Jacobi et al. 2006 study. It is percent of individuals within orders Ephemeroptera, Plecoptera, or Trichoptera that have tolerance values of 0, 1, 2, 3, or 4 as determined by available references and best professional judgement at the time of the M-SCI determination (Jerry Jacobi, personal communication, 12/7/18).

Table 3.1 Metrics included in the M-SCI by metric categories

TAXONOMIC COMPOSITION	TAXONOMIC RICHNESS	TOLERANCE	HABIT	FUNCTIONAL FEEDING GROUP
Shannon Diversity (log_2)	Ephemeroptera Taxa	% Sensitive EPT	Clinger Taxa	% Scraper
Pielou's Evenness	Plecoptera Taxa	% Intolerant	Sprawler Taxa	Scraper Taxa
% Plecoptera			Swimmer Taxa	

M-SCI scores are normalized according to the formulas in Table 3.2 utilizing the 95th percentiles associated with each metric. Each metric is first calculated and normalized. All metrics are then summed and averaged to produce an M-SCI score between 0 and 100. The resulting score is then placed in a condition category of Very Good (100 – 78.36), Good (78.35 – 56.71), Fair (56.70 – 37.21), Poor (37.20 – 18.89), or Very Poor (18.90 – 0) based on the distribution of reference site index scores. Index scores above the 25th percentile threshold were rated as "Very Good" or "Good"; below the 25th percentile threshold scores were divided into three categories: "Fair", "Poor", or "Very Poor". Therefore, sites with M-SCI ranking below the 25th percentile of reference sites (i.e., fair, poor, or very poor) are considered **Not Supporting** with respect to aquatic life use.

Table 3.2. Metric formulas and 95th percentiles for calculating the M-SCI score

METRIC	95th PERCENTILE	FORMULA[(a)]
Shannon Diversity (log_2)	3.89	if $X > X_{95}$, score = 100 if $X \leq X_{95}$, score = $100 \times X/X_{95}$
Pielou's Evenness	0.50	
% Plecoptera	26.67	
Ephemeroptera Taxa	7.00	
Plecoptera Taxa	7.00	
% Sensitive EPT	78.46	
% Intolerant	57.17	
Clinger Taxa	17.00	
Sprawler Taxa	6.00	
Swimmer Taxa	4.00	
% Scraper	43.78	
Scraper Taxa	4.00	

NOTES: [(a)] X = metric value; X_{95} = 95th percentile of respective metric

Table 3.3 explains how to interpret macroinvertebrate data to assess aquatic life use support. Biological regions outside of the Mountains region will be assessed using the RBP approach as detailed in Plafkin et al. (1989) until SCIs can be developed for the Xeric and Plains regions. Additional data are needed to determine the specific pollutant or "pollution" of concern. If one or more pollutant(s) are identified, IR Category 5a is assigned and the identified pollutant(s) are listed as cause(s) of impairment. If a form of "pollution" (for example, flow alteration by EPA's definition) and no concurrent pollutant(s) are

determined to be the reason for the biological impairment, IR Category 4c may be assigned. Otherwise, the AU is assigned IR Category 5c (more data needed). See Section 4.0 for more detail.

Table 3.3. Interpreting benthic macroinvertebrate data to determine Aquatic Life Use Support in wadeable, perennial streams

TYPE OF DATA	FULLY SUPPORTING		NOT SUPPORTING	NOTES
Macroinvertebrate assemblages in Ecoregions 22, 24, 25, and 26[(a)]	Reliable data indicate functioning, sustainable macroinvertebrate assemblages not modified significantly beyond the natural range of reference condition (>83% of reference site(s)). [(a)]	[(a)]	Reliable data indicate macroinvertebrate assemblage with moderate to severe impairment when compared to reference condition (≤79% of reference site(s)). [(a)]	Reference condition is defined as the best situation to be expected within an ecoregion. Reference sites have balanced trophic structure and optimum community structure (composition & dominance) for stream size and habitat quality.
Macroinvertebrate assemblages in Ecoregions 21 and 23 using M-SCI[(b)]	Reliable data indicate functioning, sustainable macroinvertebrate assemblages not modified significantly beyond the natural range of reference condition (> 56.7 score).		Reliable data indicate macroinvertebrate assemblage with impairment when compared to reference condition (≤56.7 score).	

NOTES:

[(a)] Percentages and recommended 4% gap for BPJ are based on Plafkin et al. (1989).

[(b)] Percentages based on Jacobi et al. (2006).

3.1.1.2 Algae composition and blooms

Algae are an important biological component of surface waters as they provide a food source for fish and other organisms. Although some forms of algae are toxic, algae do not have to be toxic to be considered a harmful nuisance. Nontoxic algae can reproduce, or bloom, at such a high rate that they reach concentrations that reduce the amount of available oxygen, which can result in fish kills and other detrimental impacts to aquatic organisms. Likewise, some algae have spines or other protrusions that may cause fish kills simply by getting caught in or otherwise irritating fishes' gills.

New Mexico has been collecting periphyton and phytoplankton community data from select streams, lakes, and reservoirs since about 1975. Periphyton is an assemblage of organisms that grow on underwater surfaces and includes a complex matrix of algae and heterotrophic microbes including bacteria, fungi, protozoa, and other organisms (Allaby 1985). Phytoplankton is the assemblage of free-floating, photosynthetic organisms, including diatoms, desmids, and dinoflagellates. Periphyton and phytoplankton data from lentic systems have also been collated and explored as response variables for the nutrient lake and reservoir assessment protocol (see Appendix D). Nutrient protocols for large rivers

are under development.

Blue-green algae (also known as cyanobacteria) are one of the largest and oldest groups of photosynthetic bacteria and form a portion of the planktonic community in New Mexico surface waters. Blooms can be blue, bright green, brown or red and may appear as green paint floating on water or washed on shore, foam or scum, or mats on the surface of fresh water lakes and ponds. Some blooms may not affect the appearance of the water but as algae in the blooms die, the water may have a noticeable odor. As single cells, large colonies and filaments, blue-green algae grow in a wide variety of conditions and can become the dominant algae in nutrient-rich lakes, ponds, and slow-moving streams when water is warm and stagnant. Some forms, but not all, can produce toxins that are poisonous to humans, fish, and wildlife that ingest water contaminated with the toxins. Additional information regarding blue-green algae can be found at:
https://www.env.nm.gov/wp-content/uploads/2017/03/BlueGreenAlgaeFAQ.pdf.

Prymnesium parvum, a golden alga found worldwide in estuarine waters and in some freshwater bodies that have relatively high salt content, had its first confirmed freshwater blooms in North America in the Pecos River basin in Texas in 1985. This microscopic flagellated alga is a relatively new invasive species and has appeared in some waters of New Mexico where salinity and nutrient conditions provide suitable habitat for periodic blooms. Physicochemical conditions, including excessive nutrients, can stimulate growth of *P. parvum* which can produce toxins that cause significant fish and bivalve (i.e. clams and mussel) kills resulting in ecological and economic harm to the affected waterbodies; however, there is no evidence these toxins harm other wildlife, livestock or humans. Research is under way to better understand, detect and manage *P. parvum* blooms. Additional information regarding this toxic golden alga can be found at:
https://www.env.nm.gov/swqb/documents/swqbdocs/GoldenAlgae/GoldenAlgaeFactSheet.pdf.

20.6.4 NMAC does not contain any specific criteria related to the presence of toxic algae or fish kills. The SWQB currently does not list water bodies as impaired due to these occurrences. Documented occurrences are noted in AU Comments on the Integrated List and the corresponding Record of Decision entries for these particular waterbodies. The SWQB will also continue to post information regarding these blooms on our web site.

3.1.1.3 Fish assemblages

The SWQB has been collecting fish community data from select streams, lakes, and reservoirs since 2000. The SWQB has collated available data to begin exploring the feasibility of biological assessment techniques using fish assemblages in select water body types. Cold water streams tend to be lacking in variety of species, making development of fish assemblage-based biological assessment challenging. The SWQB, EPA, and TetraTech are currently working together to develop a Biological Condition Gradient (BCG) for the Middle Rio Grande using both fish and benthic macroinvertebrate assemblages.

3.1.2 Chemical/physical data

20.6.4.900 NMAC provides numeric criteria related to various chemical/physical parameters. Table 3.4 explains how to interpret chemical/physical grab data relative to these standards to assess aquatic life use support. This table is divided into conventional parameters, which includes field measurements as well as major ions and nutrients, and toxic substances such as trace metals and priority pollutants. Refer to the appropriate water quality standard segment number (20.6.4.97 through 20.6.4.899 NMAC) of the WQS for numeric criteria for conventional chemical/physical parameters that may differ from those listed in 20.6.4.900 NMAC.

Conventional parameters monitored to determine aquatic life use support include: temperature, turbidity, pH, DO, specific conductance (SC), and total phosphorus (TP) (Table 3.4).

Assessment protocols for temperature, DO, and pH, are found in Appendices B, E, and F respectively. Prior to the 2005 triennial review, New Mexico had established segment-specific numeric turbidity values for all water quality standard segments detailed in 20.6.4 NMAC. In 2005, the WQCC amended 20.6.4 NMAC to remove all the segment specific turbidity values and revise the turbidity subsection under the General Criteria section (20.6.4.13.J NMAC). Because of this WQS change, an interim protocol with numeric translators for turbidity was developed to assess turbidity data from listing cycles 2006, 2008, and 2010. The SWQB has since developed a revised turbidity assessment protocol for the 2012 cycle forward. Sedimentation/siltation and turbidity assessments are described in Appendices G and H, respectively. All other parameters are detailed in Table 3.4 and discussed below.

3.1.2.1 Hardness-dependent metal criteria

Hardness-dependent acute and chronic aquatic life criteria for metals are calculated using the hardness-dependent equations in 20.6.4.900.I NMAC. Hardness values from the same sampling event are required for the assessment of hardness-dependent metals. However, in EPA's April 30, 2012, triennial review approval letter[11], EPA disapproved the hardness-dependent equations for total recoverable aluminum in waters when concurrent pH is less than 6.5. According to EPA, the previously approved CWA 304(a) aquatic life criteria for dissolved aluminum are the applicable water quality criteria for purposes of the CWA in waters when concurrent pH is below 6.5. Therefore, the benchmark to be used to determine aluminum exceedences will be 87 ug/L when concurrent pH is less than 6.5.

Assessment units (AUs) determined to be impaired prior to the 2018 listing cycle due to exceedences of the previous dissolved aluminum criteria when concurrent pH was greater than 6.5 were delisted with a delisting rationale of "WQS no longer applicable." If total recoverable aluminum data are not available to assess, an AU Comment will be added indicating the change in WQS and need to prioritize the collection of total recoverable aluminum data.

20.6.4.900.J(1)(e) NMAC states that total recoverable aluminum criteria are based on samples that were filtered to minimize mineral phases. The SWQB's study of this issue concluded that a filter of 10-micron pore size minimizes mineral-phase aluminum without restricting amorphous or colloidal phases (NMED/SWQB 2012). Therefore, if the turbidity of a sample is less than 30 NTU, no filtration is needed to minimize mineral phases. Samples from waters with turbidity greater than 30 NTU must be filtered with 10-micron disposable in-line capsule filters (rather than paper filters that are designed for use in plate or funnel-type filter holders) prior to analysis in order to determine impairment.

Total aluminum results less than the applicable water quality criterion may be used for assessment in the absence of concurrent turbidity data and/or filtering because filtering the sample prior to analysis would have resulted in a value even further below the applicable criterion. Similarly, samples filtered with a 10-micron filter regardless of turbidity levels that exceed the applicable criterion are assessable because unfiltered samples would have resulted in an even higher magnitude of exceedance. In addition, exceedences determined with concurrent total 'total hardness' vs. dissolved 'total hardness' as defined in 20.6.4.900.I NMAC are allowable because higher hardness values result in higher applicable water quality criterion.

[11] https://www.env.nm.gov/swqb/documents/swqbdocs/Standards/2012/WQS2010-EPAApprovalLetter.pdf

Table 3.4 Interpreting chemical/physical data to assess Aquatic Life Use Support

TYPE OF DATA*	FULLY SUPPORTING	NOT SUPPORTING	NOTES
•**Conventional parameters** (e.g., specific conductance, total phosphorus[(a)])			All **temperature, pH**, and **DO** listing methodologies are described in Appendices B, E, and F respectively. Sampling biases in these parameters (such as diel flux) should be addressed by sampling with continuously-recording sondes, data loggers, and thermographs during the specified index period whenever possible.
A) 4 to 10 samples	**A**) For any one pollutant, no more than one exceedence of the criterion.	**A**) For any one pollutant, more than one exceedence of the criterion.	
B) >10 samples	**B**) For any one pollutant, criterion exceeded in <10% of measurements.	**B**) For any one pollutant, criterion exceeded in ≥ 10% of measurements.	**Sedimentation/siltation (habitat)** and t**urbidity** assessments are described in Appendices G and H, respectively.
•**Toxic substance** (e.g., priority pollutants, ammonia[(b)], chlorine, metals[(c)], cyanide)	For any one pollutant, no more than one exceedence of the **acute** criterion in three years, and	For any one pollutant, more than one exceedence of the **acute** criterion in three years, or	Samples should be taken during hydrologically stable conditions to be representative of the averaging period (see Section 3.1.2.2 below for additional discussion).
≥ 4 samples	no more than one exceedence of the **chronic** criterion in three years.	more than one exceedence of the **chronic** criterion in three years.	

NOTES: * Less than 4 samples = not assessed. See Section 2.1.4 for details.

(a) Only for segment-specific total phosphorus values. Otherwise, see the nutrient listing methodologies in Appendices C and D.

(b) New Mexico's WQS require consideration of the presence of salmonids to assess against acute ammonia criteria, and the presence of fish in early life stages to assess against chronic ammonia criteria. To apply Table K of 20.6.4.900 NMAC for assessment purposes, all waters designated as high quality coldwater aquatic life (HQCWAL) or coldwater aquatic life (CWAL) will be assumed "Salmonids Present," while all other aquatic life (AL) uses will be assumed "Salmonids Absent." If actual or historic fisheries documentation indicates the presence of salmonids, the "Salmonids Present" column will be used regardless of the designated AL use. To decide whether to apply Table L or M 20.6.4.900 NMAC for assessment purposes, "Fish Early Life Stages" will be assumed present from November 1 to June 30 for HQCWAL and CWAL. "Fish Early Life Stages" will be assumed present from March 1 to August 31 for all other AL uses. If actual fisheries documentation generated during the time of ammonia sample collection, or historic fisheries documentation generated during the same date in a previous year, indicate the presence of early life stages outside of these date ranges, the criteria in Table L of 20.6.4.900 NMAC will be applied regardless of the date of collection. If the applicable uses translate to different criteria values, the most stringent criteria is used per 20.6.4.11 NMAC Subsection F.

(c) See section 3.1.2.1 for additional information on assessment of hardness-dependent metal criteria.

3.1.2.2 Assessing chronic aquatic life WQS

The acute and chronic aquatic life criteria established in the WQS are based upon the nationally recommended criteria developed by the EPA (EPA 2006b). The acute criteria are intended to protect against short-term effects and are derived from tests of lethality or immobilization. The chronic criteria are intended to protect against long-term effects and are derived based upon longer term tests that measure survival, growth or reproduction. The EPA recommends a one-hour averaging period for the acute criteria and a four-day averaging period for the chronic criteria. That is, the 4-day average exposure of aquatic life to a pollutant should not exceed the chronic criterion (EPA 1994).

During SWQB's watershed surveys, water chemistry samples are generally collected 4-12 times (depending on the parameter and site) over a two-year period in order to 1) better characterize the waterbody throughout the annual hydrograph, and 2) acquire data points that are more likely to be statistically independent with respect to time. Because of this sampling design, consecutive-day data are not available to calculate 4-day averages. Few states and tribes are obtaining composite data over a 4-day sampling period for comparison to chronic aquatic life criteria due primarily to budget and staff time constraints. The EPA believes that 4-day composites are not an absolute requirement for evaluating whether chronic criteria are being met (EPA 1997). Grab and composite samples can be used in water quality assessments if taken during stable conditions (EPA 1997) and should be representative of average conditions over the 4-day period for assessment of chronic aquatic life.

New Mexico has developed a two-step process for assessing attainment of chronic aquatic life criteria based on four or more samples after the dataset has been assembled following the data management rules in Sections 2 and Figure 3.2. The first step is to collate available data and assessed against the chronic aquatic life WQS. If four or more samples include two or more exceedences of a given criterion, these data then are evaluated to determine if the samples were collected during hydrologically stable conditions considered to be representative of the 4-day averaging period; this process is detailed below. If conditions were unstable during the time of sampling, the data are not assessed. If sample collection methodology was specifically designed to capture data from storm flow events (e.g., through the use of single stage or automated samplers deployed to capture storm events only), these data should not be used to assess chronic aquatic life criteria.

In addition, potential outliers are also identified while assessing against chronic conditions. An outlier is defined as a measurement greater than the 75th percentile (Q3) of the all measurements of a particular parameter at a site, plus three times the inter-quartile range (IQR). The IQR is defined as the difference between the 25th percentile (Q1) and Q3 (Tukey 1977, Seo 2006). This approach is intended to 1) demonstrate the repeatability of an observation meant to represent chronic conditions; 2) screen for potential field equipment, collection, or laboratory analysis errors; and 3) take into consideration potential anomalies in the data set due to extreme deviations from seasonal norms, the natural consequences of spring runoff conditions, and the influence of storm events or other anomalous events such as runoff from catastrophic fire areas. Note that the above statements and data process only apply to chronic criteria and that all grab samples will be used to assess acute criteria regardless of hydrologic or anomalous conditions.

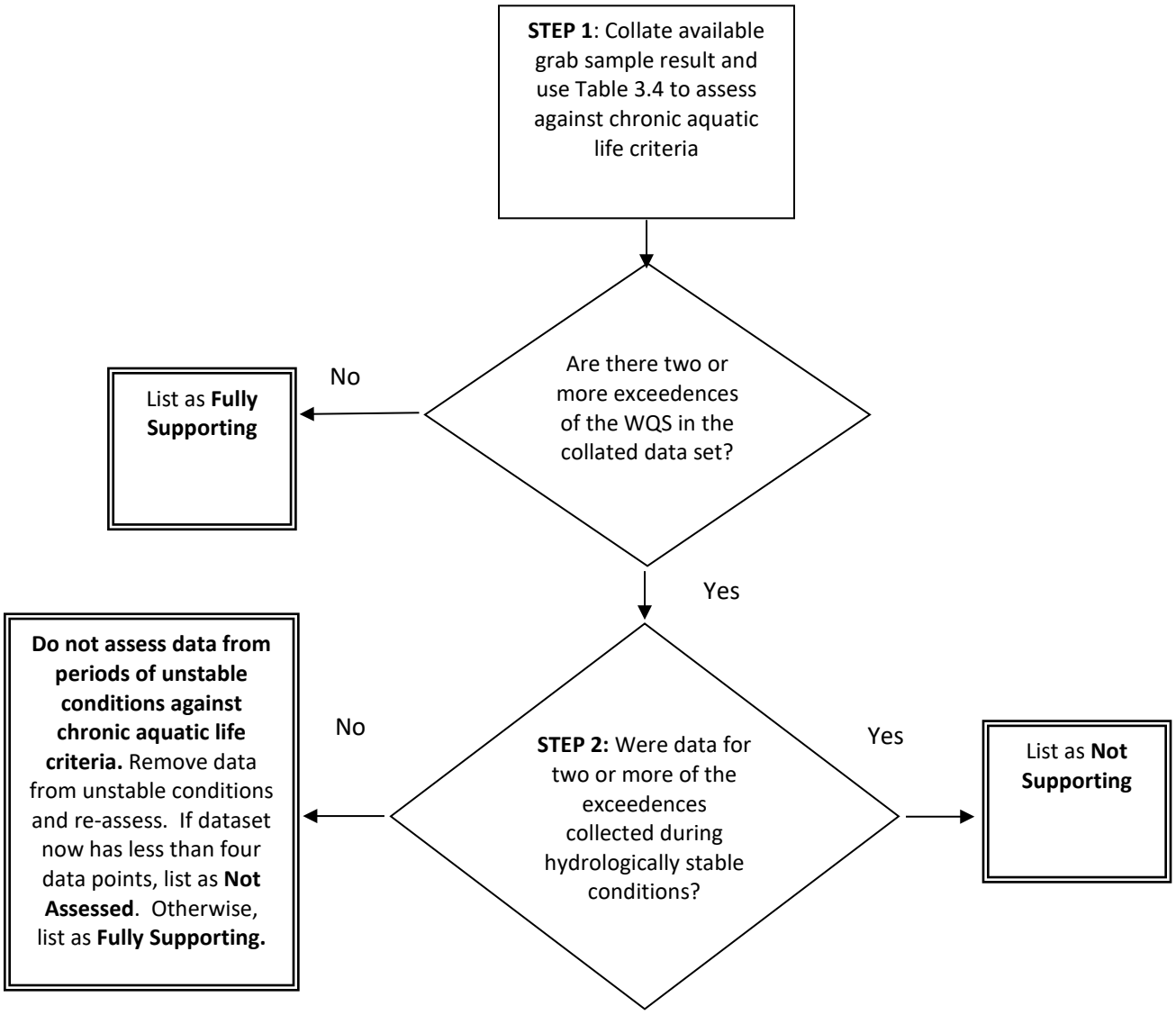


Figure 3.2 Decision process for assessing against chronic aquatic life criteria

Determining the representativeness of a sample is a qualitative assessment and is addressed primarily in the sample design, through the selection of sampling sites, and through use of procedures that reflect the project goals and environment being sampled (NMED/SWQB 2016b). These procedures ensure that a given sample represents a characteristic of a population, in this case the water in a given AU at the time of sampling. The assessment of chronic aquatic life criteria adds an additional constraint that the sample(s) must be representative of a 4-day period. As such, these samples must be collected during periods when the water is well mixed and reasonably expected to represent conditions during the averaging period. Specifically, lakes or reservoirs, as stated in 20.6.4.14.C(3) NMAC, will be assessed for attainment of criteria for toxic pollutants using data that were collected during periods of complete vertical mixing. With respect to stream or river chronic aquatic life assessments, grab samples are deemed representative for this application when there is an absence of contextual information indicating unstable hydrologic conditions. Examples of contextual information to be considered include but are not limited to: 1) stream flow measurements or flow rating, 2) precipitation, 3) location of point source discharges in relationship to the monitoring site, and 4) the occurrence of a chemical spill or other unusual event (EPA 2005).

Specifically, if there are two or more exceedences of applicable chronic aquatic life criteria, the SWQB will consider the following information to determine whether conditions were stable at the time of data collection:

- Point source discharge records in the reach or immediately upstream (if one or more point source discharges provide a significant contribution to the receiving water)
- Field notes and weather records regarding precipitation and runoff
- Flow measurements taken at the time of sampling
- Flow condition rating recorded at the time of sampling
- Gage station records (when available)
- Land uses in the vicinity
- Records of chemical spills or other unusual events
- Historic patterns of pollutant concentrations when available

If readily available contextual information indicates that the pollutant concentration and the stream flow likely remained generally constant over a four-day period surrounding the sampling event, the SWQB will conclude that the result of the grab sample, or the average of multiple day sampling events, is valid for assessing chronic aquatic life criteria.

Alternatively, these data will not be used for assessing attainment of chronic aquatic life criteria when contextual data indicate unstable conditions. Examples of unstable conditions may include, but are not limited to, samples being collected during:

- A precipitation event with runoff lasting shorter than 4-days
    - NOTE: If the data were collected during several days of high flow, the sample would be assumed representative of the 4-day average condition to assess chronic aquatic life uses. If continuous gage data are available, the procedure in the below paragraph would be performed vs. making assumptions about the longevity of the storm event
- The first flush of a precipitation event
- A short-lived but high flow monsoon event

One way to determine stable conditions is to examine the coefficient of variation (CV). When exceedences occur at or near a continuous flow gaging station and mean daily flow data are available, a stream may be considered hydrologically stable if the CV of the mean daily flow for a 4-day period surrounding the sampling collection is at or below 0.2. The CV is determined by dividing the standard deviation of the values by the mean of the values. This is a common statistical method to evaluate variability in datasets relative to the mean, and 0.2 is a common threshold below which data are considered to have minimal variability (ADEQ 2008).

The 4-day window that produces the lowest CV should be determined instead of always using a predetermined number of days before or after the sampling event. See Table 3.5 below for an example using available gage data for a grab sample collected on 8/2/07. In this example, the CV of the mean daily flows from 7/30/07 to 8/2/07 produced the lowest CV and is below 0.2, so this 4-day period surrounding the sampling event is determined to be stable. The hydrologic stability inference is about the entire 4-day period vs. just the sampling event. Utilizing the mean daily flow from 7/31/07 to 8/3/07 produces a CV of 0.22.

Table 3.5 Example of stable flow determination using gage data

Date	Mean Daily Flow (cfs)	Mean [(a)]	Standard Deviation (SD) *	CV (SD / Mean) [(a)]
7/30/07	6.0	**7.7**	**1.3**	**0.17**
7/31/07	7.5			
8/1/07	9.2			
8/2/07	**8.1**			
8/3/07	12.0			
8/4/07	11.3			

NOTES: [(a)] for mean daily flow data collected 7/30/07 – 8/2/07

If one or more point source discharges provide a significant contribution to the receiving water, the facility discharge record(s) should be reviewed to determine whether flow and associated pollutant discharges were relatively consistent during the four-day period when the exceedence occurred. Other evidence concerning unstable flow or pollutant discharges can be provided by the facility.

3.1.2.3 Assessing human health criteria

Human health is not defined as a designated use according to the current version of 20.6.4 NMAC. Instead, human health criteria apply to all waters with a designated, existing or attainable aquatic life use. Human health criteria for persistent toxic pollutants as identified in 20.6.4.900.J NMAC also apply to all tributaries of waters with a designated, existing, or attainable aquatic life use (20.6.4.11.G NMAC). Refer to Subsection 20.6.4.900.J NMAC for the numeric criteria related to human health. Human health criteria proposed by the EPA are presumed to have exposure durations of a year or more (EPA 2005), and were generally established to protect for exposure over the period of a human lifetime so a percentage-based assessment approach is appropriate when the sample size is greater than 10 samples. Table 3.6 explains how to interpret chemical/physical data to determine if these criteria are met.

Table 3.6 Interpreting chemical/physical data to assess human health criteria

TYPE OF DATA*	FULLY SUPPORTING	NOT SUPPORTING	NOTES
•**Toxic substance** (e.g., cyanide, PAHs, pesticides, PCBs, metals)			
A) 4 to 10 samples	**A)** For any one pollutant, no more than one exceedence of the criterion.	**A)** For any one pollutant, more than one exceedence of the criterion.	
B) >10 samples	**B**) For any one pollutant, criterion exceeded in <10% of measurements.	**B**) For any one pollutant, criterion exceeded in ≥ 10% of measurements.	

NOTES: * Less than 4 samples = not assessed. See Section 2.1.4 for details.

3.1.3 Toxicological data

Table 3.7 explains how to interpret toxicological data to assess aquatic life use support with respect to the narrative general standard found at 20.6.4.13.F NMAC, which states "Surface waters of the state shall be free of toxic pollutants from other than natural causes in amounts, concentrations or combinations which affect the propagation of fish…" Results from ambient toxicity testing are a valuable indicator for assessing and protecting against impacts on water quality and designated uses caused by the aggregate toxic effect of pollutants. Contaminants may flow directly from industrial and municipal waste dischargers, may come from polluted runoff in urban and agricultural areas, or may collect in the sediments. Toxicity evaluations can be used to assess the type and extent of degraded water quality (EPA 2002a). Acute toxicities of substances are determined using at least two species, one vertebrate and one invertebrate, tested in whole effluent and/or ambient stream water as well as a series of dilutions. The reason for two distinctly different species is to account for the diverse species that inhabit waterbodies. In general, fish and other vertebrates are sensitive to many compounds such as those similar to their waste material, namely ammonia or ammonium complexes. Although ammonia is toxic to invertebrates, not all invertebrates are as sensitive as fish species in general. Similarly, invertebrates are generally more sensitive to pesticides than fish.

Toxicological data for New Mexico can be downloaded from: https://www.epa.gov/regionallabs/epa-region-6-laboratory-biomonitoring-lab.

While ambient toxicity testing results are a valuable indicator, they are only the first step towards identification of a water quality concern. These listings were noted as Category 5C on previous listing cycles (see Section 4.0) because the particular pollutant(s) leading to the toxicity must be identified in order to take the next steps, such as development of TMDL documents to develop a plan to address the problem. In past surveys, the SWQB collected water and sediment samples that were subjected to the EPA toxicity tests during the survey year for a particular watershed, while concurrently sampling surface waters for a variety of chemical constituents. The SWQB has found that where there is nothing in the chemical data to indicate the source of toxicity, a false positive result from the toxicity test must be considered. There are also instances where toxicity tests fail in receiving waters due to a known issue with an upstream discharger. Once the permittee corrects the issue/malfunction, repeat toxicity testing is necessary to determine whether the impairment still exists. For these reasons, available benthic macroinvertebrate data indicating non-support using the factors in Table 3.3 must also be available to determine impairment.

Table 3.7 Interpreting toxicological data to assess Aquatic Life Use Support

TYPE OF DATA	FULLY SUPPORTING	NOT SUPPORTING	NOTES
•Acute and/or chronic toxicity testing	Significant effect noted in no more than one acute water test as compared to controls or reference conditions, and in no more than one chronic water test in three years as compared to controls or reference conditions.	Significant effect noted in more than one acute water test as compared to controls or reference conditions, or in more than one chronic water test in three years as compared to controls or reference conditions, and available benthic macroinvertebrate data indicate non-support per Table 3.3.	Significant effect refers to a statistically significant difference in a primary endpoint as defined in the latest EPA procedures documents for acute and chronic toxicity testing in water (EPA 2002b, 2002c). Reference controls will be used to compensate for possible toxic effects from naturally occurring conditions (i.e. high salinity). If toxicity testing results are from multiple years, the most recent results will be used to make the final impairment determination for the reasons stated in Section 3.1.3.

For lakes and reservoirs, impairment may be demonstrated where acute conditions (typically low DO levels) result in significant fish kills. Fish kills associated with accidental spills or isolated unauthorized discharges of toxics, or due to runoff after catastrophic wildfire, will not typically be considered a basis for CWA 303(d) listings because other regulatory or restorative actions are typically utilized.

3.1.4 Fish consumption advisories

Per guidance, the EPA considers fish or shellfish consumption advisories with supporting fish tissue data to be existing and readily available data that demonstrate non-attainment of CWA goals stating that waters

should be “fishable” (CWA Section 101(a)(2), EPA 2000, EPA 2005). The EPA also acknowledges that in some cases, fish and shellfish consumption advisories may not demonstrate that a section 101(a)(2) “fishable” use is not being attained in an individual segment when, for example, a state uses a higher fish consumption value in determining the need for an advisory compared to the value used in establishing water quality criteria for the protection of human health (EPA 2000, EPA 2005). Therefore, all water bodies for which an advisory has been issued are listed as impaired due to the specific fish tissue contaminant on the Integrated List except in cases where there is a consumption advisory due to mercury but fish tissue data indicate the methylmercury criterion of 0.3 mg/kg in fish tissue is not exceeded. In acknowledgement of the need for data to support the listing, the impairment listing will be applied to the AU where fish tissue data are available, noting that, especially for stream/river AUs, the advisory may include different geographic extents.

The majority of New Mexico’s current fish consumption advisories are based on mercury levels in fish (NMDOH et al. 2010); however, there are also listings for PCBs, DDT, or some combination thereof, in fish tissues. The current fish consumption advisory, as well as additional information on how New Mexico develops these advisories, can be found at: https://www.env.nm.gov/surface-water-quality/fish-consumption-advisories/. Fish tissue advisories for other parameters of concern may be forthcoming. The Integrated List will be updated whenever the advisory is revised.

3.1.5 Special considerations for lake data

Lentic waterbodies in New Mexico have historically been, and continue to be, studied using the methods and approaches specified in the *Clean Lakes Program Guidance Manual* (EPA 1987). For purposes of consistency and comparability, classic limnological methods for WQS attainment continue to be used in monitoring practices. For purposes of this document, the term “lake” shall include natural lakes as well as reservoirs, impoundments, and any other human-made lentic waterbodies.

Lake water quality surveys should at least contain a station in the deepest portion of the lake. Additional sample locations may be needed if the reservoir is large, contains multiple arms with multiple inflows, or the lake is divided by narrow connectors resulting in pools with unique characteristics. Additional stations may be established as needed to evaluate conditions of concern. During periods of lake stratification, 20.6.4 NMAC requires depth-integrated composite samples for assessment of toxic pollutants (e.g., organic compounds, ammonia, metals, cyanide, radionuclides, etc.). Water quality measurements taken at intervals are averaged for the epilimnion, or in the absence of an epilimnion, for the upper one-third of the water column of the lake to determine attainment of criteria per 20.6.4.14.C(3) NMAC. When multiple stations exist on a lake, they are usually sampled on the same day or within the same seven-day period. The applicable listing methodology shall be applied to the shallow and deep station datasets separately. If one or both datasets indicate impairment, the impairment conclusion for the AU is **Not Supporting**. If there are conflicting assessment conclusions, it will be noted in the Record of Decision.

3.1.6 Conflicting or duplicative aquatic use support determinations

For aquatic life use assessments, it is possible that data of differing types may lead to differing use attainment determinations for the same assessment unit. For example, there may be chemical/physical data that indicate **Not Supporting** and biological data that indicate **Fully Supporting**. If two or more data types are available for assessment, a weight-of-evidence approach is adopted when conventional parameter data (for example, non-toxic substances such as temperature, pH, or specific conductance), or habitat parameters such as sedimentation/siltation, indicate impairment. This approach considers data type, quality, quantity, and confidence of assessment methods in reaching a final aquatic life use determination. Data types with higher data quality are given more weight (see Appendix A for data quality descriptions). Typically, data quality of level 3 or 4 are used to make listing determinations. Chemical/physical data with quality level 2 may be used to list as impaired under IR Category 5c (e.g., needs more data to confirm). Chemical/physical of data quality 1, and biological or physical data of quality 1 or 2, will not be used to make designated use attainment decisions. Figure 3.3 displays a generalized flowchart for considering different data types and their quality when determining aquatic life use support. Biological assessments provide an

integrated assessment of ecological health and have the potential to provide a direct measure of the designated goal of providing for the protection and propagation of aquatic life uses, especially when evidence of impairment due to non-toxic chemical/physical parameters is weak or based on low data quality. In the case of toxic substance chemical data (e.g., priority pollutants, ammonia, chlorine, metals, cyanide), the weight-of-evidence approach is not applied.

In addition, if there are one or more causal variables (such as nutrients, temperature, or turbidity) as well as related response variables (such as DO, pH, or benthic macroinvertebrate) identified, the AU will be listed for the causal variable(s). For example, if an AU is determined to be impaired due to excessive nutrients following the procedures in Appendix C for streams or D for lakes or reservoirs, the AU will be listed for nutrients vs. the individual response variables. However, if only the response variable with established water quality criteria has been identified as impaired, the AU will be listed for that particular variable.

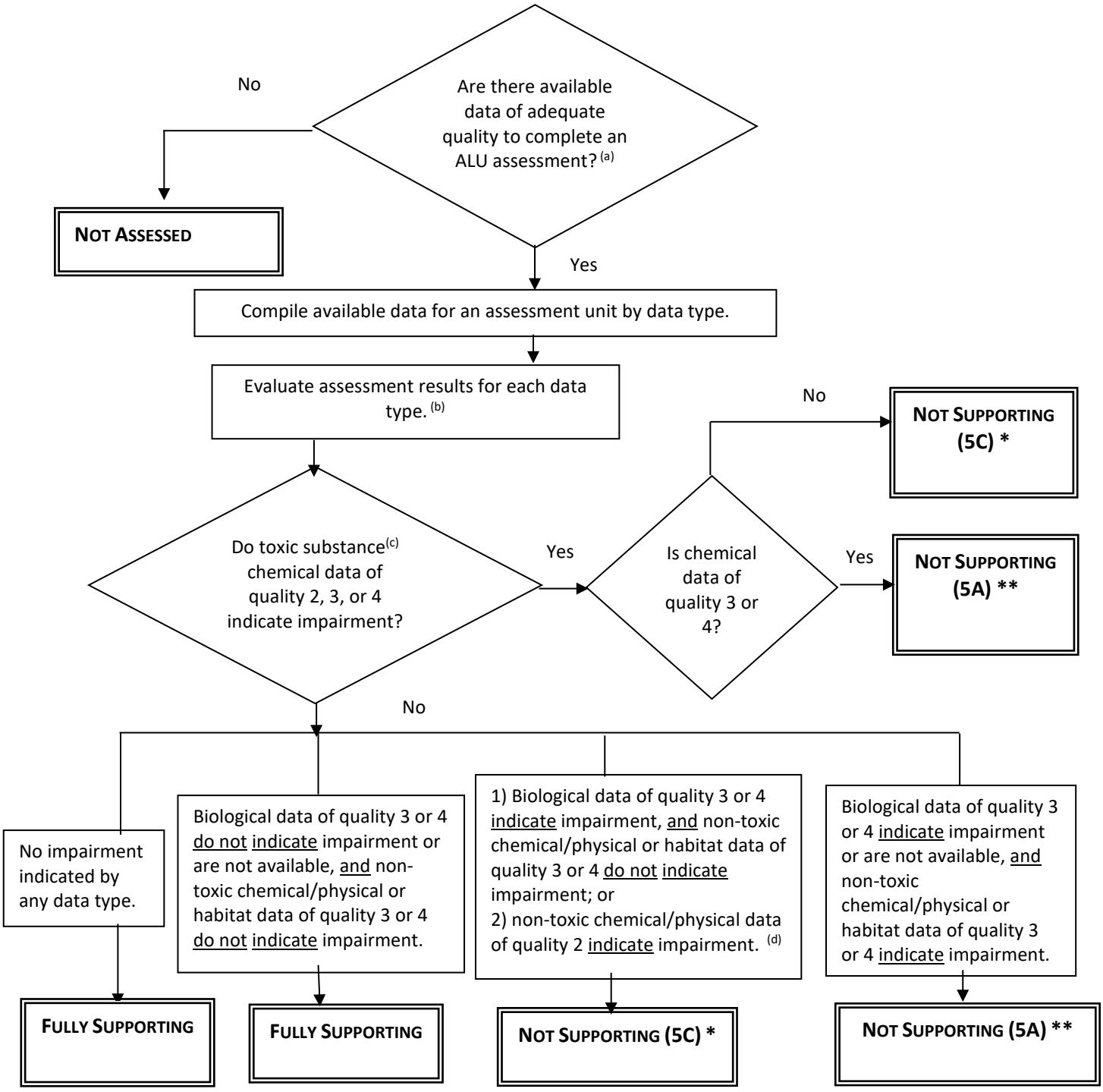


Figure 3.3 Generalized flowchart for determining Aquatic Life Use Support

NOTES: * Additional data are needed to determine the specific pollutant or "pollution" of concern. If a form of "pollution" (for example, flow alteration by EPA's definition) and no concurrent pollutant(s) are determined to be the reason for the biological impairment, IR Category 4c may be assigned. Otherwise, the AU is assigned IR Category 5c (more data needed). See Section 4.0 for more detail.

** TMDL or TMDL alternative ready to be scheduled for the cause(s) of impairment. See Section 4.0.

(a) Data quality determined per Appendix A. Chemical/physical of data quality 1, and biological or habitat data of quality 1 or 2, will not be used to make designated use attainment decisions. Data collected via SWQB SOPs are generally between data quality 3 and 4.

(b) Per Tables 3.3 through 3.6, and referenced associated appendices.

(c) Toxic substances include parameters such as priority pollutants, ammonia, chlorine, metals, cyanide (Table 3.4).

3.2 Assessing Domestic Water Supply Use Support

Table 3.8 explains how to interpret chemical/physical data to assess domestic water supply use support. Refer to 20.6.4.900.B and 20.6.4.900.J NMAC for numeric domestic water supply criteria.

Table 3.8 Interpreting chemical/physical data to assess Domestic Water Supply Use Support

TYPE OF DATA*	FULLY SUPPORTING	NOT SUPPORTING	NOTES
•**Toxic substance** (e.g., radionuclides[(a)], priority pollutants, metals, cyanide) •**Nitrate** ≥ 4 samples	For any one pollutant, no more than one exceedence of the criterion.	For any one pollutant, more than one exceedence of the criterion.	

NOTES: * Less than 4 samples = not assessed. See Section 2.1.4 for details.

[(a)] When radionuclides are analyzed using SM7110 B or EPA Method 900.0 (recommended, and equivalent to SM7110 B according to SLD), gross alpha and gross beta results generated using an Am-241 reference and a Sr/Y-90 reference, respectively, are preferred for purposes of assessing WQS attainment because these references are prescribed in the method description. If the reference type information is not available and multiple reported values are provided, the highest reported value available will be used for assessment. Also, the water quality criterion in 20.6.4.900.J NMAC is for "adjusted gross alpha." Therefore, gross alpha data should be adjusted by subtracting contributions from natural uranium, as well as any measured special nuclear and by-product material, as called for in 20.6.4.7.B NMAC, prior to assessment. To convert uranium concentrations reported in ug/L to pCi/ug prior to subtraction, a conversion factor of 0.67 is used. In the absence of uranium data to subtract in order to adjusted gross alpha, U-238 data can be used because this is the most common form of uranium in the natural environment. In the event that negative values are reported for special nuclear materials, zero will be substituted as the subtraction value used to adjust gross alpha.

3.3 Assessing Primary and Secondary Contact Use Support

Table 3.9 explains how to interpret bacteriological data to assess recreational contact use support. Refer to Subsection B under the appropriate WQS segment number (20.6.4.97 – 20.6.4.899 NMAC) and of 20.6.4.900 NMAC Subsections D and E for numeric primary and secondary contact use criteria.

Table 3.9 Interpreting bacteriological data to assess Contact Use Support

TYPE OF DATA*	FULLY SUPPORTING	NOT SUPPORTING	NOTES
•**Bacteria** **A)** 4 to 10 samples **B**) > 10 samples	**A**) No more than one exceedence of the single sample criterion. **B**) Single sample criterion is exceeded in <10% of samples or geometric mean criterion is met.	**A**) More than one exceedence of the single sample criterion. **B**) Single sample criterion exceeded in ≥ 10% of measurements or geometric mean criterion is not met.	The monthly geometric mean shall be used in assessing attainment of criteria when a minimum of five samples is collected in a 30-day period (20.6.4.14.B NMAC).

NOTES: * Less than 4 samples = not assessed. See Section 2.1.4 for details. Also, SWQB bacteria results that are marked "Ea" due to incubation temperatures between 35.5 and 38 degrees C will not be used to make assessment conclusions.

3.4 Assessing Irrigation Use Support

Table 3.10 explains how to interpret chemical/physical data to assess irrigation use support. Refer to 20.6.4.900.C and 20.6.4.900.J NMAC for numeric irrigation use criteria.

Table 3.10 Interpreting chemical/physical to assess Irrigation Use Support

TYPE OF DATA*	FULLY SUPPORTING	NOT SUPPORTING	NOTES
•**Toxic substance** (e.g., metals) ≥ 4 samples	For any one pollutant, no more than one exceedence of the criterion.	For any one pollutant, more than one exceedence of the criterion.	
•**Salinity parameters** (e.g., total dissolved solids, sulfate, chloride) **A)** 4 to 10 samples **B**) > 10 samples	**A**) For any one pollutant, no more than one exceedence of the criterion. **B**) For any one pollutant, criterion exceeded in <10% of measurements.	**A**) For any one pollutant, more than one exceedence of the criterion. **B**) For any one pollutant, criterion exceeded in ≥ 10% of measurements.	Salinity parameters are segment-specific criteria included in a few individual WQS segments based on flow qualifiers.

NOTES: * Less than 4 samples = not assessed. See Section 2.1.4 for details.

3.5 Assessing Wildlife Habitat Use Support

Table 3.11 explains how to interpret chemical/physical data to assess wildlife habitat use support. Refer to 20.6.4.900.G NMAC for narrative criteria and 20.6.4.900.J NMAC for numeric criteria with respect to wildlife habitat use.

Table 3.11 Interpreting chemical/physical data to assess Wildlife Habitat Use Support

TYPE OF DATA*	FULLY SUPPORTING	NOT SUPPORTING	NOTES
•**Toxic substance** (e.g., PCBs, DDT, cyanide, chlorine, metals) ≥ 4 samples	For any one pollutant, no more than one exceedence of the criterion.	For any one pollutant, more than one exceedence of the criterion.	

NOTES: * Less than 4 samples = not assessed. See Section 2.1.4 for details.

3.6 Assessing Livestock Watering Support

Table 3.12 explains how to interpret chemical/physical data to assess livestock watering use support. Refer to 20.6.4.900.F and 20.6.4.900.J NMAC for the numeric livestock watering use criteria.

Table 3.12 Interpreting chemical/physical data to assess Livestock Watering Use Support

TYPE OF DATA*	FULLY SUPPORTING	NOT SUPPORTING	NOTES
•**Conventional parameters** (e.g., nitrite + nitrate) **A)** 4 to 10 samples **B**) > 10 samples	**A**) For any one pollutant, no more than one exceedence of the criterion. **B**) For any one pollutant, criterion exceeded in <10% of measurements.	**A**) For any one pollutant, more than one exceedence of the criterion. **B**) For any one pollutant, criterion exceeded in ≥ 10% of measurements.	
•**Toxic substance** (e.g., radionuclides[(a)], priority pollutants, metals) ≥ 4 samples	For any one pollutant, no more than one exceedence of the criterion.	For any one pollutant, more than one exceedence of the criterion.	

NOTES: * Less than 4 samples = not assessed. See Section 2.1.4 for details.

[(a)] When radionuclides are analyzed using SM7110 B or EPA Method 900.0 (recommended, and equivalent to SM7110 B according to SLD), gross alpha and gross beta results generated using an Am-241 reference and a Sr/Y-90 reference, respectively, are preferred for purposes of assessing WQS attainment because these references are prescribed in the method description. If the reference type information is not available and multiple reported values are provided, the highest reported value available will be used for assessment. Also, the water quality criterion in 20.6.4.900.J NMAC is for "adjusted gross alpha." Therefore, gross alpha data should be adjusted by subtracting contributions from natural uranium, as well as any measured special nuclear and by-product material, as called for in 20.6.4.7.B NMAC, prior to assessment. To convert uranium concentrations reported in ug/L to pCi/ug prior to subtraction, a conversion factor of 0.67 is used. In the absence of uranium data to subtract in order to adjusted gross alpha, U-238 data can be used because this is the most common form of uranium in the natural environment. In the event that negative values are reported for special nuclear materials, zero will be substituted as the subtraction value used to adjust gross alpha.

3.7 Assessing Fish Culture, and Public or Industrial Water Supply Uses

Per applicable assessment unit, all Fish Culture, Public Water Supply, and Industrial Water Supply designated uses have been assigned "Not Assessed" because no numeric criteria apply uniquely to these uses (see 20.6.4.900.A NMAC). The Rio Grande from Cochiti Pueblo boundary to Rio Pueblo de Taos (20.6.4.114 NMAC) includes public water supply radionuclide concern levels for monitoring and disclosure only. Available data will be compared to these concern values and noted in the AU Comments on the Integrated List.

3.8 Assessing Numeric Criteria Under Multiple Use Designations

40 C.F.R. 131.11(a)(1) addresses instances where there are different water quality criteria for a particular parameter for two or more uses applicable to an AU. In these cases, the criteria used to make the final impairment decision for the AU should support the most sensitive use. In New Mexico, 20.6.4.11.F NMAC correspondently states:

> ***Multiple Uses****: When a surface water of the state has more than a single designated use, the applicable numeric criteria shall be the most stringent of those established for such water.*

For example, surface waters with both wildlife habitat and livestock watering designated uses are assessed against the lower 0.77 µg/L wildlife habitat total mercury criterion instead of only the 10 µg/L livestock watering criterion to make a total mercury impairment determination.

4.0 ASSESSMENT UNIT CATEGORY DETERMINATIONS FOR INTEGRATED LIST

The determination of individual use support using Section 3.0 and other specified protocols are combined to determine the overall WQS attainment category for each AU (EPA 2001, Figure 4.1).

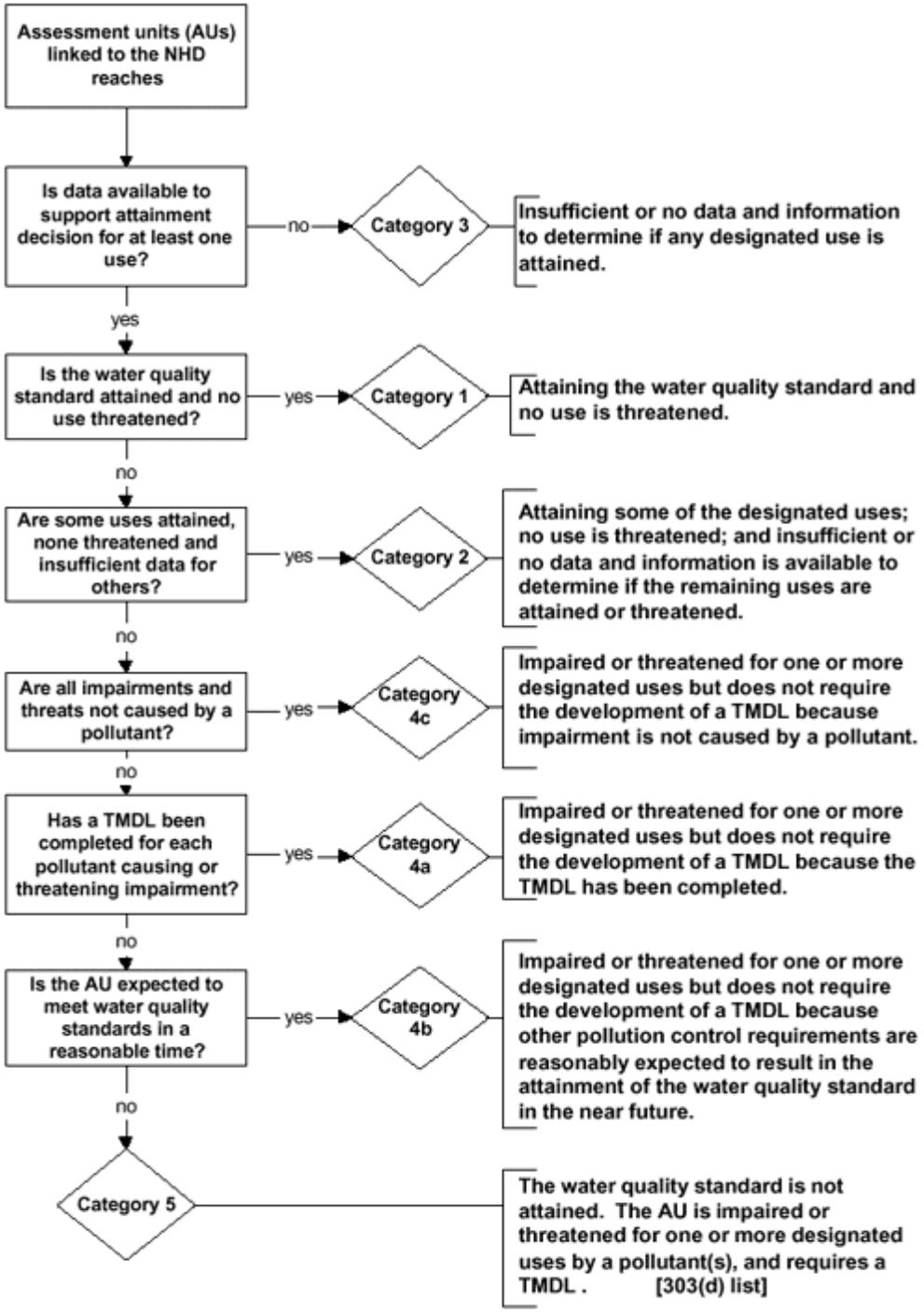


Figure 4.1. Attainment category logic (EPA 2001).

Several states, including New Mexico, further divide the EPA's recommended integrated reporting categories. New Mexico's specific reporting category interpretations are described below.

1. **Attaining the WQS for all designated and existing uses.** AUs are listed in this category if there are data and information that meet all requirements of the assessment and listing methodology and support a determination that the water quality criteria are attained based on numeric and narrative water quality criteria that were tested.

2. A**ttaining some of the designated or existing uses based on numeric and narrative parameters that were tested, and no reliable monitored data are available to determine if the remaining uses are attained or threatened.** AUs are listed in this category if there are data and information that meet requirements of the assessment and listing methodology to support a determination that some, but not all, uses are attained based on numeric and narrative water quality criteria that were tested. Attainment status of the remaining uses is unknown because there is no reliable monitored data with which to make a determination.

   2A. **Attaining with prior action still in place**. Parameters are assigned this category when the current data and listing methodology indicate the water body is no longer impaired for this parameter, and a previously-developed action (e.g., Approved TMDL, Alternative Restoration Approach, etc.) exists.

3. **Insufficient or no reliable data and/or information to determine if any designated or existing use is attained.** AUs are listed in this category where sufficient data to support an attainment determination for any use are not available, consistent with requirements of the assessment and listing methodology. In order to relay additional information to stakeholders including SWQB staff, Category 3 is further broken down in New Mexico into the following categories:

   3A. No data (n = 0) available. AUs are listed in this subcategory when there are no available data to assess. These are considered high priority for follow up monitoring.

   3B. Limited data (n = 1 to 3) available, no exceedences. AUs are listed in this subcategory when there are no exceedences of any applicable criteria in the limited data set. Their priority for follow up monitoring depends on the parameter and concentration (for example, measurements near the criteria would increase the priority for additional sampling).

   3C. Limited data (n = 1 to 3) available, exceedence(s). AUs are listed in this subcategory when there are exceedences of one or more applicable criteria in the limited data set. These are considered high priority for follow up monitoring.

4. **Impaired for one or more designated uses, but does not require development of a TMDL because:**

   4A. TMDL has been completed and approved. AUs are listed in this subcategory once all TMDL(s) have been developed and approved by the WQCC and the EPA that, when implemented, are expected to result in full attainment of the standard. Where more than one pollutant is associated with the impairment of an AU, the AU remains in Category 5 (see below) until all TMDLs for each pollutant have been completed and approved by the WQCC and the EPA.

   4B. Other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future. Consistent with the regulation under the CWA section 130.7(b)(i),(ii), and (iii), AUs are listed in this subcategory where other pollution control measures required by local, state, or federal authority are stringent enough to

implement any WQS applicable to such waters. Details regarding the specific documentation and timeline needed to propose a Category 4b listing can be found in Appendix I.

4C. **Impairment is not caused by a pollutant.** AUs are listed in this subcategory if available data and information demonstrate that the use impairment is not associated with one or more pollutants, and is attributable only to other types of "pollution" (e.g., flow or habitat alteration). For example, if the narrative biological water quality criterion found at 20.6.4.13.M NMAC is demonstrated to not be met due to pollution and no concurrent pollutant(s) are identified, the AU may be assigned Category 4c.

5. Impaired for one or more designated or existing uses. The AU is not supporting one or more of its designated uses because one or more WQS are not attained according to current WQS and assessment methodologies. **This category constitutes the *CWA §303(d) List of Impaired Waters*.** In order to relay additional information to stakeholders including SWQB staff, Category 5 is further broken down in New Mexico into the following categories:

5A. **A TMDL is underway or scheduled.** AUs are listed in this category if the AU is impaired for one or more designated uses by a pollutant. Where more than one pollutant is associated with the impairment of a single AU, the AU remains in Category 5a until TMDLs for all pollutants have been completed and approved by the EPA.

5B. **A review of the water quality standard will be scheduled.** AUs are listed in this category when it is likely that WQS are not being met because one or more current designated uses are not existing or attainable, or if available data indicate background processes are causing criteria exceedences. AUs in this category usually also have additional data needs as well.

5C. **Additional data will be collected before a TMDL is scheduled.** AUs are listed in this category if there is not enough data and information to determine the specific pollutant of concern (for example, AUs with biological impairment but inadequate data to determine the cause of this response, n<4, etc.), complete a weight-of-evidence assessment, or determine if the impairment falls under the exemption in 20.6.4.11.I NMAC.

5ALT. **Alternative restoration approach is in progress or under development.** EPA created this optional subcategory as an organizing tool to clearly articulate which impaired water bodies have or will have alternative approaches to attain WQS (EPA 2015). The alternative restoration approach needs to clearly demonstrate how the WQS will be achieved. The description of the alternative restoration approach and the waters to which it applies will be included during public review of the draft Integrated Report, so that the public has an opportunity to view the proposed alternative restoration approaches. Additional details on what must be included in the description are found in EPA's listing guidance (EPA 2015).

This present reporting approach was developed in response to a recent National Research Council (NRC) report and a desire to provide a clearer summary of the nation's water quality status and management actions necessary to protect and restore them (NRC 2001, EPA 2001, WERF 2007). With a few additions and minor changes in terminology, the information requested in the *Integrated Listing* guidance (EPA 2001) and Consolidated Assessment and Listing Methodology guidance (EPA 2002a) were previously suggested in earlier section 305(b) reporting guidance (EPA 1997). The earlier guidance formed the basis of previous SWQB listing methodology.

Assessment information is housed in the SWQB's in-house database SQUID. This database was designed to implement suggestions in the *Integrated Listing* guidance (EPA EPA 2006a, 2009, 2011, 2013b, 2015, 2017,

draft 2019), and to provide a means to directly upload New Mexico's use attainment information to the EPA's ATTAINs database. SQUID is first populated with AU information, associated designated uses, comments, and any supporting documentation. Individual use attainment decisions (i.e., **Fully Supporting**, **Not Supporting**, or **Not Assessed**) are then assigned for each AU based on assessment of data following these listing methodologies. SQUID then automatically determines the integrated reporting category for each AU based on the information entered for each applicable use.

The CWA §303(d)(1) requires states to establish a priority ranking for AUs determined to be impaired, and to schedule TMDL development in accordance with the priority ranking. New Mexico expresses this ranking, including indicating which waters bodies are targeted for TMDL development in the next two years, in the form of an estimated TMDL completion year per the EPA's recommendation (EPA 2005). This information is housed in SQUID and reported under "TMDL Date" for all AU-pollutant pairs noted as **Not Supporting** on the Integrated List. If a TMDL has already been completed and approved, the EPA approval date is displayed.

5.0 PUBLIC PARTICIPATION

The listing methodologies are periodically revised based on new EPA guidance, changes to the WQS, and the need to clarify various assessment procedures for staff. When the protocols are significantly revised, a draft is first sent to the EPA for initial review and comment. If significant changes to the overall assessment procedures and/or format of the document are being proposed, the SWQB also releases a public comment draft to solicit public review and comment. For example, a draft of this listing methodology was opened for a 30-day public comment period from June 26 to July 25, 2019. Consequent revisions to the main listing methodology are noted in the revision history below. See individual appendices for revisions histories related to those respective methodologies.

The final version of this protocol is provided to the EPA Region 6, who then considers the listing methodologies in its review and approval of Category 5 waters in the Integrated Report. The listing methodology is also posted on the SWQB website: https://www.env.nm.gov/surface-water-quality/calm/.

REVISION HISTORY:

2014 listing cycle – Pre-public comment: Moved aquatic life use data quality tables from main document to attachment. Added description of SQUID (SWQB's merger of ADB and NMEDAS databases). Added link to new data submittal website. Added information regarding assessment of hardness-dependent metals criteria (specifically, clarified that samples from waters with turbidity greater than 30 NTU must be filtered with 10-µm disposable in-line capsule filters prior to analysis). Minor revision to wording in Figure 3.3 - Generalized flowchart for determining Aquatic Life Use Support. Added protocols for determining nutrient impairment in lakes/reservoirs, and for proposing IR Category 4b. **Post- public comment:** Several minor wording and flowchart clarifications. Revisions to Limited Dataset section and associated addition of Integrated Report subcategories 3A and 3B. Added description of reference site approach to Bioassessment section. Clarified when Category 5C would be assigned. Additional clarification to Figure 3.3, clarified relationship between Data Quality Levels (Attachment A) and aquatic life use attainment decisions when conflicting conclusions from various data types, and indicated SWQB's general data quality level.

2016 listing cycle – Pre-public comment: Moved List of Common Acronyms (previously Appendix A) to the beginning of Main AP. Moved Data Quality Levels (previously Attachment A) to Appendix A. Re-named all appendices Added section regarding wildfire. Clarified assessing when multiple applicable numeric WQC for the same parameter. Added additional clarification to Integrated Report category descriptions. Removed reference to "unclassified" segments to match proposed triennial review clarification.

2018 listing cycle – Pre-public comment: Changed "Assessment Protocol" to "Listing Methodology" throughout. Clarified how to handle data reported below the MRL when data are part of an additive parameter, and when MRL is greater than the applicable WQC. Clarified when J flagged data would be used. Added additional information regarding non-representative data, and when data older than five years would be assessed. Clarified the relationship between temporary standards and the Integrated Report listing process. Added IR Category 5-alt, and expanded IR Category 3 to 3a, 3b, and 3c to better explain handling of n=1. Changed Tables 3.4 to 3.12 from "1 to 10" to "2 to 10" because n=2 is a minimum data requirement for assessment. Updated impairment determination logic in Table 3.8 for consistency with other assessment tables. **Post- public comment:** Clarified that this document was previously referred to as the "Assessment Protocol." Added the following footnote to Tables 3.4 – 3.12 to refer the reader to the appropriate section detailing the handling of limited datasets (n=1) with respect to assessment: "* Less than 2 samples = not assessed. See Section 2.1.4 for details." Clarified how SWQB will assess aluminum in waters with concurrent pH < 6.5 in Section 3.1.2.1. Based on this additional discussion, SWQB will also delist old dissolved aluminum listings for waters with concurrent pH >6.5 because the dissolved aluminum criterion is no longer applicable as stated in this revised section.

2020 listing cycle – Pre-Public Comment: Changed minimum n for assessment to 4; revised the assessment tables in Section 3, as well as IR Category 3B, 3C, and 5C accordingly. Added temporal independence language. Clarified the handling of temporary WQS. Added outlier identification to chronic ALU assessments. Clarifies the handling of concurrent hardness and turbidity data for total recoverable aluminum exceedance determination. Removed intermediate Not Assessed confirmation requirement category for biological assessments. Clarified the "Ea" validation code for bacteria assessments. Clarified how adjusted gross alpha is determined in assessment table footnotes. **Post-Public Comment:** In Section 1.0 clarified that data will be re-assessed if the assessment methodology for a specific parameter has significantly changed, and clarified which data older than five years old will be considered for assessment purposes. In Section 2.1.2, clarified that data from distinct hydrologist events collected within a seven-day period are not considered duplicates. In Section 2.1.4, added addition discussion regarding setting the minimum number of data points needed to assess. In Section 2.1.5, added reference to the critical low flow calculations used to develop point source

discharge requirements. In Section 2.1.6, clarified that available water quality and GIS data may be used to help determine AU breaks. In Section 2.1.8, added a discussion of the handling of surface water highly influenced by groundwater input with respect to assessment, as well as adding “extreme drought” to the list of catastrophic events. In the beginning of Section 3.0, clarified that the entire WQMP update in progress will have a separate public participation process, and that Appendices B through H contains regarding the specific aquatic life uses and stream types covered in these respective appendices. The assessment step regarding to the handling of consecutive-day sampling data in Table 3.4 and Section 3.1.2.2 was removed because it was confusing and these types of data sets have never been, and are not anticipated to be, available for assessment in New Mexico.

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