

Jim Harris, Program Manager

Utah Division of Water Quality

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Re: Comments on the 2014 Integrated Report

Dear Mr. Harris:

I have included additional comments to those provided by the Jordan River Farmington Bay Water Quality Council relating to the 2014 Integrated Report. Most of these comments are concerning specific issues and some have been pointed out in comments on previous DWQ documents (e.g. Comments on the Phase I TMDL). Other comments are related to changes in the assessment methods that DWQ has initiated. These issues are concerned with shortfalls in actual data needs and relaxing scientific rigor or assessment protocols that need to be changed.

Chapter 2 Assessment Methods.

Page 18; The document states: Since many of Utah's AUs contain multiple monitoring locations, this approach results in a more accurate analysis of the data on a site specific basis and provides greater resolution across sites for comparison and specification of the water quality impairments within an AU. However, for reporting purposes in populating the USEPAs Assessment Database (ADB), states are required to report use support at the AU level since it is the smallest unit of measure for individual water bodies. Therefore, if any site with sufficient data within an AU is not meeting water quality standards (i.e. category 5 at the site level) the AU will be listed as category 5. Similarly, all sites must be meeting uses for an AU to be listing as category 1 (fully supporting all uses).

Comment: This is an untenable decision and will lead to considerable effort and cost in trying to perform or make sense of a TMDL. For example, the site on the Jordan River at 7800 S is listed for Se. But sites above and below this site are fully supporting. With no known point or nonpoint sources, where are you going to start with a TMDL – without spending lots of time and money? ...after which you will not likely find the source – other than perhaps an unmitigatable groundwater source that is revealed only because of upstream diversion of the river. You should more appropriately put this site in Category 3. DWQ's newfangled "conservatism" is a misnomer and will only lead to confusion and additional costly field evaluations and staff time. The IR/303(d) list should not be such an

arbitrary exercise. Rather, only if the majority of sites within the AU, and sites within the downstream AU are in criteria violation, should the AU be listed. Within the context of the river continuum, please explain how you will develop a TMDL on a single site.

Page 20, Figure 4: The “diamonds” leading from the diamond “TMDL approved or not needed” are confusing, if not wrong. As I understand, according to your own guidance, if a TMDL is approved OR not needed, the site should be Category 4.

Page 20, Sample size requirement: The relaxation of statistical rigor should not be explained as “more conservative”. In fact, the statement “...4 samples (toxic parameters) collected at a monitoring location within the most recent five years to make an assessment of designated use support.... This rule helps ensure that assessment decisions are not made from small or sporadic data sets. However, because DWQ considers all existing and readily available data when making assessments, smaller numbers of samples may be used along with other sources of data and information to make impairment decisions. In the end, any observation that numeric criteria have been exceeded will be used to either conclude impairment or prioritize the AU for follow-up monitoring...”

Comment: This is an inaccurate statement. Indeed, the use of 4 samples is both a small and very likely sporadic data set. Further, just one sample violation, whether among 4 or 40 samples is used by DWQ to designate not supporting. So the actual range of percent violation may range from 1% to 25%. This is a vast divergence from the past assessment protocol and is not standardized rigorous science. This approach was used without any determination of the possibility of a statistical outlier. At a minimum, DWQ should perform the standard outlier test (1.5 X the median of the upper and lower quartiles of the data set). This new assessment protocol, in addition to using a single sample site data within an AU, which is also scientifically indefensible, has nearly doubled Utah’s list of impaired waters compared to the 2010 IR. This will spread limited financial and staff resources much beyond current levels and for poor scientific reasoning. A more robust data set with better statistical rigor is absolutely essential and will be far more scientifically defensible than this new protocol. DWQ needs to explain how it will proceed with TMDL development for these sites. DWQ should, at a minimum, place the newly identified impaired sites in category 3.

Page 21. Table 2, third column states: Numerous recurrence intervals are listed. Minimum and 30-day averages are used for assessments based on grab samples.

Comment: This statement is confusing; DWQ should explain how it defines recurrence intervals. Secondly, the nonscientific use of grab samples to perform an assessment of the 7-day average or 30-day average chronic DO criteria has been the subject of several earlier comments on DWQ IR and TMDL documents for more than five years. EPA has also reviewed these documents and my comments, which criticize DWQ for ignoring EPA guidance (EPA 440/5-86-003, 1986). Therefore, by ignoring EPA recommended assessment methods against chronic DO criteria, EPA and DWQ remain inexcusably remiss in their performance and review of the chronic DO assessment. As I have stated before, with such heavy financial and political responsibility, DWQ and EPA should have followed EPA’s own guidelines in establishing 7-day and 30-day average DO values in order to truly assess the water body for DO impairment. Now, 28 years after that criteria document was published, and even after recording data sondes have been available for more than 10 years (making this assessment extremely easy and scientifically accurate) EPA and DWQ continue to ignore this protocol. Accordingly, the following examples demonstrate, once again, the scientific shortfall of DWQ’s inappropriate and scientifically indefensible chronic DO assessment protocol.

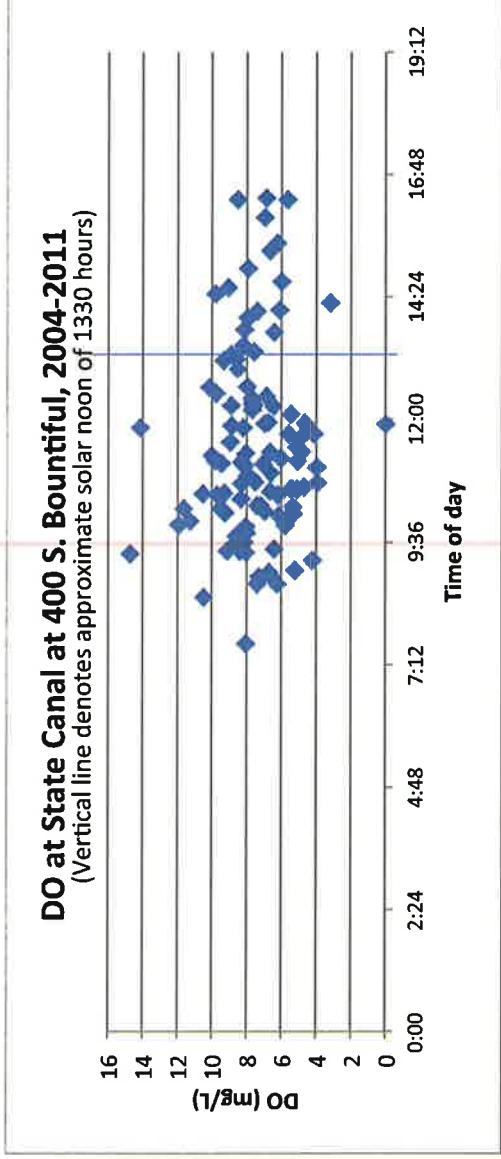
Chapters 2 and 5, Assessment of dissolved oxygen

In this exercise, I will review the data set that DWQ used in performing the beneficial use support assessment.

1. It should first be noted that the morning DO minima in the Salt Lake Valley will occur between about 0600 and 0630 for the period of about a week before to a week after summer solstice. Earlier and after this period the minima rapidly grow later to occur at about 0800 to 0830 by the beginning and end of the growing season. This has been observed repeatedly in data recorded on the JRFBWQC ysieconet.com website. Oddly, the afternoon maxima isn't nearly as sensitive to the summer solstice, with the minima usually occurring between 1630 and 1800, depending on riparian vegetation and tree height at the sample location. Also, because the Salt Lake Valley is located toward the western side of the Mountain Time Zone, solar noon occurs at about 1330, rather than at the 1200 hour. As such, it is also important to note that the daily average DO falls very near the solar noon. The facts are, that these minima and maxima data values were easy to collect as grab samples, and as of 10 years ago, there is no excuse not to use this technology for such an important assessment as the Jordan River. Similarly, the fact that DWQ grab sample data were collected without regard for the diel DO pattern, and particularly with a preponderance of data collected during morning hours – even during 2012 - suggests the absence of scientific understanding and motivation necessary to collect appropriate data. Further, this assessment protocol was performed without regard to EPA's own guidelines. To claim the lower Jordan impaired based upon such biased and inadequate is inexcusable and profoundly unacceptable for this or any IR report during the last 25 years.

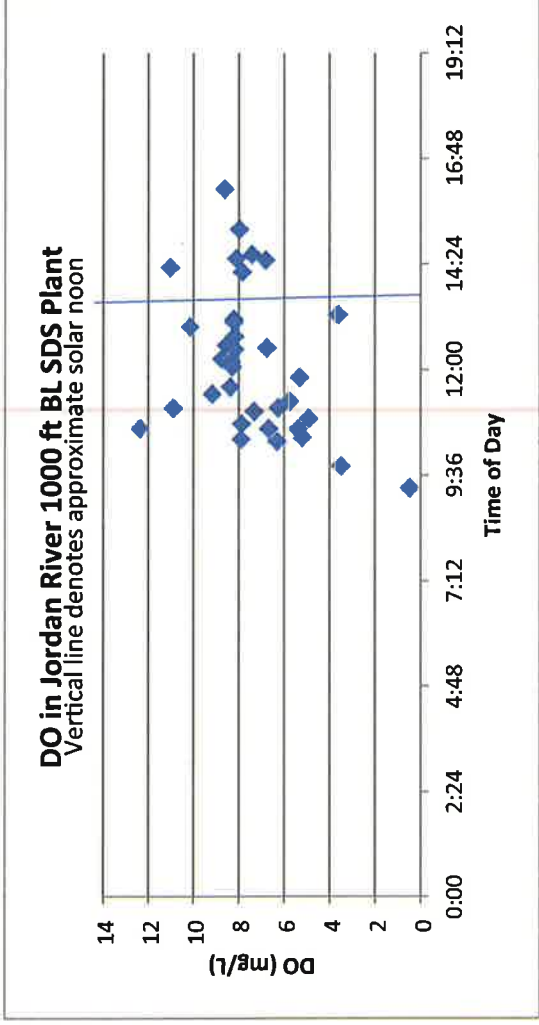
State Canal data

The following chart summarizes the data set used in DWQ's assessment of the State Canal at approximately 400 S. Bountiful (access road to Newstate and Burnham Duck Clubs). Briefly, six of the 116 samples (5.1%) violated the 4.5 acute DO criterion for fish reproduction. Three of the 116 samples (3.4%) violated the 4.0 acute DO criterion for the non fish production period. Conclusion: <10% violated = fully supporting. However, for the chronic (7-day and 30-day) criterion, DWQ did not comply with EPA guidelines and tallied the total number of individual measurements that exceeded 5.5 mg/L. Twenty out of the 116 samples (17%) had DO values < 5.5. Yet, all but one of the 20 samples was collected before the solar noon (see figure below). This is a direct violation of EPA's assessment guidelines for assessing 7-day or 30-day average DO criteria and nullifies DWQ's conclusion that the site is impaired. Nevertheless, these data have some screening value, and the AU could logically be placed in Category 3 until an accurate assessment, as described above, is performed.



Jordan River 1000 ft below South Davis South Plant

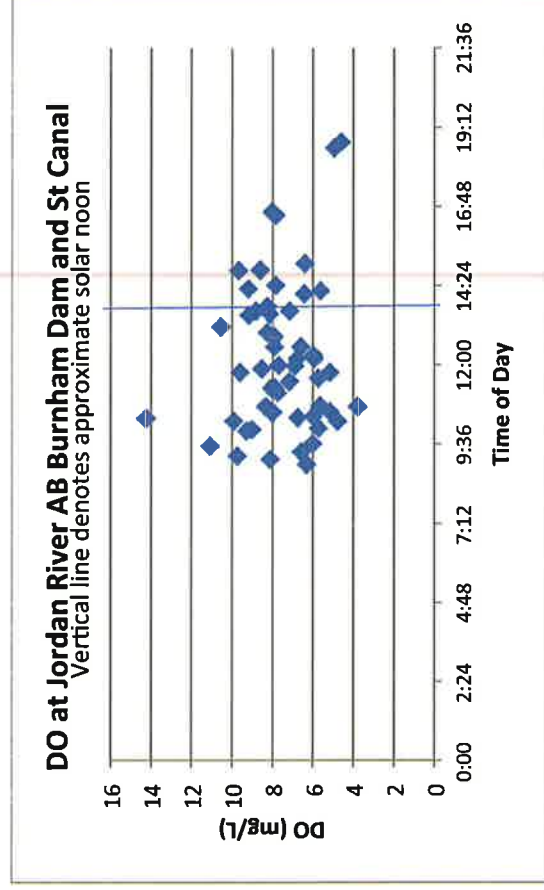
The following chart summarizes the data the DWQ used to assess this site.



Three out of the 40 samples (7.5%) used in this assessment violated the 4.5 and the 4.0 mg/L acute DO criteria. Conclusion: <10% of samples violate the criterion = fully supporting. Seven of the 40 samples (17.5%) of the data points were < 5.5 mg/L. However all of these measurements were performed before the solar noon, severely biasing the data toward the morning minimal values – as opposed to performing the chronic DO assessment according to EPA guidelines. Therefore, DWQ's assessment of this site as impaired only results from a biased, scientifically indefensible method.

Jordan River AB Burnham Dam and St Canal

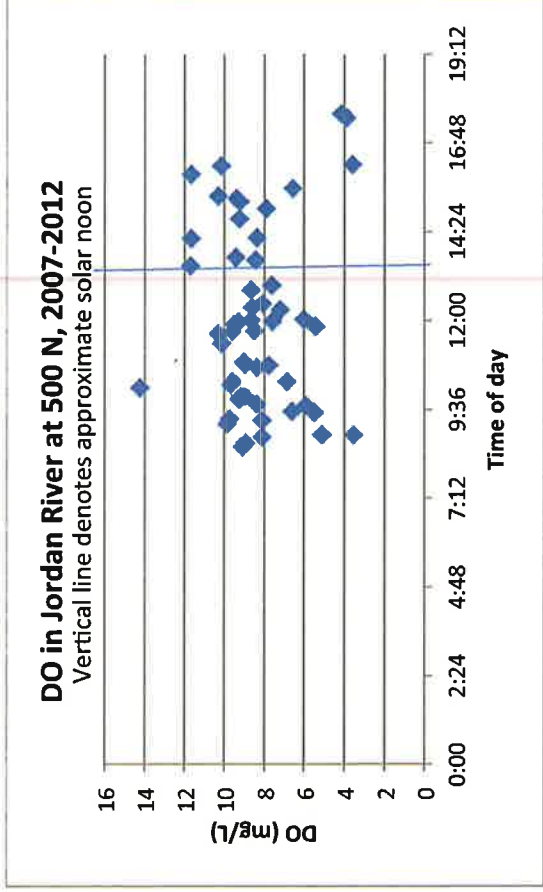
The following chart summarizes the data the DWQ used to assess the Jordan River at Burnham Dam. Data were collected between 2010 and 2012. Of the 62 samples, only 1 sample (1.6%) violated the 4.0 or 4.5 acute DO criteria. Conclusion = site is fully supporting.



Six measurements (9.7%) were below 5.5 mg/L. Of these, all but 1 were measured before the solar noon. Nevertheless, only 9.7% of the measurements exceeded the criterion. Therefore, regardless of the inaccurate method that DWQ uses to assess chronic criteria, **this site is fully supporting.**

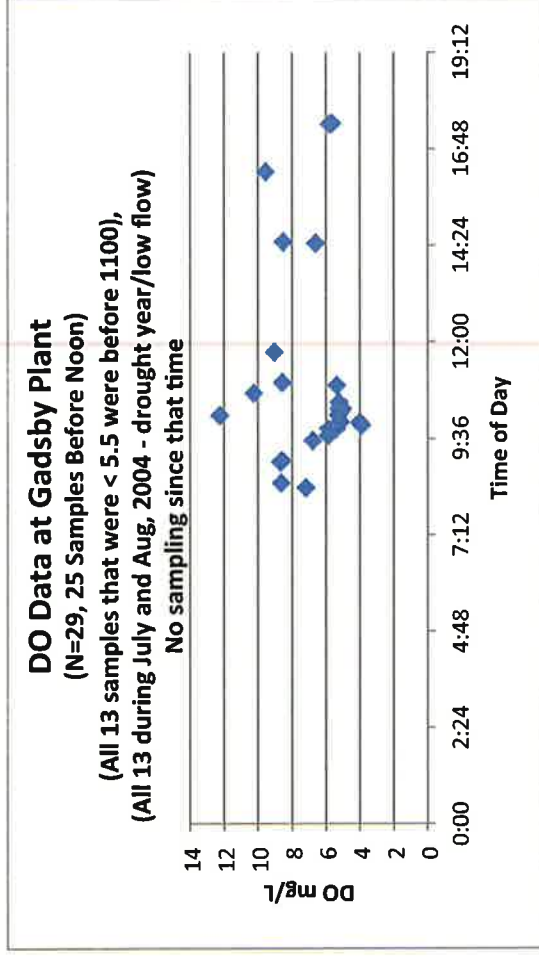
Jordan River at 500 N

The following chart summarizes the data the DWQ used to assess the Jordan River at 500 N. Data were collected between 2010 and 2012. Of the 62 measurements, four samples (6.4%) violated the 4.5 mg/L criterion for the reproductive season. Three measurements (4.8%) were below the 4.0 mg/L criterion for the nonreproductive period. Conclusion: <10% of samples violated the criterion = fully supporting. Seven measurements (11%) were <5.5 mg/L. However, four of the seven samples were measured before the solar noon, biasing the data toward the morning minimal values – as opposed to performing the chronic DO assessment according to EPA guidelines. Therefore, DWQ's assessment of this site as impaired only results from a biased, scientifically indefensible method.



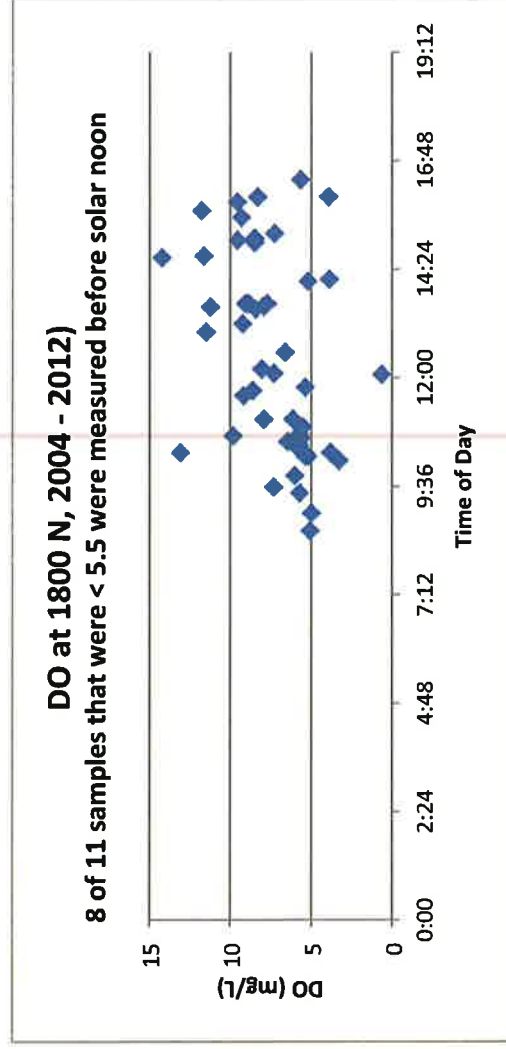
Jordan River at Gadsby Power Plant

The following chart summarizes the data the DWQ used to assess the Jordan River at the Gadsby Plant. Data were collected during June, July and August of 2004. Of the 29 measurements, two (6.9%) were < the 4.5 mg/L criterion and 1 measurement (3.4%) was below the 4.0 criterion. Conclusion: <10% of samples violated the criterion = fully supporting. A total of 13 measurements (44%) were below 5.5 mg/L. However, all of these measurements were performed prior to the solar noon, severely biasing the data toward the morning minimal values – as opposed to determining the true daily and 7- and 30- day average values according to EPA guidelines. Therefore, DWQ’s assessment of this site as impaired only results from a biased, scientifically indefensible method.



Jordan River at 1800 N.

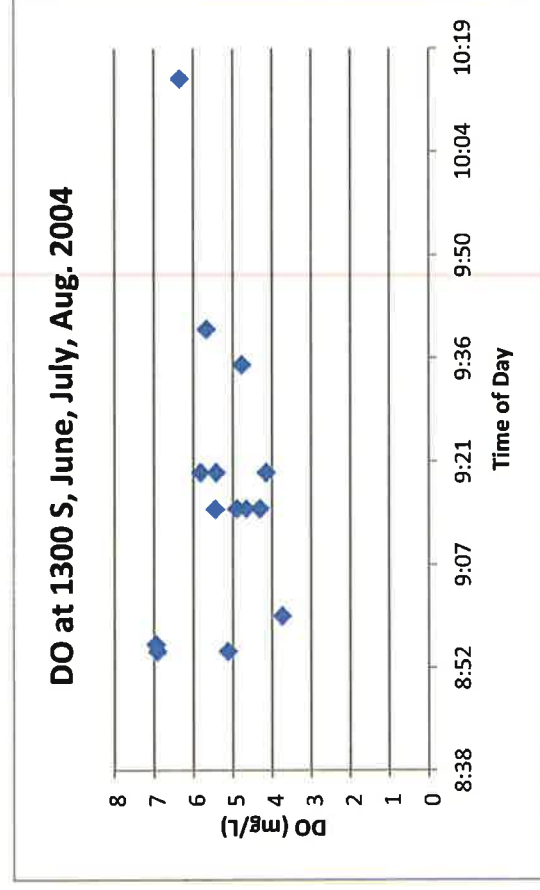
The following chart summarizes the data that DWQ used to assess the Jordan River at 1800 N. Of the 51 measurements collected during this 8-year period, five measurements (9.8%) were in violation of the 4.5 mg/L reproduction season criterion and the 4.0 mg/L non reproduction period. Conclusion: <10% of samples violated the criterion = fully supporting. Eleven measurements (21.6%) were < 5.5 mg/L. However, eight of the 11 measurements (73%) were performed before the solar noon, severely biasing the data toward the morning minimal values – as opposed to determining the true daily and 7- and 30- day average values according to EPA guidelines. Therefore, DWQ's assessment of this site as impaired only results from a biased, scientifically indefensible method.



Jordan River at 1300 S

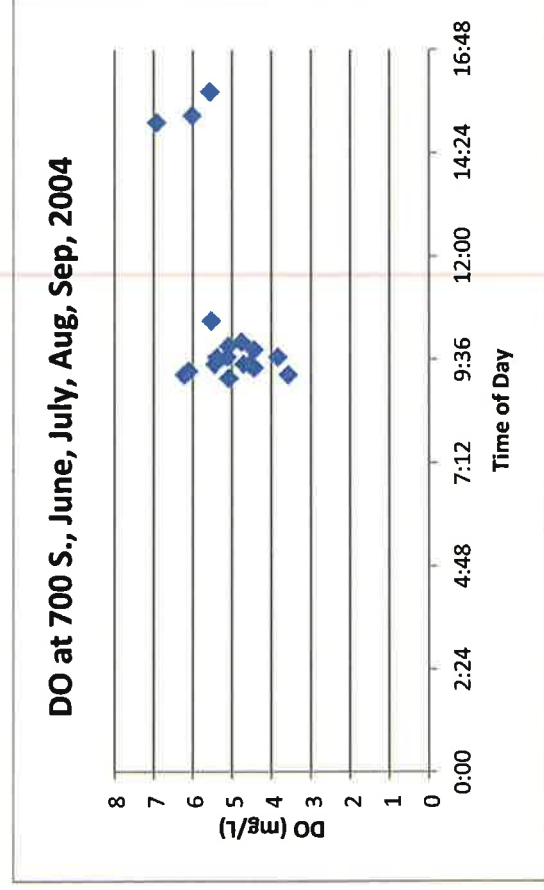
The following chart summarizes the data the DWQ used to assess the Jordan River at 1300 S. As with the data collected at the Gadsby Plant, all data used at 1300 S were collected during the summer of 2004. 2004 was a unique year in that it represents one of the most severe drought years in recent history. This resulted in both lower-than-average flows (see USGS chart below) and consequently warmer than average temperature (data not shown, but within DWQ's database). This represents another primary issue with listing the lower Jordan River as impaired for DO. Specifically, DWQ knows that the river is vastly dewatered as of result of diversion to the Surplus Canal. This diversion results in a loss of 50 to ~98 % of river flow with an average of about 60% during normal summer flow. This dewatering results in drastically reduced flow and velocity and an increase in temperature (as compared to that in the Surplus Canal). In turn, the river transitions to nearly exclusively a depositional zone, dominated by silt, clay and organic debris, making it subject to frequent dredging, all of which also results in severe habitat loss (Fluckiger and Miller 2010; Blowest 1990, 1992). Hydrological modification and habitat loss are two specific "g" factors identified in 40 CFR 131.10(g) that qualify an AU for the performance of a Use Attainability Analysis as an off ramp to

meeting normal or appropriately applied and achievable water quality criteria or biological integrity goals. I admonish DWQ for ignoring these absolute limiting factors in that they will forever prevent the lower Jordan from obtaining habitat quality goals as defined in the Federal Clean Water Act. Further, this dewatering and warming reduces DO solubility and atmospheric reaeration that would normally occur in the Jordan River under natural flows; (i.e. the Surplus Canal (the same water) has never experience a DO criteria violation). Consequently, measurement values during the summer of 2004 represent the most severe conditions since humans settled in Salt Lake Valley. From the data, two of the 14 samples (14%) violated the 4.5 mg/L DO criterion and one measurement (7%) violated the 4.0 non-reproductive period criterion. It could be concluded that the two violations constitute impairment. However, as discussed above, serious ecological conditions are created as a result of dewatering and indeed during the sampling event of July 14, 2004 the River was exceptionally dewatered to about 2 CFS (see USGS figure below), in anticipation of a storm event. The river would generally be composed of several nearly-stagnant pools linked by a relative trickle of very warm water. This constitutes a very real example of why the Lower Jordan should undergo a UAA to document such severe habitat destruction as result human interference. Finally, the entire data set was collected before about 1015 hours. Consequently, the nine samples (64%) were severely biased toward the morning minimal values – as opposed to determining the true daily and 7- and 30- day average values according to EPA guidelines. Therefore, DWQ's assessment of this site as impaired only results from a biased, scientifically indefensible method.



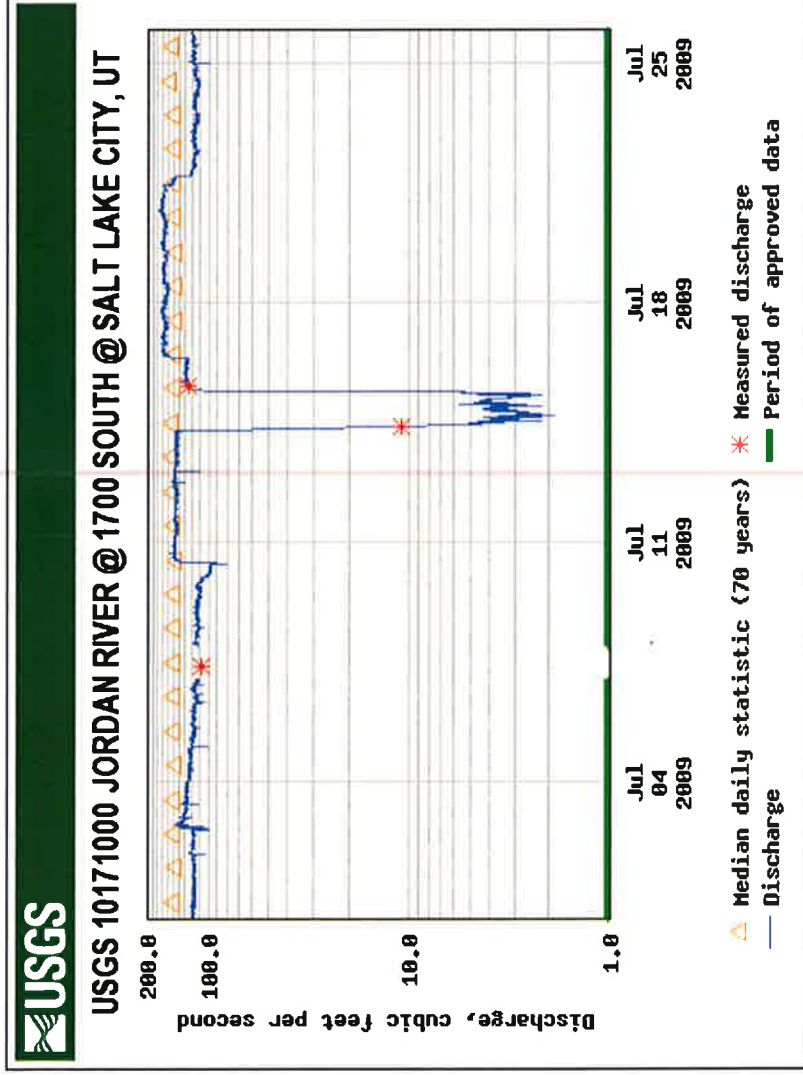
Jordan River at 700 South

The following chart summarizes the data the DWQ used to assess the Jordan River at 700 S. As with the data collected at the Gadsby Plant and 1300 S, all data used at 700 S were collected during the drought summer of 2004. All critical comments listed above also apply to the 700 S data. Particularly, the data were collected during one of the hottest and lowest-flow summers in recorded history. The only difference is that, of the 18 DO measurements, there were three afternoon measurements. Three of the 18 samples (17%) violated the 4.5 mg/L DO criterion, including one measurement made during the July 14 severely dewatered period. Two samples (11%) violated the 4.0 standard. The use of this 10-year-old data, resulting in just barely exceeding the assessment criterion should have prompted DWQ to place this site, the Gadsby Plant site, and 1300 S site in category 3 – insufficient (recent) data to make an assessment decision. This is particularly true when two of these sites constitute the only sites and sampling periods where violations occurred in the lower Jordan River. This information, along with the consistent misapplication of data for chronic DO criteria assessment suggests that DWQ is overly anxious to “list” sites as impaired.



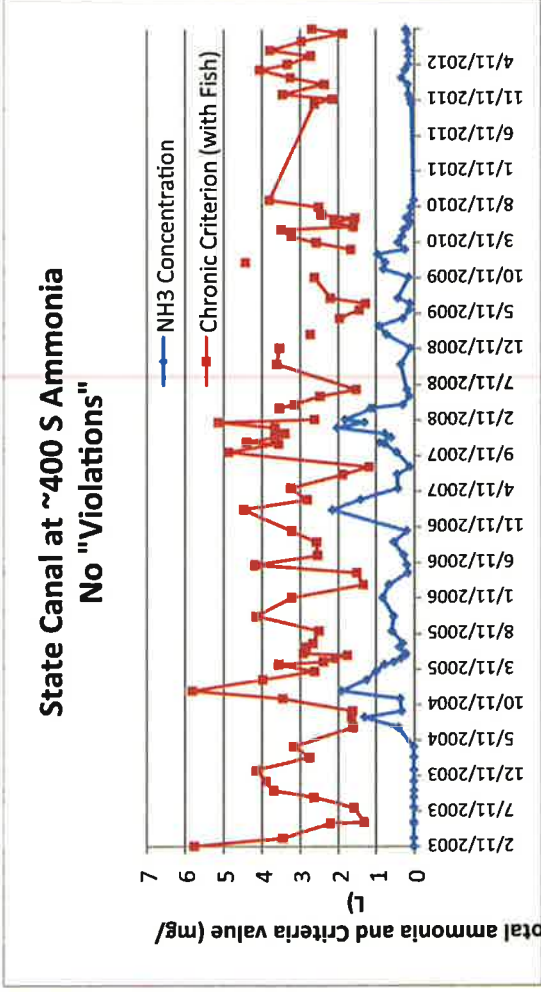
In summary, DWQ sampling and assessment protocols continue to use only the same grab sample data used for the instantaneous acute criteria assessment for assessing the chronic DO criteria by merely comparing the instantaneous data to the 7-day and 30-day criteria (5 mg/L) – requiring the same 10% of “violations” to claim non-supporting. As commented many times and for many years earlier, this treats the 7-day and 30-day average DO criteria as *de facto* acute criteria. Again, this is unnecessarily stringent, scientifically inappropriate and violates EPA’s own guidelines for collecting and assessing data against the 7-day and 30-day average DO criteria. EPA guidelines instruct: measurements must capture the morning DO minimum and the afternoon DO maximum concentration. The daily mean is the average of these two values. This is to

be repeated for 7 consecutive days (for the 7-day average criterion) or 30 consecutive days (for the 30-day average criterion). The average DO for the 7 (or 30) consecutive days is then determined and compared to the respective criteria (5.5 mg/L). This should be the guiding protocol. As these assessment guidelines were recommended by EPA in its DO criteria document (EPA440/5-86-003 Ambient Water quality Criteria for Dissolved Oxygen, April 1986), EPA is also negligent in not correcting Utah's 305(b) assessment method for chronic DO criteria throughout these many years of performing beneficial use assessments. Both EPA and DWQ need to respond to this comment.



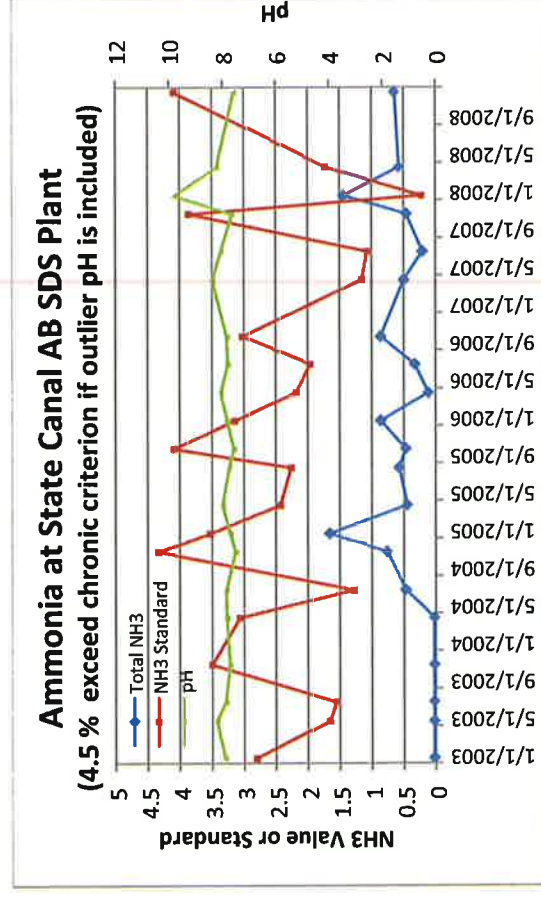
Assessment of ammonia

The assessment of ammonia values has also been inappropriately performed at two sites on the State Canal. The following graph includes all the data used by DWQ for assessing the site at approximately 400 S in Bountiful. The chart simply graphs the data against the ammonia criteria generated using the mathematical adjustments for temperature and pH values at that site and time of sample collection. The graphs clearly show that there are no acute or chronic criteria violations – even during the fish reproduction season. Therefore, the assessment of this site should be changed to “fully supporting”.



State Canal Above the South Davis South Plant

The following graph includes all the data used by DWQ for assessing this site. The chart graphs the data against the ammonia criteria generated using the mathematical adjustments for temperature and pH values at that site and time of sample collection. In addition, the pH is graphed in order to demonstrate occurrence of an outlier value on January 8, 2008. This value is nearly 2 orders of magnitude greater than typical winter values, which hover very near 7.9. Use of the statistical outlier calculation, clearly demonstrates that this is an outlier. Consequently this site should be listed in category 3 until additional seasonal data are collected to demonstrate whether the ammonia criteria are truly violated. This is another example of why the change in assessment criteria where only one sample violation is necessary to list a site is inappropriate and allows the assessment to be subject to outlier data. This assessment procedure should be abandoned.



Additional Comments

Assessment of Mill Creek near the Jordan River

The conclusion of impairment of Mill Creek due to O/E calculation provides a scientific/assessment policy review. For example, no chemical parameters exceed their respective criteria. Therefore the reason for listing this site in category 5 is questionable. An alternative and recommended assessment would be to place the site in category 4 - due to hydrologic modification (dewatering) or physical habitat loss (channelization, riparian destruction, sedimentation) – all of which are the truthful and directly affect O/E. Overall, the use of O/E to list in Category 5, when there are no accompanying chemical violations, is too premature and may be an inaccurate assumption. Category 4 or Category 3 are the logical assessment endpoints when the essential accompanying data is not available or is not used.

These comments are hopefully taken as constructive criticism. Perhaps some may be considered an affront and objectionable. However, such comments are provided in this manner in order to emphasize the importance of the comment and, to be honest, the many times I have made such comments and suggestions, and yet result in unsatisfactory response or outright ignorance of the identified deficiency (i.e. through two triennial review periods).

In all sincerity, my goal is to improve the scientific rigor and accuracy of measurement data and assessment protocols that will improve your product.

Sincerely,

Theron G. Miller, PhD

Research Scientist, JRFBWQC

