1.0 Introduction

In early 2000, the Bureau of Water Quality Planning (BWQP) formed a working group to focus on Carson River basin water quality issues. Since inception of the group, staff from the Bureau's three branches (Nonpoint Source, Standards, and Monitoring) have been strategizing on approaches for dealing with the variety of water quality issues with the basin. This report is intended to be a "living" document representing BWQP's current strategic plan for addressing those issues related to beneficial use status and attainability, numeric criteria evaluation, and TMDLs (Total Maximum Daily Loads). It is hoped that the methods and approaches developed through this process will be used as a template as the group moves its focus into other basins.

1.1 Background: Section 303(d) of the Clean Water Act (CWA) requires States to develop a list of waterbodies needing additional work beyond existing controls to achieve or maintain water quality standards. This list, referred to as the Section 303(d) List, is the basis for targeting waterbodies for watershed-based solutions, such as the development and implementation of TMDLs (Total Maximum Daily Loads). During the 1970s and 1980s, the TMDL requirements within the CWA were largely overlooked. However in recent years, pressure has been increasing on states to develop TMDLs for all the listed waters (National Research Council, 2001). These demands of the TMDL program have been difficult for states given the limited resources, unrealistic deadlines, and numerous technical issues.

Of particular interest to Nevada are the technical issues associated with our water quality standards. The water quality standards – consisting of beneficial use definitions and numeric criteria – are the foundation upon which a state builds its TMDLs. Any deficiencies in the standards will translate into inappropriate and ineffective TMDLs. According to the National Research Council (2001):

> *"Water quality standards are the benchmark for establishing whether a waterbody is impaired; if the standards are flawed (as many are), all subsequent steps in the TMDL process will be affected".*

Recognizing these issues, the National Research Council (2001) goes on to recommend that:

> *"States should develop appropriate use designations for waterbodies in advance of assessment and refine these use designations prior to TMDL development"*
>
> *"To ensure that designated uses are appropriate, use attainability analysis should be considered for all waterbodies before a TMDL is developed."*

The need to re-evaluate water quality standards prior to TMDL development is not a new concept. As part of a discussion on a "water quality-based approach to pollution control", EPA (1994) presents a framework that states can follow to meet the needs of the Clean Water Act (Figure 1) with Stage 4 involving standards evaluations and Stage 5 as TMDL development. This document provides justification for Stage 4 by stating:

> *"…many States have not conducted in-depth analyses of appropriate uses and criteria for all water bodies but have designated general fishable/swimmable use classifications and statewide criteria on a 'best professional judgment' basis to many waters…It is possible that these*

generally applied standards, although meeting the minimum requirements of the CWA and WQS regulation, may be inappropriate (either over-or under-protective) for a specific water body that has not had an in-depth standards analysis."

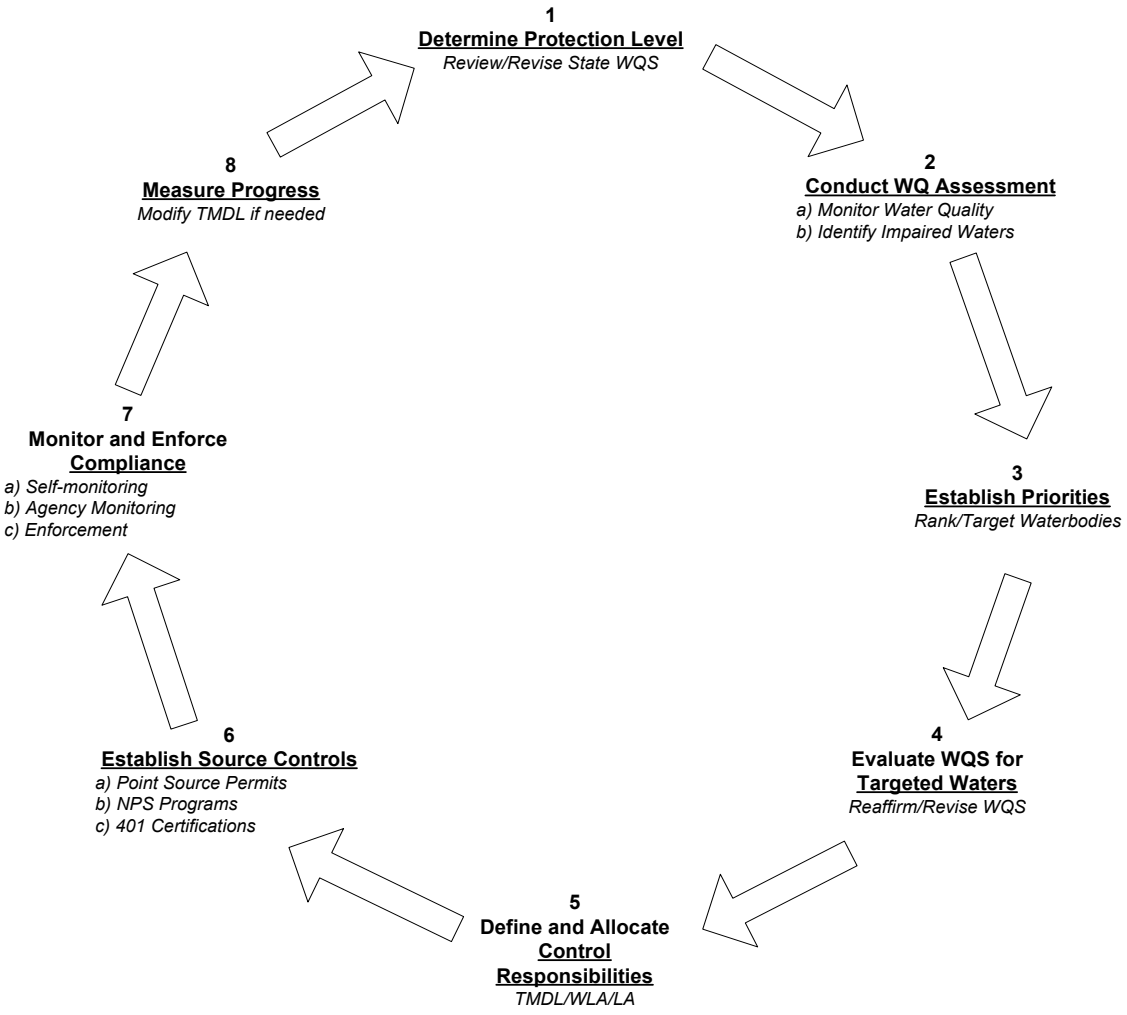

Figure 1. Water Quality-Based Approach to Pollution Control

With these factors in mind, Nevada desires to establish a sound foundation upon which to build its assessment and TMDL programs. Towards that end, the following framework has been developed to guide BWQP's water quality standard, assessment and TMDL activities (2003) (see Figure 2):

Phase 1 - Beneficial Use & Criteria Evaluation

The first phase in this approach is to evaluate whether or not the particular beneficial use is appropriate (currently exists or is attainable) or needs to be revised. Much of this phase could involve use attainability analyses (UAA), with water quality standards revisions pursued as needed. The specifics of Phase 1 will vary greatly depending upon the waterbody, and the beneficial use and pollutant of concern. In some cases, a use impairment determination (Phase 2) will be needed as part of Phase 1. It must also be noted that many of the projects needed to support Phase 1 may also support work under Phase 3 (TMDL Development).

Phase 2 - Use Impairment Determination

As the original 303(d) listing may have been based upon inappropriate or outdated criteria, or limited data, impairment of the beneficial use needs to be confirmed during the next phase. In some cases, the use impairment investigations will need to occur concurrent with Phase 1.

If no impairment of the appropriate use is determined or impairment found to be due solely to pollution[1] but not a pollutant, then the waterbody will be removed from the 303(d) List during the next listing cycle. If impairment is found to be due to a pollutant(s), then the next phase (TMDL development) is pursued.

Phase 3 - TMDL Development

If beneficial use impairment from a pollutant is confirmed, the next phase is the development of the TMDL. It is likely that a majority of the information generated during Phases 1 and 2 will be useful in the TMDL development. Another significant task could involve characterization of the impairment sources followed by load allocations.

[1] Pollution, as defined by the CWA, is "the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water" (Section 502(19)). In some cases, the pollution is caused by the presence of a pollutant and a TMDL is required. In other cases, pollution does not result from a pollutant and a TMDL is not required.

The following are two examples of pollution caused by pollutants. The discharge of copper from an NPDES regulated facility is the introduction of a pollutant into a water. To the extent that this pollutant alters the chemical or biological integrity of the water, it is also an example of pollution. (Copper is not likely to cause an alteration to the water's physical integrity). Similarly, actions that modify the landscape and may result in the introduction of sediment into a water constitute pollution when sediment (which is a pollutant) results in an alteration of the chemical, physical, biological or radiological integrity of the water. TMDLs would have to be established for each of these waters.

EPA does not believe that flow, or lack of flow, is a pollutant as defined by CWA Section 502(6). Low flow can be a man-induced condition of a water (i.e., a reduced volume of water) which fits the definition of pollution. Lack of flow sometimes leads to the increase of the concentration of a pollutant (e.g., sediment) in a water. In the situation where a pollutant is present a TMDL, which may consider variations in flow, is required for that pollutant.

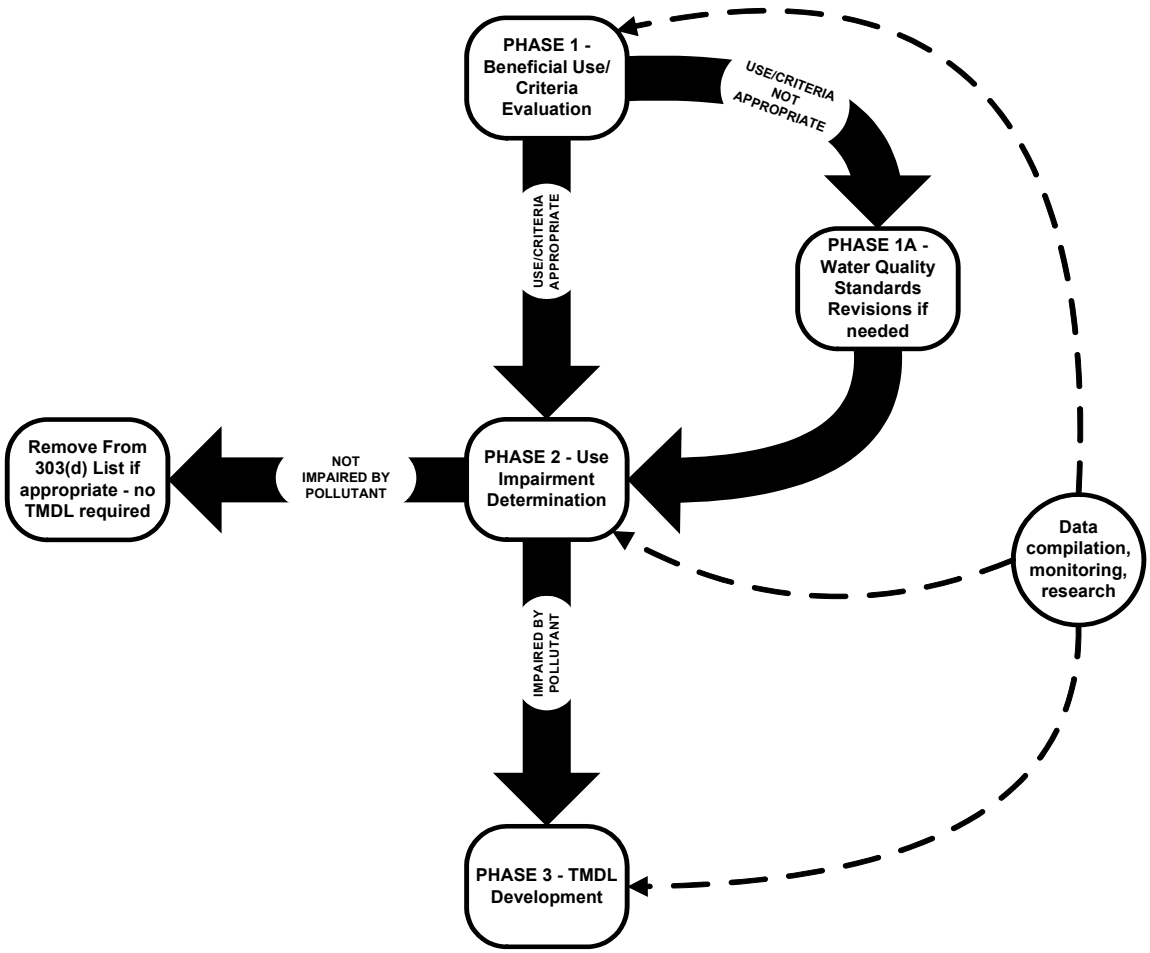

Figure 2. Schematic of Framework for Focused Watershed Project

It is important to recognize that for each of the above phases, significant data compilation, monitoring and research efforts may be needed. However, the activities needed for one phase may very well be useful for the other steps in the process.

While BWQP believes that following these 3 phases are key to creating realistic and defensible water quality criteria, assessments and TMDLs, it is recognized that significant resources (time, money, etc.) are needed to meet these needs. As a result, strict adherence to this 3-phase approach will delay our ability to develop TMDLs in the near future and increase NDEP's and EPA's liability under the Clean Water Act. For that reason, NDEP will also pursue selected simplified TMDLs concurrent with its "3 Phase" activities for waterbodies throughout the state.

1.2 Carson River Basin and the 2002 303(d) List: Nevada's 2002 303(d) List identifies a number of pollutants of concern for the Carson River basin. The main pollutants of concern include: nutrients, sediment, metals, temperature (See Table 1). As with most of the 303(d) listings, the Carson listings are based primarily upon exceedances of numeric water quality criteria for the protection of the "propagation of aquatic life". In the regulations, this beneficial use is further defined to include lists of fish species of concern: rainbow and brown primarily in the upper reaches (above New Empire) and catfish, channel catfish, walleye, smallmouth bass, and white bass in the lower reaches.

NDEP has always viewed the 2002 303(d) List as a planning tool and, as such, will be used to direct efforts defined in this report. The key issues surrounding the Carson River 303(d) listings are as follows:

- Most of the beneficial uses of concern (MDS, AQ(cwf), AQ(wwf)) shown in Table 1 need to be evaluated for appropriateness and possibly revised to more closely reflect reality. Following passage of the Clean Water Act (over 30 years ago), Nevada like many other states adopted broad use designations rather than a finely graded scale of uses. Efforts to adopt a more finely graded system would have required exhaustive studies, and states were encouraged to adopt the highest possible uses. The adoption of broad use designations was the result (Clean Water Network website, August 2003). However in some instances, states have provided some differentiation in their aquatic life uses, such as coldwater or warmwater fisheries; self-supporting fisheries or stocked fisheries; high quality aquatic life or marginal aquatic life.

    - It is believed that the "propagation of aquatic life" beneficial use for the Carson River is too broad and needs to be refined. Initial investigations suggest that the Carson River above New Empire and the East Fork Carson River have been managed as a stocked fishery for decades with limited evidence of rainbow and brown trout naturally propagating. Though identified as a coldwater fishery in the regulations, the West Carson River basically disappears near Highway 88 where all the West Carson streamflow now flows into the Brockliss Slough[2]. Below this point, the West Carson channel is no longer a natural system but is part of the irrigation delivery and drainage system in Carson Valley.

    - While Municipal and Domestic Supply has been identified as a beneficial use for all the main surface waters in the Carson basin, only Bryant Creek and Stillwater Marsh are listed based upon exceedances of Municipal and Domestic Supply criteria. The likelihood that these waters will ever be used for a drinking water supply is limited. The same may be true for most of the other major surface waters in the Carson basin however potential interactions between surface water and groundwater used for drinking water may warrant retaining this designated use in the standards.

[2] Brockliss Slough is not identified in the water quality standards. However under the tributary rule (NAC 445A.145), the numeric criteria for Carson River from Genoa Lane to Highway 395 were applied to the Slough for the 303(d) List.

Table 1. Nevada's 2002 303(d) List - Carson River Basin

Waterbody Name	Reach Description	Pollutant or Stressor of Concern	Beneficial Use of Concern	Comment
Bryant Creek	Near Stateline	Arsenic (total)	MDS	
		Copper	AQ(cwf)	Original 1998 Listing was in error. To be removed from List
		Iron (total)	AQ(cwf)	
		Nickel	MDS	
		Temperature	AQ(cwf)	2002 Listing was in error. To be removed from List
		Total suspended solids	AQ(cwf)	
		Turbidity	AQ(cwf)	
EF Carson River	Stateline to Highway 395	Iron (total)	AQ(cwf)	
		Turbidity	AQ(cwf)	
EF Carson River	Highway 395 to Highway 88	Temperature	AQ(cwf)	
		Turbidity	AQ(cwf)	
	Highway 88 to Muller Lane	Iron (total)	AQ(cwf)	
		Temperature	AQ(cwf)	
		Total phosphorus	AQ(cwf)	
		Turbidity	AQ(cwf)	
WF Carson River	Stateline to Muller Lane	Iron (total)	AQ(cwf)	
		Temperature	AQ(cwf)	
		Total phosphorus	AQ(cwf)	
		Turbidity	AQ(cwf)	
EF/WF Carson River	Genoa Lane to EF Carson River at Muller Lane and to WF Carson River at Muller Lane	Iron (total)	AQ(cwf)	
		Temperature	AQ(cwf)	
		Total phosphorus	AQ(cwf)	
		Total suspended solids	AQ(cwf)	
		Turbidity	AQ(cwf)	
Carson River	Genoa Lane to Cradlebaugh Bridge	Iron (total)	AQ(cwf)	
		Temperature	AQ(cwf)	
		Total phosphorus	AQ(cwf)	
		Total suspended solids	AQ(cwf)	
		Turbidity	AQ(cwf)	
Carson River	Cradlebaugh Bridge to Mexican Ditch Gage	Iron (total)	AQ(cwf)	
		Temperature	AQ(cwf)	
		Total phosphorus	AQ(cwf)	
		Total suspended solids	AQ(cwf)	
		Turbidity	AQ(cwf)	
Carson River	Mexican Ditch Gage to New Empire	Iron (total)	AQ(cwf)	
		Temperature	AQ(cwf)	
		Total phosphorus	AQ(cwf)	
		Turbidity	AQ(cwf)	
Carson River	New Empire to Dayton Bridge	Iron (total)	AQ(wwf)	
		Mercury (total)	AQ(wwf)	
		Total phosphorus	AQ(wwf)	
		Total suspended solids	AQ(wwf)	

MDS = Municipal or Domestic Supply
AQ (cwf) = Propagation of Aquatic Life (coldwater fishery)
AQ (wwf) = Propagation of Aquatic Life (warmwater fishery)

Table 1. Nevada's 2002 303(d) List - Carson River Basin (cont'd)

Waterbody Name	Reach Description	Pollutant or Stressor of Concern	Beneficial Use of Concern	Comments
Carson River	Dayton Bridge to Weeks	Iron (total)	AQ(wwf)	
		Mercury (total)	AQ(wwf)	Superfund site, fish consumption advisory
		Total phosphorus	AQ(wwf)	
		Total suspended solids	AQ(wwf)	
		Turbidity	AQ(wwf)	
Carson River	Weeks to Lahontan Dam	Iron (total)	AQ(wwf)	
		Mercury (total)	AQ(wwf)	Superfund site, fish consumption advisory
		Total phosphorus	AQ(wwf)	
		Total suspended solids	AQ(wwf)	
		Turbidity	AQ(wwf)	
Carson River	Lahontan Reservoir to Carson Sink	Mercury	AQ(wwf)	Superfund site, fish consumption advisory
Clear Creek	Origin to Gaging Station in Sec 1, T14N, R19E	pH	AQ(cwf)	pH standard to be revised in near future resulting in delisting for Clear Creek.
Stillwater Marsh	Area of Stillwater Marsh east of Westside Road and north of the community of Stillwater	Arsenic	MDS	Original listing dates back to 1993. Uncertain about the basis for the listing.
		Boron	IRR	
		Mercury	AQ(wwf)	Fish consumption advisory
Brockliss Slough	Above Carson River	Iron (total)	AQ(cwf)	
		Temperature	AQ(cwf)	
		Total phosphorus	AQ(cwf)	
		Turbidity	AQ(cwf)	
Indian Creek	At Stateline	Total phosphorus	AQ(cwf)	
All waters below Lahontan Dam in Lahontan Valley	n/a	Mercury	AQ(wwf)	Fish consumption advisory

MDS = Municipal or Domestic Supply
AQ (cwf) = Propagation of Aquatic Life (coldwater fishery)
AQ (wwf) = Propagation of Aquatic Life (warmwater fishery)

- Most of the numeric standards for the pollutants of concern (Table 1) need to be evaluated and possibly revised, especially if the associated beneficial use is modified. Specifically:

    - Existing phosphorus numeric criteria are based upon national guidance and may not be appropriate. Additionally, the standard is set in terms of an annual average while a seasonally variable standard may be more appropriate. Also, phosphorus levels may be the result of natural causes. Currently, the NAC does not contain nitrogen criteria which addresses eutrophication. While the Carson River is not currently listed as impaired due to dissolved oxygen standard exceedances, the dissolved oxygen standard needs to be reviewed. NAC reports the standard as a single minimum value with no consideration to duration. Current EPA guidance presents dissolved oxygen criteria for various durations – 30-day, 7-day, and 1-day.

    - The existing temperature criteria does not include any consideration of duration factors and may not be realistic for portions of the Carson system that go nearly dry at times.

    - The turbidity and TSS numeric criteria are based upon outdated national guidance and may not be appropriate for the protection of the beneficial uses. One of the problems with the criteria is

the lack of a duration/frequency component. Also, a recognition of naturally-occurring sediment levels is needed in any analysis of the standard. The shortcomings of sediment criteria throughout the nation has been recognized and EPA is working towards revised guidance.

- The iron standard is based upon outdated national guidance and the elevated levels are likely to be natural and not causing beneficial use impairment.

- The boron standard, based upon national guidance, is set at a level thought to protect sensitive crops, such as citrus, during long-term irrigation. A higher standard may be appropriate throughout the state.

- The nickel standard (used in the Bryant Creek 303(d) listing) is based upon an outdated EPA recommendation for the protection of human health during the ingestion of nickel through both water and aquatic organism consumption (referred to as "human health criteria"). Since Nevada's adoption of this standard, EPA has released updated human health criteria for nickel. However, neither of these values are deemed to be appropriate for the protection of the "municipal or domestic supply" use as they do not focus solely on the consumption of water.

- The mercury standard for aquatic life needs to be revised based upon updated EPA criteria. However, this change will not affect the 303(d) Listings.

1.3 Carson River Basin and Class Waters Standards: The Nevada water quality standards address two basic types of waters: 1) class waters; and 2) designated waters. The designated waters are typically the larger streams with each water having its own set of beneficial uses and numeric water quality criteria. Class waters are grouped into 4 classes from A to D, with Class A being the highest quality. Each waterbody within a class has the same beneficial use (Table 2) and numeric water quality standards. It is recognized that one size does not fit all and that waterbody-specific beneficial uses and numeric water quality criteria are needed for the class waters.

Table 2. Class Water Beneficial Uses

Beneficial Use	Class A	Class B	Class C	Class D
Municipal/Domestic Supply - Treatment by disinfection only	✔			
Municipal/Domestic Supply - Treatment by disinfection and filtration only		✔		
Municipal/Domestic Supply - Complete treatment			✔	
Aquatic Life	✔	✔	✔	✔
Propagation of Wildlife	✔	✔	✔	✔
Irrigation	✔	✔	✔	✔
Livestock Watering	✔	✔	✔	✔
Contact Recreation	✔	✔	✔	
Noncontact Recreation	✔	✔	✔	✔
Industrial Supply		✔	✔	
Industrial Supply – except for food processing purposes				✔

The class waters within the Carson River Basin are listed in Table 3. The key issues surrounding the Carson watershed class waters include:

- Several of the beneficial uses of concern shown in Table 3 need to be evaluated for appropriateness and possibly revised to more closely reflect reality:

    - Class A, B and C waters have municipal/domestic supply identified as a use. The likelihood that Class C waters will ever be used for a drinking water supply is limited. However potential interactions between surface water and groundwater used for drinking water may warrant retaining this designated use in the standards.

      Class A and B describe the municipal/domestic use as requiring disinfection (Class A) or disinfection and filtration only (Class B). Few surface waters in Nevada could meet Safe Drinking Water Act requirements with only disinfection and filtration.

    - It is believed that the "aquatic life" beneficial use for all the Class Waters is too broad. Under the current system, all 4 classes have the same aquatic life use. As with the Carson River, the class water aquatic life uses need improved definitions to recognize the variations in aquatic life support from the higher quality class waters to the lower quality class waters.

    - Contact recreation may not be appropriate for some of the class waters given the quality and limiting physical characteristics (depth).

    - A few of the class waters (Class C) are actually irrigation canals/drains. Assigning the full suite of beneficial uses to these waters may not be appropriate. However, NAC 445A.120 states that at a minimum "man-made waterways…must be protected for public health and the use for which the waterways were developed."

- Most of the numeric water quality standards for the class waters (Table 2) need to be evaluated and possibly revised, especially if the associated beneficial use is modified.

    - Numeric standards have been set for a limited number of parameters: pH, dissolved oxygen, temperature, fecal coliform, total phosphorus, and TDS. Additional constituents may need to be considered to provide adequate beneficial use protection.

    - As with the Carson River, the class water numeric criteria for phosphorus are based upon national guidance and may not be appropriate. Also, the NAC does not contain nitrogen criteria which addresses eutrophication. Additionally, the dissolved oxygen standard needs to be reviewed. NAC reports the standard as a single minimum value with no consideration to duration. Current EPA guidance presents dissolved oxygen criteria for various durations – 30-day, 7-day, and 1-day.
    - The existing temperature criteria does not include any consideration of duration factors and may not be realistic.

Table 3. Class Waters in the Carson River Watershed

Water	County	Reach Description
Class A		
Ash Canyon	Carson City	From its origin to the first point of diversion of the Carson City water department
Clear Creek		From its origin to gaging station number 10-3105 located in NE ¼ NE ¼, Section 1, T14N, R19E
Kings Canyon		From its origin to the point of the diversion of the Carson City water department
Daggett Creek	Douglas County	From its origin to the Carson River
Genoa Creek		From its origin to the first diversion box at the mouth of the canyon
Sierra Canyon Creek		From its origin to the first diversion structure at the mouth of the canyon
Class B		
Clear Creek	Carson City	From gaging station number 10-3105 located in NE ¼ NE ¼, Section 1, T14N, R19E to the Carson River
Class C		
Diagonal Drain	Churchill County	Its entire length
Harmon Reservoir		The entire reservoir
Indian Lakes		All the lakes, including Upper Lake, Likes Lake, Papoose Lake, Big Indian Lake, Little Cottonwood Lake, Big Cottonwood Lake and East Lake
Lower Carson River		From Lahontan Reservoir to Carson Sink
Rattlesnake Reservoir		Also known as S-Line Reservoir, the entire reservoir
South Carson Lake		Also known as Government Pasture or the Greenhead Gun Club, the entire lake
Stillwater Marsh		All that area of Stillwater Marsh east of Westside Road and north of the community of Stillwater
V-Line Canal		From the Carson diversion dam to its division into the S & L Canals
Class D		
Stillwater Marsh	Churchill County	All that area of Stillwater Marsh not designated as Class C

2.0 General Study Workplan

The 3 phases presented earlier are key to creating realistic and defensible water quality criteria, assessments and TMDLs, followed by appropriate water quality management strategies. However, it is recognized that significant resources (time, money, etc.) are needed to meet these needs. After examining statewide demands and resources, BWQP has concluded: 1) it is important to wrap up our focus on the Carson River within a reasonable timeframe and begin transitioning into our next focus basin (within the upper Humboldt River basin); and 2) it is not feasible to address all of the issues identified in Sections 1.2 and 1.3 at this time with the existing resources. Additionally, certain activities that go beyond the Carson River project need to occur before some of the identified issues can be worked through. Following is a summary of the key issues that will not be addressed during this phase of the Carson Watershed Project:

- As discussed in Sections 1.2 and 1.3, an evaluation and possible refinement of the aquatic life beneficial uses (through a UAA) is a desired activity. However, one of the obstacles to an evaluation of the aquatic life uses in the Carson system is NDEP's lack of a fully developed bioassessment infrastructure and tiered aquatic life use definitions. According to Chris Yoder, Midwest Biodiversity Institute & Center for Applied Bioassessment and Biocritieria (2002):

  > The UAA process needs to be "*under girded by an adequate monitoring and assessment infrastructure, in which tiered uses linked to biological criteria and supporting chemical and physical indicators produce an integrated assessment and recommendations for water quality standards revisions. When such an infrastructure is in place, UAAs become a matter of comparative routine, as opposed to becoming a resource intensive endeavor with little promise of outcome where such an infrastructure is lacking."*

  Therefore, it is recommended that NDEP not undertake a UAA of the aquatic life uses in the Carson watershed (designated and class waters) at this time. However, this does not preclude NDEP from undertaking bioassessment activities that increase our understanding of the Carson River and benefit our overall bioassessment, biocriteria program statewide.

- The review of nutrient criteria has been identified as a significant issue in Nevada and throughout the rest of the country. In a recent document, EPA (2003) has identified the need for improved nutrient criteria as one of the top ten priorities for the national water quality standards program. However, the refinement of Nevada's nutrient criteria will not be an easy task. The relationships between nutrients, algal growth and dissolved oxygen are complex and site specific to a waterbody. Also, there can be an enormous expense in developing more accurate nutrient criteria. For example, millions of dollars have been spent in the development of nutrient criteria and the related TMDLs for the Truckee River and Lake Mead. At this time, NDEP does not have the resources to properly redefine Nevada's nutrient criteria for the Carson River and tributaries. Nonetheless, some of the projects currently underway are starting to chip away at the huge needs for nutrient criteria revisions statewide.

- In addition to nutrient criteria, turbidity and TSS criteria have also been identified as significant issues in Nevada and in many other states. EPA (2003) has identified the need for improved suspended and bedded sediment criteria as another one of the top ten priorities for the national water quality standards program. It is expected that national efforts to update recommended turbidity and TSS criteria could take several years and take extensive resources. NDEP has limited resources to develop refined turbidity/TSS criteria and will be relying on future EPA guidance documents.

- Iron criterion is based upon national guidance nearly 30 years old and needs to be revised. However as with the other pollutants, revision of the iron criteria will not be an easy or inexpensive task. A revision of this standard could require extensive toxicity testing, compilation of past toxicity test results, and a rather involved statistical analysis of the results. At one point, updating iron criteria was identified as a

current EPA activity on their website, but has since been removed as a planned activity. At this time, it is uncertain has to when EPA could come out with new iron criteria recommendations. With our limited resources, NDEP needs to rely on EPA to develop new criteria.

For the reasons presented above, the Carson River Watershed Project is being restricted to the following activities. **December 2006** has been selected as the targeted completion date for the Carson focus with the following activities deemed to be doable within this timeframe:

- Development of a Comprehensive River Health Status Report Card
- Load Duration Curve TMDLs
- Review of Municipal and Domestic Supply Beneficial Use for Lower Carson River Class Waters – Should we include Bryant Creek??

The following section provides a discussion of each of the activities.

Activity 1) Comprehensive River Health Status Report Card: The intent of the Report Card is to present a comprehensive characterization of the past and current health of the Carson River from a Clean Water Act perspective, with a focus on aquatic life uses. The main topics to be addressed in the Report Card include:

- **History and Background:** Discusses the history of water quality regulations, aquatic life in the river, land use, river condition, etc.
- **Beneficial Use Needs and Criteria Evaluation:** Characterizes the chemical, physical and biological conditions needed for the aquatic life beneficial uses. Also, evaluates the numeric water quality standards currently set for the aquatic life beneficial uses.
- **Existing Conditions:** Characterizes the current knowledge on the chemical, physical and biological conditions of the river.
- **Use Impairment:** Evaluates current chemical, physical and biological conditions against the beneficial use needs to determine impairment levels. Also, characterizes (timing, extent, magnitude, load, location, etc.) the source of use impairment to the extent possible including differentiation between natural and human-induced causes.
- **Recommendations for Future Actions:** Presents recommendations for future work potentially related to: standards revisions, existing conditions, impairment characterization, impairment source characterization, TMDL development, etc.

A number of projects are either completed, underway or needed for the successful completion of the Report Card. Appendix A presents a summary of these projects grouped by the main topics within the Report Card document. As noted in Appendix A, these projects are being performed either by contractors, cooperating agencies or BWQP staff. An additional component to the Report Card project will include public/agency outreach. During the project, BWQP will be looking to others entities, such as conservation districts, the Carson Water Subconservancy District, and Natural Resources Conservation Service, for input as the various monitoring and research projects move forward.

The Report Card will be a valuable tool for educating the public, agencies and decisionmakers on the state of the river, providing direction for their future actions and decisions. With a voluntary nonpoint source program, the accurate identification of conditions and the education of the various stakeholders are essential for good decisionmaking to occur. The Report Card will capture information which represents conditions for a given point in time. This information will serve as a comparison point for future assessments.The Report Card will also be a key tool for NDEP in deciding next steps – monitoring, assessment, TMDLs, and nonpoint source project implementation. Assessments of this type are needed to characterize the problem with sufficient detail so that NDEP can pursue appropriate future actions.

The Report Card is scheduled for completion in December 2006 at the conclusion of the Carson Watershed Project. The findings of this report will be used for developing other workplans in BWQP.

Activity 2) Load Duration Curve TMDLs: The current Carson River TMDLs are outdated and in need of revision. While the information does not exist to develop a comprehensive TMDL document, NDEP recognizes the need to develop "phased" TMDLs based upon available information. A phased approach is used in situations where data and information needed to determine the TMDL and associated load allocations are limited. This approach enables states to use available information to establish interim targets, begin to implement needed controls and restoration actions, monitor waterbody response to these actions, and plan for future TMDL review and revision. Selected load duration curve TMDLs (phosphorus, total suspended solids, turbidity) are expected to be completed and approved by EPA by December 2004.

Activity 3) Review of Municipal and Domestic Supply Beneficial Use for Class Waters: Under the existing structure of the Nevada Administrative Code, the beneficial uses and numeric criteria for class waters are grouped into 4 classes impairing the State's ability to set waterbody-specific uses and criteria. It has been recognized that one size does not fit all and many of the class waters need to be addressed in the regulations on an individual basis. Currently, BWQP-Standard Branch is currently investigating potential regulation formats which incorporate the class waters into the designated waters sections. As part of this work, the Standards Branch will be preparing a petition laying out the proposed reformatting, with public workshops in the summer of 2005 followed by submittal to the State Environmental Commission. Concurrently as part of the Carson Watershed Project, BWQP will evaluate the appropriateness of the municipal and domestic supply beneficial use assignments for the Class C Waters in the Carson River basin (Table 3). The Class A and B waters in the Carson basin are either existing municipal supplies or are viewed as potential municipal supplies, and should not be subject to this review.

Before proceeding down this path, certain issues should be resolved up front:

- It is NDEP's policy to consider all groundwater as potential drinking water sources and to protect these waters as such. Therefore, there may be justification to maintain MDS as a use for most water since most surface waters have the potential to contribute to groundwater.

- States are allowed to only remove or reclassify "designated" uses that are not "existing" uses. "Existing" uses are those uses actually attained in the waterbody on or after November 28, 1975. It appears that use of the phrase "actually attained" is subject to some interpretation. In response to the question "What is the proper interpretation of the term 'an existing use'?", the following response was offered by EPA (1985):

  > "An existing use ***CAN BE*** established by demonstrating that fishing, swimming, or other uses have actually occurred since November 28, 1975 or that the water quality is suitable to allow such uses to occur (unless there are physical problems which prevent the use regardless of water quality)." (emphasis added)

  In other words if the water quality for a given waterbody is suitable (or has been suitable at a time since November 28, 1975) for MDS uses (following conventional treatment), the MDS use *could* be considered an existing use. Based upon this understanding, our ability to remove MDS as a use would be greatly limited. However it must be noted that EPA chose the words "can be" rather than "is". This choice suggests that the state has the option to set the use as existing or not.

- For those instances where existing water quality is adequate to attain MDS use (following conventional treatment), some feel that assigning MDS as a use affords some protection for the waterbody (will possible degradation to the MDS numeric criteria) that would not exist otherwise. However, antidegradation is perhaps the better mechanism protect existing water quality.

- Before MDS can be removed as a designated, any one of five conditions as set forth in 40 CFR 131.10(g) must be true. However, the reasons for the MDS use removal do not easily fit the use removal categories in 40 CFR 131.10(g):

  1. Naturally occurring pollutant concentrations prevent the attainment of the use;
  2. Natural, ephemeral, intermittent, or low-flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating state water conservation requirement to enable uses to be met;
  3. Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;
  4. Dams, diversions, or other types of hydrologic modification preclude the attainment of the use, and it is not feasible to restore the waterbody to its original condition or to operate such modification in a way that would result in attainment of the use;
  5. Controls more stringent than those required by section 301(b)(1)(A) and (B) and 306 of the CWA would result in substantial and widespread economic and social impact.

  In many locations throughout the state, the MDS use could be attained with conventional treatment, but it simply does not exist and is unlikely to exist in the future. If after considering the above issues NDEP still desires to pursue potential MDS removal for the Class C Waters, it is recommended that NDEP confer with EPA on strategies for meeting the 40 CFR 131.10(g) conditions.

If after considering the above issues NDEP still desires to pursue MDS removal for the Class C Waters, the following is provided as a workplan. The first step in this activity will be to develop an assessment report(s) evaluating the appropriateness of MDS removal for each waterbody (Subsequent steps could include petitioning the State Environmental Commission for standards changes). As previously discussed, certain conditions need to be met for removal of the MDS use to be acceptable. The assessment report(s) will need to address these five conditions in 40 CFR 131.10(g). Suggested major tasks grouped by key questions are given below:

- **Question 1. Is "Municipal or Domestic Supply" an existing use?**

  Task 1.1 Compile historic water quality information and collect additional water quality data as needed
  Task 1.2 Compile information related to any historic use as drinking water supply including use of adjacent groundwater aquifers for drinking water
  Task 1.3 Compare historic water quality information to MDS water quality standards

  Note: If MDS is found to be an existing use for a given waterbody, it cannot be removed from the water quality regulations and no further work is needed towards Questions 2 and 3.

- **Question 2. Is "Municipal or Domestic Supply" a potential future use that should be protected? Or is the adjacent aquifer a potential drinking water supply?**

  Task 2.1 Search water rights records for groundwater rights associated with drinking water supply
  Task 2.2 Search other sources for possible use of groundwater for domestic purposes

- **Question 3. Is a factor from 40 CFR 131.10(g) met?**

  Task 3.1 Identify pollutants exceeding MDS water quality standards
  Task 3.2 For each pollutant with exceedances of MDS standard, identify sources of pollutants including:
  Task 3.2.1 Determine if natural sources are preventing use attainment

Task 3.2.2 Determine if human-caused sources preventing use attainment; if so determine whether or not the sources can be remedied without causing more environmental damage than if the source was left in place

Task 3.3 Examine flow and water level data and determine if flow conditions or water levels prevent use attainment

Task 3.4 Compile information on dams, diversions, or other types of hydrologic modification and evaluate for potential to preclude the attainment of the use

Task 3.4.1 Examine feasibility of restoring the waterbody to its original condition or to operate such modification in a way that would result in attainment of the use;

Task 3.5 Examine whether or not the control needed to attained the use are more stringent than those required by section 301(b)(1)(A) and (B) and 306 of the CWA would result in substantial and widespread economic and social impact.

4.0 References

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U.S. Environmental Protection Agency. Questions & Answers on: Antidegradation. August 1985.

U.S. Environmental Protection Agency. Water Quality Standard Handbook: Second Edition. EPA-823-B-94-005a. August 1994.

U.S. Environmental Protection Agency. Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act. July 21, 2003

U.S. Environmental Protection Agency. Strategy for Water Quality Standards and Criteria: Setting Priorities to Strengthen the Foundation for Protecting and Restoring the Nation's Waters. 2003

Yoder, C.O. "The Importance of Tiered Aquatic Life Uses and Adequate Monitoring and Assessment to the Routine Performance of Use Attainability Analyses". National Symposium: Designating Attainable Uses for the Nation's Waters. Washington, DC. June 3-4, 2002.

Appendix A

Report Card - Identified Projects Needs and Status

Carson River Report Card: Summary of Key Project Needs **April 23, 2004**

Assessment Topic	Task	Project	Status	Applicable Reach	Description	Responsible Party	Completion Date
1. History and Background	Task 1.1 - History of Uses	WQS Regulation Summary	Pending	All	Research NAC record for history of regulation development regarding use, designated vs. existing use	NDEP	
		Beneficial Use History	Pending	All	Research available info - Carson River Chronology, etc.	NDEP	
		208 Plan - Point source history	Pending		Review of 208 Plan, look at changes in water quality		
	Task 1.2 - History of Conditions	Historic Channel Conditions & Changes made over the years	Pending	All	Historic photos, Corps of Engineer projects, historic maps - use GIS to document channel alignment changes; books on history	NDEP	
		Compilation of Historic Photos with associated recreated current photos	Pending	All		NDEP/CWSD	
2. Beneficial Use Needs and Criteria Evaluation	Task 2.1 - Identify the physical, biological, chemical needs (criteria) for use support	**Beneficial Use Needs**	**Needed?**	**All**	**Research biological, chemical, physical needs of aquatic life - looking at all the existing species in the river (and potential - LCT??)**		
		Indirect Beneficial Use Needs: Needs for cottonwood recruitment, willows	**Needed**		**Conditions needed for cottonwood/willow establishment - flow, channel conditions,**		
		Criteria Evaluation	Pending	All	Evaluate the appropriateness of the numeric criteria for nutrients, temperature, turbidity, TSS, iron, etc.	NDEP	
		Criteria Development	**Needed**		**Nutrient, etc.**		
3. Existing Conditions	Task 3.1 - Characterize chemical/physical conditions of the water and loading sources	EMAP Monitoring	Underway			EPA	
		Routine WQ Monitoring	Underway			NDEP	Ongoing
		NAWQA WQ Monitoring	Underway			USGS	
		Special WQ Monitoring: Upper Carson River - California	Underway	EFCR, WFCR		CWSD	March 2007
		Special WQ Monitoring: Upper Carson River - California	Underway	EFCR, WFCR	SSC, nutrients	LRWQCB	Underway
		Speceial WQ Monitoring: Carson Valley - 2001	Completed	CR (Genoa Lakes GC)		NDEP	Completed
		Special WQ Monitoring: Indian Creek	Underway	Indian Creek (California)		LRWQCB/STPU	Underway
		Special WQ Monitoring: Carson Valley	Underway	EFCR, WFCR, CR (Carson Valley)		CVCD	
		Special WQ Monitoring: Upper Carson River	Underway	EFCR	Turbidity, temperature	NDOW	
		Special WQ Monitoring: Middle Upper Carson River	Underway	CR (Dayton-Lahontan)		DVCD	
		Special WQ Monitoring: Temperature	Underway			NDEP	
		Special WQ Monitoring: Lahontan Reservoir	Underway	Lahontan Reservoir	Is reservoir TP limited? Trend since 1980s	NDEP	
		Indian Creek Reservoir TMDL	Completed	Indian Creek (California)		LRWQCB	Completed
		2001 Dissolved Oxygen Monitoring	Completed	CR (@Genoa Lakes Golf Course)		NDEP	Completed
		Characterization of Turbidity and TSS Levels and Loads in Upper Carson River	Underway	EFCR (Riverview), WFCR (Paynesville), CR (Genoa Lakes & Deer Run Road)	With continuous turbidity monitoring, TSS monitoring, determine duration and extent of standard violations	DRI/NDEP	July 2006
		Carson River Nutrient and Dissolved Oxygen Assessment	Underway	Main Carson (Genoa to Carson City)		DRI/NDEP	June 2005
		Pollutant loading/concentrations entering from California	Pending	EFCR, WFCR	Build off of DRI TSS and USGS TP studies		
		DRI Temperature impairment characterization and modeling	Underway			DRI	Feb 2006
		Phased Load Duration TMDLs (TP, TSS/turbidity)	Underway			NDEP	Winter 2004
		Sediment source/loading characterization	**Needed**		**May be able to derive some of this from the DRI Turbidity Study**		
		Carson River Phosphorus Study	Completed	EFCR, WFCR, CR		USGS	Completed
	Task 3.2 - Characterize the physical conditions of the channel and watershed	LIDAR	Pending	EFCR, WFCR, CR			
		Flow condition description	Pending	EFCR, WFCR, CR		NDEP	
		NAWQA Habitat Assessments	Underway		CHECK with Angie Paul	USGS	
		1996 Geomorphology Assessment	Completed			WNRCD/Interflu	Completed
		2004 Geomorphology Assessment	Underway			BLM/Gourley	Summer 2004
		Other physical constraints - diversion dams, bridges, house	Pending				
		Clear Creek Erosion Assessment	Completed				Completed
		Physical Habitat Index	**Pending**				
		Stream channel, substrate condition information					
		Substrate conditions	Completed	Dayton area	Pebble counts on K. Piper's projects in Dayton area	**NDEP/DVCD**	
			Needed		**Pebble counts in Carson Valley**		
			Completed	All	USGS NAWQA	**USGS**	
		Riffle/pool frequency	**Needed?**		**Evaluate BLM 2003 aerial photos?**		
		Sinuosity	**Underway**		**NDEP project, BLM/Gourley Geomorphology**		
		Width/depth ratio			**Hope to derive from LIDAR**		
		Extent of incisement/vertical banks			**Hope to derive from LIDAR, BLM geomorphology study**		
		Access to floodplain (channel carrying capacity vs. "natural conditions")			**See Interfluve study, see BLM/Gourley Study, etc., see R.O. Anderson work for DVCD**		
		Riparian condition characterization	**Pending/Needed???**		**Hope to get from LIDAR, hyperspectral, aerial photos, BLM Geomorph Study**	**NDEP**	
		DRI Temperature impairment characterization and modeling	Underway				Feb 2006
	Task 3.3 - Characterize the biological conditions of the waterbody/system	Biological Monitoring - Nevada	Underway			NDEP	Ongoing
		Aquatic Use Status (native and non-native)	Underway		Compilation of information on current status of aquatic life - look at USFWS Recovery Plan	CWSD	June 2004
		Index of Biological Integrity - macroinvertebrates	Pending			NDEP	Winter 2005
		Index of Biological Integrity - fisheries	Pending			NDEP	Winter 2005
		Index of Biological Integrity - periphyton	**Needed?**				
		EMAP Monitoring	Underway			EPA	
4. Use Impairment	Task 4.1 - Determine whether or not the waterbody is impaired	Carson River Nutrient and Dissolved Oxygen Assessment	Underway			DRI/NDEP	June 2005
		Additional DO Monitoring	**Needed**				
		Alpine County Watershed Assessment	Underway				
		BLM Assessment - Planning Tool	Underway				
		Characterization of Turbidity and TSS Levels and Loads in Upper Carson River	Underway			DRI/NDEP	July 2006
		DRI Temperature impairment characterization and modeling	Underway				Feb 2006

NOTE: Many of these projects will require followup work for the findings to be incorporated into the Report Card.