APPENDIX F
RESPONSE TO PUBLIC COMMENTS

The formal public comment period for *The Redwater River Nutrient and Salinity TMDLs and Framework Water Quality Improvement Plan* was initiated on October 26th, 2010 and concluded on November 26th, 2010. A public meeting was held in Circle, MT on November 3, 2010. Comment letters were received from the McCone Conservation District and two individuals. Excerpts from the comment letters are provided below. Responses prepared by DEQ follow each of the individual comments and where applicable, the text of the document has been modified to address these comments. Original comment letters are held on file at the DEQ and may be viewed upon request.

Comment #1:
Page 16 2.2.1 Vegetation; I question basin wildrye. There may be some, if any. Don't think this should be one of the grasses listed. Inland salt grass should be listed as this is common on all the creeks. You have not listed any rushes as creeping spike rush, three square bulrush, also alkali cordgrass and smooth brome are common along the creek banks in the planning area. Other grasses that should be listed is foxtail barley in the wet zone and Kentucky blue grass in the dry uplands that are common.

DEQ Response to Comment #1:
The first paragraph of **Section 2.2.1** has been edited to include mention of the plant species listed in the comment.

Comment #2:
Page 12 & 13 Geology, Soils and Water (Surface & Groundwater) I believe DEQ needs to do a more thorough job on looking into the geology, soils and the groundwater. A water resource survey was completed for McCone County and published in 1971. It gives a lot of insite to the soils, the geology and the water in the planning area and feel it could shed some light on why the streams have the salinity, high TDS and sulfates. "Horse Creek and Lost Creek rise on the Big Dry Creek-Redwater River Divide flow southeast and enter the Redwater. The high bottom lands are saline for some distance above their mouths." (McCone Water Resource Survey 1971) There are several statements in the survey relating the salinity and salts in the soils.

DEQ Response to Comment #2:
The watershed characterization section (**Section 2**) of the document is intended to give the reader a broad understanding of the physical and cultural setting of the planning area. The inherent salinity of the area for both the mainstem Redwater River and tributaries is explicitly illustrated in **Figures 6-1** and **6-2,** that graph changes in specific conductivity with changes in flow. The salinity target development discussion (**Section 6.4**) repeatedly points out the elevated dissolved solids concentration of planning area surface waters relative to other areas of the state for which salinity TMDL targets have been developed. The target departure discussion for Nelson Creek (**Section 6.5.3**) recommends, due to the inherent high salinity of Nelson Creek surface water and lack of cropland salinity source areas, that the salinity impairment be reassessed. The DEQ's understanding of inherent salinity in the planning area is adequately demonstrated in these discussions. The more elaborate descriptions of salinity sources in the McCone County Water

Resource Survey are appropriate for a document published to assess the county's historical water use and identify areas suitable for irrigation development. The detailed discussions of salinity sources and the limitations to irrigation development are beyond the more general scope of **Section 2**.

Comment #3:
On Page 2; you talk about "the water chemistry monitoring during the 1970s and 1980s and it states commonly included corresponding flow measurements". Then it goes on to say that "these are lacking in the more recent monitoring efforts that occurred from 2003-2005". Then you go on to talk about using mean daily flows to generate flow duration curves for each stream.

If you don't have flow with each nutrient sample or wasn't taken because there was no flow and use a mean daily flow, this is allowing for HUGE ERROR. I do know that the sampling that was done between 2003-2005 as the district helped DEQ with the sampling that there were a lot of those sample sites had NO flow. It was also documented in the field visit sheets.

DEQ Response to Comment #3:
All impairment evaluations were based on water column nutrient concentrations, which may include measurements both with and without corresponding measured stream flows. This approach is consistent with stream assessments completed throughout eastern Montana during development of a reference data set for nutrients in wadeable prairie streams. Although we acknowledge the value of data obtained during flow conditions, paired flow and water chemistry data are not critical for development of the nutrient TMDLs. The existing chemistry data has sufficient corresponding flow measurements to provide a reasonable understanding of water column nutrient conditions and associated impacts. This information provides adequate estimates of the overall load reductions needed and does not represent a source of significant error, despite including results measured during summer flow conditions commonly encountered in the Redwater planning area.

We used flow duration curves to provide additional analyses. These curves help illustrate the seasonal flow variability. Individual measured loads that appear on the graphs of load duration curves for specific streams are those that correspond to a measured or estimated flow at the time of sampling. The loads illustrated as open circles on the load duration curves in **Section 5.0** are for actual sample results having corresponding measured or estimated flows. Results obtained under non-flowing conditions or samples collected without measured or estimated flows do not appear on the graphs. This method of illustrating loading shows the loads associated with specific sample results in the context of the stream's annual loading pattern, and illustrates the TMDL over the annual range of estimated flows. This approach provides more information than a simple comparison of measured loads versus the TMDL for a single flow condition. The individual loads shown on the curves as open circles are only those having corresponding flows. The same results would be obtained if each concentration was multiplied by the corresponding flow and compared to the target value multiplied by the same flow.

The flow duration curves are constructed from gage records. Where gage records are not available, the curves were estimated from similar streams by multiplying the total annual runoff of the stream in question by a daily proportion of total annual runoff calculated for the gaged stream. The total annual runoff values for the stream in question were estimated using the equations of Omang and Parrott (1984). This process is described in the third paragraph of **Section 5.3.1**. Estimated mean daily flows, multiplied by nutrient target concentrations, are then used to construct load duration curves. Therefore, there is inherent error in estimating mean daily flows for an ungaged stream. This flow estimation error does not significantly affect overall TMDL calculations since, as discussed above, the basic loading reduction conclusions are derived from the measured nutrient concentrations and their departures from target values The level of uncertainty in nutrient TMDLs using this approach is well within that acknowledged in protocols developed by EPA where load allocations can range "from reasonably accurate estimates to gross allotments" (USEPA 1999).

Comment #4:
Did you use any of the data Aquatic Life Uses in the Redwater River Based on Periphytron Composition Report and the Biological Integrity of the Redwater River Of the Benthic Algae Community Report that was completed by Loren Bahls in December 11 2000 on the 8 miles of Redwater segment? Was this compared to the samples you took in 2008? The 2 reports were prepared for DEQ.

DEQ Response to Comment #4:
Table 5-13 contains diatom inferred DO values generated for all algae samples collected within the listed reach. These included the samples collected in 2000 and 2003 and assessed by Bahls in reports for streams in the Redwater TPA. The values derived for 2008 samples are also in the table for comparative purposes. The average of the inferred DO values for 2008 is 5.4 mg\L; the mean for the earlier samples is 6.4 mg/L.

Of the various indices referenced in the reports by Bahls, the DEQ currently focuses on one of these indices to help assess water quality health related to nutrients. This is the oxygen tolerance index (OTI) used to derive the inferred DO values in **Table 5-13**. Therefore, other indices discussed by Bahls are not incorporated into the document. Other indices may be appropriate for future assessment of impairments due to causes other than nutrients. The criteria for selection of the algae tolerance indices is discussed in detail in **Sections 2.8** and **2.9** of **Appendix A** of the document entitled "Scientific and Technical Basis of the Numeric Nutrient Criteria of Montana's Wadeable Streams and Rivers" (Suplee 2008) that describes the development of nutrient criteria.

Comment #5:
Paragraph five of Section 5.4.1 states that "Nitrate appears specifically as an impairment cause in the assessment records for East Redwater and Nelson Creek. Nitrate is a common form of nitrogen found in agricultural fertilizers applied to croplands etc". Nelson Creek is about 90% rangeland.

DEQ Response to Comment #5:
Section 5.4.1 provides some general information on potential nitrate sources. Even relatively small percentages of a land use can contribute to elevated pollutant loading depending on many specific factors. The statement referenced above was included in the discussion as a justification for including targets for NO_3+NO_2-N in the nutrient target suite, rather than a specific statement regarding its applicability in Nelson Creek. The data record for NO_3+NO_2-N in Nelson Creek

suggests that target exceedences are a high flow phenomenon. Recent Nelson Creek sampling events did not occur under high flow conditions. In light of this uncertainty, a NO_3+NO_2-N TMDL was developed, since there was not enough data to remove this form of impairment from Montana's 303(d) list. Future high flow NO_3+NO_2-N sampling in Nelson Creek during the growing season may confirm or dispute the NO_3+NO_2-N impairment cause. The adaptive management process can accommodate justifiable future adjustments to impairment causes in Nelson Creek or other locations in the Redwater River TPA.

Comment #6:
The document states on page 7 the DO concentration standard for C-3 streams. Again there has been no ground truthing to determine if all these streams are C-3 streams. The assessment that was done for the entire Redwater in 1998-2000 determined that not all of the stream was a C-3 stream some parts of the Redwater was an E channel.

DEQ Response to Comment #6:
The "C-3" designation is a *water use* classification category within the Montana Water Quality Standards (ARM 17.30.629), rather than a Rosgen or other type of *stream channel* classification. The classification of the Redwater River as a C-3 stream is contained in ARM 17.30.610(i). Waters classified as C-3 are to be maintained suitable for bathing, swimming and recreation; growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl and furbearers. The quality of these waters is naturally marginal for drinking, culinary, and food processing purposes, agriculture, and industrial water supply.

Comment #7:
It states "Although the diatom index and meter readings are linked to aquatic life use support through the standards, the inherent uncertainty in both measures makes them more suitable as supplemental indicators of nutrient enrichment". Also were all DO reading taken the same time of the day when samples were collected? That is also a huge factor your DO reading can change throughout the day.

DEQ Response to Comment #7:
The optimum time for DO readings that would be compared to the minimum criteria described in **Section 5.4.2** is during the pre-dawn hours, before photosynthetic oxygen generation by aquatic plants. The readings associated with sampling and assessments in the Redwater TPA were generally taken during daylight hours. Such reading are useful for identifying acutely limiting DO conditions but are less than optimum for standards comparisons. Therefore, the DO readings are used as supplemental indicators of nutrient enrichment. Where DO values are lower than the supplemental indicator value, one can conclude that pre-dawn conditions would be even worse and the information indicates a water quality concern. Where DO values satisfy the supplemental indicator value, stream health is still uncertain since pre-dawn measures could be less than the indicator value. This is further explained in paragraph six of **Section 5.7**.

Comment #8:
Page 8, second paragraph; the exceedence of one or more targets or supplemental indicators does not automatically equate to beneficial use impairment. The number of target exceedences, as well as the magnitude of the target departures is considered by following the methodology of

Suplee and Sada de Suplee (2010) for water quality assessment. The combination of target analysis, meaningful qualitative observations and sound professional judgment is applied in each assessment of TMDL development needs.

I don't believe this is the best way to determine impairments by observations and sound professional judgment. Who's professional judgment? Do you allow only DEQ's judgment calls? What about NRCS or landowners. Landowners have to take care of the land or they won't have the land to produce food or keep them in business. There is a lot of professional judgment put into there operations or they won't be in business long. NRCS is technically trained with guidelines to follow and to help protect the natural resources. Best way is by ground truthing the entire reach of a stream and personally knowing the area.

DEQ Response to Comment #8:
The TMDL process is not static. The process occurs in the context of adaptive management, where adjustments to loading estimates and allocations can be made based on updated water quality data and an objective investigation of source contributions. Planning area stakeholders, therefore, have the opportunity for a continuing consultation role in water quality management. The nutrient targets used to assess impairment are the most up-to-date values.

The Montana Water Quality Act directs the DEQ to monitor and assess the quality of state waters and identify surface waters not meeting standards. In addition, it specifies a consultation role for conservation districts and watershed advisory groups in DEQ assessments and TMDL development responsibilities. In the Redwater River TPA, this role has been realized through a series of meetings attended by DEQ, Conservation District, NRCS and private landowner representatives. The agendas for these meetings have focused on describing assessment methods, summarizing assessment results and explaining impairment conclusions. Conservation district and NRCS personnel have reviewed and commented on draft sampling and analysis plans and draft document sections.

We agree that the understanding of water quality and the assessment of pollutant loading improves with first hand knowledge of field conditions. All TMDL development is a compromise between further data collection and finalizing required TMDL documentation to help move toward continued implementation of water quality protection. Finding that balance is difficult and there will tend to be differing opinions.

Comment #9:
Page 9 Table 5-4 Do any of the sample results in Table 5-4 have a flow reading with them? Don't see that in the document.

DEQ Response to Comment #9:
The nutrient water quality data are assembled in **Appendix B**, **Table 1.3**. Flow values, if measured, are included in the table.

Comment #10:
Page 9; All 11 TN results exceed the applicable TN target and seven of 11 TP results (64%) exceed the applicable TP target. Only one NO3+2-N result of 12 exceeded the 20 µg/L target for

the glaciated portion of the watershed. The 76 µg/L NO3+2-N target was met in all samples collected within the unglaciated portion of the watershed. This contradicts the statement on the previous page "The exceedence of one or more targets or supplemental indicators does not automatically equate to beneficial use impairment".

DEQ Response to Comment #10:
Section 5.4.3.1 of the document was edited to address this comment during the stakeholder review and the above referenced sentence was removed because it does not adequately describe target application in all situations. Regarding the NO_{3+2}-N listing, the results are summarized for each of the two ecoregions. The results are summarized for each of the two ecoregions. The NO_{3+2}-N impairment is due to one exceedence in 10 results for the glaciated ecoregion.

The original 2006 NO_3+_2-N listing for East Redwater Creek stems from a the interpretation of a 70 µg/L result as being excessive compared to a level of 20 µg/L that was the use support threshold at the time. With later development of the 76 µg/L target for the unglaciated ecoregion, the 70 µg/L result no longer is a target exceedence. A concentration of 30 µg/L in a sample from the glaciated area (site 5288NO01), where the 20 µg/L target does apply, is the target exceedence resulting in the current NO_3+_2-N listing.

Comment #11:
Page 10 Table 5-5 I don't see any of the samples taken in May of 2004 for the four sites in the 8 miles of Redwater. Samples were taken in May. Samples were collected once a week for 4 weeks as it was collected in August, that would demonstrate best -case conditions and worst -case conditions. Again do all samples have a flow?

DEQ Response to Comment #11:
For the purpose of determining nutrient impairment, the numeric targets in **Table 5-3** apply during the growing season for algae (mid-June through September). The target departure comparisons include algae growing season results only. **Table 5-5** contains only those results for samples collected during mid-June through September. **Appendix B** contains the results for all seasons, including the May 2004 information, and flow values when measured.

Comment #12:
Table 5-6 Again only one sample I thought that one samples doesn't warrant it to be a factor.

DEQ Response to Comment #12:
Table 5-6 contains comparisons with diatom-inferred DO, a supplemental indicator for assessing nutrient impairment. Although only one result had a value less than the 7-day mean minimum standard, all of the results in lower Horse Creek indicate low DO supply. This condition, together with the numeric target comparisons indicates use impairment and need for a TMDL.

Comment #13:
Table 5-7 Nelson Creek; What about all the sampling that was done on Nelson Creek by Golder & Associates that was completed for 3 years and was done year round. Flow was taken year around plus groundwater sampling. Again do all samples have flow?

DEQ Response to Comment #13:
This comment was also addressed in the stakeholder review and the available Nelson Creek data for Nelson Creek collected by Golder and Associates, have been inserted into **Table 5-7** and **Appendix B**.

Comment #14:
Page 14 Table 5-11 Sampling that was done in October 2003 that DEQ collected isn't listed in Table 5-11 here. Again do all these samples have flow?

DEQ Response to Comment #14:
Per the above response to Comment #12, the month of October is not within the growing season and so is not included in the analysis. The October data is included, with flow when measured, in **Appendix B**.

Comment #15:
Page 15; Table 5-13 May sampling is missing on 8 miles of Redwater DEQ states that the growing season is from mid June to September. The samples that the district took in May, in the 8 miles of the Redwater had algae blooms on the water. Photos were taken during this sample period. Other creeks sampled during this time also had algae. Our growing season is from April 1 to October 1. Why is the growing season set from June to September? Our main run-off is in March first part of April. We are dealing with prairie streams that don't have mountain snow run-off in June. Dept of Ag has the growing season as May-October. The growing season needs to be corrected in this document. By June we have landowners cutting hay. If water has a different growing season from plants, then why was there algae growing in May in the creeks in the planning area?

DEQ Response to Comment #15:
Optimum growing conditions for algae are different from those of crop plants. Seasonal variation in stream nutrient concentrations is not only influenced by factors such as runoff patterns, but also by biological uptake and release by organisms, including aquatic plants. Aquatic plant growth (including algae growth) is also influenced by light availability and air temperature which are climate factors. Optimum growing conditions for crop plants likely determine growing season designations established by the U.S. Department of Agriculture. The growing season period used in the Redwater analysis is an expansion of those developed for level III Great Plains ecoregions. The June 30th start of the growing season was expanded to include the last half of June. Further expansion of the growing season into May would best be evaluated by temporally targeted chlorophyll sampling that is not currently available for specific planning areas.

The observations you provide regarding algal growth during May are helpful in understanding systems such as the Redwater, and such observations of spring algal growth in other prairie regions of the state have been noted. The algal growing season is based on the season where such growth is most likely to occur.

Comment #16:
Page 17 Table5-14 Were these samples compared to the samples taken in 2000 by Loren Bahls report? Table 5-15 Where is the June 3 2003 samples? Did all samples have flow?

DEQ Response to Comment #16:
Table 5-14 contains diatom inferred DO values generated for all algae samples collected within the nutrient listed reach of the Redwater River for the period mid-June through September. These included the samples collected in 2000 and 2003 and assessed by Bahls in reports for streams in the Redwater TPA. The diatom-inferred DO values in the table are developed from the species composition of the samples and are independent of flow condition. Diatom samples collected on June 4, 2003 were from sampling sites on Horse Creek. These results are given in **Appendix B** since June 4 is outside of the algae growing season. Water quality samples from the listed reach of the Redwater River that have corresponding flow measurements are also given in **Appendix B**, **Table 1.3**.

Comment #17:
On all the DO tables What time of the day were the samples taken Samples that were done in June and the ones done in August; Were they all at the same time of day?

DEQ Response to Comment #17:
The DO readings associated with sampling and assessments in the Redwater TPA were taken between 8:00 AM and 8:00 PM. Refer to the response to Comment #7 above for information on the optimum timing of field DO readings under current protocols.

Comment #18:
Page 19 Table 5-19 On the sample 8/29/08 Is this sample site the one that is on the State section? And have you consider the rest area upstream at Flowing Well Rest Area that has its own septic system and the ground water well that the public use in the rest area has tested positive for e-coli. This is documented in the public water reports. This area is all rangeland. Also was there flow with this sample or was this an isolated pool?

DEQ Response to Comment #18:
Site M31TMBRC03, sampled on 8/29/08 is located in Section 6, Township 18 North, Range 44 East, on the portion of the section owned by the State of Montana. The measurement was taken in a channel pool. Flow at the time of the reading was not measureable.

A query of the bacterial sampling record for the public supply at the Flowing Wells rest area (PWSID# MT0001964) from April 1995 through July 2010 contains two positive detections for coliform bacteria that occurred in July of 2006. The DEQ program record for this system for the above period contains no detections for E. Coli.

The Montana Department of Transportation operates the Flowing Wells rest area that discharges about 380 gallons of domestic wastewater per day from a septic drain field operated each year from April through November. The nitrogen concentration in rest area septic effluent is estimated at 180 mg/L. The system discharges about 0.6 lbs of TN/day (180mg/L*0.0006 cfs*5.39 =0.58 lbs/day), minus the amount lost through denitrification. The low water table gradient (0.002) and fine-textured (silty clay) sediments receiving the discharge makes for a sufficiently long travel time between the drain field and the stream channel to allow denitrification of the entire load. Therefore, the TN allocation for Timber Creek is to natural background sources and composite agricultural sources.

Furthermore, the August 2008 sample containing 8,700 µg/L TN also contained a total ammonia concentration of 2,390 µg/L. This level of ammonia could not have been delivered from a single, drain field located several miles upstream. Throughout this stream distance, nearly all ammonia would have been converted to nitrate nitrogen and consumed during the growing season by aquatic plants. The high ammonia result suggests a more immediate and perhaps transient loading source that may include livestock in and along the Timber Creek channel near the sample site.

Comment #19:
On table 5-19 With the ONE low reading, Was this sample taken the same time of day as the others?

DEQ Response to Comment #19:
The DO reading at site M31TMBRC03 was taken at 8:45 AM. Dissolved oxygen readings taken during the 2008 field work, as well as any previous field sampling effort, were taken during daylight hours rather than a specific time slot for each site visited. Refer to the response to Comment #7 above for information on the optimum timing of field DO readings under current protocols.

Comment #20:
Page 20; 5.5, You talk about the percentage of land use in the planning area. What is the amount of acres of each land use? I don't see that in this planning document. This would give a more accurate picture of what type of land use there is and just how many acres you are actually talking about.

DEQ Response to Comment #20:
The land use acreages are given in **Section 2.3.3**, **Table 2-6**.

Comment #21:
Page 22 second paragraph; Kemp and Dodds (2001) studied TN concentrations in streams draining two undeveloped native tall grass prairie watersheds. They reported a TN range from 200 to 400 µg/L. Corresponding samples from stream transects through tilled cropland had a mean TN concentration of 1,200 µg/L. The study reported a positive correlation between stream discharge and nitrogen concentration in grassland streams, compared to a negative correlation with data from tilled cropland. The increase in nitrogen with decreasing stream flow resulted from base flow groundwater loading beneath fertilized cropland (Kemp and Dodds 2001). Dodds and Oakes (2004) used regression models to identify the land use and population density predictors of TN and TP using surface water data from central and eastern Kansas, as well as a nationwide USGS dataset. Why are you using surface water data set from central and eastern Kansas? Why not use data set according to Montana glaciated and unglaciated regions as in the Redwater planning area. Using central and eastern Kansas is a lot different than Montana.

DEQ Response to Comment #21:
Literature reports of research into the relationship between and land cover and surface water nutrient concentration is relevant as a check on the results reported for studies in Montana. The data from Kansas are presented as supporting evidence of the effects of crop nutrient additions on local water quality. The paragraphs following the discussion of work by Dodds clearly state that nutrient targets are based on studies conducted in Montana.

Comment #22:
This statement is very troublesome; Assembly of a true reference dataset for the Redwater TPA is problematic due to the large extent of agricultural land use.

DEQ Response to Comment #22:
Even with agricultural use within a watershed, there is potential to obtain reference data. The nutrient targets are developed from reference data collected from many areas that include agricultural land uses. Due to a lack of data from streams where long-term land uses are consistent with the application of all reasonable land, soil and water conservation practices, the ability to assemble additional reference data from the Redwater TPA is limited. The discussion in the document regarding the quality of reference data from the planning area has been edited to replace the word “problematic” with the word “challenging.” The nutrient targets within this document are a logical and appropriate translation of the State’s narrative water quality standard for nutrients.

Comment #23:
Page 23; Agricultural nutrient sources in the Redwater TPA were inventoried through combined interpretation of 2005 National Agricultural Imagery Program (NAIP) aerial photography (USDA 2005) and the 2001 USGS land cover dataset (Homer et al. 2004) in a geographic information system (GIS). The land cover raster data (30-meter resolution) were used to quantify the acreage of rangeland, cropland, woodland and urban land use areas. The CRP program acreage was calculated from percent cropland enrollment figures provided by the McCone County UDSA, Farm Service Agency. Percent cropland enrollment figures for McCone County were extrapolated to cropland in the other four planning area counties. Acreage in the CRP program was subtracted from the raster-based estimate of cropland acreage. “Feedlot” area was measured using GIS tools applied to seasonal livestock confinement polygons identified on NAIP photography. The assessment identified 102 confinement areas ranging from 0.1 to 6.5 acres. Figure 5-2 illustrates a confinement area from the inventory.

Aerial photography does not tell the whole picture in order to tell exactly what is going on. You need to ground truth. That has been proven by other TMDL work that was done by aerial photography. For instance on Big Spring Creek, DEQ hired a contractor to do a riparian assessment. They used aerial photos. The Fergus Conservation District did not agree with what they reported. They hired consultants to assess the stream (walking the whole length of the creek)

Another example is last month the District went out with DEQ and the Keystone Pipeline people to look at creeks that would require a 310 permit for the pipeline. After assessing the crossings on the ground instead of going just by what the aerial imagery, they actually found that some *areas were better to cross in a different area then what computer model suggested. Other comments made were that some of the streambanks weren't has steep has the aerial imagery suggested. The aerial photos did not warrant what was there and the ground truthing gave a more accurate picture.*

DEQ Response to Comment #23:
Interpretation of aerial photo and satellite imagery is a common source assessment tool in TMDL development. As discussed above in the response to Comment #9, ground truth work can be desirable but not necessary to meet our TMDL development goals and level of detail requirements. "Walking the whole length of the creek" is an unrealistic approach to nutrient TMDL development, a quantitative analytical process that occurs in the context of time constraints, limited availability of field personnel and financial limitations. Given the extent and variety of nutrient sources and loading pathways, observation of the physical conditions along listed stream channels does not produce a complete source inventory at the watershed scale, where loading contributions are common from upland and tributary sources. Opportunities are available to further refine and document our understanding of source loading through TMDL reviews and development of local watershed plans during TMDL implementation.

Comment #24:
From the feedlots points that you sent the district I have pulled up every feedlot that you identified. Some of the so called feedlots indentified by aerial photos (the district well aware of who owns livestock and who don't) some of the feedlots listed do not own livestock. Another problem we are having is with some of the feedlots, they are a considerable distance from the creeks. One area that we measured had a 385 feet of buffer before it would be a direct source to the creek plus it was perennial coverage. This buffer was the closes distance if you actually measured where the corals are and then where the runoff would drain the distance is even greater. The other problem is just with the runoff from these corals; Have you check with the landowners to see if the corrals are ultilized for more then 45 days? By looking at the aerial photo can you determine if the corral has been cleaned out and has a minimal amount of manure? Or what if they only have two livestock compared to a producer that may have 100 livestock for the same acreage? Wouldn't your amount or source of nutrients be different for that area?

By using the work sheet guide in the STEPL model it states:
Function ; Calculates pollutant load from the feedlots based on animal types, weight and average rainfall.
Under hidden tables;
Feedlot load calculation
Ratio of nutrients produced by animals relative to 10001b. of slaughter steer.

Another point is the numbers of livestock put in the data for the STEPL model are incorrect. The District checked with the McCone County Assessor and for an example in the Appendix D, Table A-2 it has listed 7215 sheep in the planning area. All of McCone County as of February 1, 2010 has 2606. In McGuire it list 242 and Nelson list 276.1 talked with the 2 landowners that had big sheep numbers and they told me they no longer have sheep. They have sold all there sheep due to problems with coyotes. I don't believe there is 5000 sheep in the sub-watershed for the East

Redwater and Pasture Creek. For the hogs the County has 2760. 2744 of those hogs are out of the planning area and are a permitted operation. The total for McCone County in the planning area is 16 hogs. This is a big difference from 440 swine listed in the STEPL model. The other livestock numbers are also incorrect.

According to the STEPL model this method has two assumptions l)if the feedlot is adjacent to receiving hydrological system without any buffering areas; and 2) installing the animal waste BMP will reduce pollutants from the lot from reaching the hydrologic system. Feedlots that cannot show impact to the hydrologic system being protected should not be evaluated with this computation. See notes below.

Notes: An animal lot refers to an open lot 01 combination of open lots intended lor confined feeding, breeding, raising or holding animals. It is specifically designed as a confinement area in which manure accumulates or where the concentration of animals is such [hat vegetation cannot be maintained The purpose of these calculations if to represent nitrogen (N), phosphorus [P], and Biological Oxygen Demand [BOD] reductions after an animal waste BMP is installed. This method has two assumptions: 1] the feedlot is Adjacent to a receiuing hydrological system without any buffering areas; and 2] installing the animal waste BMP will reduce pollutants from the lot from reaching the hydrologic system. Feedlots that cannot show impact to the hydrologic system being protected should not be evaluated with this computation.

In the FAQ's section of the STEPL model information it states that the numbers that in the data charts should not be changed and it caution the users. It also states that the model should not be used to set criteria only used as a guide.

You state; "In Appendix D, D-24 4.4.3 These totals were then distributed by the proportion of grazing land within each of the 10 modeled watersheds". If this is the case how can any of the data that is being used give you a true picture or even come close to what is actually in the watershed?

DEQ Response to Comment #24:
The STEPL model was used to broadly identify nutrient source categories and to determine whether the application of common BMPs would cause loading reductions similar to those suggested by target departures. The model results were not used to develop nutrient targets, quantify TMDLs, or quantify individual source allocations. Nutrient targets, TMDLs, allocations, and load reductions were based on a comparison of nutrient chemistry data from listed streams with geographically stratified nutrient reference data.

The modeled estimate of nutrient loading from livestock confinements includes a number of broad assumptions regarding animal numbers, the rate of animal waste generation, the nutrient concentrations in the runoff, and the frequency of clean-out and land application. The description of uncertainty in nutrient TMDLs was expanded to incorporate that associated with estimated animal numbers and their distribution within the planning area.

A field-based inventory that includes survey information from each facility and operational specifications from each owner was not feasible with the personnel, funding and time limitations inherent in the TMDL program. The reality of these limitations is acknowledged in published guidance for nutrient TMDL development that allows for allocations to broad source categories (USEPA 1999).

The small per animal contributions from both swine and sheep to nutrient loading, in turn, translate to small contributions from these animal classes at the planning area scale. Eliminating all swine from the calculations reduces TN loading from livestock by 0.03 percent and reduces TP loading by 0.06 percent. Similarly, eliminating all sheep from the calculations reduces livestock TN and TP loading by 0.4 and 0.2 percent respectively. At the planning area scale, these are not significant contributions to loading from livestock. Again, the uncertainty in livestock numbers and distribution is specifically itemized in **Section 5.7** of the document.

The nutrient load allocations for listed tributaries in the Redwater TPA are to natural background sources and composite agricultural sources. This allocation scheme recognizes the uncertainty in the absolute values from the model for nutrient loading from livestock and cropland sources. The loading analysis broadly concludes that livestock and crop production are nutrient sources that likely affect surface water quality. Excluding either of these sources would not constitute a rational allocation scheme in a predominantly agricultural planning area.

The uncertainty in the loading estimate can be reduced by a comprehensive inventory of the livestock source category throughout the planning area, similar to that suggested in the above comment. The process of adaptive management provides for future loading and allocation adjustments based on a targeted assessment of a subset of livestock confinements and an extrapolation of conditions to similar facilities.

Comment #25:
Page 24; The model calculates the annual nutrient loading for each subbasin based on runoff volume and runoff pollutant concentration as influenced by land cover, soil type, slope and management practices. Runoff volume is estimated from annual precipitation data using the SCS runoff curve number equation. Annual sediment loading from sheet and rill erosion is calculated from the Universal Soil Loss Equation (USLE) and an area-based sediment delivery ratio. Nutrient loads are determined using event mean concentrations developed from the water quality database for the planning area. How can this be determined for such a large area It is very hard to determine slope and runoff on a very small area. And you are taking a whole sub basin watershed of 2.1 million acres.

DEQ Response to Comment #25:
The USLE and runoff curve number equation are applied generally to large subbasins because individual, field-based assessments cannot be applied within the time, funding and staffing constraints inherent in the TMDL program. This type of modeling approach is common for TMDL evaluations throughout the United States and is appropriate for an area like the Redwater.

Comment #26:
How many shallow wells in the watershed that are considered shallow. Was the volume of groundwater actually measured to determine the discharge to a stream? I don't see anywhere in the document the number of springs in the planning area addressed. There are 85 appropriated springs on file in 1971. Sampling that was done in 2003-2004 on Prairie Elk had springs flowinf

into the stream from along the creek banks. They also had algae growing from the source of water. Photos were taken of those springs.

DEQ Response to Comment #26:
There are about 111 wells with water quality data that are less than 150 feet in total depth. In the STEPL modeling exercise, the volume of groundwater discharging to streams is a calculated fraction of precipitation. No loading analysis described in the document included a measured value for groundwater discharge to streams. The flow calibration related to the modeling exercise used gaged flows for several streams (including Prairie Elk Creek) that would have included flows contributed by springs and other groundwater sources. While useful for a field scale loading assessment, measurement of discharges from individual springs would have little advantage in quantifying the groundwater contribution to stream flow at the subbasin scale.

Comment #27:
Page 25 You list BMPs that you have selected that DEQ assumes will help reduce nutrients. Have you talked to any landowners to see if these are already put into place? I know for a fact that landowners already have prescribed grazing in place. Another issue is that I see no reference to continuous cropping or chem.-fallow. There are very few landowners that use crop fallow rotation.

DEQ Response to Comment #27:
The planning area landowners were not surveyed to determine the type and extent of BMP use. The BMP selection in the model was based on field and aerial evidence of current common practices. The differences in nutrient contributions from continuous cropping versus crop-fallow rotations for grain production are not distinguished in the STEPL model framework. The USLE soil parameters are selected to broadly characterize cropland cover conditions and these parameters are the principal drivers of sediment yield that is the major contributor to nutrient loading. The USLE C-factor used in the model for cropland reflects a crop residue level of 750 pounds per acre.

Comment #28:
Page 28 It states; Based on engineering specifications for the new ponds and liners and an assumed effluent TN concentration of 10.6 mg/L, the daily seepage volume from the new system is approximately 40 gallons per day, delivering a small fraction (0.004) of a pound of nitrogen per day to the river. Assuming that the permeability test for the liner material is the actual permeability of the primary cell, detectable TN loading to the river from effluent pond seepage has practically been eliminated by the system upgrade. The only remaining seepage load is associated with sewage sludge disposal at the pond site". Approximately 3,100 tons of sewage sludge that accumulated in the old ponds between 1954 and 2009 has been deposited in the portion of the former two-celled system that is outside of the newly built, three-celled system. The sludge was "bulked up with on-site soils and covered with 3-5 feet of on-site soils as a final cover" (Interstate Engineering 2009). Appendix E contains a third computation page to estimate residual nitrogen loading to the Redwater River from groundwater affected by precipitation infiltration through the buried sludge. This process was permitted by DEQ. Why is that not in this document?

DEQ Response to Comment #28:
Although DEQ reviewed the new lagoon design and was aware of the sludge disposal approach, a formal written permit from DEQ for disposal of the sludge was not a requirement. EPA also was aware of the disposal approach and determined that a formal permit via 503 sludge disposal regulations was not required. Land application based on agronomic rates would have been a preferred alternative for protecting water quality.

Comment #29:
Page 32 Figure 5-8; I would like to see the amount of acres each one of these land uses covers.

DEQ Response to Comment #29:
See response to Comment #21 above.

Comment #30:
Page 33 You state" The results reflect the dominant land area extents of rangeland and cropland in the planning area. The contributions from livestock confinements within the model are driven by the high nutrient concentrations in runoff from these areas rather than the facility acreage." How did you determine that confinements are driven by high nutrient? Did you actually check all of these livestock confinements to see if they were a huge source for nutrients? Then you state "Application of a simple loading model over 2.1 million acres of the Redwater TPA introduces significant uncertainty in the loading estimates. Much of this uncertainty is associated with the assumed uniformity of precipitation patterns, soil conditions, water quality conditions and land management practices over such a large area. Despite its simplicity, STEPL is considered an adequate load allocation tool for the Redwater because it addresses all of the major land use categories in this predominantly agricultural planning area. However, the lack of information on the current extent and location of BMPs on the landscape and the broad application of BMPs through the model make its output for relative source loading more useful than its absolute nutrient loading estimates. Therefore, load allocations are based on the relative source contributions predicted by the model rather than its absolute load values. This has a potential for huge error. Have you not adequately looked into the geology, soils that are huge factor in the landscape that could result from a natural background.

DEQ Response to Comment #30:
The estimates of loading from livestock confinements are driven by the nutrient concentrations in runoff from such facilities. The link between runoff concentrations and loading are built into the model equations. The STEPL model uses literature-based load reduction efficiencies to quantify the reductions associated with BMP implementation.

Because, near-stream livestock confinements are a nationally recognized source of nutrient pollution, they were included in the nutrient source assessment. The modeled estimate of loading from livestock confinements was not used to calculate loading to listed streams. Loading was calculated based on the water quality record and modeled determinations of relative source contributions. Uncertainty in loading estimates is unavoidable. The sources of uncertainty are acknowledged in **Section 5.7** of the document.

Comment #31:
Page 40; You state "The 10 samples collected from 2003 through 2008 (Table 5-5) with TP target exceedences had either no corresponding flow measurements or were collected under non-flowing conditions." Were these samples used?

DEQ Response to Comment #31:
Yes, the growing season water quality data in **Table 5-5** were used to calculate the mean nutrient parameter concentrations that, in turn, were used to estimate loading.

Comment #32:
Page 41,Table 5-24; With all the data that has been collected and all the uncertainly, the percent of reduction that is needed to meet the TMDL my not be accurate or even possible.

DEQ Response to Comment #32:
Questionable accuracy in required loading reductions is addressed through adaptive management, which can include additional water quality sampling and analysis to improve the understanding of source contributions and effects of BMPs. This process consists of implementing the suggested BMPs, evaluating the resultant water quality response relative to the TMDL, and reevaluating both the TMDL and BMP effectiveness if maximum daily loads are being exceeded. Adjustments to initial load reductions or BMP applications are a logical follow-up if targeted growing season monitoring shows that targets are not being met by BMP implementation, or if monitoring results refine our understanding of current and future water quality. DEQ's five-year review process is being developed to facilitate TMDL implementation and adaptive management.

Comment #33:
Page 43 Table 5-25 In order for Nelson Creek to meet the TMDL it needs 2.0 cfs for flow. This is very unrealistic. Have you check the gauging station on Nelson Creek that has been operating for 3 years. It is the Van Norman Gauging Station.

DEQ Response to Comment #33:
The value of two cfs in the table is used as an example flow condition. A stream flow of two cfs is not needed to meet the TMDL. Pollutant loading changes with flow. At any flow rate, TMDLs are met by meeting in-stream nutrient concentrations equal to or less than the nutrient parameter targets.

Comment #34:
Why would you use the gage station from Timber Creek to estimate Horse Creek and Pasture Creek flows. Why not the Redwater or the Vida gage station? Timber Creek is in the Big Dry Creek and start from the Big Dry Creek-Redwater River Divide Basin (Water Survey Resource Report 1971) and Pasture Creek is in the Lower Redwater River Basin (Water Survey Resource Report 1971)Wouldn't it be more accurate to use one in the Redwater Basin? Two different watersheds or basins.

DEQ Response to Comment #34:
The Redwater River is a fourth order perennial stream. Timber Creek, like Horse and Pasture creeks, is an intermittent stream draining an upland watershed in the planning area.

Comment #35:
As it states on page 72 Figure 5-18 shows the load duration curve of the TN TMDL for Pasture Creek, based on Equation 5-1. The mean growing season TN concentration is 1,835 µg/l. Pasture Creek is a sedimentary upland watershed lacking the river breaks topography of Nelson Creek. The flow duration curve shows a short base flow period followed by rapid evaporative dewatering. All current TN loads in the figure are based on samples collected under low flow conditions. When sampling was done in June there were two sample sites. In August there was no water at the one site upstream and an isolated pool at the sample site near the mouth of the Pasture Creek. In fact the site at the mouth of Pasture Creek was a different site for sampling then you previous sampling that took place in June due to no water at the original site. DEQ and the Consultant moved down stream to an isolated pool of water to collect a sample. The training that the District received from DEQ and consultants was that you GPS a site so that you can go back to the same site to keep your sampling consistent to compare to other samples collected at that site. In Table 1.3, Pasture Creek samples; is it listed in the field notes that this is a differenct site from the sample taken in June? Were you measuring groundwater or stangnant surface water? Is this data credible? Technically it should have been noted that it was dry. Other comment is that 2.0 cfs seems unrealistic for Pasture Creek.

DEQ Response to Comment #35
The spatial difference between the sample sites on Pasture Creek in June and August of 2008 for site M48PSTRC01 was about 2,500 feet; the August site collected downstream of the June location. The location adjustment made by the field crew under non-flowing conditions in August were in keeping with the objective of the sampling and analysis plan to characterize impairment determinations and, when possible, bracket potential sources. No significant nutrient sources occur between the June and August locations. Pasture Creek, typical of intermittent prairie streams, becomes a series of isolated pools under dry conditions. In its more gravelly lower reaches, sub-surface flow is likely occurring in the channel alluvium between pools. The sampling of the isolated pool in August simply served to characterize the seasonal water quality and represented no undue bias toward sampling stagnant water in an intermittent stream.

The flow volume of two cfs used in the allocation table for Pasture Creek (**Table 5-25**) is for example purposes only. Any flow that might occur in Pasture Creek during the growing season could be used for TMDL example purposes. The specific daily allocations for nonpoint sources adjust with changes in flow because the nutrient targets are expressed as concentrations.

Comment #36:
Page 45-46 it states "Figure 5-18 shows the duration curve of the TN TMDL for Prairie Elk Creek, based on Equation 5-1. Based on existing data, the mean growing season TN concentration is 1,833 µg/L. The clustering of measured TN loads around the 32nd percentile flow (about 2.0 cfs) puts downward pressure on the growing season mean. This is offset by several extremely high loads measured during common summer storm events.

Figure 5-19 shows the load duration curve for the TP TMDL based on Equation 5-2 and measured growing season TP loads based on existing data with corresponding flow measurements. As with TN, measured data are clustered along the dry conditions portion of the curve. All loads measured under high flow conditions are greater than the TMDL. The mean growing season TP concentration is 549 µg/L."

Isn't this consider to be standard since when these creek are stagnant and there has been drought and no runoff I would think common sense would say high flow during storm events would exceed the TMDL because the creeks haven't been flushed out for sometime.

DEQ Response to Comment #36:
The large number of results at flows between 0.5 and 1.0 cfs is due, in large part, to the larger number of samples collected between mid-July and mid-September when low flow conditions prevail. The comment assumes that target exceedences result from either evaporative concentration or the flushing of evaporative concentrations during flushing flows. Plausible alternative explanations for target exceedences are that runoff from uplands actually contains TN and TP concentrations that exceed the targets, or that a combination of evaporation, flush loading and runoff target exceedences cause excess loading. Given the large stream lengths in the planning area, elevated concentrations in high flows may be strongly linked to controllable nutrient loading occurring at lower flows or periodic high flow loads that have settled in channel pools.

The reference datasets, that are the basis for ecoregional nutrient targets, are based on sample results over a range of flow conditions. Approximately 50 percent of samples from reference prairie streams were collected from isolated channel pools under non-flowing conditions. Despite this notable proportion of reference stream results from non-flowing channel pools, the mean TN concentration in Prairie Elk Creek exceeds the 1,120 µg/L target by over 60 percent; the mean TP concentration in Prairie Elk Creek exceeds the 150 µg/L TP target by several hundred percent. Under these circumstances, it is reasonable to assume that some upland loading reductions are possible.

Comment #37:
Page 47; You have less flow for Prairie Elk Creek than Pasture and Nelson Creek. Pasture Creek is more of ephemeral stream then Prairie Elk. Prairie Elk at the bottom end usually flow year round.

DEQ Response to Comment #37:
The load duration curves for Prairie Elk Creek (**Section 5.6.8**), show *greater* flows than those for either Nelson Creek (**Section 5.6.6**), or Pasture Creek (**Section 5.6.7**).

Comment #38:
Page 54-55 You state " At a flow rate of 0.1 cfs, the mean daily TN load from Horse Creek is 2.05 lbs/day (Table 5-24). This load, added to 3.09 lbs/day calculated for MCNREDW-03 at 0.335 cfs, should result in a loading rate of 5.14 lbs/day (2.05+3.09) in the Redwater River flowing at 0.435 cfs (0.1+0.335) downstream of Horse Creek. The combined TN load of 5.14 lbs/day is only 63 percent of the 8.16 lbs/day calculated from the 3,472 µg/L mean TN

concentration at MCNREDW-04 multiplied by the combined flow of 0.435 cfs. Therefore, 37 percent of the TN loading at MCNREDW-04 remains unaccounted for after Horse Creek loading is added to loading from the Redwater River above Horse Creek.

Pages 56-57; states "The nutrient loading analysis in Sections 5.6.9.1-3 documents increasing downstream concentrations of both TN and TP from the upper to the lower end of the listed river segment. The magnitude of potential agricultural loading adjacent to the eight-mile length of the listed segment is assumed small compared to that from the 550 square miles of watershed area upstream of the segment. Loading from agricultural sources in the upper watershed is accounted for in the water quality monitoring records of sites MCNEDW-01, MCNEDW-02 and 06177500. It is reasonable to assume that the 40 percent increase in TN loading and the more than doubling of the TP loading along the 1.4 mile reach between station 06177500 and site MCNREDW-03 are mainly from seepage from past operations of the Circle WWTP pond system."

Have you taken any consideration of the household septic systems that are not on city sewer or out of the city limits along Horse Creek as a source? Or the storm drains that drain to Horse Creek. There are also household septic systems upstream from sample site MCNREDW-03 in the 8 miles of Redwater above the lagoon. Has any consideration been taken as far as fertilizer that residents put on their lawns that could enter the storm drain during runoff. Did you know that there is a bigger source of nutrients from fertilizer applied to golf courses then applied to agricultural lands?

DEQ Response to Comment #38:
The wording in **Section 5.6.9.4** describing the discrepancy identified above has been changed to attribute the unexplained nutrient increases within the listed reach of the Redwater River to unspecified human-caused loading. The corresponding column heading in the allocation table (**Table 5-28**) has been changed to read "Combined Domestic and Agricultural LA". If the source of the unexplained increase was exclusively single family dwellings, the three pound difference in daily TN loading would require about 90 homes discharging a waste stream about twice the strength of the Circle WWTP effluent. It is unlikely that storm water nutrient loading to either the listed Redwater River reach or lower Horse Creek is reflected in the growing season data records for these two streams since storms discharges were not encountered during growing season sampling events. Lawn fertilizers are a recognized source of nutrient loading to groundwater but probably represent a minor contribution in a setting containing a 20-acre wastewater pond with excessive leakage for 55 years and a domestic sewage collection system with acknowledged deteriorating segments. The unexplained source is more likely a combination of individual septics, deteriorating segments of the municipal collection system, local livestock sources, and past seepage from the Circle WWTP pond system. The language regarding unknown sources reflects the contribution from a combination of sources.

Comment #39:
Page 59-61 where and when were these samples taken and was there flow ?There is nothing on the tables that indicate time of year flow etc.

DEQ Response to Comment #39:
The tables on pages **Sections 5.6.10** and **5.6.11** are loading and allocation tables for Sand and Timber creeks. They present loading conditions under example flow conditions with the mean TN and TP concentrations from the datasets for these streams and the target TN and TP concentrations. The entries in the tables do not represent individual sampling events.

Comment #40:
Page 62; States" Approximately 87 percent of the Timber Creek watershed is native rangeland where livestock grazing is the predominant land use. Annual, near-stream livestock grazing, during extended periods of high temperatures and minimal surface flows, is a conceivable source of elevated phosphorus loading to pooled channels of intermittent streams. Grazing patterns that reduce hot weather livestock access to intermittent channels may help prevent sporadic TP loading that exceeds the allocation. Although target exceedences are uncommon, focused reductions are needed to consistently meet the TMDL." Have you taken in to consideration the rest area as a source of nutrients?

DEQ Response to Comment #40:
See response to Comment #18 above.

Comment #41:
Under Section 5.6 There was a sample taken on Horse Creek and Redwater during a major storm event that flooded the flat on Horse Creek. I did not see that sample referenced. The District did comment about this sampling that did take place in June earlier in the process. The sample was taken June 5, 2005. Then the district was told the growing season is mid June to September. Throughout the document it states June -September for the growing season. How is it that the document can change to fit the criteria to apply only to samples that were taken in mid June?

DEQ Response to Comment #41
The Horse Creek and Redwater River samples collected during high flow in 2005 were collected on June 7th at sites MCNREDW-04, MCNREDW-1-8, MCNREDW-2A and MCNHORC-05. They are contained in **Appendix B**, **Table 1.3** of the document.

The growing season assumed in the document is mid-June through September. The references to the "June-September" growing season length in **Sections 5.6.3**, **5.6.9.4**, and **5.8** have been edited to read "mid-June" through September. The "June through September" growing season length was specified by Suplee (2010). The DEQ continues to refine the algae growing season length applicable to prairie streams. The mid-June through September timeframe in applied in the Redwater River TMDL document.

Comment #42:
Other comments You state that DEQ has developed recommendations for numeric standards and anticipates a formal rule making process for adoption of numeric standards in the near future. The process includes a statutory requirement to accept public comment on proposed standards. Depending on the outcome of standards adoption, the targets presented in Table 5-3 may be

revised. The revisions may, in turn, require adjustments to the TMDLs and allocations in Section 5.6.

This is very troublesome. Just like the assessments that were done by DEQ in the early phase of the Clean Water Act or the TMDL process; Some of the assessments have errors and a lot of professional judgment calls and the stream was listed impaired. Some creeks had only one sample taken with a reading that exceed the clean water standards without any scientific facts to see what actually could be the problem. It seems like the standard practice is to set a number right or wrong then we will look at it later to see if it's right. Then we are set with a numbers that never seems to get changed due to lack of funds and personnel. What if the number that is set is too high or too low? Nelson Creek is a good example with one bad sample. If the process was done properly the first time then we would have credible data.

DEQ Response to Comment #42

The current protocol for nutrient impairment listings is contained in the reference by Suplee and Sada de Suplee (2010) entitled *Guidance Document: Assessment Methodology for Determining Wadeable Stream Impairment due to Excess Nutrients (Nitrogen and Phosphorus). Draft. Montana Department of Environmental Quality, Water Quality Planning Bureau*. Standards development is, by necessity, an evolving process influenced by changes in analytical methods and our understanding of the effects of in-stream nutrient concentrations on growth of aquatic organisms. Significant investigations have occurred over the past decade to better refine water quality criteria for nutrients in Montana's wadeable streams. Adjustments to recommend criteria can be interpreted as logical outcomes of an investigative process that improves our understanding of nutrients aquatic systems, rather than as a randomly changing selection of values. Aside from the peculiar timing of the NO_{2+3}-N impairment on East Redwater Creek and the development of ecoregion specific NO_{2+3}-N criteria, there have been no nutrient impairment determinations in the Redwater planning area that have been based on a single sample result. The Nelson Creek data record (**Table 5-7**) contains several target exceedences for each of the three nutrient parameters.

Comment #43:

As with any empirical model applied at the scale of the Redwater TPA, a number of assumptions are required to simplify the range of existing conditions that affect nutrient loading. The following are among the most notable simplifying assumptions that introduce uncertainty in the modeled loading estimates:

I was in a workshop several years back when DEQ had an employee talking about modeling to help determining the affects of runoff etc. I remember that they were looking at a stretch of the Tongue River and the Yellowstone. The model wasn't working the way it should because one area they had 2 inches of rainfall while just 1-2 miles away they had very little rain if any and wasn't give an accurate picture. Just like any modeling it was never intended to be precise. What data you enter into any modeling tool can make a huge difference. If this is to be done right and with the best data available you need to ground truth every reach of each creek in the TMDL planning area. There are so many variables that come into play. The McCone CD took on task in 1998 to assess the whole length of the Redwater (168 miles) with several partners including

DEQ, NRCS, FW&P and landowners. The whole Redwater was listed and after taking the time and effort to ground truth the entire reaches, parts that were listed impaired were not impaired.

DEQ Response to Comment #43
All empirical models have limitations similar to those listed in the uncertainty discussion in **Sections 5.7** and **6.8**. While the results of field scale assessments may more accurately describe current stream conditions, they have limited utility for an assessment program that is large in scale, has legal time constraints, limited funding, and requires numeric estimates of loading from significant, discrete sources. Because of these logistical constraints, nearly all TMDLs are based on modeled or extrapolated conditions. Numeric modeling is a means of applying a broad understanding of the relationships between climate, hydrology, land characteristics and pollutant loading to a localized set of environmental conditions. Due to the scale of TMDL planning areas, modeling exercises are a realistic approach to loading analysis. The improved accuracy of a well-designed field scale assessment, applied through the process of adaptive management, can be used to fine tuning the results of a broader analytical approach. We encourage data collection and analysis in combination with an evaluation of where BMPs are and are not being implemented to help provide a more detailed view of water quality and potential activities impacting water quality.

Comment #44:
Page 90 Table 5-31;1 don't believe the STEPL model was intended to set target departures. Some of the reduction percentages are very high. What if the percentages cannot be achieved due to more of a natural component?

DEQ Response to Comment #44
The STEPL model was not used to set target departures. The comparison in **Table 5-31** is of percent reductions determined from the data record versus those suggested by the application of BMPs through the model. Adjustment in the load reduction percentages may be appropriate where all reasonable land, soil and water conservation practices have been applied for a sufficient duration without significant reductions in human caused loading.

Comment #45:
Appendix D-37 The District questions the number of rain days and the average rain event. According to the STEPL model the data was collected from the Glasgow Air Base Station. The District contacted the NOAA/NWS weather station in Glasgow. They found it hard to believe that that folks running the model are not using the National Climate Data Center normals. This is the official database can't imagine why they would use anything else. This is just another example of how data can be flawed by using a model with default data set in the model.

DEQ Response to Comment #45
The average value of a meteorological element over 30 years is defined by the National Oceanic and Atmospheric Association as a climatological normal. The normal climate parameters include temporal temperature, precipitation and heating and cooling degree-day averages. They do not include parameters specifying number of rain days or values for average number of rain events (a rainfall that results in runoff). Meteorological data from weather stations within the planning area, rather than model default values, were used to specify mean annual rainfall for modeled

subbasins. Number of rain days and values for average number of rain events were generated from the Glasgow database because such parameters cannot be generated for all existing weather stations. Glasgow was the closest station with a daily data record capable of generating values for these parameters. In other words, the data used was the data available.

Comment #46:
Page 109 second paragraph need to change 21 month fallow period to 19-21 months.

DEQ Response to Comment #46
This comment was addressed in response to stakeholder review. The length the fallow period is described as ranging from 19 to 21 months.

Comment #47:
Table 6-11 Under the table is list other assumptions and states Most tilled cropland is managed in a crop-fallow rotation. Even if this is the case the producers have to leave a certain amount of residue on the land to be in compliance with their conservation plan. Have considered any of this data in your TMDL data?

It seems that DEQ is assuming that everything has a recharge area or that the cropping practices are the main problem. That is not always true in the watershed. There are some area landowners that though they had a saline seep and found out there was no recharge area. It was just a saline area. The McCone County Resource Survey Report data states several times where there is poorly drained floodplains and saline and alkali soils that are in the TMDL planning area.

Prairie Elk Creek watershed is alluvial soil in the upper drainage is generally light textured and free of saline salts. However, there are numerous areas of high saline soil in portions of the area. The lower part of Prairie Elk is in the Bearpaw shale soils formed from the shale parent material are high in exchangeable sodium, and also saline salts.

In the Big Dry Creek Basin Nelson Creek and Timber Creek drain into the Big Dry Creek Arm of the Fort Peck Reservoir. The geologic formations are stratified sandstones and shale-capped buttes and ridges on the upper divides. The erosion of the predominantly shale formations has deposited highly saline, sodium alluvium into the stream valleys. The soils formed from this alluvium are heavy textured,highly saline and unfit for any consideration of irrigation. (McCone County Water Resource Survey 1971) It seems that maybe there could be more of a natural component of high TDS and salinity in the planning area.

DEQ Response to Comment #47
The estimate of the area contributing to agricultural contributions to salinity is based on broad land cover classification categories that may include other than the crop-fallow rotation. This source of error, and that associated with the landscape scale, versus field scale, approach to estimating loading is acknowledged in the discussion of uncertainty in **Section 6.8.2**. Inherently broad approaches to load estimation are commonly used where temporal and financial limitations restrict the level of analytical complexity.

The low flow TDS target of 3,332 mg/L is intended to represent loading from a landscape dominated by native rangeland cover underlain by salt laden stratigraphy. At low flow conditions, loading with TDS concentrations at or below the target are considered as naturally occurring levels. At these concentrations, naturally occurring sources contribute tons of dissolved solids to surface waters each day. Therefore, the salinity loading analysis identifies a significant natural salt load in each of the salinity listed segments.

Comment #48:

In Appendix B; Why are there no field meter readings listed for the samples that were collected in 2003, 2004 and 2005. They are listed for the samples collected in June and August of 2008 by DEQ. The samples collected in 2003,04 and 05 followed the proper protocol for DEQ. In fact DEQ trained the District and helped with some of the sampling. The District bought high quality equipment through 319 grants to assure that the data collected was credible and spent several days and hours to collect data to help with the TMDL process. All of the data was entered into the WEBSIM STORET data base for DEQ as part of the grant requirements.

DEQ Response to Comment #48

Appendix B, **Table 1.3** has been edited to include the field meter readings.

Comment #49:

DEQ reference's Suplee's Wadeable Stream and Rivers 2008. Under the nutrient criteria It states that a 12 sample minimum is recommended. Some of the reference streams in this report do not have 12 samples and DEQ does not have 12 samples on the creeks in the planning area. This section also talks more about nutrient criteria wastewater treatment. How does this apply to prairie streams?

Most of the reference streams listed in Suplee's report originate from the mountains and then flow to prairie streams. The creeks that are in the planning area do not originate from the mountains. Also the reference streams are all in a glaciated region. How can this data be reference materials for creeks in the Redwater TMDL planning area?

DEQ Response to Comment #49

Although the 12 sample minimum is recommended, both the binomial test and the t-test statistical tools used by DEQ to determine impairment can be used with fewer samples to draw impairment conclusions based on number and magnitude of exceedences.

The effects of point source discharges from wastewater treatment facilities are not unique to mountain and foothill streams. An example is the suite of wastewater issues related to the Circle wastewater treatment plant in the Redwater River planning area.

Approximately 50 percent of the planning area is within the glaciated region. The uncertainty in extrapolating conditions from the reference prairie streams to the unglaciated portions of the planning area is compensated by use of a lower (75^{th}) percentile of the reference dataset. The streams in the two broad ecoregions have many similarities such as similar climate, common intermittent flows, low stream gradients, fine textured substrate materials, and support of warm water fisheries and associated aquatic life.

Comment #50:

Page 88 Section 5.7 With all the assumptions and uncertainties in the accuracy of field data, source assessments methods, loading calculations and the uncertainty in the model loading estimates in the TMDL document.; Do you know if the reduction percentage of TP and TN are possible. If BMP's suggested will work or maybe are already in place. DEQ talks about adaptive management. Who is going to pay for this continued monitoring and collecting accurate data? During the public meeting it was addressed that DEQ just needs to get the TMDL plan done. As professional government entity every effort should be made to produce a high quality document.

Past history shows that once something is put into place and TMDL standards are set based on professional judgment or windshield assessments, you are stuck with these TMDL's. It is too costly to start over. Funds and personnel are usually a factor. This is a huge waste of tax payer's money. There has already been thousands of dollars spent on the Redwater planning area since 1998. The District has always taken a proactive approach since the TMDL process started. The District takes great pride in putting sound conservation practices on the ground and protecting our natural resources. We have stressed numerous times the need to produce high quality and accurate information yet we continue to go down the road of assumptions and uncertainty.

DEQ Response to Comment #50

Refer to the response to Comment #44 above regarding the level of uncertainty and the use of assumptions in developing loads and allocations. **Table 5-31** contains a comparison of the nutrient reductions suggested by the data record with those derived by applying BMPs in the STEPL model framework. While noted differences exist for the listed segment of the Redwater River and Horse Creek, there is reasonably good agreement between the two modes of quantifying reductions. Reduction percentages in the range of from 30 to 50 percent are not inherently unreasonable for agricultural operations.

Comment #51:

The data in the study is not scientifically sound. The number of livestock confinement operations is incorrect. Using averages to apply limits to a large area is not fair to specific areas. The growing season is too narrow; should be April 10th to October 15th. The methods and science is too weak. The number of samples are two limited to make comparisons. Targets based on sites north of the Missouri do not reflect local soils. Dry season samples and old data are used as baseline.

DEQ Response to Comment #51

The water quality data were collected according to sampling and analysis protocols in place at the time. When issues with laboratory interference came to light, methods were adjusted and additional field work was completed. The correct number of livestock confinement operations is currently and will probably remain a moving target. The limited GIS-based inventory has correctly concluded that these facilities, whatever the exact number, are a justifiable component of a broad agricultural nutrient load allocation. The growing season dates are geared to bracketing the sunlight and temperature conditions that produce aquatic plant growth that could be a threat to beneficial uses. They do not necessarily correspond to crop growing seasons that may be longer. As in the case of loading from the municipal sewage source, where early season loading patterns could result in later damage to aquatic life and fishery uses, the loading allocation was protectively applied a month prior to the growing season.

The diffuse nature of nonpoint sources of pollutants along with climatic variability, the variety of land management practices, the effects of crop type, soil variables, ground cover conditions and flow path characteristics creates a great degree of uncertainty in estimating loading and measuring the effects of applied BMPs. Strategies for reducing uncertainty include measuring, modeling or estimating BMP effectiveness. Lacking detailed measurements of BMP effectiveness in the planning area, modeling and literature-based estimates of effectiveness were used to estimate possible loading reductions.

See the response to Comment #49 regarding the applicability of data collected north of the Missouri River. See the response to Comment #36 above regarding sampling from channel pools under low flow conditions.

Comment #52:
We think that DEQ should do more testing and use test that were done with this years samples and not 2008. As for the lagoon in circle it hasn't even been tested since the new one was put in we feel like you are just trying to get this done without a good study or testing so you meet your deadline and you could care less how it is going to effect the people that live here and ranch and farm.

DEQ Response to Comment #52
The samples collected during the 2008 field work were helpful in both validating impairment listings and sorting out the source contributions within the listed reach of the Redwater River. However, future monitoring of the Circle pond system performance will be needed to verify the assumptions in the analysis about loading from the ponds, sludge disposal area and uncontrolled sewage sources in the Circle area. The degree to which the loading conclusions in the document affect local residents and agricultural producers depends on how they voluntarily wish to proceed to both carry out additional monitoring and apply land management practices that reduce nutrient and dissolved solids loading.